NAVAIR 01-45HHB-1

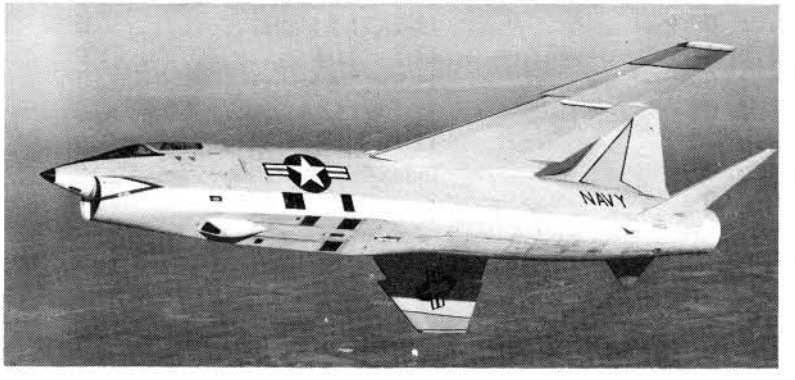
NATOPS FLIGHT MANUAL

NAVY MODEL

RF-8G

AIRCRAFT

THIS PUBLICATION IS INCOMPLETE WITHOUT SUPPLEMENTAL NATOPS FLIGHT MANUAL NAVAIR 01-45HHB-1A



ISSUED BY AUTHORITY OF THE CHIEF OF NAVAL OPERATIONS
AND UNDER THE DIRECTION OF COMMANDER,
NAVAL AIR SYSTEMS COMMAND

1 SEPTEMBER 1978

AIRCRAFT 1
INDOCTRI-NATION 2
NORMAL PROCD 3
FLT PROCD & CHARAC 4
EMER PROCD 5
ALL-WTHR OPERATION 6
COMMUNI-CATIONS 7
RECON SYSTEMS 8
FLT CREW COORD 9
NATOPS EVAL 10
PERFORM DATA 11

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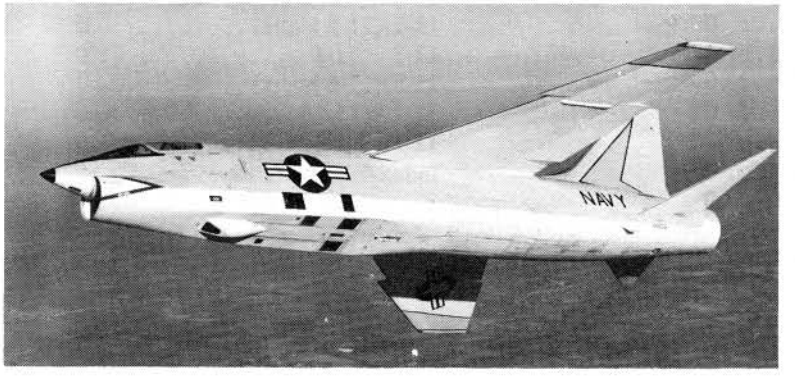

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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 502, CONSISTING OF THE FOLLOWING:

Page No.	*Issue*	*Page No.*	*Issue*
Title	0	5-47/(5-48 blank)	0
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B/(C blank)	0	5-65/(5-66 blank)	0
Letter of Promulgation (Reverse Blank)	0	6-1/(6-2 blank)	0
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1-1 — 1-8	0	6-13/(6-14 blank)	0
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4-1 — 4-32	0	11-3 — 11-4	0
4-33/(4-34 blank)	0	11-5/(11-6 blank)	0
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*The asterisk indicates pages changed, added, or deleted by the current change.

INTERIM CHANGE SUMMARY

The following Interim Changes have been canceled or previously incorporated in this manual:

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
1 through 39	Previously incorporated or canceled.

The following Interim Changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE
40	Afterburner use for launches
41	Blown tire procedures

Interim Changes Outstanding - To be maintained by the custodian of this manual:

INTERIM CHANGE NUMBER	ORIGINATOR/DATE (or DATE/TIME GROUP)	PAGES AFFECTED	REMARKS/PURPOSE

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

1 September 1978

LETTER OF PROMULGATION

1. The Naval Air Training and Operating Procedures Standardization Program (NATOPS) is a positive approach toward improving combat readiness and achieving a substantial reduction in the aircraft accident rate. Standardization, based on professional knowledge and experience, provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative, but rather to aid the Commanding Officer in increasing his unit's combat potential without reducing his command prestige or responsibility.

2. This manual standardizes ground and flight procedures but does not include tactical doctrine. Compliance with the stipulated manual procedure is mandatory except as authorized herein. In order to remain effective, NATOPS must be dynamic and stimulate rather than suppress individual thinking. Since aviation is a continuing, progressive profession, it is both desirable and necessary that new ideas and new techniques be expeditiously evaluated and incorporated if proven to be sound. To this end, Commanding Officers of aviation units are authorized to modify procedures contained herein, in accordance with the waiver provisions established by OPNAVINST 3510.9 series, for the purpose of assessing new ideas prior to initiating recommendations for permanent changes. This manual is prepared and kept current by the users in order to achieve maximum readiness and safety in the most efficient and economical manner. Should conflict exist between the training and operating procedures found in this manual and those found in other publications, this manual will govern.

3. Checklists and other pertinent extracts from this publication necessary to normal operations and training should be made and may be carried in Naval Aircraft for use therein. It is forbidden to make copies of this entire publication or major portions thereof without specific authority of the Chief of Naval Operations.

F.C. Turner

F.C. TURNER
Vice Admiral, USN
Deputy Chief of Naval Operations
(Air Warfare)

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FOREWORD

SCOPE

The NATOPS Flight Manual is issued by the authority of the Chief of Naval Operations and under the direction of Commander, Naval Air Systems Command in conjunction with the Naval Air Training and Operating Procedures Standardization (NATOPS) Program. This manual contains information on all aircraft systems, performance data, and operating procedures required for safe and effective operations. However, it is not a substitute for sound judgement. Compound emergencies, available facilities, adverse weather or terrain, or considerations affecting the lives and property of others may require modification of the procedures contained herein. Read this manual from cover to cover. It's your responsibility to have a complete knowledge of its contents.

APPLICABLE PUBLICATIONS

The following applicable publications complement this manual:

NAVAIR 01-45HHB-1B Pilot's Pocket Checklist

NAVAIR 01-HHB-1F Functional Checkflight Checklist

NAVAIR 01-HHB-1A Supplemental NATOPS Flight Manual

NAVAIR 01-45HHA-1T Tactical Manual (U) (Confidential)

NAVAIR 01-45HHA-1T (A) Tactical Manual (U) (Secret)

HOW TO GET COPIES

Each flight crewmember is entitled to personal copies of the NATOPS Flight Manual and appropriate applicable publications.

Automatic Distribution

To receive future changes and revisions to this manual or any other NAVAIR aeronautical publication automatically, a unit must be established on an automatic distribution list maintained by the Naval Air Technical Services Facility (NATSF). To become established on the list or to change existing NAVAIR publication requirements, a unit must submit the appropriate tables from NAVAIR 00-25DRT-1 (Naval Aeronautic Publications Automatic Distribution Requirement Tables) to NATSF, Code 321, 700 Robbins Avenue Philadelphia, PA 19111. Publication requirements should be reviewed periodically and each time requirements change, a new NAVAIR 00-25DRT-1 should be submitted. NAVAIR 00-25DRT-1 only provides for future issues of basic, changes, or revisions and will not generate supply action for the issuance of publications from stock. For additional instructions, refer to NAVAIRINST 5605.4 series and Introduction to Navy Stocklist of Publications and Forms NAVSUP Publication 2002 (S/N 0535-LP-004-0001).

Additional Copies

Additional copies of this manual and changes thereto may be procured by submitting DD Form 1348 to NAVPUBFORMCEN Philadelphia in accordance with Introduction to Navy Stocklist of Publications and Forms NAVSUP Publication 2002.

UPDATING THE MANUAL

To ensure that the manual contains the latest procedures and information, NATOPS review conferences are held in accordance with OPNAVINST 3510.9 series.

CHANGE RECOMMENDATIONS

Recommended changes to this manual or other NATOPS publications may be submitted by anyone in accordance with OPNAVINST 3510.9 series.

Routine change recommendations are submitted directly to the Model Manager on OPNAV Form 3500-22 shown on the next page. The address of the Model Manager of this aircraft is:

Light Photographic Squadron 63
Naval Air Station
Miramar, California 92145
AUTOVON telephone 959-3560

NATOPS/TACTICAL CHANGE RECOMMENDATION
OPNAV FORM 3500/22 (5-69) 0107-722-2002

DATE

TO BE FILLED IN BY ORIGINATOR AND FORWARDED TO MODEL MANAGER

FROM (originator) | Unit

TO (Model Manager) | Unit

Complete Name of Manual/Checklist	Revision Date	Change Date	Section/Chapter	Page	Paragraph

Recommendation (be specific)

☐ CHECK IF CONTINUED ON BACK

Justification

Signature	Rank	Title

Address of Unit or Command

TO BE FILLED IN BY MODEL MANAGER *(Return to Originator)*

FROM | DATE

TO

REFERENCE
(a) Your Change Recommendation Dated _____

☐ Your change recommendation dated _____ is acknowledged. It will be held for action of the review conference planned for _____ to be held at _____

☐ Your change recommendation is reclassified URGENT and forwarded for approval to _____ by my DTG _____.

/S/ _____ MODEL MANAGER. | _____ AIRCRAFT

Change recommendations of an URGENT nature (safety of flight, etc.,) should be submitted directly to the NATOPS Advisory Group Member in the chain of command by priority message.

YOUR RESPONSIBILITY

NATOPS Flight Manuals are kept current through an active manual change program. Any corrections, additions, or constructive suggestions for improvement of its content should be submitted by routine or urgent change recommendation, as appropriate, at once.

NATOPS FLIGHT MANUAL INTERIM CHANGES

Flight Manual Interim Changes are changes or corrections to the NATOPS Flight Manuals promulgated by CNO or NAVAIRSYSCOM. Interim Changes are issued either as printed pages, or as a naval message. The Interim Change Summary page is provided as a record of all interim changes. Upon receipt of a change or revision, the custodian of the manual should check the updated Interim Change Summary to ascertain that all outstanding interim changes have been either incorporated or canceled; those not incorporated shall be recorded as outstanding in the section provided.

CHANGE SYMBOLS

NEW NEW NEW

Revised text is indicated by a black vertical line in either margin of the page, adjacent to the affected text, like the one printed next to this paragraph. The change symbol identifies the addition of either new information, a changed procedure, the correction of an error, or a rephrasing of the previous material.

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to "WARNINGS", "CAUTIONS", and "NOTES" found through the manual.

WARNING

An operating procedure, practice, or condition, etc., which may result in injury or death if not carefully observed or followed.

CAUTION

An operating procedure, practice, or condition, etc., which may result in damage to equipment if not carefully observed or followed.

Note

An operating procedure, practice, or condition, etc., which is essential to emphasize.

WORDING

The concept of word usage and intended meaning which has been adhered to in preparing this Manual is as follows:

"Shall" has been used only when application of a procedure is mandatory.

"Should" has been used only when application of a procedure is recommended.

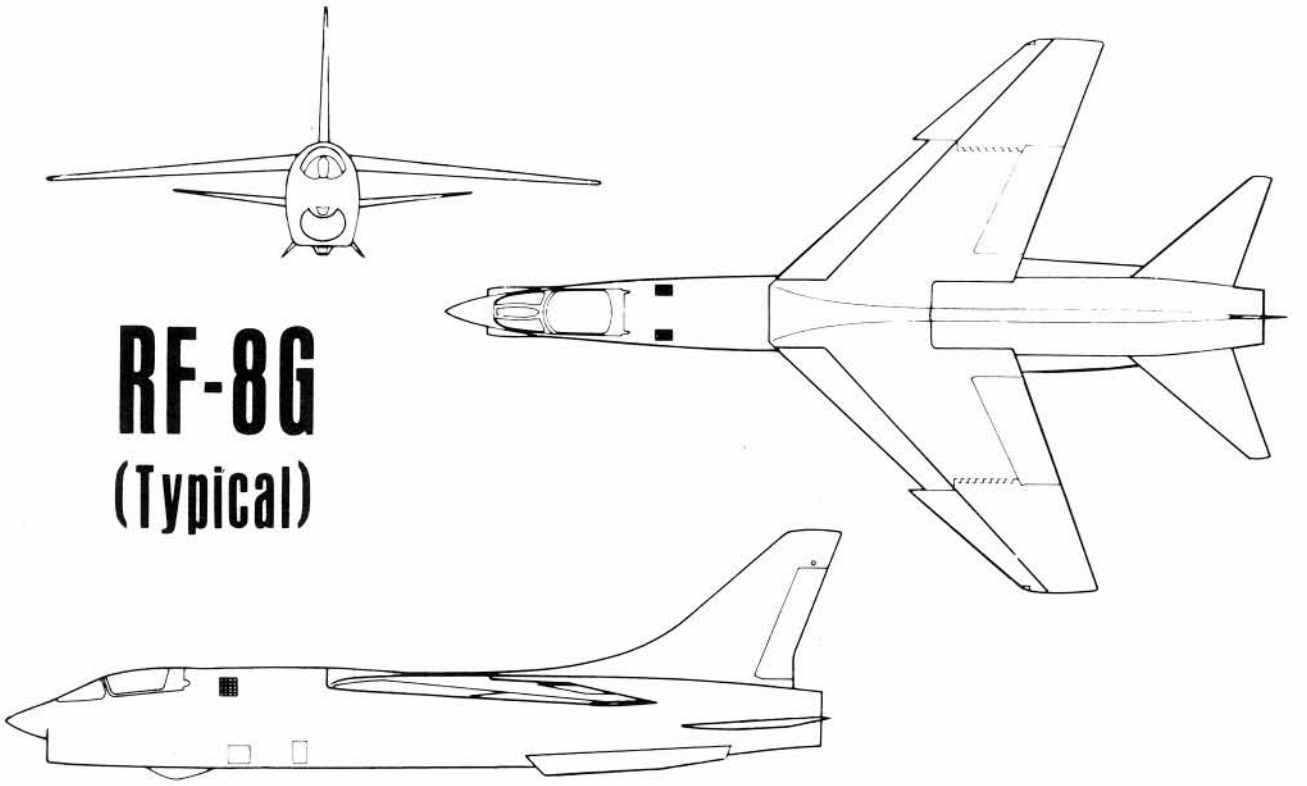
"May" and "need not" have been used only when application of a procedure is optional.

"Will" has been used only to indicated futurity, never to indicate any degree of requirement for application of a procedure.

LIST OF APPLICABLE CHANGE DIRECTIVES

Following is a list of change directives which apply to this manual but which may not be incorporated in the aircraft. The change directive is briefly described and, where applicable, information is given for visual determination of incorporation.

Type Change and Change Number	*Description*	*Visual Identification*
Airframe Change 472	Replacement of AN/APR-25 and AN/APR-27 with the AN/ALR-45 vector warning receiving system and AN/ALR-50 alert system.	Presence of modified antenna radome assembly on vertical stabilizer.
Airframe Change 592	Correction of out-of-phase indications between vertical speed indicator and altimeter at transonic speeds.	By reference to logbook entry.
Airframe Change 596	Reinforcement of arresting gear support structure to extend service life.	By reference to logbook entry.
Airframe Change 598	Replacement of AN/ALQ-100 with the AN/ALQ-126 defense electronic countermeasures system.	Presence of antenna on lower intake duct lip area.
Airframe Change 599	Replacement of AN/APR-30 and AN/APR-27 with the AN/ALR-45 vector warning receiving system and AN/ALR-50 launch alert system.	Presence of modified antenna radome assembly on vertical stabilizer.
Airframe Change 606	KA-66A camera automatic mode shift improvement.	By reference to logbook entry.
Airframe Change 609	Modification of AIMS pitot-static L-probe heater circuit to lower operating temperature and extend probe life.	By reference to logbook entry.
Airframe Change 610	Installation of KS-87B camera system into camera stations 3 and 4.	Presence of KS-87B signal converter units P/N 23HI799-1 in camera stations 2 R-H and 2 L-H.
Airframe Change 612	Relocation of AN/ALR-45 azimuth display indicator into instrument panel.	Presence of azimuth display indicator in R-H instrument panel.
Airframe Change 613	Rewire/improvement modification.	Reconfigured R-H cockpit control console.
Airframe Change 614	TTRI exhaust gas temperature indicator power source relocation to emergency ac bus.	By reference to logbook entry.
Aircrew Systems Change 384	Modification of Martin-Baker Ejection Seat Drogue Gun.	By reference to logbook entry.



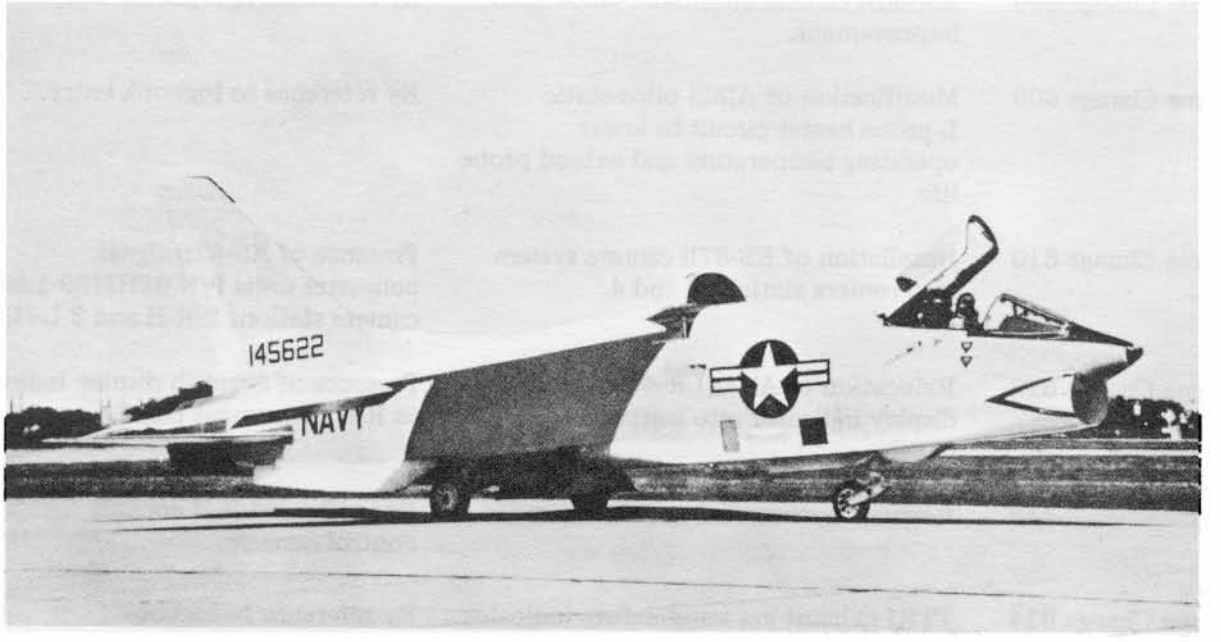


Figure 1–1

section I
aircraft

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PART 1—AIRCRAFT AND ENGINE

AIRCRAFT

Note

Throughout this manual, Block I RF-8G aircraft effectivity statements refer to the following bureau serial numbers:

144615	145631	145647	146882
144617	145633	146835	146883
144618	145639	146838	146889
145608	145641	146855	146897
145609	145645	146856	146898
145625	145646	146863	146901

Block II RF-8G aircraft effectivity statements refer to aircraft modified from the following bureau serial numbers:

144607	145622	145635	146860
144614	145623	146845	146865
145607	145627	146858	

References to aircraft without Block identification refer to all RF-8G aircraft.

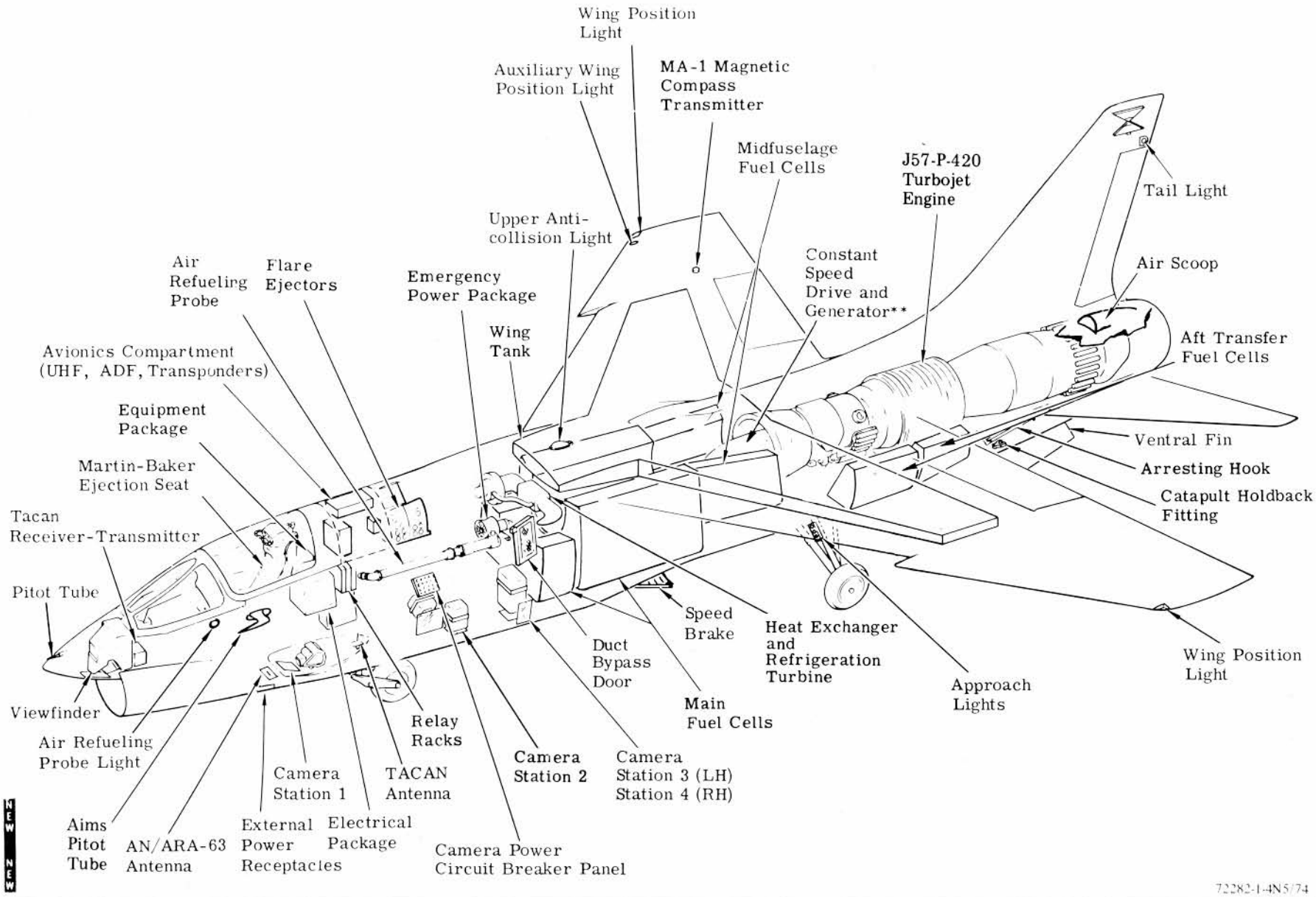
DESCRIPTION

The RF-8G is a single-place, carrier- or land-based supersonic aircraft equipped with photographic equipment to provide the capability of performing both day and night photographic missions.

The aircraft (figure 1–1) is identified by a long slender fuselage with a large air intake duct and a camera station "blister" mounted under the nose section. A thin, swept-back, two-position wing is mounted high on the fuselage and is raised for takeoff and landing. The wing contains an integral fuel cell, and incorporates flaps, ailerons (which also serve as flaps when the wing is raised) and a full-span leading edge droop. The entire horizontal tail moves as a unit to provide elevator control. A single, large speed brake is mounted on the fuselage underside just forward of the main landing gear. Figure 1–2 presents the general arrangement of the aircraft.

The arrangement of the RF-8G cockpit instrument board and consoles is illustrated in figures 1–3 through 1–5.

On Block I RF-8G airplanes with AFC 499 and Block II RF-8G airplanes, provisions are made for the installation of armor plating in the nose bulkhead area, cockpit area, engine gear box and accessory area, and around power control units in the empennage and wing.



NEW NEW

Figure 1–2

PRINCIPAL DIMENSIONS AND WEIGHT

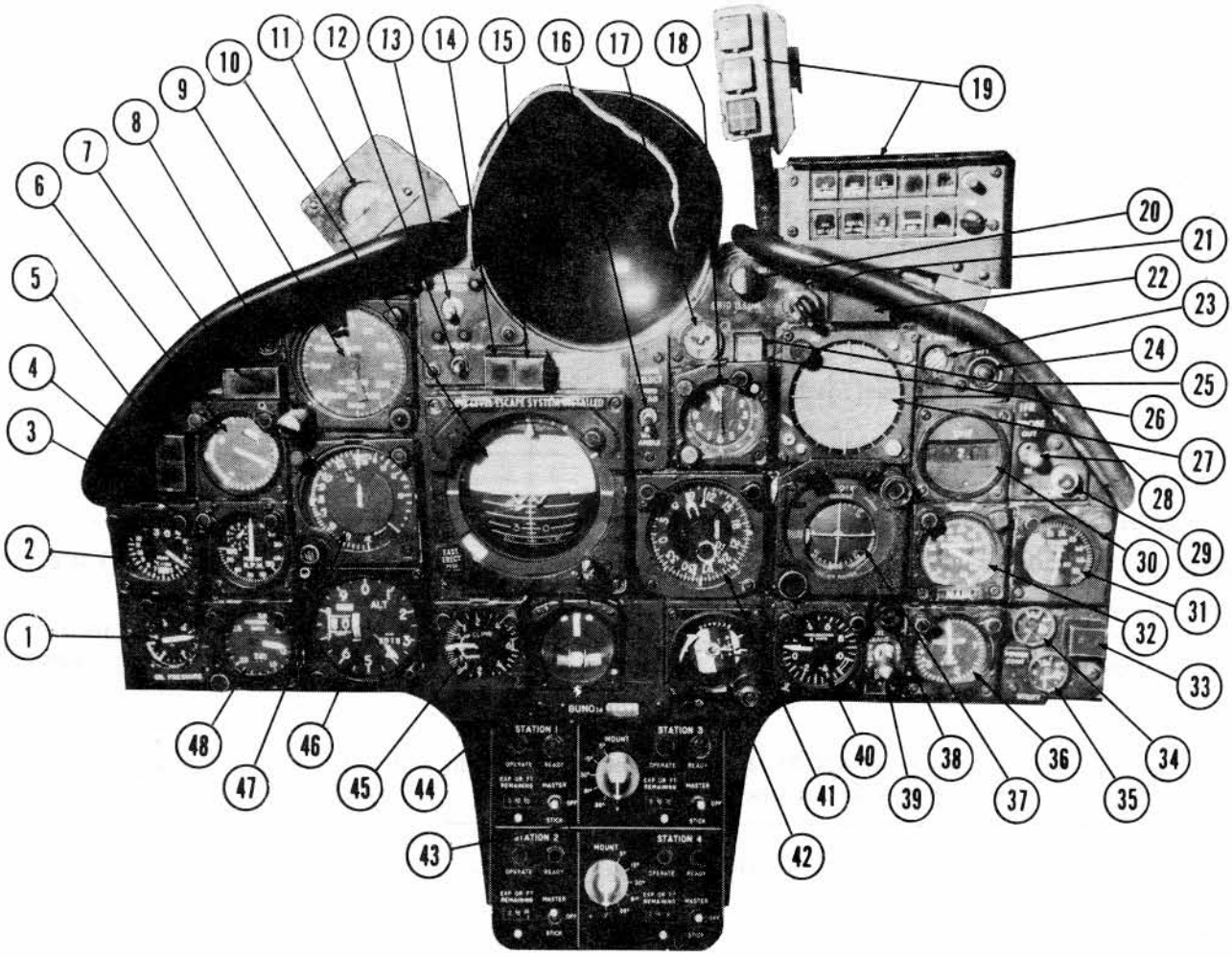
Wing	
Span, maximum	35 ft 8 in.
Span, wings folded	22 ft 6 in.
Chord (streamwise)	
At root	16 ft 10 in.
At construction tip (theoretical extended section at tip)	4 ft 8 in.
Mean geometric	141.4 in.
Incidence at mean aerodynamic chord	–1°
Sweepback of ¼ chord line	42°
Dihedral	–5°
Aspect ratio	3.4
Tail	
Horizontal	
Span	18 ft 2.4 in.
Sweep of ¼ chord line	45°
Dihedral	5° 25′
Aspect ratio (including enclosed fuselage area)	3.5
Vertical	
Sweep of ¼ chord line	45°
Aspect ratio	1.5
Height (overall, static ground position; this height will not be exceeded with the wings folded)	15 ft 9.1 in.
Length (overall, static ground position)	55 ft 6.5 in.
Approximate weight (less usable fuel, ECM, photographic equipment and pilot)	
RF-8G aircraft before AFC 613	19,350 lbs.* NEW
RF-8G aircraft after AFC 613	19,000 lbs.* NEW

Note

Refer to AN 01-1B-40, Handbook of Weight and Balance for specific airplane weight.

*Includes weight of protective armor provisions (AFC 499) - approximately 50 lbs. When a full load of armor plate is carried, add an additional 500 lbs. NEW

INSTRUMENT BOARD
RF-8G (TYPICAL)



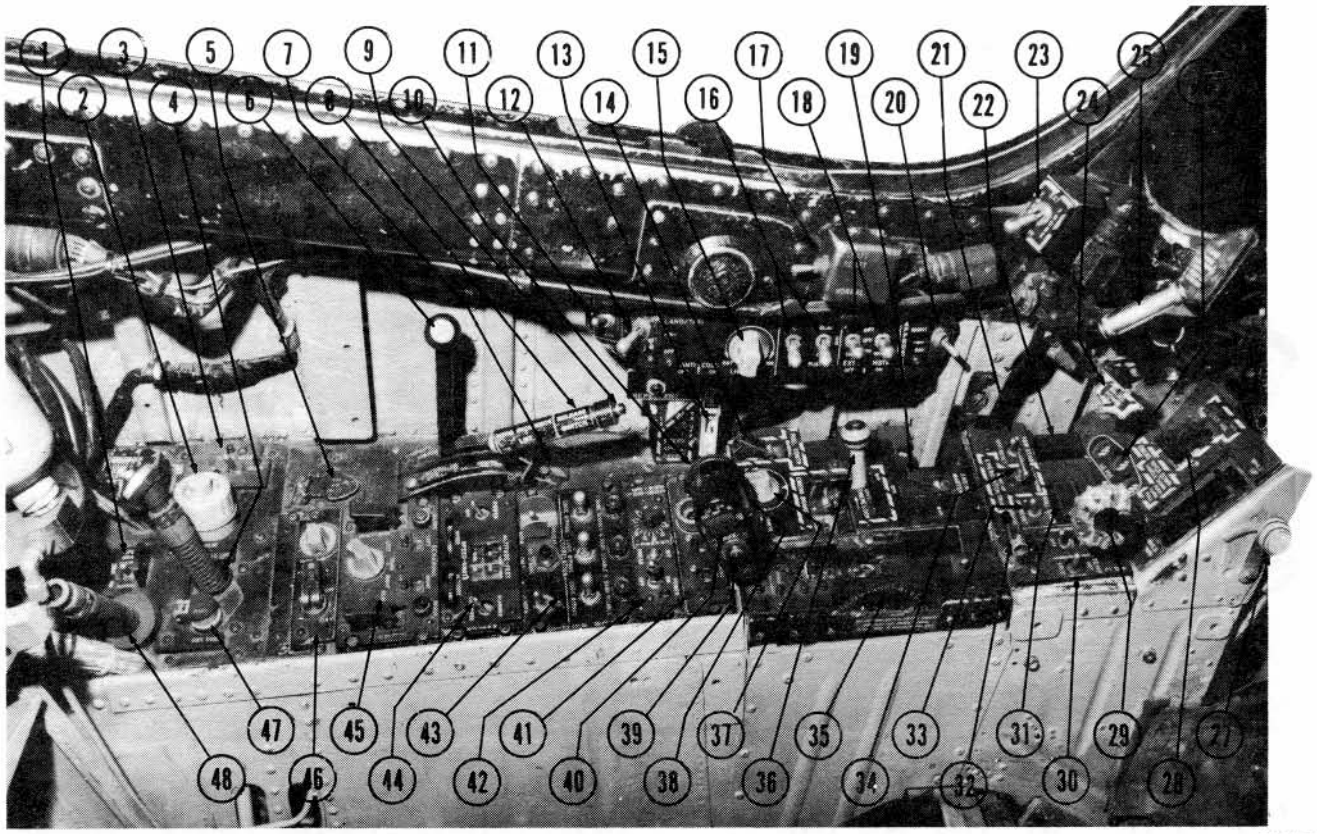
N9/78

1. Engine oil pressure indicator
2. EGT indicator
3. Tachometer
4. Engine fuel pump warning light
5. Fuel low level warning light
6. Angle-of-attack indicator
7. Fire warning light
8. Fire warning test switch
9. Radar altimeter
10. Primary attitude indicator
11. Exposure indicator
12. Drift correction switch
13. Camera master operation switch
14. Speed brake open light
15. Fuel boost pumps warning light
16. View selector switch
17. Liquid oxygen indicator
18. Clock
19. ECM threat lights
20. Grid illumination switch
21. Mode switch
22. Wing-wheels-droop warning light
23. Leading edge droop indicator
24. Fuel quantity test switch
25. Oxygen warning light
26. UHT lock indicator
27. ALR-45 warning indicator
28. Inflight refueling probe switch
29. Inflight refueling probe out light
30. UHF remote indicator
31. Transfer fuel quantity indicator
32. Fuel quantity indicator
33. Engine oil/hydraulic pressure warning light
34. Power control hydraulic pressure indicator
35. Utility hydraulic pressure indicator
36. Fuel flow indicator
37. BDHI course indicator
38. Transfer fuel pump caution light
39. Fuel transfer switch
40. Acceleration indicator
41. TACAN BDHI
42. Standby attitude indicator
43. Camera station control panel
44. Turn-and-bank indicator
45. Vertical velocity indicator
46. Altimeter
47. Airspeed-Mach number indicator
48. Engine pressure ratio indicator

Figure 1-3

LEFT CONSOLE

RF-8G (TYPICAL)

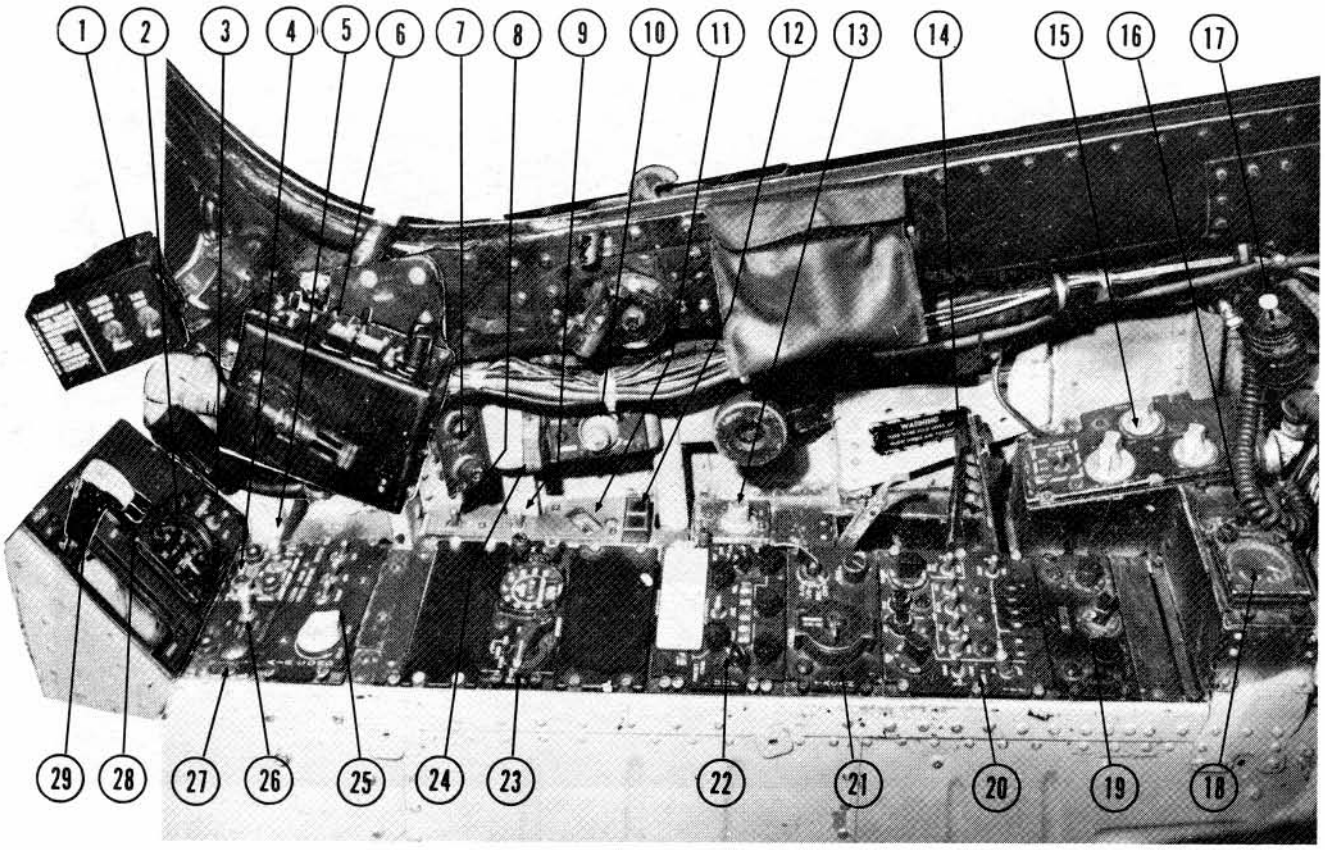


N9/78

1. Speed brake override switch
2. G Valve
3. Flare reset switch
4. Antiblackout line
5. External air inlet
6. Wing downlock handle
7. Emergency droop and wing incidence guard
8. Wing incidence handle
9. Wing incidence release switch
10. Cruise droop switch
11. ACLS/TACAN select switch
12. Land/taxi light switch
13. Emergency spin droop switch
14. Fuel control switch
15. Camera exposure control
16. Speech security controls
17. Chaff reset switch
18. Exterior lights switches
19. Engine master switch
20. Approach light dimming switch
21. Yaw stabilization switch
22. Yaw stabilization warning light
23. IFR probe emergency extend switch
24. Emergency power handle
25. Canopy jettison handle
26. Landing gear indicators
27. Emergency rudder lock
28. Emergency downlock release switch
29. Landing gear handle
30. Approach power compensator panel
31. Roll stabilization warning light
32. Throttle catapult handle
33. Roll stabilization switch
34. Emergency pitch trim handle
35. Throttle friction wheel
36. Emergency brake handle UHT lock
37. Rudder trim knob
38. Throttle
39. Microphone switch
40. Speed brake switch
41. Chaff panel
42. AN/ARA-63 control panel
43. ALR-45 disable panel
44. Camera master control
45. Flare release panel
46. Ventilation/oxygen panel
47. Oxygen receptacle
48. Antiexposure coverall vent connection

Figure 1-4

RIGHT CONSOLE
RF-8G (TYPICAL)



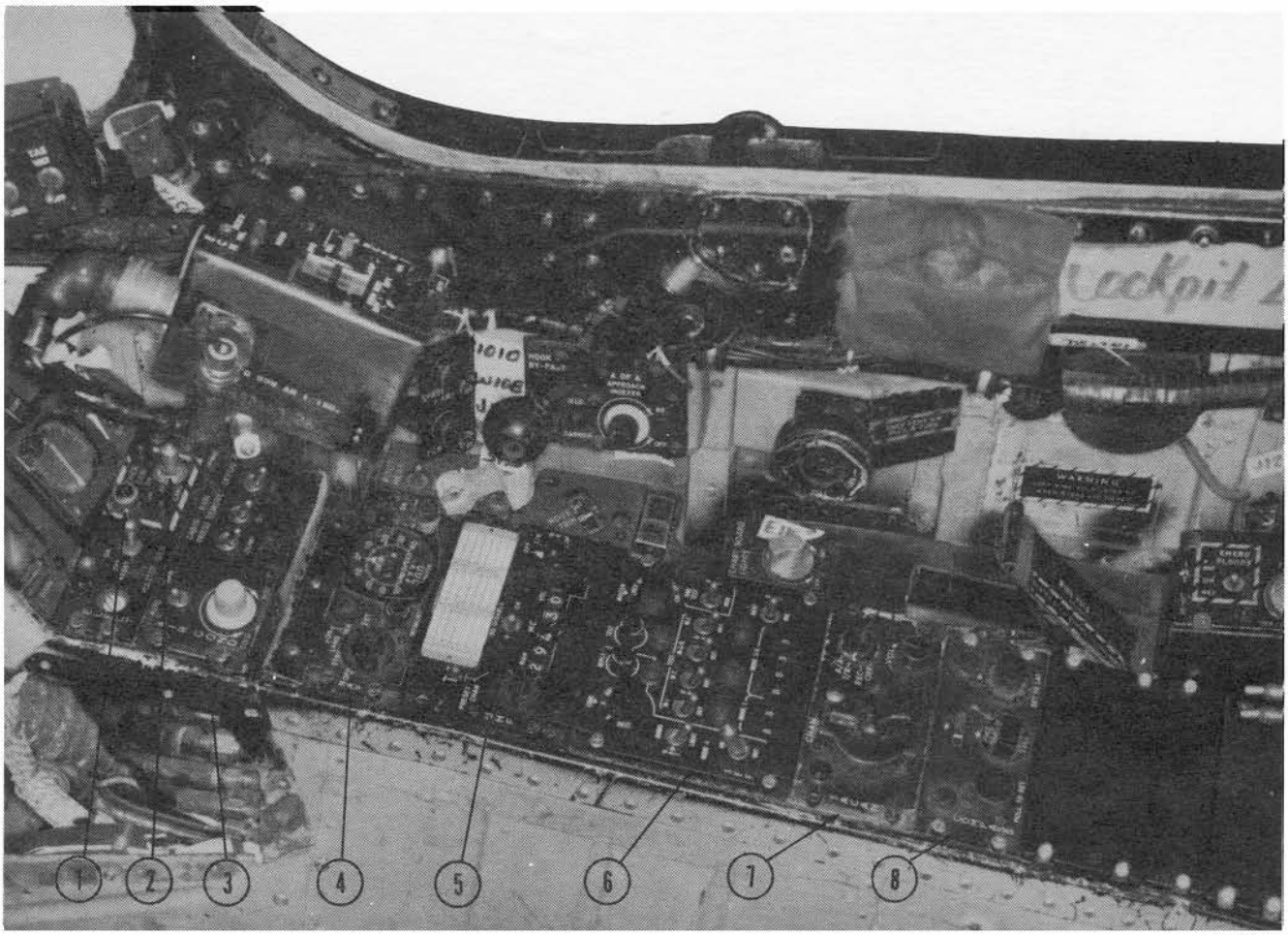
N9/78(1)

1. True airspeed computer panel
2. Cabin pressure altimeter
3. Recorder switch
4. Emergency power indicator light
5. Emergency generator switch
6. ECM panel
7. ECM fuse panel
8. Pitot heat switch
9. Seat adjustment switch
10. Approach indexer dimming knob
11. Nose trim indicator
12. Aileron-rudder neutral trim light
13. Chartboard lights dimming knob
14. Wingfold controls
15. Interior lights control panel
16. IFF volume control knob
17. Emergency spotlight
18. Free air temperature
19. Compass panel
20. IFF panel
21. TACAN panel
22. UHF panel
23. Doppler navigation panel
24. Approach light hook bypass switch
25. Air conditioning panel
26. Master generator switch
27. Main generator power indicator
28. Fuel dump switch
29. Arresting gear handle

Figure 1-5 (Sheet 1)

RIGHT CONSOLE

After AFC 613



N9/78(2)

1. Emergency power indicator light
2. Emergency generator switch
3. Air conditioning panel
4. Navigation panel
5. UHF panel
6. IFF panel
7. TACAN panel
8. Compass panel

Figure 1-5 (Sheet 2)

ENGINE AND AFTERBURNER

DESCRIPTION

The aircraft is equipped with a Pratt and Whitney J57-P-420 continuous-flow gas-turbine engine with an afterburner for thrust augmentation. The axial flow compressor is split into two mechanically separate rotors which provide greater flexibility for starting and permit part load operation. Each rotor is driven by a separate turbine. During starting, external starter power is connected to the high-pressure rotor since it is smaller and requires less torque. With the high-pressure rotor turning at governed speed, the low-pressure, low-speed rotor rotates so as to ensure optimum airflow through the compressor. Flow matching between compressors and turbines and prevention of surge are accomplished by interstage bleeding between the rotors. Engine speed is based on high-pressure rotor operation (N^2 RPM) and is varied by a hydromechanical fuel control unit.

Test stand static thrust ratings of the engines are:

J57-P420:
Military thrust – 12,400 pounds
Maximum thrust (afterburner) – 19,500 pounds

ENGINE CONTROLS

Nomenclature	*Function*
Engine master switch (19, figure 1–4)	ON – accomplishes the following: 1. Admits aircraft fuel to engine driven pump by opening engine fuel shutoff valve. 2. Energizes crank switch. 3. Energizes boost pumps. 4. Energizes fuel transfer switch.
Engine oil pressure indicator (1, figure 1–3)	Indicates oil pressure in psi.
Engine oil/hydraulic pressure warning light (33, figure 1–3)	On, indicates low pressure in one of the following systems: engine oil, utility hydraulic or either power control hydraulic system.
Engine pressure ratio indicator (48, figure 1–3)	Indicates ratio of turbine outlet pressure to engine inlet pressure.
Exhaust gas temperature (EGT) indicator	(Indication is average temperature taken from eight thermocouples just aft of the turbine outlet)
A. Pointer	Indicates approximate exhaust gas temperature
B. Digital window	Indicates exhaust gas temperature accurate within ±2°C
C. Warning light	Illuminates at 680°C exhaust gas temperature to indicate an overtemperature condition.
D. OFF flag (2, figure 1–3)	Indicates loss of electrical power to the instrument and the pointer will remain at the temperature reading at time of power loss.
Fuel flow indicator (36, figure 1–3)	Indicates rate of engine (but not afterburner) fuel flow in pounds per hour.
Tachometer (3, figure 1–3)	Indicates high-pressure rotor speed by percent based on 9,976 rpm as 100%.

(35, figure 1–4)

ENGINE CONTROLS

Nomenclature	*Function*
Throttle (38, figure 1–4).	OFF – shuts off fuel flow from fuel control unit. CRANK – momentary position, initiates engine cranking cycle. IGNITE – momentary position, energizes ignition timer for engine starting. IDLE – adjustable stop, prevents inadvertent retarding to OFF. MILITARY – selects maximum thrust without afterburner. MAX – placed outboard, selects maximum thrust with afterburner.
Throttle friction wheel (37, figure 1–4)	Rotate to adjust throttle friction.
Fuel control switch (14, figure 1–4)	NORMAL – activates automatic fuel metering of fuel control unit. Manual – bypasses automatic fuel metering of fuel control unit, giving manual control with throttle position.
Engine fuel pump warning light (4, figure 1–3)	On, indicates insufficient fuel pressure from engine stage of fuel pump.

ENGINE OPERATION

Engine Fuel *(See figure 1-6.)*

Fuel is pumped from the fuel cells through a motor-driven engine fuel shutoff valve to the engine fuel pump. The pump directs fuel to the fuel control unit for automatic fuel metering. Metered fuel then passes through the oil-fuel heat exchanger for fuel preheating and oil cooling. A pressurizing and dump valve directs the fuel to six dual orifice fuel nozzles for atomization in each of the eight burners and provides an overboard drain for the engine fuel manifolds after engine shutdown.

The engine-driven fuel pump serves both the engine and the afterburner. The pump consists of a centrifugal booster stage and separate gear stages for the engine and afterburner. The pump mounts a transfer valve which routes afterburner fuel to an internal recirculating line when the afterburner is not in use. When the afterburner is selected, an electrically-operated shuttle valve in the transfer valve directs after-burner stage output to the afterburner fuel control unit and transmits a fuel flow signal to the afterburner exhaust nozzle control unit. If the engine stage of the pump fails completely, the transfer valve automatically transfers afterburner stage output to the engine fuel control unit and reduces fuel flow to the afterburner fuel control unit during high thrust conditions. Complete failure of the engine stage will be indicated by illumination of the engine fuel pump warning light.

The fuel control unit provides a speed governing control by metering fuel to compensate for variations in ambient conditions, compressor inlet temperature, and burner pressure to maintain optimum engine operation for various throttle settings. During rapid acceleration, the unit limits fuel flow to prevent surge, overtemperature and overpressure. During rapid deceleration, a minimum fuel flow is maintained to prevent engine flameout.

If a malfunction occurs in the automatic metering unit, engine operation may be continued by switching to manual fuel control. The fuel control unit changeover is powered by electrical power from the emergency dc bus. This electrical power is required to switch back and forth from manual to normal. If electrical power is lost, the fuel control will remain in the last selected position. With the fuel control switch in manual, all automatic fuel metering functions are bypassed and fuel flow is manually controlled by throttle movement. Care should be exercised when accelerating. A motor-operated valve in the fuel control unit transfers engine fuel from the main metering system to a manual metering system. Fuel metering is then controlled directly by throttle position through a manual throttle valve. The manual metering system does not afford engine protection during normal operation as does the automatic metering system. Compressor stalls and over-temperature may result if throttle movement is too rapid. At normal climb airspeeds, EGT will increase with an increase in altitude. Throttle settings must be reduced as necessary to remain within allowable EGT limits.

Time/Temperature Recorder and Integrator

The J57-P-420 engine incorporates a Time/Temperature Recorder and Integrator (TTRI). This single parameter monitoring equipment includes a computer/receiver mounted on starboard side aft of nose wheel well area and a digital exhaust gas temperature (EGT) indicator mounted on the instrument panel. The indicator consists of a digital counter which displays accurate EGT information (±2°C), and a small amber caution light which illuminates above 680°C. Refer to Section 1, Part 4 for engine operating limitations. The system measures and records relative exposure to temperatures which cause engine damage; therefore, it is a maintenance tool for detecting overtemperature conditions, predicting engine trim requirements, and for determining hot section inspection criteria. Electrical power for indicator operation is supplied by the emergency ac bus, the computer/recorder by the emergency ac bus. The computer/recorder by the emergency ac bus. The computer/recorder is shown in figure 1-6A, the indicator in figure 1-3.

ENGINE FUEL

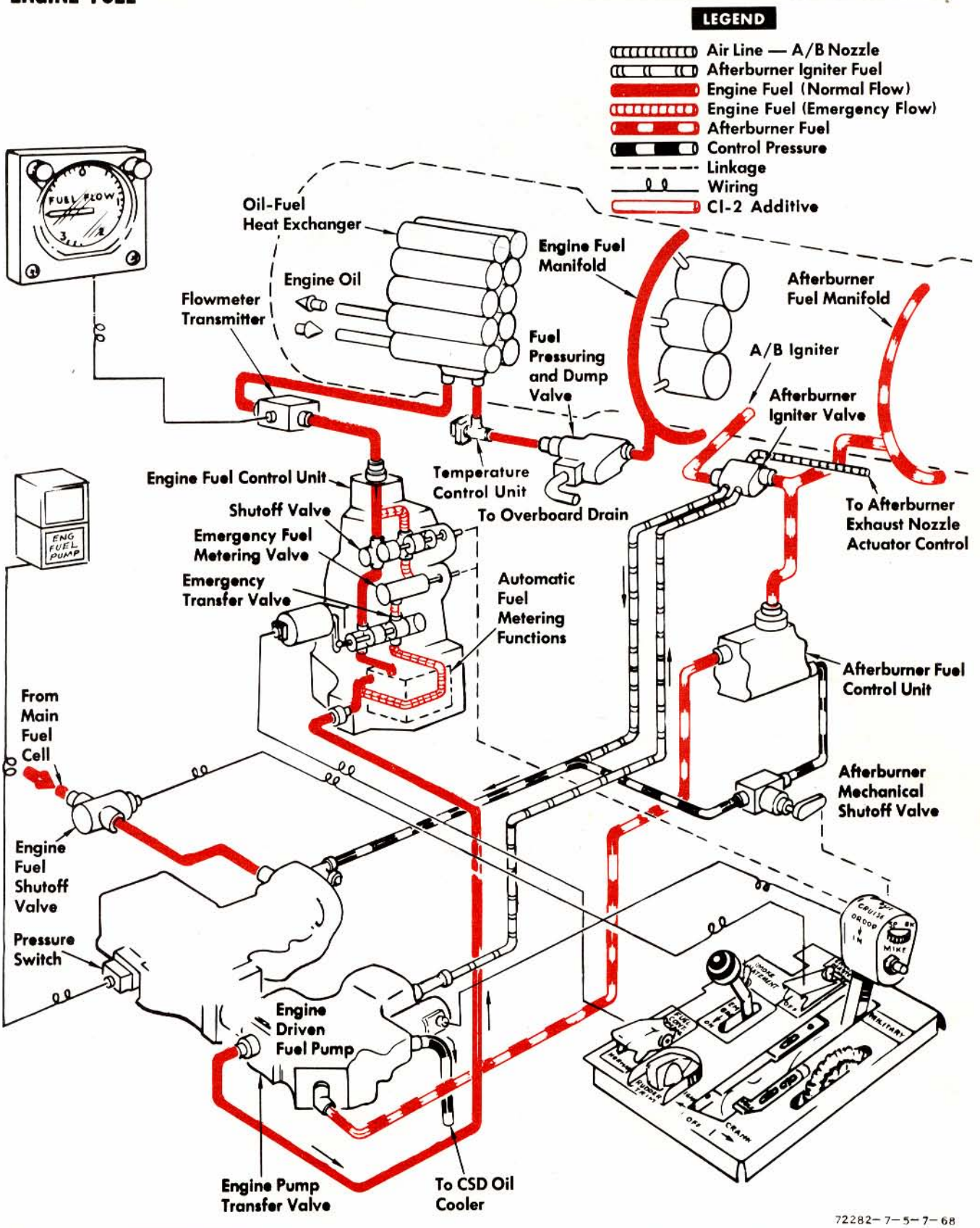
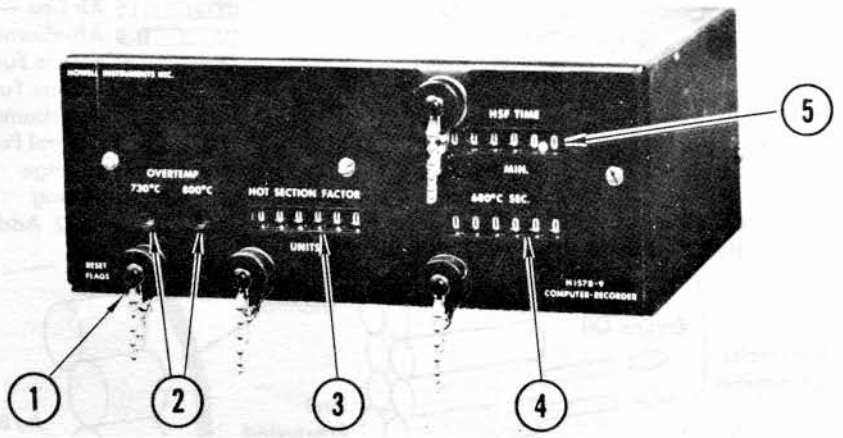


Figure 1-6

TIME/TEMPERATURE COMPUTER/RECORDER



Mounted on Starboard Side Aft of the Nose Wheel Well Area

Nomenclature	*Function*
1. Push-to-reset mechanisms (4)	Cover removed, button pressed – resets applicable counter or returns overtemperature indicator to nonbarberpole position.*
2. Overtemperature indicators (2)	Barberpole – indicates 730°C or 800°C overtemperature condition. EGT indicator digital window reading agrees with barberpoled indicator.
3. Hot Section Factor Counter	Integrations of time and temperature. Count rate ranges from 0.4 count per minute at 535°C to 400 counts per minute at 720°C EGT.
4. Time Overtemperature Counter	Records in seconds time of engine operation above 680°C EGT.
5. Hot Section Factor Time Counter	Records in minutes and tenths time engine operated above 535°C EGT.

*Electrical power is required for overtemperature indicator test.

Figure 1-6A

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Engine Oil *(See figure 1-7.)*

Oil is supplied from a tank by direct gravity feed to an engine-driven gear-type pump and directed to the main engine bearings and to the accessory drives for pressure lubrication. Total system capacity is 7 gallons, 5 of which are for servicing purposes and 2 of which are trapped in the system.

Note

During zero or negative g conditions, oil pressure fluctuations may be apparent. The fluctuations are normal and should damp out within approximately 30 seconds after resuming positive g conditions. Air in the oil pressure line to the transmitter lines can cause fluctuations of 3 to 5 psi.

ENGINE OIL

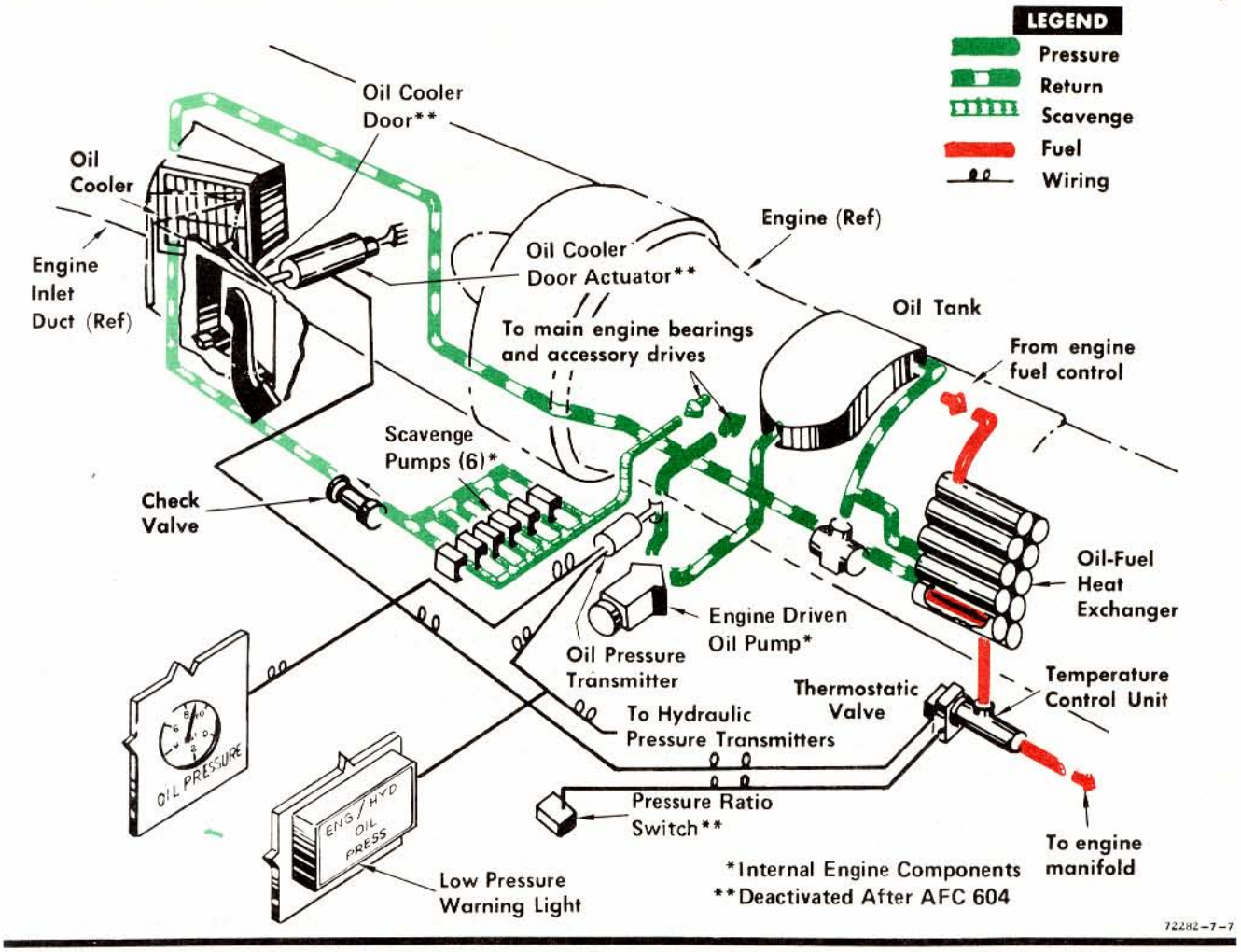


Figure 1-7

The oil is pumped from the engine by six gear-type scavenge pumps. Oil temperature is stabliized by a thermostatic bypass valve which senses oil temperature and permits oil to flow through or bypass an oil-fuel heat exchanger. Oil is returned to the tank from the valve or heat exchanger.

The engine contains packing O-rings, labyrith seals, and spring loaded seals. High oil pressure can cause the packing and O-ring to blow out and oil to be forced past the seals. Damage can also occur to the seals.

ENGINE STARTING

External pressurized air and electrical power are required to start the engine. With external power connected, place the ENGINE MASTER switch in ON to energize the master fuel relay which connects electrical power from the primary dc bus to the CRANK switch. (The ENGINE MASTER switch also opens the fuel shutoff valve, energizes the fuel boost pumps, and energizes fuel transfer switch.) Momentarily placing the throttle in CRANK position energizes the ignite relay. The crank position must be actuated to energize the ignition relay. When the throttle is moved to the IGNITE position (5% rpm) the ignition relay connects ignition power to number 4 and 5 combustion chamber burner cans. The ignition timer, actuated by the ignite relay, allows ignition to continue for 30 to 40 seconds even though ignition normally occurs much sooner. At 12% rpm the throttle is moved to the IDLE position. Lightoff should occur within 20 seconds and engine rpm should reach idle rpm within 45 seconds of placing throttle to the idle detent.

NEW NEW

Engine Operating Limitations

Refer to Section I, part 4 for engine operating limits.

Compressor Stalls

Compressor stalls result from conditions under which engine compressor blades operate at an excessive angle of attack in much the same way as stalling occurs on an airplane wing. Although compressor stalls may be caused by engine damage or accessory malfunctions, they are more commonly associated with high-altitude operation. Stalls may occur in either the high- or low-pressure compressors of the engine and are accompanied by an eventual engine speed drop to between 40% and 60% rpm. Some stalls do not make themselves known by noise or surges, but result in not being able to accelerate the engine, or loss of rpm with no movement of the throttle. At the other extreme, stalls may be characterized by severe vibration and a loud banging noise. Thumbing the ignite microswitch may assist in recovery if rpm has decayed; the EPP may be required for electrical power. It is often difficult at high altitude for the pilot to determine whether a compressor stall or an engine flameout has occurred; exhaust gas temperature is the most positive indicator.

Compressor stall recovery may be accomplished by retarding the throttle to idle to reduce the amount of fuel admitted to the engine, actuating the engine ignite microswitch, reducing G-load, extending the EPP if electrical power is required, and increasing airspeed if practical to admit more air into the engine. It may be necessary to sacrifice as much as 10,000 feet to obtain recovery below 50,000 feet and even more at higher altitudes. Exhaust gas temperature must be monitored and if it exceeds the limits, the engine must be shut down.

Airstart may be accomplished as soon after shutdown as practical.

NEW Acceleration stalls, or "chug stalls," are not normally experienced in this aircraft. Should a severe chug stall occur, the throttle should be retarded and the engine allowed to stabilize. The throttle may then be advanced to the desired setting.

If unstable engine conditions persist and exhaust temperature does not return to normal following a stall, land as soon as practical. Continued engine operation under unstable engine conditions is dangerous. Regardless of the duration of compressor stalls, abort the mission and land as soon as practical.

AFTERBURNER OPERATION

Afterburner operation is initiated when a switch in the throttle quadrant is actuated by placing the throttle outboard in the afterburner detent. The switch energizes a motor actuated afterburner shuttle valve to direct afterburner fuel from the fuel pump to the afterburner fuel control unit. Simultaneously a fuel pressure signal is sent to the afterburner exhaust nozzle control unit to open the exhaust nozzle. The afterburner fuel control unit automatically meters fuel for changes in burner pressure as affected by throttle movement and altitude changes. The metered fuel is directed to the afterburner fuel nozzles and to the afterburner igniter valve. The igniter valve directs a charge of fuel into a burner can. A flame streak then passes through the turbines into the afterburner section and ignites fuel discharged by the afterburner fuel nozzles. The afterburner is normally ignited at MILITARY thrust; however, it may be ignited at any point above the afterburner aft detent stop.
Normally, no trim changes are associated with afterburner ignition but an immediate increase in airspeed will be evident at all altitudes. Thrust may be varied during afterburner operation by varying throttle position in the afterburner detent.

At, or above, an altitude of approximately 40,000 feet, afterburner lightoff may not be obtained on the first attempt using JP-4 fuel. If first attempt is unsuccessful, place throttle in MILITARY and wait 15 seconds before reselecting afterburner. This delay is necessary because vaporization of JP-4 in the fuel manifold creates a pressure which resists recycling of the afterburner igniter. This delay is not necessary when using the less volatile JP-5 fuel. A relight should be obtained within two attempts if the engine is operating normally. Afterburner lightoff is most reliable above 0.85 IMN and below 40,000 feet.

AFTERBURNER EXHAUST NOZZLE

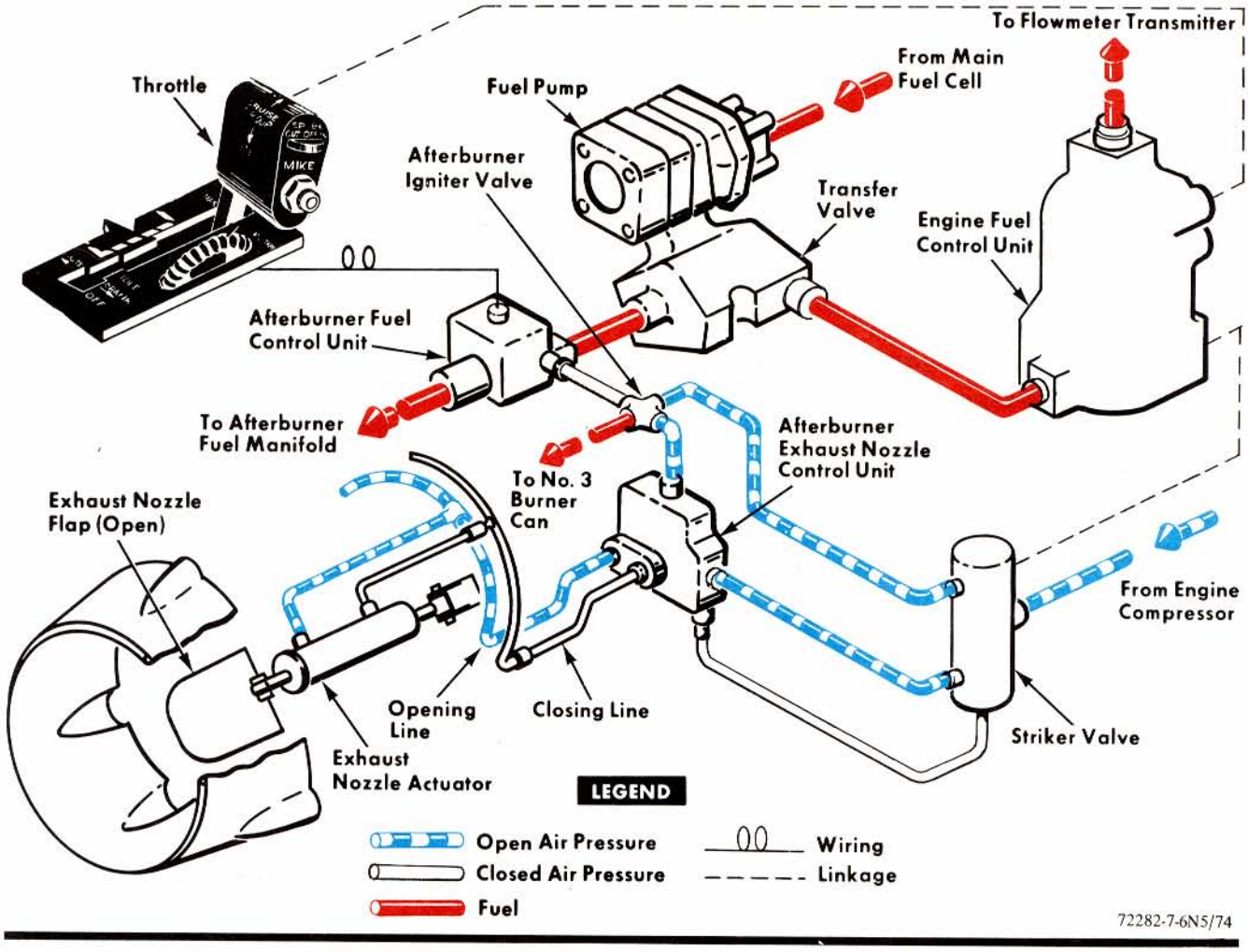


Figure 1–8

Afterburner Exhaust Nozzle *(See figure 1–8.)*

The exhaust nozzle area is automatically increased when an air signal from the afterburner igniter valve positions the exhaust nozzle actuator control to direct engine compressor bleed air to the eight exhaust nozzle flap actuators. The actuators are mechanically linked to the exhaust nozzle flaps and hold the flaps open during afterburner operation. When afterburner is stopped, the control unit directs air to the actuators to close the flaps and hold them closed. If the exhaust nozzle fails to close, there will be a thrust loss of approximately 20% at "MILITARY." In such a case, throttle settings approximately 3% to 5% rpm higher will be required to maintain approach thrust. Selection of afterburner will restore full-thrust operation if required for a wave-off.

During engine idle operation, the throttle mechanically causes the striker valve to direct air pressure directly to the nozzle actuators by bypassing the afterburner igniter valve. Using air pressure, the striker valve will hold the exhaust nozzle open from idle to 2% above idle rpm.

The engine is equipped with a nozzle-closed lightoff (NCL) system. The NCL system, installed primarily to improve lightoff characteristics at high altitudes, prevents momentary loss of thrust during afterburner lightoff at all altitudes by delaying exhaust nozzle opening until lightoff has occurred. This feature is particularly advantageous when afterburner is selected in taking a wave-off.

PART 2 — SYSTEMS

FUEL SYSTEM

DESCRIPTION

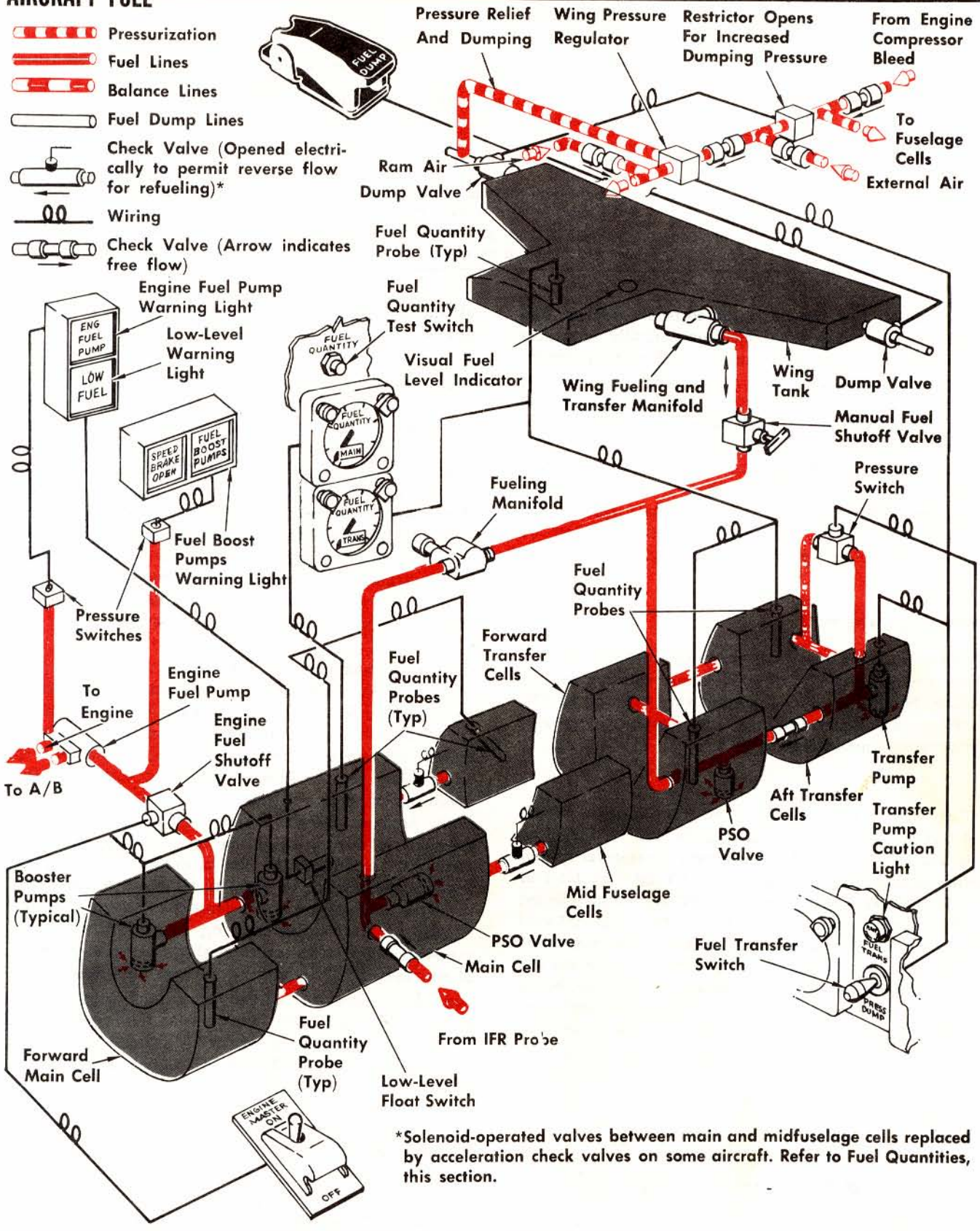
Refer to figure 1-9 for system illustration.

Fuel is supplied to the engine from the main fuel cell and forward main fuel cell, through the engine fuel shutoff valve, by five fuel boost pumps. Three of these pumps operate at all times when the engine master switch is on and provide proper fuel flow for all upright flight attitudes. Two of the boost pumps are controlled by an attitude switch to supply fuel at inverted attitude. The inverted flight boost pumps operate when pitch attitude exceeds 130° nose up or 10° nose down, or when roll attitude exceeds 90°. Only the boost pump in the forward main cell operates when electrical power is being supplied by the emergency power package with the emergency generator switch in ON. With the emergency generator switch in LAND, none of the boost pumps operate and flight operation must be restricted to avoid flameouts. Fuel from the midfuselage cells of the main system flows into the main cell by gravity feed.

FUEL SYSTEM CONTROLS

Nomenclature	*Function*
Engine master switch (19, figure 1-4)	ON — energizes fuel boost pumps, attitude switch (which controls inverted flight boost pumps) and fuel transfer switch.
Fuel selector switch (left main wheel well)	Positions fuel valves during central-point fueling for selection of different types of fuel loads or for defueling. POWER OFF is the flight position.
Fuel transfer switch (39, figure 1-3)	PRESS DUMP – relieves wing tank pressure and shuts off transfer fuel pump to discontinue all fuel transfer. FUEL TRANS – energizes transfer fuel pump and provides wing tank pressure. PUMP OFF – shuts off transfer fuel pump but permits wing fuel transfer to continue.
Fuel quantity test switch (24, figure 1-3)	Depressed momentarily, checks continuity of main and transfer fuel quantity indicating circuits.
Inflight refueling probe switch (28, figure 1-3)	OUT – opens probe door, extends probe, deenergizes the transfer fuel system and relieves wing tank pressure. Deenergizes the automatic fuel transfer circuit. The probe illuminating light will come on when the probe door opens with the exterior lights switch in ON. Energizes electrical circuit to the EMERG PROBE switch. IN – retracts probe, closes probe door, energizes the transfer fuel system and repressurizes wing tank. The probe illuminating light will go off when the probe door closes. OFF – deenergizes probe door valve, repressurizes wing tank, and energizes the transfer fuel system.
Inflight refueling probe light (29, figure 1-3)	On, indicates probe door is open. Off, indicates probe door is closed.
NEW EMERG PROBE switch (figure 1-10A)	EXT – with IFR PROBE switch in the OUT position, pneumatically opens probe door and extends probe. Once the probe is pneumatically extended inflight, it cannot be retracted, range will be reduced by 12%. OFF – deenergizes the emergency pneumatic system.
Main fuel quantity indicator (29, figure 1-3)	Indicates total weight of fuel in main fuel system cells.
Transfer fuel quantity indicator (31, figure 1-3)	Indicates total weight of fuel in transfer fuel system cells.
Wing tank manual fuel shutoff valve (left main wheel well)	OPEN – allows normal operation of fuel system. *Engine cannot be started using external power, nor fuel transferred from or to wing tank unless valve is in this position. Airstart can be obtained in the OPEN or CLOSE positions.* CLOSE – prevents leakage of fuel from wing to main cell while aircraft is secured; also, aids defueling of main system after wing is empty by stopping airflow from wing.
Wing tank visual quantity indicator (left wing leading edge)	Appearance of red spherical float indicates wing tank is full.
Fuel dump switch (28, figure 1-5)	DUMP – jettisons fuel from wing tank.

AIRCRAFT FUEL



*Solenoid-operated valves between main and midfuselage cells replaced by acceleration check valves on some aircraft. Refer to Fuel Quantities, this section.

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Figure 1-9

FUEL SYSTEM CONTROLS (Continued)

Nomenclature	*Function*
Fuel low level warning light (5, figure 1–3)	LOW FUEL – on when fuel level in main cell drops to approx. 1,050(+100,-0) pounds (JP-5) in level flight. Flashing when the main cell level drops below approximately 1,200 pounds with the fuel transfer switch in PRESS DUMP, causing the automatic fuel transfer circuit to become energized.
Fuel boost pumps warning light (15, figure 1–3)	FUEL BOOST PUMPS — on when fuel boost pressure drops to 4 psi.
Transfer fuel pump caution light (38, figure 1–3)	Steady light with fuel transfer switch on, over 3,500 pounds transfer fuel remaining and aircraft in normal flight attitude indicates transfer fuel pump failure. Intermittent lighting progressing to steady indicates aft fuselage transfer fuel pressure drop induced by maneuvers or low fuel level in aft fuselage transfer cells.

The transfer fuel system composed of aft fuselage fuel cells and the wing tank semiautomatically sequences flow of transfer fuel to the main cell. Optimum center-of-gravity conditions are maintained provided the transfer switch is in the proper position. Float valves in the main cell open to admit fuel from the transfer system when the main cell fuel level drops to a predetermined point. Aft fuselage fuel is transferred under pump pressure. Wing fuel is transferred by air pressure supplied by the air-conditioning system. The transfer fuel pump automatically shuts off when the inverted flight boost pumps are operating.

FUEL QUANTITIES

Fuel load indications will vary depending upon temperature and type of fuel used. Under extreme temperature changes, gage readings can vary as much as 10% (6% gage tolerance and 4% fuel density change) of the average quantities.

With partial refueling selected (fuel selector switch in PARTIAL), the main system cells will be fueled to the transfer level (630 gallons) and the transfer system will be completely refueled for a total fuel load of 1,381 gallons. With only main cell refueling selected (fuel selector switch in FWD CELL), the main cell will be completely refueled (654 gallons). On some aircraft, the solenoid-operated check valves between the main fuel cell and the midfuselage cells are being replaced with acceleration check valves. On these aircraft, placing the refueling selector switch in FWD CELL will refuel the midfuselage cells in addition to the main cell. On aircraft with solenoid-operated check valves, only the main cell will be completely refueled.

FUEL CELL PRESSURIZATION AND VENTING

Pressurization and venting maintain a constant pressure in the fuel cells and cell cavities during climbs, dives, fueling, defueling, and fuel transfer. Air pressure is used to transfer wing tank fuel. Pressure in all the cells prevents excessive fuel loss due to boiling at high altitude.

Pressurized air is bled from the engine compressor section and cooled by the air-conditioning system. The air passes through a check valve to the combined wing tank pressure regulator and relief valve and to the fuselage cells pressure regulator. The regulators admit the air to the fuel cells and wing tank as required. A check valve is installed in each pressure line to prevent fuel transfer between the cells and to keep fuel from entering the regulators. For all flight conditions except negative g, an emergency airscoop automatically admits ram air to pressurize the fuselage cells if the pressure regulator fails in the closed position.

The wing tank pressure regulator is electrically controlled to permit selection of fuel transfer conditions by the pilot. When the fuel transfer switch is placed in FUEL TRANS or PUMP OFF, the pressure regulator admits air to the wing tank at sufficient pressure to cause wing fuel to flow to the main cell when the condition of main cell fuel level and aft transfer fuel boost pressure permit. A level or nose-up attitude is required to transfer wing fuel as the wing tank fuel outlets are located to the rear of the tank. Placing the fuel transfer switch in PRESS DUMP shuts off the flow of air to the wing tank and vents the existing pressure to discontinue transfer of wing fuel. With the wing pressure dump valve actuated, slight positive pressure is maintained in the tank by the ram air pressure system. Upon loss of normal wing tank pressurization (air conditioning system failure), wing tank fuel transfer is negligible. However, the RF-8G is unique in that if the pilot selects CABIN DUMP on the cockpit pressurization switch, the fuel cells will continue to receive pressurization if the air conditioning system is operating normally. The only means of securing wing tank transfer is to select PRESS DUMP on the fuel transfer switch. A vacuum relief valve or a ram air scoop admits air into the wing tank to prevent structural collapse from excessive negative pressure if no pressurization is provided. Wing fuel can be gravity dumped in an extended time period (approximately 15 minutes)if the wing is not pressurized.

FUEL QUANTITIES

FUEL CELL	*POUNDS JP-4*	*POUNDS JP-5*	*U.S. GALLONS*
Forward Fuselage	741	775	114
Main Fuselage	3510	3672	540
Midfuselage	572	598	88
TOTAL MAIN FUEL	4823	5045	742
Aft Fuselage	1118	1170	172
Wing	3763	3937	579
TOTAL TRANSFER FUEL	4881	5107	751
TOTAL AIRCRAFT FUEL	9704	10,152	1493

Note

In the event of loss of the emergency DC bus, the wing cell will be repressurized even if PRESS DUMP had been selected prior to the failure. Wing cell transfer will continue.

On RF-8G aircraft, an automatic fuel transfer circuit is provided as a safety against fuel mismanagement. This circuit does not increase fuel transfer capabilities and when deenergized (inoperative) does not affect normal fuel system operation. If the fuel transfer switch is inadvertently left in the PRESS DUMP position until the fuel quantity in the main cell reaches the low level point (approximately 1,050 (+100,-0) pounds), the circuit is energized and fuel will be automatically transferred. When the automatic transfer circuit is energized the following occurs:

1. The low fuel caution light flashes.

Note

The automatic transfer system will not be activated if the fuel transfer switch is in the PUMP OFF position.

2. The wing fuel tank is automatically pressurized.
3. The fuselage transfer pump is energized.

Once the low fuel caution light begins flashing it will continue to flash until the automatic fuel transfer circuit is deenergized. The circuit is deenergized (automatic transfer system inoperative) by:

1. Moving the fuel transfer switch from the PRESS DUMP position.
2. Loss of the main generator.
3. Placing the inflight refueling switch in the OUT position.

Note

If the low fuel caution light illuminates steadily after the automatic transfer circuit is deenergized, the fuel quantity in the main cell is below the low-level point (approximately 1,050 (+100,-0) pounds).

The fuselage fuel cells are vented overboard through interconnected lines to a vent mast on the fuselage left-hand midsection. The common vent line is connected to a pressure relief valve which relieves cell pressure above 1.0 (±0.25) psi to prevent excessive pressures if the fuselage cells pressure regulator fails in the open position. A float valve in the main cell prevents main cell fuel from being vented overboard during maneuvering flight by shutting off fuel transfer when the vent outlet is covered. Check valves are installed in the other cell vent lines to prevent fuel from entering the vent lines during maneuvering or inverted flight.

FUEL SYSTEM MANAGEMENT

For takeoff, the fuel transfer switch is placed in FUEL TRANS which energizes the transfer pump and pressurizes the wing tank. Flow of transfer fuel to the main fuel cell is then automatically sequenced until all transfer fuel is consumed. Sequencing is obtained through variations in fuel line sizes and pressures to maintain proper aircraft center-of-gravity at all times. The aft transfer cells empty first and the wing tank empties next. The aircraft then consumes main cell fuel. During transfer from the aft cells, there will be a noticeable transfer from the wing tank.

Failure of the aft transfer pump (or loss of main electrical power) will result in as much as 1,170 pounds (JP-5) fuel being trapped in the aft transfer cells. Wing tank fuel transfer will continue in such cases.

The transfer pump caution light is on the secondary dc bus and will not indicate the fact that the aft transfer pump is inoperative on emergency generator power.

In level cruising flight, intermittent illumination progressing to steady illumination of the transfer pump caution light provides usable indication that the fuse-

lage transfer fuel cells are empty. When the aft transfer cells are empty, there will be up to 3,000 pounds (JP-4) or 3,150 pounds (JP-5) of wing tank fuel remaining depending on when the transfer pump is turned on. When the transfer pump caution light comes on under these conditions, turn pump and light off by placing the fuel transfer switch in PUMP OFF. When the transfer switch is placed in the PUMP OFF position, wing transfer will continue until the tank is empty.

Note

Slow but complete transfer of the aft cluster may result from loss of one of the three phases of AC power from the secondary AC bus.

The transfer fuel system, composed of aft fuselage fuel cells and the wing tank, semiautomatically sequences flow of transfer fuel to the main cell. Optimum center-of-gravity conditions are maintained even after the transfer fuel quantity indicator reads zero. To prevent wing tank air from entering the fuel lines, two pressure shutoff valves in the wing fueling manifold are automatically closed when the wing tank is empty or a fuel outlet is uncovered.

If the fuselage pump is turned off too soon (as might be the case if turned off because of the caution light flickering during maneuvering flight), a small amount of fuel may be trapped in the aft cells. If this occurs, there will be an indication of transfer fuel remaining late in the flight when all fuel transfer would normally have been completed. This fuel can be pumped out by placing the fuel transfer switch in FUEL TRANS for a brief period. Maintaining a nose-up attitude will aid in pumping out the aft cells.

WARNING

Aircraft loss from main fuel depletion can result from fuel transfer failure in conjunction with either misread quantity indications or failure to monitor main fuel quantity. Main fuel quantity must be regularly checked for proper indication except during maneuvering flight. Do not mistake transfer quantity indications as main fuel quantity indications.

The F-8 fuel system is designed to maintain a given fuel level (transfer level) in the main fuel cell during unaccelerated, level flight. This is accomplished by transferring fuel from the left and right midfuel cells and the fuel transfer system. The fuel from the left and right midfuel cells feeds by gravity through check valves into the main fuel cell. The fuel flow from the transfer system is regulated by the fuel transfer float valve mounted in the main fuel cell. The quantity of fuel during unaccelerated, level flight in the main fuel system (main, the left and right midcells and forward cell) at the transfer level is approximately 4,300 pounds of JP-5. The transfer level can vary depending on aircraft attitude, acceleration or deceleration, duration, and the type of check valve (solenoid or acceleration) installed between the main and midcells.

During climbs and/or positive longitudinal acceleration the fuel quantity in the main fuel system can increase as much as 600 pounds. After returning to level flight the increased fuel will be consumed and with fuel remaining in the transfer system the normal transfer level will be reestablished.

During prolonged nose-down attitude and certain other profiles with 1,500 pounds fuel remaining in the transfer system, the quantity in the main fuel system can decrease as much as 600 pounds. After returning to level flight with fuel remaining in the transfer fuel system the normal transfer level will be established. In aircraft with solenoid check valves between the main and midfuel cells, the main system may remain as much as 350 pounds below normal transfer level.

Note

During afterburner operation at high Mach numbers, the transfer fuel system will supply sufficient fuel to the main cell to maintain the fuel level in the main cell at the transfer level above 20,000 feet. Below 20,000 feet, transfer flow rate will fall slightly behind engine fuel demand and transfer level will drop slowly.

The fuel low level warning light, which derives power from the secondary dc bus, will be on when the fuel in the main cell is at approximately 1,050 (+100,-0) pounds. A float valve in the main cell controls the light and will indicate accurately at aircraft attitudes between 25^{O} nose-up and 25^{O} nose-down.

The transfer fuel quantity indicating system will be accurate only between 10° nose-up and 4° nose-down. With transfer fuel from the fuselage transfer cells depleted, the transfer capability from the wing is reduced in nose-down attitudes. Normal wing transfer will be regained with return to normal flight attitude.

The fuel flow indicator, which indicates engine fuel flow in pounds per hour, may momentarily indicate zero flow when the throttle is retarded to IDLE from a high power setting. Should the indicator continue to reflect zero flow at a sustained IDLE power setting, advancing the throttle momentarily to obtain a higher fuel flow rate may restore proper indications.

WING TANK FUEL DUMPING

An electrically operated variable orifice restrictor, installed upstream of the wing tank pressure regulator, controls wing tank air flow for pressurization or provides a high fuel dump rate by allowing a greater air flow to the wing tank during fuel dumping. Two dump valves operated by electrical power from the emergency dc bus, one in each outboard corner of the wing tank, permit fuel to be dumped overboard. Placing the fuel dump switch in DUMP fully opens the restrictor and opens the dump valves. After fuel has been dumped, the fuel dump switch should be placed in OFF. When fuel is dumped from the wing cell, pressure is applied to the wing cell. If the main cell has less than a transfer level of fuel, some fuel will be transferred to the main cell during the process of dumping.

Note

A nose-up attitude must be maintained to obtain the maximum rate of fuel dumping. Engine power setting is also critical during the dump cycle and 87% rpm or above will always ensure a maximum rate of fuel dumping. A power setting of 80% or less with a nose-down attitude may stop fuel dumping completely.

AIR REFUELING

DESCRIPTION

A retractable probe (figure 1-10), mounted in a well on the left side of the fuselage, is extended and retracted by utility hydraulic pressure. Placing the IFR PROBE switch in OUT deenergizes the transfer pump, depressurizes the wing tank, positions the fuel valves to accept fuel, opens the probe fairing door, and extends the probe. The air refueling PROBE OUT light on the instrument board will also be illuminated when the fairing door opens. With the probe engaged in the tanker's drogue, fuel is admitted into the aircraft fuel system. Complete refueling can be accomplished only with the IFR PROBE switch in the OUT position. If desired, partial refueling of the main cell up to the transfer level can be performed with the IFR PROBE switch in OFF. If a malfunction occurs and it is impossible to retract the probe, placing the switch in OFF will permit normal operation of the fuel transfer system.

CAUTION

Movement of the IFR PROBE switch inadvertently through OFF to the IN position momentarily and then back to OFF could cause the probe to unlock. Should the probe unlock, refueling would be impossible until the switch is again placed in the OUT position.

Note

Although the OFF position energizes the entire fuel transfer system, the main cell will refuel to the transfer level because air refueling pressure is greater than transfer pressure.

Total time for refueling depends upon fuel on board when fueling begins and type of tanker supplying fuel. Total system fueling can be accomplished in 5 to 7 minutes. When the desired amount of fuel has been taken aboard, as indicated by the fuel quantity indicators, a slight reduction in airspeed will disengage the probe. Holding the IFR PROBE switch in the IN position will reenergize the transfer system and reposition the fuel valves for normal operation, retract the probe, and close the fairing door. Hold the switch IN for 5 seconds after the PROBE OUT light goes off before releasing to OFF to ensure locking of fairing door. Releasing the switch to OFF will deenergize the door selector valve. Air refueling system control circuitry receives power from the primary dc bus, while the probe illuminating light is powered by the secondary ac bus.

If the fuel transfer switch is in FUEL TRANS when the probe is extended, the transfer pump warning light will come on and remain on until the IFR PROBE switch is placed in IN or OFF.

PROBE CONTROL

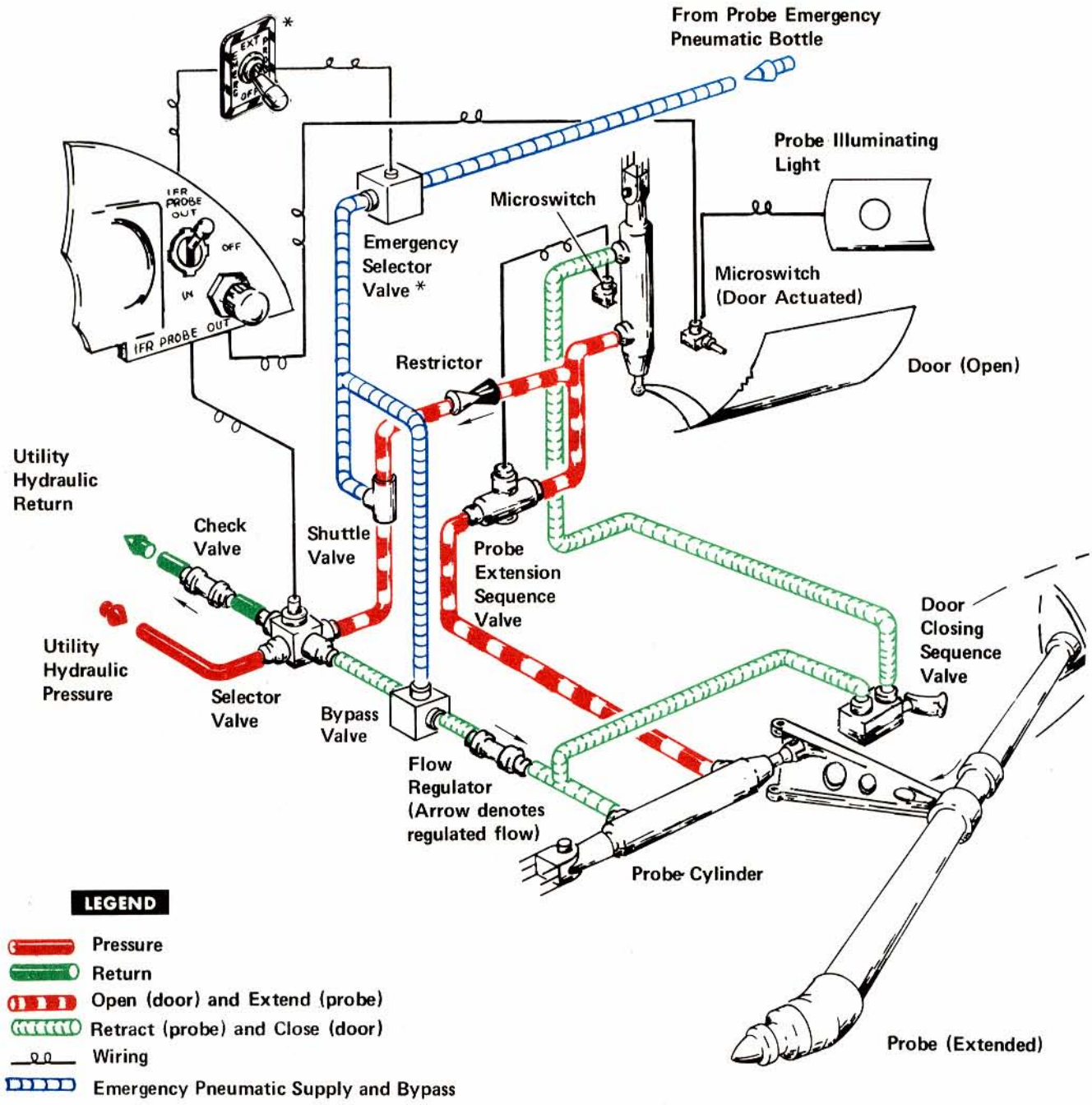

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Figure 1-10

AIR REFUELING CONTROLS

Nomenclature	*Function*
IFR PROBE switch (28, figure 1–3)	OUT – opens probe door, extends probe, deenergizes the transfer fuel system and relieves wing tank pressure. Deenergizes the automatic fuel transfer circuit. The probe illuminating light will come on when the probe door opens with the exterior lights switch in ON. Energizes electrical circuit to the EMERG PROBE switch. IN – retracts probe, closes probe door, energizes the transfer fuel system, and re-pressurizes wing tank. The probe illuminating light will go out when the probe door closes. OFF – deenergizes probe door valve, repressurizes wing tank, and energizes the transfer fuel system.
PROBE OUT light (29, figure 1–3)	On, indicates probe door is open. Off, indicates probe door is closed.
EMERG PROBE switch (figure 1–10A)	EXT – with IFR PROBE switch in the OUT position, pneumatically opens the probe door and extends probe. Once pneumatically extended, the probe cannot be retracted. OFF – deenergizes the emergency pneumatic system.

The system is connected to the primary dc bus to permit refueling all but the aft cells when electrical power is being supplied by the emergency power package. Fuel from the aft cells is not available when using emergency electrical power.

Before air refueling, turn off all unnecessary electrical equipment to reduce electrical load and fire hazard.

A separate 50-cubic inch pneumatic system is installed for emergency extension of the air refueling probe in the event utility hydraulic pressure is lost. The system is electrically actuated through the normal probe extension system by a two-position EMERG PROBE switch located at the base of the windshield bow on the left side of the cockpit. Figure 1-10A displays a schematic of the probe pneumatic system.

With the IFR PROBE switch in the OUT position, placing the EMERG PROBE switch in the EXT position routes pneumatic pressure to extend the probe. Pneumatic pressure remains on the extend cylinder as long as the IFR PROBE switch is in the OUT position and the EMERG PROBE switch is in the EXT position. Repositioning either switch permits pressure from the extend cylinder to be vented overboard. The solenoid valve (EXT position) for actuating the emergency pneumatic system is powered by the emergency dc bus; however, electrical connection is not completed until the IFR PROBE switch, which derives power from the primary dc bus, is placed in the OUT position. Normally the IFR PROBE switch should remain in the OUT position and the EMERG PROBE switch should remain in the EXT position during emergency refueling; however, the transfer system may be actuated by placing the IFR PROBE switch to the OFF position.

CAUTION

- Should the IFR PROBE switch be inadvertently moved momentarily through the OFF position to the IN position, the probe could become unlocked. With the probe unlocked, air refueling is not possible. Should this occur, reextension and locking of the probe is more likely if a reduction of airspeed to minimum allowable is completed before reactuating the emergency extension system.
- If the emergency IFR probe switch is in the EXTEND position when IFR probe switch is activated, the probe will actuate pneumatically, hydraulic actuator pressure will be dumped and the probe will not retract without maintenance assistance.

NEW NEW NEW NEW

Range inflight with the IFR probe extended is reduced by 12%. Following actuation of the emergency probe extension system, the probe cannot be retracted while inflight.

Following actuation of the emergency probe extension system, the probe cannot be retracted while inflight.

An air refueling probe illuminating light is flush mounted on the left side of the fuselage just below the windshield side panel. This light illuminates the refueling probe tip and the tanker drogue as an aid to night air refueling. The probe illuminating light is turned on when the air refueling door is opened with the exterior lights switch ON. The air refueling probe illuminating light is actuated when the landing gear is down, oleos extended, and the taillight is on.

Refer to section IV, part 1, for air refueling techniques and procedures.

PROBE PNEUMATIC SUPPLY

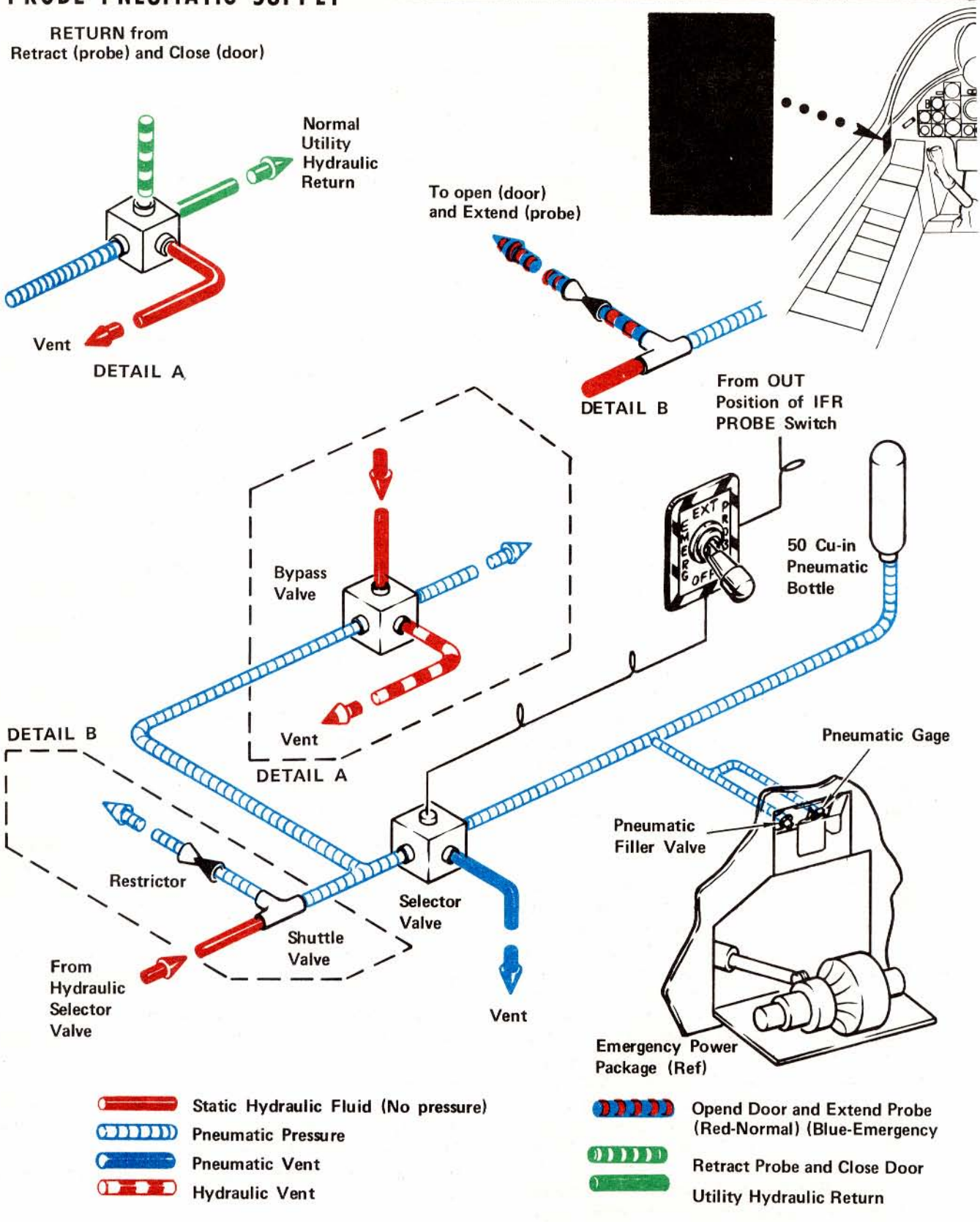

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Figure 1-10A

POWER CONTROL HYDRAULIC SUPPLY

DESCRIPTION

The two power control hydraulic systems (figure 1–11), PC 1 and PC 2, each supply hydraulic pressure at 3,000 ±200 psi. The systems are completely separate and operate independently of each other. Both systems function in the same manner through identical components and act together to operate the flight control surfaces through the slider valves of the surface power control cylinders. The slider valves, positioned by the control stick, the rudder pedals or the trim and stabilization system servo actuators control the direction and amount of control surface deflection. The use of dual power control hydraulic control systems ensures full controllability of the aircraft in case of failure of one of the systems.

The only difference in operation of the two systems is that the aileron spoilers and the yaw stabilization system operate only off the PC 2 system, while roll stabilization operates only off the PC 1 system. An emergency hydraulic pump in the emergency power package is connected to the PC 1 hydraulic circuit to permit pressurization of the PC 1 system in case of a failure that does not involve loss of fluid from the system (pump failure). The emergency pump is placed in operation whenever the emergency power package is extended, but the pump will pressurize the system only when normal system pressure has been lost. The rudder is powered by the PC 1 and utility hydraulic system. Refer to EMERGENCY POWER PACKAGE for additional details on power package operation.

Refer to Section V for procedure to be employed upon failure of the power control hydraulic systems; to Section I, part 4, of flight restrictions imposed with one PC system inoperative; and to Section IV, part 2, for flight characteristics encountered when operating on only one PC system.

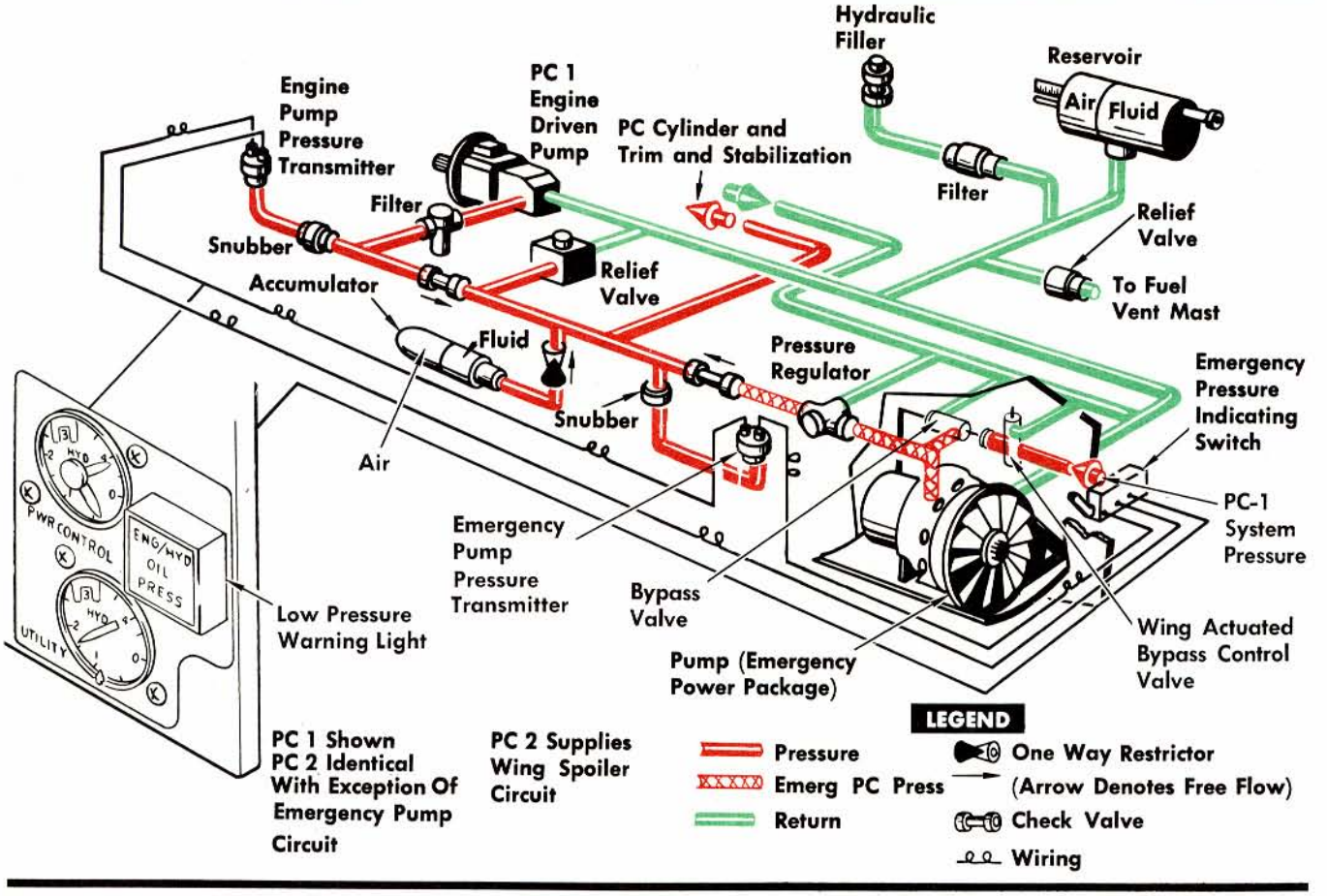
Note

The engine oil/hydraulic pressure warning light will illuminate when either PC pressure drops below 1,500 psi, when the utility hydraulic pressure drops below 700 psi, or when the engine oil pressure drops below 34 psi.

POWER CONTROL SYSTEM CONTROLS

Nomenclature	*Function*
Power control hydraulic pressure indicator (34, figure 1–3)	Indicates pressure in power control systems. Pointers are identified as No. 1 and No. 2 for PC 1 and PC 2 respectively. When ram air turbine hydraulic pressure is being used, pressure is indicated by pointer No. 1.
Engine oil/hydraulic low pressure warning light (33, figure 1–3)	On (ENG/HYD OIL PRESS) when pressure drops excessively in either power control system, utility hydraulic or engine oil system.

POWER CONTROL HYDRAULIC SUPPLY



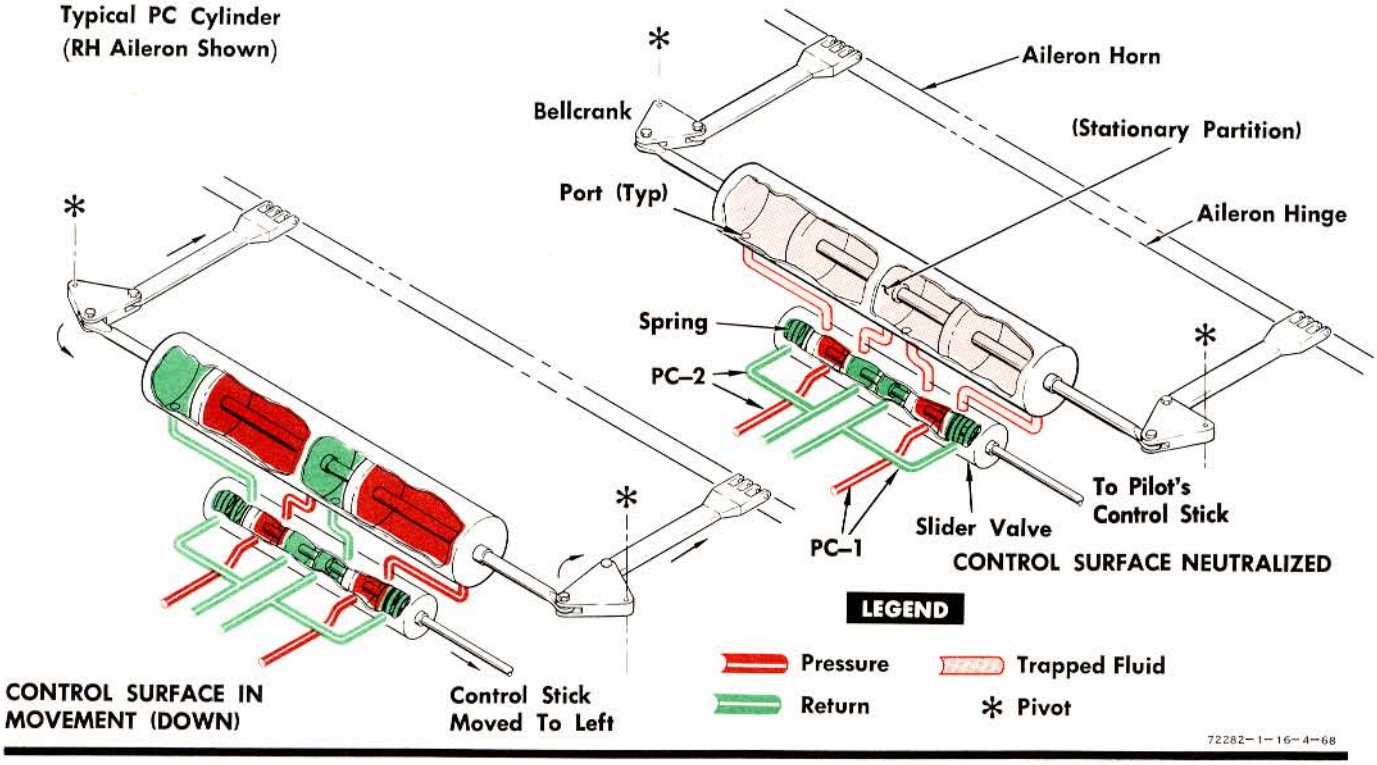


Figure 1–11

FLIGHT CONTROLS

Note

Refer to FLIGHT CONTROLS and EMERGENCY FLIGHT CONTROL SYSTEM of section IV and HYDRAULIC SYSTEM FAILURES of section V for further discussion.

DESCRIPTION

The flight control system uses the control stick (figure 1–12) and rudder pedals to operate mechanical linkage to position the slider valves of hydraulic power control cylinders. In response to this movement the slider valves, through mechanical linkage of the power control cylinders to the control surfaces (aileron, horizontal tail, and rudder), cause movement of the desired surface. As this irreversible system has no airload feedback to the control stick or rudder pedals, artificial "feel" is introduced into the system by feel springs, bobweights, and viscous dampers. The amount of simulated feel introduced is proportional to the amount of surface deflection. The feel springs return the control stick or rudder pedal to neutral after the stick or pedal has been actuated and released. Movement of the control surfaces is also controlled by the trim and stabilization system. Operation of the trim and stabilization system does not affect the neutral position of the control stick or the rudder pedals. See TRIM AND STABILIZATION, this section, for operation of aileron-rudder interconnect.

An assembly of links and levers in the horizontal tail pushrod system reduces control sensitivity in the vicinity of neutral stick position by changing the ratio of stick travel to surface movement as the stick is moved away from neutral. By reducing surface travel for a given stick displacment, the variable gain linkage eliminates large pitch changes with small stick movement. This provides less chance for overcontrolling during formation flight at high indicated airspeeds.

STICK GRIP

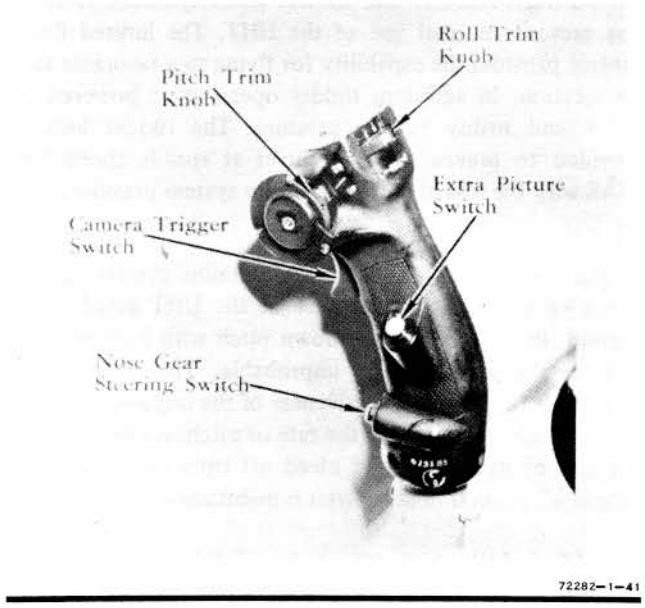


Figure 1–12

When the wing is raised to the landing position, the ailerons and flaps are automatically drooped 20° from the cruise neutral position. This is accomplished by means of mechanical linkage from the wing to the aileron power control hydraulic slider valves and the flap segment inboard of the

FLIGHT CONTROLS

Nomenclature	*Function*
Pilot's control stick	Controls aileron deflection of 15° up and 45° down in landing condition (wing raised and ailerons drooped).
	Controls aileron deflection of 15° up and 15° down in clean condition (wing lowered and aileron cruise neutral restored). Overridable clean condition stops are encountered at 9½°.
	Controls horizontal tail deflection between 29° 30′ nose up and 6° 45′ nose down.
Rudder pedals	Control rudder displacement between 17° left and right of neutral with wing raised.
	Control rudder displacement between 6° left and right of neutral with wing down.
Rudder pedal adjustment crank	Rotated right or left adjusts rudder pedal assembly fore or aft.

ailerons. Aileron droop and flap action provide increased lift and stability when the wing is raised and the wing leading edge is extended.

NEW NEW NEW NEW NEW

The emergency flight control system (EFCS) (see figure 1-12A) provides limited flight control in the event both PC 1 and PC 2 hydraulic systems have failed. The EFCS consists of a UHT restraint and a rudder lock which provide limited flight stability and control when hydraulic pressure loss prevents normal use of the UHT. The limited flight control provides the capability for flying to a favorable area for ejection. In addition, rudder operation is powered by PC 1 and utility system pressure. The rudder lock is provided to prevent rudder flutter at speeds above 200 KIAS with the loss of PC 1 and utility system pressures.

NEW NEW NEW NEW

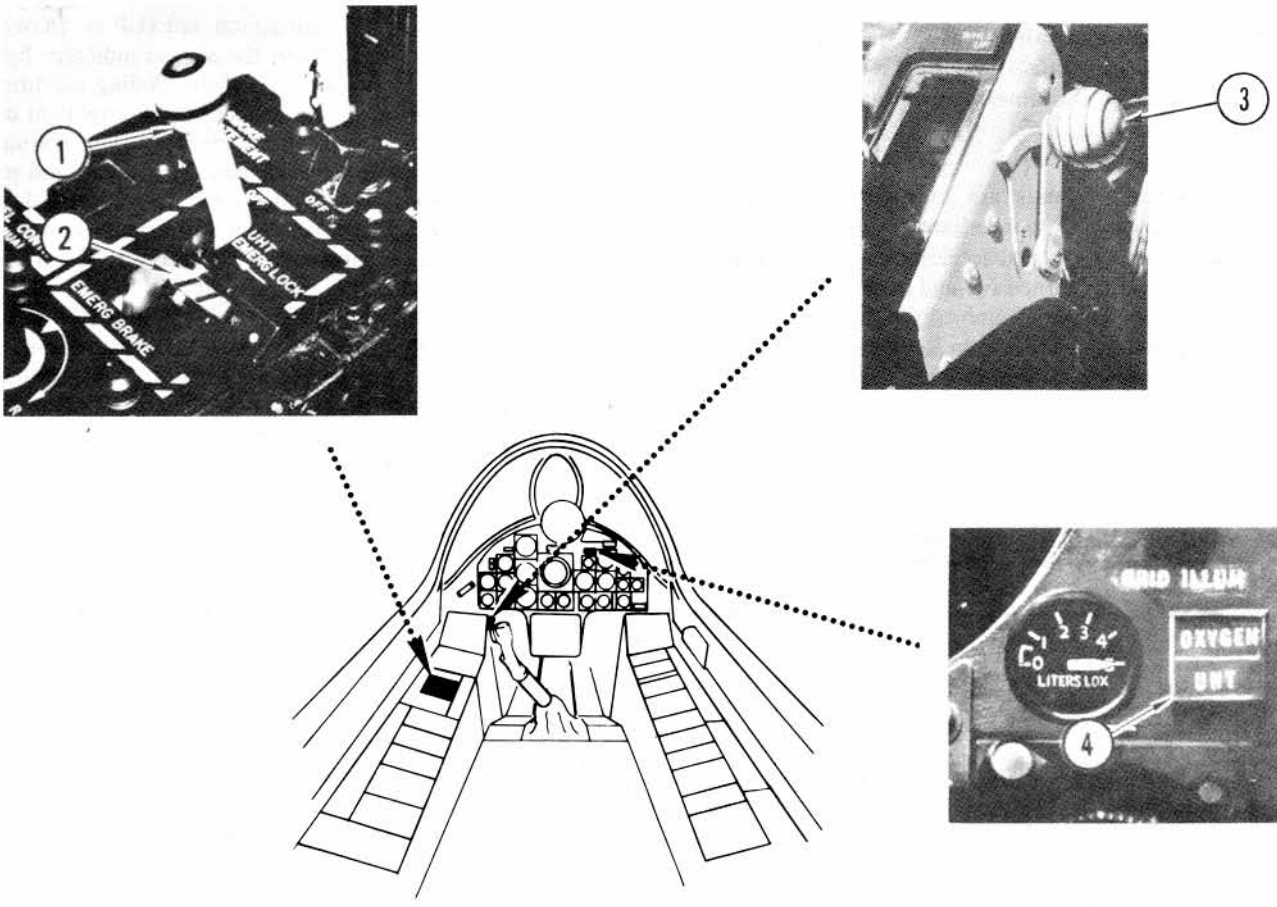
In the event of PC 1 and PC 2 hydraulic system failure, check valves have been installed at the UHT actuators to prevent uncontrollable nose-down pitch with high negative g forces making ejection improbable. The pitchover is caused by the loss of effectiveness of the unpowered UHT. These check valves reduce the rate of pitchover by reducing the rate of hydraulic fluid bleed off from the actuator as long as aft stick or nose-up trim is maintained.

The UHT lock is actuated by pulling the EMERG BRAKE/UHT EMERG LOCK handle fully aft and locking it in this position by flipping the latch lock outboard. This poises the camlock to drop in place on the UHT horn. The UHT restraint is a pneumatically-actuated, cam-detented fitting which is forced over rollers on the UHT horns when the UHT is at 4 3/4° trailing edge up (TEU). The stick must be pulled sufficiently aft to ensure achieving the required UHT angle before complete loss of both PC systems. Air pressure is supplied from the 1,100 cubic inch emergency air bottle and is actuated by the emergency brake handle. A manually operated latch is provided to hold the brake handle in the full aft position. A UHT LOCKED indicator lamp provided in the cockpit comes on when both UHT's are restrained. With approximately 1,500 psi or greater in either PC hydraulic system, the restraint may be overridden by normal UHT control. The rudder lock consists of pneumatically operated shutoff valves in the hydraulic lines to the rudder actuator. The shutoff valves are operated by a rudder lock handle located forward on the left vertical panel of the cockpit. When the handle is pulled to the aft detent, the valves trap hydraulic fluid in the rudder actuator. The rudder, if locked in an out of trim position, will slowly assume an aerodynamic trail condition because of actuator internal leakage.

A wing spoiler control surface is installed flush with the upper surface of the wing forward of each aileron to increase rate of roll at low altitudes and high airspeed. The spoilers are slaved directly to aileron control and function in both the clean condition and landing condition. When the aileron is deflected more than 2° above the aileron clean condition neutral, the spoiler control surface is deflected an amount proportional to aileron deflection. Maximum spoiler deflection is 49°. Mechanical linkage from the aileron power control package positions a slider valve, allowing PC 2 hydraulic pressure to actuate the spoiler control surface. The spoilers will be inoperative with loss of PC 2 hydraulic system.

The clean condition aileron stops are not firm surface stops but are overrideable stops which warn the pilot against overcontrol about the roll axis. When the wing incidence handle is in the wing down position (clean condition), two stops are engaged, which limits control stick movement to 9-1/2° of aileron deflection. With adequate stick pressure these clean condition stops can be overridden to produce up to 15° aileron deflection. See figure 1–15 for UHT, rudder, and aileron information.

EMERGENCY FLIGHT CONTROLS



Nomenclature	*Function*
1. UHT Emergency Lock/ Emergency Brake Handle	Pulled aft, pneumatically engages UHT cam lock assembly over UHT horn and directs pneumatic pressure to both wheel brake cylinders simultaneously. Pressure is proportional to handle movement. (If emergency brake system is used, hydraulic brake system must be bled before flight). OFF – Permits UHT cam lock assembly to return/remain in the disengaged position.
2. Manual Latch Lock	Engaged, permits retention of the UHT EMERG LOCK handle in the aft (engaged) position.
3. Emergency Rudder Lock	Aft detent, pneumatically actuates rudder hydraulic lines shutoff valves, trapping hydraulic fluid in the rudder actuator. Forward detent, reopens/retains rudder hydraulic shutoff valves in open position.
4. UHT Locked Indicator Light	Comes on when the rollers on the UHT horn are positioned in the cam lock detent.

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Figure 1–12A

TRIM AND STABILIZATION

DESCRIPTION

This system senses flight deviations about the yaw and roll axes and automatically applies corrective stabilization signals to the control system. Normal yaw, pitch and roll trimming and emergency pitch trimming are provided through cockpit controls. System operation is illustrated in figure 1–13.

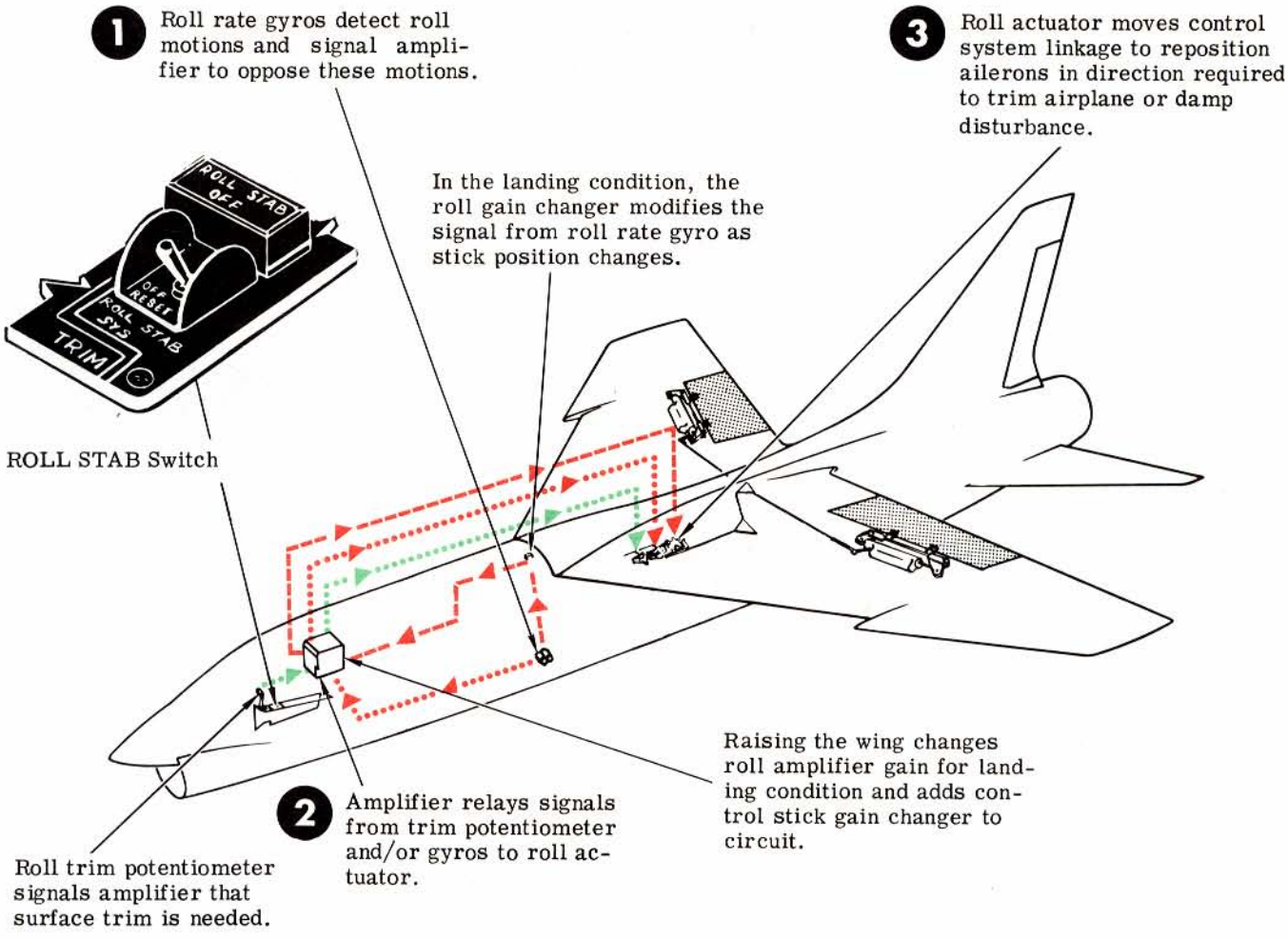
Roll stabilization signals are automatically initiated by roll rate gyros. Yaw stabilization and "stiffening" signals are initiated by lateral accelerometers. The stabilization functions can be turned off and on by controls on the left-hand console. Roll and pitch trim knobs are located on the stick grip and the rudder trim knob is on the left-hand console. Pitch trim is calibrated with the wing in the UP position and the control stick in neutral. Trim neutral indicating circuits provide indications when the horizontal tail, aileron, and rudder control surfaces are in the neutral position. The NOSE TRIM cockpit indicator reflects in units the position of the horizontal tail (UP or DOWN) from the neutral position. When the aileron indicator light is on, the ailerons are within ±1° of the landing condition 20° neutral position. With the rudder trim neutral light on, the rudder is within ±1° of the neutral position. Warning lights monitor the locking mechanism for the yaw and roll stabilization systems. When the YAW STAB OFF light comes on, the yaw actuator is locked in the neutral position and the yaw system is inoperative. When the ROLL STAB OFF light comes on, the roll actuator is locked in the neutral position and the system is inoperative. With the wing in the clean condition, full nose up trim at the control surface is reached prior to full movement of the control knob. Movement of the trim knob does not affect the position or feel of the control stick.

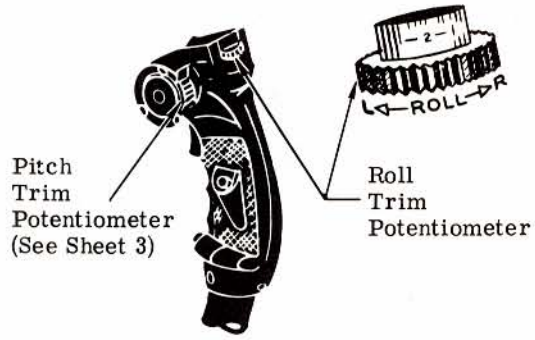
TRIM AND STABILIZATION CONTROLS

Nomenclature	*Function*
	Roll
Aileron neutral trim light (12, figure 1–5)	On (AIL NEUT), indicates ailerons at neutral (0° trim). Off, indicates ailerons not in neutral. Inoperative with weight off landing gear.
Roll stabilization switch (33, figure 1–4)	OFF-RESET shuts off roll damping and trim circuits and resets system after cutout by comparator circuit. ON makes hydraulic power available for roll damping and trim.
Roll trim knob (On control stick grip)	Rotated left or right, adds corresponding roll trim.
Roll stabilization warning light (31, figure 1–4)	On (ROLL STAB OFF), indicates system not operating. Off, indicates system operating.
	Yaw
Rudder neutral trim light (12, figure 1–5)	On (RUD NEUT), indicates rudder in neutral (0° trim). Off, indicates rudder not in neutral. Inoperative with weight off landing gear.
Rudder trim knob (37, figure 1–4)	Rotated left or right adds corresponding yaw trim.
Yaw stabilization switch (21, figure 1–4)	OFF RESET — shuts off yaw damping and trim circuits and resets system after cutout by comparator circuit. ON — makes hydraulic power available for yaw trim and damping.
Yaw stabilization warning light (22, figure 1–4)	On (YAW STAB OFF), indicates yaw stabilization system not operating. Off, indicates system operating.
	Pitch
Pitch trim knob (On control stick grip)	Rotated forward (nose down) or aft (nose up) adds pitch trim. (Calibrated in units of trim for wing up position.)
Nose trim indicator (11, figure 1–5)	OFF – indicates instrument inoperative. (Deenergized with weight off landing gear.) Units UP or DOWN indicates amount of pitch trim attained by the control surface with stick in neutral and wing up. Pitch trim available exceeds the limits of the indicator, but the indications are true within limits.
Emergency pitch trim handle (34, figure 1–4)	Pulled, cuts off normal pitch trim and places emergency trim circuit in standby. NOSE DOWN or NOSE UP — adds desired trim to horizontal tail through emergency trim channel selected with emergency pitch trim channel selector switch.

TRIM AND STABILIZATION

ROLL TRIM AND DAMPING





LEGEND

- Damping Signals (Landing Condition)
- Damping Signals (Clean Condition)
- Trim Signals

NOTES

1. Roll trim and damping operates electrically from emergency buses and hydraulically from PC No. 1 system.
2. No emergency roll trim is provided because the electrohydraulic actuators will lock at neutral if electrical or hydraulic power is lost.
3. A monitor system maintains a constant check of roll actuator. If the two channels within the actuator get more than 20% out of agreement, the monitor shuts off the system and it locks in neutral.
4. With the emergency power package extended and EMER GEN switch in "LAND," the roll monitor is overridden. To prevent a malfunctioning system from being energized by the roll monitor override, the ROLL STAB switch must be in " OFF" before the EMER GEN switch is placed in "LAND," if the monitor had previously shut off the system because of a malfunction.

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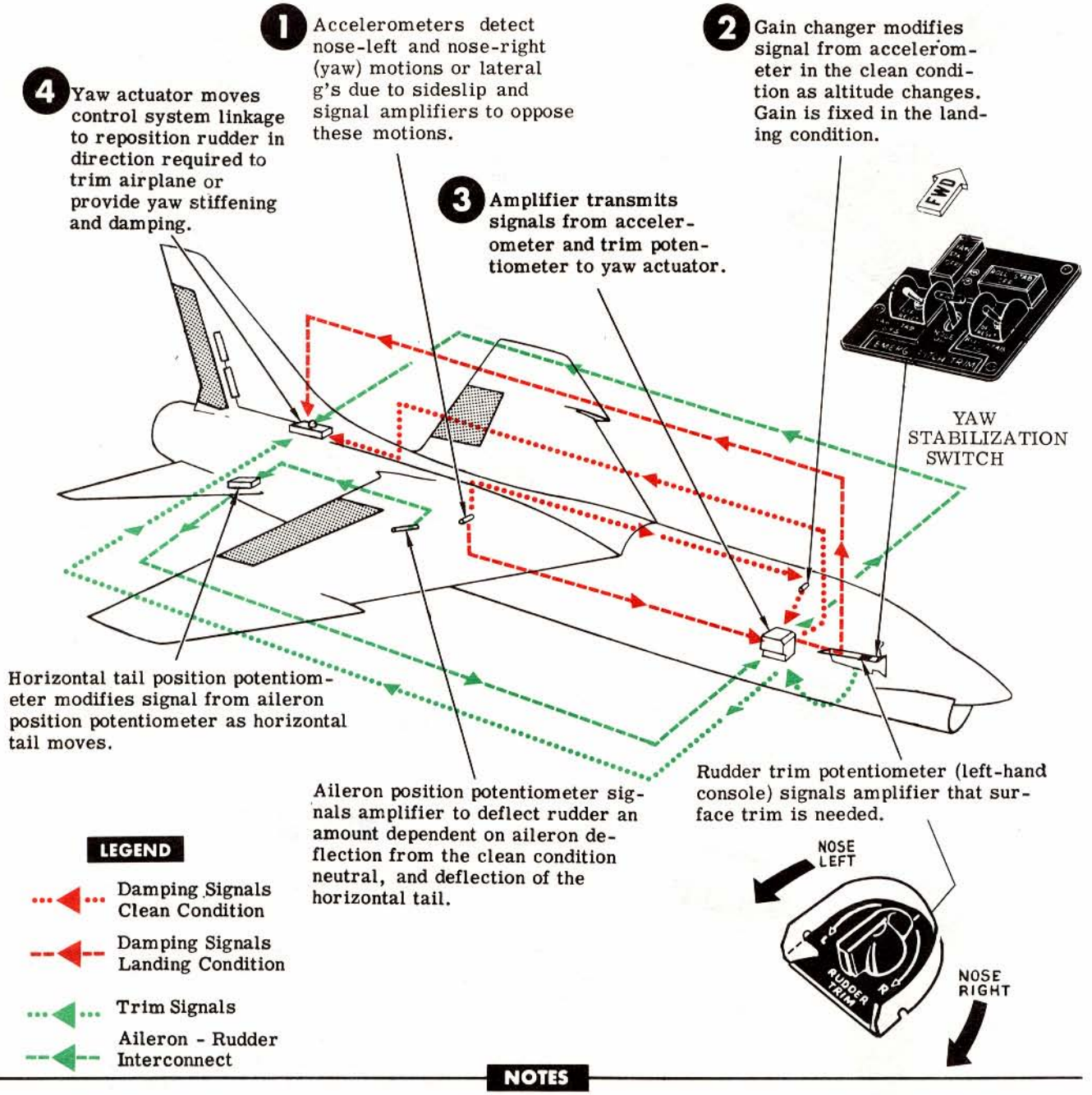
Figure 1-13 (Sheet 1)

TRIM AND STABILIZATION

YAW TRIM AND DAMPING



NOTES

1. Yaw trim and damping operates electrically from primary buses and hydraulically from PC No. 2 system.
2. This system incorporates dual servo channels with dual components throughout.
3. No emergency yaw trim is provided because the actuators will lock at neutral if electrical or hydraulic power is lost.
4. A monitor system maintains a constant check of yaw actuator. If the two channels within the actuator get more than 20% out of agreement, the monitor shuts off the system and locks it in neutral.

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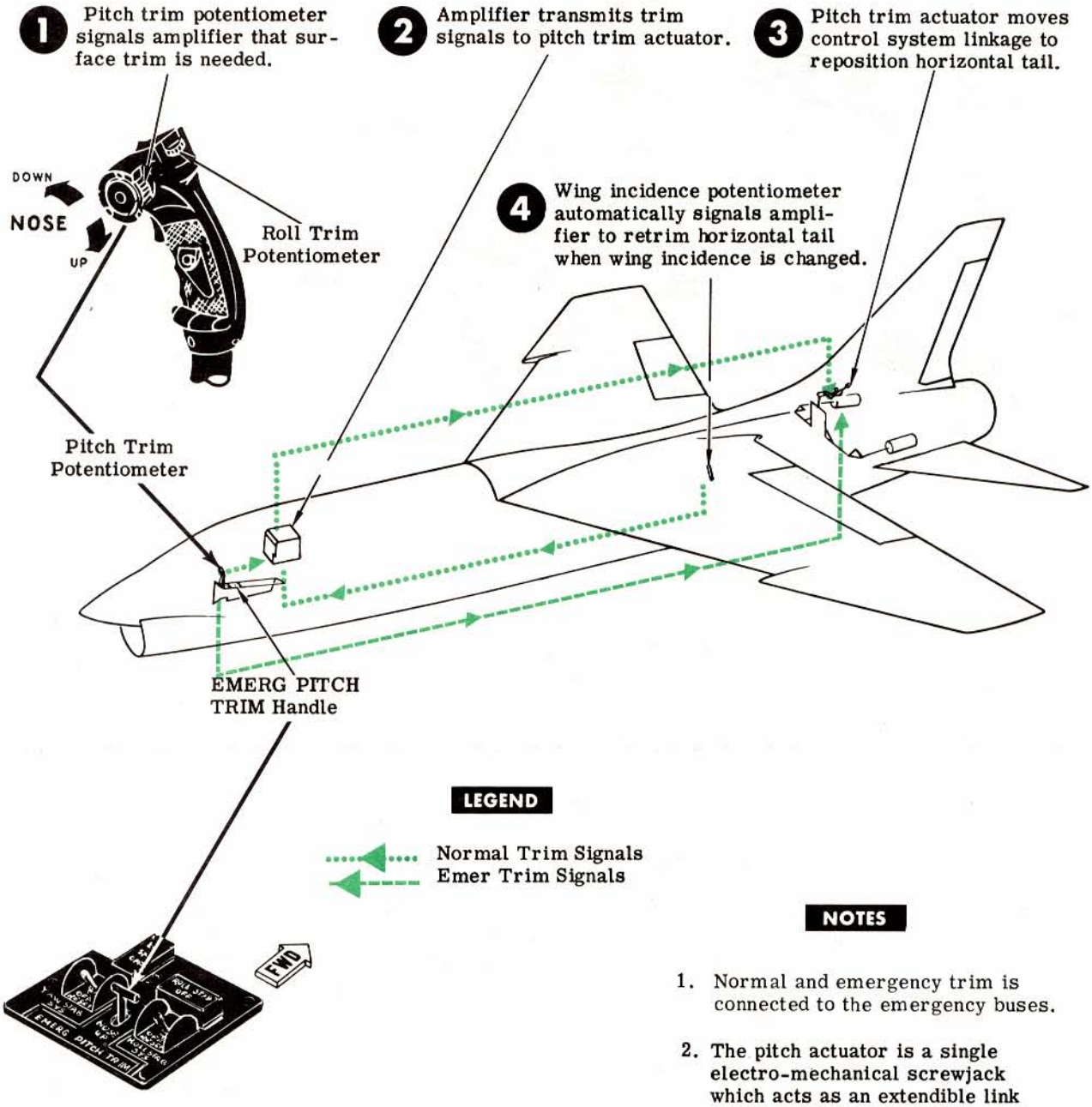
Figure 1-13 (Sheet 2)

TRIM AND STABILIZATION

PITCH TRIM



STABILIZATION TRIM PANEL

NOTES

1. Normal and emergency trim is connected to the emergency buses.
2. The pitch actuator is a single electro-mechanical screwjack which acts as an extendible link in the control linkage.
3. No pitch damping is provided because inherent damping is satisfactory.

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Figure 1-13 (Sheet 3)

UTILITY HYDRAULIC SUPPLY

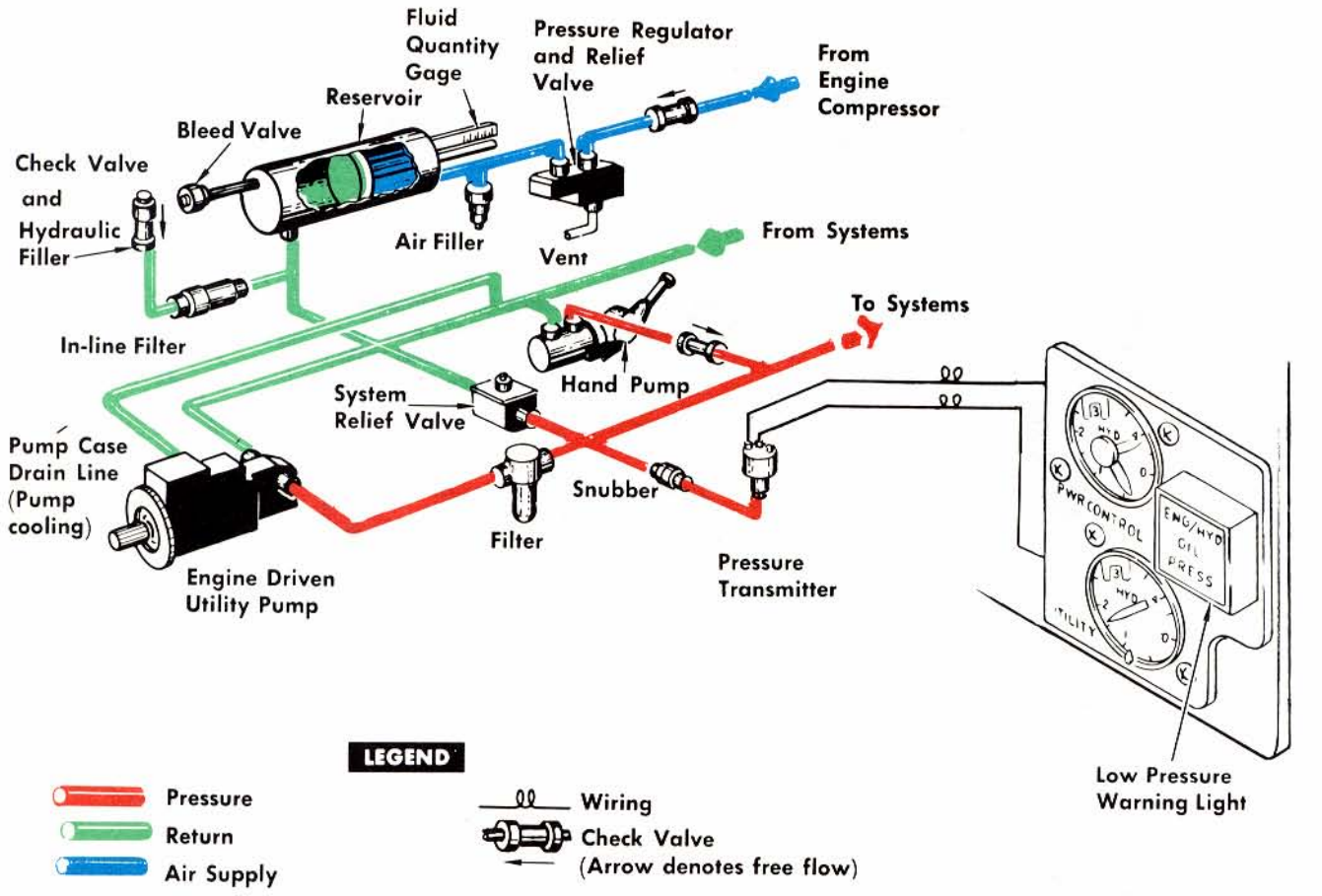

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Figure 1–14

UTILITY HYDRAULIC SUPPLY

DESCRIPTION

The system, illustrated in figure 1–14, provides hydraulic power to operate the following systems.

Arresting Hook	Two-Position Wing
Inflight Refueling Probe	Wheel Brakes
Landing Gear	Wingfold
Nose Gear Steering	Wing Leading Edge
Speed Brake	

The utility system, in conjunction with PC 1 hydraulic system, provides power for rudder operation.

An engine-driven hydraulic pump supplies pressure (3,000 (±200) psi) for the operation of the utility hydraulic circuits. Hydraulic pressure failure will be indicated by illumination of the engine oil/hydraulic pressure warning light (33, figure 1–3).

Illumination of the engine oil/hydraulic pressure warning light also indicates that the utility hydraulic pressure has dropped below 700 psi, either PC hydraulic pressure has dropped below 1,500 psi or the engine oil pressure has dropped below 34 psi. If illumination occurs, check hydraulic pressure and oil pressure indicators to verify the system affected.

Note

Utility hydraulic pressure may surge to 3,500 psi when any of the systems are actuated.

There is no utility hydraulic emergency system. Emergency operation of major utility circuits is provided by air pressure from the pneumatic system.

A hydraulic hand pump, located in the left main landing gear well, is connected to the utility hydraulic supply system main pressure and main return lines. A check valve between the hand pump and the hand pump pressure gage prevents hydraulic pressure from entering the hand pump. The pump develops only a limited amount of hydraulic pressure which is not sufficient to allow cycling of more than one supplied system at a time.

Refer to part 3, this section, for servicing information.

TWO-POSITION WING

DESCRIPTION

The two-position wing provides increased visibility at low takeoff and landing speeds by permitting the angle-of-attack of the wing to be increased without increasing the fuselage angle. The wing leading edge and ailerons are automatically drooped and flaps extended when the wing is raised to provide increased lift and stability during takeoff and landing. The wing leading edge can be extended to the land droop position with utility hydraulic pressure as an aid to spin recovery. Extension and retraction is accomplished by actuation of a guarded two position switch located at the base of the left longeron outboard of the throttle. With the switch in the ON position and the guard down, the switch is locked in the ON position. The system is illustrated in figures 1–15 and 1–16.

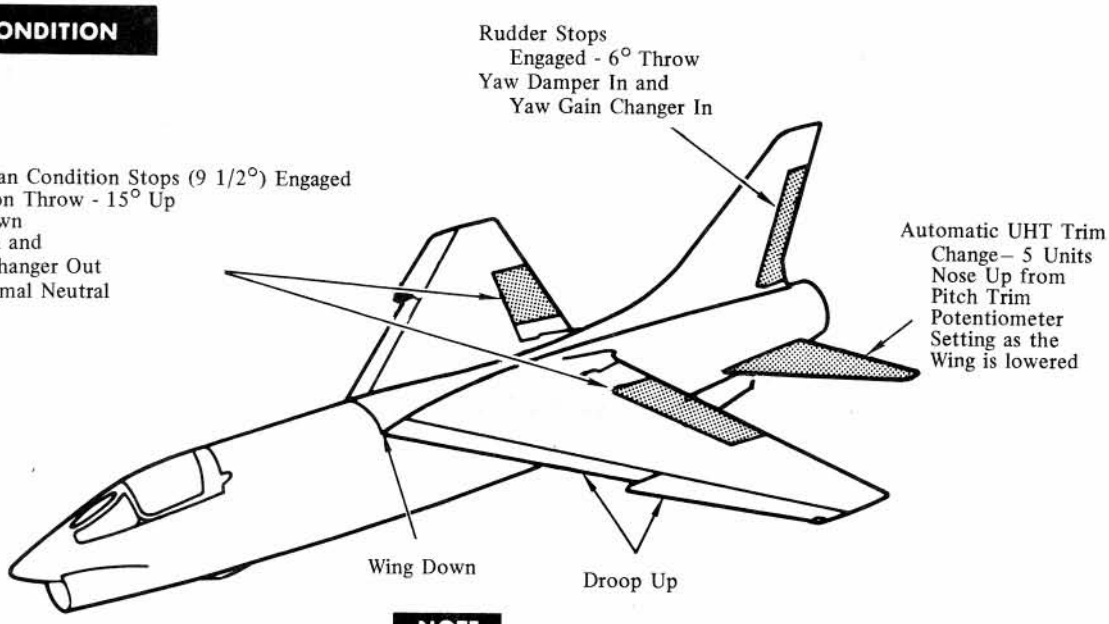
The wing is normally raised or lowered and the leading edge simultaneously extended to or retracted from the landing droop position by utility hydraulic system pressure. If hydraulic pressure is lost, the wing can be raised and the leading edge extended to the landing droop position by pneumatic system pressure.

During wing-up transition, a momentary low pressure indication of the PC 1 system may occur, which could also cause momentary illumination of the warning light. The RAT bypass pressure sensing line is tapped downline of the PC 1 pressure snubber. A slow response of the pressure snubber following the use of a small amount of fluid to actuate the bypass valve causes the low indication even though the actual pressure of the PC 1 does not drop off. Cycle the wing and wipeout cockpit every 5 minutes on deck to facilitate hydraulic pump and line cooling. NCN

Figure 1–15 illustrates changes automatically effected by raising or lowering the wing.

WING INCIDENCE CHANGE

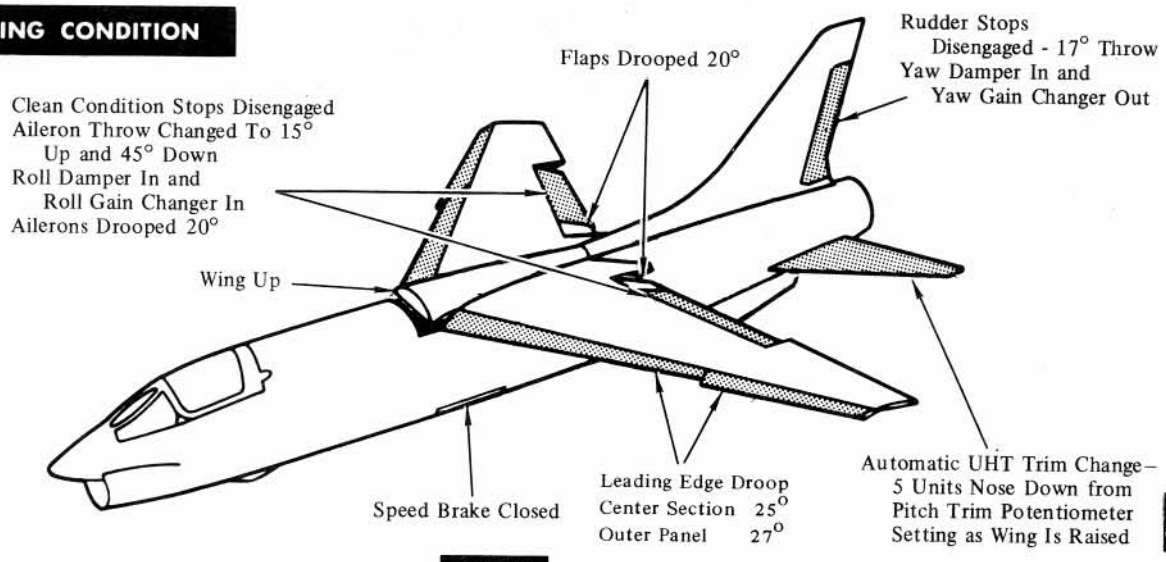
CLEAN CONDITION



NOTE

Cruise droop selected – center section leading edges drooped 6.8° and outer panel leading edges drooped 7°.
Emergency spin droop selected – center section leading edges drooped 25° and outer panel leading edges drooped 27°.

LANDING CONDITION



NEW

NOTE

If the emergency droop and wing incidence guard is raised with the wing incidence handle in UP, it will be impossible to move the handle to the extend droop position or the emergency wing up position without first manually repositioning the guard in the down position and then continuing with the proper sequence.

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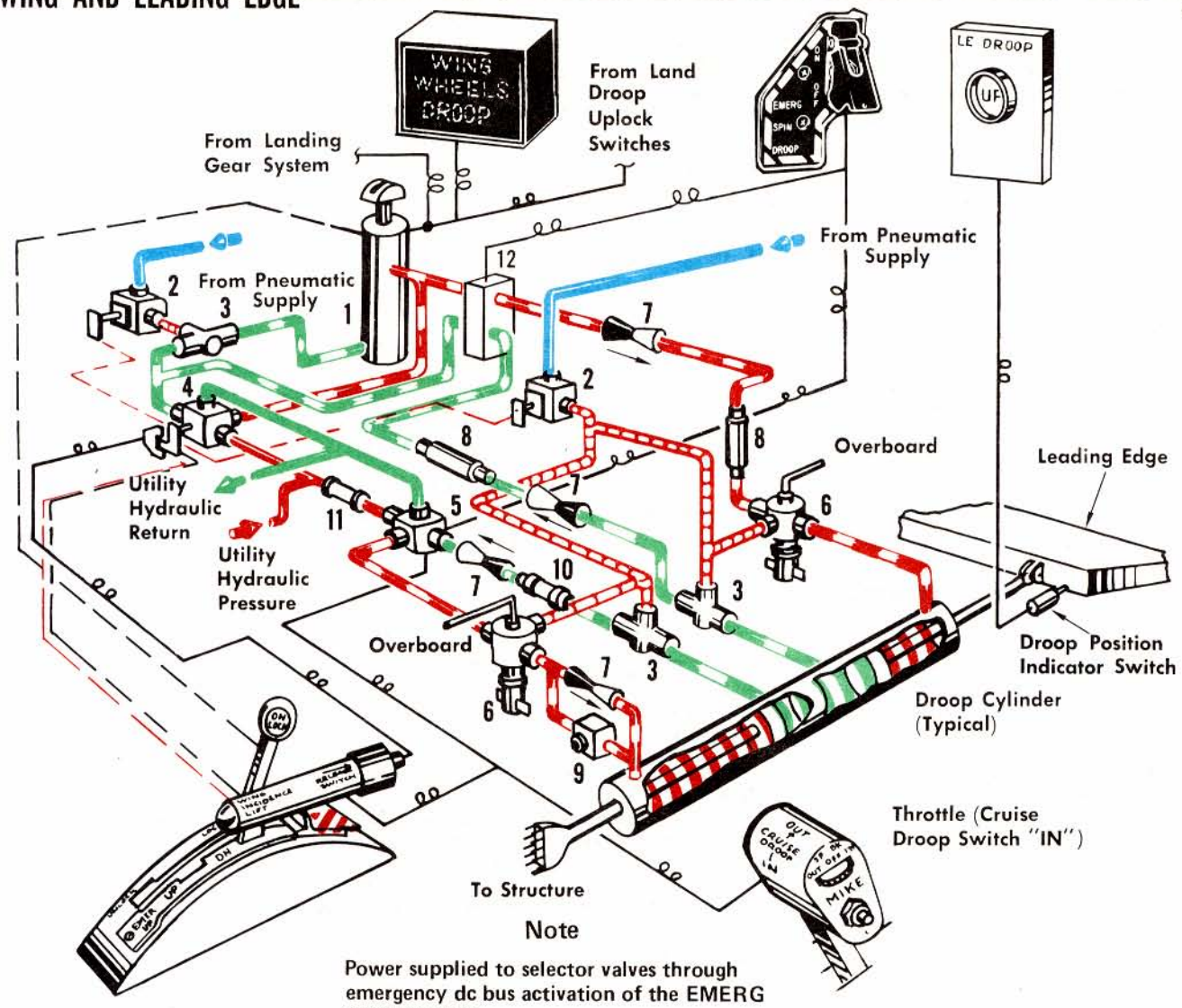
Figure 1–15

WING AND LEADING EDGE



1 Wing Incidence Cylinder (wing down)
2 Emergency Air Valve
3 Shuttle Valve
4 Selector Valve (Mechanically Operated)
5 Selector Valve (Solenoid Operated)
6 Bypass Valve
7 Restrictor (Arrow denotes free flow)
8 Sequence Valve
9 Pressure Relief Valve
10 Restrictor Relief Valve
11 Check Valve
12 Selector Valve (Solenoid Operated)

LEGEND

- Pressure
- Return
- Lower (wing) and Retract (leading edge)
- Raise (wing) and Extend (leading edge)
- Emergency Air
- Pneumatic Pressure
- Linkage (Red denotes emergency)
- Wiring

72282-1-21-12-70

Figure 1-16

The wing actuating cylinder has both a mechanical downlock, controlled by the downlock handle, and an integral locking mechanism. The downlock handle must be fully engaged in the UNLOCK detent before the wing incidence handle is actuated. Positioning the wing incidence handle with the downlock handle out of detent will cause misalignment of wing cylinder mechanical downlock and binding of handles. During subsequent wing DN selection, mechanical interference between retracting cylinder and mechanical downlock will prevent further hydraulic or pneumatic operation of the wing and leading edge.

With a force applied to the handle, it will be possible to move the handle toward the LOCK detent, due to action of spring struts in the rigging, but not sufficiently so as to engage the detent. When the downlock handle is in LOCK, a cam is positioned to prevent the wing incidence handle from being placed in UP.

The wing cylinder internal lock locks the cylinder in position when it is not actuated or when pressure is lost. During wing positioning, the lock will engage if g forces are applied due to hydraulic pressure being neutralized. The wing will continue movement when g forces are removed.

The wing incidence handle has a solenoid-operated dual lock latch, which locks the handle in the up or down position and is controlled by the release switch. The dual lock latch is engaged when energized by secondary bus power and is unlocked by spring action when the circuit is broken by depressing the release switch or when electrical power is lost.

If pneumatic system pressure is to be used to extend leading edge droop or raise the wing, the wing incidence handle must be placed in DN before the emergency droop and wing incidence guard is raised or the handle will bind as the detent plate is released and swings outboard.

The wing leading edge is drooped by six actuating cylinders. Normal operating pressure is supplied by the utility hydraulic system. Each cylinder is divided

TWO-POSITION WING CONTROLS

Nomenclature	*Function*
Cruise droop switch (throttle grip)	OUT — extends leading edge to cruise position with wing incidence handle in DN position. IN — retracts leading edge from cruise droop to clean position with wing incidence handle in DN position.
Leading edge droop indicator (23, figure 1–3)	UP — indicates leading edge in clean position or in travel toward the cruise droop position. DN — indicates leading edge in cruise droop position or in travel toward the clean position or land droop pistons mechanically locked in land droop position. Barberpole indicates one or more land droop pistons unlocked, or electrical power not connected. Indication will normally occur during wing transition, but will not occur when cycling droops between cruise and clean position.
Wing downlock handle (6, figure 1–4)	UNLOCK – unlocks wing cylinder mechanical downlock and permits movement of the wing incidence handle. LOCK – with wing incidence handle in DN, locks wing in down position and turns out wing/wheels/droop warning light with gear retracted and landing droop locked up.
Wing incidence release switch (9, figure 1–4)	Held depressed, unlocks wing hydraulic selector valve to permit positioning of wing incidence handle.
Wing incidence handle (8, figure 1–4)	UP and DN – positions wing and leading edge selector valves for raising or lowering of wing and simultaneous extension or retraction of land droop (see figure 1–15 for other changes taking place automatically when wing is raised or lowered).
Emergency droop and wing incidence guard (7, figure 1–4)	Raised, permits moving wing incidence handle forward to blow landing droops down, and then aft to EMERG UP position to raise wing.
Emergency spin droop switch (13, figure 1–4)	ON – with landing gear retracted and wing down, extends leading edge to land droop position OFF – with landing gear retracted and wing down, retracts leading edge to position selected by cruise droop switch.
Wing/wheels/droop warning light (22, figure 1–3)	Flashing (WING/WHEELS/DROOP) when: Landing gear handle up and wing not down and locked. Landing gear handle down and wing not up. Landing gear handle UP, wing down and locked with one or more land droop pistons unlocked. Landing gear handle up, wing down and locked – EMERG SPIN DROOP switch ON and droops extended (flashing will continue if wing is inadvertently raised with EMERG SPIN DROOP switch in ON).

into two elements by a wall inside the cylinder barrel, and each has two pistons. One piston rod extends from each end of the cylinder barrel, with one rod connected (directly or indirectly) to the wing and the other to the leading edge. Both elements of the cylinder are used to obtain the land (full) droop position and only one element is used to obtain the cruise droop position. One piston (in the cruise element) is controlled by the cruise droop selector valve which is actuated electrically by the cruise droop switch (throttle grip). The other piston (in the land droop element) is controlled by a hydraulic valve which is actuated by direct linkage from the wing incidence handle in the cockpit. When the wing incidence handle is put in the UP position, the cruise droop selector valve is energized to include the operation of the cruise elements in obtaining full extension of the leading edge to the land droop position.

Note

Do not operate spin droop on the ground. Spin droop can be actuated to the down position but may not retract without maintenance assistance.

Mechanical locks in the land droop elements provide droop locking. Emergency land droop can be obtained by using the pneumatic system. With the landing gear retracted and the wing down, full landing droops can be extended from the clean or cruise position using utility hydraulic pressure. Placing the guarded EMERG SPIN DROOP switch in the on position extends the droops. Placing the switch to OFF retracts the droops to the position selected by the cruise droop switch. A counter mounted on the left canopy deck records the number of actuations. The system is operative when electrical power is supplied by the main generator or the EPP, since control power is from the emergency dc bus. There is no emergency provision for obtaining cruise droop.

CAUTION

- The spin droops are designed to aid in spin recovery and are not recommended for use in any other regime.
- If the wing is raised with spin droop selected, the droops will retract to the full clean position.

NEW

NORMAL OPERATION

To raise the wing and extend the leading edge, proceed as follows:

1. Wing downlock handle — UNLOCK
2. Wing incidence release switch — DEPRESS
3. Wing incidence handle — UP

To lower the wing and retract the leading edge:

1. Wing incidence release switch — DEPRESS
2. Wing incidence handle — DN
3. Wing downlock handle — LOCK

To raise the wing and extend the droop pneumatically:

1. Wing downlock handle — UNLOCK
2. Wing incidence handle — DN
3. Emergency droop and wing incidence guard—RAISE
4. Wing incidence release switch — DEPRESS
5. Wing incidence handle — Full forward to extend droop, then inboard and aft to EMERG UP

WINGFOLD

DESCRIPTION

The wingfold system is illustrated in figure 1–17.

CAUTION

Ensure ailerons are in neutral and roll stab is off before folding/spreading wings or damage to ailerons/outer wing panels may result.

The wing outer panels are folded by utility hydraulic pressure and secondary dc bus electrical power. They are spread by utility hydraulic pressure. They may be folded or spread with the wing raised or lowered. When the wingfold lock lever is raised, red warning flags (figure 1–18) are extended mechanically and the lock safety latches are released. When the wingfold lever is raised, a selector valve is mechanically positioned to supply hydraulic pressure to the hinge pin cylinders and the wingfold cylinders. The hinge pin cylinders retract the hinge pins. The wingfold cylinders are not actuated until the retracting hinge pins energize microswitches powered by the secondary dc electrical bus which open the fold sequence valves, permitting the wingfold cylinders to fold the outer panels.

During spreading the folding sequence is reversed. The wing is mechanically locked in the spread position by the wing hinge pins. The lock safety latches lock the hinge pins in place. The warning flags will be visible any time the lock safety latches are not engaged.

Inspection ports are provided to permit a visual check of the wing hinge pin and lock mechanism to ascertain a positive wing-lock condition. (Refer to figure 1–19.)

WINGFOLD

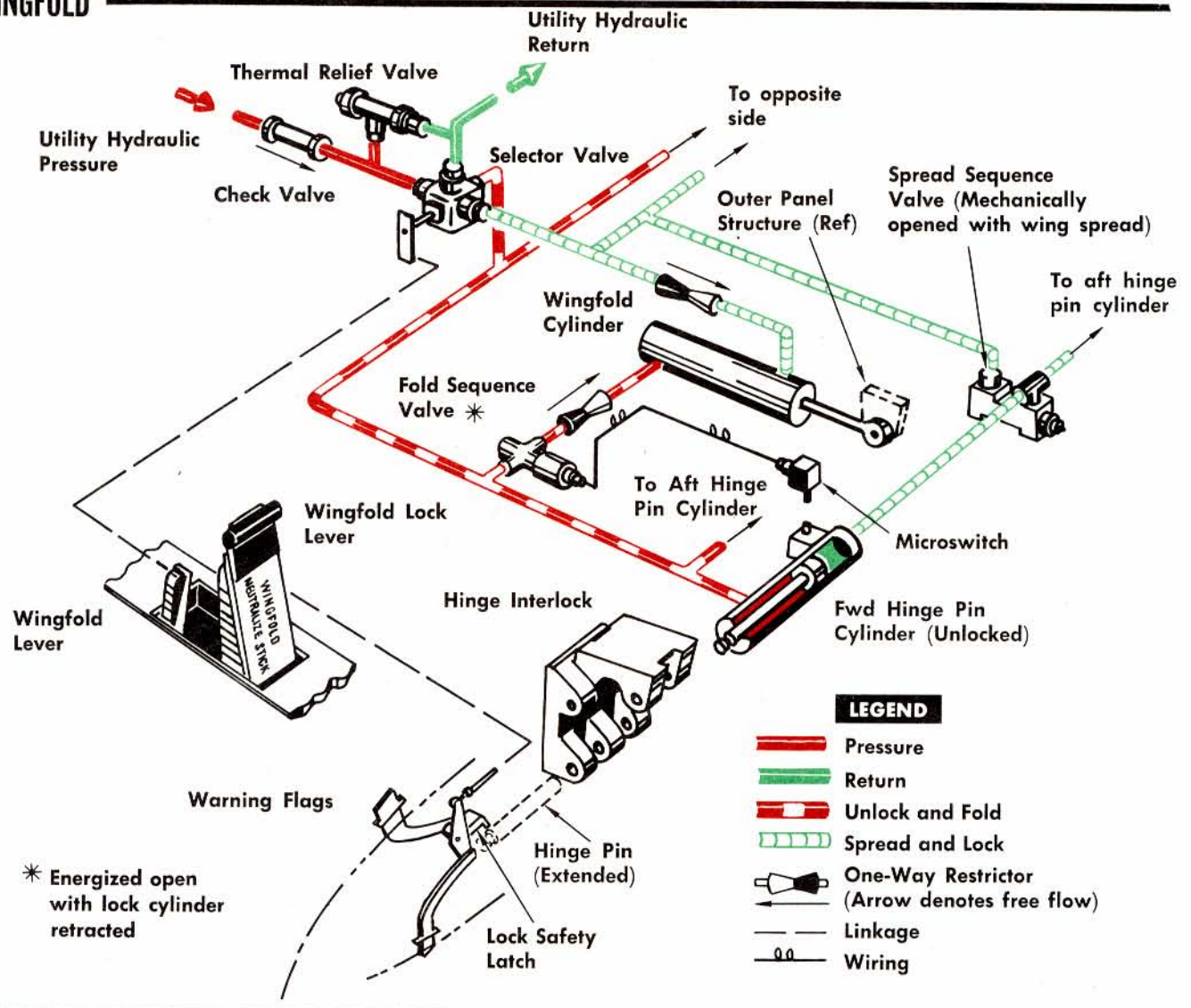
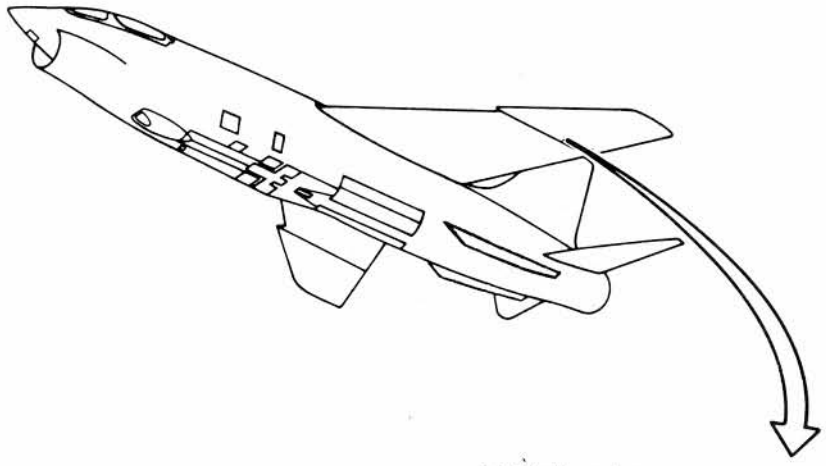


Figure 1–17

WINGFOLD CONTROLS

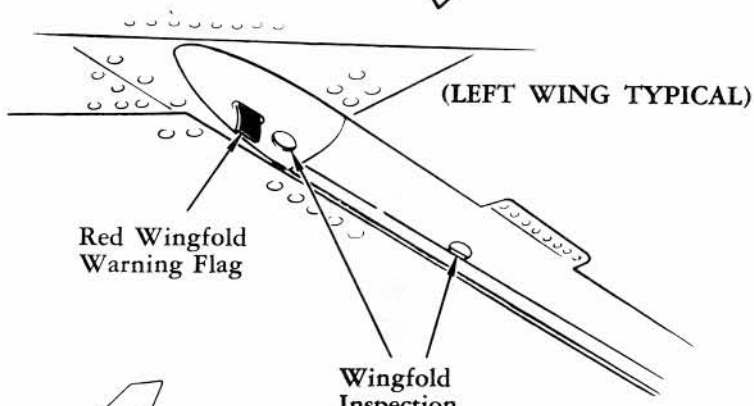
Nomenclature	*Function*
Wingfold lock lever (14, figure 1–5)	Up (depress tab, squeeze latch, and pull up and back until the lever engages the detent), mechanically releases lock safety latches and extends warning flags, provided secondary dc bus electrical power is available. Down (only after wings fully spread by placing wingfold lever in down position), mechanically positions lock safety latches to lock the hinge pins and to retract warning flags.
Wingfold lever (under wingfold lock lever)	*Ailerons must be neutral.* Do not deflect stick during folding. Up (squeeze and pull up), hydraulically folds wings. Down, hydraulically spreads wings.
Warning flags (top and bottom wing leading edge — wingfold area)	Extended, indicates hinge pins are not locked. Retracted, indicates hinge pins are locked.

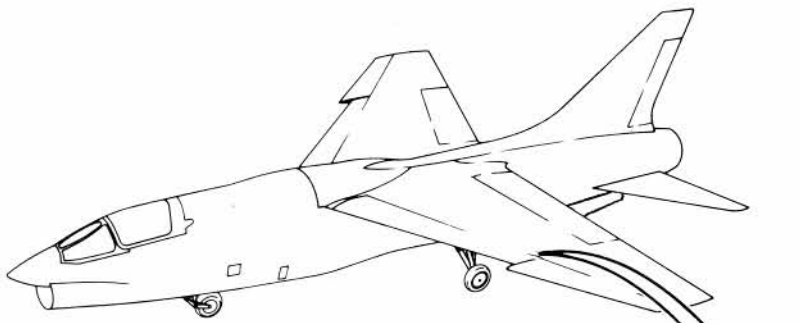
WINGFOLD WARNING FLAGS



WARNING

Check both left and right wings. If warning flags are visible, the hinge pins are not locked in position. Do not clear aircraft for flight if any warning flag is visible or before the positions of the hinge pins and lock safety latches are visually checked by ground personnel.





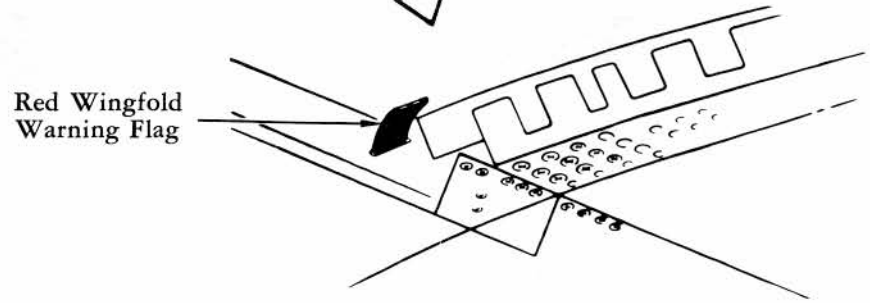


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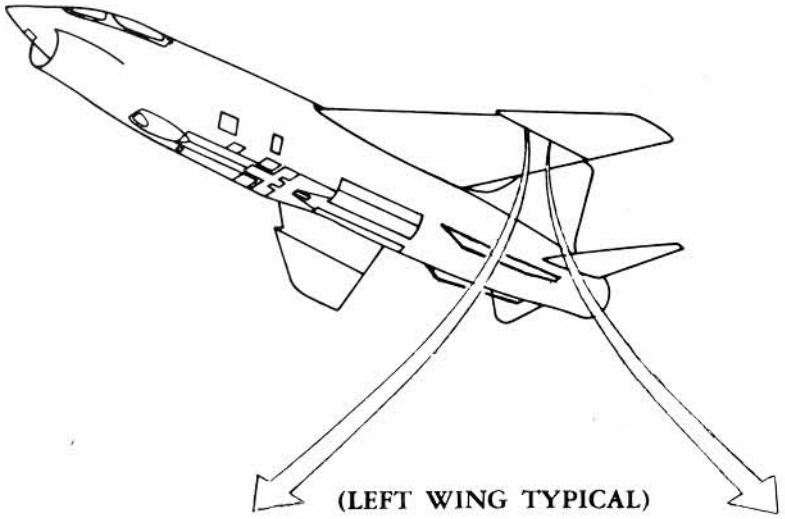
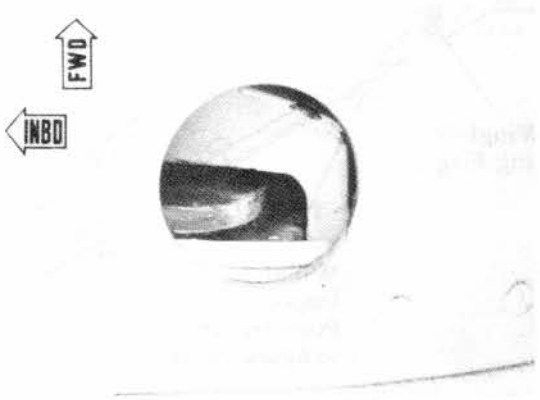
Figure 1–18

WINGFOLD SAFETY INSPECTION PORTS

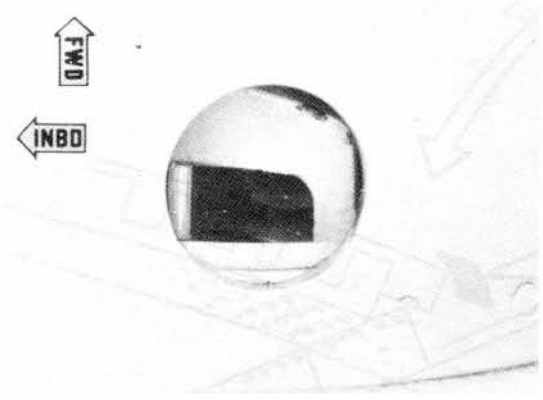


(LEFT WING TYPICAL)



LATCHED
Forward Port

LATCHED
Aft Port



UNLATCHED
Forward Port

UNLATCHED
Aft Port

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Figure 1–19

SPEED BRAKE

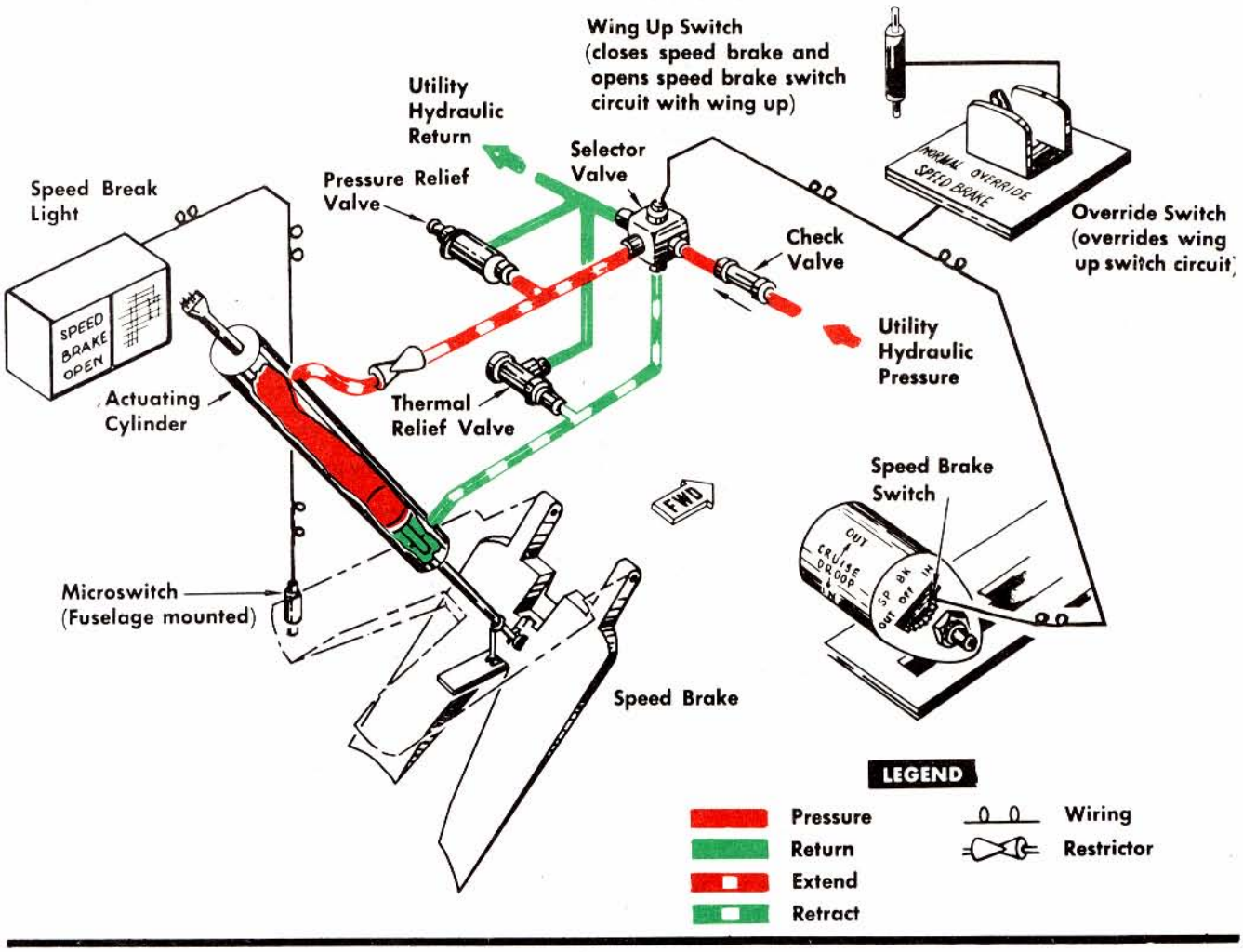

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Figure 1–20

SPEED BRAKE

DESCRIPTION

The system is illustrated in figure 1–20.

The speed brake is electrically actuated from the primary dc bus and is operated by utility hydraulic pressure. It can be fully or partially extended. When fully extended, the speed brake opens to 59°. While the speed brake is open, the speed brake warning will come on STEADY. The speed brake is automatically closed and the speed brake switch circuit is broken by the wing-up switch when the wing is raised. An override circuit permits speed brake extension with wing up. In the override mode, the speed brake warning light will flash indicating that the speed brake is open and that override is selected. When fully extended, the lower edge of the speed brake is well below the level of the landing gear. Landing with speed brake fully extended would damage the speed brake. The speed brake would be retracted as the weight on the gear switch is actuated. This may cause a puncture of the main fuel cell.

The speed brake will partially close when excessive airloads exerted on the extended surface neutralize hydraulic pressure and cause a pressure relief valve

to open. The brake is prevented from being fully extended by the same function at very high speeds. As airspeed decreases the brake can be further extended. With loss of main generator electrical power the speed brake automatically closes and is inoperative until electrical power from the emergency power package is connected (emergency generator switch in ON). During ground operations, a safety circuit prevents opening of the speed brake when weight of the aircraft is on the main gear.

CAUTION

There have been instances of partial electrical failures where there has been sufficient power to hold the speed brakes in the down position but insufficient power to reposition the selector valve when speed brakes were selected up. Cycling the generator in VFR conditions will retract the speed brakes in these instances.

SPEED BRAKE CONTROLS

Nomenclature	*Function*
Speed brake light (14, figure 1–3)	On (SPEED BRAKE OPEN), indicates speed brake is open.
Speed brake override switch (1, figure 1–4)	OVERRIDE — permits extension of speed brake (by use of speed brake switch) with wing raised. NORMAL — is normal flight position.
Speed brake switch (40, figure 1–4)	OUT – extends speed brake to desired position. OFF – holds speed brake in any extended intermediate position. IN – closes and holds speed brake closed.

LANDING GEAR

DESCRIPTION

Normal operation is accomplished by means of utility hydraulic system pressure. Two doors covering each main gear automatically unlock and open when gear extension is selected. A third main gear door (fairing) and the nose gear doors are mechanically linked to the gear and extend with it. The main landing gear is locked down by internal locks in the main gear actuators. When the gear extends, the finger locks are cammed into a lock position, requiring utility hydraulic pressure to be unlocked. The nose gear is locked down by the overcenter position of the pin which attaches the lower drag link to the upper drag link. In emergency extension of the gear, pneumatic system pressure unlocks and extends the main gear doors, unlocks the main gear, and extends and locks the nose gear. The main gear falls by its own weight and is locked by airloads acting on it.

CAUTION

If the landing gear handle is not properly positioned in the gear down detent during field takeoffs, gear retraction could occur before becoming completely airborne. Fluctuations of gear strut during takeoff run could cause actuation of weight-off-gear microswitch causing withdrawal of the downlock mechanical stop, thus placing the gear lock in an unsafe condition which could allow it to move it UP.

A downlock solenoid safety circuit prevents accidental gear retraction while weight is on the main gear. With weight on the left main gear, contacts of the landing gear safety switch are opened, which deenergizes the downlock solenoid, and energizes a mechanical stop to hold the landing gear handle in WHLS DOWN. The downlock solenoid receives operating power from the secondary dc bus. The landing gear can be unlocked with weight on the left main gear by depressing the EMER DN LOCK RELEASE switch, allowing emergency retraction. With weight on the main gear the speed brake control circuit is deenergized and the nose gear steering system is energized.

There are three landing indicators, one for each gear, located on the cockpit instrument board. Power is connected to the indicators from the emergency dc bus. When a gear is down and locked, circuits are completed by down and downlock switches and a miniature gear appears on the appropriate indicator. When a gear is neither up nor down, the appropriate gear indicator will show a barberpole. When a gear is up and locked, its indicator will show UP.

A manual release on the landing gear normal control system is installed to permit the retraction of the landing gear when the main generator electrical power fails or with the wheels down-lock solenoid deenergized. A clamp with an extended screw is mounted on the stop assembly beneath the forward end of the port console and directly below the landing gear handle. Aft rotation of the extended screw will permit the stop assembly to clear the crank assembly and allow the landing gear handle to be placed in the WHEELS UP position. See MAIN GENERATOR FAILURE, Section V for detailed procedure.

The pneumatic system is normally used to extend the landing gear following loss of utility hydraulic pressure. However, the pneumatic system also can be effective in extending the gear in some cases where utility

hydraulic pressure remains but has proven ineffective in extending the gear. This would be the case, for example, if the landing gear hydraulic selector valve became jammed (the pneumatic system has its own selector valve) or if the hydraulic return lines had become restricted (use of the pneumatic system causes hydraulic return fluid to be relieved overboard).

A mechanical linkage will center the nose gear during retraction provided the nose gear is within 30° of center position. If the nose gear is turned beyond the 30° limit, the landing gear handle can be raised and the main gear will retract, but the nose gear will remain extended due to interference between the centering linkage and the strut. The main gear must be extended and the nose gear steering switch depressed. This moves the nose gear toward center to permit the mechanical centering mechanism to center and release the nose gear for retraction.

Clamp type external downlocks are provided for the main gears which fit loosely around the cylinder rod end and tension strut lug. Any binding or tight fitting of these locks could indicate that the internal gear locks are not properly locked.

Refer to figure 1–21 for system illustration.

The photographic flare system is dearmed when the landing gear handle is down, and the approach lights are energized when the gear is extended.

LANDING GEAR CONTROLS

Nomenclature	*Function*
Landing gear handle (29, figure 1–4)	WHEELS UP — with aircraft airborne and nose gear centered, retracts and locks gear in up position. WHEELS DOWN — extends and locks gear in down position, dearms flares. Emergency extension (pneumatic) is obtained by placing handle in WHEELS DOWN, pushing in, rotating clockwise, and pulling aft. Landing gear handle must be placed in WHEELS DOWN for nose gear downlock and indication.
Landing gear position indicators (three) (26, figure 1–4)	UP — indicates corresponding gear up and locked. Miniature wheel indicates corresponding gear down and locked. Barberpole indicates position of corresponding gear differs from selected position, gear moving to selected position or electrical power not connected.
Landing gear warning light (in landing gear handle)	On, indicates position of one or more gears differs from selected position or gear moving to selected position. Off, indicates all gears locked in position indicated by handle position.
Emergency down-lock release switch switch (28, figure 1–4)	*For Emergency Use Only.* Depressed position permits moving landing gear handle to WHEELS UP while aircraft is on ground. If utilized in the air, the nose gear will be retracted regardless of whether or not it is canted, and damge could result.
Wing/wheels/droop warning light (22, figure 1–3)	Flashing (WING/WHEELS/DROOP) when: Landing gear handle up and wing not down and locked. Landing gear handle down and wing not up. Wing down with one or more land droop pistons unlocked.

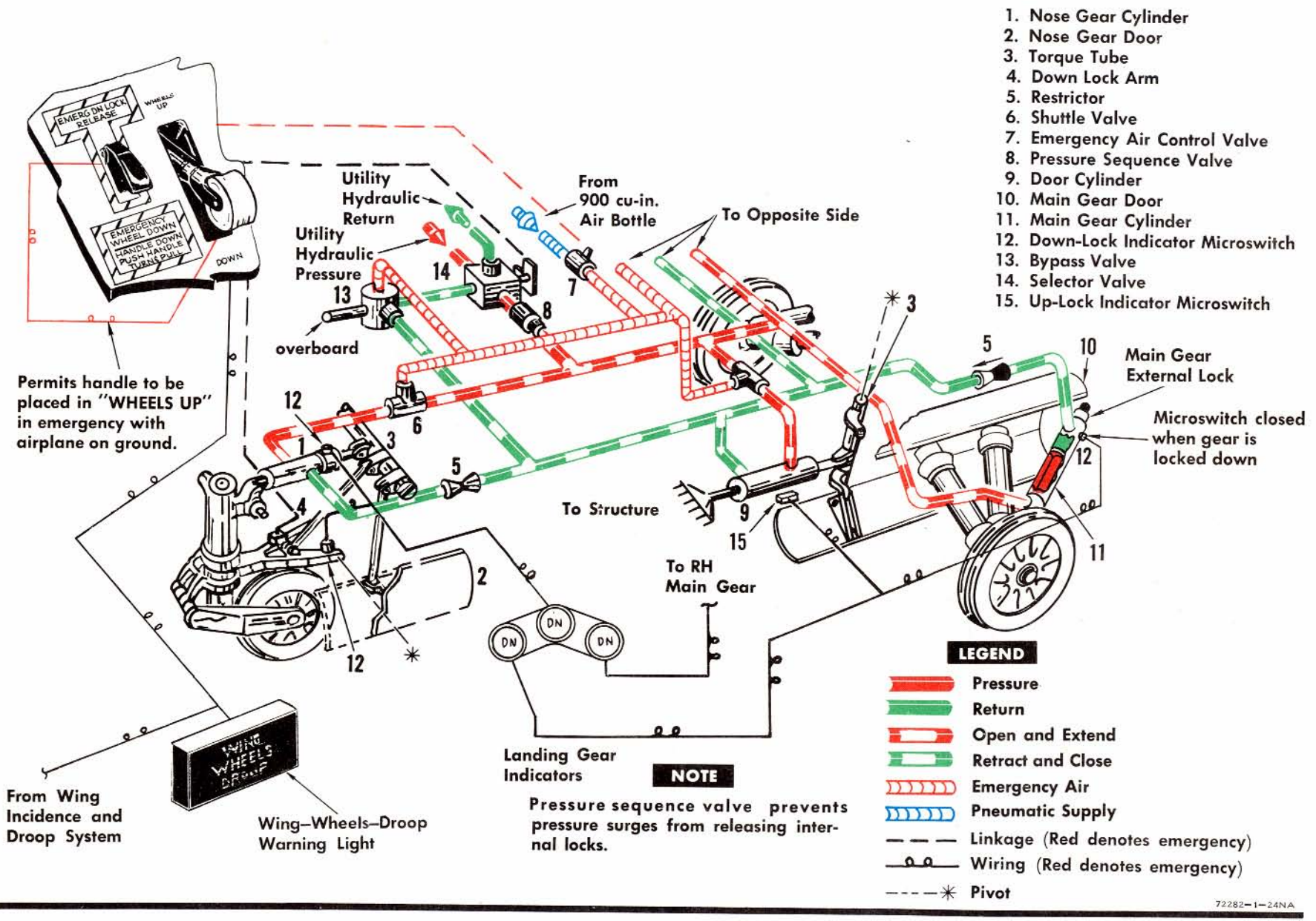

1. Nose Gear Cylinder
2. Nose Gear Door
3. Torque Tube
4. Down Lock Arm
5. Restrictor
6. Shuttle Valve
7. Emergency Air Control Valve
8. Pressure Sequence Valve
9. Door Cylinder
10. Main Gear Door
11. Main Gear Cylinder
12. Down-Lock Indicator Microswitch
13. Bypass Valve
14. Selector Valve
15. Up-Lock Indicator Microswitch
EMERG DN LOCK RELEASE
WHEELS UP
EMERGENCY WHEEL DOWN HANDLE DOWN PUSH HANDLE TURN PULL
DOWN
Permits handle to be placed in "WHEELS UP" in emergency with airplane on ground.
Utility Hydraulic Return
Utility Hydraulic Pressure
From 900 cu-in. Air Bottle
To Opposite Side
overboard
To Structure
To RH Main Gear
Main Gear External Lock
Microswitch closed when gear is locked down
Landing Gear Indicators
DN
From Wing Incidence and Droop System
WING WHEELS DROOP
Wing–Wheels–Droop Warning Light
NOTE
Pressure sequence valve prevents pressure surges from releasing internal locks.
LEGEND
Pressure
Return
Open and Extend
Retract and Close
Emergency Air
Pneumatic Supply
Linkage (Red denotes emergency)
Wiring (Red denotes emergency)
Pivot
72282–1–24NA

Figure 1–21

NOSE GEAR STEERING

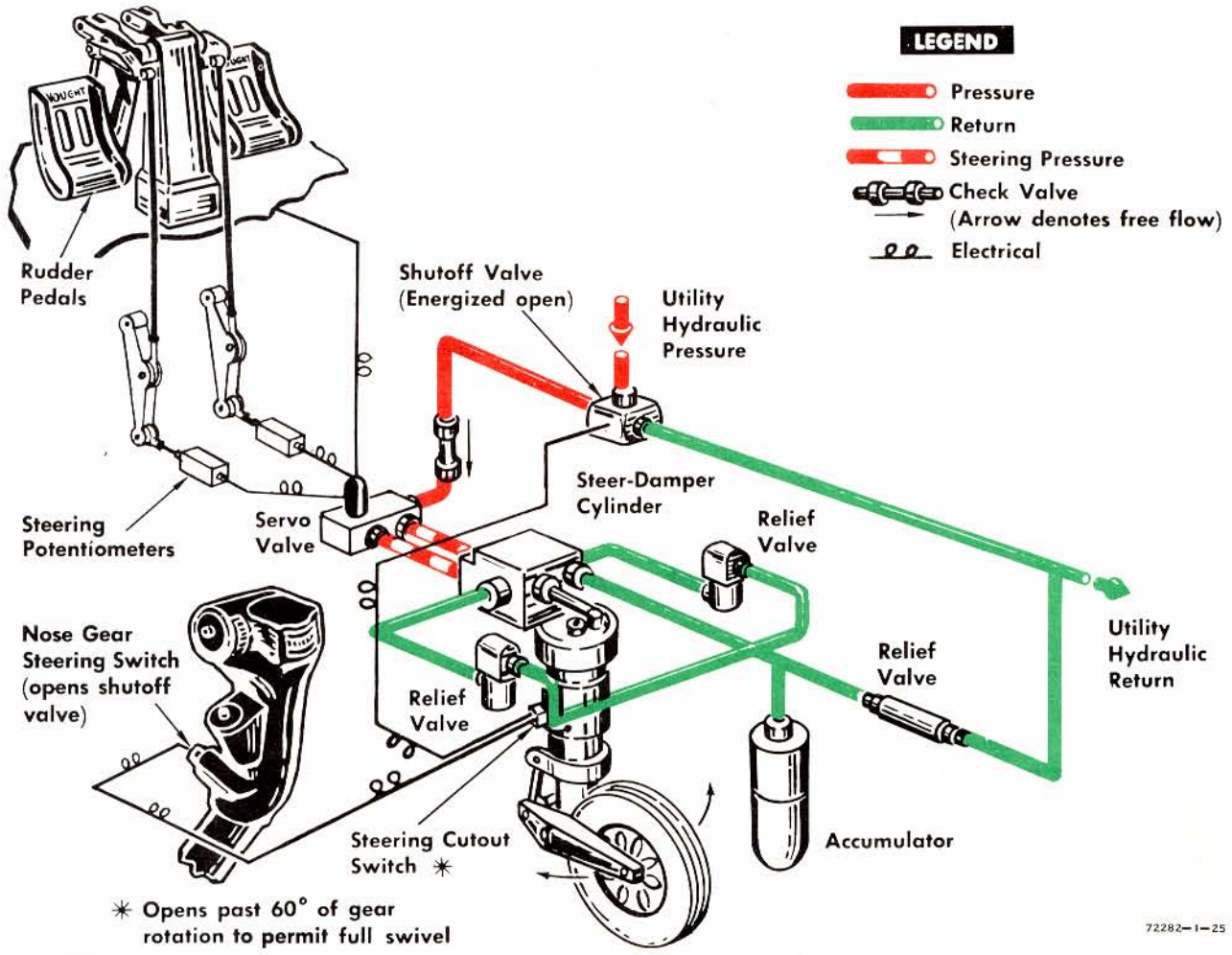


Figure 1–22

NOSE GEAR STEERING

DESCRIPTION

In addition to providing directional control during ground operation, the nose gear steering system (figure 1–22) permits powered centering of the nose gear for retraction and provides shimmy damping. The steering and centering operations are pilot-controlled, while shimmy damping is accomplished automatically.

NOSE GEAR STEERING CONTROLS

Nomenclature	*Function*
Nose gear steering switch (left side of flight control stick grip)	Depressed while taxiing, directs hydraulic pressure to steer-damper cylinder. Steering is effective when rudder pedals are moved. Depressed after takeoff, directs hydraulic pressure to steer-damper cylinder to center nose gear if automatic centering has not been effective, permitting gear to be retracted.
Rudder pedals	Control steering with steering switch depressed.

Steering action is obtained by pressing the nose gear steering switch and pushing the appropriate rudder pedal, which admits utility hydraulic pressure to the steer-damper cylinder to rotate the nose gear. Powered steering is limited to 60° right or left by the steering cutout switch, which is actuated to deenergize the system whenever the nose gear rotates more than 60° in either direction.

Because of rudder stop engagement, the full nose gear steering range is not available with the wing down. Unpowered 360° nosewheel swivelling is available when the steering system is not actuated. The system is energized only when aircraft weight is on the main landing gear and the nose gear is down and locked. Nose gear steering is powered by the secondary dc bus and is not available when operating on emergency electrical power or when the utility hydraulic system has failed. With heavy gross weights or during high cross winds on carrier decks, nose gear steering effectiveness is degraded.

Mechanical centering is provided for nose gear offcenter condition up to 30° right or left. If travel beyond 30° exists when nose gear retraction is selected the gear cannot be fully retracted. In this case powered centering is made available by reextending the gear and depressing the steering switch, which drives the gear to the centered position regardless of rudder pedal position.

The damping function is automatically accomplished by the steer-damper cylinder. An accumulator is provided to ensure adequate damping pressure for all operating conditions.

WHEEL BRAKES

DESCRIPTION

The self-adjusting wheel brakes are normally actuated by utility hydraulic system pressure. Mechanical linkage from the rudder pedal tips actuates the piston in the power-boosted brake cylinder which hydraulically operates the brake assemblies. The force applied to the rudder pedal tips governs the amount of braking action. A brake accumulator provides hydraulic pressure for approximately 6 to 12 "boosted" brake applications when utility system pressure is not available. Manual (no boost) operation of the brakes is possible for ground handling without the engine running and with brake accumulator pressure depleted. If all brake hydraulic pressure is lost a pneumatic metering system provides emergency brake pressure. Differential braking action (applying pressure to one brake at a time) is not possible when using pneumatic pressure.

Note

Before moving aircraft ashore or aboard ship, without the engine running, utility pressure should be pumped up by utilizing the manual pump in the port wheel well. This will provide boosted brakes for positive braking capability.

The system is illustrated in figure 1–23.

WHEEL BRAKE CONTROLS

Nomenclature	*Function*
Rudder pedals	Depressing tips directs hydraulic pressure to wheel brake cylinders in proportion to amount of force applied.
EMERG BRAKE/UHT EMERG LOCK handle (36, figure 1–4)	Pulled toward ON, directs pneumatic pressure proportional to handle movement to both wheel brake cylinders simultaneously. (If emergency brake system is used, hydraulic brake system must be bled before flight.) OFF – Shuts off pneumatic pressure and releases brake. (See FLIGHT CONTROLS, this section, for function of UHT EMERG LOCK handle.)

WHEEL BRAKES

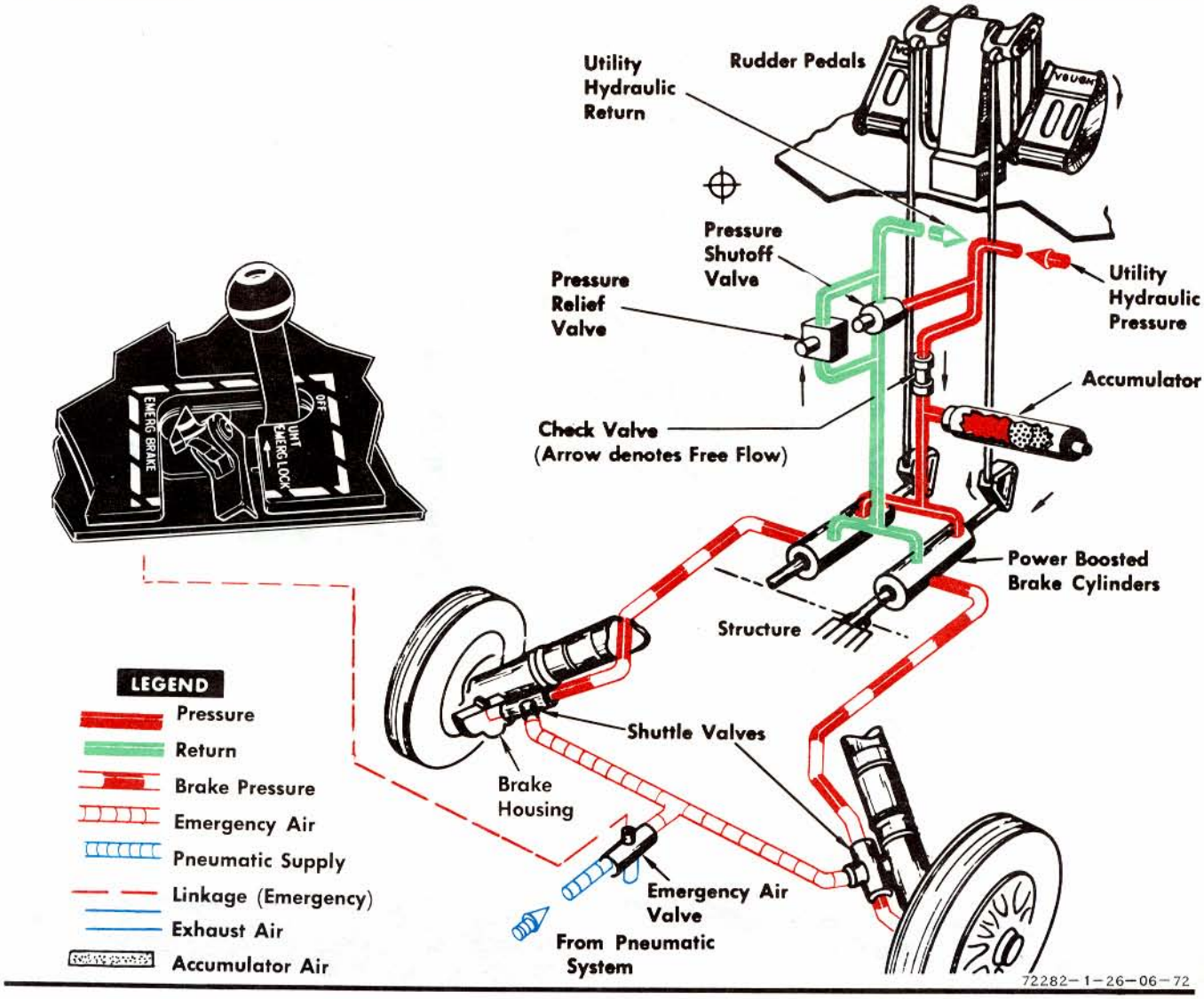


Figure 1–23

ARRESTING HOOK

DESCRIPTION

The arresting hook (figure 1–24) is retracted by utility hydraulic pressure and extended by pressure from an accumulator. The hook is normally held retracted by hydraulic pressure, and with loss of hydraulic pressure, by a mechanical uplock latch. The hook is held extended by overcenter locking-gear linkage which is connected to a spring-loaded linkage unlocking cylinder. Approximately 8 seconds are required to fully extend the hook. If accumulator pressure is lost, the hook will drop into position when the arresting hook handle is placed in HOOK DOWN.

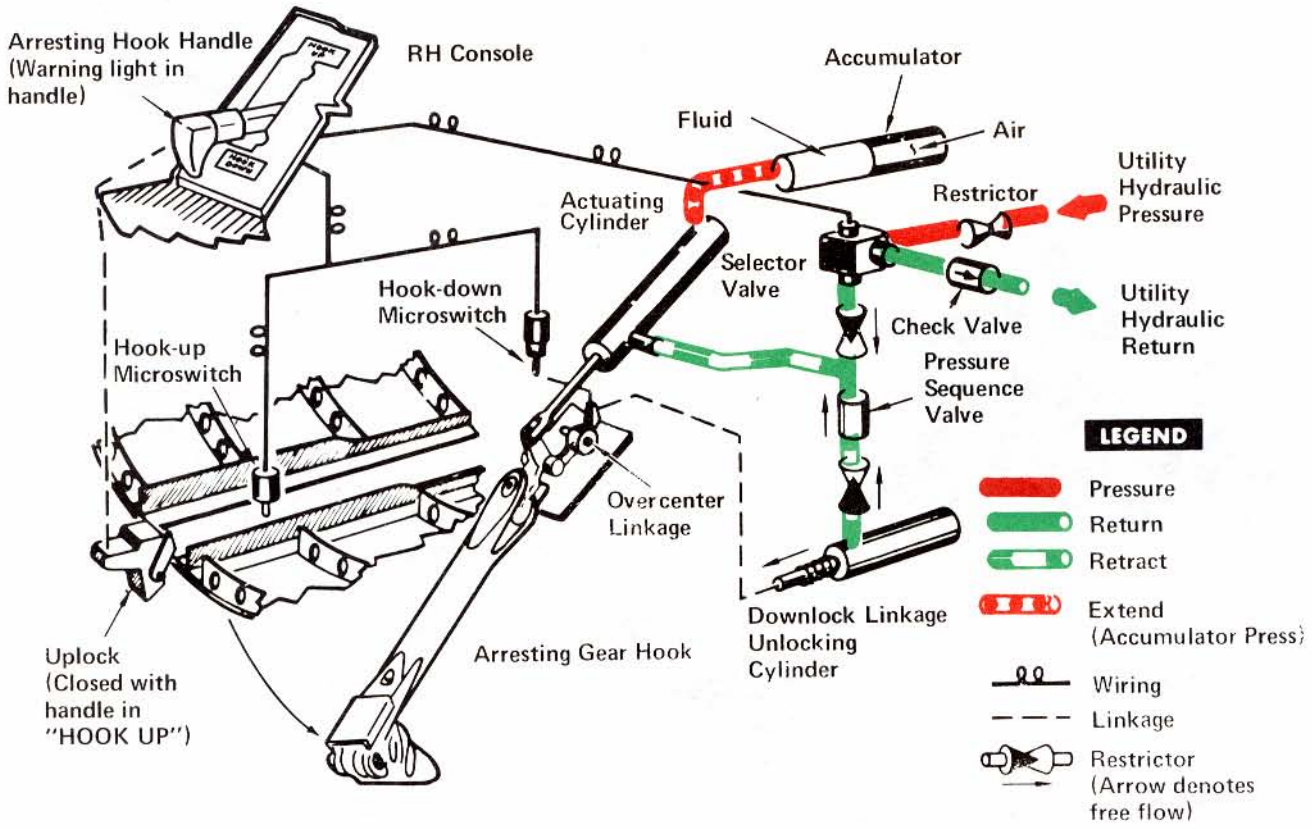
WARNING

If an unsafe indication occurs and the hook is not down and locked (linkage not over center), an arrested landing could cause excessive loads and failure of the arresting hook assembly during arrestment.

ARRESTING HOOK CONTROLS AND INDICATORS

Nomenclature	*Function*
Arresting hook handle (1, figure 1–5)	HOOK DOWN — relieves hydraulic pressure, retracts uplock latch and extends hook. HOOK UP — energizes selector valve, positions uplock latch and retracts hook.
Arresting hook warning light (in arresting hook handle)	ON — arresting hook handle and hook positions do not agree.

ARRESTING HOOK



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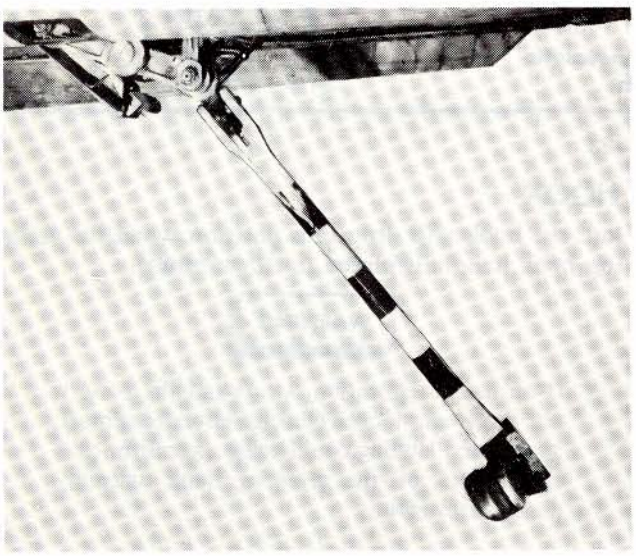
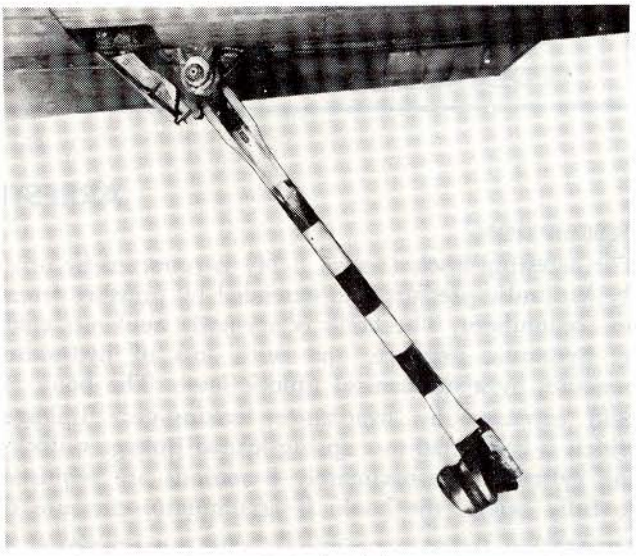


Hook down and locked — linkage over center.



Hook down but not locked — linkage not over center.

NEW NEW NEW NEW NEW NEW NEW NEW

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Figure 1-24

PNEUMATIC SUPPLY

DESCRIPTION

WARNING

Actuation of any emergency pneumatic system except for the EPP may introduce air to the brake lines; consequently, a short field arrested landing should be made unless another emergency precludes it.

This system (figure 1–25) supplies air from a high-pressure bottle for operation of the circuits listed. There is no cockpit indication of air bottle pressure. Bottle pressure is checked before flight during the exterior inspection (figure 3–1). (Refer to part 3, this section, for servicing information.)

Pneumatic Circuit	Function
Emergency power package	For extension of package.
Landing gear	For emergency extension of landing gear.
Wheel brakes	For emergency operation of wheel brakes and UHT lock.
Two-position wing	For emergency raising of two-position wing.
Wing leading edge	For emergency extension of wing leading edge to landing droop position.
Rudder lock	For emergency locking of rudder.

PNEUMATIC SUPPLY

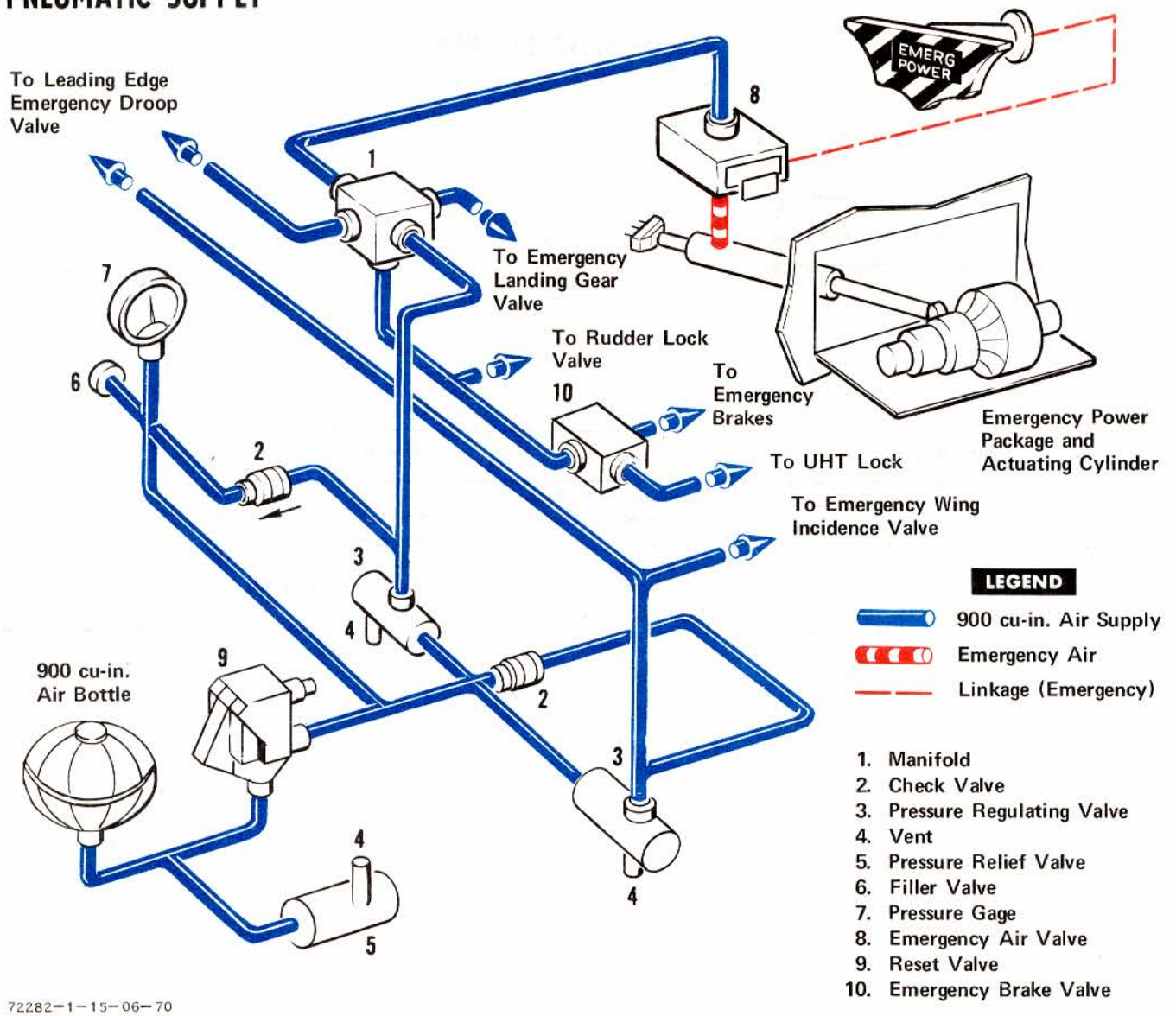


Figure 1-25

ELECTRICAL SUPPLY

DESCRIPTION

In normal operation, all electrical power is supplied by an ac generator which is engine driven through a constant-speed drive unit. The ac generator output is 25-KVA and supplies a three-phase ac output at 115/200 volts, 400 cycles. Main generator output voltage and frequency are automatically monitored by a supervisory system for protection against improper operating conditions. The main generator drops off the line at approximately 45% of engine rpm. The camera ac bus is supplied powered through the secondary ac bus.

DC power for all needs is obtained from a 150-ampere transformer-rectifier which supplies power to the aircraft dc buses during operation on either external or main generator electrical power. The camera dc bus is supplied through the secondary dc bus. The systems are illustrated in figure 1-26.

Emergency electrical power is supplied by ram air-driven ac and dc generators in the emergency power package. Refer to EMERGENCY POWER PACKAGE for additional information.

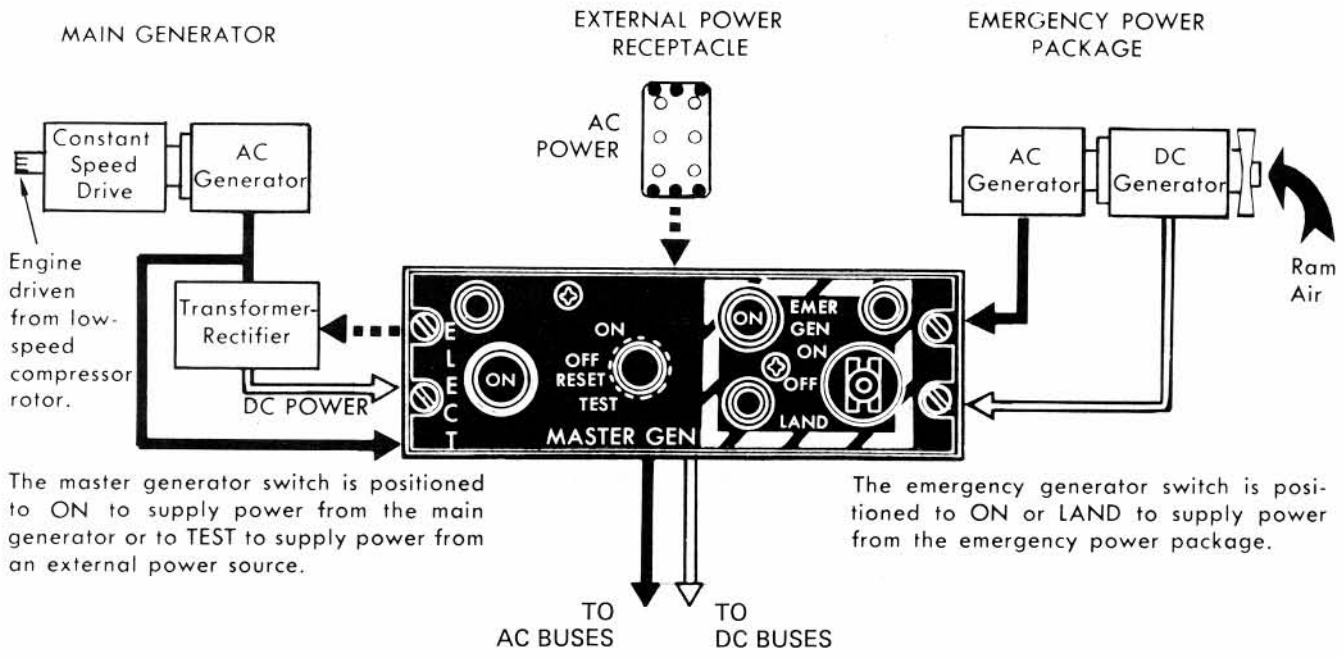
If a flameout occurs, engine windmilling speed may not be adequate to drive the main generator to operating speed. If the dc power indicator indicates power failure, power from the emergency generators must be used for engine ignition for an airstart. After an airstart, the main generator will automatically supply power to the secondary buses (master generator switch in ON or MAIN) but will not supply power to the emergency bus or the primary bus until the emergency generator switch is placed in OFF. Engine windmilling speed is presented in figure 1-26A.

Electrical power distribution is shown in figure 1-27.

ELECTRICAL SUPPLY SYSTEM CONTROLS

Nomenclature	*Function*
Attitude indicator (10, figure 1-3)	OFF – flag indicates that ac power is not connected to emergency bus or that ac power has failed
Main generator indicator (29, figure 1-5)	ON – indicates that main ac generator is producing electrical power within proper limits. Barberpole indicates that main ac generator is not operating properly and is not connected to the buses
Master generator switch (28, figure 1-5)	ON – connects power from the main ac generator or from external power source to ac buses and to transformer-rectifier (dc power to buses). In this position, transfer from external power to aircraft power is automatic when the main generator voltage and frequency are within the prescribed limits. TEST – connects external ac power to the ac buses, to the transformer-rectifier (dc power to buses), and disconnects generator power from ac and dc buses (main generator indicator will still be operating). OFF-RESET – disconnects main generator or external power from buses. Readies electrical system for reset when placed in ON or TEST. (Refer to EMERGENCY POWER PACKAGE for emergency electrical power.)

ELECTRICAL SUPPLY



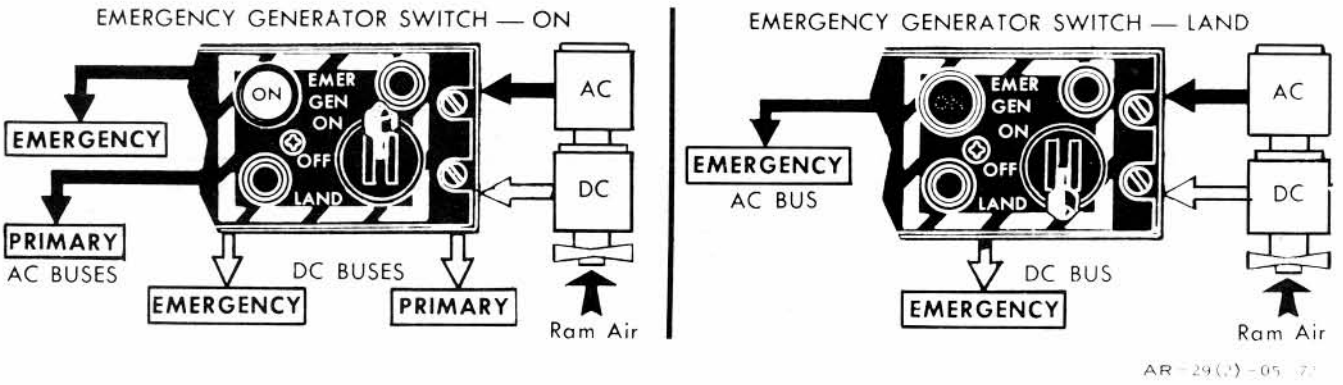


Figure 1-26

STABILIZED ENGINE WINDMILLING SPEED

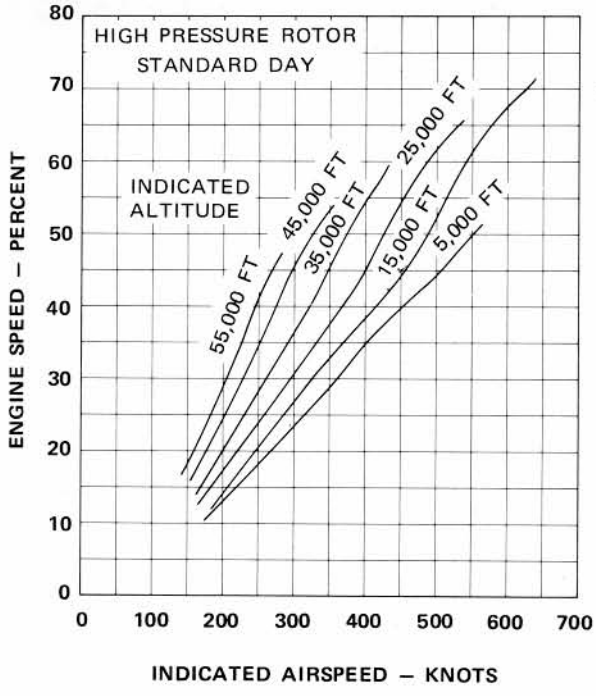


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Figure 1–26A

ELECTRICAL DISTRIBUTION

AIRPLANE POWER

	EMERGENCY	PRIMARY	SECONDARY
A-C BUSES	Console Floodlights Emergency Pitch Trim Engine Fuel Flow Engine Oil Pressure Engine Pressure Ratio Flight Instrument Lights Hydraulic Pressure Indicator Instrument Lights Pitch Trim Position Lights (EPP in LAND) Primary Attitude Indicator Roll Trim and Stabilization TTRI (computer) & Indicator	AAU-19A/A Altimeter Computer Airborne Transponder ARA-63 Receiver/Decoder Automatic Direction Finder (ADF) Command Radio (UHF) Cabin Temperature Control Forward Main Fuel Pump Liquid Oxygen Quantity MA-1 Compass Main Fuel Quantity Pitot Heater TACAN Transfer Fuel Quantity Yaw Amplifier	Aft Main Fuel Pump Radio Altimeter, AN/APN-22 Anticollision Lights Approach Power Compensator Camera AC Bus Camera Compartment Temperature Control Camera Window Defog Console Lights Duct Bypass Door (deleted after AFC 604) ECM, AN/ALQ-126 ECM, AN/ALR-45 ECM, AN/ALR-50 Air Refueling Probe Illuminating Light Inverted Flight Fuel Pumps Main Fuel Pump Nonflight Instrument Lights Pneumatic Bottle Heaters Position Lights Standby Attitude Indicator Seat Adjust Tape Recorder TAS Computer Transfer Fuel Pump TTRI (indicater)
D-C BUSES	Altimeter Vibrator AOA Indicating System Approach Lights Arresting Hook Warning Light Automatic Fuel Transfer* Chartboard Lights Console Floodlights DC Power Indicator Emergency Probe Switch Emergency Spin Droop Valve Emergency Spotlight Engine Fuel Pump Warning Light Engine Fuel Shutoff Engine/Hydraulic Oil Pressure Warning Light Engine Ignition and Timer Flasher Unit† Fire Detector Instrument Emergency Floodlights Landing Gear Position Leading Edge Cruise Droop Liquid Oxygen Warning Light(s) Manual Fuel Control Master Switch Probe Emergency Extension Valve Roll Trim and Stabilization Stab Warning Lights Transfer Fuel Pump Caution Light UHT Lock Indicator Wing Fuel Dump Wing Pressurization Wing/Wheels, Droop Warning Yaw Trim and Stabilization	Afterburner Fuel Control Airborne Transponder Air Refueling (Except Aft Cell) Automatic Direction Finder (ADF) Command Radio (UHF) Engine Cranking Fuel Boost Pumps Warning Lights Fueling System and Valves (Except Aft Cluster) MA-1 Compass Speech Security Equipment Speed Brake TACAN	Aft Cluster Fueling Vlaves Approach Power Compensator Arresting Hook Camera DC bus Crank Air Valve ECM, AN/ALE-29A Chaff Dispenser ECM, AN/ALQ-126 ECM, AN/ALR-45 ECM, AN/ALR-50 ECM, HRB Singer L/A Electronics Package Fan Flasher Unit Free Air Temperature Fuel Low Level Warning Light Air Refueling (Aft Cell Control) Landing Gear Downlock Solenoid Land/Taxi Light (BuNo. 146352 and Subsequent) Liquid Oxygen Warning Light Nose Gear Steering Radio Altimeter, AN/APN-22 Tape Recorder TAS Test and Doppler Transfer Fuel Pump Caution Light Trim Neutral Lights Wingfold Wing Selector Valve Lock

*Inoperative on emergency generator †Block II RF-8G

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Figure 1–27 (Sheet 1)

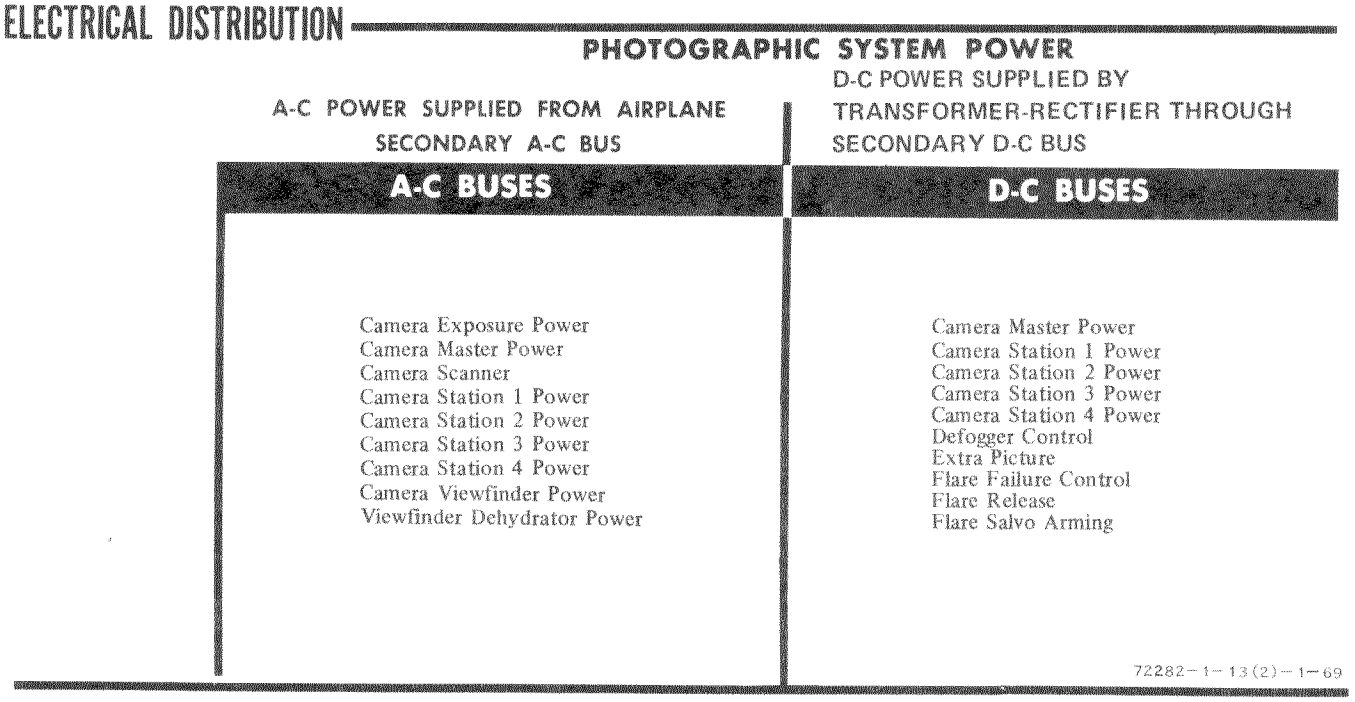


Figure 1–27 (Sheet 2)

EMERGENCY POWER PACKAGE (EPP)

DESCRIPTION

An emergency power package (EPP) is the emergency source of electrical power and hydraulic pressure. The package consists of a ram air turbine, a pneumatic extension system, an electrical supply system, and a hydraulic pressure supply system. When the package is extended, the slipstream rotates the turbine which drives an ac and dc generator and a fixed displacement hydraulic pump. Within airspeed limitations, a governor automatically regulates the turbine speed by adjusting the vanes through a flyball governor to maintain frequency of the electrical power at 400 (±40) cps. A flow sensitive pressure regulator controls the hydraulic pressure. The EPP extension system is powered by pneumatic pressure from the 900-cubic inch pneumatic bottle.

OPERATION

When the EMER POWER handle is pulled, the emergency power package pneumatic control valve is mechanically opened and pneumatic pressure actuates the piston within the extension cylinder. Speed of extension is regulated by restricting the flow of hydraulic fluid on the nonpressure side of the extension piston. Once the EPP has been extended, internal mechanical locks hold the extension cylinder piston in the extended position. The EPP cannot be retracted during flight.

The emergency hydraulic system uses fluid from the PC 1 system and in turn supplies pressure for the PC 1 system only. The flow sensitive pressure regulator controls the flow of the emergency hydraulic system into the PC 1 system. When the PC 1 is operating normally, the emergency system pump continually works against PC 1 system pressure. A check valve prevents normal system pressure from entering the outlet port of the emergency system. The hydraulic fluid return line for both PC 1 and emergency systems are direct from the PC 1 system reservoir. With PC 1 system operating normally and with the wing up, a bypass in the emergency hydraulic system reduces the pressure against which the emergency hydraulic system is operating to provide additional power for operation of the emergency electrical generators. This allows the emergency electrical generators to maintain minimum frequency at slower airspeeds. When PC 1 system pressure is lost, or with the wing down, the emergency system bypass valve closes and the emergency hydraulic system reverts to its normal mode of operation.

The ac generator is rated at 4.2 KVA and delivers 115/200 volt, 360 to 440 Hertz 3 phase ac power to the primary and emergency ac buses. The dc generator is rated at 30 amperes, and delivers regulated 28 volts dc power to the primary and emergency dc buses. When the EPP is operating, the EMER GEN switch must be in either ON or

LAND positions to provide usable electrical power. In ON position, electrical power is supplied to ac and dc primary and emergency buses. In LAND position electrical power is supplied to ac and dc emergency buses only. Refer to ELECTRICAL SUPPLY for tie-in to the main electrical circuit and for circuits available at various emergency generator switch positions.

EPP MINIMUM AIRSPEED REQUIREMENTS

Emergency	*Requirement*	*EPP Generator Switch*	*Minimum Airspeed*
Generator failure	Electrical	ON (wing-down)	175
Generator failure	Electrical	ON (wing-up)	160*
Generator failure	Electrical	LAND (wing-up)	130*
Engine failure	Electrical and hydraulic	LAND (wing-up)	145
Engine or PC 1 failure	Hydraulic	OFF	140

*PC 1 operating normal

EMERGENCY POWER PACKAGE CONTROLS

Nomenclature	*Function*
Emergency power handle (24, figure 1–4)	Pulled — extends emergency power package. Package cannot be retracted in flight.
Power control hydraulic pressure indicator (34, figure 1–3)	Indicates emergency hydraulic pressure on pointer No. 1 (emergency power package extended and PC 1 system inoperative).
Emergency power indicator light (4, figure 1–5)	On (emergency generator switch in ON) indicates that power is being supplied by emergency generators and serves as a reminder to place emergency generator switch in LAND before landing. Off indicates emergency generator switch in LAND or OFF.
Emergency generator switch (5, figure 1–5)	ON — (emergency power package extended) connects power from emergency generators to emergency and primary ac and dc buses. LAND — (emergency power package extended) connects power from emergency generators to only the emergency ac and dc buses. This decreases electrical load on the emergency power package to improve package performance at low airspeeds. OFF — disconnects emergency electrical power from buses.

EXTERIOR LIGHTS

DESCRIPTION

The exterior light system consists of the conventional position (navigation) lights, two anticollision lights, carrier landing approach lights, a landing and taxi light (aircraft BuNo. 146852 and subsequent) and an inflight refueling probe illuminating light. Exterior light controls are presented in figure 1–28.

The conventional red and green wing position lights and the white tail position light are powered from the secondary ac bus for normal operation. The taillight is visible from the front and rear of the aircraft to aid the landing signal officer in monitoring aircraft pitch. When on emergency electrical power the emergency generator switch must be in LAND to power these lights. Power is then delivered from the emergency ac bus.

The anticollision lights are high-intensity red lights mounted on the top and bottom of the fuselage at the centerline. These lights, which are powered from the secondary ac bus, rotate approximately 80 times per minute and will not be available when operating on emergency electrical power.

An approach light unit containing green, amber and red lights is attached to the left main strut. These lights are powered through the angle-of-attack indicating system from the emergency dc bus. The approach lights illuminate automatically when the landing gear handle is placed in WHEELS DOWN and weight is off the gear, regardless of the position of the exterior lights switch. The approach lights will operate on emergency power with the emergency generator switch in either ON or LAND.

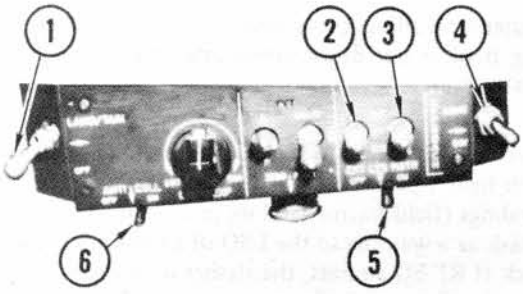
For carrier operation, the approach lights will flash if the arresting hook is not down unless operating on emergency electrical power.

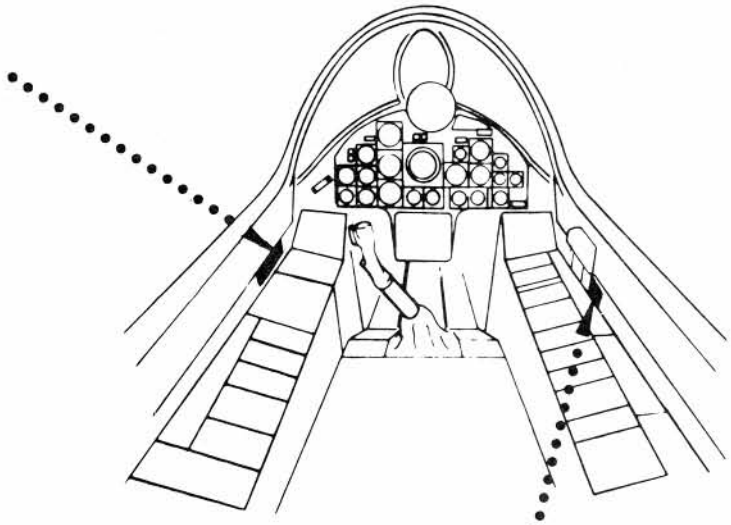
An approach light hook bypass circuit permits selection of approach light operation for either carrier landings or for field landings (field mirror landing practice). The approach lights flash as a warning to the LSO of a hook up approach. On Block II RF-8G aircraft, the flasher is on the emergency dc bus and will be available on emergency electrical power. On Block I RF-8G aircraft, the flasher is on the secondary dc bus and is not available on emergency electrical power. Refer to ANGLE-OF-ATTACK INDICATING, this section, for information concerning sequence of approach light operation. An exterior light master control circuit is provided with a switch located above the throttle to permit signaling to catapult officer and for rapid turnout of all exterior lights in tactical operations that require blackout.

An inflight refueling probe illuminating light is flush mounted on the left-hand side of the fuselage just below the windshield side panel. The light is turned on when the probe door is opened with the exterior lights switch in ON. Additionally, the inflight refueling probe illuminating light is actuated when the landing gear is down, oleos extended, and the taillight is on. The light operates on secondary ac power.

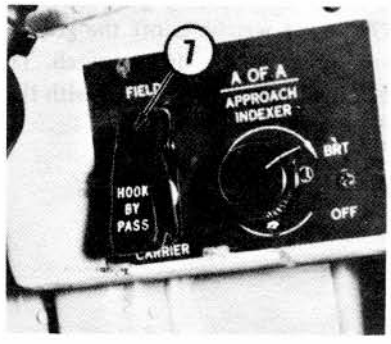
On airplanes BuNo. 146852 and subsequent, a landing and taxi light is incorporated on the right main gear door. It is controlled by a land/taxi light switch located beside the exterior lights switch above the left-hand console. Power for the light is supplied by the secondary dc bus.

EXTERIOR LIGHTS CONTROLS





1. Land/taxi light switch*
2. Tail light switch
3. Wing lights switch
4. Approach light dimming switch
5. Exterior light switch
6. Anticollision light switch
7. Approach light hook bypass switch



* Limited to Block I RF-8G aircraft BuNo. 146852 and subsequent and Block II RF-8G Aircraft.

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Figure 1–28

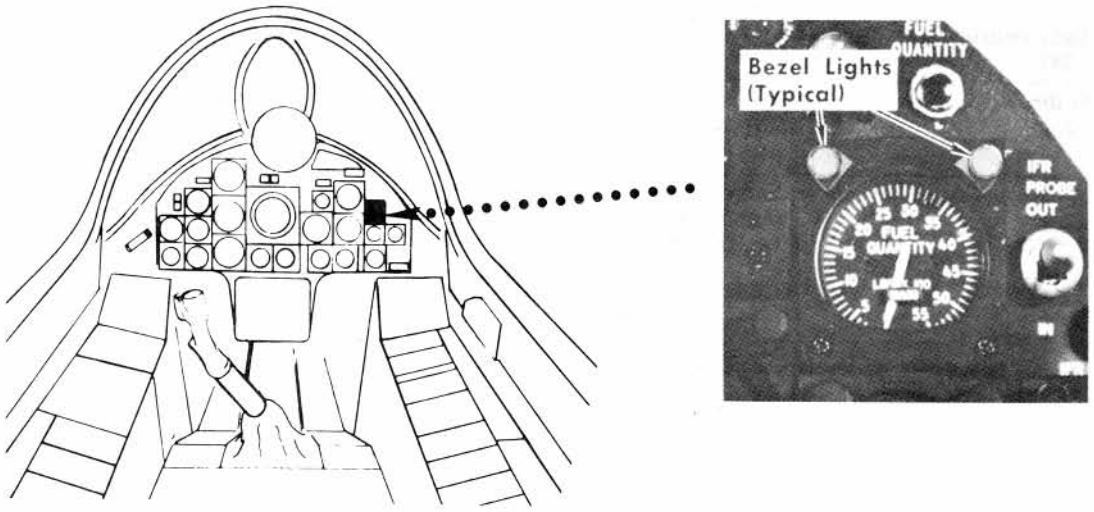
EXTERIOR LIGHTS CONTROLS

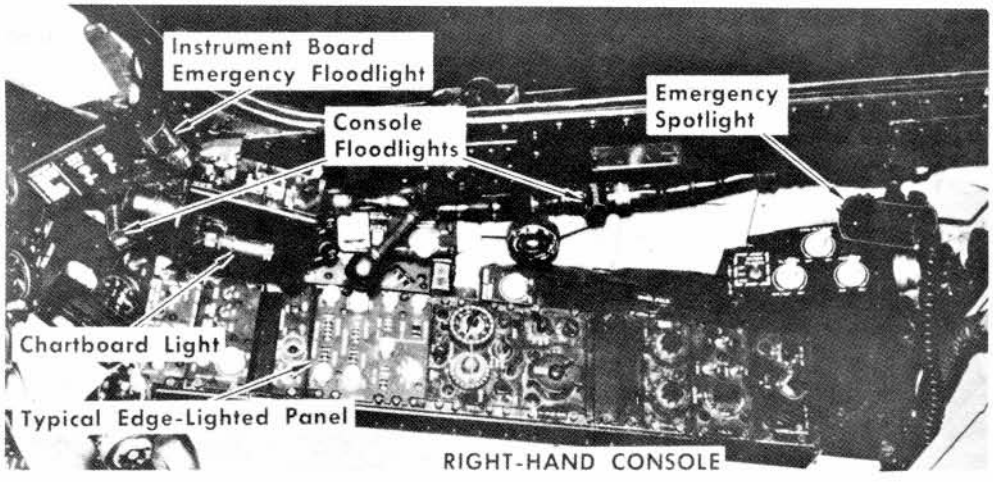
Nomenclature	*Function*
Anticollision light switch (6, figure 1–28)	ON* — turns on red anticollision lights.
Approach light dimming switch (4, figure 1–28)	DAY — selects bright lighting of approach lights for daylight operations. NIGHT — selects dim lighting of approach lights for night operations, except when on emergency power.*
Approach light hook bypass switch (7, figure 1–28)	CARRIER — causes approach lights to flash if arresting hook is not down when landing gear handle is in down position and no weight is on the gear. The lights will not flash when operating on emergency electrical power. FIELD — permits approach light to burn steadily for field mirror landing practice when arresting hook is up, landing gear handle is in down position and weight is not on the gear.
Exterior light master switch (5, figure 1–28)	ON — energizes exterior master control light switch circuit to permit selection of desired exterior lights.
Land/taxi light switch† (1, figure 1–28)	ON — turns on landing and taxi light when landing gear handle is in WHEELS DOWN.
Taillight switch (2, figure 1–28)	BRT* — causes tail navigation lights to burn brightly. DIM* — causes tail navigation lights to burn dimly.
Wing light switch (3, figure 1–28)	BRT* – causes wing navigation lights to burn brightly. DIM* – causes wing navigation lights to burn dimly. Must be in this position to obtain lights on emergency electrical power.

*With exterior light switch in ON.
†Aircraft BuNo. 146852 and subsequent.

INTERIOR LIGHT FIXTURES

(TYPICAL)





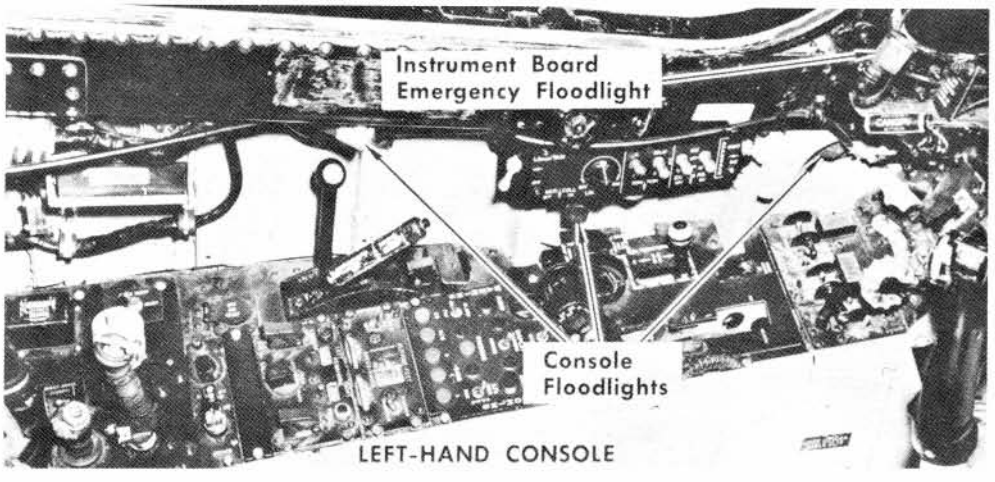


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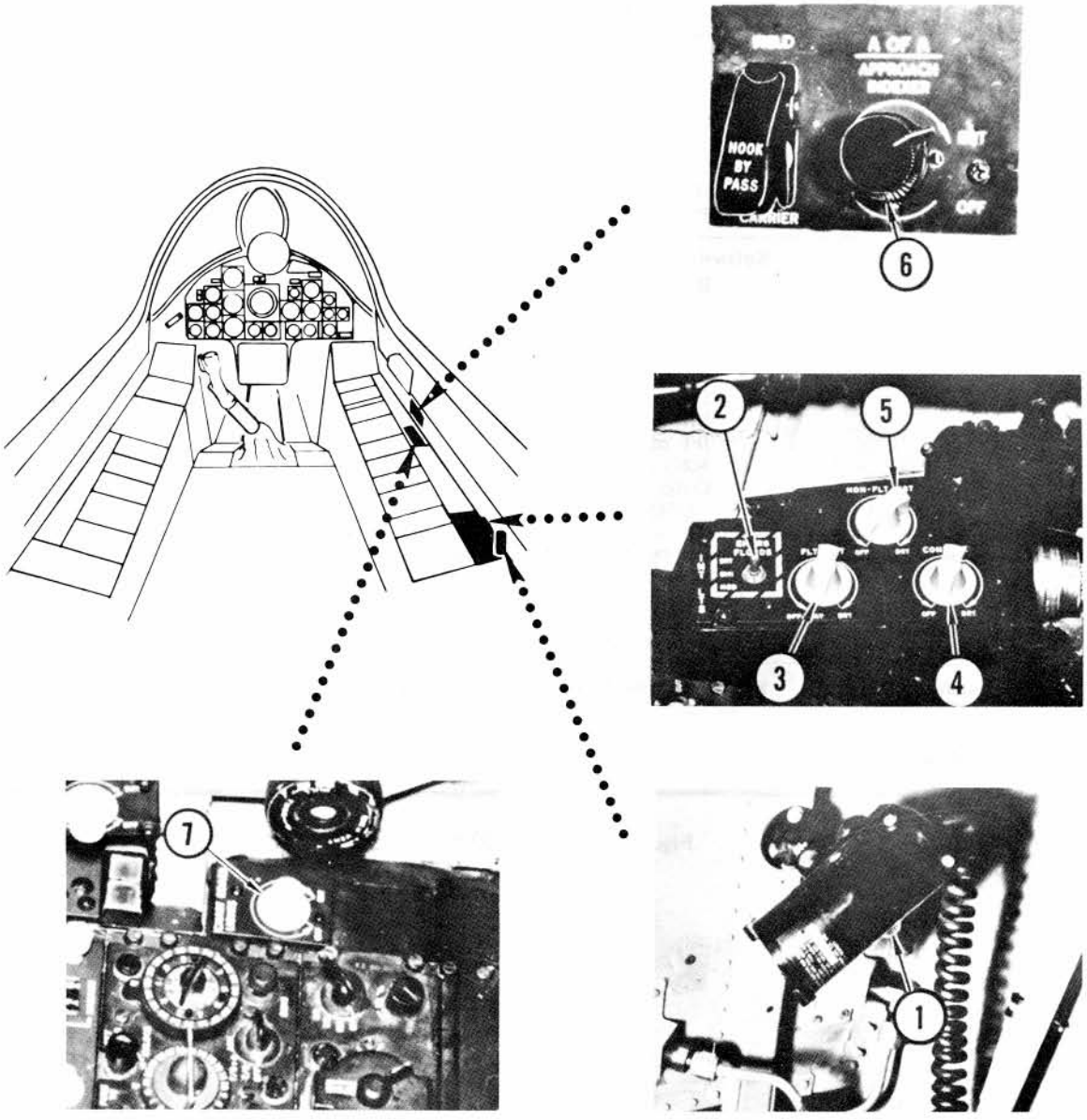
Figure 1-28A

INTERIOR LIGHTS CONTROLS



Nomenclature	*Function*
1. Spotlight switch	ON — turns on spotlight
2. Emergency floodlight switch	DIM — with the console lights dimming knob in any position except OFF, places console floodlights at dim intensity. MED — with the console lights dimming knob in any position except OFF, places console floodlights at medium intensity. Turns on instrument emergency floodlights and attitude indicator supplementary lights at medium intensity. BRT — with the console lights dimming knob in any position except OFF, places console and instrument emergency floodlights and attitude indicator supplementary lights at bright intensity.

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Figure 1-29 (Sheet 1)

INTERIOR LIGHTS CONTROLS

3. Flight instrument lights dimming knob	Rotated between OFF and BRT, turns on and controls intensity of the flight instrument bezel lights, which illuminate the following flight instruments: Tachometer Rate of climb indicator Radar altimeter Barometric altimeter Airspeed indicator Course indicator Turn and bank indicator TACAN BDHI Doppler BDHI Primary attitude indicator
4. Console lights dimming knob	Rotated between OFF and BRT, turns on and controls intensity of the following lights: Right and left-hand console floodlights (knob turns on, but does not control intensity of floodlights) Takeoff checklist edge-lighted panel Landing checklist edge-lighted panel Outside air temperature indicator bezel lights Landing gear position indicator edge-lighted panel UHF edge-lighted panel IFF edge-lighted panel MA-1 compass edge-lighted panel Coder group edge-lighted panel TACAN edge-lighted panel
5. Nonflight instrument lights dimming knob	Rotated between OFF and BRT, turns on and controls intensity of all instrument bezel lights on the instrument board not controlled by the flight instrument lights dimming knob; also controls intensity of all edge-lighted panels on the instrument board, the standby compass, the standby attitude indicator, the cabin altimeter, and the remote frequency/channel indicator.
6. Approach indexer dimming knob	Rotated between OFF and BRT, turns on and controls intensity of angle-of-attack approach indexer lights.
7. Chartboard light dimming knob	Rotated between OFF and BRT, turns on and controls intensity of chartboard floodlights.

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Figure 1-29 (Sheet 2)

INTERIOR LIGHTS

DESCRIPTION

Interior light controls are located on the right-hand console and cockpit sidewall. Sources of electrical power are presented in figure 1–27. Interior light controls and their functions are presented in figure 1–29.

Console Lighting – Normal Operation

General illumination of the consoles is provided by floodlights. Floodlights are mounted several inches above each console. Panel nomenclature on edge-lighted panels is lighted from within. (An edge-lighted panel is formed of plastic with a light bulb encased in the plastic. Light from the bulb is diffused in the plastic and shows only through the panel nomenclature since the remainder of the panel surface is painted black.) Bezel lights are used in some places.

Rotating a console lights dimming knob out of OFF turns on the console lights. Light intensity is increased by rotating the dimming knob further toward BRT. The dimming knob turns on the console floodlights, but does not control their intensity. Intensity of the console floodlights is controlled by an emergency floodlight switch.

Instrument Lighting – Normal Operation

Normal instrument board lighting is provided by bezel lights. Control of the lights is provided by two dimming knobs on the right-hand console. One dimming knob turns on and controls the intensity of the flight instruments and dims warning and indicator lights. The other dimming knob turns on and controls the intensity of the non-flight instruments.

Approach Indexer Lighting

An approach indexer dimming knob, located on the right-hand cockpit sidewall, turns on and controls the intensity of the angle-of-attack approach indexer lights. The knob is rotated between OFF and BRT.

Chartboard Lights

Two chartboard lights are provided, one on each side of the cockpit. A chartboard dimming knob on the right-hand console turns on and controls the intensity of these lights.

Emergency Lighting

Utilizing emergency ac and dc buses only, the following interior lights are available:

Console floodlights
Instrument board emergency floodlights
Flight instrument bezel lights
Supplementary attitude indicator lights
Emergency spotlight
Chartboard lights

With all interior lights on, a complete electrical failure results in the following sequence of events: All lights extinguished until the EPP is extended and the emergency generator brought back on the line. With emergency power available, the console floodlights, flight instrument bezel lights, and chartboard lights come back on. All edge-lighted panels remain off. All bezel lights, except those provided for flight instruments, remain off. Moving an emergency floodlight switch (right-hand console) to MED increases console floodlights and supplementary attitude indicator lights to medium intensity and turns on two instrument board emergency floodlights. Moving the switch to BRT further increases the intensity of these lights. A spotlight mounted above the right-hand console can be lifted from its holder and used like a flashlight, or it can be inserted in a socket provided on the right canopy rail. There is an on-off switch on the spotlight.

ANGLE-OF-ATTACK INDICATING

DESCRIPTION

The angle-of-attack indicating system and the approach lights provide the pilot and the landing signal officer with visual indications of aircraft angle of attack. Indications are presented on the angle-of-attack indicator (6, figure 1–3) under all flight conditions and may be used for such purposes as stall warning and for establishing maximum endurance flight attitudes. For convenience in controlling airspeed in landing approaches, indicator readings are supplemented by lights on the angle-of-attack approach indexer which is mounted on the windshield frame. The approach lights, mounted on the left main strut provide the LSO with a similar indication of angle of attack as illustrated in figure 1–30. The port taillight is visible from the front and rear of the aircraft and the inflight refueling probe illuminating light is actuated when landing gear is down, oleos extended, and taillight on to aid the landing signal officer in monitoring aircraft pitch. (Refer to EXTERIOR LIGHTS this section, for additional information concerning approach light operation.) Electrical power for the angle-of-attack indicating system is supplied by the emergency dc bus.

The angle-of-attack transducer, located on the right-hand side of the fuselage, transmits to the indicator a signal representing the relative angle of the fuselage to the airstream. This information is presented to the pilot as the position of the indicator pointer over a scale reading from 0 to 30. Each unit on the indicator dial is equal to 1.5° of indicated angle of attack or approximately 5 knots indicated airspeed in the region of the optimum approach angle of attack. On aircraft equipped with the approach power compensator system, the transducer also supplies information to the system computer. (Refer to APPROACH POWER COMPENSATOR SYSTEM this section.)

The angle-of-attack indicator controls operation of the approach indexer and the approach lights to provide indications of high, optimum, and low angle of attack in the landing condition. Indexer and approach lights are operated relative to pointer movement about the reference index marker at the 3 o'clock position on the indicator. The angle-of-attack indexer has a tri-color filter. The upper indexer chevron is illuminated in green, the circle indexer is illuminated in amber, and the lower indexer chevron is illuminated in red (figure 1–30).

The angle-of-attack system is ground boresighted and the indicator dial is set so that an indication corresponding to the optimum approach angle of attack coincides with the center of the approach index marker at the 3 o'clock position. If the aircraft is flown so that the indicator pointer is held at the optimum approach angle-of-attack value (pointer centered on the approach index marker) the optimum approach speed will result for any aircraft gross weight within the allowable limits. A preflight check should be made as prescribed in figure 3–1 to assure that the angle-of-attack vane or arm is not bent.

NORMAL OPERATION

An inflight check of the angle-of-attack system may be made as follows:

1. Descend below 5,000 feet and maintain straight and level flight.
2. Raise wing and lower landing gear.
3. Stabilize airspeed at recommended value for aircraft gross weight corresponding to the optimum units indication (figure 3–11).
4. Angle-of-attack indicator pointer should indicate the optimum number of units.

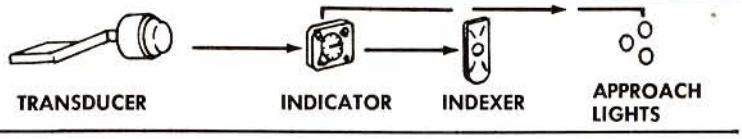
CAUTION

The cockpit emergency ventilation port must be closed when using the angle-of-attack system as a flight reference. The port, when open, disturbs air flow, resulting in erroneous angle-of-attack indications and faulty operation of the approach power compensator system.

Approach indexer lights function only when the landing gear handle is in WHEELS DOWN and the approach indexer dimming knob is rotated out of OFF position. Indexer light brightness is controlled by positioning the approach indexer dimming knob (10, figure 1–5) as desired between OFF and BRT.

The approach is flown by coordinating throttle and stick movements to establish the desired glide path at optimum angle of attack. The stick is used to bring angle of attack to the optimum value, as indicated by illumination of the indexer circle (donut). As angle of attack goes high or low, with resulting decrease or increase in airspeed, the indexer upper or lower chevron will be illuminated to point the direction in which the nose should be moved to return to the optimum angle of attack. The throttle is manipulated to control rate of descent so as to establish the desired

ANGLE-OF-ATTACK INDICATIONS



SLOW

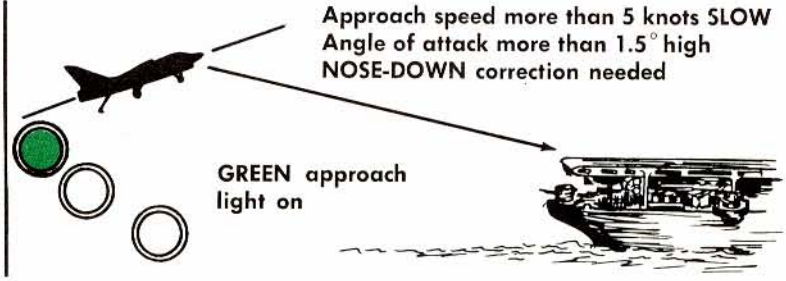
UPPER CHEVRON lighted

14.5 Units

Pointer at or above upper edge of approach index marker

Approach speed more than 5 knots SLOW
Angle of attack more than 1.5° high
NOSE-DOWN correction needed

GREEN approach light on



MODERATELY SLOW

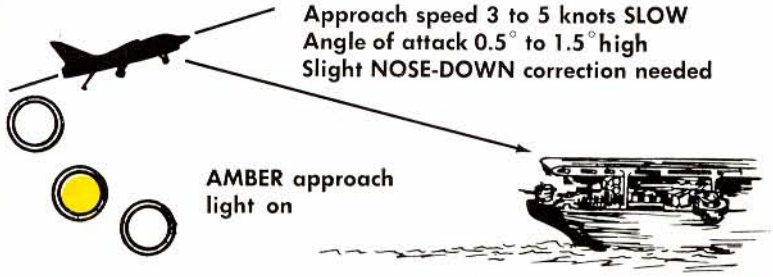
UPPER CHEVRON and CIRCLE lighted

14.0 Units

Pointer just above center of approach index marker

Approach speed 3 to 5 knots SLOW
Angle of attack 0.5° to 1.5° high
Slight NOSE-DOWN correction needed

AMBER approach light on



OPTIMUM

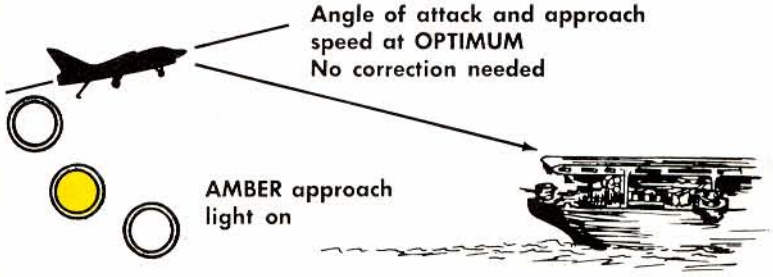
CIRCLE lighted

13.5 Units

Pointer near center of approach index marker

Angle of attack and approach speed at OPTIMUM
No correction needed

AMBER approach light on



MODERATELY FAST

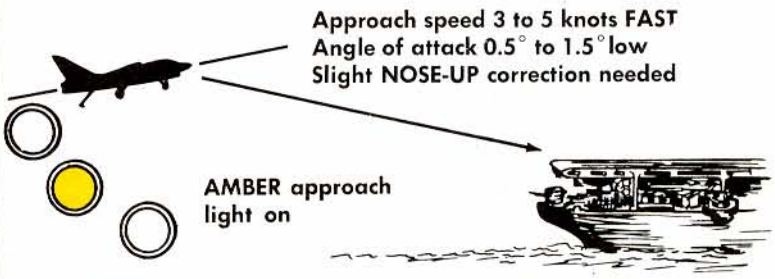
LOWER CHEVRON and CIRCLE lighted

13.0 Units

Pointer just below center of approach index marker

Approach speed 3 to 5 knots FAST
Angle of attack 0.5° to 1.5° low
Slight NOSE-UP correction needed

AMBER approach light on



FAST

LOWER CHEVRON lighted

12.5 Units

Pointer at or below lower edge of approach index marker

Approach speed more than 5 knots FAST
Angle of attack more than 1.5° low
NOSE-UP correction needed

RED approach light on

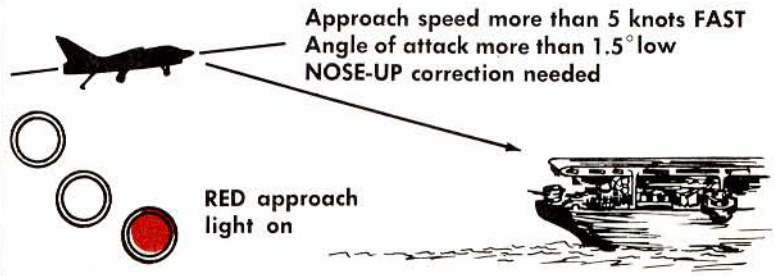


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Figure 1–30

glide path. The relationships of the various indications to angle of attack and airspeed are shown in figure 1–30.

If the indexer lights fail, the approach may be flown with reference to angle-of-attack indicator readings. In this case, attitude is corrected to keep the indicator pointer as close as possible to the center of the 3 o'clock reference index. Indications above and below the index indicate that the approach is being made more than 5 knots slow or fast.

APPROACH POWER COMPENSATOR

DESCRIPTION

The approach power compensator system consists of a computer, an accelerometer, a servo amplifier, a servo actuator, a pilot's control panel (figure 1–31), the existing angle-of-attack detector, a dual horizontal tail position (UHT) potentiometer. One element of the potentiometer provides UHT position information to the APC computer. The other element is used by the UHT position indicating system for cockpit indication of UHT position. The computer, servo amplifier and accelerometer are located in the left-hand wheel well. The servo actuator is located in the engine bay (left-hand side). The horizontal tail position potentiometer is located in the dorsal of the vertical fin. Electrical power for the system is supplied by the secondary ac and dc buses.

The system is designed for use when the aircraft is in the landing (wing-up) configuration. The aircraft can be flying straight and level, climbing, descending or turning at the time of engagement. The initial UHT trim position has no effect on APC engagement or operation since the UHT position signal input to the APC system is obtained from the integration of the UHT rate of movement. Upon landing, the system will disengage automatically.

The system sense deviations that would vary aircraft speed from optimum approach speed or change the aircraft flightpath. These deviations are acceleration, angle-of-attack, UHT position. These deviations initiate automatic corrections through the system to alter the engine power setting. During a normal approach using the APC, the system should maintain airspeed within a range of ±4 knots in light to moderate turbulence.

System components operate as follows: The system accelerometer and angle-of-attack detector, the UHT potentiometer supply their respective information to the system computer. When normal acceleration is 1g with a steady UHT position and the angle of attack is optimum for a landing approach, the computer sends no corrective signal and the throttle position does not change. When acceleration, angle of attack and/or UHT position deviate from these values, the deviations are interpreted by the computer as either offsetting each other or as requiring a change of engine power setting. If a power change is required, the computer sends an electrical signal to the servo amplifier. The amplified signal is then sent to the servo actuator. The servo actuator moves the engine fuel control cross-shift, mechanically changing engine power and throttle position.

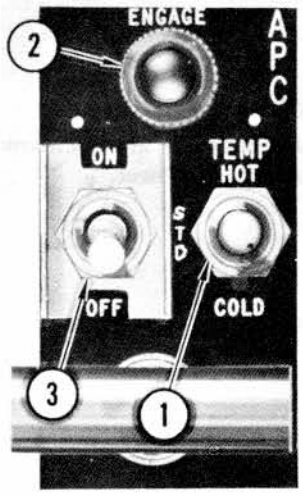
In flight, the system will not retard the throttle below approximately 78% rpm. Upon touchdown, compression of the main landing gear shock strut actuates the deck compress switch to cause the system to disengage automatically, leaving the throttle at approach power. The system will also disengage if the throttle is overridden with a force of 12 to 22 pounds in either direction, or if the landing gear is raised with the system in operation. The system may disengage inadvertently if throttle friction is excessive. With the loss of UHT input signal to the computer, the throttle will be positioned to MRT and will remain in MRT until disengaged.

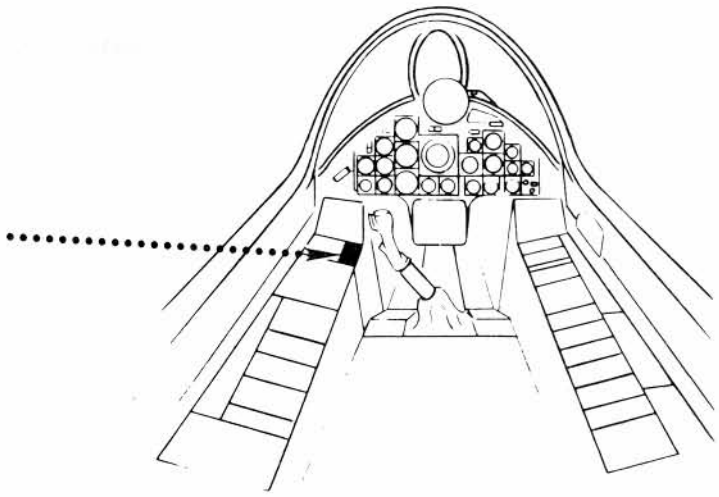
The system is normally maintained in operation by an engage switch, which is magnetically held in ON against spring tension by a holding coil. The switch springs back to OFF anytime power is removed from the holding coil. This occurs under the conditions described for disengagement in the preceding paragraph. If the 12- to 22-pound throttle force will not disengage the system, the system can be disengaged by turning off the engage switch unless the engage switch itself has failed or the servo actuator gears are jammed. If the system does not disengage when the airplane touches down, it can be

APPROACH POWER COMPENSATOR CONTROLS

Nomenclature	*Function*
Temperature switch (1, figure 1–31)	HOT — compensates for ambient temperatures above 27°C (80°F). STD — normal position when ambient temperature is between 4°C (40°F) and 27°C (80°F). COLD — compensates for ambient temperatures below 4°C (40°F).
Engage switch (3, figure 1–31)	ON — engages system to correct for deviations to normal acceleration and angle of attack during approach. OFF — disengages system.
Engage indicator light (2, figure 1–31)	On, indicates system engaged.

APPROACH POWER COMPENSATOR CONTROLS





1. Temperature switch
2. Engage indicator light
3. Engage switch

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Figure 1–31

disengaged by turning off the engage switch or overriding the throttle.

If certain gears in the servo actuator jam, the throttle will be stuck until a shear pin in the actuator output shaft is sheared. Applying a force of 34 to 46 pounds to the throttle will shear the pin. (It is preferable to shear this pin with a forward throttle force to avoid retarding the throttle to OFF.)

If the engage switch fails in ON, normal throttle override will not disengage the system, and it may not be possible to shear the pin. If the APC cannot be disengaged by any other method, turn off power to the system (master generator switch — OFF) and extend the power package to regain emergency and primary buses.

Even though the system automatically disengages with weight on the gear or with the landing gear retracted, it can be placed into operation if the engage switch is placed on and held there. This action is not recommended.

Since engine performance varies with ambient air temperature, the system has a three-position temperature switch (1, figure 1–31) to compensate for this effect. This switch must be placed in COLD below 4°C (40°F), in STD from 4°C (40°F) to 27°C (80°F), or in HOT above 27°C (80°F). Switch settings should be based upon the average temperature anticipated throughout the approach.

NORMAL OPERATION

Before Landing

WARNING

Do not engage the system with the fuel control switch in manual (EMERG). Automatic throttle movements associated with system operation are rapid, which could result in compressor stall and engine flameout.

1. Aircraft – LANDING CONFIGURATION
2. Throttle friction wheel – MINIMUM FRICTION
3. Fuel control switch – NORMAL
4. Cockpit emergency ventilation knob – CLOSED
   - If the emergency ventilation port is open, airflow around the angle-of-attack vane will be disturbed resulting in erroneous system inputs.
5. Temperature switch – HOT, STD, or COLD (according to ambient air temperature).

6. Engage switch – ON (engaged)
7. Engage indicator light – ON
8. Throttle – OBSERVE MOVEMENT
   - If it is desired to disengage the system, the engage switch can be placed in OFF or the throttle can be pushed to manually overpower the system. Use caution when disengaging the APC by retarding the throttle; the idle detent position could be inadvertently bypassed and the engine shut down.
9. Check that optimum angle of attack is obtained when airspeed stabilizes at the recommended approach value.

Note

If the angle-of-attack reading is known to be erroneous, the APC may still function normally because the APC system receives its AOA input from a separate side of the AOA transducer. If the APC system, once engaged, maintains the optimum airspeed consistent with the aircraft gross weight, it may be used.

10. Check that APC will add or retard power as the aircraft nose is raised or lowered before starting final approach.

After Landing

1. Throttle — REPOSITION AS REQUIRED
   - System will disengage at touchdown, leaving throttle at approach power.
2. Engage indicator light — OFF
   - Check that light has gone out automatically.
3. Engage switch — OFF
   - Check that switch has moved to OFF position automatically.

FLIGHT INSTRUMENTS

PRIMARY ATTITUDE INDICATOR

This indicator (10, figure 1–3) presents a pictorial indication of the aircraft pitch and roll attitude with respect to the real horizon. The system functions throughout 360° of roll attitude, but is limited to ±82° from the horizon in pitch attitude. A gyro caging switch is not provided because the system gravity-sensing erection circuit corrects induced errors at a rate of approximately 1° per minute. This system also provides for a fast erection capability. A pushbutton switch, located on the lower left corner of the indicator activates a fast erect circuit which, when pressed and held, corrects induced errors at the rate of 15° per minute. The indicator is operative any time the aircraft electrical circuits are energized. The OFF flag will appear when ac power is removed or while the FAST ERECT switch is being depressed. A pitch trim knob, located on the lower right corner of the indicator, is provided for the purpose of setting the artificial horizon to the "zero pitch" position when in level flight attitude. Flight attitude information is electrically transmitted from the instrument gyros to the pilot's indicator by power from the emergency ac bus. Loss of flight attitude indications can be expected simultaneously with loss of power.

WARNING

The primary attitude indicator may fail without the appearance of the warning off flag.

STANDBY ATTITUDE INDICATOR

A 2-inch self-contained standby flight attitude indicator (42, figure 1–3) is installed on the lower right side of the instrument panel which provides backup flight attitude information in the event of malfunction or failure of the primary attitude indicator. It provides flight information throughout 360° of roll but is limited to 92° in the climb attitude and 72° in the dive attitude. A single knob controls the pilot's operation of the indicator. Rotation of the knob positions a miniature airplane for reference by the pilot to a maximum of 5° either above or below the instruments zero pitch position. When the knob is pulled and outward pressure is maintained, the gyro is caged and a warning flag comes into view. Upon release of the knob, the gyros are uncaged and the flag disappears. With the gyro caged, clockwise rotation of the knob locks the instrument in the caged position. This position is used for shipping and handling of the indicator, and the gyro should not be locked in the caged position at any time when installed in the aircraft.

Note

Although the warning flag will come into view in the event electrical power is lost, the indicator will continue to display reliable pitch and roll information within 6° of vertical for a minimum of 9 minutes.

The instrument operates on 3-phase, 115-volt, 400-hertz power from the secondary ac bus and is operative within 2 minutes after power is applied to the bus.

TURN-AND-BANK INDICATOR

The gyro of this indicator (44, figure 1–3) is operated by bleed air from the engine compressor section.

ACCELERATION INDICATOR

This indicator (40, figure 1–3) is self-contained and indicates continuously the existing g-load on the aircraft during flight. It also indicates the maximum positive and negative loads that were imposed on the aircraft during any particular flight period.

Counting accelerometers are installed in the left-hand side of the aircraft just aft of the cockpit. These accelerometers are event recorders that record each time given g levels are exceeded. Maintenance personnel can verify an overstress reported by the aviator by reading the counting accelerometers prior to the next flight. Normally, counting accelerometers are read once a month for aircraft fatigue life prediction purposes.

AIRSPEED – MACH NUMBER INDICATOR

This pitot-static pressure indicator (47, figure 1–3) provides indicated airspeed and indicated Mach number readings. An airspeed correction card provides calibrated airspeed data. Conventional pitot tube anti-icing is provided.

VERTICAL VELOCITY INDICATOR

WARNING

Prior to AFC 592, the vertical speed indicator will fluctuate between speeds of 0.95 and 1.10 IMN. These fluctuations are approximately 180° out of phase with similar altimeter fluctuations of -2,000 to +1,500 feet. When in this speed region it is mandatory that flight be conducted with reference to the primary attitude indicator only; furthermore, transonic flight below 5,000 feet AGL in IFR or marginal VFR conditions should not be conducted unless operationally necessary.

This indicator (45, figure 1–3), operated by static pressure, provides rate-of-climb and rate-of-descent information in feet-per-minute.

AAU-19A/A ALTIMETER

The AAU-19A/A servo-pneumatic altimeter is installed (40, figure 1–3). It is a combined pneumatic altimeter and a servo repeater indicator. The servo repeater indications, which are corrected for position error, are provided by a CPU-46A/A-22 computer that is located in the utility compartment. The pneumatic indications are from a pitot/static source and are uncorrected for position error.

WARNING

NEW

Prior to AFC 592, the AAU-19A/A altimeter will fluctuate -2,000 to +1,500 feet between 0.95 and 1.10 IMN. These fluctuations are approximately 180° out of phase with similar vertical speed indicator fluctuations. When in this speed region it is mandatory that flight be conducted with reference to the primary attitude indicator; furthermore, transonic flight below 5,000 feet AGL in IFR or marginal VFR conditions should not be conducted unless operationally necessary.

Note

A separate pitot/static pressure system is installed for inputs to the CPU-46A/A altitude encoding computer and the AAU-19A/A altimeter. The system utilizes an L-shaped pitot/static probe mounted on the fuselage slightly forward and to the left of the cockpit.

The normal mode of operation is the servoed mode which is obtained by placing the RESET-STBY lever on the right corner of the instrument case in RESET when normal aircraft power is available.

Note

When operating in conjunction with the AN/APX-72 IFF transponder system, pressure altitude information is automatically transmitted upon interrogation from air traffic control ground equipment. Excluding computer failure, the CPU-46A/A computer continues to provide coded altitude information to the APX-72 whether the AAU-19A/A altimeter is in the STBY or RESET mode. The altitude transmitted is based on an altimeter setting of 29.92 inches of mercury.

If power failure, computer failure, or servo system malfunctions occur, the altimeter automatically reverts to the pneumatic (STBY) mode of operation. During STBY operation, a STBY flag appears on the instrument face to indicate pneumatic operation. The CPU-46A/A computer operates on electrical power from the primary ac bus. Position error correction information for operation in STBY mode is presented in Section XI.

NEW

The altimeter has a counter-drum-pointer display. The 1,000 and 10,000 foot counters and the 100 foot drum provide a direct digital readout of altitude in increments of 100 feet, from -1,000 to 80,000 feet. The pointer

repeats the 100-foot indications of the drum, and serves both as a vernier for the drum and as a quick indication of the rate and sense of altitude changes. Either of two methods may be used to read indicated altitude:

a. Read the counter-drum window, without reference to the pointer, as a direct digital readout in thousands and hundreds of feet.

b. Read the thousands of feet on the two counter indicators, without referring to the drum and then add the 100-foot pointer indication.

WARNING

If the altimeter's internal vibrator is inoperative because of internal failure or dc power failure while in STBY mode only, the 100 foot pointer may momentarily hang up when passing through "0" (12 o'clock position). If the vibrator has failed, the 100 foot pointer hangup can be minimized by tapping the case of the altimeter. Be especially watchful for this failure when minimum approach altitude lies within the 800- to 1,000-foot part of the scale (1,800 to 2,000 feet, 2,800 to 3,000 feet, etc.), and use any appropriate altitude backup information available for altitude cross-check.

During standby operation, a dc powered internal vibrator operates to minimize friction to allow a smoother display during altitude changes. A vibrating pointer and counter-drum may be noticeable due to vibrations set up by the vibrator. This is an indication that the vibrator is operating and shall be considered normal provided excursions of the pointer do not exceed approximately the width of a large graduation marker on the dial face and the counters are not excited to the extent that the counters appear blurred. Should vibrator failure occur, the altimeter continues to function pneumatically, but the vibrating will not be present and a less-smooth movement of the instrument display will be evident with changes in altitude. If the altimeter automatically reverts to STBY, an attempt should be made to reset the servoed mode. If the fault condition was temporary, the altimeter will reset and the STBY flag will disappear. Although the primary mode of operation is electrical (servoed), the pneumatic mode of operation can be selected at any time by holding the RESET-STBY lever in the STBY position until the STBY flag appears. The vibrator operates on electrical power from the emergency dc bus.

WARNING

If altimeter setting knob can be moved in or out and the pointer moves without a corresponding change of the barometric setting when the knob is rotated, then the altimeter pneumatic and electrical calibration may have been shifted. In this case accurate altimeter settings cannot be made and the instrument is unsafe for flight reference.

CAUTION

During normal use of the barometric setting system, momentary locking of the barocounters may be experienced at counter rollover from 29.99 to 30.00 inches of mercury. If this occurs, do not force the setting. Application of force may cause internal gear disengagement and result in excessive altitude errors in both pneumatic (STBY) and servo (RESET) modes. If locking occurs, the required setting may sometimes be attained by rotating the knob a full turn in the opposite direction and carefully reapproaching the required setting.

The altimeter setting is entered in the normal manner and can be set over a range from 28.10 to 31.00. A field elevation check should be made in both the pneumatic and servoed modes of operation, using the normal ±75 feet as the maximum allowable error in either case. In addition, indications in the two modes should correspond to within 75 feet.

ANGLE-OF-ATTACK INDICATOR

The indicator (6, figure 1–3) provides continuous angle-of-attack indications for use primarily as an aid in controlling attitude and, hence, in controlling airspeed in landing approaches. The indication can also be used in establishing various other flight conditions. The indicator also controls operation of the angle-of-attack approach indexer and the approach lights. Refer to ANGLE-OF-ATTACK INDICATING, this section, for details of system operation.

FIRE DETECTOR

FIRE DETECTOR SYSTEM CONTROLS

Nomenclature	*Function*
Fire warning test switch (8, figure 1–3)	Depressed, checks system circuit continuity and operation of fire warning light.
Fire warning light (7, figure 1–3)	On (FIRE), indicates fire or overheat condition in engine bay or afterburner compartment area.

RADIO EQUIPMENT

DESCRIPTION

The aircraft is equipped with UHF command radio, ADF, TACAN, radio altimeter, IFF radar, and a Doppler Radar Navigation Set. An integrated electronics package provides a cooled and pressurized housing for the UHF, ADF and IFF components.

Primary ac and dc bus power is connected to the modified UHF receiver-transmitter, IFF receiver-transmitter, and an ADF electronic control amplifier in the electronic package through the UHF function switch (3, figure 1-32).

Engine compressor bleed air is directed from the engine bleed air control manifold to the integrated electronics package for pressurization, and cooling is provided by ram air circulated around the outside of the package. An internal fan, powered by secondary ac bus power, provides air circulation within the package. If pressurization is lost due to engine flameout or a system malfunction, a check valve traps the pressure in the package. Tests have shown that the electronic package may be operated for extended periods of time without the internal fan in operation with no damage to the equipment. However, continuous use of the integrated electronic package equipment without air circulation may result in damage from overheating.

During ground operation without the engine running, operating time of the electronic package is limited. Do not operate IFF or UHF receiver-transmitter continuously for more than 15 minutes; this time period may be extended to 30 minutes if receiving only. If either time limit is reached, wait 30 minutes before continuing operation.

ELECTRONIC EQUIPMENT

Type	*Designation*	*Function*	*Range*	*Location of Controls*
Direction Finder (ADF) Group	AN/ARA-50	Indicates bearing of received rf signals.	Line of sight	UHF panel (right console)
Airborne IFF Transponder Set	AN/APX-72	Coder group for IFF.	Line of sight	IFF panel (right console)
	KIT-1A/TSEC	Identifies aircraft for other than friend or foe. Identifies aircraft as friend or foe.	Line of sight	IFF panel (right console)
Radio Navigation (TACAN) Set	AN/ARN-52(V)	Provides range and bearing information in reference to a selected beacon.	Line of sight (range info limited to 200 NMI)	TACAN PANEL (right console)
UHF Command Radio Set	AN/ARC-51A	Two-way voice communication.	Line of sight	UHF panel (right console) throttle
Doppler Radar Navigation System	AN/APN-153(V)	Provides ground speed and drift angle indications.	50 to 50,000 feet	Doppler panel (right console)
Precision Approach Receiver/Decoder Group	AN/ARA-63	Displays precision approach information on the course indicator	Maximum 40 miles Minimum 10 miles	ARA-63 control panel (left console)

COMMAND RADIO SET

AN/ARC-51A UHF RADIO SET

Description

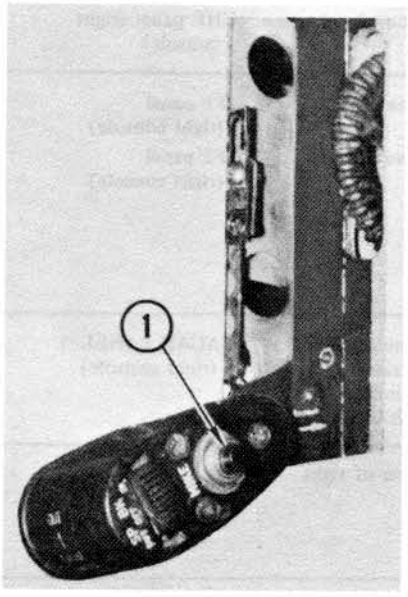
RF-8G aircraft are equipped with UHF radio set AN/ARC-51A. The AN/ARC-51A radio primarily functions as the command radio, with an additional capability (in conjunction with AN/ARA-50) as an automatic direction finder (ADF). The system consists of a receiver-transmitter unit and a guard channel receiver, located in the CNI compartment; a cockpit control panel, located on the right console; a cockpit remote frequency/channel indicator, located on the right side of the instrument board; and an antenna located on the vertical tail. The set transmits and receives on any one of 3,500 frequencies, spaced at 50 kiloHertz intervals, in the 225.00 to 399.95 megaHertz band. The command set operates on electrical power from the primary ac and dc buses.

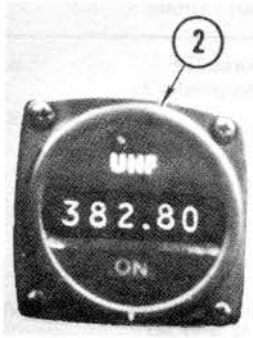
Note

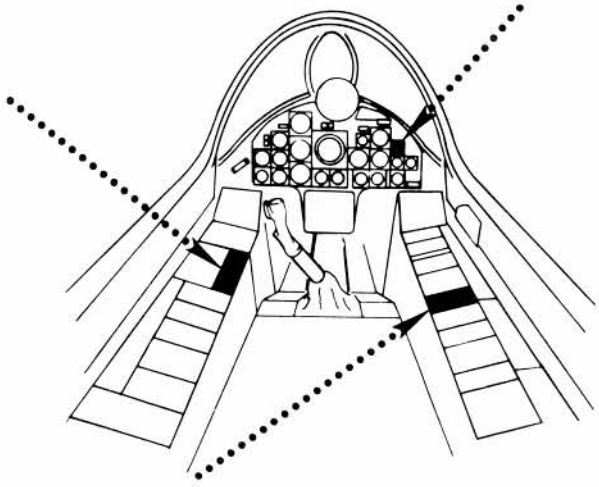
It is possible to set frequencies below 225.00 megaHertz, but reception or transmission is not possible. Normal side tone may give the impression that the set operates on frequencies below 225.00 megaHertz.

Radio set controls permit selection of any one of 20 preset channels within the specified operating frequency range, or manual selection of any of the 3,500 available frequencies. Guard channel may be monitored simultaneously. When at extreme reception ranges, placing the squelch disable switch in the ON position permits readability of weak signals at the expense of increased noise level.

COMMAND RADIO CONTROLS







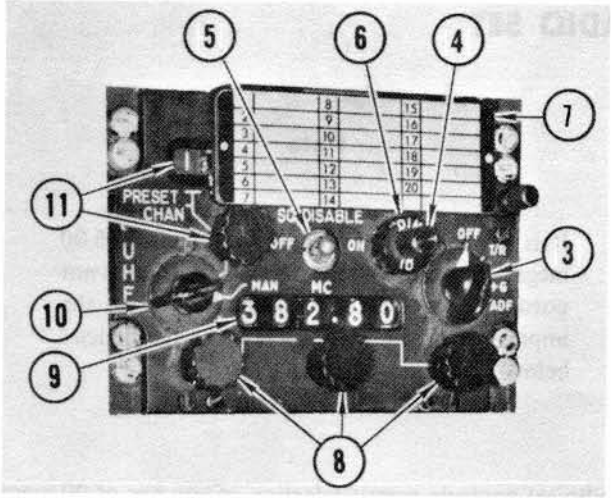


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Figure 1-32 (Sheet 1)

COMMAND RADIO CONTROLS

Nomenclature	*Function*
1. Microphone switch	Places main receiver in standby and operates transmitter.
2. Remote frequency/channel indicator	Displays which of 20 preset channels is selected for operation when the mode selector switch is in PRESET CHAN position. Displays digits of the manually selected frequency when mode switch is in MAN position. Displays "G" when mode switch is in GD XMIT position.
3. Function switch	OFF – terminates electrical power to AN/ARC-51A set.
	T/R – set is energized to receive or transmit on a selected channel or frequency. T/R+G – same as T/R and energizes the guard receiver. ADF – energizes the ADF function of the command radio. Routes received signals of the selected frequency (mode selector) through the ADF antenna. Magnetic bearings are displayed on the number 1 needle of the bearing-distance-heading indicator.
4. UHF volume control knob	Adjusts level of audio signals delivered to headset.
5. SQ DISABLE switch	In the ON position, the receiver squelch circuit is disabled,
6. Remote frequency/channel indicator dimming switch	Inoperative – brilliance of remote frequency/channel indicator integral light controlled by nonflight instrument lights dimming knob.
7. Preset memory drum hinged cover	Cover raised – provides access to preset memory drum. Cover closed – provides placard for recording 20 preset frequencies.
8. Manual frequency selector knobs	Rotated to manually select any one of 3,500 frequencies. Frequency selected becomes operable when the mode switch is placed in MAN position.
9. Frequency counters	Displays digits of manually selected frequency.
10. Mode selector	PRESET CHAN – permits automatic selection of one of 20 preset channels with preset channel knob. MAN – permits manual selection of any one of 3,500 frequencies by use of the manual frequency selectors. GD XMIT – selects 243.00 MHz on the transmitter and main receiver with function switch in T/R. With function switch in T/R+G, 243 MHz is selected on the transmitter and main receiver and the guard receiver is energized.
11. Preset channel knob and	The indicator displays which one of 20 channels has been selected by the knob. Selected channel becomes operable when the mode selector switch is placed in PRESET CHAN.

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Figure 1-32 (Sheet 2)

TSEC/KY-28, Speech Security equipment is installed in the aircraft and is used in conjunction with the AN/ARC-51A command radio. Refer to Section I, (Confidential) Supplemental NATOPS Manual for detailed information on the Speech Security system. When KY-28 speech security equipment is not installed, a jumper cable is required to complete audio and ADF circuits.

Controls for the AN/ARC-51A radio set are illustrated and described in figure 1–32.

Channel Reset Procedures

Twenty preset frequencies can be selected with the PRESET CHAN rotary switch. Presetting of the 20 frequencies is accomplished by opening the hinged cover on the upper portion of the cockpit control panel, and adjusting the selector pins using the special provided tool stored beneath the hinged cover. Although it is possible to set these frequencies while inflight, they are normally set before flight.

Normal Operation

To place the set in operation for normal two-way communication inflight or on the ground:

1. Function selector – T/R or T/R + G
   - Allow a 2-minute warmup time before attempting to transmit.
2. Mode selector – PRESET CHAN or MAN
3. Desired frequency or channel – SET
   - Select desired channel number (mode selector-PRESET CHAN) or position frequency selector dials to desired frequency (mode selector-MAN).
4. Volume control – ADJUST
5. Squelch disable switch – AS DESIRED

To transmit on guard frequency:

6. Mode selector – GD XMIT

Note

A 400-cps tone is audible in the headset any time the AN/ARC-51A frequency is changed during normal operation. When switching from a frequency on a preset channel to the same frequency set in manually, absence of the tone is an indication of a properly preset channel.

AUTOMATIC DIRECTION FINDER (ADF) SET

AN/ARA-50 AUTOMATIC DIRECTION FINDING SET

Description

The AN/ARA-50 automatic direction finding set operates in conjunction with the AN/ARC-51A command UHF radio set. The set consists of an AS909/ARA-48 directional antenna and an AM 3624/ARA-50 amplifier relay unit. The set is a navigational aid used to determine the direction of a distant UHF transmitter that is transmitting on the frequency selected on the ARC-51A control panel. Placing the ARC-51A function switch in the ADF position actuates the ARA-50 amplifier which turns the antenna to the direction of the incoming signal. The received signal is routed to the main receiver where it is demodulated to provide audio to the pilot and to the AM 3624/ARA-50 amplifier for antenna control. Until the directional antenna is nulled on the received signal a chopped 100 cps aural tone will be heard. As the received signal is processed by the directional antenna a relative bearing to the transmitting station is determined and is then displayed as a magnetic bearing on the number 1

needle of the Bearing Direction Heading Indicator (BDHI). With the function selector in the ADF position, pressing the microphone switch disables the ADF capability and allows normal transmission through the command antenna until the microphone switch is released. The ADF operates on electrical power from the primary ac and dc buses.

Normal Operation

To start ADF operation:

1. Mode selector – PRESET CHAN, MAN or GD XMIT

   - If GD XMIT is selected, guard frequency (243 MHz) is automatically selected.

2. Function selector – ADF

3. Desired frequency or channel – SET

4. Volume control – ADJUST

5. Squelch disable switch – AS DESIRED

To terminate operation:

6. Function switch – ANY POSITION EXCEPT ADF

   - Placing the function switch to T/R or T/R + G connects the command radio antenna to the main receiver.

ADF CONTROLS

Nomenclature	*Function*
UHF function switch (3, figure 1–32)	ADF – actuates the ADF function of the Command Radio. Routes incoming signals of the selected frequency through the ADF antenna.
TACAN bearing-distance-heading indicator (2, figure 1–35)	Pointer No. 1 indicates magnetic bearing of distant UHF transmitter from the aircraft. The MA-1 compass inoperative or operating in FREE mode indicates relative bearing of distant UHF transmitter from the aircraft.

AIRBORNE TRANSPONDER SYSTEM

AN/APX-72 TRANSPONDER SET

Description

The AIMS transponder system is capable of automatically reporting coded identification and altitude signals in response to interrogations from surface (or airborne) stations so that the stations can establish aircraft identification, control air traffic, and maintain vertical separation. The system has five operating modes: 1, 2, 3/A, C and 4. Modes 1 and 2 are IFF modes, mode 3 and mode C (automatic altitude reporting) are primarily air traffic control modes and mode 4 is the secure (encrypted) IFF mode, Mode 4 is not operational unless the system includes a KIT-1A/TSEC. (See figure 1–33.)

Aims Transponder System Components

The basic AIMS transponder system components are:

1. Control Box, C-6280A(P)/APX.
2. Transponder, APX-72
3. Transponder Test Set, TS-1843/APX
4. An Altitude Computer, CPU-46S/A.
5. A Servo Altimeter, AAU-19A/A.

The following components provide the secure IFF function:

6. Transponder Computer, KIT-1A/TSEC
7. IFF caution light
8. Landing gear interlock

Transponder Test Set

The TS-1843 Transponder Test Set provides the self-test and monitor functions for modes 1, 2, 3/A, and C. The TS-1843 accomplishes the self-test functions, when actuated, by interrogating the transponder and monitoring the replies. The monitor function is accomplished, when selected, by monitoring the replies to external interrogations. The controls for the TS-1843 are on the C-6280 Control.

C-6280 Transponder Control

Most of the controls for the AIMS transponder system are included on the C-6280. The REPLY Light and the controls on the left side of the C-6280 are concerned with mode 4. The TEST light and the remaining controls are associated with modes 1, 2, 3/A, and C; except that the MASTER Switch controls all modes of operations.

MASTER Switch

The MASTER Switch applies power to all of the AIMS transponder system components except the altimetry components. It is a five-position rotary switch placarded OFF, STBY, LOW, NORM, and EMER. The switch must be lifted over a detent to switch to EMER or to OFF. STBY should be selected for 2 minutes prior to switching to LOW or NORM to allow the transponder to warm up. In the NORM position, the transponder system is operational at normal receiver sensitivity. In the LOW position, the system is operational, but the transponder receiver sensitivity is reduced. In the EMER position, the transponder transmits emergency replies to mode 1, 2, or 3/A interrogations. The mode 3/A emergency reply includes code 7700. When EMER is selected, mode 4 and mode C are enabled regardless of the position of the selector switches.

Note

The transponder automatically switches to emergency operation and the mode 4 codes zeroize when seat ejection occurs, if the MASTER switch is in any position except OFF.

INDENT-OUT-MIC Switch

The INDENT-OUT-MIC switch is a three-position toggle switch. The spring-loaded IDENT position adds an identification of position pulse to mode 1, 2, and 3/A codes. The mode 2 code selector switches are located on the transponder and cannot be changed by the pilot during flight.

Mode 1, 2, and 3/A Code Selectors

The two mode 1 thumbwheel selector switches allow selection of 32 mode 1 codes, and the four mode 3/A thumbwheel selectors allow selection of 4096 mode 3/A codes. The mode 2 code selector switches are located on the transponder and cannot be changed by the pilot during flight.

Mode Switches

The four Mode Switches (M-1, M-2, M-3/A, and M-C) each have OUT, ON, and spring-loaded TEST positions. The center ON position of each switch enables that mode. To test the transponder, press the mode switch of each mode to the TEST position. Illumination of the TEST light indicates proper operation of that mode. The MASTER switch must be set to NORM for the test function to operate. The mode switches of the modes not being tested should be OUT when testing on the ground to prevent unnecessary interference with nearby ground stations.

Note

The TEST light may flash once as each mode switch is released from the TEST position, and as the RAD TEST-OUT-MON switch is moved. This is a characteristic of the TS-1843B transponder test set and is meaningless.

RAD TEST-OUT-MON Switch

The MON position of the RAD TEST-OUT-MON switch is used to monitor the operation of modes 1, 2, 3/A and C. When MON is selected, the TEST Light will illuminate for 3

AIRBORNE TRANSPONDER CONTROLS - AN/APX-72

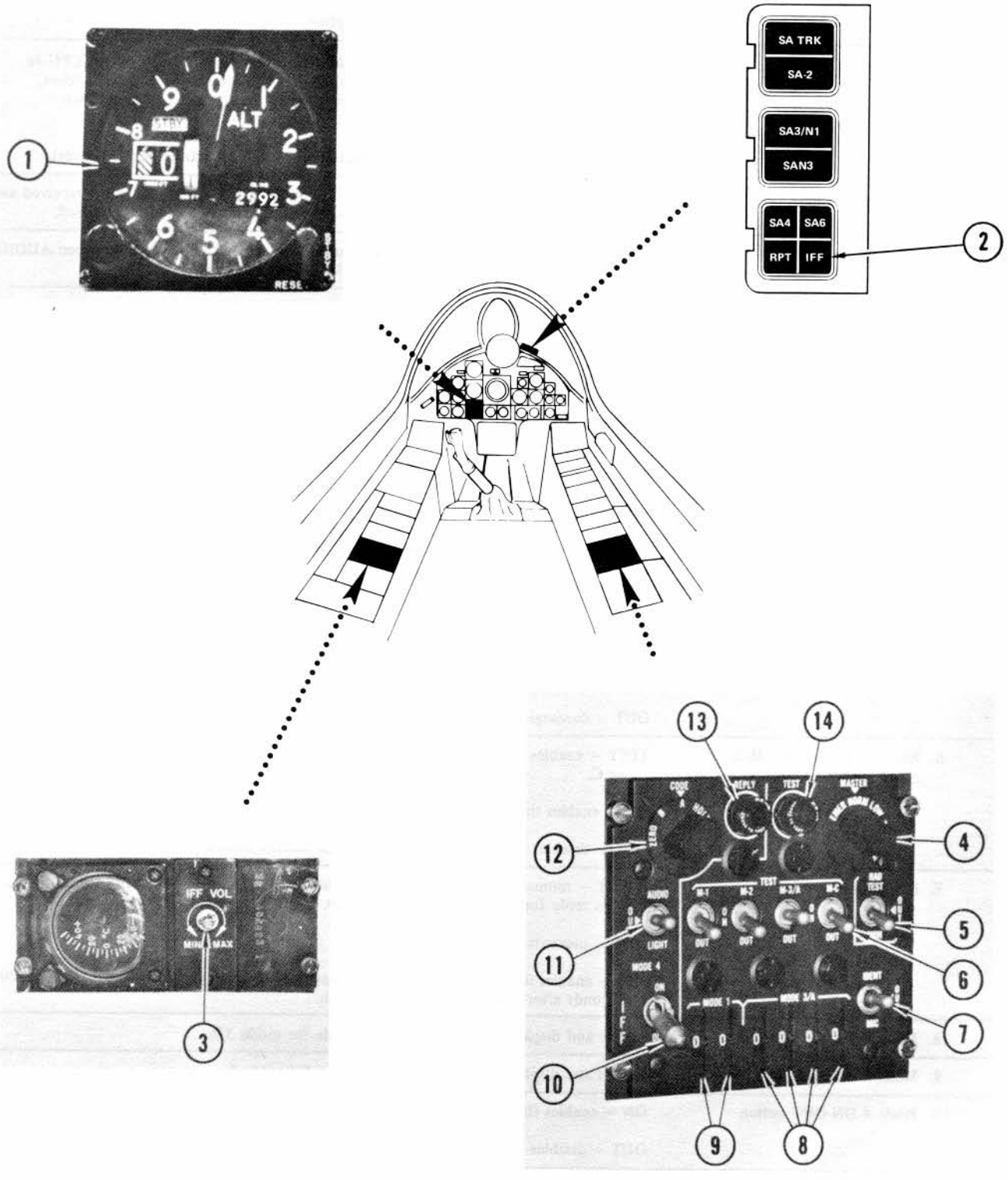

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Figure 1-33 (Sheet 1)

AIRBORNE TRANSPONDER CONTROLS - AN/APX-72

Nomenclature	*Function*
1. AAU-19A/A Altimeter	RESET (servoed) – displays calibrated altitude information furnished by the CPU-46 computer (corrected for position error). With altimeter setting of 29.92 inches, displays pressure altitude which is transmitted to interrogation stations when mode C is activated. STBY – displays indicated altitude information (not corrected for position error).
2. IFF caution light	On (IFF) – with KIT-1A/TSEC computer in operation indicates mode 4 has received an interrogation and has not generated a valid reply, or mode 4 code is zeroized.
3. IFF VOL control	Rotated between MIN and MAX adjusts audio tone level in pilot's headset when AUDIO position is selected for monitoring mode 4 interrogations.
4. MASTER control switch	OFF – disconnects power to IFF system. STBY – connects power to receiver-transmitter for warmup (minimum of 1 minute for standard temperatures and a maximum of 2 minutes for extreme temperatures); after initial warmup, maintains system in operation-ready status. LOW – energizes the set and provides reduced receiver sensitivity for response to strong interrogation signals. NORM – energizes the set at normal receiver sensitivity. EMER – enables modes 1, 2, and 3/A for special emergency replies regardless of mode switch's position. Enables modes C and 4 for normal replies.
5. RAD TEST-OUT-MON switch	RAD TEST – momentarily engaged (spring loaded to OUT) enables transponder to reply to test mode interrogations from test equipment. Other functions of this switch position are classified. MON – enables the monitor circuits of an internal test set. TEST light will go on when replies are transmitted in response to either internal or external interrogations of modes 1, 2, 3/A, or C. OUT – deenergizes RAD TEST and MON.
6. Mode switches (M-1, M-2, M-3/A, M-C)	TEST – enables an internal transponder tester to locally interrogate modes 1, 2, 3/A, or C. ON – enables the receiver-transmitter to reply to the selected mode interrogations. OUT – disables the reply capability to mode interrogations.
7. IDENT-MIC switch	IDENT – momentarily actuated (spring loaded to OUT) initiates identification of position reply for approximately 20 seconds. OUT – prevents triggering of identification of position reply. MIC – enables identification of position replies to be transmitted for approximately 20 seconds after pressing microphone switch.
8. Mode 3/A code selectors	Selects and displays the four digit reply code for mode 3/A.
9. Mode 1 code selectors	Selects and displays the two digit reply code for mode 1.
10. Mode 4 ON-OUT switch	ON – enables the receiver-transmitter to reply to mode 4 interrogations. OUT – disables the reply capability to mode 4 interrogations.

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Figure 1-33 (Sheet 2)

AIRBORNE TRANSPONDER CONTROLS - AN/APX-72

Nomenclature	*Function*
11. AUDIO-LIGHT switch	AUDIO – enables aural and REPLY light monitoring of valid mode 4 interrogations and replies. LIGHT – enables REPLY light only monitoring of valid mode 4 replies. OUT – disables aural and REPLY light monitoring of mode 4.
12. Mode 4 CODE control switch	HOLD – momentarily actuated (spring loaded to A position) with the system energized and landing gear down and locked, retains preset code for both A and B positions after system has been deenergized. A – selects the preset code for A position. B – selects the preset code for B position. ZERO – zeroizes code from both A and B positions.
13. Mode 4 REPLY light	On – indicates valid mode 4 replies are being transmitted.
14. TEST light	On (with AUDIO-OUT-MON switch in OUT) – indicates proper receiver-transmitter response when switches for modes 1, 2, 3/A, or C are placed in TEST position, or proper response to an outside interrogation if RAD TEST/MON switch is in MON position.

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Figure 1–33 (Sheet 3)

seconds each time an acceptable response is made to an interrogation on a selected mode.

The spring-loaded RAD TEST position is used for test. It enables a mode 3/A code reply to a TEST mode interrogation from a ramp test set. It also enables a mode 4 reply to a VERIFY 1 interrogation from a surface station or a ramp test set. A VERIFY 1 interrogation is a modified mode 4 interrogation used for testing.

Mode 4 Operation

Mode 4 operation is selected by placing the MODE 4 toggle switch to ON, provided that the MASTER switch is NORM or LOW. Placing the mode 4 switch to OUT disables mode 4.

The Mode 4 CODE switch is placarded ZERO, B, A, and HOLD. The switch must be lifted over a detent to switch to ZERO. It is spring-loaded to return from HOLD to the A position. Position A selects the mode 4 code for the present code period and position B selects the mode 4 code for the succeeding code period. Both codes are mechanically inserted into the KIT-1A/TSEC transponder computer by single insertion of the KIK-18/TSEC code changing key. The codes are mechanically held in the KIT-1A/TSEC, regardless of the position of the MASTER switch or the status of aircraft power, until the first time the landing gear is raised. Thereafter, the mode 4 codes will automatically zeroize anytime the MASTER switch or the aircraft power is turned off. The code settings can be mechanically retained after the aircraft has landed (landing gear must be down and locked) by turning the CODE switch to HOLD and releasing it at least 15 seconds before the MASTER switch or aircraft power is turned off. The codes again will be held, regardless of the status of aircraft power or the MASTER switch, until the next time the landing gear is raised.

The mode 4 codes can be zeroized any time the aircraft power is on and the MASTER switch is not OFF by turning the CODE switch to ZERO.

An audio signal, the C-6280 REPLY light, and the IFF caution lights are used to monitor mode 4 operation. The AUDIO-OUT-LIGHT switch controls the audio signal and the REPLY light, but not the IFF caution light. In the LIGHT position, the REPLY light illuminates as mode 4 replies are transmitted. In the AUDIO position, an audio tone in the pilot's headset indicates that valid mode 4 interrogations are being received and the REPLY light illuminates if mode 4 replies are transmitted. In the OUT position, the audio indications and the REPLY light are inoperative and the REPLY light will not press-to-test.

IFF Caution Light

The IFF caution light, located on the instrument panel, lights to indicate that mode 4 is not operative. The light is operative whenever aircraft power is on and the MASTER switch is not OFF. However, the light will not operate if

the KIT-1A/TSEC computer is not physically installed in the aircraft. Illumination of the IFF caution light indicates that (1) the mode 4 codes have zeroized, (2) the self-test function of the KIT-1A/TSEC Computer has detected a faulty computer, or (3) the transponder is not replying to proper mode 4 interrogations.

If the IFF caution light illuminates, switch the MASTER switch to NORM (if in STBY) and insure that the Mode 4 toggle switch is ON. If illumination continues, employ operationally directed flight procedures for an inoperative mode 4 condition.

Other Controls

A mode 4 Audio Volume Control is located on the starboard light control console.

CPU-46/A

The CPU-46/A altitude computer is a small air data computer consisting of an altitude sensor, airspeed sensor, electromechanical computing section, servo monitors, synchro outputs, and a digital encoder.

The CPU-46/A computer outputs are altitude information corrected for static position error. The synchro output is supplied to the AAU-19 altimeter providing the pilot with a corrected altitude indication. The digital output is coded in increments of 100 feet and is referenced to 29.92 inches of Hg. The CPU-46/A operates automatically whenever aircraft power is on. In case of an electrical failure in the computer, the AAU-19 altimeters automatically switch to standby operation and the computer digital output circuit is disabled. In addition, the transponder test set mode C enabling circuit is opened preventing a GO test for mode C.

AAU-19A/A Servo Altimeter

The AAU-19A/A Counter-Drum-Pointer Servo Altimeter consists of a pressure altimeter combined with an ac powered servomechanism. Altitude is displayed in digital form by a 10,000-foot counter, a 1,000-foot counter, and a 100-foot drum. A single pointer also indicates hundreds of feet on a circular scale, with center graduations of 50 feet. Below 10,000 feet, a diagonal warning symbol appears on the 10,000-foot counter. A barometric pressure setting (baroset) knob is provided to insert barometric pressure in inches of Hg. The baroset knob has no effect on the digital output (mode C) of the altitude computer which is always referenced to 29.92 in Hg. The altimeter has a primary (servo) mode and a standby (pressure) mode of operation, controlled by a spring loaded self centering mode switch placarded RESET and STBY. In the primary (servo) mode, the altimeter displays altitude, corrected for position error, from the synchro output of the altitude computer. In the standby mode of operation, the altimeter displays altitude directly from the static system (uncorrected for position error) and operates as a standard pressure altimeter. A dc powered internal vibrator is automatically energized while in the standby mode to minimize friction in the display mechanism.

AAU-19A/A Operating Characteristics

The counter drum-point display is designed so that the 100-foot drum and the pointer rotate continuously during altitude changes, while the 10,000-foot and 1,000-foot counters remain in a fixed position. When each 1,000-foot increment is completed, the counter abruptly indexes to the next digit. However, when operating in the Standby mode, there may be a noticeable pause, or hesitation of the pointer caused by the additional friction and inertia loads involved in indexing the counter. The momentary pause is followed by a noticeable acceleration as the counter changes. The pause-and-accelerate behavior occurs in the 9 to 1 sector of the scale and is more pronounced when the 10,000-foot counter changes. It is also more pronounced at high altitudes and high rates of ascent and descent. During normal rates of descent at low altitudes the effect is minimal.

Note

If the altimeter's internal vibrator is inoperative, the pause-and-accelerate effect may be exaggerated in the standby mode. If operating in the Standby mode, be watchful for this behavior when the minimum approach altitude lies within the 8 to 2 sector of the scale, i.e.; 800-1200 feet, 1800-2200 feet, etc.

AAU-19A/A Operation

The Primary mode of AAU-19A/A operation is selected by positioning the mode switch to RESET for 1 to 3 seconds, provided the ac power is on. During standby operation, a red STBY flag appears on the dial face. The altimeter will automatically switch to standby operation in case of an electrical power interruption longer than 3 seconds, or in case of an electrical failure in the altimeter or altitude computer. Standby operation can also be selected by placing the mode switch to STBY. During standby operation, it is possible for the transponder to continue to transmit altitude information (corrected for position error) on mode C, while the altimeter is displaying altitude uncorrected for position error.

AAU-19A/A Field Elevation Check

When the local barometric pressure is set into the AAU-19A/A, the altimeter should agree within ± 75 feet of field elevation in both modes.

Note

If momentary locking of the barocounters is experienced during normal use of the baroset knob, do not force the setting. Application of force may cause internal gear disengagement and result in excessive altitude errors in both primary and standby modes. If locking occurs, rotate the knob a full turn in the opposite direction and approach the setting again with caution.

RADAR SET (RADIO ALTIMETER) AN/APN-22

DESCRIPTION

The AN/APN-22 radar set is a microwave radio altimeter which is designed to measure the terrain clearance of the aircraft without the necessity for externally mounted equipment. The equipment operates in the 4200- to 4400-mc band and is designed to provide reliable operation from 0 to 10,000 feet over land and 0 to 20,000 feet over water. This equipment is accurate to 2 feet from 0 to 40 feet and 5% of the indicated terrain clearance from 40 to 20,000 feet. It operates from the secondary ac and dc electrical buses.

The radio altimeter (figure 1–34) may be set to provide a reference for flight at constant terrain height or to provide a warning of descent below a preset terrain clearance up to 20,000 feet. The adjustable index marker (bug) at the outside of the scale can be positioned at the desired reference height by turning the on-limit knob.

A reliability circuit disables the indicator when the signal is too weak, and the head of the pointer will assume an offscale position behind the dropout mask below the 0 scale mark.

WARNING

Radio altimeter indications become erroneous at airspeeds over 300 KIAS. Aircraft bank angles of more than 30° will cause the pointer to become erratic and assume the offscale position.

NORMAL OPERATION

To start operation:

1. On-limit knob — ON

RADIO ALTITUDE INDICATOR

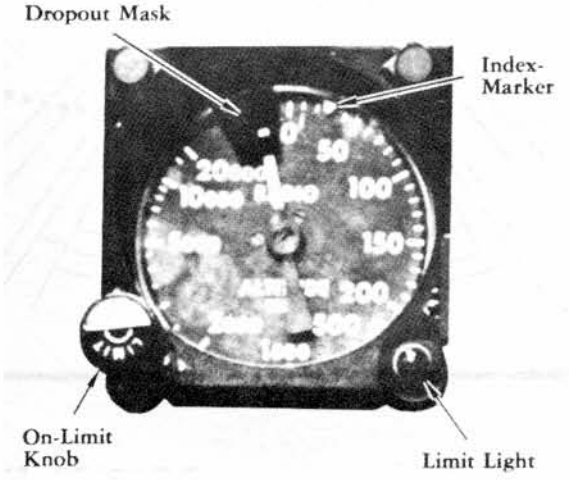


Figure 1–34

CAUTION

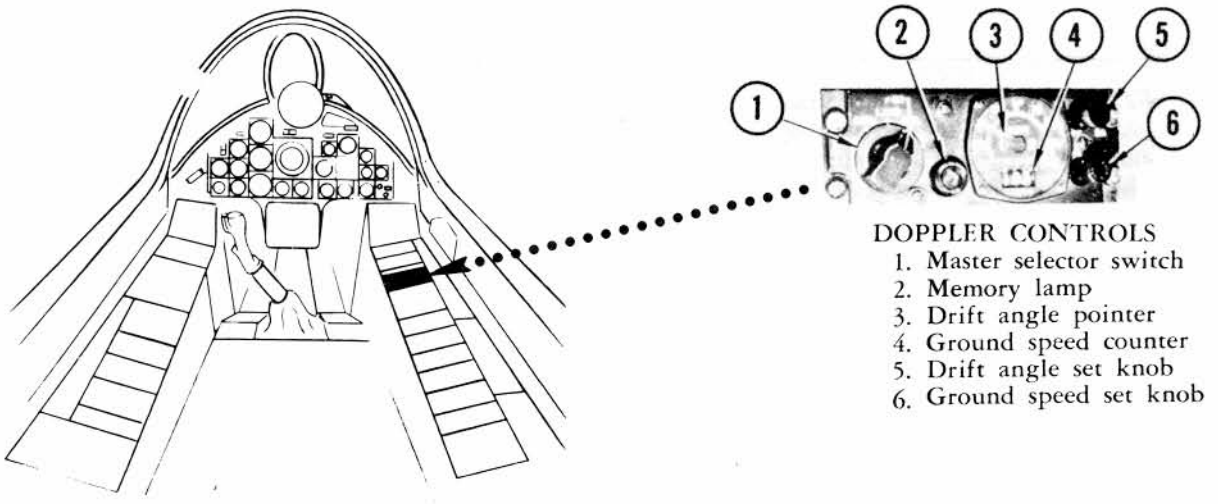
Allow at least 12 minutes warmup time after starting the equipment to ensure final accuracy.

2. On-limit knob — SET TO DESIRED HEIGHT
3. Limit light — ON (if below designated height)

RADIO ALTIMETER CONTROL AND INDICATIONS

Nomenclature	*Function*
Radio altitude indicator (figure 1–34)	Indicates terrain clearance on a scale with increments that vary from 10 feet, at low levels, to 5,000 feet, at high levels.
On-limit knob	Initial clockwise rotation turns set on. Further clockwise turning increases setting of height index marker. Turned counterclockwise decreases setting of height index marker. Turned fully counterclockwise turns set off.
Limit light	On, if aircraft is below height indicated by index marker. Off, if aircraft is above height indicated by index marker.
Index marker	Indicates reference height selected by the pilot.

RF-8G DOPPLER NAVIGATION SYSTEM CONTROLS AND INDICATORS



DOPPLER CONTROLS
1. Master selector switch
2. Memory lamp
3. Drift angle pointer
4. Ground speed counter
5. Drift angle set knob
6. Ground speed set knob

Figure 1–34A

DOPPLER NAVIGATION SYSTEM

DESCRIPTION

This system consists of an AN/APN-153(V) Radar Navigation Set (Doppler). This component is described in the following paragraphs. Controls and indicators are illustrated in figure 1–34A and described in the system controls and indicators table.

RADAR NAVIGATION SET (DOPPLER) AN/APN-153(V)

The AN/APN-153(V) uses the doppler effect to measure ground speed and drift angle with a high degree of accuracy with complete independence from ground navigation aids.

The antenna used with this set transmits radar pulses downward in four different directions, right and left front and right and left rear. With this arrangement, doppler shifts result from sideways motion and this results in the antenna axis aligning itself with the aircraft ground track. The drift angle is then measured as the resultant angle between the antenna axis and the aircraft axis. Ground speed is proportional to the frequency shift along the ground track axis.

The set operates in three modes: normal, memory, and test. In the normal mode the set is tracking a doppler signal. Ground speed is displayed on a dial in degrees. In the memory mode, the set is not tracking a doppler signal and a memory lamp is illuminated. When tracking of a doppler signal is resumed, the set returns to the normal mode of operation and the memory lamp is extinguished. The test mode is used to verify proper operation of the set.

PREFLIGHT TEST – DOPPLER NAVIGATION SYSTEM

Place the navigation computer function selector switch in TEST and the doppler master selector switch in TEST.

Check the AN/APN-153(V) Doppler Set in the following manner:

1. Memory lamp on Doppler Set control panel should go out approximately 1½ to 2 minutes after placing system in TEST mode.
2. Ground speed should read 121 (±3) knots on ground speed counter. (Reading will be low until system has warmed up approximately 8 minutes.)
3. Drift angle should read 0° (±2°) on drift angle indicator.

NORMAL OPERATION – DOPPLER NAVIGATION SYSTEM

At any time before takeoff:

1. Perform preceding PREFLIGHT TEST of all system components.

When readying for takeoff:

2. Doppler master selector switch — ON LAND or ON SEA (as applicable).

In the course of maneuvering the aircraft, the doppler signal may be lost temporarily and the memory lamp illuminated. The lamp should extinguish, however, as level flight is regained. If the memory lamp remains on for more than 30 seconds after returning to level flight, it may be necessary to reset the doppler. Momentarily place the doppler master selector switch in OFF, then return it to the desired operating position.

Note

In level flight, doppler operations is sometimes erratic above 35,000 feet and the memory lamp will illuminate. The doppler may not regain a lock until some lower altitude is obtained.

DOPPLER NAVIGATION SYSTEM CONTROLS AND INDICATORS

Nomemclature	*Function*
Doppler master selector switch (1, figure 1–34A)	OFF – Removes all power from the doppler set. Also serves as a reset position STBY – Applies power to the doppler set with the exception of the modulator power used to drive the doppler transmitter. ON LAND OR ON SEA – Applies power and correct calibration to the set for either land or sea operation. (In the ON SEA position, a small percentage is added to the doppler-received groundspeed to correct for overwater error. This position is necessary only for prolonged overwater flight.) TEST – Provides an overall go–no-go check of the doppler set.
Memory lamp (2, figure 1–34A)	Illuminated – Indicates that the set is not tracking doppler signal. Extinguished – Indicates that the doppler set is in the normal mode of operation or is tracking in the test mode.
Drift angle pointer (3, figure 1–34A)	Indicates drift angle to a maximum of 40° left or 40° right.
Ground speed counter (4, figure 1–34A)	Indicates ground speed from 0 through 999 knots.
DA (drift angle) set knob (5, figure 1–34A)	Allows pilot to insert drift angle information while the doppler set is off or in the memory mode of operation.
GS (ground speed) set knob (6, figure 1–34A)	Allows pilot to insert ground speed information while the doppler set is off or in the memory mode of operation.

RADIO NAVIGATION (TACAN) AN/ARN-52(V)

DESCRIPTION

NEW The AN/ARN-52(V) TACAN is installed in the RF-8G aircraft.

The signal transmitted by the surface beacon contains reference (fixed) and variable bearing information, the range reply signal, and the station identification signal.

The aircraft receiver-transmitter compares the difference between the fixed and the variable bearing signals, and transmits the resulting bearing signal to pointer No. 2 of the TACAN BDHI.

The slant range in nautical miles from the aircraft to the surface beacon is determined from the time it takes a coded interrogation signal from the receiver-transmitter to reach the surface beacon and the time required for a reply. The resulting computation is shown on the range indicator.

Station identification signals are received in the headset in the form of Morse code identifying characters.

CAUTION

When operating in air-to-air mode, if more than one aircraft in a formation is interrogating another distant aircraft on the same channel, the distance information displayed in the interrogated aircraft may be unreliable.

The set will furnish range information between two similarly equipped aircraft simultaneously operating 63 channels apart on the bilateral air-to-air mode. TACAN operates from primary ac and dc electrical buses. NEW

Controls are illustrated in figure 1–35.

NORMAL OPERATION

Note

Refer to Supplemental Flight Manual for additional information.

1. Master switch – REC (bearing only)
   – T/R (bearing and range)
   – A/A (air-to-air range)
   - Allow 90-second warmup.
2. COURSE SELECT switch – TACAN
3. Channel selector knobs – DESIRED CHANNEL
4. Volume control – MIDPOINT OF RANGE

If either REC or R/T is selected, pointer No. 2 of the TACAN BDHI or radio magnetic indicator should stop and indicate bearing of surface beacon with relation to aircraft. If A/A is selected, pointer No. 2 will continue to rotate.

TACAN CONTROLS
(TYPICAL)

1. Course indicator
2. Bearing–distance–heading or radio magnetic indicator
3. Master switch
4. Volume control knob
5. Channel selector switch
6. COURSE SELECT switch

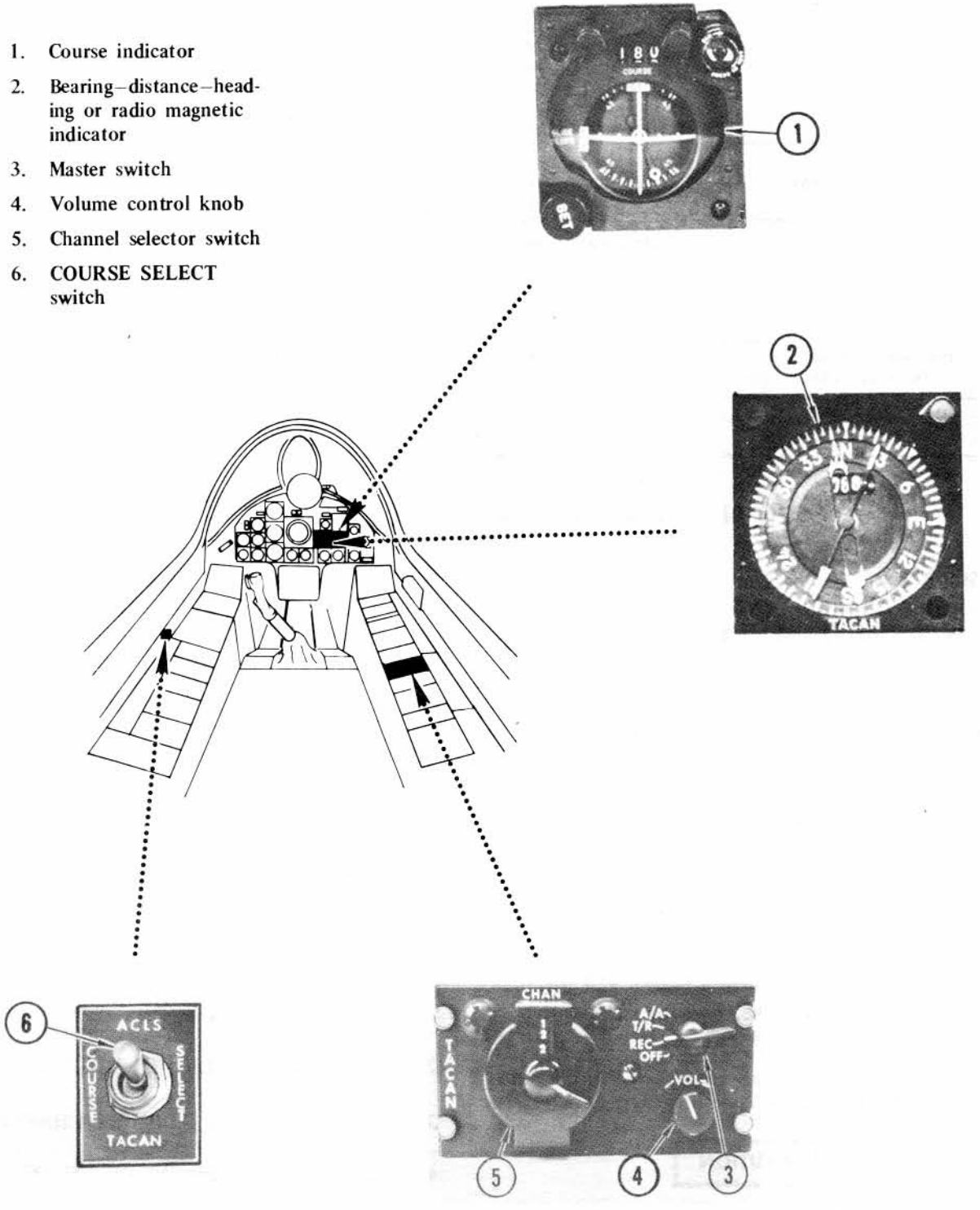


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Figure 1–35

If T/R position was selected, the range dials will rotate for a short period, then stop to display slant range of surface beacon from aircraft.

If A/A is selected, only slant range between cooperating aircraft is displayed.

TACAN CONTROLS

Nomenclature	*Function*
Channel selector switch (5, figure 1–35)	Combined settings of both knobs select desired channel.
Course indicator (1, figure 1–35)	Vertical bar shows position of aircraft in relation to the set course. To-from window indicates whether selected course will take aircraft to or from the station. Course set knob permits setting of course heading in course window. Relative heading needle indicates angle between magnetic heading of aircraft and selected course. Warning flags show as result of power failure or loss of station signal. Horizontal bar not used.
Master switch (3, figure 1–35)	OFF — deenergizes radio set. REC — energizes bearing circuit only. T/R — energizes both bearing and range circuits. A/A — energizes air-to-air range circuits.
TACAN bearing-distance-heading indicator (BDHI) (2,figure 1–35)	Pointer No. 2 indicates magnetic bearing of TACAN surface beacon from the aircraft. Numerals in window display slant range (nautical miles) to surface beacon station or air-to-air slant range (nautical miles) to cooperating aircraft.
Volume control knob (4, figure 1–35)	Controls volume of audible signal to headset. Refer to Supplemental Flight Manual for additional information.
Course select switch	TACAN – Connects TACAN receiver to Course Indicator. ACLS – Connects AN/ARA-63 receiver/decoder to Course Indicator.

AN/ARA-63 PRECISION APPROACH SYSTEM

DESCRIPTION

The AN/ARA-63 precision approach receiver/decoder system is installed. The system consists of a radio receiver/pulse decoder located in the ADF antenna compartment, a control panel, an antenna and a COURSE SELECT switch. The system receives precision approach guidance information on a designated channel from carrier based AN/SPN-41 equipment or land based AN/TRN-28 equipment. The guidance information received from either of these surface transmitters is displayed to the pilot on the Course Indicator (CI/ID-249). The AN/ARA-63 CONTROL panel, located on the left console, consists of a CHANNEL selector knob, a BIT PRESS (Built-in-test) button and a POWER switch with an indicating light.

The surface equipment uses two transmitters, one for elevation and one for azimuth, which time share the same frequency. The ARA-63 converts the transmissions into azimuth and glide slope information and presents a "fly to the needles" display to the pilot on the CI.

AZIMUTH AND ELEVATION BEAMS

A 2° azimuth beam is transmitted which scans 20° either side of the landing deck centerline. When the aircraft is outside of the 20° horizontal scan, the Course Deviation Indicator (CDI) will be deflected full right and a warning OFF flag will appear. As the aircraft enters the 20° scan, the warning OFF flag disappears and the CDI will deflect full scale in the proper direction. This full directional deflection will remain until the aircraft is within 6° of centerline at which time the CDI deflection becomes proportional to aircraft displacement from centerline.

A 1.3° elevation beam is transmitted which scans from the true horizon upward to 10°. A warning OFF flag and a full-up presentation will be displayed on the Glide Slope Indicator (GSI) when the aircraft is outside of this cone. When entering the upper portion of the 10° scan, the warning OFF flag will disappear and directional full scale deflection is displayed. The full scale deflection will remain until the aircraft is within 1.4° of the glide slope at which time the deflection becomes proportional to the aircraft displacement from optimum glide slope.

The height or width of these beams increase as the distance from touchdown increases. At any distance from 5 nautical miles to touchdown the dimension of the beams and proportional areas can be determined from figure 1–35A. By entering the bottom of the chart on sheet 1 at 5 NM and tracing upward to the WIDTH OF CENTERLINE BEAM line, then tracing left to the HEIGHT OR WIDTH REFERENCE line, a width of approximately 510 feet is indicated. By entering the bottom of the chart of sheet 2 at 1/2 NM the width of the centerline beam is found to narrow to approximately 52 feet. When within 500 feet either right or left of centerline at 5 NM or within 50 feet at 1/2 NM from touchdown, the CDI will be centered. Dimension of the glide slope can be determined in the same manner.

If either the glide slope or azimuth signal is lost or is not of sufficient strength, the appropriate warning OFF flag will appear, the GSI will move to the top and the CDI will sweep full right.

Controls are illustrated in figure 1–35B.

NORMAL OPERATION

Placing the POWER switch to the ON position supplies electrical power to the receiver/decoder group. The channel selector knob selects any one of 20 preset frequencies. The COURSE SELECT switch, located forward of the right longeron switch panel, has two positions, ACLS and TACAN. ARA-63 precision approach information is displayed on the CI in the ACLS position and TACAN information when in the TACAN position. With ACLS selected, TACAN information remains on the BDHI. Should dc electrical power be lost, the CI will automatically revert to the TACAN display. The ARA-63 operates on electrical power from the primary ac bus.

The BIT feature can be used anytime by the pilot to assure the operational status of the system. With the system set for normal operation, press and hold the BIT PRESS button. As long as the button is depressed, proper operation is indicated by the warning OFF flags disappearing, the CDI sweeping to the center of the CI and oscillating, and the GSI maintaining a steady-on glide slope indication. Following procedures will actuate BIT:

1. CHANNEL selector – Any channel
2. POWER switch – ON
3. COURSE SELECT switch – ACLS
4. BIT PRESS button – Press and hold
   - If airborne system operational:
     Warning OFF flags will disappear
     GSI will center
     CDI will sweep from side to side of center

DIMENSIONS OF PROPORTIONAL AREAS AND CENTERLINE/GLIDE SLOPE BEAMS

5 NAUTICAL MILES TO TOUCHDOWN

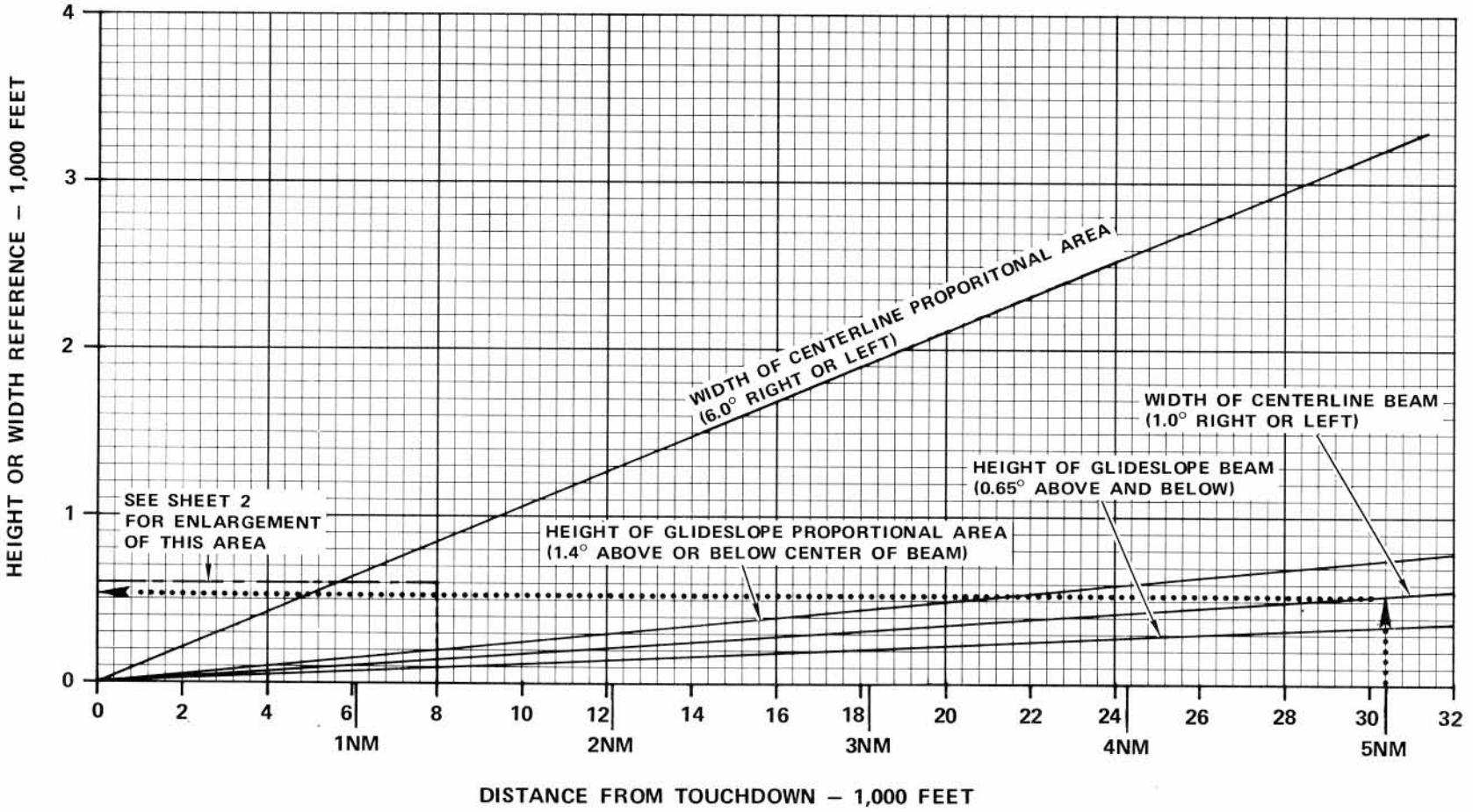

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Figure 1–35A (Sheet 1)

DIMENSIONS OF PROPORTIONAL AREAS AND CENTERLINE/GLIDE SLOPE BEAMS

1.25 NAUTICAL MILES TO TOUCHDOWN

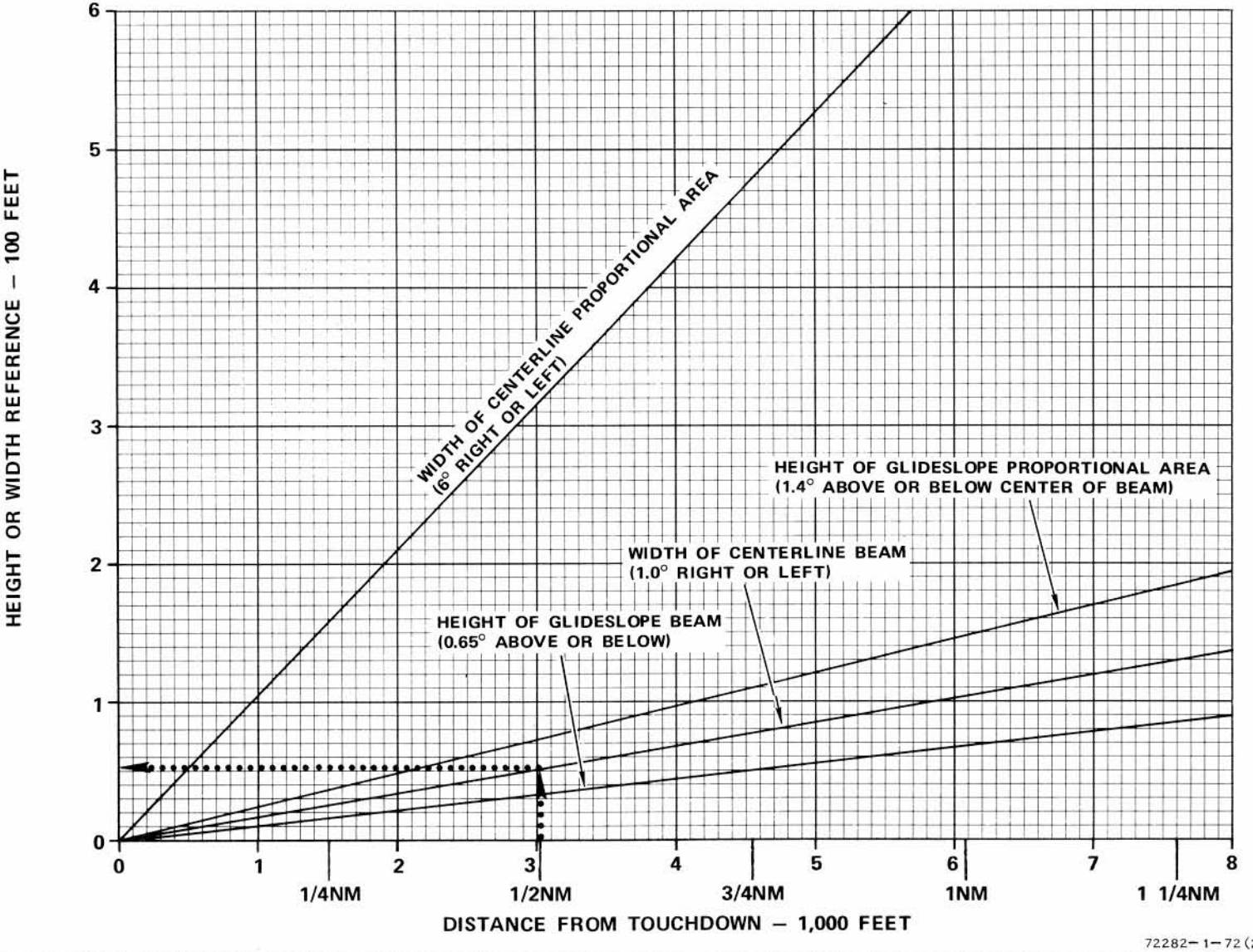

Figure 1–35A (Sheet 2)

AN/ARA-63 CONTROLS

1. POWER ON/OFF switch
2. BIT button
3. CHANNEL selector knob
4. COURSE SELECT switch
5. Course Indicator (CI)

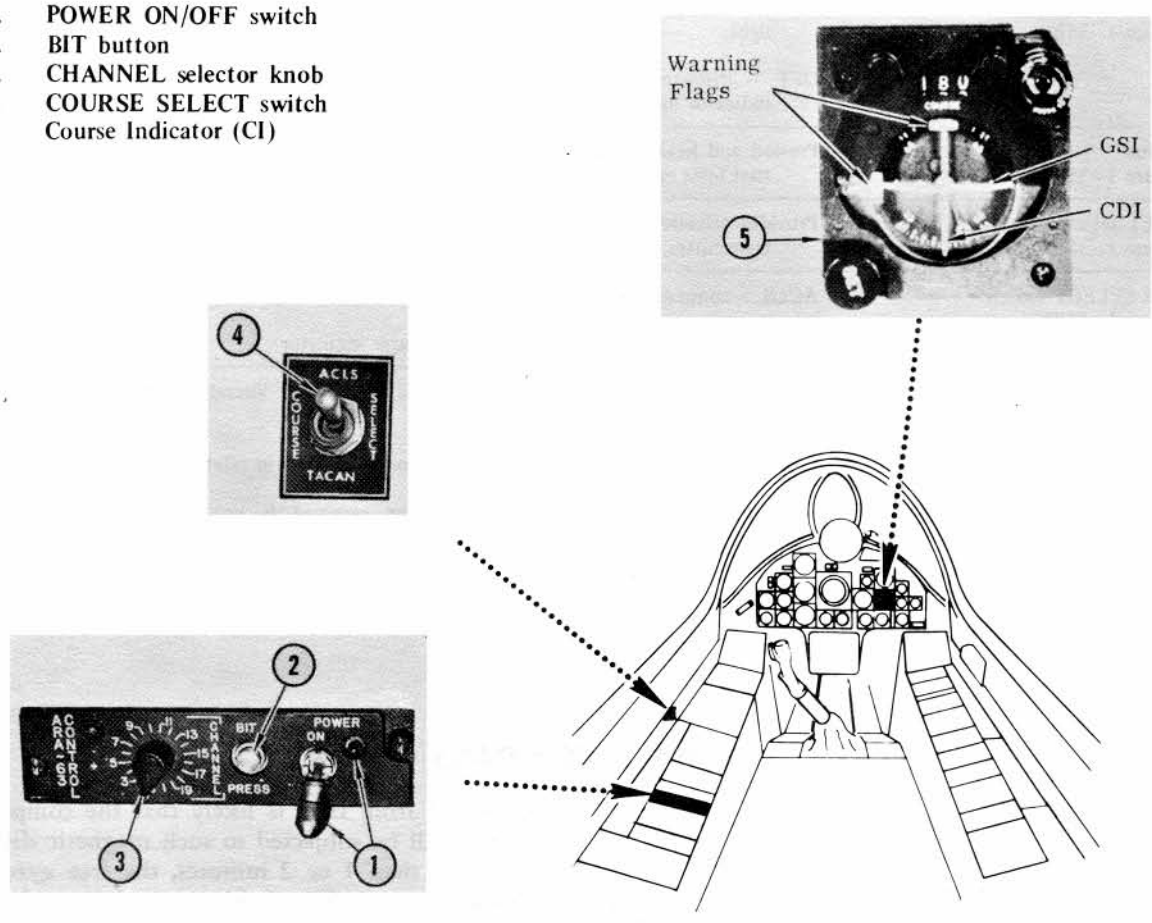

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Figure 1-35B

ARA-63 CONTROLS

Nomenclature	*Function*
POWER switch/light (1, figure 1–35B)	ON – connects electrical power to ARA-63 receiver/decoder and turns on power indicator light. OFF – disconnects electrical power from ARA-63 receiver/decoder and turns off power indicator light.
BIT button (2, figure 1–35B)	Pressed and held, actuates built-in-test circuitry which generates a signal through the decoder that tests entire system.
CHANNEL selector knob (3, figure 1–35B)	Provides selection of (1 through 20) channels which sets receiver to frequency of surface transmitter.
COURSE SELECT switch (4, figure 1–35B)	ACLS – connects ARA-63 receiver/decoder to course indicator. TACAN – connects TACAN receiver to course indicator.
Course Indicator (5, figure 1–35B)	Course Deviation Indicator (CDI) indicates position of aircraft in relation to landing deck centerline. Glide Slope Indicator (GSI) indicates position of aircraft in relation to glide slope. Warning OFF flags indicates signal being received is not capable of providing glide slope/azimuth guidance or the system is inoperative.

MA-1 COMPASS

DESCRIPTION

The MA-1 compass system combines the action of the remote compass transmitter and the directional gyro to provide accurate, reliable, and continuous azimuth headings on the doppler and TACAN bearing-distance-heading indicators. The system can be set to operate by either of two methods: slaved or free gyro. The slaved method is normally used since inherent gyro drift errors are automatically corrected by the remote compass transmitter. During operation by the slaved method the system has normal slaving rate of approximately 1 1/2° per minute. For example, if aerobatics cause a 3° heading error, the directional gyro will be properly aligned and the BDHI or RMI will read true magnetic heading in about 2 minutes.

There are times when the remote compass transmitter is not dependable, such as when making sustained turns or when flying in polar regions or near large masses of iron. If it is likely that the compass transmitter will be subjected to such magnetic disturbance for more than 1 or 2 minutes, the free gyro method should be used. When this method is used the compass transmitter is disconnected from the directional gyro, and since the directional gyro is then subjected to a drift of less than 4° per hour, the BDHI or the radio magnetic indicator should be reset whenever an accurate heading can be obtained.

A standby compass mounted on the windshield frame indicates magnetic heading.

Refer to figure 1–36 for controls illustration.

NORMAL OPERATION

Slaved Method

1. Power failure indicator flag — NOT SHOWING
2. Mode selector switch–SLAVED

3. Setting knob – After 2-minute warmup, PULL OUT AND SET NEEDLE
   - Wings must be spread, canopy closed, and all normal electrical equipment on and aircraft not near a magnetic source. If this procedure is not acceptable (CVA), set compass to known ship's heading before launch.
   - Turn until white bar of synchronizing indicator is centered under arrow.

CAUTION

The white bar must move to the right with clockwise rotation or to the left with counterclockwise rotation of the compass setting knob. If it does not, the BDHI or radio magnetic indicator compass card will reflect an erroneous indication. Continue rotation of knob until white bar moves in correct direction and is centered.

Free Gyro Method

1. Power failure flag – NOT SHOWING

2. Mode selector switch – FREE N. LAT or FREE S. LAT
   - After 2-minute warmup, set selector to hemisphere in which you are flying.

3. Compass setting knob – PULL OUT AND SET
   - Turn until BDHI or radio magnetic indicator reads desired heading. Ignore synchronizing indicator.

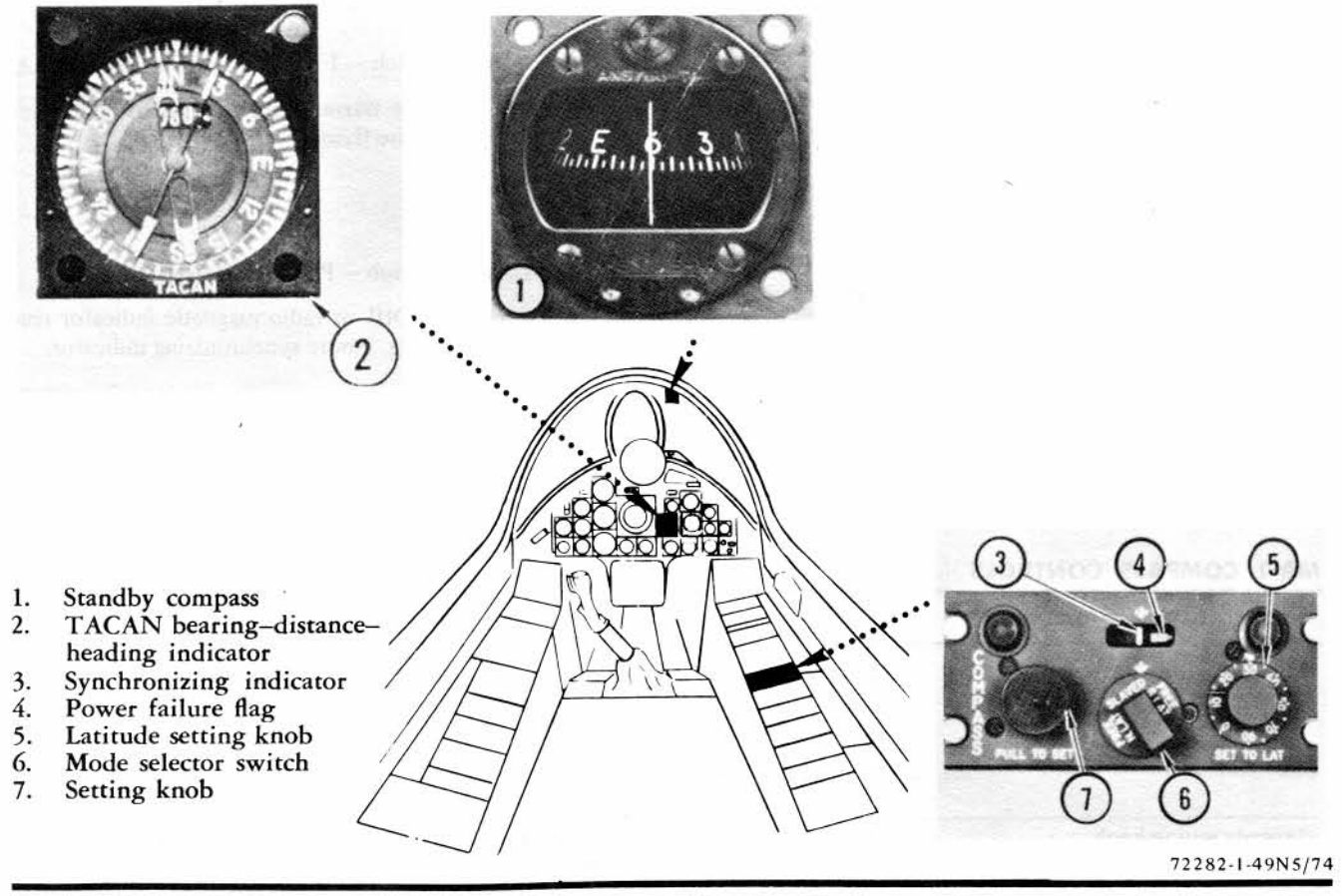
4. Latitude setting knob – SET
   - Turn knob to latitude at which you are flying.

MA-1 COMPASS CONTROLS

Nomenclature	*Function*
Compass setting knob (7, figure 1-36)	Pulling and turning (clockwise or counterclockwise as applicable) when operating system by slaved method, synchronizes directional gyro with remote compass transmitter and aligns BDHI or radio magnetic compass card with exact magnetic heading of aircraft. Pulling and turning when operating system by free gyro method, adjusts BDHI or radio magnetic indicator compass card to any desired heading.
Latitude setting knob (5, figure 1-36)	Adjusts system to the degree of latitude at which you are flying, when operating system by free gyro method. This compensates for apparent drift of gyro due to earth's rotation.
TACAN bearing-distance-heading indicator (BDHI) (2, figure 1-36)	Top index indicates aircraft magnetic heading on compass card.
Mode selector switch (6, figure 1-36)	SLAVED — connects remote compass transmitter to system which constantly corrects gyro drift. FREE N. LAT. — disconnects remote compass transmitter from system to allow free gyro operation north of the equator. FREE S. LAT. — disconnects remote compass transmitter from system to allow free gyro operation south of equator.
Synchronizer indicator (3, figure 1-36)	Alignment of the white bar of the synchronizing indicator with the arrow above the window (by turning compass setting knob) indicates that the compass system is "slaved in" and correctly synchronized. Constant oscillation of the white bar is a normal condition and provides another check that the system is operating normally.
Power failure flag (4, figure 1-36)	OFF — indicates that power is not connected to system. (Flag disappears 5 to 10 seconds after power is turned on.)

COMPASS CONTROLS

MA-1 COMPASS AND STANDBY COMPASS



1. Standby compass
2. TACAN bearing–distance–heading indicator
3. Synchronizing indicator
4. Power failure flag
5. Latitude setting knob
6. Mode selector switch
7. Setting knob

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Figure 1–36

AIR-CONDITIONING

DESCRIPTION

The air-conditioning system provides the following services:

- Cockpit temperature control and pressurization.
- Ventilation for anti-exposure coverall.
- Windshield defogging and rain removal.
- Automatic pressurization and cooling of the integrated electronic package.
- Automatic cooling of the unpressurized electronic compartment.
- Automatic pressurization of the fuselage fuel cells and wing tank.
- Automatic air-conditioning of the camera compartments and viewfinder window defogging.

Hot bleed air from the engine compressor section is directed through the air-conditioning unit which cools this air by means of a heat exchanger and an expansion-turbine refrigeration unit. The heat exchanger reduces the temperature of the engine bleed air by transferring heat through coils to ram air from the engine intake duct. The refrigeration unit further cools some of the warm air from the heat exchanger by expansion through the turbine.

When cockpit pressure is dumped, a cockpit manifold pressure valve closes and stops airflow to the cockpit. All other air-conditioning functions continue normally.

The temperature of the air entering the cockpit is controlled by mixing hot air from the temperature control bypass valve with cold air from the turbine.

The cockpit temperature controller automatically regulates operation of the bypass valve to maintain the temperature selected by the pilot. In aircraft BuNo. 145631 and subsequent, a manual override switch permits the pilot to control the bypass valve directly by adjusting the cockpit temperature knob for each change in flight conditions.

The cockpit air pressure regulator automatically regulates pressurization of the cockpit at altitudes above 8,000 feet by limiting outflow of air into the viewfinder compartment. (See figure 1–37 for cockpit pressurization schedule.)

Negative cockpit pressure is automatically limited to 0.25 psi maximum and positive pressure is automatically limited to 5.5 psi maximum by the cockpit air safety valve. This valve also opens to depressurize the cockpit when the pilot elects to dump cockpit pressure.

All camera compartment temperature is regulated by hot air drawn from the air-conditioning system. Camera compartment temperature is controlled at approximately 100°F by an automatically regulated, electronically operated valve.

Compressor bleed air is directed from the engine bleed air control manifold to the integrated electronics package for pressurization. Air circulation (internal cooling) within the package is provided by an internal fan. External cooling is provided by ram air circulated around the outside of the package. If pressurization is lost due to engine flameout or a system malfunction, a check valve traps the pressure in the package.

Warm air flows directly from the heat exchanger through the rain removal valve and is discharged at high velocity on the exterior of the left-hand side panel for rain removal. Fog is removed from the inside of the windshield by directing hot air from the heat exchanger through the defogger valve and mixing this air with cool air from the air-conditioning unit. This air is then discharged on the windshield side panels through the windshield manifolds. Air from the heat exchanger is also used to pressurize the fuselage fuel cells and wing tank. (Refer to FUEL CELL PRESSURIZATION AND VENTING, this section.)

An external air inlet on the left console (1, figure 1–39) provides for ground ventilation of the anti-exposure coverall. The system is illustrated in figure 1–38.

NORMAL OPERATION

Air-Conditioning and Pressurization

(See figure 1–39.)

To operate the air-conditioning and pressurization system, position controls as follows:

1. Cockpit pressure switch — CABIN PRESS

COCKPIT PRESSURIZATION

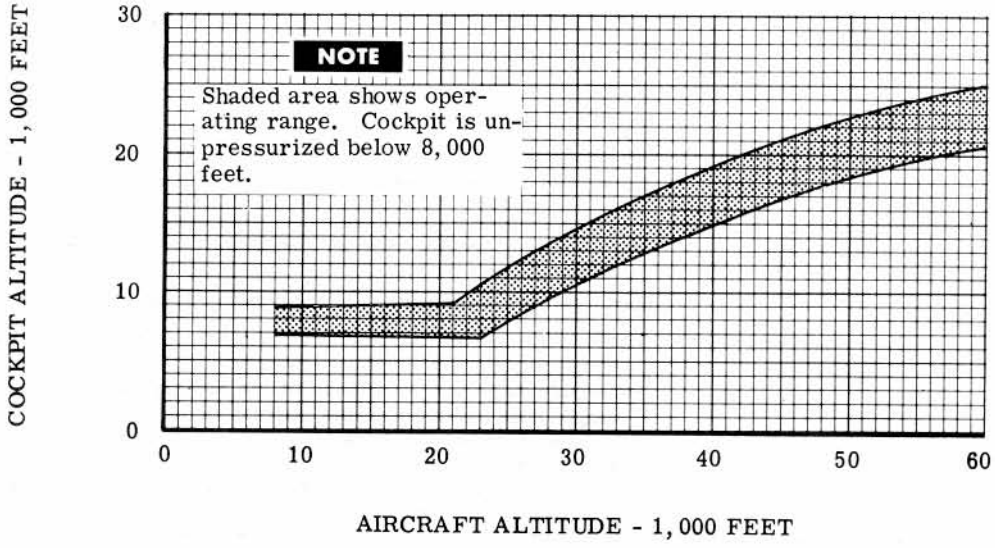


Figure 1–37

2. G Valve — AS DESIRED
3. Manual override switch* — AUTO
4. Temperature knob — AS DESIRED

Repressurization

If it is desired to repressurize the cockpit at any altitude:

1. Throttle — IDLE
2. Cockpit emergency ventilation — OPEN
3. Cockpit pressure switch — CABIN PRESS
4. Throttle — CRUISE RPM
5. Cockpit emergency ventilation — CLOSE

Defogging

The defogging system may be operated continuously to provide additional cockpit heat during loiter or cruise above 30,000 feet. If fogging occurs, proceed as follows:

1. Defogger switch — DEFOG
   - During negative g operation, long periods of cruise, or at supersonic speeds, oil vapor or smoke may be emitted from the air-conditioning system when the defogger switch is turned on.
2. Temperature knob — HOT
3. Throttle — 90% RPM MINIMUM
   - After fog clears, reduce throttle to desired position and adjust cockpit temperature as desired.

Rain Removal

Operate the rain removal system as required during takeoff and landing.

1. Rain removal switch — RAIN REMOVE
   - Do not operate the rain removal system above 200 KIAS or the windshield may be overheated. Overheating of the windshield will cause it to crack.
   - If left on after takeoff, a considerable reduction in cockpit pressurization will occur as altitude is gained.
   - If the rain removal system has not been operated for several flights, oil accumulation in the system may result in oil being blown on the windscreen when the system is first activated.

*Aircraft BuNo. 145631 and subsequent.

AIR-CONDITIONING CONTROLS

Nomenclature	*Function*
Cockpit pressure switch† (7, figure 1-39)	CABIN PRESS—initiates cockpit pressurization and temperature control. CABIN DUMP—dumps cabin pressure and stops conditioned airflow to cabin. Airflow to anti-exposure coverall, fuel system and integrated electronics packages will continue.
Defogger switch† (5, figure 1-39)	DEFOG—directs hot airflow to windshield and side panels through windshield manifolds.
Rain removal switch† (6, figure 1-39)	RAIN REMOVE—directs high velocity stream of warm air across left-hand side panel to deflect rain.
Temperature knob (8, figure 1-39)	COLD to HOT, selects temperature of conditioned air entering cockpit and anti-exposure coverall.
Cockpit pressure altimeter (3, figure 1-39)	Indicates cockpit pressure altitude.
Cockpit emergency ventilation knob (4, figure 1-39)	Pulled and rotated, controls volume of ram airflow into cockpit for emergency ventilation.
Manual override switch* (9, figure 1-39)	AUTO—permits cockpit inlet air temperature to be automatically controlled to the controller knob setting. MAN—permits cockpit inlet air temperature to be manually controlled by the pilot.
Anti-exposure coverall vent valve† (PRESS SUIT — 2, figure 1-39)	LOW to HI, regulates the volume of ventilating air flowing from the air-conditioning system into the anti-exposure coverall. EXT—permits ground ventilation of the anti-exposure coverall with an external air supply hose inserted into the external air inlet connection. OFF—stops flow of ventilating air. OFF TO HIGH range—regulates the volume of ventilating air flowing into the anti-exposure coverall from the air-conditioning system or from an external source. OFF—stops the flow of ventilating air.

*Aircraft BuNo. 145631 and subsequent
†These switches are pneumatic and do not require electrical power.

AIR-CONDITIONING SYSTEM

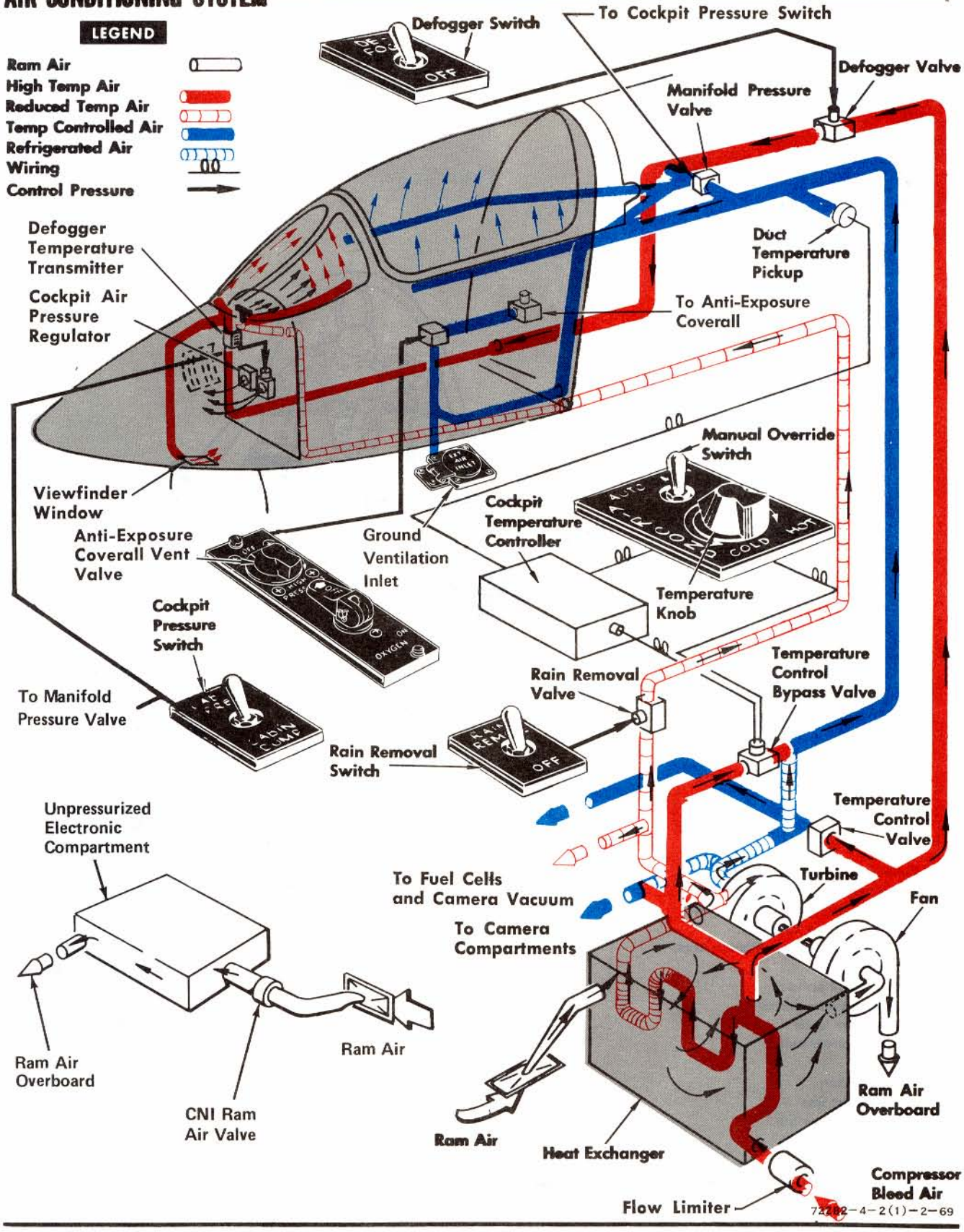
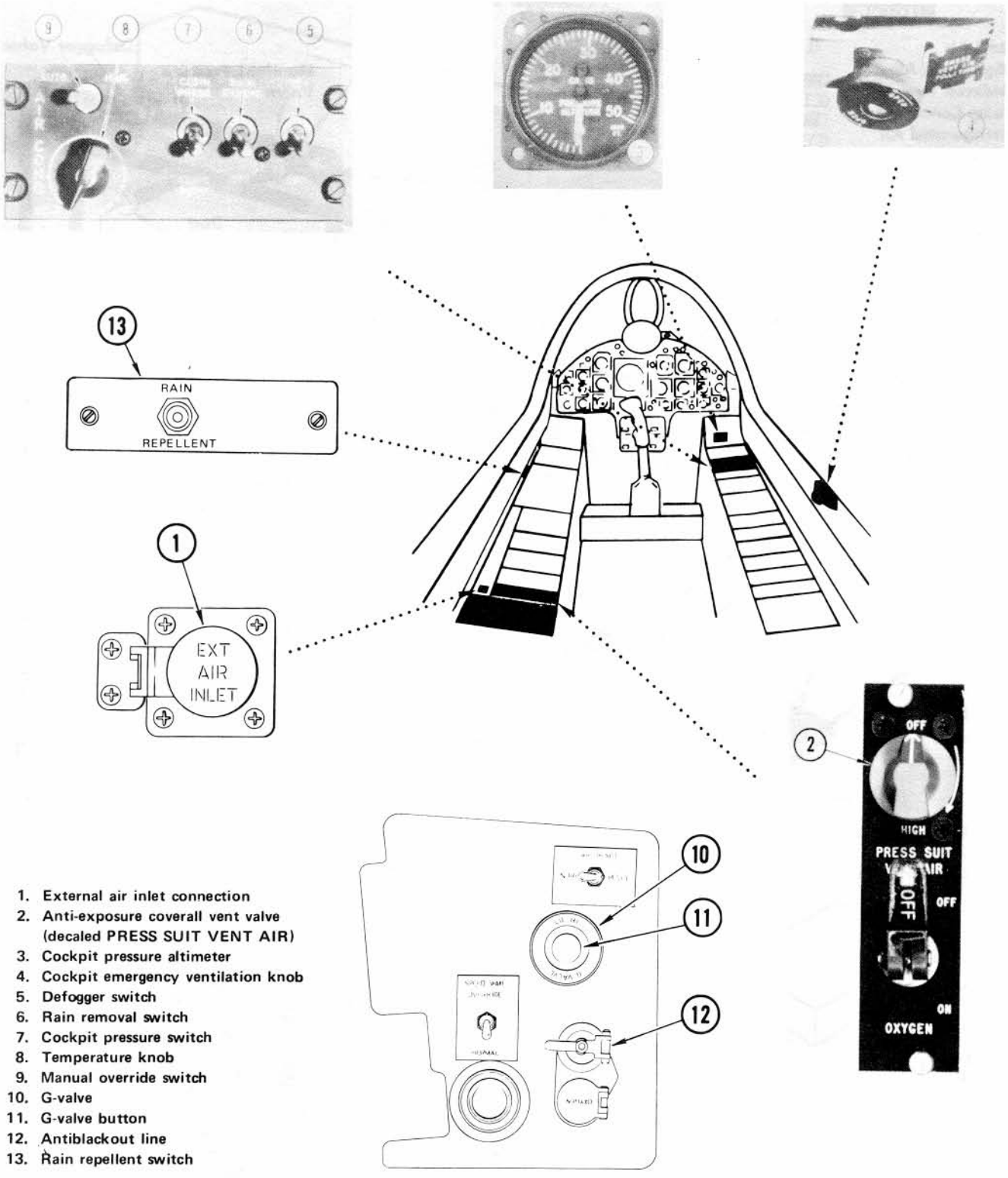


Figure 1–38

AIR-CONDITIONING CONTROLS (TYPICAL)



1. External air inlet connection
2. Anti-exposure coverall vent valve (decaled PRESS SUIT VENT AIR)
3. Cockpit pressure altimeter
4. Cockpit emergency ventilation knob
5. Defogger switch
6. Rain removal switch
7. Cockpit pressure switch
8. Temperature knob
9. Manual override switch
10. G-valve
11. G-valve button
12. Antiblackout line
13. Rain repellent switch

Figure 1–39

RAIN REPELLENT

The rain repellent application system consists of a reusable pressurized container, a solenoid, and interval timer, a system gage, a windwhield dispensing nozzle, and a cockpit operating switch.

The system is designed for use under heavy rain conditions during approach and landing.

A push button switch on the left wall of the cockpit activates the system. (See figure 1–39.) Momentarily depressing the switch initiates a 2.5-second cycle of the timer. During this time, approximately 10 cc of rain repellent fluid is dispensed on the exterior surface of the center and left portions of the windshield. A single application of fluid will provide improved visibility for 10 to 30 minutes, depending on rainfall rate and airspeed.

CAUTION

Excessive amounts or improper application of rain repellent fluid can create a hazardous condition by decreasing instead of increasing visibility.

To attain maximum system effectiveness and to avoid results which are detrimental to visibility, observe the following:

1. Do not apply rain repellent fluid to a dry windshield.
2. Do not apply rain repellent fluid under light rain conditions. Without sufficient water and/or airstream on the windshield to spread the fluid, a translucent film will form which obscures visibility.
3. Use rain removal for improving vision under light rain conditions.
4. Do not apply rain repellent fluid with rain removal operating. Rain removal may be used after applying rain repellent.
5. Avoid excessive applications of rain repellent fluid.

ANTIBLACKOUT

DESCRIPTION

Antiblackout pressure is automatically supplied by routing engine bleed air through the G valve and into the pilot's suit. The G valve, opened by centrifugal force, regulates suit pressure as g-loads are applied or reduced. A HI and LO range may be manually selected.

The antiblackout connection is made at the pilot's services disconnect located on the left console. The antiblackout line is routed from the G valve through the base of the console to the disconnect. The antiblackout fitting at the disconnect serves the anti-g suits worn with flight coveralls.

ANTIBLACKOUT CONTROLS

Nomenclature	*Function*
G valve (10, figure 1–39)	HI — supplies a pressure of 1.5 psi for each g over 1.75 g up to 10 psi. LO — supplies a pressure of 1 psi for each g over 1.75 g up to 10 psi.
G valve button (11, figure 1–39)	Depressed and released, permits inflating the suit for body massage to lessen fatigue and to check operation of G valve. If valve tends to stick or fails to close, it should be replaced.

OXYGEN

DESCRIPTION

Pure gaseous oxygen is supplied by a 5-liter vacuum-insulated liquid oxygen converter through the pilot's oxygen valve on the left-hand console to the miniature regulator of the face mask. This regulator delivers a constant positive safety pressure during use. Above 35,000 feet, the regulator will automatically deliver the required pressure for pressure breathing in the event cabin pressurization is lost. Figure 1–40 presents a graphic illustration of oxygen duration.

An emergency oxygen supply in the seat pan provides breathing oxygen upon manual actuation while in the cockpit or upon automatic actuation in the case of ejection from the aircraft.

The emergency oxygen supply can be activated by either of two means. An emergency oxygen actuator, located at the forward edge of the seat pan permits manual operation of the emergency oxygen supply. A separate lanyard is attached to the structure of the aircraft so as to activate the oxygen bottle automatically upon ejection. This does not shut off normal supply of oxygen.

Oxygen controls are illustrated in figure 1–41.

NORMAL PROCEDURE

Before each flight, check the following:

1. Vent and buildup valve – BUILD UP
   - Access panel cannot be secured unless valve is in BUILD UP.
2. System quantity – CHECKED

Note

The liquid oxygen system must not be permitted to go dry or be exposed to surrounding atmosphere. Water vapors or other gases may condense in the converter bottle, causing system malfunction or contamination. If exposure to atmosphere has occurred for any extended period, the system should be purged with hot dry nitrogen before use.

3. Pilot's oxygen valve – OFF
4. Oxygen warning light – ON

OXYGEN DURATION

CABIN ALTITUDE FEET	GAGE INDICATION - LITERS						
	5	4	3	2	1	1/2	Below 1/2
40,000 & Above	30:18	24:12	18:12	12:06	6:00	——	Descend Below 10,000 Feet
35,000	18:30	14:48	11:06	7:24	3:42	1:48	
30,000	13:36	10:54	8:12	5:24	2:42	1:24	
25,000	10:12	8:12	6:12	4:06	2:00	1:00	
20,000	8:00	6:24	4:48	3:12	1:36	:48	
15,000	6:24	5:06	3:48	2:36	1:18	:36	
10,000	5:00	4:00	3:00	2:00	1:00	:30	
5,000	4:12	3:18	2:30	1:36	:48	:24	
Sea Level	3:30	2:48	2:06	1:24	:42	:18	

Consumption data per Specification MIL-1-19326 (AER) taken from NAVAER 03-50-517.

NOTE

Duration is given in hours and minutes.
Consumption data assumes the use of properly fitted oxygen equipment.
Face mask leakage will decrease tabulated duration.

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Figure 1–40

5. Mask connections – CONNECTED

   - Connect face mask hose to hose leading from aft right-hand side of seat pan. Connect hose leading from aft left-hand side of seat pan to the oxygen receptacle to complete the connection to the aircraft supply.

6. Pilot's oxygen valve – PROPER OPERATING POSITION

   - Allow oxygen to flow before placing mask to face.

7. Oxygen warning light – OFF

   - Check oxygen flow by breathing several times. If difficulty in breathing is experienced, the regulator or oxygen supply system is not functioning properly.

   - Following servicing in which the bottle has been filled, the light will sometimes illuminate intermittently.

8. Oxygen connections – CHECKED

   - Complete or intermittent loss of radio communications or illumination of the oxygen warning light may indicate that oxygen connections are not fully engaged.

9. Emergency bottle – CHECKED

   - Complete bottle for 1,800 pounds pressure when ejection seat is inspected before each flight.

During flight, frequently check the following:

1. Gage indication – OXYGEN REMAINING

2. Mask – CHECK FOR LEAKS

3. Breathing tube coupling – CHECK FULLY ENGAGED

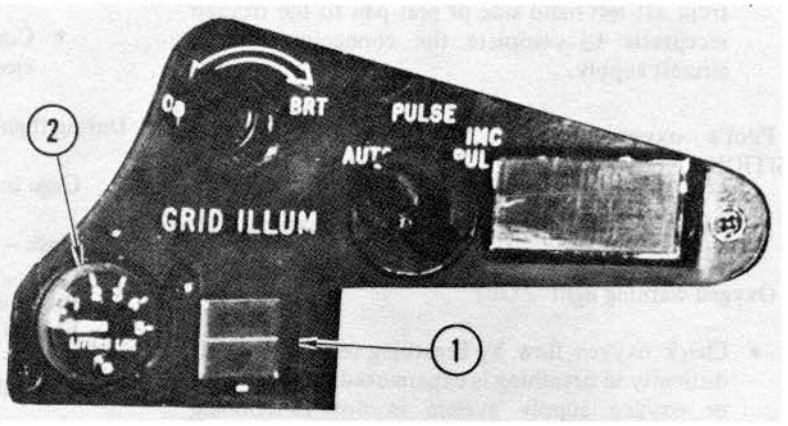
Upon completion of flight:

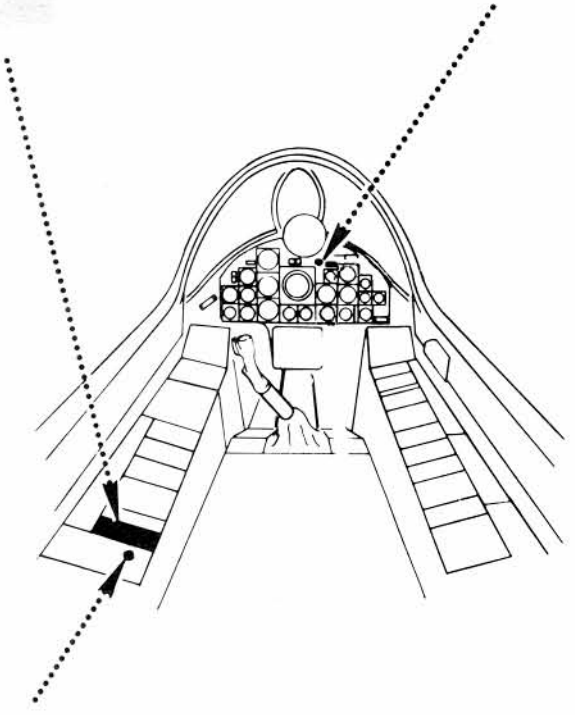
1. Oxygen valve – OFF

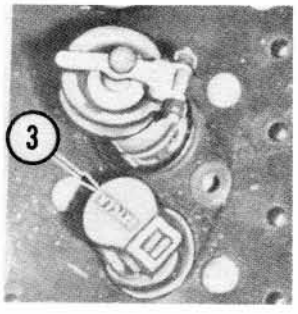
2. Mask – DISCONNECTED

   - If flow continues from mask after shutoff, check for possible inadvertent actuation of the emergency system. If the system has been actuated, disconnect supply hose before emergency supply is depleted. If supply is allowed to become depleted, system will require purging.

OXYGEN CONTROLS







1. Oxygen warning light
2. Oxygen quantity indicator
3. Oxygen receptacle
4. Oxygen valve

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Figure 1–41

OXYGEN SYSTEM CONTROLS

Nomenclature	*Function*
Emergency bottle pressure gage	Indicates emergency bottle pressure.
Oxygen quantity indicator (2, figure 1–41)	Reflects quantity of liquid oxygen in converter.
Oxygen valve (4, figure 1–41)	OFF – closes oxygen supply. ON – opens oxygen supply.
Vent and buildup valve (in area behind liquid oxygen filler valve access panel on right side of nose section)	BUILDUP – normal position. Close system for automatic buildup of operating pressure. VENT – opens system to allow venting during refilling.
Oxygen warning light (1, figure 1–41)	On (OXYGEN), indicates liquid oxygen quantity is at or below ½ liter or when oxygen pressure drops in line to oxygen receptacle. Depress lens actuates system self-test. LOX quantity indicator moves toward O liter position. Upon passing ½ liter indication, warning light will go on and remain on until lens is again depressed and indicator passes upward through ½ liter indication. LOX quantity will return to system quantity indication. (UHT lock light will go on momentarily.)

CANOPY

DESCRIPTION

The one-piece clamshell-type canopy (figure 1–42) is attached to the aircraft by pivots or arms at the aft end of the canopy. A counterbalance strut is provided to aid the pilot in raising and lowering the canopy without the aid of power devices. Cockpit pressure sealing is provided by a striker and diaphragm arrangement. The canopy is locked in closed position by four rotating hook latches that can be operated from either inside or outside the cockpit. The only positive criteria for determining that the canopy is locked is the feel of the locking handle going over center as it travels to the locked position. Simultaneous movement of the locking indicator as the locking handle is moved assures continuity of the canopy locking linkage system.

A cartridge-operated emergency canopy actuator provides for canopy jettisoning in landing emergencies, ditching, ground rescue, and as part of the ejection sequence. Pulling the face curtain, the lower ejection handle, or the emergency canopy jettison handle while in flight fires the canopy actuator **cartridge. This blows open the canopy locks and forces the canopy up into the airstream where it is separated from the aircraft by air loads. On the ground, pulling the emergency canopy handle or** either of the two exterior rescue handles fires the actuator to release the locks and forcibly open the canopy. The canopy will jettison with no air load. Additional momentum and increased overcenter travel achieved through modification of canopy pivot bolts, canopy skirt, and air conditioning duct disconnects carry the canopy clear of the aircraft.

WARNING

To effect a successful ejection or canopy jettison, canopy must be down and locked.

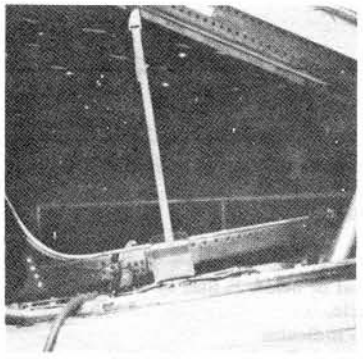
CANOPY RESTRAINING STRAP

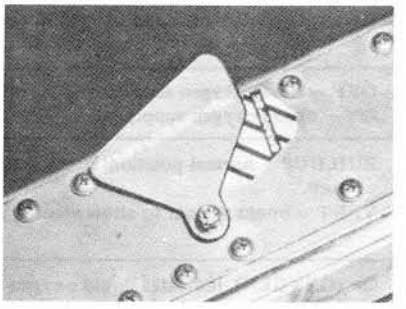
A restraining strap and stowage pouch are provided on the right canopy sill to restrain the canopy when it is opened. Without the strap, a steady state wind, jet blast, or wind gust of 60 knots will separate the canopy from the aircraft. If canopy opening is extremely rapid without the restraining strap installed, the aircraft should be downed for inspection of the actuator rod. Deployed at full length, the strap restrains the leading edge of the canopy two inches short of the full open position. An intermediate open position for use in high winds or jet blast conditions can be obtained by securing the restraint strap loop to the canopy locking handle. The canopy cannot be closed and locked while the restraint strap is deployed because the right forward canopy locking latch will not engage until the restraint hook is removed. When not in use, the restraint strap shall be stowed in the storage pouch.

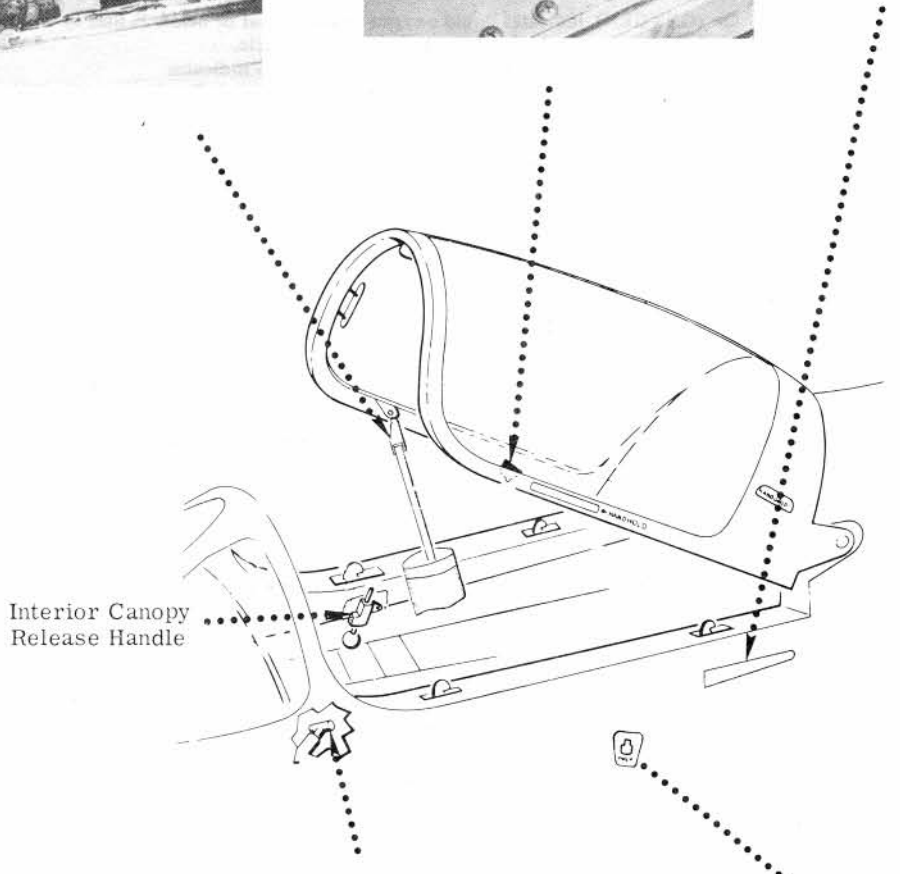
CAUTION

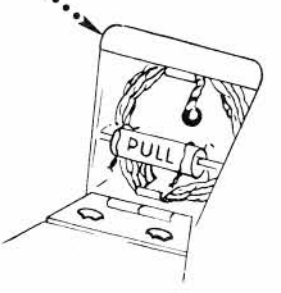
The canopy restraining strap shall be utilized for all open canopy operations.

CANOPY









RESCUE HANDLES
(both sides of fuselage)

Figure 1–42

CANOPY CONTROLS

Nomenclature	*Function*
	Figure 1–42
Canopy lock indicator	Indicates canopy locks in locked or unlocked position.
Exterior canopy release handle	Open canopy — push forward end of handle, grasp aft end and pull outboard. Open canopy manually. Close canopy — close canopy manually and push aft end of handle inboard.
Interior canopy release handle	Open canopy — extend handle, pull aft, and manually open canopy. Close canopy — pull and hold handle aft while manually closing canopy and then push handle fully forward. Stow handle.
Emergency canopy jettison handle	Pulled out fully, fires canopy actuator to release canopy locks and opens canopy.
Rescue handles	Pulled out to full length of lanyard, fire canopy actuator to release canopy locks and open canopy.

MK-F7 EJECTION SEAT

DESCRIPTION

The ejection system utilizes the Martin-Baker MK-F7 ejection seat, equipped with an RSSK-6 survival kit. Ejection envelope of the ejection seat is 0 to 600 KIAS and 0 to 50,000 feet. Maximum boarding weight for pilot and flight equipment is 247 pounds. The system provides the pilot with a means of escape from the aircraft with no minimum airspeed or altitude requirement except for limits imposed by sink rate and bank or dive angles. See figures 5–3 and 5–4. The escape capability of the MK-F7 ejection seat is obtained through the use of two major components: a telescoping, long-stroke ejection gun, which propels the seat from the aircraft, and a rocket motor which ignites after the seat has traveled six feet upward. The rocket pack makes high velocities possible with accelerations reduced from those obtained from a pure ballistic type seat. The use of drogue parachutes to withdraw the pilot's parachute ensures controlled action under all ejection conditions.

The seat is equipped with a pilot's shoulder restraint harness that accommodates standard suits with integrated harness provisions. A Skysail E parachute packed in a hardshell container is positioned behind the pilot's shoulders. This parachute location was selected to permit positive parachute withdrawal at the moment the pilot is released from the seat. The shoulder restraint harness is equipped with a power retractor mechanism which positions the pilot before ejection to ensure proper center-of-gravity position of the ejected mass. When the face curtain is pulled, the shoulder restraint harness power retractor cartridge is fired. Expanding gases from the cartridge supply the energy to spin a reel and draw the pilot back against the seat in a safe position for ejection. Leg restraint lines, one for each leg (two garters), are secured to the airframe and to the seat and are routed through the pilot's leg restraint garters so as to draw the legs back against the front of the seat during ejection. The pilot's legs are restrained until release occurs before deployment of the personnel parachute. As the pilot sits in the seat with seat and rudder pedals adjusted for comfort and rudder throw, the leg restraint lines should be long enough to allow full rudder throw but should exert a slight tug on his leg.

The seat bucket accommodates an RSSK-6 survival kit. The kit is in two halves. The upper half contains an emergency oxygen bottle, which is automatically actuated by a cable attached to the cockpit structure as the seat moves upward during the ejection sequence. The bottle may also be actuated at any time during flight when emergency oxygen is required, such as following normal oxygen system failure. In such cases, the bottle is manually actuated by pulling the emergency oxygen actuator. The bottom half of the kit contains a life raft, a radio transmitter and a survival equipment bag. The radio transmitter is switched on automatically by displacement of the seat during the ejection sequence. After ejection an emergency beacon signal will be transmitted on Guard channel frequency.

After ejection and subsequent parachute deployment, when time and altitude permit, pulling up on the raft release on the right-hand side of the survival kit will allow the bottom half of the kit to separate from the top half and fall the length of a retaining lanyard, deploying and inflating the life raft. This deployment allows the bottom half of the kit, survival equipment and life raft, to contact the surface first.

WARNING

A small pilot utilizing the MK-F7 ejection seat should raise the seat as high as practical while on the ground and in the traffic pattern. This is to ensure a favorable ejection seat center-of-gravity position. In the somewhat unlikely event that a small pilot had the seat fully lowered and was forced to eject at close to zero-zero conditions, a safe ejection could be jeopardized due to unfavorable seat cg position.

Seat height adjustment is provided by an electrical actuator that raises or lowers the bottom portion of the seat with respect to the upper portion. The parachute container serves as the pilot's headrest and backrest. There is no headrest adjustment. A backpad cushion ensures proper posture for the occupant.

The upper housing of the seat contains the controller and stabilizer drogue parachutes and serves as a mounting for the face curtain handle and the canopy interrupter release handle. The housing has breaker points mounted on each side of the headbox to ensure proper penetration of the canopy in a through-the-canopy emergency ejection. The drogue parachutes are deployed by the action of a drogue gun piston that is fired automatically during ejection to drag a 22-inch controller drogue into the slipstream. A 5-foot stabilizer drogue is automatically drawn into the slipstream and deployed by the controller drogue.

Withdrawal of the personnel parachute begins 2.25 seconds after initial seat movement unless delayed by the altitude limiter (barostat).

A pilot's services disconnect, mounted on the left console, holds the antiblackout line and the anti-exposure coverall ventilating air line in position to ensure proper separation at ejection. The oxygen supply line from the seat pan is separately connected to the oxygen receptacle in the left console. Communications connection between the pilot's equipment and the aircraft is automatically completed when the oxygen line is connected to the console fitting.

Ejection seat controls are illustrated and described in figure 1–43. Ejection seat components are illustrated in figure 1–44.

OPERATION

NEW

See figure 1-45 for a description of the ejection sequence and for a list of pilot's equipment that may be used with the Martin-Baker seat.

NEW

EMERGENCY RELEASE FROM THE SEAT

In landing emergencies, in ditching, and in the event of the automatic release failing to function in ejection, the pilot can release himself, his parachute, and his survival equipment from the seat by pulling the emergency restraint release. This releases the leg restraint lines and the lap and shoulder harness, and trips the guillotine which cuts the linkline that connects the stabilizer drogue parachute to the pilot's parachute withdrawal line. Separation of the pilot from the seat should break the pilot's services connections at the disconnect on the left console. Parachute deployment under these conditions is attained by pulling the parachute ripcord D-ring on the left shoulder harness strap. When ditching, the pilot should release the shoulder harness fittings before pulling the emergency restraint release, and should manually separate the pilot's services connections to ensure separation.

MISCELLANEOUS EQUIPMENT

CATAPULT PROVISIONS

A catapult pin on the underside of the fuselage front section transmits the thrust of the catapult to the aircraft structure. The holdback pin on the underside of the fuselage aft section restrains the aircraft during the buildup of thrust, then releases it when a breakable link snaps. The throttle catapult handle on the left-hand console permits the throttle lever to be held in full forward position during catapult acceleration without locking the throttle lever.

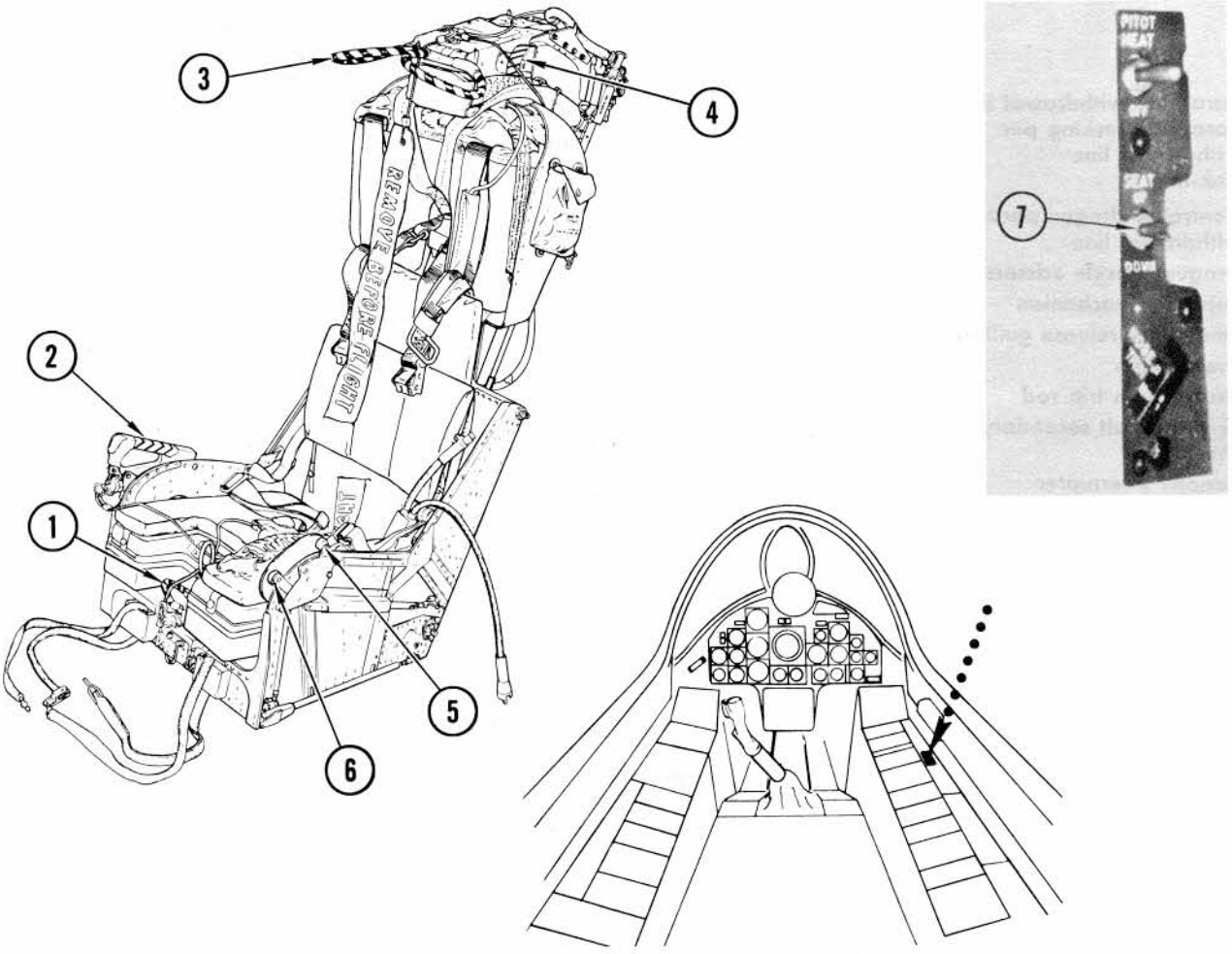
REAR VISION MIRRORS

Three adjustable rear vision mirrors are mounted inboard on the canopy frame.

MAP CASE

A fixed map case is mounted on the inboard side of the left-hand console. A removable map case is mounted on the inboard side of the right-hand console.

MK-F7 EJECTION SEAT CONTROLS



Nomenclature	*Function*
1. Lower ejection handle	Pulled upward fully, jettisons canopy and ejects seat.
2. Emergency restraint release	Button pressed, handle rotated sharply aft, releases integrated harness, leg restraint lines, and parachute from seat, permitting the pilot to leave the seat with parachute and full survival equipment.
3. Face curtain handle	Pulled down fully, jettisons canopy and ejects seat.
4. Canopy interrupter handle	Pulled fully forward, bypasses canopy firing and overrides interrupter, permitting complete travel of the face curtain or lower ejection handle to eject the seat through the canopy.
5. Shoulder harness lock lever	Pulled aft against tension, unlocks shoulder harness inertia reel so that the pilot may lean forward. Neutral position holds unlocked condition. Pushed to forward position, locks inertia reel to prevent any forward motion of the pilot.
6. Leg restraint release lever	Pushed forward, releases leg restraint snubber to permit additional length of line to be pulled out. Pulled aft, releases leg restraint line plug in fitting from front seat to permit normal exit from aircraft.
7. Seat adjustment switch	UP or DOWN raises or lowers seat pan to desired height.

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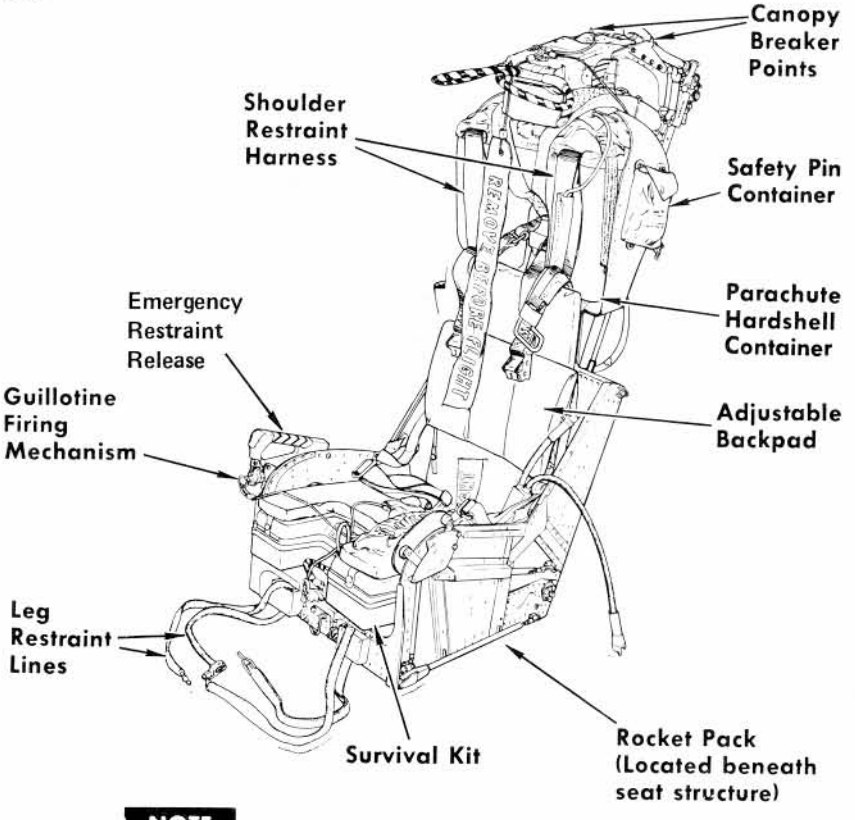
Figure 1–43

MK-F7 EJECTION SEAT COMPONENTS

1. Parachute withdrawal line
2. Parachute locking pin withdrawal line
3. Link-line
4. Controller drogue parachute withdrawal line
5. Drogue shackle scissors
6. Top latch mechanism
7. Emergency release guillotine
8. Drogue gun
9. Drogue gun trip rod
10. Seat catapult secondary charges
11. Canopy interrupter
12. Controller and stabilizer drogue parachute container
13. Power retractor gun
14. Handle restraint bungee
15. Timed release mechanism (including barostat and g controller)
16. Timed release trip rod
17. Canopy breaker points



NOTE

Ejection seat controls are described separately in Figure 1–43.

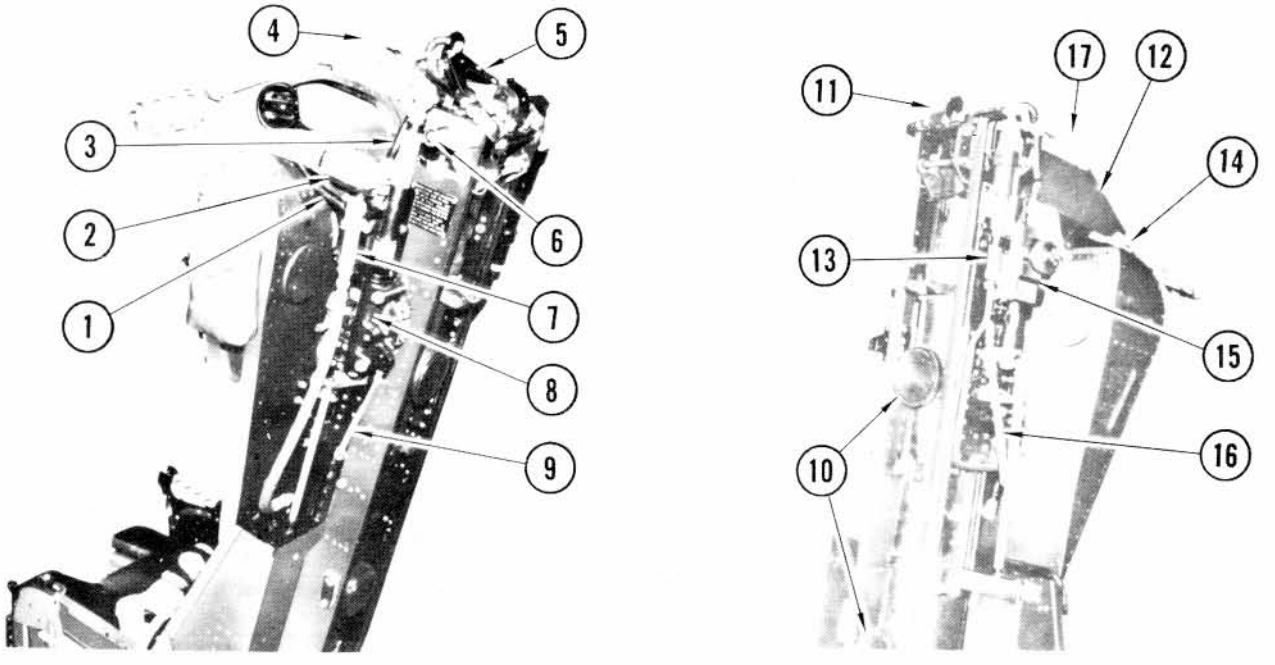


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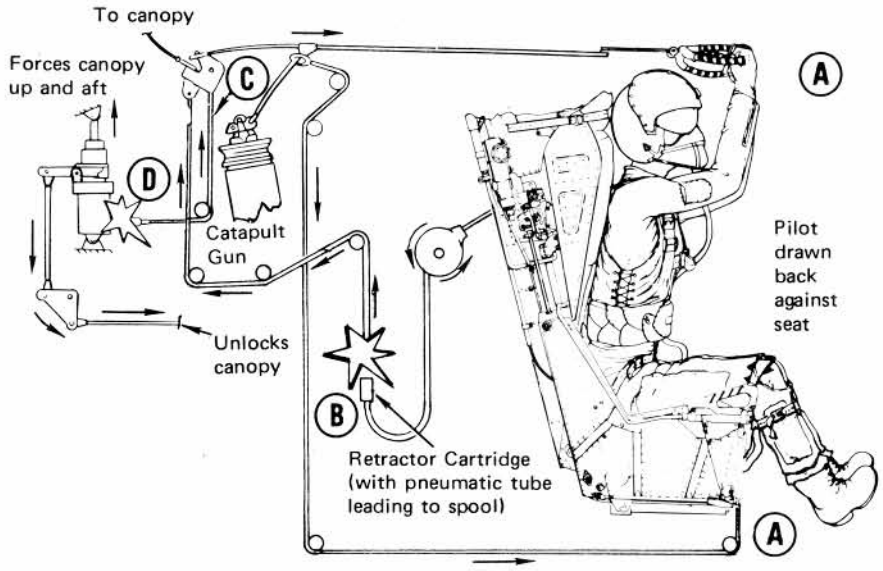
Figure 1–44

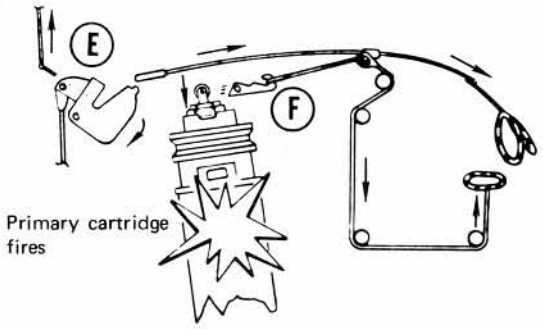
MK-F7 EJECTION SEQUENCE

LOW-ALTITUDE SEQUENCE
(BELOW 13,000(±1500) FEET)

1 When either the face curtain handle or the lower ejection handle (A) is pulled, initial travel of the handle fires the shoulder harness power retractor cartridge (B) drawing the pilot back against the seat in a safe position for ejection. At the same time, the canopy firing cable is pulled (C), firing the emergency canopy actuator (D) which opens the canopy locks and jettisons the canopy.



2 As the canopy separates from the aircraft, it pulls a lanyard to withdraw a pin from the canopy interrupter (E), permitting the interrupter to release either ejection control (face curtain or lower ejection handle) for further travel. Continued motion of the ejection control withdraws the catapult firing sear (F) at the top of the catapult to fire the seat primary cartridge. As the seat rises, heat and pressure from the primary cartridge fires auxiliary cartridges in rapid succession to increase seat velocity.



3 As the seat begins to move upward, the drogue gun firing mechanism and timed release mechanism trip rods are pulled free and both mechanisms are armed (G). Initial motion of the seat also causes the leg restraint lines, which are secured to the airframe by shear pins, to be drawn up to place the pilot's legs in the proper position against the front face of the seat (H). The leg restraint snubber in the bottom of the seat holds the pilot's legs in the restrained position until harness release occurs. When the seat is fired, the pilot's services are automatically disconnected and the IFF is automatically switched into operation in the emergency mode. The Shoehorn destruct switch is actuated as the seat leaves the aircraft.

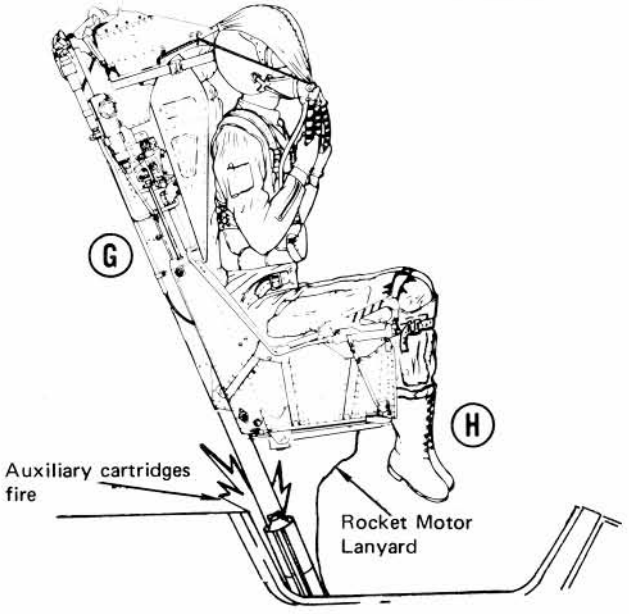


Figure 1–45 (Sheet 1)

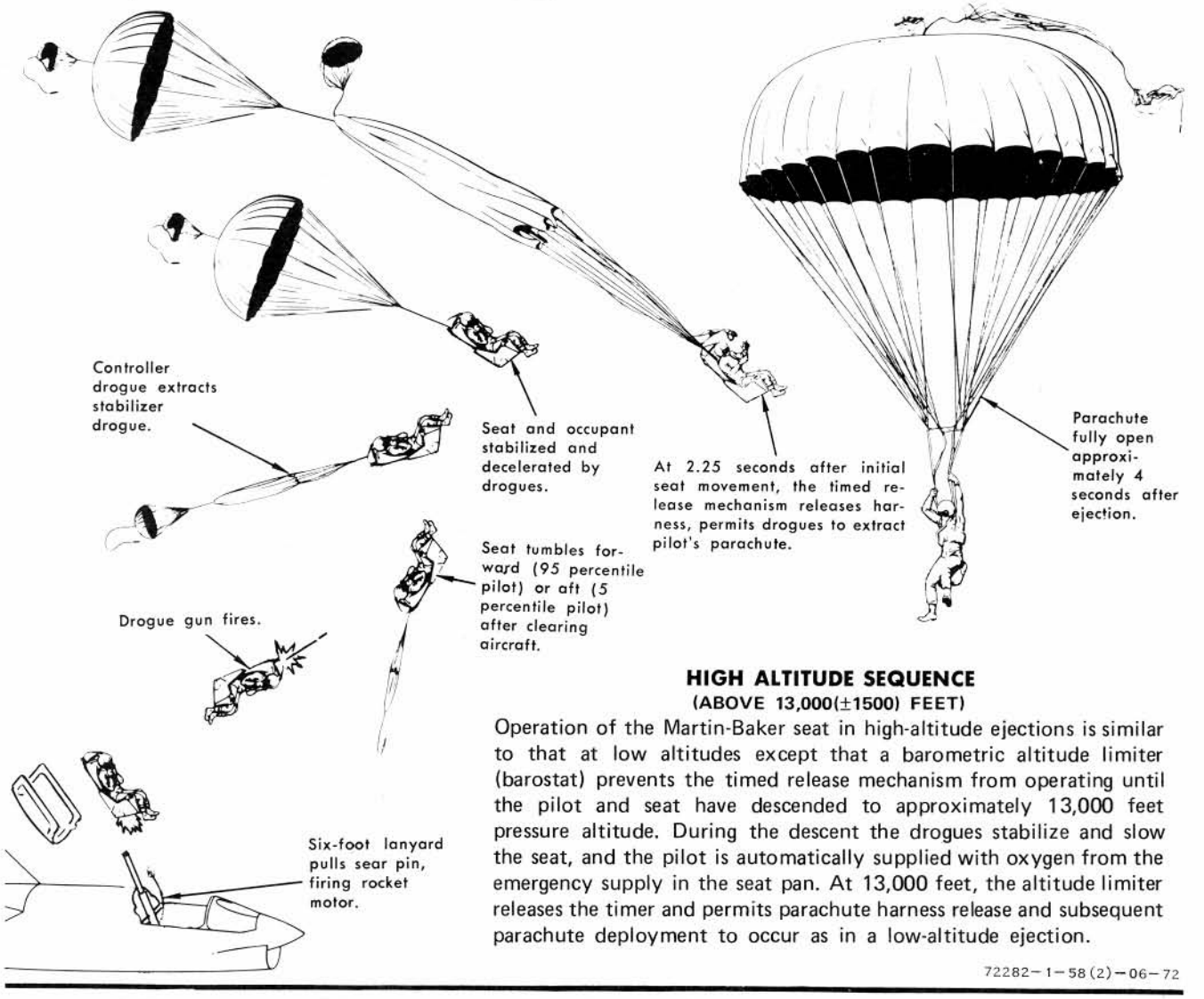
MK-F7 EJECTION SEQUENCE

4 When the ejection seat has lifted the length of the rocket motor firing lanyard (six feet), the lanyard withdraws a sear from the rocket motor initiator, firing the rocket motor.

5 The drogue gun ejects a piston which withdraws the controller drogue from the seat upper housing and pulls it into the slipstream where it tilts the seat into a horizontal attitude and, in turn, withdraws the stabilizer drogue.

6 The timed release mechanism, which is armed by initial seat movement, releases the drogue shackle scissors and permits the drogues to withdraw the pilot's parachute 2.25 seconds after initial seat movement. The timed release mechanism also actuates the integrated harness release devices to allow the pilot to be separated from the seat by the drag of the parachute.

7 To prevent the pilot from delaying seat separation by holding onto the face curtain longer than is desirable, the curtain is freed from the seat with harness release. To ensure clean separation of the pilot and seat, two friction fastenings (sticker tabs) briefly restrain the pilot in the seat after harness release occurs.



HIGH ALTITUDE SEQUENCE
(ABOVE 13,000(±1500) FEET)

Operation of the Martin-Baker seat in high-altitude ejections is similar to that at low altitudes except that a barometric altitude limiter (barostat) prevents the timed release mechanism from operating until the pilot and seat have descended to approximately 13,000 feet pressure altitude. During the descent the drogues stabilize and slow the seat, and the pilot is automatically supplied with oxygen from the emergency supply in the seat pan. At 13,000 feet, the altitude limiter releases the timer and permits parachute harness release and subsequent parachute deployment to occur as in a low-altitude ejection.

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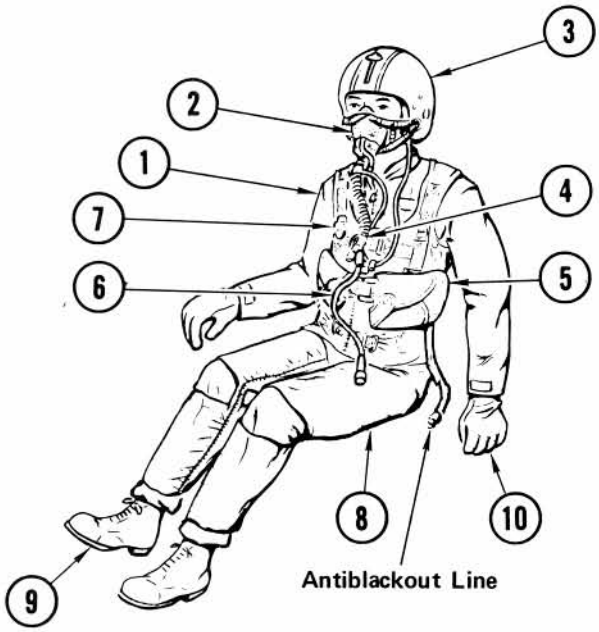
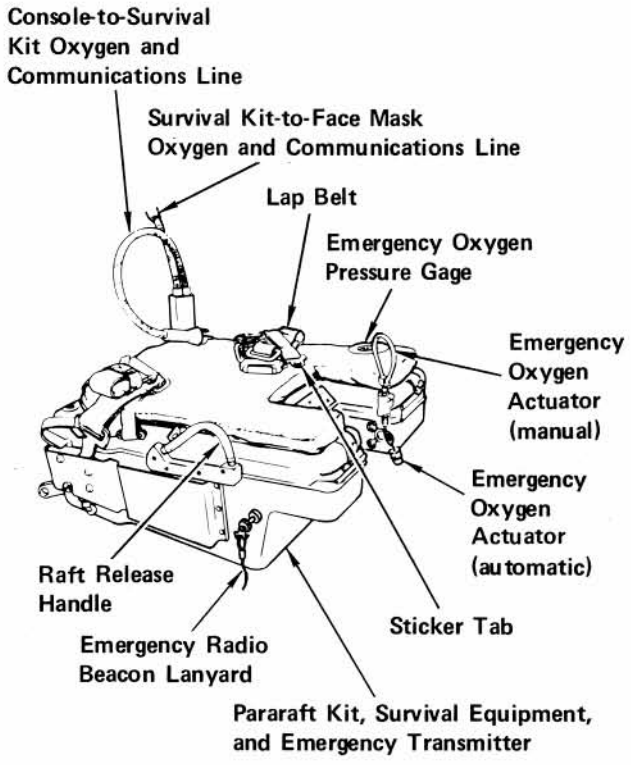
Figure 1-45 (Sheet 2)

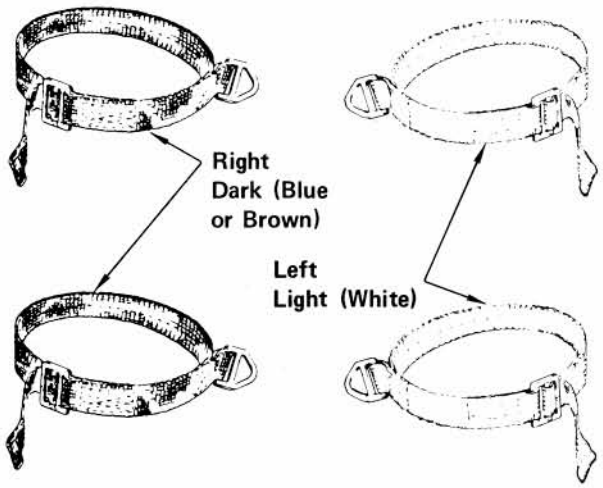
PILOT'S EQUIPMENT



1. Coveralls, flying, summer, fire resistant, type CS/FRP
   or
   Coveralls, flying, anti-exposure, (not shown)
2. Mask, oxygen, with retainer and release assy
3. Helmet, pilot's protective,
4. Regulator aviators miniature oxygen, breathing
5. Life preserver, inflatable,
6. Oxygen hose assembly mini-regulator to seat pan
7. Harness, integrated parachute,
8. Suit, Antiblackout,
9. Boots, flying, impact resistant
10. Gloves, flying, summer
    or
    Gloves, anti-exposure coverall



RIGID SEAT SURVIVAL KIT-6



MARTIN-BAKER COLOR-CODED LEG RESTRAINT GARTERS

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Figure 1–45 (Sheet 3)

PART 3 — AIRCRAFT SERVICING AND HANDLING

SERVICING

Refer to NAVAIR 01-45HHB-2-1, General Information Handbook, for permissible panel removal and detailed servicing instructions. Figure 1—46 illustrates aircraft servicing points.

FUELING

Authorized fuels are listed under FUEL GRADE in part 4 of this section.

Partial Refueling

If FUEL SELECTOR is at:

REFUEL PARTIAL — Transfer system filled; 661 gallons pumped into main cells.

REFUEL FWD CELL — Main cell (s) filled;midfuselage cells also filled on those aircraft in which the solenoid-operated check valves (between main and midfuselage cells) have been replaced by acceleration check valves.

Precautions

If the fueling facility is not equipped with a flowmeter, only procedural checkpoints applicable to aircraft fuel quantity gages shall be used. The aircraft main and transfer indicating systems must be operating properly to obtain valid checks.

A pumping pressure of 40 to 60 psi should be used with a flow rate not to exceed 300 gpm.

No radio or radar activity is permissible within a radius of 75 feet during refueling. Check that the aircraft and fuel truck are properly grounded. Discharge any static electricity from the fuel nozzle before attaching it to the fueling manifold.

Failure of the vent system during fueling can cause cell rupture and structural damage.

Station a fire guard during fueling operations. Station one man in the cockpit to monitor main and transfer fuel quantity indicators during fueling operations.

To prevent the possibility of fuel cell rupture and structural damage, fuel venting must be monitored during the fueling process. Wing cell venting is monitored by a man utilizing a gage and hose assembly connected to the wing. The hose is connected to a pressure-sensing line quick-disconnect fitting located in the right-hand wing access panel and the gage is hung in the left gear well. Station a man at the fuselage vent (located in the left-hand ventral fin) to check vent airflow during fueling. Check wing vent airflow at fuel dump line (donut) seal on right wingfold rib with wings folded or at fuel dump outlet with wings spread if gage and hose assembly is not available. Do not block the vent by holding the cupped hand over it. At the start of the cycle, after completing the primary and secondary checks, there will be a strong continuous flow of air from the fuselage vent with a barely detectable indication on the wing pressure gage. As the airflow from the fuselage vent decreases, wing vent pressure will rise to 1¼ to 1½ psi if the system is operating properly. Should the gage reading exceed 1½ psi, stop fueling immediately.

If the aircraft is fueled with the fuselage aft section removed, check fuselage cells vent airflow at vent line disconnect on upper left-hand side of disconnect bulkhead. If engine has been run with aft section removed, the CV15-206325-1 drain hose must be removed from the vent line before fueling. If aircraft is fueled with the wings folded, check wing vent airflow at fuel dump line (donut) seal on right-hand wingfold rib.

All fueling personnel shall be properly instructed before attempting refueling operation. The complete fueling procedure cannot be accomplished while the aircraft generator is supplying electrical power since primary and secondary checks require external dc power with the master generator switch in EXT. Pressure fueling on the deck on aircraft electrical power used shall be limited to one such cycle between normal ground fueling operations. During every pressure fueling on the deck, with or without the engine operating, the vents must be checked. During every pressure fueling on external electrical power, primary and secondary checks must be performed in accordance with the fueling procedure. To permit complete fueling on aircraft electrical power, the inflight refueling probe switch left in the OUT position; or external power must be applied with the IFR probe in and the probe switch in the OFF position. There must be enough wind across the deck to dissipate fuel fumes from the wing and fuselage vent outlets.

Fueling Procedure — Static

1. Check that fueling nozzle, aircraft and fueling unit are grounded.
2. Place engine master, fuel dump, all radio/radar, inflight refueling probe, emergency generator and master generator switches in OFF.
3. Connect external dc electrical power.
4. Place master generator switch in EXT.
5. Check that manual shutoff valve in wing fuel transfer line is open. Rotate fuel selector switch to CHECK SECONDARY.

Note

If the fuel selector switch knob is missing, the flat side of the knob shaft is opposite the pointer.

6. Adjust fueling source to 40 to 60 psi.
7. Remove cap from fueling manifold.
8. Attach fueling nozzle to fueling manifold. If nozzle has manual lever, lever must be locked fully open. Start fuel flowing into aircraft.
9. Check flowmeter or aircraft main transfer fuel quantity gages. Fuel flow must stop before fuel admitted to aircraft exceeds 45 gallons on flowmeter or 300 pounds total increase on gages. If fuel flow does not stop, disconnect nozzle immediately and notify proper maintenance personnel.

Note

This step is performed to prime the shutoff system.

10. Check flowmeter or aircraft main and transfer fuel quantity gages. Rotate fuel selector switch to CHECK PRIMARY. Fuel flow must stop before additional 30 gallons on flowmeter or 200 pounds on gages is admitted to aircraft. If fuel does not stop, disconnect nozzle immediately and notify proper maintenance personnel. Monitor flowmeter and gages for no less than 30 seconds. If flow rate after shutoff exceeds 3 gallons per minute on flowmeter or 20 pounds per minute on gages, disconnect nozzle and notify proper maintenance personnel.
11. Rotate fuel selector switch to CHECK SECONDARY and with switch in this position, repeat check of step 10.
12. If steps 10 and 11 are acceptable, rotate fuel selector switch to fuel load desired. While monitoring fuselage and wing venting, complete desired fueling.
13. When system automatically shuts off, stop fueling source pump, remove nozzle, place master generator switch in OFF and remove external electrical power.
14. Rotate fuel selector switch to the OFF position and remove grounding connection.

Fueling Procedure (Hot Refueling) With External Electrical Power

1. Check that fueling nozzle, aircraft and fueling unit are grounded.
2. With pilot in the aircraft and engine running, turn master generator, all radio/radar, fuel dump, inflight refueling probe, and electrical switches off.
3. Connect electrical power.

   If low fuel-level light is flashing when refueling, the flashing may be stopped by placing the fuel transfer switch in PUMP OFF. The flashing light in no way affects or is affected by the fueling procedures.

4. Place master generator switch in EXT. (Primary/secondary fueling checks can be accomplished while the engine is in operation with external power supplied and master generator switch in the EXT position.)
5. Rotate fuel selector switch to CHECK SECONDARY.
6. Refueling procedure remains the same as steps 6 through 14 in the FUELING PROCEDURE — STATIC. No restriction is placed on this refueling procedure providing satisfactory primary/secondary checks are completed.

Fueling Procedure (Hot Refueling) On Aircraft Electrical Power

Full Loads

CAUTION

Primary/secondary fueling checks and fueling by selecting REFUEL PARTIAL cannot be accomplished on airplane power. Complete refueling on the remaining positions of the fuel selector switch (REFUEL TOTAL and REFUEL MAIN CELL) shall be limited to one cycle between normal ground fueling operations on ground power.

1. Check that fueling nozzle, aircraft, and fueling unit are grounded.
2. With pilot in the aircraft and engine running, turn all radio/radar, fuel dump, and electrical switches to off.

   If low fuel-level light is flashing when refueling, the flashing may be stopped by placing the fuel transfer switch in PUMP OFF. The flashing light in no way affects or is affected by the fueling procedures.

3. Extend inflight refueling probe and leave probe switch in out position and master generator switch ON.
4. Adjust fueling source to 40 to 60 psi.
5. Remove cap from fueling manifold.

6. Attach fueling nozzle to fueling manifold. Start fuel flowing into aircraft. Fuel cell venting must be checked during this and all ground refueling operations.
7. Complete desired fueling. When the system automatically shuts off, stop the fueling source pump, remove the nozzle, and retract inflight refueling probe.
8. Rotate fuel selector switch to the OFF position and remove grounding connection.

FCLP Partial Loads

For field carrier landing practice it may be desirable to take on less than a full load with the engine running. This can be safely accomplished (consecutively) without primary/secondary checks by adherence to the following procedure. The procedure is designed to permit replenishing the aircraft fuel quantity to approximately 3,500 pounds without exercising the aft or main cell pressure shutoff valves. Fuel quantities shall be closely monitored on the airplane fuel quantity gages during fueling.

1. Complete steps 1 through 6 under FULL LOADS.
2. Set fuel selector switch to POWER OFF.
3. Attach fuel nozzle to fueling manifold and start fuel flowing into aircraft.
4. Monitor fuel cell venting.
5. When fuel gages indicates 3,500 pounds, secure fueling operation by placing the inflight refueling probe switch to IN.
6. Detach fuel nozzle and remove ground connections.

ENGINE OIL SYSTEM

Service the engine oil system with gas turbine lubricating oil, MIL-L-23699 (Wep) or at temperatures below –40F, use MIL-L-7808 oil. Do not overfill. Operate engine for a minimum of 30 seconds at 75% rpm and check oil level within 5 minutes after engine shutdown. If shutdown is not practical, operate engine for a minimum of 30 seconds at 75% rpm before checking oil level. If checked at any other time, an erroneous reading will be obtained. If oil is visible in the filler neck, the system is properly serviced.

When changing oil, the required oil quantity is approximately 5 gallons.

OXYGEN SYSTEM

Service oxygen system with MIL-O-27210 (Type II) liquid oxygen only. Liquid oxygen boils at -183°C (-297.4°F). Keep oxygen away from oil, grease, or other combustible materials. Ensure adequate ventilation.

UTILITY HYDRAULIC SYSTEM

Service the systems with red hydraulic fluid, MIL-H-83282A (alternate MIL-H-5606A) and dry nitrogen. NEW

System Servicing Procedures

1. Remove access panel 226.
2. Remove caps on hydraulic filler valve and air filler valve.
3. Stroke pressure oiler hand pump until filler hose is full of clean hydraulic fluid. Attach filler hose to hydraulic filler valve.
4. If possible, service utility hydraulic system with components positioned as follows:

   Arresting gear – UP
   Landing gear – DOWN
   Speed brake – CLOSED
   Wing and droop – CLEAN CONDITION
   IFR probe – RETRACTED NEW
5. If components are in position as noted, fill reservoir to full mark. If wing cannot be lowered, fill only to

refill mark. If any of the other components cannot be positioned as above, fill reservoir until indicator is ½ inch below full mark.

6. Remove lockwire from reservoir bleed valve. Connect bleed line to valve and bleed until clear fluid, free of air and foam, flows from bleed line. Close bleed valve. Remove bleed line and lock-wire valve.
7. Recheck fluid level and add more fluid if necessary.
8. Remove hydraulic filler line and install filler valve cap.
9. Connect nitrogen source and pressure gage to air filler valve. Pressurize reservoir until gage indicates 35 (+5, –0) psi.
10. Disconnect nitrogen source; install filler valve cap and access panel.

POWER CONTROL HYDRAULIC SYSTEMS

NEW Service the systems with red hydraulic fluid, MIL-H-83282A (alternate MIL-H-5606A) and dry nitrogen.

Servicing valves for PC1 system are located in the left main gear well. Servicing valves for the PC2 system are located in the right main gear well.

Accumulator Servicing Procedures

1. Remove cap from air filler valve.
2. Connect T-handle filler and pressure gage to air filler valve. Check that bleed valve is closed (screwed out).
3. Hold lower nut of air filler valve with wrench and loosen upper nut to open internal valve seal.
4. Slowly screw T-handle in and read pressure on gage. If pressure is above 1,600 psi, slowly open bleed valve and reduce pressure to 1,500 (±100) psi. If pressure is below 1,400 psi, connect nitrogen source to bleed valve and pressurize accumulator to 1,500 (±100) psi. Close bleed valve and disconnect nitrogen source.
5. Screw T-handle out and tighten upper nut to close valve seal.
6. Open bleed valve to bleed air from line and disconnect T-handle filler and pressure gage from filler valve.
7. Install cap on air filler valve handtight.

Reservoir Servicing Procedures

1. Cycle control stick to droop control surfaces.
2. Remove cap from hydraulic filler valve and air filler valve.
3. Remove access panels 310, 313, and 353.
4. Stroke pressure oiler hand pump until filler hose is full of clean hydraulic fluid. Connect hose to filler valve.
5. Pump hydraulic fluid into reservoir until indicator reads FULL SYS PRESS ZERO.
6. Connect T-handle filler and pressure gage to air filler valve. Check that bleed valve is fully closed.
7. Slowly screw T-handle in and read pressure on gage. If pressure is above 55 psi, slowly open bleed valve and reduce pressure to 50 (+5, –0) psi. If pressure is below 50 psi, connect nitrogen source to bleed valve and pressurize to 50 (+5, –0) psi. Close bleed valve and disconnect nitrogen source.
8. Screw T-handle out and open bleed valve to bleed air from line. Remove T-handle filler and pressure gage.
9. Cut and remove lockwire from PC system bleed plug, and connect plastic tubing.
10. Open bleed plug and bleed until clear fluid, free of air and foam, flows from bleed plug. Remove plastic tube from bleed plug. Torque bleed plug to 10 (±5) pound-inches and lock-wire.
11. Check fluid level indicator for FULL SYS PRESS ZERO indication.
12. Disconnect hydraulic filler line from filler valve. Install caps on filler valves and install access panels.

PNEUMATIC PRESSURES – PSI*

Service with dry nitrogen to the pressures listed.

System Servicing

1. Open access panel 2221-3.
2. Reset all actuated emergency systems.
3. Check that electrical power is disconnected from the aircraft.
4. Remove applicable pneumatic bottle filler valve cap and attach T-handle adapter filler. Attach nitrogen source to T-handle filler adapter.

***If bottle heaters have been operated, pressures will exceed those listed; do not reduce pressure.**

5. Screw T-handle in and fill bottle slowly. Rapid filling will cause bottle to heat. Screw T-handle out and shut off nitrogen supply as pressure on applicable gage reaches desired gage indication for ambient temperature.

6. Disconnect nitrogen source and install filler cap on valve.

7. Install access panel.

At Ambient Air Temperature	*Charge Bottle Pressure (PSI) To*	
	900-Cubic Inch	*50-Cubic Inch (±100)*
−18° to −1°C (0°−30°F)	2,400 (+50, −0)	2,400
−1° to 10°C (30°−50°F)	2,400 (+50, −0)	2,500
10° to 21°C (50°−70°F)	2,450 (±50)	2,600
21° to 32°C (70°−90°F)	2,500 (±100)	2,700
32° to 43°C (90°−110°F)	2,610 (±100)	2,800

Note

Do not fill pneumatic bottles with electrical power connected to airplane. Bottle heater blankets will be energized precluding proper pressurization of bottles.

CONSTANT SPEED DRIVE SYSTEM-J57-P-420 ENGINE

Reservoir Servicing Procedures

1. Make sure that fill and overflow hose connections are clean.

2. Remove cap and connect filler line from preoiler to CSD oil filler connection in right main gear well.

CAUTION

Obtain an overflow line 3/4 inch in diameter with no restrictions in the line, to prevent overfilling the CSD reservoir.

3. Connect overflow line to CSD overflow connection. Oil will flow from line when servicing is being done after an engine run or flight, even if low oil level has been indicated. However, this is only collected oil, and system must still be serviced.

4. Fill system with filtered gas turbine lubricating oil, MIL-L-23699, until oil flows from open end of overflow line. Discontinue filling. When oil flowing out overflow line has diminished to a slow drip disconnect overflow and fill lines.

5. Reinstall caps.

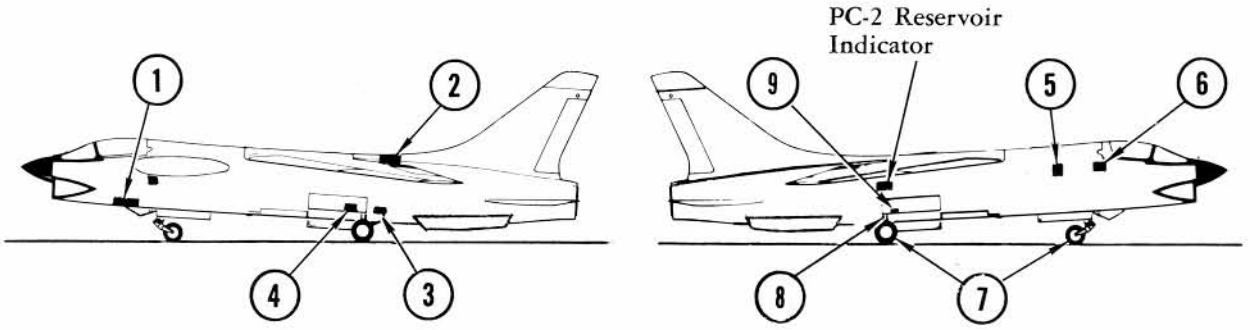
TIRES

Service with dry nitrogen as follows:

Main gear — 300 psi (land)
400 psi (carrier or FCLP)

Nose gear — 230 psi (land)
365 psi (carrier or FCLP)

SERVICING POINTS



1. Electrical power
2. Engine oil
3. Engine starter
4. Fuel system (central-point fueling)
5. Utility hydraulic and pneumatic system
6. Oxygen system (Aircraft BuNo. 144610 and subsequent)
7. Tires
8. Power control hydraulic systems (PC 2 shown, PC 1 in same location in LH wheel well)
9. Constant speed drive (Right hand wheel well, aft bulkhead)

72282–1–54–10–67

Figure 1–46

HANDLING

EXTERNAL ELECTRICAL POWER REQUIREMENTS

AC power — 115 (±5) volts, 400 (±20) cps, 3-phase, ABC rotation

ENGINE STARTER REQUIREMENTS

Engine starting requires one of the following starting units:

GTC-85 gas turbine compressor

MD-3A jet starting trailer*

USAF Model MA-1TA gas turbine compressor

USAF Model MA-2 gas turbine compressor*

NCPP/RCPP/RCPT-105 gas turbine compressor*

*Set to low pressure ratio.

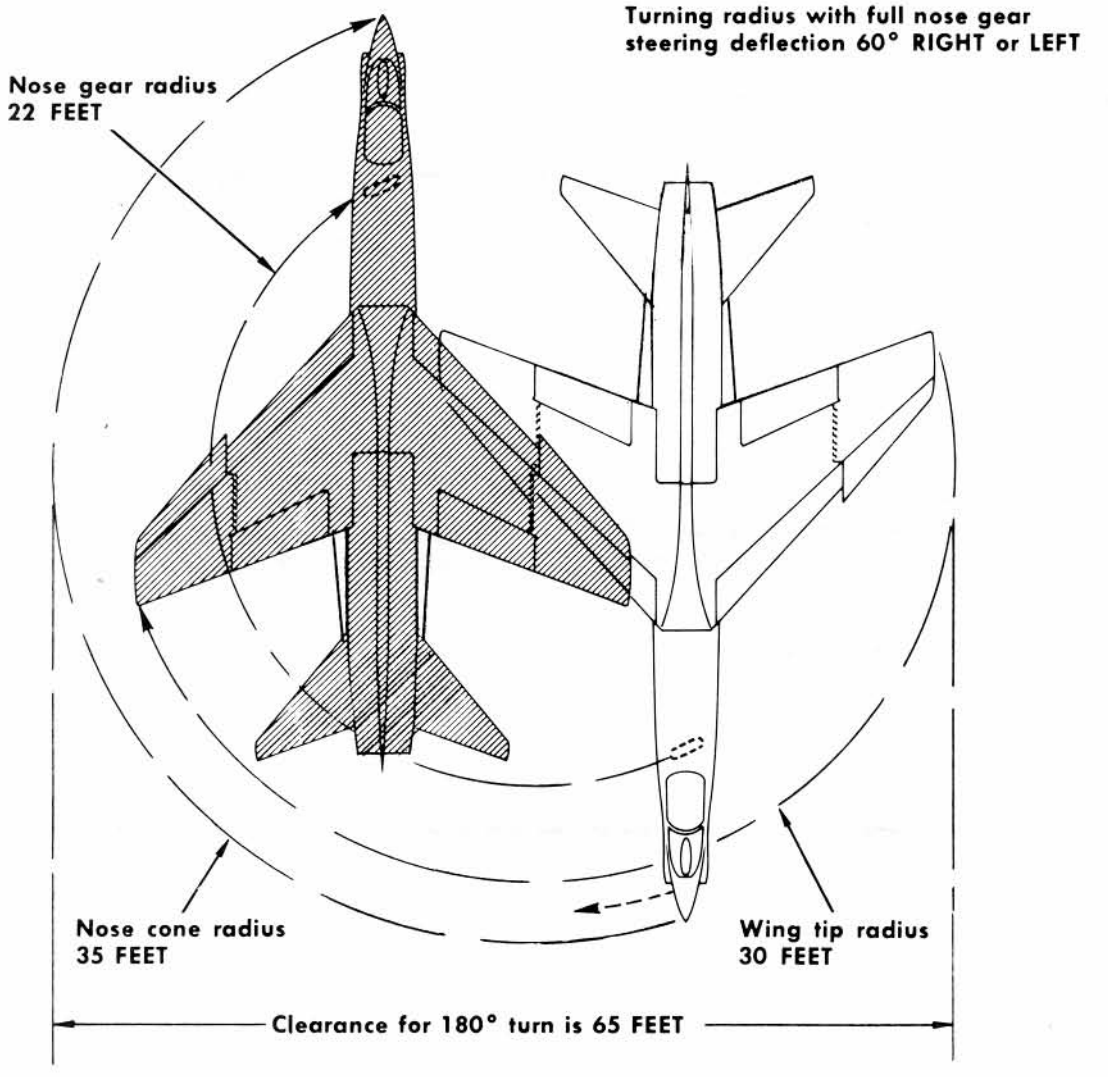
MINIMUM TURNING RADIUS

Minimum turning radius and approximate ground clearances while taxiing are illustrated in figure 1–47.

DANGER AREAS

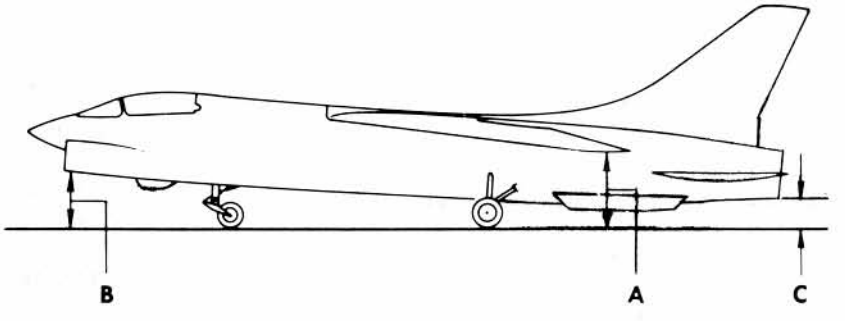
Exhaust, inlet, turbine and noise danger areas are illustrated in figure 1–48.

MINIMUM TURNING RADIUS
(TAXIING)



APPROXIMATE GROUND CLEARANCES*

A — Wing tip	(wing down)	5 FEET 6 INCHES
	(wing up)	3 FEET 6 INCHES
B — Duct lip		3 FEET 9 INCHES
C — Tail cone		2 FEET



* Clearances vary slightly with aircraft loading and strut and tire servicing.

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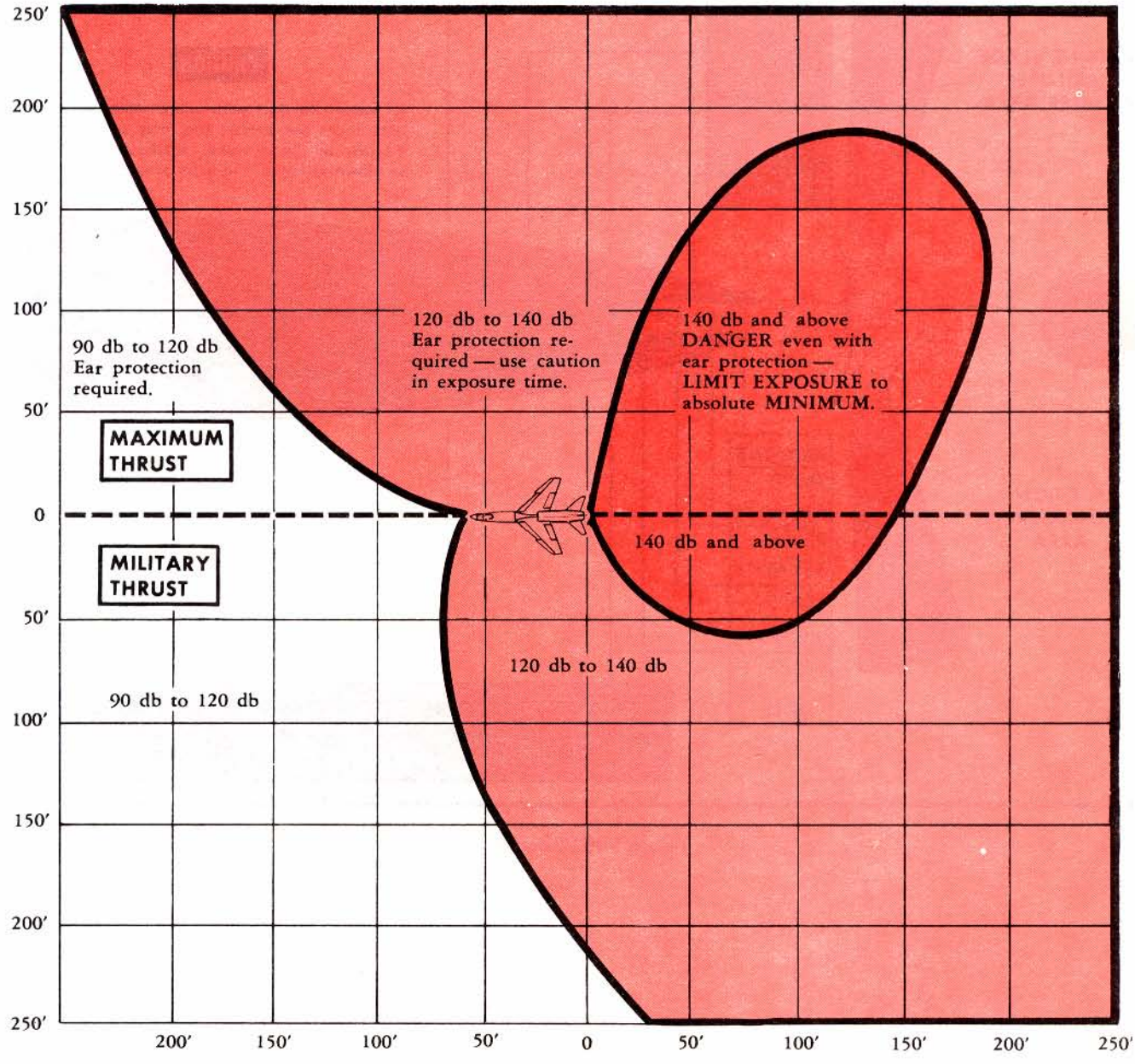
Figure 1-47

DANGER AREAS — ENGINE GROUND OPERATION

NOISE DANGER AREAS



NOTE

Approved ear protective devices are specified in Bu Med Inst. 6260.

72282—2—3 (1)

Figure 1—48 (Sheet 1)

DANGER AREAS – ENGINE GROUND OPERATION

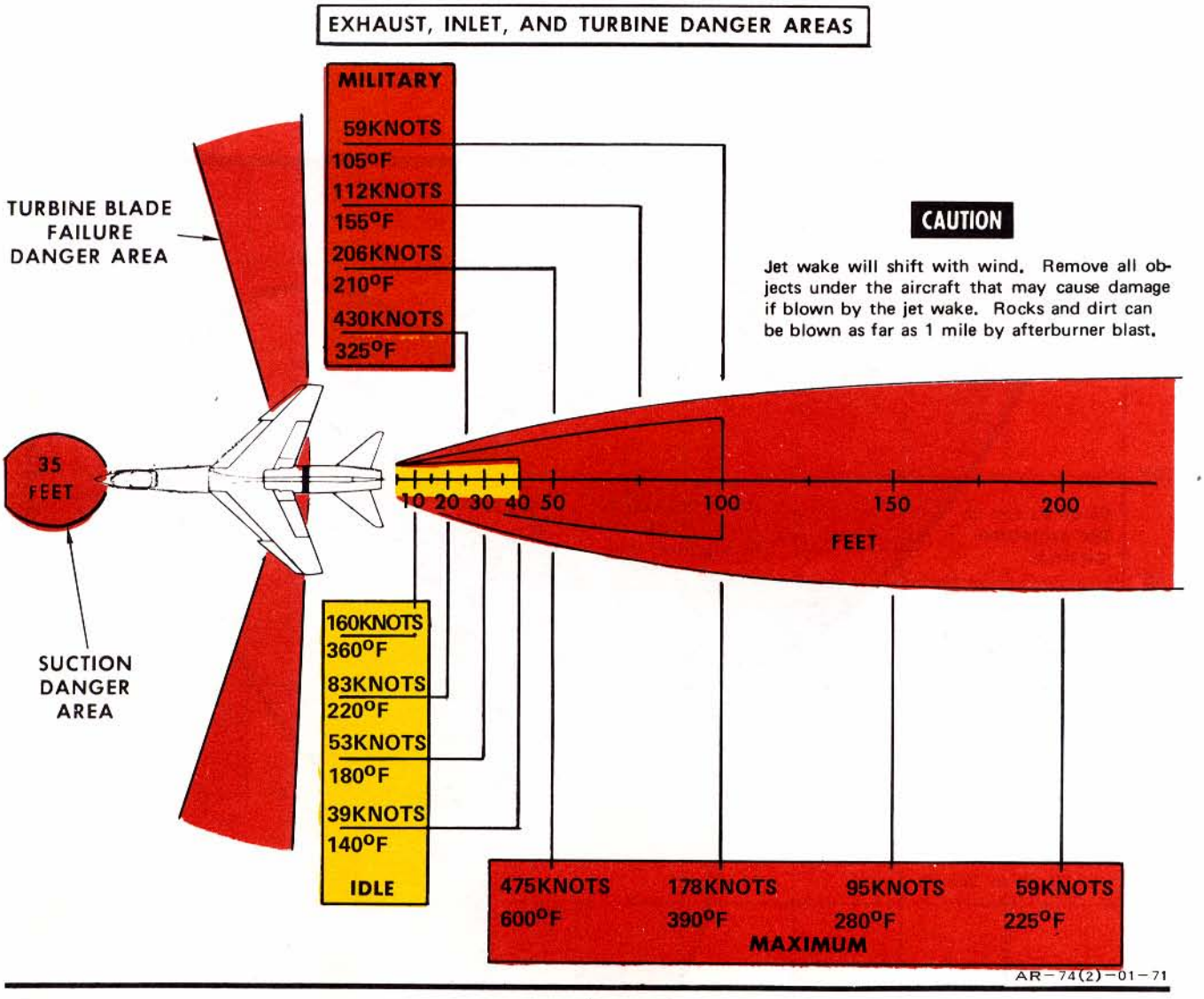


Figure 1-48 (Sheet 2)

PART 4 — AIRCRAFT OPERATING LIMITATIONS

INTRODUCTION

This section specifies limitations that must be observed during the normal operation of the aircraft. They are derived from actual flight tests and demonstrations. Limitations which are merely associated with a certain technique or specialized phase of operation are discussed appropriately in sections III, IV, and V and in other parts of this section.

INSTRUMENT MARKINGS

The operating limits indicated by flight and engine instruments are illustrated in figure 1–49. These limits are not all repeated in the text. Should engine overtemperature or overspeed occur in excess of limitations listed, the engine should be shut down as soon as possible and the required maintenance inspection be performed before further operation.

AIRSPEED LIMITATIONS

The maximum permissible indicated airspeeds in smooth or moderately turbulent air are as follows:

With arresting hook, landing gear, speed brake, and wing leading edge droop retracted and wing down — As shown in figure 1–50

With speed brake extended — As shown in figure 1–50 or 1.45 IMN, whichever is less

With leading edge cruise droop
Extending or retracting — 500 KIAS
Extended — 550 KIAS

With wing down and leading edge landing droop extended pneumatically — 300 KIAS

With leading edge droop unlocked (barberpole indication — 300 KIAS

For extension of emergency power package — 650 KIAS or 1.40 IMN, whichever is less

Note

Refer to EMERGENCY POWER PACKAGE in section IV for handling characteristics when extending the package above 500 KIAS.

With wing up, landing gear extended — 220 KIAS

Note

Do not exceed 220 KIAS until a positive indication of manual wing incidence locking is observed.

Arresting hook:
Extension — 350 KIAS
Extended and locked — None

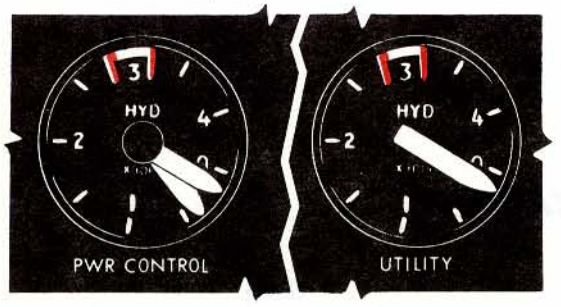
For operation of inflight refueling probe — 350 KIAS or 0.92 IMN, whichever is less

For extension of air refueling probe by the emergency pneumatic system — 275 KIAS

INSTRUMENT MARKINGS

ACCELEROMETER

Refer to figures 1–50, 1–51 and 1–52.



HYDRAULIC PRESSURE (UTILITY OR PC)

2800 to 3200 psi – Normal Range

TACHOMETER

106.3% absolute maximum rpm

98 to 101%—Normal rpm at standard day temperature.

OIL PRESSURE

NOTE

The cockpit oil pressure gage, because of gage/oil pressure transmitter error, may in some instances show oil pressure out of limits when actual engine oil pressure is within the required 40–55 psi range. Oil pressure outside the normal range is permissible if gage/transmitter error is confirmed as the cause or if the excursion is transient in nature (fluctuation limits: 37 min – 58 max).

40 psi to 55 psi – Normal Range

EXHAUST TEMPERATURE

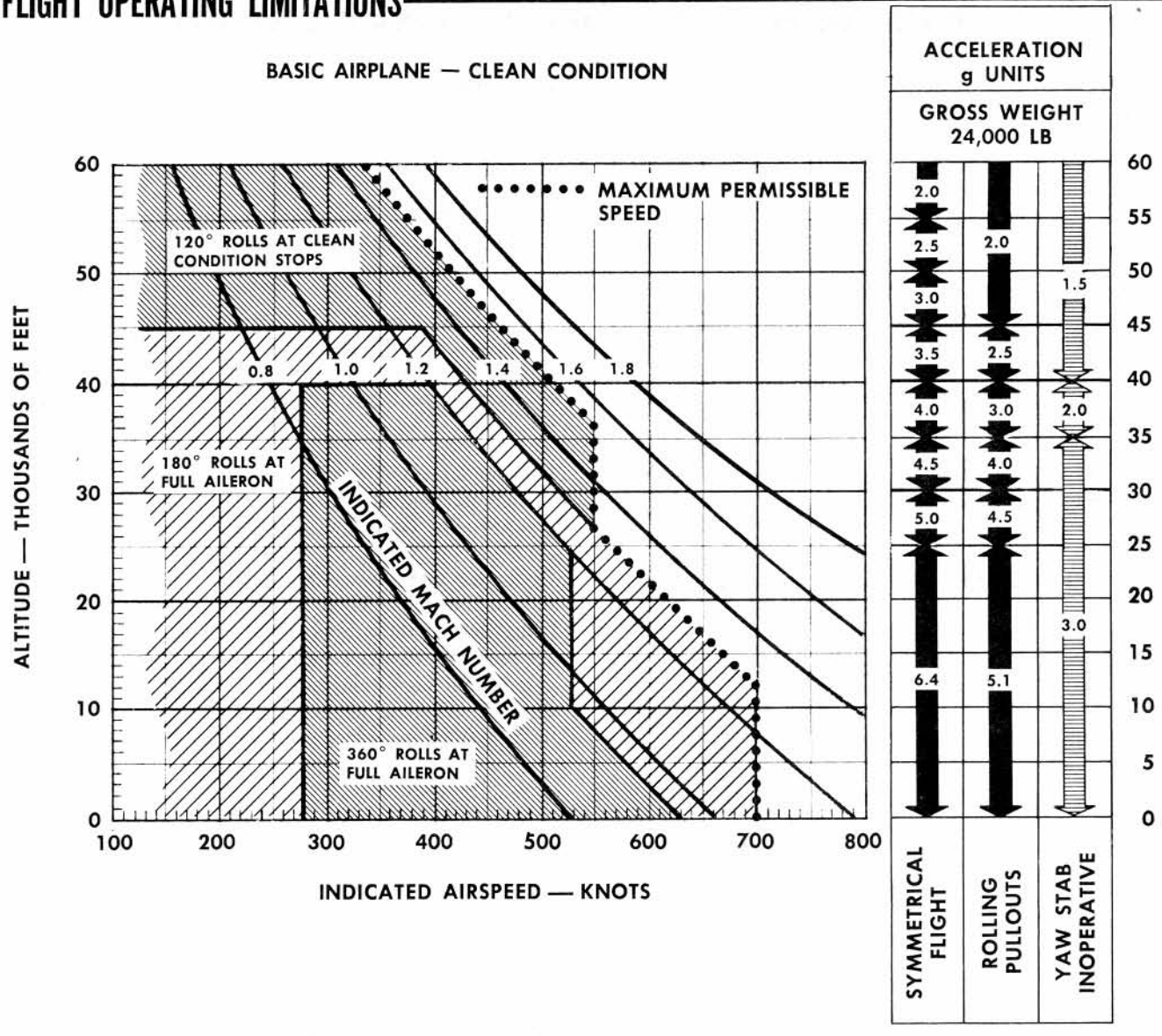
MAXIMUM AND MILITARY RATED TEMPERATURE LIMITS 670°C

SEE FIGURE 1-54 FOR ADDITIONAL OPERATING LIMITATIONS

72282-5-1N5/74

Figure 1–49

FLIGHT OPERATING LIMITATIONS



NOTES

1. Refer to figure 1-51 for effect of gross weight on acceleration limits from sea level to 25,000 feet.
2. Refer to Section IV for effects of yaw stabilization failure on flight characteristics.

72282-1-62-2-69

Figure 1–50

POWER CONTROL AND UTILITY HYDRAULIC SYSTEM

When operating on emergency power package hydraulic pressure with no electrical load on the emergency generator, the minimum airspeed for adequate flight control is 140 KIAS. With emergency generator switch in LAND, minimum airspeed is 145 KIAS, and with switch in ON, minimum airspeed is 175 KIAS.

With any single hydraulic system inoperative (other than utility system), or any combination of two systems inoperative, operation is restricted to the following limits:

Maximum airspeed – 600 KIAS or 1.0 IMN, whichever is less

Maximum acceleration – same as yaw stab inoperative in figure 1–50

Aileron deflection – limited to clean condition stops.

Maximum bank angle change – 90°

No abrupt flight control movements

No slipping or skidding

EXCEPTIONS

1. With only the utility system inoperative, observe the same flight limits as yaw stab inoperative.
2. With PC 1 and utility systems inoperative, these limits apply only if the rudder is locked. Observe 200 KIAS maximum speed limit if rudder is not locked.
3. With PC 1 and PC 2 inoperative, UHT restraint must be engaged. Engagement of UHT restraint is permitted at any flight condition, but decelerate as soon as possible and remain between 300 KIAS and 400 KIAS.

Full rudder skidding rolls in excess of 90° bank angle change are permitted if required for recovery, but avoid abrupt rudder control movements.

Optimum dive recovery (minimum altitude loss) is obtained at 500 KIAS or 0.9 IMN, whichever is less (wings level, cruise droop retracted). Following recovery, a speed range between 300 KIAS and 400 KIAS should be observed, if conditions permit, because of the possibility that one or both aileron actuators have lost hydraulic fluid resulting in undampened ailerons and possible flutter.

TRIM AND STABILIZATION SYSTEM

In the clean condition, with only the roll stabilization system inoperative, restrictions are not changed from basic aircraft restrictions. With yaw stabilization and rudder-aileron interconnect systems inoperative, the following restrictions apply:

Maximum airspeed — 600 KIAS or 1.30 IMN, whichever is less

Aileron deflection — (1) Clean condition stops, 180°. roll angles

(2) Above 1.10 IMN or 45,000 feet — clean condition stops, 90° roll angles, and no abrupt lateral stick movement

Maximum permissible load factors — See figure 1–50 With any of the stabilization systems inoperative, the maximum permissible speed in the landing configuration is 180 KIAS.

MANEUVERS

The following maneuvers are permitted if the restrictions of figures 1–50 and 1–51 are observed:

Loop

Chandelle

Immelmann turn

Aileron rolls

Note

Aileron rolls shall not be initiated at less than 1.0 g. During rolls, the stick shall not be moved forward of the level flight longitudinal stick position for the entry airspeed used.

The following maneuvers are not permitted:

Intentional spins

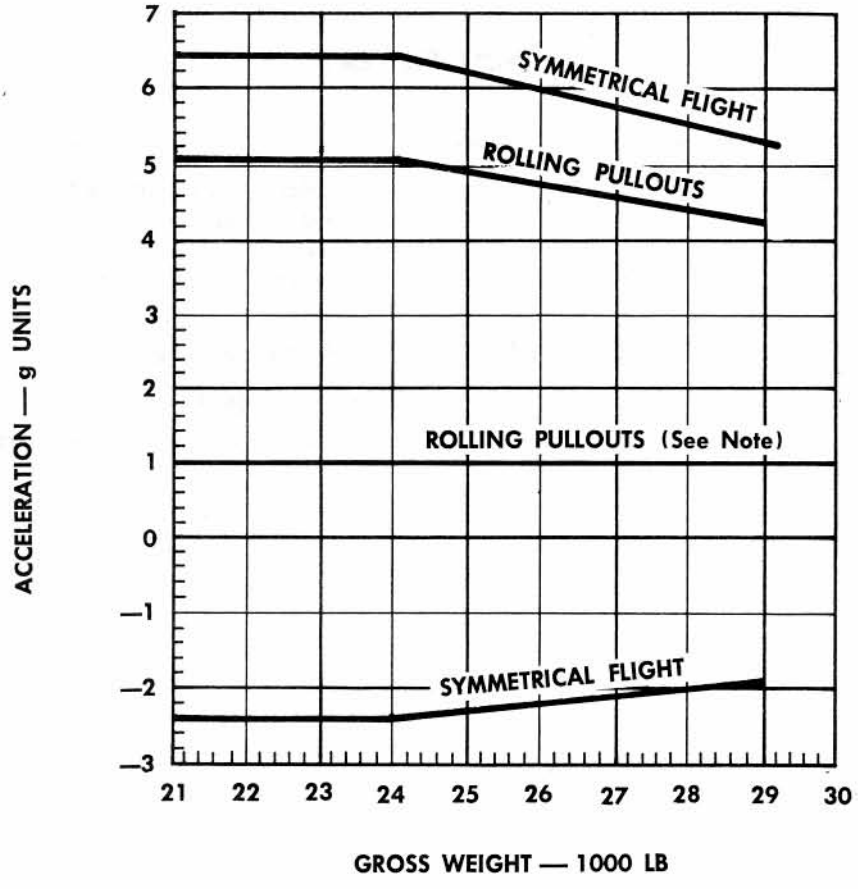
Rolls in excess of 360° bank angle change

ACCELERATION LIMITS VS GROSS WEIGHT

BASIC AIRPLANE

SEA LEVEL TO 25,000 FEET

CLEAN CONDITION



NOTE

Aileron rolls shall not be initiated at less than 1.0 g. During rolls the stick position shall not be moved forward of the level flight longitudinal stick position for the entry airspeed used.

72282—1—63—2—69

Figure 1–51

ACCELERATION LIMITATIONS

Note

Except as noted, the following restrictions apply for the basic aircraft with wing down, gear up and with speed brake or leading edge cruise droop extended or retracted.

The maximum accelerations permitted for symmetrical and unsymmetrical flight in smooth air or light turbulence are shown in figures 1–50 and 1–51. When flying in conditions of moderate turbulence, it is essential that accelerations from deliberate maneuvers be reduced 2.0 g below that shown in figure 1–2. This is to minimize the possibility of overstressing the aircraft as a result of the combined effects of gust and maneuvering loads.

The V-n diagram (figure 1-52) depicts the maximum (C_L Max) normal acceleration capability for the basic airplane at 24,000 pounds gross weight and flying at low altitude. The diagram also depicts the normal acceleration capability for sustained (airspeed is maintained) maneuverability with military rated thrust. Normal accelerations greater than those shown for sustained maneuverability will result in an airspeed decay which reduces the maximum (C_L Max) normal acceleration available. This type maneuvering results in rapid approach to an accelerated stall. Refer to section IV part 2 for a discussion on stall characteristics.

Note

Refer to section IV, part 2, for flight characteristics and erroneous accelerometer indications during rolling pullouts near acceleration limits.

With the aerial refueling probe extended, the permissible acceleration range is −1.0 g to 3.0 g.

Permissible range in the landing configuration is 0 to 2.0 g.

The use of landing droop during spin recovery is permitted. With the wing down, landing droops can be extended and retracted hydraulically and extended pneumatically. Following spin recovery, with wing down and landing droop extended, the permissible acceleration range is 0 to 3.5 g. Use of land droops during combat maneuvering is prohibited.

With leading edge droop unlocked (barberpole indication), the permissible acceleration range is 0 to 3.5 g.

Pullups at a rate which exceeds 5.0 g in less than 3 seconds are prohibited.

FUEL SYSTEM ACCELERATION LIMITATIONS

The fuel system is not designed to operate at zero g for extended periods. However, the system will function properly during rapid transient periods between positive and negative accelerations.

To ensure adequate fuel flow to the engine at all times, flight in the range from +0.3 g to −0.3 g is restricted to rapid transient conditions only.

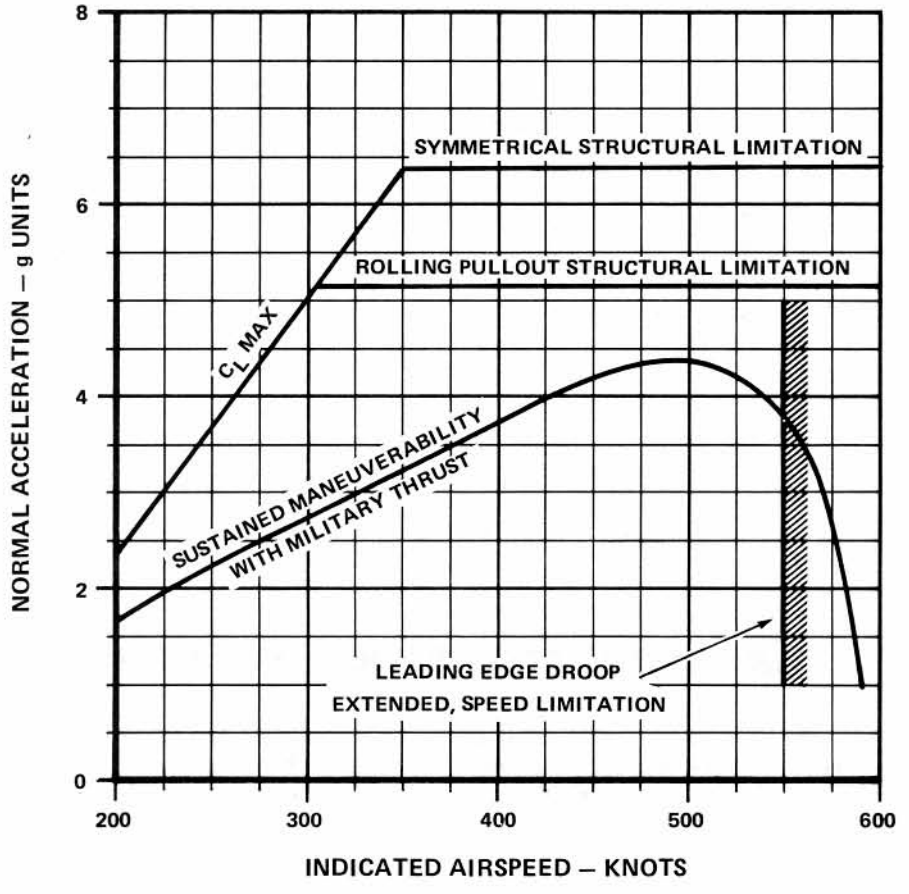
Avoid prolonged operation in the g ranges listed in figure 1–53.

V-n DIAGRAM

Cruise Condition
Standard Day

J57–P–420 Engine

PRESSURE ALTITUDE – 5,000 FEET
GROSS WEIGHT – 24,000 POUNDS



Note

Refer to Section IV, Part 2 for stall characteristics.

Figure 1-52

FUEL SYSTEM ACCELERATION LIMITATIONS

Note

With 1,800 pounds or more of main fuel, adequate fuel is available for sustained operation at military thrust or less at any altitude, and any MACH number while in the g range of +0.3 and above, or in the range of –0.3g and below.

Power Setting	*Main Fuel Quantity*	*Altitude*	
		Below 45,000 ft	*Above 45,000 ft*
MILITARY	More than 1,800 pounds	+0.3g to –0.3g*	+0.3g to –0.3g*
MILITARY	Less than 1,800 pounds	+0.3g and below*	+0.3g and below*
MAXIMUM	More than 2,500 pounds	+0.5g to –1.0g*	+0.3g to –1.0g*
MAXIMUM	Less than 2,500 pounds	+0.5g and below*	+0.3g and below*

*Avoid prolonged operation in these g ranges.

72282-1-51

Figure 1–53

FUEL AVAILABILITY

The following minimum fuel quantities must be maintained in the main fuel system to prevent flameout under the operating conditions stated:

Level flight.....Military thrust — 150 pounds
Maximum thrust — 300 pounds
Best glide ratio.....Idle thrust — 150 pounds
Normal landing attitudes.....Military thrust — 50 pounds
Maximum thrust — 300 pounds
90° climb.....Military thrust — 1,000 pounds
Maximum thrust — 2,000 pounds
70° climb.....Military thrust — 800 pounds
Maximum thrust — 1,500 pounds
Nose down attitudes.....Military thrust — 150 pounds
Maximum thrust — 1,000 pounds

Note

Since there is no instrument that indicates the very high afterburner fuel flow rate, monitor main system fuel quantity carefully when using afterburner following depletion of transfer fuel.

During operation in the allowable negative g range, fuel flow is not sufficient to maintain military thrust with less than 1,500 pounds of fuel in the main system or to maintain maximum thrust with less than 2,200 pounds of fuel in the main system.

In shallow dives (less than 10°), 1,400 pounds of wing tank transfer fuel will not be available because the fuel outlets are at the aft end of the tank.

In dives exceeding 10° the transfer pump shuts down and neither wing tank nor transfer fuselage fuel is available during the dive.

No intentional slips or skids are permitted below 35,000 feet during afterburner operation with less than 2,000 pounds of main fuel.

Do not make abrupt attitude changes with less than 800 pounds of fuel remaining.

ENGINE LIMITATIONS

ENGINE OPERATION

Continuous negative g operation is limited to 10 seconds.

For engine operating limitations, refer to figure 1–54.

To maintain adequate cooling for the engine compartment, observe the limitations presented under COOLING FLOW LIMITATIONS.

OVERTIME ENGINE OPERATION

Engines should not normally be operated beyond the specified time limitations for maximum thrust and military thrust; however, if this becomes necessary for a particular mission, the engine should be operated continuously for the required period of use. Overtime operation can be sustained without immediate adverse results but *the total operating life of the engine will be shortened.* Operating continuously for one slightly longer period instead of using two or more shorter periods will avoid an additional heat cycling of the engine, which is detrimental to engine life.

FUEL GRADE

Approved fuels are:

Ashore
- Primary grade
  - JP-5 (F-44)
- Acceptable alternates
  - JP-4 (F-40)
  - JP-8 (F-34/Jet A-1)
- Emergency fuels†
  - AvGas grades 100/130 (F-18), 115/145 (F-22)
  - F-35*
  - F-42*
  - F-45*

Afloat
- Primary grade
  - JP-5 (F-44)
- Emergency fuels†
  - AvGas grades 100/130 (F-18), and 115/145 (F-22)

Note

F-34, F-35, F-40 and F-45 fuels shall not be defueled into JP-5 (F-44) fuel storage on aircraft carriers because of their low flash points.

*May not be used for high altitude maximum range missions because of relatively high fuel freeze temperature.

†Use of emergency fuel imposes restrictions which are required to prevent excessive fuel cell pressures or to prevent flameout due to booster pump cavitation. Emergency fuel restrictions, none of which apply to the primary or acceptable alternate fuels, are as follows:
- No afterburner operation above 6,000 feet or above 300 KIAS.
- Maximum rate-of-climb, 1,500 feet per minute.
- If less than 2,200 pounds of emergency fuel remains in the transfer system prior to reaching 10,000 feet, do not exceed this altitude. This restriction does not apply when this fuel loading is reached at altitudes above 10,000 feet.

ENGINE OPERATING LIMITATIONS

Operating Condition	Max rpm (%)	Max Exhaust Gas Temp (°C)	Time Limits	Oil Pressure Normal Range (psi)
Ground Starting	— —	450	Momentary	— —
Air Starting	— —	610	Momentary	Indication
Idle	68-70	340	Continuous	35 minimum
Acceleration	106.3			
		720**	Absolute Max	40-55**
		710-719	10 seconds	40-55**
		700-709	20 seconds	40-55**
		690-699	60 seconds	40-55**
		680-689	90 seconds	40-55**
		670-679	4 Min.	40-55**
Military Thrust	106.3	670	30 minutes	40-55**
Maximum Thrust (Afterburner)	106.3	670	15 minutes	40-55**
Normal Rated Thrust	106.3	580	Continuous	40-55**
Negative G Flight	— —	— —	10 Seconds	0

* The cockpit oil pressure gage, because of gage/oil pressure transmitter error, may in some instances show oil pressure out of limits when actual engine oil pressure is within the required 40-55 psi range. Oil pressures outside the normal range are permissible if gage transmitter error is confirmed as the cause or if the excursion is transient in nature (fluctuation limits: 37 minimum — 58 maximum)

** A 10 second peak above 710 degrees C but less than 720 degrees C during and just after acceleration shall not be exceeded. During acceleration, exhaust gas temperature shall not remain above 680 degrees C for more than 90 seconds or above 670 degrees C for more than 4 minutes. This limit is predicated upon the normal overshoot of exhaust gas temperature, as well as thrust, which is experienced upon acceleration of a cold engine from idle to military thrust. A cold engine is defined as an engine which has not, except for momentary excursions, run above idle since starting or which operated 5 or more minutes at idle since operating at powers approaching military thrust. Exhaust gas temperature approaching this limit at other times or which, during steady state operation, exceeds maximum exhaust gas temperature indicated for the applicable thrust setting is indicative of engine malfunction.

72282—1—52—06—72

Figure 1-54

COOLING FLOW LIMITATIONS

Ram air from the engine inlet duct is used for cooling many compartments and components, the most important being the engine compartment, air conditioning compartment, electronic compartment and the oil cooler for the air turbine motor. During most flight conditions, the ram air pressure in the inlet duct is greater than ambient pressure, and air will flow from the inlet duct into the various compartments. On the ground and during flight at low airspeed with a high engine power setting, the cooling air flow reverses. Under these conditions, engine suction creates a low-pressure area in the inlet duct causing air to flow from the compartments into the inlet duct.

There are certain flight conditions for which the engine suction exactly matches the ram air pressure in the duct, and there will be no cooling flow. The flight conditions for no cooling depend on airspeed, altitude and engine power setting, but generally occur only during transient conditions, such as climb or landing approach. However, there are two steady-state flight conditions that can cause reduced or no cooling from the inlet duct and are therefore restricted. These are:

Flight in the landing condition above 175 KIAS, limited to 5 minutes.

Flight in the clean condition below 200 KIAS, limited to 5 minutes.

CENTER-OF-GRAVITY LIMITATIONS

The center of gravity of the basic aircraft will remain within acceptable limits if fuel sequencing is normal. Refer to section V for effects of the center of gravity exceeding aft limits as a result of fuel transfer system failures.

The recommended center-of-gravity range during flight is 24%* to 36% MAC. Refer to the Handbook of Weight and Balance Data AN 01-1B-40 to determine actual center-of-gravity location.

WEIGHT LIMITATIONS

NEW NEW NEW

The maximum recommended gross weights are as follows:

Field takeoff – 30,000 lb

Field landing (minimum rate of descent)– 26,000 lb

Field landing (other than minimum rate of descent) – 24,000 lb

Catapulting – 30,000 lb

Carrier landing and carrier arrestment – 24,000 lb

Barricade engagement - 24,000 lb (22,500 lb aboard carriers equipped with Mk 7 Mod 1 arresting gear without sheave dampers).

NEW NEW NEW

*Approximate takeoff center-of-gravity with full fuel load and normal fuel sequencing.

section II
indoctrination

CONTENTS

Ground Training Requirements 2–1
Flight Training 2–2
Flight Qualification Requirements 2–2
Personal Flying Equipment 2–3

GROUND TRAINING REQUIREMENTS

The overall ground training syllabus for each activity varies according to local conditions, field facilities, requirements from higher authority, and the immediate unit commander's estimation of operational squadron readiness. However, in order to ensure that all F-8 pilots are properly indoctrinated, thoroughly briefed, and adequately prepared to fly the aircraft, certain specific courses must be standardized. An outline of those courses and subjects which are required for all F-8 pilots is presented below. Also presented are the subjects upon which continued ground training is based. The frequency and number of hours devoted to each course depends upon the progress and circumstances pertaining to each command.

GENERAL REQUIREMENTS

Prior to familiarization flights in the F-8, the FAM pilot must:

1. Possess a current medical clearance.
2. Meet physiological requirements of the current edition of OPNAV Instruction 3710.7 series.
3. Complete the F-8 NAMT Pilot's Familiarization Course consisting of approximately 40 hours of instruction.

4. Receive lectures on the following subjects from the readiness training squadron or an F-8 operational squadron:
   All aircraft systems
   Emergency procedures
   Flight characteristics and operating limitations
   Stall and spins (including LTV movie)
   Ground operations
   Local area course rules and facilities
5. Complete a torso harness suspension drill.
6. Satisfactorily complete a minimum of three oft/wst procedures trainer flights of which one must have been completed within two weeks of first FAM flight.
7. Practice a dry-run ejection in an F-8 ejection seat.
8. Satisfactorily complete a blindfold cockpit check.
9. Complete a supervised engine start and taxi checkout.
10. Satisfactorily complete NATOPS open and closed book examinations.

RECONNAISSANCE REQUIREMENTS

The aerial reconnaissance ground training syllabus will include:

1. Basic aerial photography
2. Aerial cameras, magazines and films
3. Photo systems and operation
4. ECM systems and operation
5. Maps and grids
6. Photo planning
7. Night photography
8. Flight technique

FLIGHT TRAINING

The geographic location, the specific flight training concept, local command restrictions, and other factors influence the actual flight syllabus and the sequence in which it is completed. This training is accomplished in the readiness training or fleet squadron.

FLIGHT QUALIFICATION REQUIREMENTS

The following criteria shall be met within specific flight phases:

FAMILIARIZATION PHASE REQUIREMENTS

1. Prior to the familiarization phase, all pilots shall have:
   - Completed the ground training syllabus covered under GENERAL REQUIREMENTS
   - Prior landings in a swept-wing aircraft
2. A qualified chase pilot will be assigned for a minimum of three familiarization flights. The chase pilot will certify that the FAM pilot is safe for solo.
3. An F-8 experienced RDO or instructor chase pilot will monitor all familiarization landings until the FAM pilot is certified in writing to be safe for solo.

ADDITIONAL PHASE REQUIREMENTS

Additional requirements for various phases are:

1. Instruments (Actual)
   - Be basic instrument qualified in series:
     Three satisfactory simulated instrument sorties
     Three satisfactory TACAN penetrations
     Five satisfactory GCA approaches
   - Have satisfactorily completed an instrument progress check on the instrument training portion of the aircraft series training syllabus and an in-type instrument check
2. Night
   - Be instrument qualified in series

3. Cross-Country
   - Have 25 hours in series
   - Be instrument qualified in series
   - Have completed a servicing checkout
   - Have had at least one night familiarization flight
4. Carrier Qualification

   Type Commanders criteria plus:
   - Day qualification:
     Be FCLP qualified
     Have a minimum of 50 hours in series
   - Night qualification:
     Be night FCLP qualified
     Completed day carrier landings

CURRENCY, AIRCRAFT FERRY, AND REQUALIFICATION REQUIREMENTS

To be considered currently qualified in the F-8, the pilot must meet the following requirements:

Total Time in F-8 Series	*Pilot must have flown . . .*	*Within last . . .*
10 – 100 hours	5 hours	3 months
100 – 300 hours	10 hours or	6 months
	5 hours	3 months
300 hours or more	10 hours or	12 months
	5 hours	3 months

If these requirements are not met, familiarization phase requirements with the exception of NAMT must be completed.

Training requirements, checkout procedures, evaluation procedures and weather minima for ferry squadrons are governed by the provisions contained in OPNAVINST 3710.6 series.

GENERAL REQUIREMENTS

Any pilot not flying for a 2-week period after commencing a training syllabus shall complete at least one OFT/WST or COT procedures trainer flight (if available) prior to his next F-8 flight. Any pilot not flying the F-8 for a 2-week period shall be required to have a day launch prior to any F-8 night flight.

Note

Commanding Officers are authorized to waive minimum flight requirements and/or OFT/WST or COT training where recent experience in similar models warrants.

PERSONAL FLYING EQUIPMENT

The following equipment will be worn or carried on all flights. All flying equipment will be modified in accordance with current aviation clothing and survival equipment bulletins.

1. Protective helmet – adorned with high visibility paint/reflective tape.
2. Impact resistant flying boots.
3. Fire resistant flight gloves.
4. Fire resistant flight suit.
5. Identification tags.
6. Survival sheath knife and shroud line cutter.
7. Flashlight (for all night and cross-country flights).
8. Signal device – an approved pistol with tracer ammunition, or pencil flare gun, MK 79 series.
9. Oxygen mask, A-13 series.
10. Anti-g suit. Two ejection seat garters shall be attached to each leg. One shall be centered on the heavy part of the calf, and the other above the knee directly on a line with the front edge of the ejection seat.
11. Survival vest.
12. Integrated torso harness – full or cutaway.
13. Authorized NAVAIR flotation garment for all over-water flight.
14. Antiexposure garment on all over-water flights when the water temperature is 59°F (15°C) or below; or OAT is 32°F (0.00°C) or below; or when the

combined air/water temperature is 120°F (48.89°C) or below. Exceptions to these requirements are as follows:

- Not required when the water temperature is above 50°F (10°C) and aircraft is within gliding distance of land.
- When high ambient cockpit temperature would create a hazardous debilitating effect on the pilot, type commanders are authorized to grant a waiver.

15. Operational equipment appropriate to climate or the area.

16. Navigation packet.

17. Pocket checklist.

The maximum weight of pilot and flight gear for safe operation of the MK F-7A ejection seat is 247 pounds.

section III
normal procedures

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PART 1—BRIEFING/DEBRIEFING

BRIEFING

The flight leader is responsible for ensuring that all flight members are properly briefed on the operation and conduct of the mission. The briefing will be conducted using a briefing guide and a syllabus card, if applicable. Each pilot in the flight will maintain a kneepad and will record flight numbers, call signs, and all other data necessary to assume the lead and complete the assignment if it should become necessary. The following information will be covered during the briefing:

GENERAL

- Aircraft assigned, call signs
- Engine start, taxi, and takeoff times
- Visual signals and rendezvous instructions

MISSION

- Priority of mission and specific targets
- Electronic countermeasures requirements
- Purpose of photography
- Type of photography
- Location of target
- Description of target
- Types of cameras, magazines and films
- Number and length of runs
- Time required on station
- Altitude and scale with alternate targets and targets of opportunity
- Approach and retirements
- Fighter escort
- Pathfinder escort

COMMUNICATIONS

- Frequencies
- Radio procedure and discipline
- Navigational aids
- Identification and ADIZ procedures

WEATHER

- Local area
- Local area and destination forecasts
- Weather at alternate
- High altitude weather for jet stream, temperature, and contrail band width

NAVIGATION AND FLIGHT PLANNING

- Takeoff
- Climbout
- Mission route, including ground controlling agencies (GCI, APC, etc.)
- Fuel/oxygen management
- Marshall/holding
- Penetration
- GCA or CCA
- Recovery

EMERGENCIES

- Aborts
- Divert fields
- Bingo and low-state fuel
- Wave-off pattern
- Ready deck
- Radio failure
- Loss of visual contact with flight
- SAR procedures
- System failures
- Stall/spin procedures

AIR INTELLIGENCE AND SPECIAL INSTRUCTIONS

- Friendly and enemy force disposition
- Current situation
- Targets
- Safety precautions

OPERATING AREA BRIEFING

Prior to air operations in and around a new area, it is mandatory that a comprehensive briefing be given covering (but not limited to) the following:

Bingo Fields

Instrument approach facilities
Runway length and arresting gear
Terrain and obstructions

Emergency Fields

Fields suitable for landing but without required support equipment
Instrument approach facilities
Runway length and arresting gear
Terrain and obstructions

SAR Facilities

Type
Frequencies
Location

DEBRIEFING

Immediately after the flight, all pilots will assemble for a debriefing and critique. It will be conducted or supervised by the flight leader and will cover the following:

- Interrogation by an intelligence officer if applicable
- General discussion covering all phases of the flight
- Operational and tactical information that can be given to squadron operations for relay to flight leaders of subsequent flights (include weather, etc.)
- Critique of breakups and landings

The importance of the postflight debriefing and critique cannot be stressed too highly. To derive maximum benefit, constructive criticism and suggested improvements to doctrine, tactics, and techniques should be given and received with frankness, purpose, and in the spirit of improving the proficiency of the unit as well as the individual pilot.

PART 2—MISSION PLANNING

Refer to section XI for detailed instructions concerning mission planning.

PART 3—SHORE-BASED PROCEDURES

LINE OPERATIONS

ACCEPTING THE AIRCRAFT

Check the yellow sheet for flight status, fuel load, camera configuration, and ordnance loading. Review the discrepancies from the 10 previous flights and the corrective action taken. When satisfied with the yellow sheet information, sign the applicable portions and proceed with the exterior inspection.

EXTERIOR INSPECTION

The exterior inspection is presented in figure 3–1, and is reproduced in the pocket checklist. During flight operations away from the parent organization, ensure that the following additional systems postflight and servicing procedures are completed:

Engine accessory gear drive oil level
Viscous dampers
Wing fuel quantity (external indications)
Liquid oxygen system
Hydraulic systems

The airplane may be cleared for flight with fasteners missing from access doors and panels provided that the following restrictions are observed:

- No fastener shall be missing from any door or panel in the cockpit area. Missing fasteners could affect cockpit pressurization.

- Not more than 10% of the total fasteners in any row on any door or panel may be missing. Two fasteners in a row of 20 or more fasteners may be missing only when the two missing fasteners are separated by two installed fasteners.

- The first and last fastener in any row must be installed. No fastener may be missing from the leading edge of any door or panel if an unfastened gap longer than three inches is created.

- No fastener which performs a secondary function of supporting a bracket or other equipment may be missing.

COCKPIT ENTRY *(See figure 3–2)*

The canopy is opened manually by the canopy release handle, located on the left side of the fuselage directly below the canopy frame. Depress the forward part of the handle, grasp the handle arm and pull forward to unlock the canopy. Raise the canopy by using the handle on the canopy frame and attach restraining strap.

COCKPIT CHECKS

Perform the following checks before connecting external power:

General

1. Ejection Seat – INSPECT; PULL 4 OF THE 7 PINS (See figure 3–3.)
   a. Canopy actuator
   b. *Power retractor sear
   c. *Main gun (scissors type)
   d. *Drogue gun (push-to-release type)

*These should be attached to the face curtain pin and REMOVE BEFORE FLIGHT flag.

- Leave the face curtain pin installed until strapped into seat.

(Text continued on page 3–13)

EXTERIOR INSPECTION

1 NOSE SECTION

Access doors and panels	SECURED*
Pitot cover	REMOVED
Nose cone	SECURED

WARNING

Do not enter the intake duct with an external pneumatic source connected to the engine starter.

Intake duct	In the presence of the pilot the plane captain will remove all loose gear from his person and crawl down the duct to inspect the entire area including the front row of compressor blades.
A/A transducer vane	NO DAMAGE
Oxygen filler	CAP SECURE, ON BUILDUP, COVER CLOSED
Emergency air vent	CLOSED
Viewfinder and camera windows	NO DAMAGE, CLEAN

2 NOSEWHEEL WELL

Nose gear doors	SECURE
Nose gear	STRUT, TIRE
Spotting/Jacking bar	REMOVED
Downlock	INSTALLED
Underside of fuselage	NO HYDRAULIC LEAKS

NEW 3 RIGHT FORWARD FUSELAGE

TTRI	COUNTERS ZERO, NO FLAPS
Static ports	CLEAR
Utility hydraulic reservoir	PROPER SERVICE
Pneumatic gages	PROPER PRESSURE
Underside of fuselage	NO FLUID LEAKS
Camera Compartment Windows	NO DAMAGE, CLEAN
Time temp recorder integrator	COUNTERS ZEROED, NO FLAGS
Lower anticollision light	NO DAMAGE
Access doors and panels	SECURED*
Speed brake	NO DAMAGE OR FLUID LEAKS

4 RIGHT MAIN WHEEL WELL

Gear door and actuator	SECURE, NO CRACKS
Wheel well	NO HYDRAULIC LEAKS
Gear	STRUT EXTENSION, TIRE INFLATION
Chocks	IN PLACE
Main wheel brakes	CHECK FOR SECURITY DISC NOT BINDING
Wheel bolts	SECURE, NONE MISSING
Land/taxi light	NO DAMAGE
Fuel system vent port	NOT COVERED
Downlock	INSTALLED AND ROTATES FREELY
PC accumulator	NO LEAKS
Tiedown ring	FLUSH
Gear-up lockpin	SECURE
Uplock roller	NO BINDING
Main fuel line	NO LEAKS
Chaff disable power switch pin	INSTALLED

5 RIGHT WING

Check general condition	NO FLUID LEAKS
Access doors and panels	SECURED*
Leading edge	NO DAMAGE OR HYDRAULIC LEAKS
Wing hinge pins (wings spread and locked)	LOCKED
Wingfold warning flags (wings spread and locked)	RETRACTED
Donut seal (wings folded)	NOT LEAKING OR DEFORMED
Jury struts (wings folded)	REMOVE
Position light	NO DAMAGE
Aileron	NO DAMAGE OR LEAKS, BATTEN REMOVED
Spoiler	NO DAMAGE
Flap	NO DAMAGE

*Refer to EXTERIOR INSPECTION paragraph for information on allowable missing fasteners.

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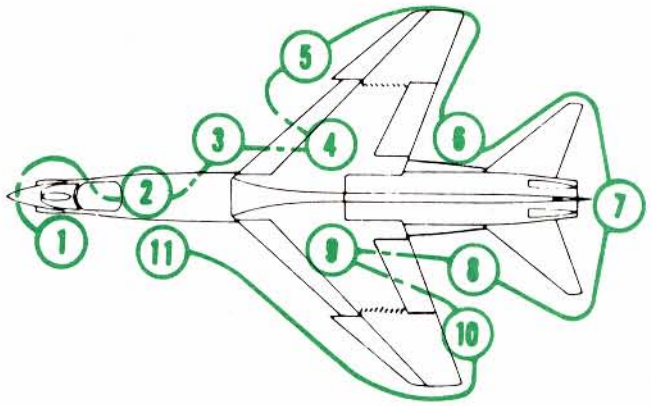
Figure 3-1 (Sheet 1)



6 RIGHT AFT FUSELAGE

PC No. 2 reservoir	PROPER SERVICING
Access doors and panels	SECURED*
Fuel cell cavity vent ports	NO OBSTRUCTION
Right ventral fin	SECURE, NO DAMAGE
Underside of fuselage	PANELS SECURE, NO FLUID LEAKS

7 EMPENNAGE AND TAIL CONE

Tail hook	SECURE, NO LEAKS
Horizontal tail	NO DAMAGE
Vertical tail	NO DAMAGE
Rudder	NO DAMAGE, BATTEN REMOVED
Position light	NO DAMAGE
Tailpipe	NO WRINKLES OR CRACKS, COLOR NORMAL
Nozzle bearings	NO RUST OR BINDING
Nozzle flaps	NO DAMAGE, BINDING OR RUST ON LINKAGE
Upper wing surfaces	PANELS SECURE, NO WRINKLING OR BUCKLING

8 LEFT AFT FUSELAGE

Repeat step 6

Fuel vent	NO OBSTRUCTION
PC No. 1 reservoir	PROPER SERVICING
Engine oil filler cap and door	SECURE

9 LEFT MAIN WHEEL WELL

Repeat step 4

Wing fuel manual shutoff valve	OPEN
Fuel selector switch	POWER OFF
Pressure fueling cap	SECURED
Approach lights	NO DAMAGE, LENSES CLEAN
Jet starting receptacle	STARTER PROBE LEAD CONNECTED
Hydraulic hand pump handle	STOWED
Bypass valve indicator	INDICATOR PIN-IN

10 LEFT WING

Repeat step 5

11 LEFT FORWARD FUSELAGE

Access doors and panels	SECURED*
Static ports	CLEAR
Camera compartment windows	NO DAMAGE, CLEAN
Upper anticollision light	NO DAMAGE
Canopy	CRAZING OR CRACKS WITHIN LIMITS

*Refer to EXTERIOR INSPECTION paragraph for information on allowable missing fasteners.

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Figure 3-1 (Sheet 2)

COCKPIT ENTRY

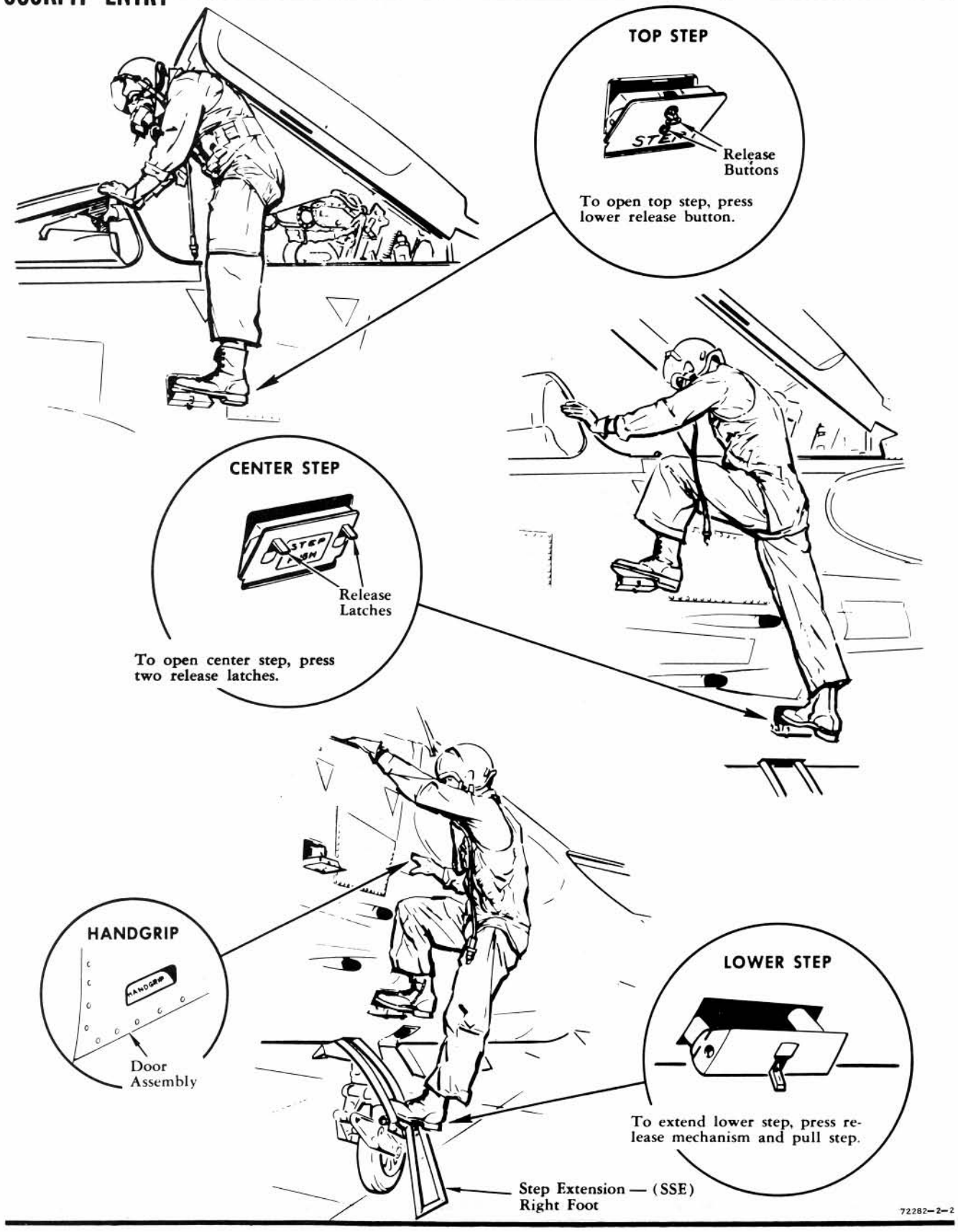


Figure 3–2

MK-F7 EJECTION SYSTEM INSPECTION

WARNING

Ensure that all seven ejection system safety pins (sheets 3 and 4) are installed before entering airplane.

BEFORE ENTERING SEAT, CHECK:

1 Check seat type to determine ejection capability.

1A Canopy interrupter release handle stowed.

2 Link line passed through guillotine trap (yellow door) and connected to parachute withdrawal line with no gap between connector halves. Assure parachute locking pin withdrawal line is free of guillotine trap door.

2A Top latch plunger not protruding from end of top latch housing.

2B Indicator plunger flush with end of top latch plunger.

3 Parachute ripcord stowed.

4 Shoulder harness–to ensure proper attachment.

4A Check that the indicator on the bottom of the drogue gun firing mechanism extends about one-half inch from the bottom of the mechanism. This indicates the mechanism is cocked.

5 Drogue gun trip rod (LH side) pinned to bulkhead behind seat. Red painted section of trip rod not showing (should be covered by trip rod outer barrel).

5A Rocket firing lanyard properly inserted in tiedown fitting. (Fitting is located on floor and is visible to pilot by viewing down the rear of the left hand side of the seat.)

6 Face curtain handle stowed.

7 Face curtain firing cable undamaged and connected to ejection gun sear.

8 Canopy interrupter cable undamaged, properly routed, and connected to interrupter release pin and to canopy bulkhead.

NOTE

On ejection seats with Aircrew Systems Change No. 270, the shoulder of the interrupter release pin hole has been reworked to a larger radius.

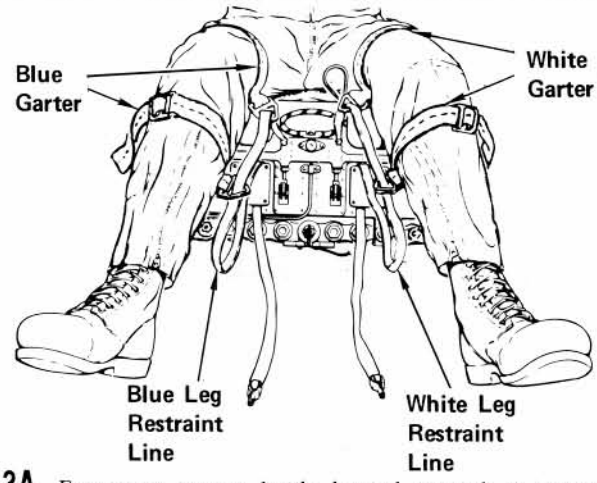
9 Drogue parachute withdrawal line routed as shown and lying aft and below level of canopy breaker points.

10 Timed-release mechanism trip rod (RH side) pinned to bulkhead behind seat. Red painted section of trip rod not showing (should be covered by trip rod outer barrel).

11 Emergency restraint release handle stowed and attached to guillotine firing mechanism.

12 Lap harness–to ensure proper attachment.

13 Emergency oxygen bottle fully charged.



13A Emergency oxygen bottle lanyard secured to structure, lanyard quick-disconnect locked, and lanyard not fouled on seat or cockpit floor.

14 Pull the first group of safety pins in the following order:

a. Canopy actuator initiator pin

b. Power retractor firing mechanism pin

c. Ejection gun pin

d. Drogue gun pin

(Pins and locations are illustrated in sheets 3 and 4.)

AFTER ENTERING SEAT, CHECK:

15 Lower ejection handle stowed.

CAUTION

If it is necessary to fully extend the power harness reel straps, maintain tension on strap while recoiling to prevent overlapping of webbing on reel spool. If overlapping occurs, it will prevent complete strap retraction.

15A Emergency oxygen actuator stowed.

16 Leg restraint lines pulled to check snubber action.

16A Don garters: Both blue garters on the right leg and both white garters on the left leg. The upper garter should be worn just above the knee directly in line with the front edge of the ejection seat, the lower garter shall be worn centered on the heavy part of the calf.

17 Emergency canopy jettison handle stowed (not illustrated).

18 Remove remaining safety pins in the following order:

a. Guillotine firing mechanism pin

b. Lower ejection handle pin

c. Face curtain pin (plane captain may remove)

(Pins and locations are illustrated in sheet 4.)

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Figure 3–3 (Sheet 1)

MK-F7 EJECTION SYSTEM INSPECTION

19 Hand safety pins to plane captain who shall display the seven pins prior to stowing them in the safety pin container.

WARNING

A small pilot utilizing the MK-F7 ejection seat should raise the seat as high as practical on the ground and in the traffic pattern. This is to ensure a favorable ejection seat center-of-gravity position. In the somewhat unlikely event that a small pilot had the seat fully lowered and was forced to eject at close to zero-zero conditions, a safe ejection could be jeopardized due to unfavorable seat cg position.

20 Route leg restraint lines as shown and attach plug-in fittings to front of seat. The leg restraint lines must be hooked up at all times during flight to ensure that the legs will be restrained in the aft position following ejection. This will prevent leg injury and enhance seat stability by preventing the legs from flailing.

WARNING

Do not cross the leg restraint lines or pass them around the control stick. Misrouted lines can result in serious pilot injury upon ejection.

21 Push leg restraining release lever and extend legs to normal operating position. If too much line has been released from the restraint snubber, raise the seat and manually pull the line from the lower side of the snubber.

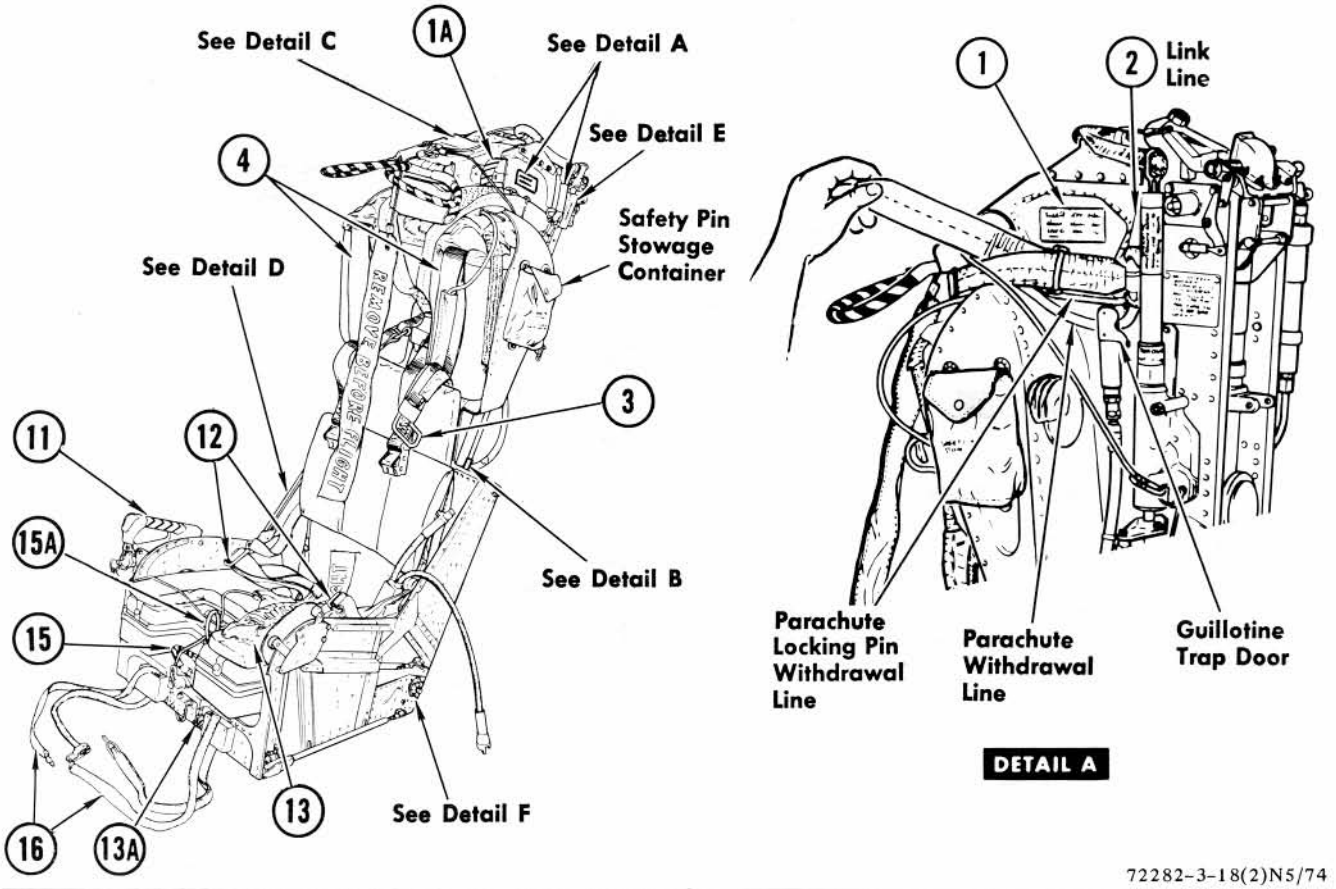
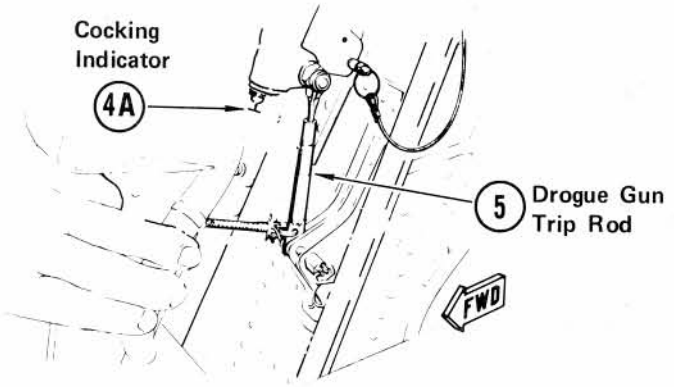
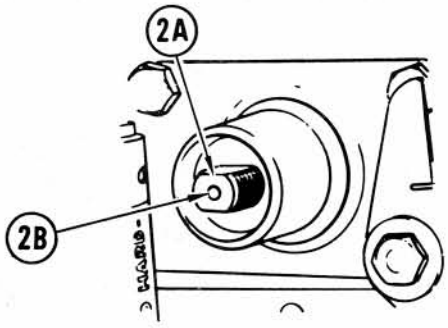


Figure 3–3 (Sheet 2)

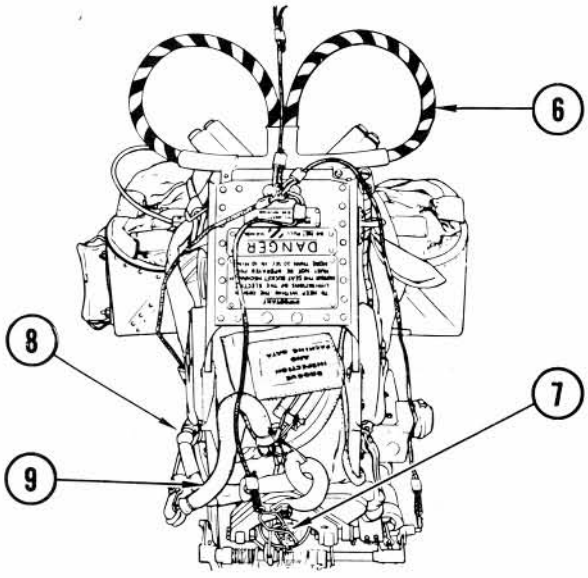
MK-F7 EJECTION SYSTEM INSPECTION



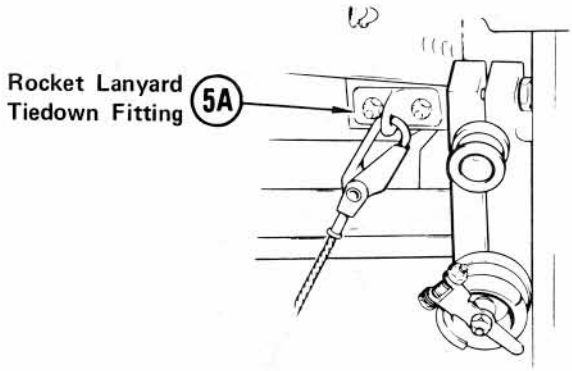
DETAIL B



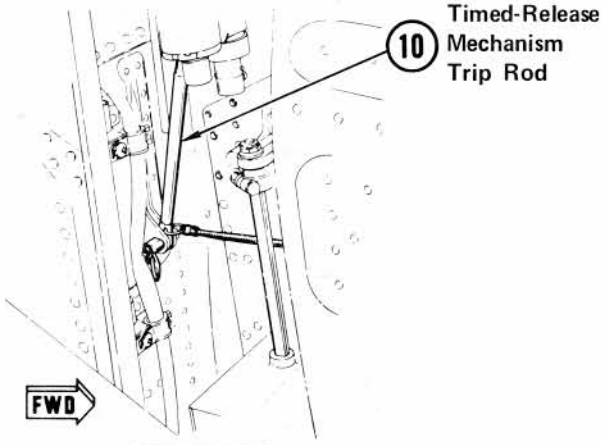
DETAIL E



DETAIL C



DETAIL F



DETAIL D

CANOPY ACTUATOR

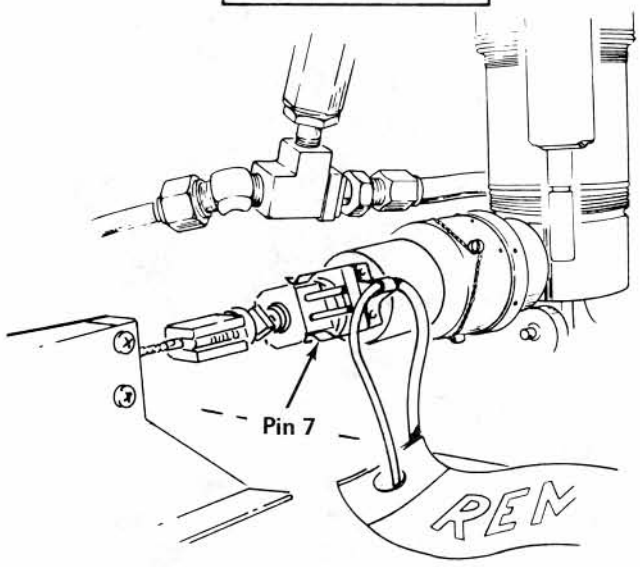


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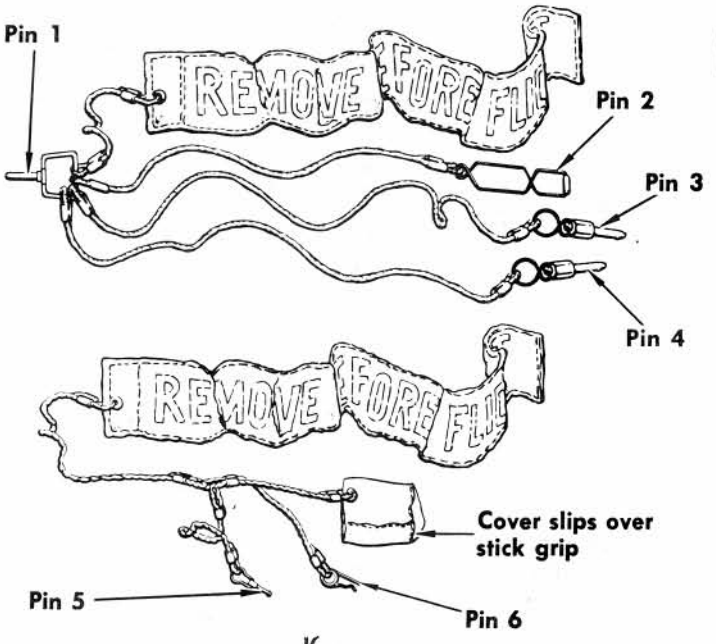
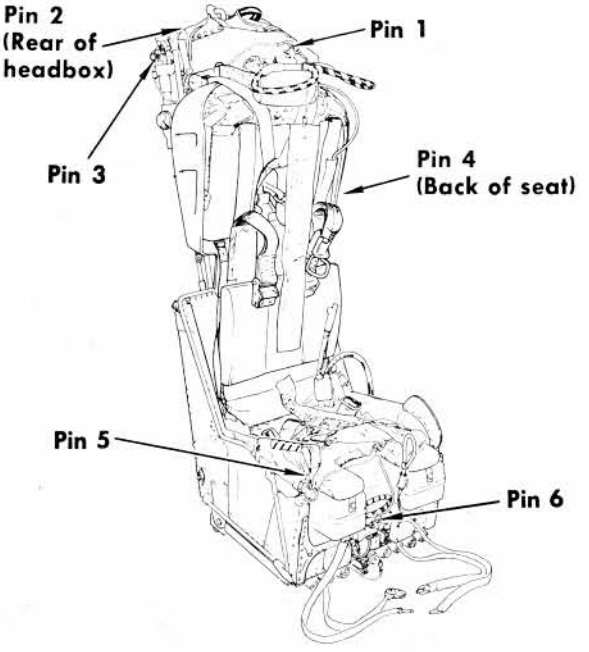
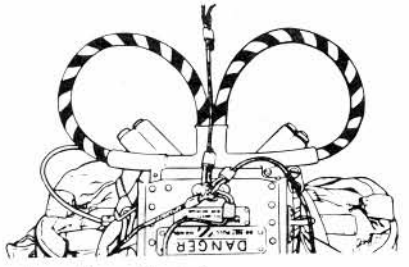
Figure 3-3 (Sheet 3)

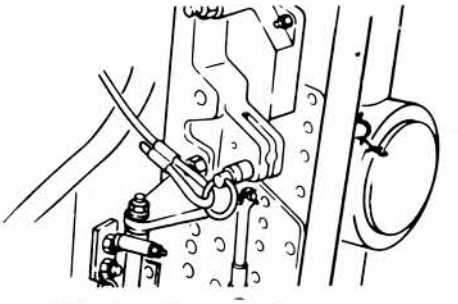
MK-F7 EJECTION SYSTEM INSPECTION



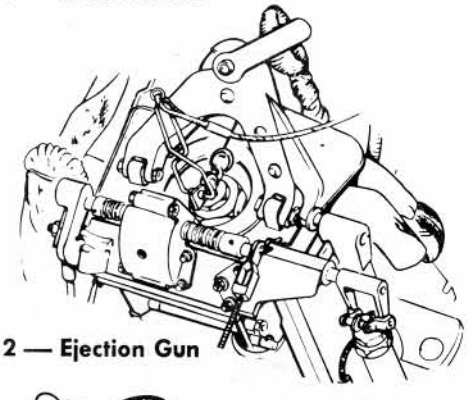




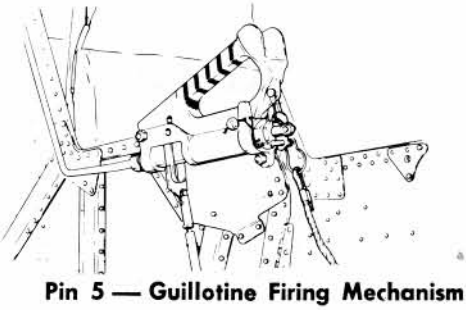
Pin 1 — Face Curtain



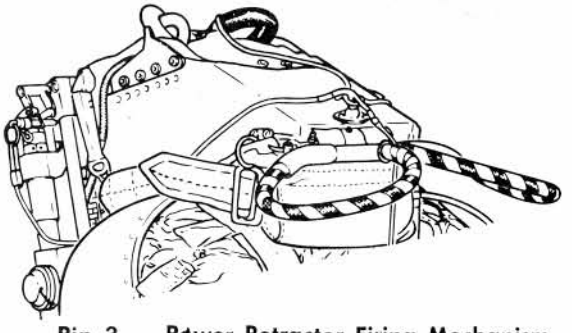
Pin 4 — Drogue Gun



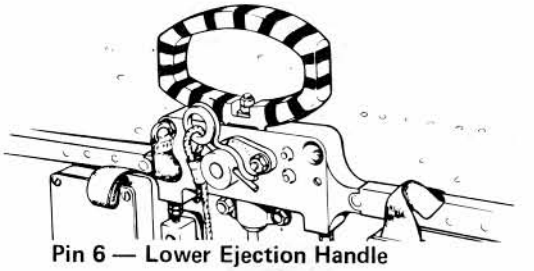
Pin 2 — Ejection Gun



Pin 5 — Guillotine Firing Mechanism



Pin 3 — Power Retractor Firing Mechanism



Pin 6 — Lower Ejection Handle

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Figure 3–3 (Sheet 4)

2. Seat – BOARD, CONNECT FITTINGS, PULL LOWER 2 PINS

- Check seat pan for security, emergency oxygen bottle, and URT-33 deck lanyards for proper attachment.
- Exercise care in stepping into cockpit; try not to step on seat pan or inadvertently to pull out URT-33 beacon pin.
- Fittings to attach: leg restraints (2) routed through leg garter D rings; lap-belt Koch fittings (2) to torso harness lap fittings; parachute riser Koch fittings (2) to torso harness riser attachments.
- When strapped in, pull 2 lower pins (guillotine sear and lower ejection handle) attached to REMOVE BEFORE FLIGHT flag and/or stick-grip cover. Stow pins.
- Pull, or instruct plane captain to pull, face curtain pin and note 4 pins and flag; stow. Total of 7 pins removed and stowed. Seat armed.

3. Rudder pedals – ADJUST

- Use crank under armament (photo) panel.
- Seat and rudder should be adjusted so that full throw of rudder pedals is available. Leg restraints should exert slight tug on leg when full rudder pedal throw is reached and should not be loose.

Left Side

4. Pilot services – CONNECT

- Includes oxygen/communications fitting, anti-g suit fitting, and antiexposure coverall vent hose fitting (if suit is worn).
- Check oxygen/communications plug-in to left console.

5. G-Valve knob – SET AS DESIRED; CHECK TEST VALVE

- Clockwise rotation of knob sets HI (inflation at lower g); counterclockwise rotation sets LOW (inflation at higher g).
- Test valve should depress and spring back freely.

6. Speed brake override switch – NORMAL, GUARD DOWN

7. Antiexposure coverall vent switch – NORMAL CABIN PRESS

- The COOL position may be used to direct more air into the ventilated exposure suit during ground operations, but it must be in NORMAL CABIN PRESS during flight for proper cabin pressurization.

8. Antiexposure coverall ventilation knob – AS DESIRED

- If an antiexposure coverall is not worn, knob should be OFF (fully counterclockwise).

9. Wing locking handle – UNLOCKED

- The wing is left unlocked for all ground operations.

10. Emergency droop/wing incidence guard – DOWN

- The guard should be flush with the forward edge of the wing incidence control and the wing incidence handle track should be in place (not cocked to one side).

11. Wing incidence handle – MATCH WING POSITION

- Normally the wing is down prior to starting, and the wing incidence handle should be down. If the wing is up check that the wing incidence handle is up.

12. ARA-63 power switch – OFF

- The location of the ARA-63 precision approach system control box varies from one aircraft to another.

13. Flare ready and salvo switches – OFF/GUARD DOWN

14. Camera power switch – OFF

15. Computer/scanner switch – COMPUTER

16. ECM power switch – OFF

17. Fuel control switch – NORMAL

18. Rudder trim knob – NEUTRAL (12 o'clock)

19. Throttle – OFF

CAUTION

If throttle is not OFF when main fuel shutoff valve opens, a fuel spill could result from the engine fuel drain lines.

20. Speed brake switch – IN (FORWARD)

- Switch has three positions: OUT (aft), OFF (center) and IN (forward). If the switch actuates improperly or resists movement into any position, have it checked by maintenance personnel.

21. Cruise droops switch – IN

- The throttle grip will be aligned with the shaft when IN is selected.

22. Throttle friction wheel – ADJUST

- Forward rotation increases friction; aft rotation decreases friction. Normally, friction is set at minimum for starting. There should be no binding of the throttle at minimum friction setting.

23. Emergency brakes/UHT locking handle – OFF (forward)

- Do not move handle out of its OFF (full forward) position unless emergency brakes are required. If it is used, or if it is found to be locked aft, the brakes must be bled prior to taxi/flight.

24. UHT lock latch – UNLOCKED (not across slot)

WARNING

If the lock latch is locked, it will prevent full lockup of the UHT locking cams and decrease emergency braking effectiveness.

25. Engine master switch – OFF

CAUTION

If engine master switch is left ON and throttle is not OFF, a fuel spill could occur from the engine fuel drain lines when the main fuel shut-off valve opens.

26. Emergency spin droop switch – OFF, GUARD DOWN

Note

If the emergency spin droops are extended on the ground, maintenance assistance will be required to reestablish normal cruise and land droop sequencing.

27. Land/taxi light switch – OFF

Note

Some aircraft do not have the land/taxi light system installed.

28. Exterior lights master switch – OFF

29. Anticollision light – ON

30. Emergency probe extend switch – OFF

Note

If the emergency probe extend switch is in the EXT position when the IFR probe switch is placed in the OUT position, maintenance assistance will be required to retract the IFR probe.

31. Speech security switches – P and OFF (both down)

- Failure to position these switches as indicated could result in UHF communications difficulties.

32. Yaw stabilization switch – OFF RESET

33. Roll stabilization switch – OFF RESET

34. Approach power compensator engage switch – OFF (aft)

- Switch will not hold in the engaged (forward) position until certain electrical and configuration conditions are satisfied. If it does not spring-return to OFF after being moved to ENGAGE, the switch is defective or installed incorrectly.

35. Emergency pitch trim handle – CHECK STOWED (down)

- The T handle must be fully stowed or normal pitch trim and automatic retrim functions will be inoperative.

36. Emergency power package handle – STOWED

37. Emergency canopy jettison handle – STOWED COPPER SHEAR WIRED NEW

38. Landing gear handle – DOWN, IN DETENT

- Also ensure that the emergency extension feature is properly stowed.

39. Emergency downlock release switch – OFF, GUARD DOWN

40. Rudder lock handle – UP, IN DETENT

Instrument Board

41. Camera master switch – OFF

42. Radio altimeter – OFF

- Set is off when the knob is full counterclockwise.

43. Altimeter barocounters – CHECK

- Slowly rotate the setting knob on the AAU-19A/A altimeter through a range so that the pointer and 100-foot counter passes through zero. Note smooth operation through the rollover region.

CAUTION

In performing this check do not exceed the range 28.81 to 30.10.

- The STBY indicator should be showing until electrical power is applied and servoed mode is selected.

44. Standby attitude indicator – UNCAGED AND TUMBLED

CAUTION

The standby attitude indicator should be left uncaged except during shipping and handling.

45. Fuel transfer switch – PUMP OFF or PRESS DUMP

46. Air refueling probe (IFR) switch – OFF (center)

NCCS-4 Recon System Control Panel

47. Station selector switches – OFF (center)

48. Rotatable station controls – VERTICAL

49. Film counters – CHECKED AND SET

Right Side

50. Fuel dump switch – OFF

- Raise guard and double check switch in OFF (down) position.

51. Arresting hook handle – MATCH HOOK POSITION

- It is most desirable that the hook be up, so that it can be free-fall checked; however, if it is down, place the hook handle down.

52. Pitot heat switch – OFF

53. Emergency generator switch – OFF

54. Master generator switch – OFF

55. Air conditioning override switch – AUTO

56. Temperature control rheostat – AS DESIRED

- On cool days a setting at about 1 o'clock should be adequate; on warm days an 11 o'clock setting is a good initial setting.

57. Cockpit pressurization switch – CABIN DUMP

58. Rain removal switch – OFF

59. Defogger switch – OFF

60. TACAN switch – OFF

61. UHF function switch – OFF

62. IFF master switch – OFF

63. Cockpit emergency vent knob – CLOSED, STOWED

64. Instrument/console lights rheostats – AS DESIRED

Note

Unless the primary instruments control rheostat is fully counterclockwise in the DAY setting, the warning and caution lights will be dim.

65. Compass mode – SLAVED

- Select the appropriate latitude using the LATITUDE SET knob, in case one of the free gyro modes is selected in flight.

66. Hook bypass switch – FIELD (for shore-based operations)
CARRIER (for ship-based operations)

67. Auxiliary (utility) light – AS DESIRED

- Since the storage socket to the right of the seat is difficult to reach in flight, the light should be removed and placed in the socket on the canopy rail prior to flight.

Stick Grip

68. Pitch trim – SET AT 0 UNITS

69. Roll trim – SET AT 0 UNITS

STARTING ENGINE

Pre-start Checks

1. Starting equipment – IN PLACE

- Equipment should be safely positioned so that exhausts are not directed at the airplane or at ordnance.
- Ensure that areas in front of the intake and aft of the tail pipe are clear of men and equipment.

2. Fire guard – IN PLACE

- One of the ground personnel should be stationed near a fire bottle in case it is needed during the starting sequence.

3. Danger areas (figure 1-48) – CLEAR

- Exchange thumbs up signal with plane captain prior to lowering tailhook and continuing with the start.

4. Arresting hook handle – LOWER

- This free-fall check (without electrical or hydraulic power to the airplane) is desirable, but it is impractical if the aircraft is spotted tail-over-catwalk, or if the tailhook is already down.

5. External electrical power – PLUGGED IN, EXTERNAL POWER UNIT ON

- Give the plane captain the one finger plug-in signal.

NEW 6. Master generator switch – TEST

7. Landing gear position indicators and seat adjust – CHECK 3 WHEELS/CHECK UP AND DOWN OPERATION

- These checks establish the presence of EMERGENCY DC bus and SECONDARY AC bus power.
- Exchange the drink and pitot heat check signals with the plane captain.

8. Engine master switch - ON/OFF/ON

- The BOOST PUMPS warning light will go out, come on, and go out again during this sequence.
- The plane captain will check the main fuel shutoff valve in the right main landing gear well, ensuring that it opens, closes, and opens again in response to the engine master switch.

9. Pitot heat switch – ON

- The plane captain will check the pitot tube for proper operation of the heater and then indicate by a thumbs up signal that pitot heat and the main fuel shutoff valve are operating properly.

10. Engine oil/hydraulic warning light – ON

- Warning light will be on until oil and hydraulic pressures are at sufficient levels to cause it to go out.

Note

If light is not on, ask for maintenance assistance to determine the cause of its failure.

11. Engine fuel pump warning light – ON

- This light must be on prior to start, which indicates lack of pressure from the engine-driven fuel pump's main engine stage.

WARNING

If warning light is not on, ask for maintenance assistance to determine the cause of its failure.

12. Warning and advisory lights – PRESS TO TEST

- All warning and advisory lights should be checked at this time. They include the following:

EMER GEN ON	FIRE
*OXYGEN/UHT Locked	PROBE OUT
FUEL BOOST PUMPS	SPEED BRAKE
LOW FUEL	RUDDER NEUTRAL
TURN PUMP OFF	AILERON NEUTRAL
*ECM	APC ENGAGE

*These are light cubes – press once to test, press again to extinguish.

13. Fuel control switch – NORMAL, GUARD DOWN

Advisory Lights – CHECK, AS FOLLOWS:

SHOULD BE ON	MAY BE ON
WING/WHEELS/DROOPS (flashing)	AILERON NEUTRAL
	RUDDER NEUTRAL
YAW STAB	SPEED BRAKE
ROLL STAB	LOW FUEL (main cell level less than 1100)

14. Exterior lights master switch – ON

- The anticollision light and any other exterior lights preselected should illuminate, warning personnel in the area that the aircraft is about to be started.

Engine Start Checks

1. External air source – CONNECTED

- If the air source has not already been connected, give the plane captain the two-finger plug-in signal.
- Give the plane captain the two-finger turn-up signal to start airflow from the air starting unit.

2. Throttle – CRANK – IGNITE (at about 5% rpm) IDLE (at about 12% rpm)

- Static can usually be heard in the headset, confirming operation of the igniters.
- Fuel flow should advance to 750-850 pph initially, and the engine fuel pump light should go out.

3. Engine instruments – MONITOR

- Light-off occurs between 17% and 21%, EGT being the first indication. Lightoff should occur within 20 seconds and engine rpm within 45 seconds of placing throttle to idle detent.
- EGT must not exceed 450°C during start and acceleration to idle; maximum temperature usually observed is less than 350°C.
- Fuel flow will normally be between 1500 and 2000 pph during acceleration to idle.
- Oil and hydraulic pressures should rise, and the engine oil/hydraulic warning light should go out.
- If any indication is incorrect, abort the start.

4. External air source – DISCONNECT AT 40%

- Give the plane captain the two-finger disconnect signal at 40% rpm, and he will cut off air and disconnect the air hose from the starting receptacle.
- If rpm fails to rise above 40%, retard throttle to OFF and ask for maintenance assistance to determine the cause.
- IF rpm hangs up at a point above 40%, execute the HUNG START PROCEDURES.

5. Master generator switch – OFF (IDLE)

- After the generator is OFF, give the plane captain the one-finger unplug signal.

6. External electrical power – OFF AND DISCONNECTED

7. Master generator switch – ON

8. Master generator indicator – ON

9. Primary attitude indicator – NO OFF FLAG

- Disappearance of the OFF flag is one indication of primary ac bus power.

10. Landing gear indicators – 3 WHEELS INDICATE

- Landing gear indicators operate from the primary dc bus.
- If one indicator shows a barberpole, recycling the master generator from ON to EXT may result in a down and locked indication.

CAUTION

If down and locked indications do not appear, request maintenance assistance. Do not allow the plane captain to remove the external downlocks.

11. Engine oil/hydraulic and engine fuel pump warning lights – OUT

- Check oil and hydraulic pressures on the gages.
- Idle rpm gage readings and warning/advisory lights summary:

EGT:	340°C maximum.
RPM:	68%-70%
Oil pressure:	35 psi minimum
Fuel flow:	1400 pph
Hydraulic pressures:	2800-3200 psi

Note

Occasionally a hydraulic gage will read 180 degrees out of phase (approximately 1200 psi vice 3000 psi) without illumination of the warning light, or the needle will spin so fast that there appears to be no needle on the gage. Both discrepancies may usually be corrected by cycling the generator in VFR conditions.

Pitch trim: 5 units up (wing down); Ø units (wing up)
Wing/wheels/droops light – flashing (wing down); out (wing up)
Aileron neutral light – ON, with ailerons neutral
Rudder neutral light – ON, with rudder neutral
Low fuel light – OUT, when main cell fuel level is over 1150 pounds
– ON, when main cell fuel level is under 1050 pounds

UNSATISFACTORY ENGINE STARTS

Hot Start

Note maximum temperature reached. If 450° is exceeded, shut down the engine and down the airplane so that a maintenance evaluation of the overtemperature history of the engine may be made and the airplane either approved or disapproved for flight. If EGT exceeds 610°C during starting, engine should be checked for cause of trouble and possible damage.

Hung Start

If rpm hangs up at a point above 40%, execute the following procedure:

1. Switch momentarily into manual fuel control and then back to NORMAL. This alone will often overcome the hung condition.

2. If step 1. fails to overcome the hung condition, note the fuel flow, switch to manual fuel control, and smoothly advance the throttle so that fuel flow is increased by about 200 pph.

3. As rpm rises, smoothly advance the throttle to increase rpm to about 70%. Temperature must not exceed 450°C during this process.

Note

If the engine chugs or bangs, retard the throttle slightly until chugging ceases and then slowly and smoothly advance the throttle again. If chugging still persists, retard the throttle to OFF and ask for maintenance assistance to determine the cause.

4. Retard the throttle to the IDLE stop and immediately switch the fuel control back into NORMAL. RPM, EGT and fuel flow should stabilize within normal idle ranges.

False Start

If rpm fails to rise above 40%, the pilot should not attempt to correct this situation by switching to manual fuel. Retard the throttle to OFF and ask for maintenance assistance.

Wet Start

If engine fails to ignite within 20 seconds after the throttle is placed in IDLE, place the throttle and master generator switch in OFF. The ignition and fuel system shall be checked for cause of trouble. If fuel is present in the tail pipe, perform PURGING ENGINE procedure before next starting attempt.

PURGING ENGINE

To clear the engine of trapped fuel or vapors, the pneumatic starter is installed and the following operations performed:

Note

If strong tailwinds exist, turn the airplane into the wind before purging the engine.

1. External electrical power – CONNECTED

2. Master generator switch – EXT

Note

Check that the dc power indicator shows ON and the attitude horizon indicator does not have OFF showing.

3. Throttle – OFF

4. Fuel control switch – NORMAL

5. Engine master switch – ON

6. Begin engine cranking with external pneumatic source by signal to plane captain.

7. After 20 seconds, stop engine cranking by signal to plane captain.

8. Master generator switch – OFF

9. Engine master switch – OFF

CAUTION

Prior to engine starting, following an aborted start, a check shall be performed to ensure that all excess fuel is drained out of the afterburner section. Fuel will leak out of the afterburner flanges and into the tail cone shroud and afterburner compartment. The shroud and afterburner section should be cleaned by flushing out fuel through drains in the tail and afterburner compartment. A check shall then be made to ensure that no fuel remains that would cause an aft section fire during subsequent engine starting.

Note

Operation of the integral starter is limited to 1 minute. After two unsuccessful starting cycles, a 15-minute cooling period is required before attempting a third start.

GROUND CHECKS (Refer to Section VII for hand signals)

Poststart Checks

1. Comm/Nav equipment – ON

   UHF – T/R + G
   TACAN – REC
   APN 153 – STBY
   AN/APX-72 – STBY

2. Hydraulic pressures – CHECKED

   - If hydraulic pressures are within limits, give the plane captain the signal to remove the downlocks.

3. Landing gear downlocks – CHECK REMOVED

   - Pilot shall be shown all three external downlocks prior to taxi.

4. Arresting hook handle – UP, LIGHT OFF

5. Fuel transfer switch – PUMP ON

   - The TURN PUMP OFF light should flicker on and off momentarily when PUMP ON is selected. If it does not flicker, and the FLIGHT INSTRUMENTS light rheostat is not in the DAY position or the IFR probe switch is in the OUT position, the aft cluster transfer pump may be inoperative.

6. Fuel flow – CHECK

   Fuel flow at idle rpm should be 650 to 1400 pph. If it is incorrect, and other engine instruments (rpm and EGT) indicate that the engine is idling normally (68–70%), the problem may be a 180° out-of-phase fuel flow indicator. This may be corrected using the following procedure:

   NEW WEN

   a. In an area where it is safe to run up the engine, advance the throttle until the fuel flow passes through zero and indicates 1200 pph.

   b. Turn the master generator switch to OFF.

   NEW

   c. Retard the throttle to IDLE and allow rpm to stabilize at idle (68–70%).

   d. Turn the master generator switch back ON.

7. Fuel quantity test switch – DEPRESS, CHECK GAGE RESPONSE

   - When the test button is depressed, the quantity indicators should show steadily decreasing quantities; when released, the quantity indicators should return to actual quantities in the fuel system.

8. Yaw and roll stabs – SWITCHES OFF AND LIGHTS ON

   - If the lights are off and they press-to-test satisfactorily, there may be a problem in the stabilization system or a switch may be improperly installed.

9. Yaw and roll stabs – SWITCHES ON, AND LIGHTS OFF

   - There may be a slight reaction in the stick and/or rudder pedals as the stabs are turned on.
   - If a light goes out and then comes back on, try resetting the appropriate stab.

Note

If a stab will not engage, trim will not be available and flight restrictions are imposed which could severely degrade the aircraft's mission capability.

Manual Fuel Control Check

Note

During this check, the rpm should be kept from falling below 65% to prevent an underspeed condition in the generator.

1. Throttle – IDLE

2. Fuel control switch – MANUAL

3. Throttle – ADVANCE SMOOTHLY TO 75%

   - This is to check engine response to throttle movement. Monitor EGT and fuel flow.
   - If engine chug stalls are experienced, retard the throttle slightly until the chugging ceases; then slowly and smoothly advance the throttle again.

4. Throttle – RETARD SMOOTHLY TO IDLE

5. Fuel control switch – NORMAL

   - This should be accomplished as the throttle reaches the IDLE stop, while rpm is decreasing.

6. Rpm – STABILIZED AT IDLE

Wing Down Checks

(Items preceded by an asterisk (*) are normally performed under the direction of a plane captain)

* 1. Emergency pitch trim – CHECK

   - On signal from the plane captain, raise the T handle and run the emergency pitch trim through its full travel.

* 2. Controls/aileron-rudder interconnect – CYCLE STICK SLOWLY

   - Feet should be off the rudder pedals.
   - The plane captain should notice slight rudder deflection in the opposite direction that the ailerons are deflected. The pilot may notice the rudder neutral light go out and come back on as the stick is moved from one lateral extreme to the other.

* 3. Cruise droops – SELECT OUT (down)

   - The plane captain should confirm extension of the cruise droops.

- The LE DROOPS indicator should flip from UP to DN with no momentary barberpole indication.
- The plane captain will then signal the pilot to raise the wing and place his hands out of the cockpit.

4. Wing locking handle – MOVE TO LOCKED POSITION THEN TO UNLOCK POSITION. CHECK FOR FREEDOM OF MOVEMENT

* 5. Wing incidence handle – PULL OUT OF DETENT, CHECK FOR NO MOVEMENT, PRESS BUTTON, RAISE WING HANDLE, HANDS OUT OF COCKPIT

WARNING

Do not place hands or arms inside cockpit until the plane captain completes his checks under the wing.

Note

If the wing incidence handle moves up without pressing unlocking button, the aircraft is down.

- The following events occur as the wing incidence handle is raised:

  a. Wing raises.

  b. LE DROOPS indicator goes from DN to barberpole to DN as the land droops extend.

  c. Flaps and ailerons droop.

  d. WING/WHEELS/DROOPS warning light goes out.

  e. UHT's retrim 5 units down from the wing down setting.

Wing Up Checks

6. Angle-of-attack vane – CHECK

- While hands are out of the cockpit as plane captain is checking under wing, carefully move the AOA vane through its full range. Note that the AOA indicator and indexer lights respond properly.

7. Wing incidence handle – CHECK MOVEMENT DOWN WITHOUT PRESSING UNLOCKING BUTTON

Note

If the wing handle moves down without pressing unlocking button, the aircraft is down.

8. Emergency vent door – CHECK CLOSED

* 9. Controls/aileron-rudder interconnect – CHECK

- Cycle the control stick slowly through its limits of travel. Feet should be off the rudder pedals, and no rudder deflection should be noticed.

Note

If PC pressures bleed off rapidly, such as would occur if the controls were cycled too rapidly, the rudder will seek a neutral position, resembling aileron-rudder interconnect reaction. If this occurs, repeat the check, cycling the stick more slowly.

*10. Rudder trim – CHECK

- Cycle the rudder trim knob rapidly in the directions indicated by the plane captain. Check for a neutral light after checks are complete.

*11. Aileron trim – CHECK

- Cycle the aileron trim in directions indicated by the plane captain. Check for a neutral light after the checks are complete.

*12. Pitch trim – CHECK

- Rapidly roll in full pitch trim in the directions indicated by the plane captain, returning trim to zero on the pitch trim indicator at the completion of the checks.

Note

There are three indicators of UHT position: fuselage reference marks, the pitch trim indicator gage, and the pitch trim potentiometer. The reference marks are the most reliable (but aren't visible to the pilot), the gage is next in order of reliability, and the potentiometer is least accurate. Therefore, when a plane captain is available, calibrate the gage and potentiometer to his reference; if plane captain is not present, use the pitch trim gage as the reference.

*13. Viscous dampers – CHECK

- Push the control stick full forward and then release it; the stick should return smoothly to neutral and stop with no significant overshoot and rebound. Then pull the stick full aft; likewise, it should smoothly return to neutral and stop without rebound. Recheck pitch trim and readjust as necessary to zero.

*14. Rudder throw – CHECK

- Fully deflect rudder pedals in the directions indicated by the plane captain. There should be no binding, and they should spring-return to neutral.

*15. Exhaust nozzles – CHECK

- Advance the throttle slowly until the rpm decreases and/or EPR increases slightly, indicating nozzle area reduction (closed nozzles). This should occur at 2% above stabilized idle rpm.

*16. Arresting hook – CHECK

- The hook warning light should come on as the hook is in transit.

WARNING

If the hook warning light does not go out within a few seconds (8 seconds maximum) after the handle is lowered, request maintenance assistance to inspect it. Attempting an arrestment with a hook not down and locked/hook not over center condition could result in failure of the arresting gear assembly.

*17. Air refueling probe – CHECK

- Place the IFR PROBE switch in the OUT position.
- If the LOW FUEL warning light was flashing, it will illuminate steadily as the IFR PROBE switch is placed in OUT.
- If a plane captain is present, he will check for leaks in the probe and probe door actuators and for proper lubrication of the receiver assembly.
- Place the IFR PROBE switch to the IN position, holding it there for a full 5 seconds after the PROBE OUT light extinguishes.

Note

As the IFR PROBE switch is moved to the OFF or IN position, the TURN PUMP OFF light should flicker, indicating resumption of operation of the aft transfer pump (if the transfer switch is in PUMP ON and fuel remains in the aft transfer cells), or illuminate steadily (if no fuel remains in the aft transfer cells, or if fuel remains but the pump has failed). If the transfer switch is in the PRESS DUMP position, and if the LOW FUEL light was on, the LOW FUEL LIGHT will begin to flash once again, indicating resumption of the automatic transfer system.

*18. Brakes – CHECK

- Pump the brake pedals slowly. The plane captain will check clearances between brake housings and inboard discs (3/8 inch maximum with brakes applied), and for freedom of movement as brakes are released.

*19. Fuel transfer switch – PRESS DUMP

- The plane captain will check for air flow from the vent at the starboard wing tip (or wing butt, if wings are folded).

20. Fuel transfer switch – PUMP ON

21. Roll stab – OFF, LIGHT ON

22. Control stick – CENTERED

*23. Wing fold controls – SPREAD WINGS, LOCK, CHECK FLAGS RETRACTED

- Place wingfold lever down to spread outer wing panels.
- After both outer wing panels have reached their fully spread positions, place the wing lock lever down to lock the hinge pins and retract the warning flags.

WARNING

If wingfold lock lever springs back during operation, or if excessive force is required to move the lever to the lock position, down the aircraft. The wingfold lock system must be checked for proper operation and rigging before flight.

24. Roll stab – ON, LIGHT OFF

25. Oxygen – ON, LIGHT OUT, QUANTITY CHECKED

- When turning oxygen on, mask should be turned away from the face until flow has begun.
- Occasionally, if the aircraft has recently been serviced with liquid oxygen, the OXYGEN warning light will illuminate with normal inhalation.

WARNING

If any resistance to inhaling is encountered, whether or not the light illuminates, down the aircraft until the oxygen system is investigated and the discrepancy is corrected.

Note

Oxygen mask shall be on from takeoff to final landing, except as an emergency may dictate otherwise.

26. Standby attitude gyro – MOMENTARILY CAGE AND UNCAGE

- If the attitude gyro is within 10% of the horizon, this step is unnecessary.

TAXI

TAXIING

1. External lights – ON AS REQUIRED
2. Area – CLEAR

- Give plane captain the signal to pull out wheel chocks. He should remove the chocks and any other loose gear in the jet blast path to a secure area prior to advancing the throttle to taxi power.

3. Throttle – ADVANCE TO 75%
4. Brakes – RELEASE AND TAP

- Forward movement will cause the nose wheel to caster into trail and will reduce load on the nose gear steering system.

5. Nose gear steering – ENGAGE AND CHECK RESPONSE

- To improve turning performance at heavy gross weights and during high wind conditions, differential braking may be employed. Care must be exercised so as not to exceed the limits of the NGS system.

CAUTION

If it is suspected that the nose wheel has exceeded steering limits, disengage the NGS button and employ differential braking to recenter the nose wheel. Failure to do this will cause failure of the nose gear steering system.

6. Throttle – IDLE

- Once taxi speed has been attained, and whenever executing turns where personnel and loose equipment are in the path of the exhaust, the throttle should be at idle to decrease thrust by opening the nozzle flaps.

7. Magnetic (standby) compass – CHECK

- Check for proper response during turns and for alignment on known headings.

Note

Standby compass reading will be unreliable if there are ferromagnetic materials stowed on the glare shield. Canopy should be down and locked for accurate reading.

NEW NEW

8. Bearing - distance - heading indicator (BDHI) – CHECK

- Check for proper response of the compass card during turns and for alignment on known headings.

9. Turn and slip indicator – CHECK

- Check for proper needle displacement during turns and for alignment of the balance ball.

Note

Asymmetrical main landing gear strut extensions can cause the ball to be placed from the center during ground operations.

INSTRUMENT AND PRETAKEOFF CHECKS

Instrument Checklist

1. Altimeter – SET and in the RESET mode

NEW NEW

- The reset mode is the primary mode of operation.
- When the toggle is moved to RESET, the STBY flag should disappear and the vibrator should stop. The pointer should indicate within ± 75 feet of field elevation at the current local altimeter setting, and it should be within ± 75 feet of the indication in STBY mode.

2. Radio altimeter – ON, LIMIT SET
3. Airspeed – ZERO
4. Vertical velocity (VSI) – ZERO
5. Primary attitude indicator – ERECT, SET, AND NO OFF FLAG

- The FAST ERECT button may be used to expedite obtaining a proper indication.

THRUST CHECK DATA

J57-P-420

°F	Minimum Engine Pressure Ratio	°C	°F	Minimum Engine Pressure Ratio	°C
118	2.18	47.8	38	2.61	3.3
116	2.19	46.7	36	2.62	2.2
114	2.20	45.6	34	2.63	1.1
112	2.21	44.4	32	2.64	0
110	2.22	43.3	30	2.65	-1.1
108	2.23	42.2	28	2.66	-2.2
106	2.24	41.1	26	2.67	-3.3
104	2.25	40.0	24	2.68	-4.4
102	2.26	38.9	22	2.69	-5.6
100	2.27	37.8	20	2.70	-6.7
98	2.28	36.7	18	2.71	-7.8
96	2.30	35.6	16	2.72	-8.9
94	2.31	34.4	14	2.73	10.0
92	2.32	33.3	12	2.74	-11.1
90	2.33	32.2	10	2.76	-12.2
88	2.34	31.1	8	2.77	-13.3
86	2.35	30.0	6	2.78	-14.4
84	2.36	28.9	4	2.79	-15.6
82	2.37	27.8	2	2.80	-16.7
80	2.38	26.7	0	2.81	-17.8
78	2.39	25.6	-2	2.82	-18.9
76	2.40	24.4	-4	2.83	-20.0
74	2.41	23.3	-6	2.84	-21.1
72	2.42	22.2	-8	2.85	-22.2
70	2.44	21.1	-10	2.86	-23.3
68	2.45	20.0	-12	2.87	-24.4
66	2.46	18.9	-14	2.88	-25.5
64	2.47	17.8	-16	2.89	-26.6
62	2.48	16.7	-18	2.91	-27.7
60	2.49	15.6	-20	2.92	-28.9
58	2.50	14.4	-22	2.93	-30.0
56	2.51	13.3	-24	2.94	-31.1
54	2.52	12.2	-26	2.95	-32.2
52	2.53	11.1	-28	2.96	33.3
50	2.54	10.0	-30	2.97	-34.4
48	2.55	8.9	-32	2.98	-35.5
46	2.56	7.8	-34	2.99	-36.7
44	2.57	6.7	-36	3.00	-37.8
42	2.58	5.6	-38	3.01	-38.9
40	2.60	4.4			

Figure 3-4

- At normal operating gross weights and when the aircraft is on a level ramp or on a steady deck, the VGI should be set at 0^{O} pitch.

6. Standby attitude indicator – ERECT, SET, AND NO STBY FLAG

- If the instrument has not erected within 10^{O}, slowly pull the set/caging knob out and hold it until the instrument is erect in roll and pitch. Do not allow the caging knob to snap back.

7. Clock – SET AND RUNNING

8. MA-1 compass – ON, SLAVED MODE, ALIGNED/SET

- The OFF flag must not be visible in the sync window.
- Preset the approximate latitude, using the LATITUDE SET knob, in case one of the free gyro modes is used.

9. ID-249 function switch – TACAN

10. TACAN – T/R, CHANNEL SET, ID CHECKED

11. ID-249 – COURSE SET

12. ADF – CHECK

13. IFF/SIF – TEST, SET CODES, STBY

- In performing the self-test of the set (APX-72), select a code which is not in use in the local area (e.g., 0000); so that ATC/CATCC facility equipment does not interrogate the test squawk.

14. Pitot heat – CHECK ON

15. Engine pressure ratio (EPR) – SET AT MIN EPR FOR TEMP (See Figure 3-4.)

Pretakeoff Checklist

The takeoff checklist shall be completed while holding short of the runway just before takeoff. Figure 3-5 presents the short, cockpit-mounted checklist.

1. Fuel: Fuel transfer switch – ON OR PUMP OFF (AS APPROPRIATE)

   Fuel quantities – CHECK
   Fuel control switch – NORMAL

2. Wingfold – CHECK SPREAD, LOCKED, NO FLAGS

3. Incidence: Wing – RAISED

   Cruise droops switch – OUT

TAKEOFF CHECKLIST
(COCKPIT MOUNTED)

72282-2-4

Figure 3–5

- Check land droops visually and ensure that LE DROOPS indicator shows DN.

4. Yaw and roll stabs – SWITCHES ON, LIGHTS OUT

5. Trim: Rudder – SET AT NEUTRAL, RUDDER NEUTRAL LIGHT ON
   Aileron – SET AT 0, AILERON NEUTRAL LIGHT ON
   Pitch – SET AS APPROPRIATE

- Ashore, use 3 unit nose up for MRT takeoffs, and 1 unit for CRT takeoffs.

- Afloat, use trim as determined from the CG/configuration chart for catapult launches.

6. Speed brake switch – IN

- Recheck speed brake override switch in NORMAL and SPEED BRAKE advisory light out

7. Harness – LOCKED

8. MA-1 compass – SET, CHECK MODE, SYNC NEEDLE

9. Canopy – PRESSURIZATION OFF, CLOSE, LOCK, STOW HANDLE

- The only positive indication of canopy locking is the feel of the handle as the locking hooks engage. When this has occurred, the handle shaft should stow easily aft of the canopy lock handle indicator.

- The canopy lock indicator on the port canopy rail will show a locked indication before the locking hooks are fully engaged with the lock lugs.

10. Canopy strap – STOW IN POUCH

CAUTION

If the canopy restraint strap is left draped over the cockpit ledge outside the aircraft, the flailing action will damage the side of the cockpit, canopy, and/or angle-of-attack vane.

11. Cockpit pressurization – CABIN PRESS
12. Rain removal – AS DESIRED
13. Seat pins – CHECK REMOVED
14. Seat and rudder pedals – ADJUSTED

TAKEOFF

TAKEOFF (RUNWAY OR CATAPULT)

1. Throttle – MILITARY THRUST STOP

   - Smoothly but rapidly move the throttle fully forward.
   - Grasp the catapult grip for catapult launches.

2. Engine instruments – CHECK

   - Rpm must increase to MRT reading within 10 seconds.
   - Oil pressure must be in the 40 to 55 psi range.
   - EGT may lag rpm in reaching its maximum.
   - EPR must reach or exceed the minimum computed from the EPR chart for ambient temperature.

WARNING

EPR is the most reliable indicator of engine performance and exhaust nozzles operation. If the minimum is not reached or exceeded, do not take off.

- Fuel flow must be 9,750 to 11,750 pph, depending on ambient altitude and temperature, and upon rpm at MRT.

- If the control stick is cycled, PC hydraulic pressure must return to the 3,000 psi (±200) range immediately.
- Utility hydraulic pressure must be at 3,000 (± 200) psi.
- The brakes should hold at MRT; occasionally, however, when new brakes are installed, they will not hold at MRT.

3. IFF/SIF – NORM, AS REQUIRED

4. Brakes – RELEASE

- Slight brake applications may be necessary in the early stages of the takeoff roll to correct for crosswinds or misalignment with the runway heading.

WARNING

Do not use nose gear steering during any portion of the takeoff roll.

5. Throttle – AFTERBURNER DETENT (IF DESIRED)

- Normally, afterburner is used for takeoff.

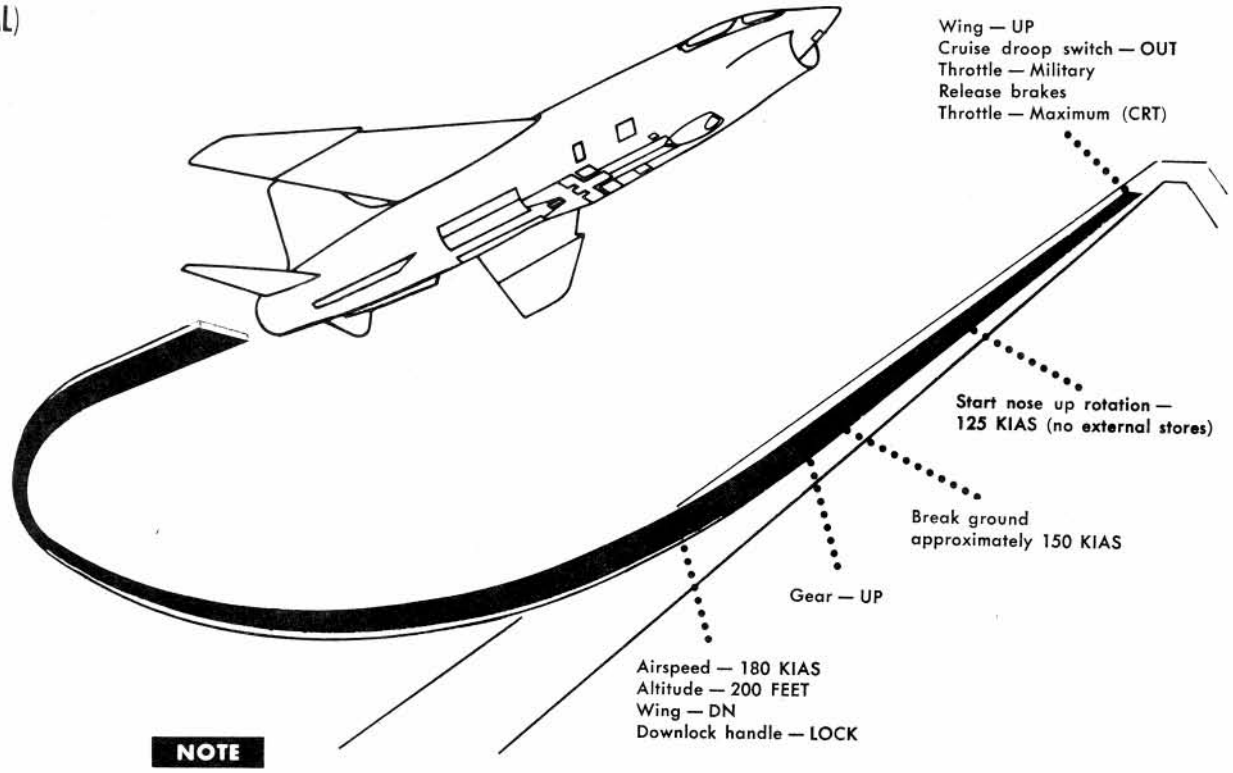
- Afterburner should be selected very early in the takeoff roll after initial heading corrections have been made. This is to reduce the adverse effects of asymmetrical nozzle flap opening and to allow sufficient time/runway remaining for aborting should a malfunction occur.

WARNING

Should the afterburner fail to ignite, or if the nozzles fail to open, deselect afterburner and abort the takeoff. EPR is the most immediate reliable indicator of nozzle flaps operation.

If aborting, moving throttle immediately from afterburner to OFF could result in a residual fire. Be prepared to notify crash crew and exit aircraft.

TAKEOFF (TYPICAL)



NOTE

Speeds are for maximum thrust takeoff at gross weight of 28,000 pounds. At takeoff gross weights greater than 28,000 pounds, increase wing lowering speed approximately 3 knots for additional 1,000 pounds. Refer to section XI for additional data at other gross weights.

WARNING

The gear must be retracted and the wing must be down and locked before reaching 220 KIAS.

72282-3-16-1-69

Figure 3–6

Crosswind Takeoff (MRT/CRT)

Refer to figure 3-7 for allowable crosswinds for takeoff.

The aircraft tends to roll into the downwind wing and turn into the wind because of the narrow wheel tread and high vertical fin. However, the ailerons become effective at low speed and are effective in reducing the heel angle.

During takeoff, oppose rolling tendency with aileron, while maintaining directional control with the brakes until the rudder becomes effective. In extreme crosswinds, utilize CRT to keep the nosewheel on the runway until flying speed (approximately 150 KIAS) is obtained; then lift the aircraft from the runway. This technique decreases the lift generated while on the runway, minimizing the tendency of the aircraft to drift laterally.

Whenever practical, takeoffs under substantial crosswind conditions should be individual rather than section.

Formation Takeoffs (MRT/CRT)

Formations will normally take off in two-aircraft sections. If a flight of four aircraft is involved, the second section will delay the takeoff roll until the first section becomes airborne. Should either aircraft of a section abort, a radio transmission shall be made stating "—— (call sign) aborting." The other aircraft shall continue the takeoff unless the abort occurs early in the takeoff roll.

The section leader shall line up on the downwind side of the runway. The wingman shall form in echelon with a wingtip separation of approximately 10 feet which shall be maintained throughout takeoff.

When both aircraft are in position, the leader shall give a two-finger signal for engine turnup. When these checks are completed, each pilot shall visually check the exterior of the other's aircraft. A thumbs-up signal shall be given when ready for takeoff.

After receiving the thumbs-up signal from the wingman, the leader will decrease rpm 1% and raise his hand to a vertical position. To commence takeoff roll, the leader shall simultaneously drop his hand and re-

ALLOWABLE CROSSWINDS FOR TAKEOFF AND LANDING

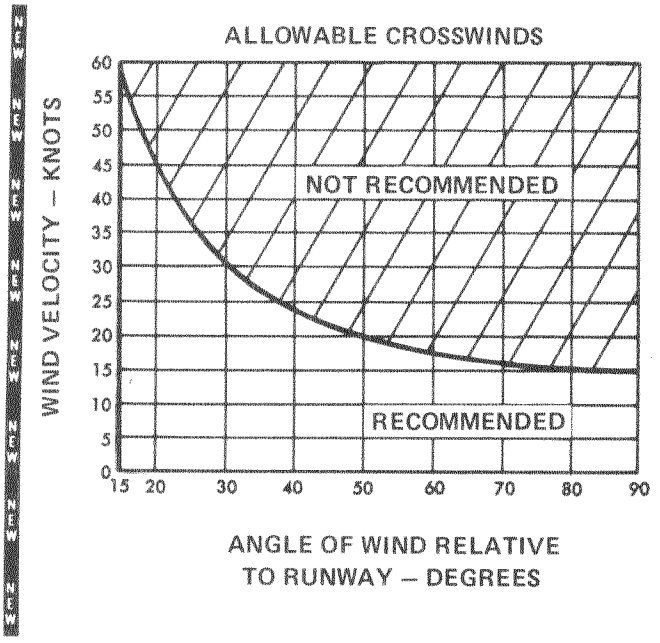


Figure 3–7

lease the brakes. If afterburner is to be used, it will be selected by both pilots when the leader turns his head smartly to the left. Minor adjustments to power setting may be made by the leader to assist the wingman.

During the takeoff, the leader shall monitor the progress of the wingman. When both aircraft are definitely airborne, the leader will retract his landing gear without signaling. When the leader observes the wingman's gear retracted, he places his head against the headrest as the preparatory signal for lowering the wing. Both pilots lower the wing when the leader nods his head smartly forward. Afterburner, if used, shall be deselected simultaneously by both pilots when the leader turns his head smartly to the right.

Due to weight, thrust, and performance differences, formation takeoffs should not be attempted with different models of the F-8 or with other dissimilar aircraft.

Scramble Takeoffs

Aircraft scrambles will generally occur under varying conditions of radio silence.

When assuming an alert posture that may result in actual launching of the aircraft, conduct the normal preflight, start, and poststart checks. If practicable, conduct radio checks with the controlling agencies and the other aircraft of the flight. Check reconnaissance systems. Shut down the engine, but leave the aircraft as ready for flight as possible. Check that ground equipment is positioned to provide for rapid removal during scramble.

If the radio is being monitored to receive the scramble order, observe the ground operating limitations (section I, part 2).

When the scramble order is received, restart the engine and ensure that all gear downlocks and safety pins are removed. When ground crew and equipment are clear, taxi expeditiously, but safely. Energize all electrical and electronic equipment in accordance with existing directives.

Complete the takeoff checklist and the engine turnup check before takeoff.

AIRBORNE CHECKS

1. Safely airborne, climbing, landing gear handle – UP

Prior to 200 KIAS

2. Rain removal switch – OFF

CAUTION

The windscreen will crack if rain removal is left ON above 200 KIAS.

3. Wing – LOWER

- The wing should be lowered at 180 KIAS and 200 feet AGL. At night and IMC, delay until 190 KIAS and 300 feet AGL.

Prior to 220 KIAS

4. Landing gear – UP (3 UP INDICATIONS, NO LIGHT IN HANDLE)

5. Wing locking handle – LOCKED

Prior to 300 KIAS

6. Wing/wheels/droops warning light – OUT

7. Droops indicator – DN (NO BARBERPOLE)

Note

If a barberpole indication persists for longer than a few seconds, cycling the droops switch in and out, cycling the speed brake out and in, and/or applying slight positive and negative g may achieve a safe indication.

Above 300 KIAS

8. Throttle – DESELECT AFTERBURNER (IF DESIRED)

9. Cockpit pressurization switch – CHECK CABIN PRESS, PRESSURIZATION OPERATING

10. Fuel transfer switch – PUMP ON

Above 350 KIAS

11. Cruise droops switch – IN, DROOPS INDICATE UP

- Drag is decreased and range is increased with cruise droops up at speeds greater than 350 KIAS.

CLIMB, CRUISE AND DESCENT

CLIMB

After the wing is lowered on takeoff, the leading edge droop will be in the cruise condition. Retract the droop to the clean condition when climbing at indicated airspeeds above 350 KIAS and extend it when speed drops below 350 KIAS to obtain best performance. This rule of thumb also applies for cruise and descent. Refer to sections XI and VI for optimum climb speed schedules, distances covered during climb, climb rates, and recommended IFR departure climb speeds and procedures.

NEW NEW The minimum safe maneuvering airspeed for the F-8 above normal landing fuel weights is 350 KIAS. During FAM stage or if operating in high density areas where FAR part 91 applies, the following reduced airspeed climb procedures are recommended:

If afterburner is used for takeoff and a CRT climb is to be made, establish a climb at 350 KIAS until above 10,000 feet MSL; then, a steady-state climb of 450 KIAS until intercepting 0.92 IMN. If an MRT climb is desired, the afterburner should not be secured below 300 KIAS. Establish a steady-state climb of 350 KIAS until intercepting the climb schedule. Although no performance charts are available in this manual for these reduced airspeed climb schedules, the time, fuel, and distance to climb vary only slightly from those of the optimum climb charts (figures schedules, the time, fuel, and distance to climb vary only slightly from those of the optimum climb charts (figures 11-44 through 11-46). During the climb it may be necessary to modulate the throttle to maintain engine operation within exhaust gas temperature limits.

CRUISE

NEW The normal cruising airspeed below 10,000 feet MSL is 350 KIAS except:

(a) When feasible comply with 250 KIAS limit in airspace where FAR part 91 applies. (Normally feasible only at relatively light gross weights, during holding, penetration, and landing approach).
(b) When otherwise indicated in specific operational/training procedures.

Refer to section IV, part 2, for a description of flight characteristics, to section I, part 2 for fuel management information, and to section XI for cruise data.

DESCENT

Refer to section XI for time, fuel, distance, and rate of descent data for both maximum range and constant speed descents and to section IV for dive recovery information. Deenergize ECM upon completion of the mission, in accordance with existing directives.

Before Descent Checklist

1. Altimeter — SET
2. Defogger switch — DEFOG
   - To avoid fogging during rapid descent, place defogger switch to DEFOG at least 5 minutes prior to descent.
3. Cockpit temperature — AS DESIRED
4. Pitot heat — ENSURE ON
5. Fuel — QUANTITY CHECKED

Before Entering Traffic Pattern

1. Speed brake override switch – NORMAL
2. Fuel quantity – CHECKED
3. Viewfinder lens cover – AS DESIRED
   - Landing with the viewfinder cover removed may prove distracting and can result in pilot disorientation.
4. Emergency spin droop switch – OFF
5. Cruise droop – OUT
6. Camera power switch – OFF
7. Shoulder harness – LOCKED
8. Seat adjustment – AS DESIRED

WARNING

A small pilot utilizing the MK-F7 ejection seat shall raise the seat as high as practical while on the ground and in the traffic pattern. This is to ensure a favorable ejection seat center-of-gravity position. In the somewhat unlikely event that a small pilot had the seat fully lowered and was forced to eject at close to zero-zero conditions, a safe ejection could be jeopardized due to unfavorable seat cg position.

TRAFFIC PATTERN AND LANDING

TRAFFIC PATTERN

Refer to section I, part 4 for maximum recommended landing gross weights.

Enter the traffic pattern at 325 KIAS or above with the cruise droop extended. Execute a level break:

1. Establish 60° angle of bank.
2. Apply 2 – 2 1/2 g
3. Retard throttle to 80% rpm.
4. Extend speed brakes after 90° of turn.
5. Monitor angle-of-attack as aircraft decelerates to avoid flying into stall region. Reducing angle of bank or relaxing g will reduce angle-of-attack.
6. When airspeed has decreased to 220 KIAS, landing gear handle down, unlock and raise wing.

Perform cockpit mounted landing checklist as follows (figure 3-8):

1. Landing gear – DOWN
   - Check indicators down and the warning light in, the gear handle off.
2. Wing incidence – UP
   - Check the wing-wheels-droop warning light off.
   - Visually check the land droop extended.
3. Arresting hook – AS REQUIRED
   - If hook is to be used for an arrested landing, check that the hook warning light is off.

LANDING CHECKLIST
(COCKPIT MOUNTED)

72282–2–5

Figure 3–8

4. Speed brake – IN
   - Speed brake switch in the forward position.
   - Speed brake warning light off.
5. Brakes – PUMP
   - Verify brake pedal response.
6. Shoulder harness – LOCKED

7. APC — — AS DESIRED
   - If utilized, engage as soon as practical downwind.
   - Check angle-of-attack indicator, indexer, and airspeed in accordance with figure 3–11.
   - If APC is engaged, check response to nose attitude changes.

FIELD LANDING

See figure 3–9 for typical field landing pattern. Refer to section XI for landing speeds and ground roll distances. Permissible acceleration range in the landing configuration is 0 to 2.0 g.

Use center-of-gravity loadings forward of 29% MAC. Enter the downwind leg of the traffic pattern for the final landing with a minimum of 1,000 pounds of fuel remaining.

WARNING

If the cockpit emergency ventilation port is open, angle-of-attack indications will be erroneous.

Before the 180° position, the angle of attack should be cross-checked with airspeed (figure 3–11) and the approach power compensator engaged and checked, if it is to be used.

At the 180° position, the aircraft should be wings level, on optimum angle of attack of 13.5 units, and with sufficient power to maintain altitude and airspeed. Distance abeam should be 1½ miles. Delay turnoff downwind to permit approximately 3/4 mile of straightaway on the final approach. Plan the turn from the 180° position to reach the 90° position at 500 feet AGL on optimum angle of attack.

If a carrier landing aid is available on the landing runway, fly a standard FCLP approach from the 90° position to touchdown. If no carrier landing aid is available, continue a power-on rate of descent with the angle-of-attack indexer indicating a circle (donut) and aim for a touchdown point 500 to 700 feet beyond the runway threshold. Use the throttle primarily to control rate of descent and the stick to control attitude. If, at any time, the sink rate becomes excessive, correct first by adding power, and then adjust attitude. It is important to maintain proper touchdown attitude to prevent landing either on the tailpipe or nosewheel. Hold the donut to touchdown.

On touchdown, the nose has a tendency to rock forward, and unless a small amount of back pressure is applied, the nosewheel will contact the runway. If the aircraft bounces, reestablish the proper landing attitude (donut on indexer or 13.5 units angle of attack) and adjust sink rate with the throttle. If a porpoise develops, or if doubt exists as to the success of the landing, execute a wave-off.

On the rollout, adjust the fuselage attitude to produce optimum aerodynamic braking. At airspeeds in excess of 115 KIAS, this attitude corresponds to 15 units but angle-of-attack indications will become unreliable as speed decreases. Visually check the nose attitude by reference to the horizon at 15 units just after touchdown and maintain that attitude until UHT effectiveness is lost on rollout. As the airspeed approaches 100 KIAS, the nose will fall through. Keep the stick full aft even after the nosewheel is on the runway since the UHT is still effective in creating drag. Do not apply full nose-up trim; this could create a hazardous situation if a late waveoff was attempted. Normal braking may be applied at a maximum of 90 KIAS. Apply constant friction braking, gradually increasing pressure as required. On wet runways, intermittent braking may be necessary to avoid skidding.

CAUTION

Do not engage nose steering until speed has slowed to normal taxi speed. Neutralize the rudder pedals before depressing the nose gear steering switch or the nosewheel will be abruptly displaced in the direction of rudder deflection.

At normal landing gross weight, elect to go around when speed is in excess of 105 KIAS with 4,000 feet of runway remaining. Failure of the exhaust nozzle to open may result in excessive runout and high taxi speed. Employ normal engine shutdown to avoid these effects, if necessary.

CROSSWIND LANDING

Refer to figure 3–7 for allowable crosswinds for landing. The maximum crosswind component recommended for landing is 15 knots.

Allow extra interval behind the preceding aircraft and sufficient straightaway on the final approach to establish a stable crab approach. Maintain normal approach speed, and line up so that touchdown will be on the upwind side of the runway.

FIELD LANDING

(TYPICAL)

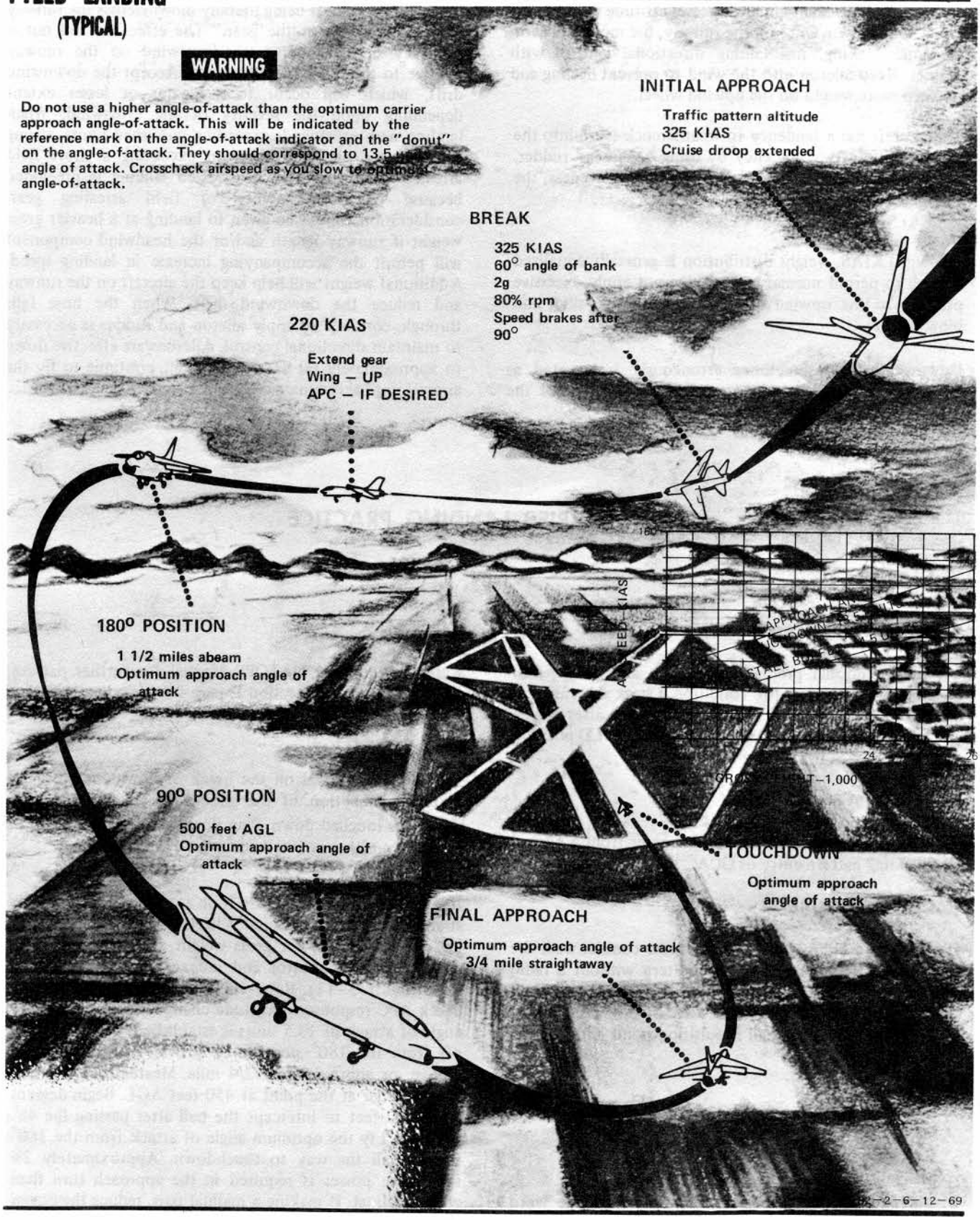


Figure 3–9

Just before touchdown, align the aircraft with the runway by using rudder. Maintain a wing level attitude with aileron upon touchdown. Once on the runway, use moderate aerodynamic braking, maintaining directional control with rudder. Keep aileron into the wind to prevent heeling and to keep more weight on the upwind wheel.

The aircraft has a tendency to weathercock (turn into the wind). Oppose this tendency by using downwind rudder. As speed decreases and the rudder loses effectiveness, the weathercocking tendency also decreases.

Below 90 KIAS, weight distribution is generally equalized enough to permit normal braking. Do not apply excessive pressure to the upwind brake or it may lock, skid, and blow the tire.

Downwind drift, sometimes erroneously interpreted as downwind weathercocking or weathercocking out of the wind, occurs during a crosswind landing roll out. It is the result of the aircraft being literally blown across the runway while still "light on the gear." The effect on roll out is primarily one of ending up downwind on the runway relative to the point of touchdown. Accept the downwind drift, which will occur to a greater or lesser extent depending upon the severity of the crosswind. When landing with crosswinds exceeding published limits, strong consideration shall be given to executing a short field arrested landing. When an arrested landing is precluded because of nonavailability of field arresting gear, consideration should be given to landing at a heavier gross weight if runway length and/or the headwind component will permit the accompanying increase in landing speed. Additional weight will help keep the aircraft on the runway and reduce the downwind drift. When the nose falls through, continue to apply aileron and rudder as necessary to maintain directional control. Ailerons are effective down to approximately 60 KIAS. Above all, continue to fly the aircraft until aerodynamic control is no longer effective.

FIELD CARRIER LANDING PRACTICE

PREFLIGHT INSPECTION

Conduct a normal preflight inspection and give special attention to strut and tire condition. Check the angle-of-attack and APC systems as soon as possible after engine start. Place the hook bypass switch in the FIELD position to keep approach lights from flashing.

TAKEOFF/PATTERN ENTRY

Takeoff directly into the pattern or enter from a normal field landing pattern entry or GCA.

RADIO PROCEDURE

Do not make approaches without radio contact with the LSO, and do not remain in the pattern without a radio receiver. On the first pass report the 180° position with "gear down" and "pilot's name." Give the following report upon reaching the meatball acquisition point and on each subsequent pass:

NEW
Aircraft call sign
Crusader
Meatball
Fuel state (nearest 100 pounds)
Manual (if non-APC)
NEW

If the meatball is not visible, transmit the code word "Clara" to the LSO.

PATTERN

Refer to the LSO NATOPS Manual for further pattern information, and to section I, part 4 for maximum recommended gross weights.

Establish an interval on the break or downwind turn to ensure interception of the glide path after the aircraft ahead has touched down. Plan downwind turn to arrive at the 180° position at 600 AGL and 1 1/2 miles abeam. NEW

If APC is to be utilized, turn it on as soon as the aircraft is straight and level downwind. Check the APC for maintaining proper airspeed for gross weight and cross check the angle-of-attack indicator and indexer for proper indications (figure 3–11). Raise and lower the nose slightly to check APC response to attitude changes. As the optimum angle of attack of 13.5 units is established, delay the turn-off from the 180° position to provide for a 20-second groove, or approximately 3/4 mile. Meatball interception should occur at the point at 450 feet AGL. Begin descent from 600 feet to intercept the ball after passing the 45° position. Fly the optimum angle of attack from the 180° position all the way to touchdown. Approximately 2% rpm more power is required in the approach turn than when on final. If making a manual pass, reduce the power slightly when rolling wings level in the groove.

A poor approach rarely results in a good landing. A good pass on the optical landing aid requires:

- Angle of attack and/or airspeed commensurate with landing gross weight.
- Meatball in the center of the mirror/lens face.
- Aircraft lined up with the runway (or simulated carrier) centerline.

At the point where the meatball is first observed during the turn to final approach, the difference between a Roger and a high or low indication is 75 feet. At the ramp, the difference is 5.5 feet and at touchdown, only 2.0 feet. As a pass progresses down the groove, smaller corrections are required to move the meatball a certain distance on the mirror/lens face. A 3.25° glide slope is normally used during FCLP to approximate the rate of descent encountered when landing aboard a carrier. Any time the meatball is lost close in, initiate a waveoff. Maintain the optimum angle of attack. Do not overrotate and do not turn. After touchdown, add power to MRT and maintain optimum angle of attack until clear of the runway. Initiate the turn to downwind no lower than 300 feet AGL. Maintain 150 KIAS until level on the downwind leg.

In the FCLP pattern, do not begin another approach with 1,000 pounds or less of fuel remaining.

All procedures and techniques that apply to day FCLP apply to night FCLP; except that, if field traffic pattern conditions permit, a longer groove should be utilized. Thirty seconds or 1¼ miles is desirable. Maintain 600 feet AGL to provide wings level interception of the meatball. The meatball should be centered before starting descent. Exterior lights should be on bright, approach light in the night position, and anticollision light as required by local course rules.

WAVE-OFF

When executing a wave-off, place the throttle in MRT (or CRT if required). Leave the landing gear and wing in the landing condition and level the wings. Maintain optimum angle-of-attack until positive rate of climb has been established. NEW

TOUCH-AND-GO LANDING

NEW When making a touch-and-go landing, touch down at optimum angle of attack, after touchdown, immediately add MRT and hold optimum angle-of-attack until a positive rate of climb has been established. NEW

AFTER LANDING

CAUTION

Do not taxi with a main generator failure, with the wing down, or with a utility hydraulic failure. Nose gear steering will not be available without electrical power, and overheating of the wheel brakes could result. Neither wheel brakes nor nose gear steering will be available with a utility hydraulic failure.

With either a main generator failure or a utility hydraulic failure, landing gear safety down-locks should be installed prior to shutdown.

AFTER LANDING CHECK WHEN CLEAR OF RUNWAY

1. Cockpit pressurization – CABIN DUMP
   Rain removal – OFF
   Defog – OFF

CAUTION

Selecting cabin dump depressurizes the cockpit and deflates the canopy seal. Failure to select cabin dump prior to opening the canopy could cause unusually abrupt opening of the canopy and damage to the canopy hinge and counterbalance mechanism. If the cockpit altitude indicator shows a negative reading (indicating cockpit is pressurized), open the emergency vent to relieve cockpit pressure before opening canopy.

2. Canopy – UNLOCK, OPEN, ATTACH RESTRAINT STRAP

   - Monitor canopy opening by holding canopy rail. Excessive opening speed could result in overtravel which will shear pins. Once the strap is attached, continue to monitor upward travel until the strap is taut.

Note

Occasionally, the canopy will not stay up. Gentle raising and lowering of the canopy may, in this case, increase the air pressure enough to balance the canopy's weight.

3. Photographic switches – OFF

4. Yaw and roll stab switches – OFF/RESET, LIGHTS ON

5. Radio altimeter – OFF, LIGHT OUT

6. Pitch, roll and yaw trim – 0 UNITS, NEUTRAL AND NEUTRAL

   - Set pitch trim at 0 units, using the nose trim indicator. Set 0 units on the roll trim potentiometer and note the aileron neutral light on. Set yaw trim potentiometer at 12 o'clock and note the rudder neutral light on.

7. Pitot heat switch – OFF

CAUTION

When debarking the cockpit, do not touch or grasp the L-shaped pitot static probe on the left side of the cockpit. It could be hot and cause burns.

8. TACAN function switch – OFF

9. IFF master switch – OFF

10. APN-153 – OFF

11. Wings – FOLD, IF DESIRED

    - If wings are to be folded, ensure that the roll stab is off and the control stick is centered.

12. Oxygen valve – OFF, LIGHT ON, FLOW CEASES

    - If flow continues with the valve off and the oxygen warning light on, the emergency oxygen supply in the seat pan has probably been activated. In this case, do not disconnect the supply hose until the emergency supply has been depleted.

HOT REFUELING CHECKLIST

Prior to Entering Fuel Pit/Hot Refueling Area

1. Radio altimeter – OFF

2. TACAN function switch – OFF

3. IFF master switch – OFF

4. ECM switches – OFF

5. Yaw and roll stabs switches – OFF RESET

6. Brakes – CHECKED

WARNING

If the wheel brakes are found to be overheated they must be allowed to cool in a safe hot brakes area prior to refueling.

7. Wings – FOLD OR LEAVE SPREAD, AS DIRECTED

After Entering Fuel Pit/Hot Refueling Area

Note

Do not transmit over UHF except in an emergency.

8. Wing incidence – LOWER

9. Anticollision light – OFF

   - At night leave wing and tail lights on bright.

10. Fuel transfer switch – PRESS DUMP

If Taking on Partial Fuel Load

11. Inflight refueling probe switch – OUT

    - The IFR probe will extend and fueling valves will be set up to accept fuel. PSO valve checks will not be possible with the IFR probe out and with the master generator switch on.

Note

While it is possible to take on a full load with the IFR probe out and the master generator switch on, it is recommended that total refueling be accomplished using external electrical power and with the master generator switch in EXT so that PSO valve checks can be made. At least every second total refueling shall be accomplished using external power and checking the PSO valves. Partial refueling (when neither main nor transfer cells are filled completely such as when refueling between FCLP periods) may be accomplished consecutively with the IFR probe out and the master generator switch on.

If Taking on Full Fuel Load

Note

The IFR probe may be left in (the IFR probe switch in the OFF position) when external electrical power is used.

12. Master generator switch – OFF

    - Turn the generator off before signaling for external power.

13. External electrical power – CONNECTED, ON

    - Ensure external power is connected and on prior to turning generator switch to EXT.

14. Master generator switch – EXT

    - Check for indications of ac and dc power.

Fueling

15. Fuel gages – MONITOR

    - Right wing and left ventral fuel vents must be monitored by ground personnel.

Fueling Completed

16. Inflight refueling probe switch – IN, PROBE OUT LIGHT OUT (5 SECONDS), OFF

17. Master generator switch – OFF

    - After turning master generator switch off, signal ground personnel to disconnect electrical power.

18. External electrical power – DISCONNECTED

    - Ensure that external power is disconnected prior to turning master generator switch on.

19. Master generator switch – ON

    - Check for ac and dc power indications.

20. Wing incidence – RAISE WING

21. Anticollision light – ON

WARNING

If further flight is intended after refueling, carefully accomplish the items on the pretakeoff/instrument checklists prior to calling for takeoff clearance.

BEFORE SHUTDOWN IN CHOCKS

1. Wing incidence – DOWN

   - Wing/wheels/droop light should flash.

2. Cruise droops switch – IN, DROOPS INDICATOR UP

3. Seat safety pins – INSTALL

- Pilot always installs the face curtain pin, the lower ejection handle pin and the guillotine sear (emergency restraint release handle) pin prior to egress. If at a field other than home base, he must ensure that the remaining pins are installed also.

4. Wings – FOLD, OR LEAVE SPREAD AS DIRECTED

5. Landing gear safety ground locks – CHECK INSTALLED

6. Oxygen toggle – OFF, OXYGEN WARNING LIGHT ON

- Check for flow stoppage. If flow continues, check for possible inadvertent actuation of the emergency oxygen supply. If the bottle was actuated, do not disconnect supply hose until emergency supply is depleted.

7. UHF function switch – OFF

STOPPING ENGINE

1. Throttle – ADVANCE, SET RPM AT 75% FOR 30 SECONDS

- At least 30 seconds of stable operation at 75% rpm is required for proper oil scavenge.

2. Throttle – OFF

- Simultaneously, move throttle to off and start the clock.

3. Master generator switch – OFF, PRIOR TO DROP-OFF RPM

- Generator will drop off due to underspeed between about 50% and 45% rpm. Generator switch should be turned off prior to drop off.

4. Engine master switch – OFF

- Except in an emergency, do not turn engine master switch off prior to securing the generator. Doing so will cause the main fuel shutoff valve to close, which could cause collapse of the engine fuel supply line and damage to the engine-driven fuel pumps.

5. Rpm – 10%, STOP CLOCK

- Engine rundown is timed from 75% to 10% rpm and recorded on the yellow sheet.

BEFORE EXITING COCKPIT

1. Pilot services and straps – DISCONNECT

- Disconnect communications-oxygen supply hose, parachute riser Koch fittings, lap belt Koch fittings, and leg restraint lines prior to attempting to egress.

2. External lights master switch – OFF

3. Anticollision light switch – OFF

4. UHF function switch – OFF

5. All electrical switches – OFF

6. Wheels – CHOCKED

BEFORE LEAVING AIRCRAFT

1. Postflight walkaround inspection – PERFORM

- Note condition of tires and brakes, presence of fluid leaks (air, hydraulic, fuel, oil) missing panels and fasteners, TTRI readings, etc., check oil within 5 minutes after shutdown.

- Ensure that the main fuel shutoff valve is closed manually after engine winds down.

2. Seat and canopy actuator safety pins – ENSURE REMAINING PINS ARE INSTALLED

- If the aircraft is to be parked overnight or for several hours, or if weather is adverse (wind, dust, or precipitation) close the canopy. In hot weather, with the canopy closed, the emergency vent may be opened.

NIGHT FLYING

The instructions contained in the following paragraphs are supplemental to those covered in the normal VFR and IFR flight procedures.

PREFLIGHT

Before starting the engine, check operation of all interior and exterior lights with the exception of the land/taxi light which is not checked with the airplane in the chocks. For shore-based aircraft, the anticollision light will be turned on prior to starting the engine to warn personnel in the area to beware of intakes and jet blast. Turn on the position lights during the period 30 minutes before official sunset until 30 minutes after official sunrise or at any time when the prevailing visibility as seen from the cockpit is less than three miles. (This applies to aircraft in flight or operated on the ground, or if stationary and likely to cause a hazard.)

TAXIING

Taxi with caution and use the taxi light as necessary.

TAKEOFF

Perform the takeoff using the same techniques and procedures used during day flight, but be prepared for transition to complete instrument flight immediately upon leaving the runway. It is common to experience distracting reflections of ground lighting from the windshield. Minimums for lowering the wing are 190 KIAS and 300 feet AGL.

FORMATION

The basic principles of formation remain unchanged. However, exercise extra vigilance since it is difficult to accurately determine depth, closure rate, and relative motion. Fly a rendezvous bearing that is slightly aft and more stepped down than that employed during daytime operation. Rendezvous airspeed and altitude must be prebriefed.

Reduce the closure rate. If recognized to be dangerously high, immediately break off the rendezvous to assure separation. Cross under and to the outside of the leader's turn.

Except for the last aircraft, exterior lights will be on dim and the anticollision lights will be off. The last aircraft will have lights set to bright with the anti-collision lights on unless the tactical situation dictates otherwise (during actual weather penetrations, etc).

A GCA is the preferred means of landing or entering the traffic pattern.

During night landings, fly the angle-of-attack indexer, airspeed, and primary flight instruments; utilize a carrier landing aid if available.

PART 4—CARRIER-BASED PROCEDURES

BRIEFING

Briefings will include the items outlined in the briefing guide, with particular emphasis placed upon bingo procedures, carrier's probable launch and recovery course, position in force, PIM, and ready deck. Operations Department and Air Department briefings covering the following procedures are required before actual carrier air operations:

Flight and hangar deck safety precautions
Launching procedures and signals
Arrested landing procedures and signals
Aircraft control doctrine and procedures
Emergency procedures peculiar to carrier operations
Special procedures for night and IFR
Landing aids
Communications
Flight deck configuration and lighting

FLIGHT DECK OPERATION

PREFLIGHT

Man the aircraft when directed by air operations (generally not in less than 30 minutes prior to launch time). Conduct a normal preflight with particular emphasis given to the condition of the landing gear, shock struts, tires, arresting hook, and to the underside of the fuselage for cat keel and keel pin integrity and for launching pendant or arresting cable damage. A complete inspection of the aft fuselage may not always be possible due to aircraft spotting.

Leave the tiedown chains installed until directed to remove them by a flight deck director (yellow shirt). During night operation, conduct the exterior preflight using a red-lensed flashlight. Ensure that the exterior light switches are properly positioned for a poststart light check. Observe the general rule of not showing a white light on the flight deck at night. Ensure that the land/taxi light switch is off prior to connecting external electrical power. Set all colored lights to DIM and rotate the instrument and console lights out of OFF. This will prevent daytime illumination of the red and amber system lights when external power is applied. Emergency floodlights and spotlights may be used as desired.

ENGINE START

Engines will normally be started 10 minutes before launch time. Perform the system functional checks thoroughly. Adjust the rudder pedals and be prepared to hold the brakes when the tiedowns are removed.

POSTSTART

Perform the systems checks as outlined in the shore-based procedures with the following exceptions:

1. During cockpit check, place the approach light hook bypass switch in the CARRIER position.
2. During ground checks:
   a. After the viscous damper check, trim the UHT to the proper catapult trim setting (figure 3–10). Plane captain will signal the units of nose-up trim which he actually sees on the UHT.
   b. Ascertain that standby attitude indicator is uncaged.
   c. When dropping the hook for the hook check, ensure that the hook shank will not strike the deck edge or other obstruction. This could crack or weaken the shank. Dependent on aircraft spot it may be necessary to taxi forward to check the hook.
   d. Due to aircraft spot it may be impossible for the plane captain to check the exhaust nozzle. The pilot can check its performance by observing the rpm gage. As the throttle is advanced from the idle stop, the rpm will drop approximately 1% rpm as the nozzle closes.

Be ready to taxi when directed. As the carrier turns into the wind, either close the canopy or secure it with the lanyard to prevent damage by wind or jet blasts. Spread the outer wing panels on signal from the plane director as soon as possible to prevent damage to the wingfold castings, which can be caused by wind or jet blast onto the panels from the side.

TAXI

Normally, any signal by the plane director that is above his waist is intended for the pilot; any signal below the waist is intended for deck handling personnel.

Taxiing aboard ship is similar to taxiing ashore. Nose gear steering permits the aircraft to be maneuvered easily and should be used to prevent the nose gear from castering and the nose from swaying with the ship's roll. Keep taxi speeds under control, particularly in the landing area where the deck is slippery from cable lubricant. Use both brakes to stop sideways motion of the nose, since use of a single brake will only provide a different pivot point and the sideways motion will continue. Use power setting as low as possible to avoid injury to flight deck personnel.

During night deck operation, the tempo is conderably reduced from daytime operation. Slow and careful handling by aircraft directors and pilots is mandatory. If any doubt exists as to the plane director's signal, stop the aircraft. It is advisable to turn the cabin pressurization to the cabin dump position if positioned close behind another jet aircraft. Fumes from the aircraft's exhaust will enter the cockpit through the pressurization system and cause eye irritation. Have the oxygen mask on before starting taxi.

HANGAR DECK OPERATION

CAUTION

Before moving the aircraft without the engine running, the utility pressure shall be pumped up by use of the hand pump. This will ensure adequate wheel braking available.

Occasionally, the assigned aircraft will be manned on the hangar deck. Follow the same procedures as those concerning flight deck operation. If the aircraft is not already on the elevator, it will be towed or pushed (with the pilot in the cockpit) into position to be raised to the flight deck. The signal to stop an aircraft that is being moved by other than its own power is either a hand signal or a whistle blast. The whistle blast signifies an immediate or emergency stop. Leave canopy open and the hard hat off to ensure hearing the whistle and keep the plane director in sight at all times. If unable to see the plane director, or if in doubt of safe aircraft movement, stop the aircraft immediately.

LAUNCH OPERATIONS

Refer to the applicable aircraft launching bulletin for offcenter spotting and launching limitations, and for minimum permissible endspeeds.

CATAPULT HOOKUP

Current deck procedures aboard CVA class carriers provide for astern and angling approaches to both forward and waist catapults. Approach the catapult track slowly, lightly riding the brakes, with the nose gear steering engaged. Watch the plane director's signals, using peripheral vision to sight down the catapult track. The takeoff checklist will be completed and the wings spread and locked before taxiing over the shuttle. Anticipate the initial hold immediately after the nosewheel drops over the shuttle. The come ahead signal will be received after the tension bar is placed in the holdback. Use very slow movement to prevent overstressing the tension bar as the aircraft is taxied forward until it is engaged.

WARNING

Pilots shall avoid deflecting the ailerons until after running up to MRT to avoid striking inspection personnel.

At night, it is very difficult to determine speed or motion over the deck. Rely on the plane director's signals and follow them closely. As the catapult is approached, the plane director should position himself forward of the aircraft and remain stationary. Use him as a visual reference to determine aircraft movement. It is very difficult to properly spot the aircraft on the catapult when the carrier is in a turn or listing.

During all catapult hookups, personnel designated as checkers will visually inspect the aircraft to ensure that it is suitable for flight. The inspection includes, but is not limited to: Checking the entire aircraft for evidence of fuel or hydraulic leaks; security of access panels; proper extension of struts; condition of the hook point; relative symmetry of control surfaces; proper UHT trim setting; wheels, wheel wells, and tires for damage or foreign matter; a positive check of wing hinge pin locks; and that the wing is raised.

TRIM SETTINGS

The recommended horizontal tail trim setting for catapult launching is a function of center-of-gravity position and end airspeed (see figure 3–10). Aileron and rudder trim should be neutral.

CATAPULT LAUNCH (MRT)

Complete all cockpit checks, except for engine runup before taxiing over the shuttle for catapult hookup and tensioning. On run-through-the-deck periods, actuate the controls and positively check that the aileron and rudder neutral trim lights illuminate as the control surfaces pass through neutral. Failure of either light to illuminate is a downing discrepancy unless the controls are near center and it can positively be established that the fault lies in the indicating circuit. During the control check, flight deck personnel will note freedom and response of all control surfaces, that they return to relative symmetry when pressures are released, and that the UHT trim is properly set.

Upon receipt of the standard tensioning signal, apply military thrust and at the same time release the brakes and nose gear steering. When the turnup signal is received from the catapult officer, thoroughly check all engine instruments. Grip the throttle and the catapult handgrip firmly. When satisfied that the aircraft is functioning properly, place your head against the headrest, salute, and wait. Normally, a 3 to 5 second delay will occur before the catapult fires.

Normal catapult launches provide 15 knots excess endspeed. The aircraft leaves the catapult in a near-level attitude. A slight nose-up rotation may be beneficial, depending upon degree and angle of deck pitch and the UHT trim setting. Retract the landing gear and lower the wing according to land-based procedures. Clearing turns off the catapult will depend upon the ship's catapult configuration and the policy established within the air wing. Check alignment of the bearing-distance-heading indicator or the radio magnetic indicator once in stabilized flight.

CATAPULT LAUNCH (CRT)

The afterburner shall be used for all launches except with CQ fuel loads. A/B

CATAPULT TRIM SETTING

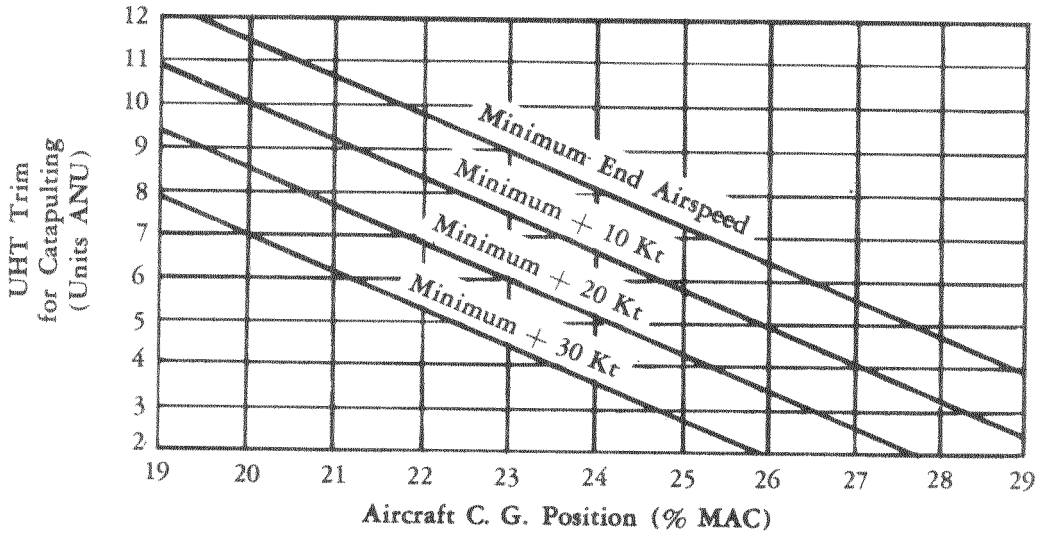


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Figure 3–10

After reaching MRT and upon receipt of the two-finger turnup signal, check the engine instruments. When the catapult officer signals with 5 fingers (open hand towards the pilot), assume position for launch, select afterburner, check engine instruments, and salute. The catapult officer observes afterburner light and pilot's salute, then gives the fire signal. Follow post launch procedures described in MRT. It is recommended that a minimum speed of 300 KIAS be obtained before deselecting afterburner at weights above 22,500 pounds.

NIGHT CATAPULT LAUNCH

Follow the same cockpit procedures and signals used during a daytime launch. When satisfied the aircraft is ready for launch, signal the catapult officer by placing the exterior lights master switch to ON.

Be prepared to establish a wings level climbing attitude on instruments. A 7° nose up rotation is recommended after clearing the catapult. Do not make clearing turns. When established in a wings level climb, retract the landing gear. Lower the wing at 190 KIAS and 500 feet MSL. At 2,500 feet or above, turn exterior lights to bright and turn on anticollision lights.

AIRCRAFT OR CATAPULT MALFUNCTION

If, after establishing power at MRT or CRT, it is determined the aircraft is down, signal this fact to the catapult officer by shaking the head from side-to-side, and transmit on launch frequency, "Suspend the__catapult; ___(call sign) is down." Never raise a hand into the catapult officer's view to give a thumbs down signal or it may be misconstrued to be a salute and the catapult will be fired. NEW

The catapult officer will relay a no-go situation to the deck edge catapult operator by crossing his forearms in front of his face. He will then give the release tension signal and walk in front of the wing to give the throttle back signal. Then, and only then, reduce the throttle to idle.

The same signals will be used to signify a catapult malfunction. Leave the throttle at MRT/CRT until the catapult officer walks in front of the wing and signals for power to be reduced to idle.

If a no-go situation arises during night operation, do not turn on the exterior lights. Call on the launch frequency and advise, "Suspend the_____catapult:_____(call sign) is down." Maintain MRT until the catapult officer walks in front of the wing and gives the signal to reduce

power. If exterior lights are already turned on, do not remove hand from the throttle/catapult grip to turn them off; use UHF to suspend the catapult launch.

LAUNCHING CHARACTERISTICS

When spotted off center, the aircraft oscillates directionally during the catapult power stroke. The oscillations increase in magnitude with increasing forward center-of-gravity position, increasing main gear off-center distance and decreasing catapult pressures. Yaw will be noticed during the power stroke which will increase and reverse direction twice as the aircraft travels down the catapult. As the aircraft leaves the catapult, it tends to roll in the direction of the yaw. When spotted 6 inches off center (using minimum catapult pressures with a 20% MAC center of gravity), approximately one-half lateral stick deflection will be necessary to stop the roll. This control input is a natural reaction and should cause no difficulty.

MINIMUM END AIRSPEED LAUNCHING

Minimum end airspeed is determined by ability to rotate the aircraft to the optimum angle of attack when the gross weight is less than 25,000 pounds. At greater gross weights, proximity to the speed at which the aircraft drag is equal to or greater than the engine thrust becomes the limiting factor.

At gross weights below 25,000 pounds, sink-off-bow will be about 10 feet with moderate rotation required to prevent excessive sink. Do not overrotate. Avoid the use of excessive nose-up trim which will cause a high rate of rotation requiring rapid forward stick to avoid stall. Very light buffet will be encountered during rotation. Acceleration is reduced but comfortable, and as the usual end airspeed is attained acceleration becomes normal.

At gross weights above 25,000 pounds, moderate rotation will prevent sink-off-bow. Very light buffet will be encountered, and acceleration is reduced but comfortable.

CARRIER LANDING

Refer to field carrier landing practice, this section, for additional information, to figure 3–11 for illustration of typical carrier landing, and to section I, part 4 for carrier operating limitations.

While maneuvering to enter the traffic pattern, attempt to determine the sea state. This information will be of value in predicting problems that may be encountered during the ensuing approach and landing. If the sea state is smooth, the carrier is creating all (or most) of the wind over the deck by hard steaming. Enter the pattern at a weight so as to be on the ball at or below max trap. Expect the wind to be down the axial deck which will result in a 10° crosswind when lined up with the angled deck. Stack wash will be encountered, so expect some turbulence when approaching the ship's wake. Pay particular attention to lineup.

With a moderate sea state, the carrier should be able to place the wind down the angled deck so lineup will not be a problem. As the wind over deck increases, additional power will be required to fly a proper approach.

If blowing spray is observed the sea state is rough and the carrier will be steaming to maintain steerageway. The wind over deck will be gusty which will necessitate more frequent power and control corrections to maintian the glide slope. Turn earlier at the 180° position to avoid being long in the groove.

VFR PATTERN

Enter with a level break from a course parallel to Base Recovery Course (BRC), close aboard the starboard side of the ship at 800 feet MSL. Use break procedures described in shore-based procedures. When on downwind leg, descend to 600 feet MSL and perform landing cockpit checks as described in shore-based procedures. Engage and check operation of the approach power compensator. Cross-check angle-of-attack and airspeed indicators for 13.5 units angle of attack and proper airspeed. Check cockpit emergency ventilation port closed before using angle-of-attack indications. Fly a race-track pattern with the 180° position approximately 1-1/4 to 1-1/2 miles abeam (check distance with TACAN, if desired) at 600 feet MSL. With a 30-knot wind over deck, begin the 180° turn to the final approach when approximately abeam the LSO platform. To be lined up with the angled deck centerline, roll out immediately to the right of the ship's wake. When the meatball is acquired, transmit aircraft call sign "Crusader," "meatball," and fuel state in nearest 100 pounds. Signify no meatball by transmitting the code word "Clara." If a non-APC pass is to be made transmit the signal "manual" before meatball.

GLIDE SLOPE

The physical glide slope projected from the ship is approximately 3.5°. Due to the wind over the deck, the aircraft flies approximately a 3.0° slope through the air.

NEW NEW NEW NEW

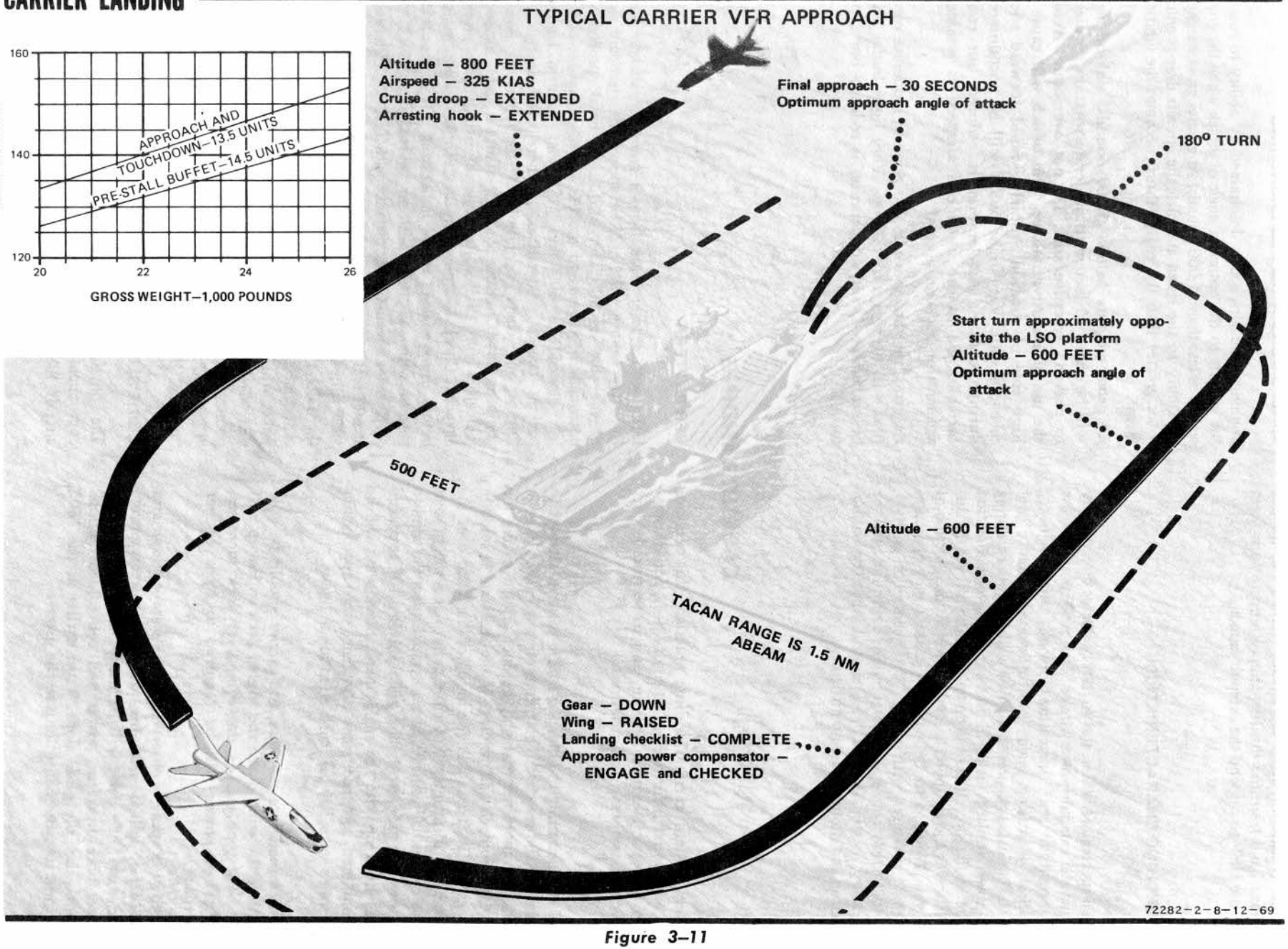


Figure 3-11

However, at any given point in the approach, the pilot is looking at the ship on a 3.5° slope. This, of course, gives the pilot the feeling that he is too high. This feeling should be disregarded, and only the meatball and the LSO shall be relied upon for proper glide slope information. Closure rate on the ship is on the order of 105 knots, whereas on the field, closure rate is usually equal to true airspeed (light wind). This difference in "distance/time" relationship further emphasizes the need for looking at, and flying the meatball all the way to touchdown, rather than estimating power required by looking at the deck. It is necessary to carry a little more power on the glide slope on the ship than ashore, in order to maintain the proper glide slope and airspeed.

FLYING THE MEATBALL

Use of the approach power compensator is recommended for all normal carrier landings. An occasional manual approach will suffice to maintain proficiency. The approach power compensator should not be used if operating in manual fuel control or if the wing cannot be raised.

When utilizing the APC, the position of the nose adjusts power and consequently the rate of descent, while holding a constant angle of attack/airspeed. Positive changes of nose attitude are required to correct and maintain the proper glide path. Smooth corrections made early enough that only a slight amount of correction is necessary is the desired technique. However, a low meatball must never be accepted and positive nose-up response is required to correct it. If the LSO calls for power when the pilot is flying an APC pass, that is the signal to break out of APC by adding power. Two power calls in close succession are a demand for MRT. When correcting a low meatball, correct the ball all the way to the center before reestablishing the required rate of descent. When correcting a high meatball at maximum gross weights or in high ambient temperatures when limited excess thrust is available, care should be exercised to lead the correction enough as the ball approaches the center to avoid settling through a center ball and going low. The typical F-8 bolter results when the pilot allows the ball to go low in the middle of the approach and then overcontrols the nose position/power to end up with the ball high at the ramp. Corrective procedure is to keep the ball in the center throughout the entire approach. When in close on the final stages of the approach do not attempt to center a high ball. The aircraft is already on a steeper glide path with the high ball, and if the nose is lowered in an attempt to correct it back to the center, the APC will pull power with a resultant high rate of descent which may damage the aircraft. Keep the "in close high ball" where it is on the optical landing aid and a safe arrestment will result. Never accept a low ball regardless of the position in the approach.

CAUTION

If it is necessary to break out of APC, do so by advancing the throttle. Retarding the throttle with sufficient force to disengage the APC could result in bypassing the idle stop and shutting down the engine.

If a manual pass is necessary, the throttle is used to control the rate of descent and the nose to maintain the proper angle of attack/airspeed. The scan pattern remains the same; i.e., equal scanning of lineup, meatball, and angle of attack/airspeed throughout the approach until in the very last stages near the ramp the entire scan is devoted to the meatball.

PITCHING DECK

With increasing rough seas the glide slope varies, particularly in the vertical plane. The glide slope is stabilized only to the extent that it passes through a point in space 1,800 to 2,200 feet astern (approximately half way out on the final approach). As the deck pitches, the glide slope deflects as necessary to remain focused on this point. It is apparent that the vertical movement of the glide slope increases in magnitude as distance from the focal point increases. With a line stabilized lens the glide slope is stabilized for all ship movement except heave. No meatball movement due to deck motion should be discernible to the pilot, except under the most severe conditions.

After rolling wings level on the final approach, begin a rate of descent of approximately 600 feet per minute. Average out the meatball movement. Maintain a glide path that shows the same degree, or distance, of meatball movement above and below the datum lights.

As the aircraft progresses into the middle third of the approach, meatball movement due to carrier pitch is at a minimum. Use this part of the approach to advantage. Adjust nose attitude and establish the proper rate of descent.

As the aircraft moves into the final third of the approach, the meatball will again begin to cycle on the optical landing system. Hold the attitude and the rate of descent established during the middle third of

the approach, unless instructed otherwise by the LSO. If the meatball goes high when approaching the ramp, do not attempt to center it. The ramp could be cycling down, and an increased rate of descent, coupled with a rising ramp on touchdown, could exceed aircraft design limits. If the meatball starts to go low, do not hesitate to override the approach power compensator by adding power. In this case, the aircraft could be descending below the glide path, or the ramp could be cycling up. In either event, the aircraft is getting too close to the ramp and the only correction is power. Accept the fact that wave-off and bolter rates increase when landing with a pitching deck. The higher rates are acceptable, particularly when the alternatives are considered (hard landings, ramp contacts, etc).

NIGHT/IFR PATTERN

Refer to CVA/CVS NATOPS for additional information. The pilot will normally begin transitioning to the approach configuration at the 10-mile gate. This will ensure passing through the 6-mile gate with the landing checklist completed at 150 KIAS. If the APC is to be used, engage it at this position. Intercept the PAR glide path at 1,200 feet MSL and 2-1/2 miles. If an ASR approach is to be made, start descent to 600 feet MSL in time to intercept the meatball at 1-1/4 miles. When a straight-in approach is being made, it will be difficult to see over the nose of the aircraft to properly fly the meatball and line up. Raise the seat as high as practical before starting the approach to help overcome this problem. Shift the scan of the meatball and line up to the left windscreen as soon as possible. Attempting to see the meatball and line up through the center windscreen when close in can result in the inadvertant lowering of the nose. This is especially true at night when no horizon references is available. The glide path is being intercepted from below when on a straight-in approach and pilots must use caution not to begin a rate of descent when the ball first appears on the optical landing aid. The aircraft could be as much as 75 feet below the glide path at that point. The meatball will be ill defined at distances beyond 1-1/4 miles, and the pilot must not begin his descent until he is certain the ball is centered. At 1-1/4 miles, transmit the same voice call as required in the VFR pattern. Any time the ball is lost off the optical landing aid at night, initiate a waveoff and transmit "Clara." LSO will advise position and whether to continue the approach.

WAVE-OFF

Wave-off characteristics are good and the engine accelerates from approach thrust (about 87% rpm) to military thrust in about 2.5 seconds.

BOLTER

In the event of a bolter, add MRT and rotate the nose to 7° nose up. Do not begin a turn downwind at night until reaching a minimum of 1200 feet MSL.

BINGO FUEL

If the carrier is operating with divert fields available and the bingo fuel state is reached, notify the controlling authority of intentions, clean up the aircraft, and depart on course. Do not orbit the carrier awaiting instructions. Fly towards the bingo field and if you are in doubt as to the exact heading, ask for it before switching frequency. Shipboard control may be contacted for radar monitoring. Check heading to the bingo field with control and ensure that the RMI is set properly. If possible, relay a "feet dry" message to the ship. Operational necessity may require the CVA to operate without bingo fields. In this case applicable CVA/air wing tanking policy will be observed.

ARRESTMENT OPERATIONS

CAUTION

Actuation of the nose gear steering before the nose gear has returned to within the 60° left/right limits can damage the system.

Fly the aircraft on the glide slope all the way to touchdown and do not attempt a flare. Add power to MRT as the aircraft touches down. When forward motion has ceased, reduce power to idle and allow the aircraft to roll aft. Apply brakes on signal and immediately add taxi power. Hold brakes to prevent forward movement and raise the hook when directed. When the come ahead signal is received, release brakes and expedite exit from the landing area. Use caution on wet decks. Use brakes for initial directional control and engage nosewheel steering after forward motion is established. When clear of the landing area, turn stabs off and fold outer wing panels on signal. Signal aircraft status to flight deck control with thumbs up/down.

CAUTION

Pulling the aircraft aft with the hook handle in the up position can damage the arresting gear assembly.

While the hook is retracting, the aircraft must remain static or a reengagement is likely. If a reengagement occurs, reduce power, drop the hook when directed, and allow the aircraft to be pulled aft. Raise the hook again on signal.

Normally, all night recoveries will be from CATCC controlled approaches. The LSO shall assume control when the aircraft is approximately one mile from the ramp. Exterior lights should be on bright with the anticollision lights off. Following arrestment, reduce power to idle and immediately turn off the exterior lights. Allow the aircraft to roll aft, apply brakes, raise the hook when directed, and taxi slowly out of the landing area. Do not stare at the director's wands, but use them as the center of a scan pattern. When clear of the landing area, signal aircraft status to flight deck control.

POSTFLIGHT

Taxi the aircraft as directed. Do not use excessive power. Keep the engine running until the chocks and at least one tiedown are installed. Landing gear downlocks should also be installed before engine shutdown. Always control canopy opening rate by holding the rails with both hands. Install the canopy restraint strap as soon as canopy opens, being careful to hold the canopy down. The wind over the deck will exert strong forces on the canopy tending to force it open. Perform engine shutdown and postflight as described in shore-based procedures except do not attempt to run the engine for 30 seconds at 75% rpm. This procedure is too dangerous to flight deck personnel. Normally the time from arrestment to engine shutdown will be short enough to ensure the oil is properly scavenged. Do not attempt a postflight inspection if recovery is still in progress. Clear the flight deck by the most expeditious route.

If the aircraft is to be spotted on the hangar deck, open the canopy and remove the hard hat as you are descending on the elevator. Normally, taxi the aircraft from the elevator into the hangar bay. Expect the cut signal when clear of the elevator. Lower the wing and raise the droop before engine rundown. From this point, aircraft handlers will move the aircraft. Keep speed under control and be alert for stop signals. Hold the brakes after being spotted until a 3-point tiedown has been completed.

PART 5–FUNCTIONAL FLIGHT CHECK PROCEDURES

GENERAL

Functional flight checks are required to determine whether the airframe, power plant accessories, and items of equipment are functioning in accordance with predetermined requirements while subjected to the intended environment. Such flights are conducted when it is not possible to determine proper operation by ground checks (e.g., aerodynamic reaction, air loading, or signal propagation). This part contains a detailed description of the procedures required to accomplish the functional flight check of the RF-8G aircraft and shall be accomplished in addition to procedures found in Part 3 and 4 of this section.

OPNAVINST 4790.2 directs functional flight checks be performed after completion of any one of the maintenance functions listed below. The alphabetical identification following each procedure identifies the maintenance function for which it applies. The maintenance functions below are alphabetically keyed to flight profiles in figure 3-12 and are referenced by letter as they apply to the individual procedures.

A. When fixed flight surfaces have been installed or reinstalled: this excludes removal and reinstallation of quick-disconnect aft section of gas turbine engine aircraft when no work which requires a functional flight check is performed on the removable section. Normally the flight check requirement for this maintenance function will be accomplished in combination with an operational mission.

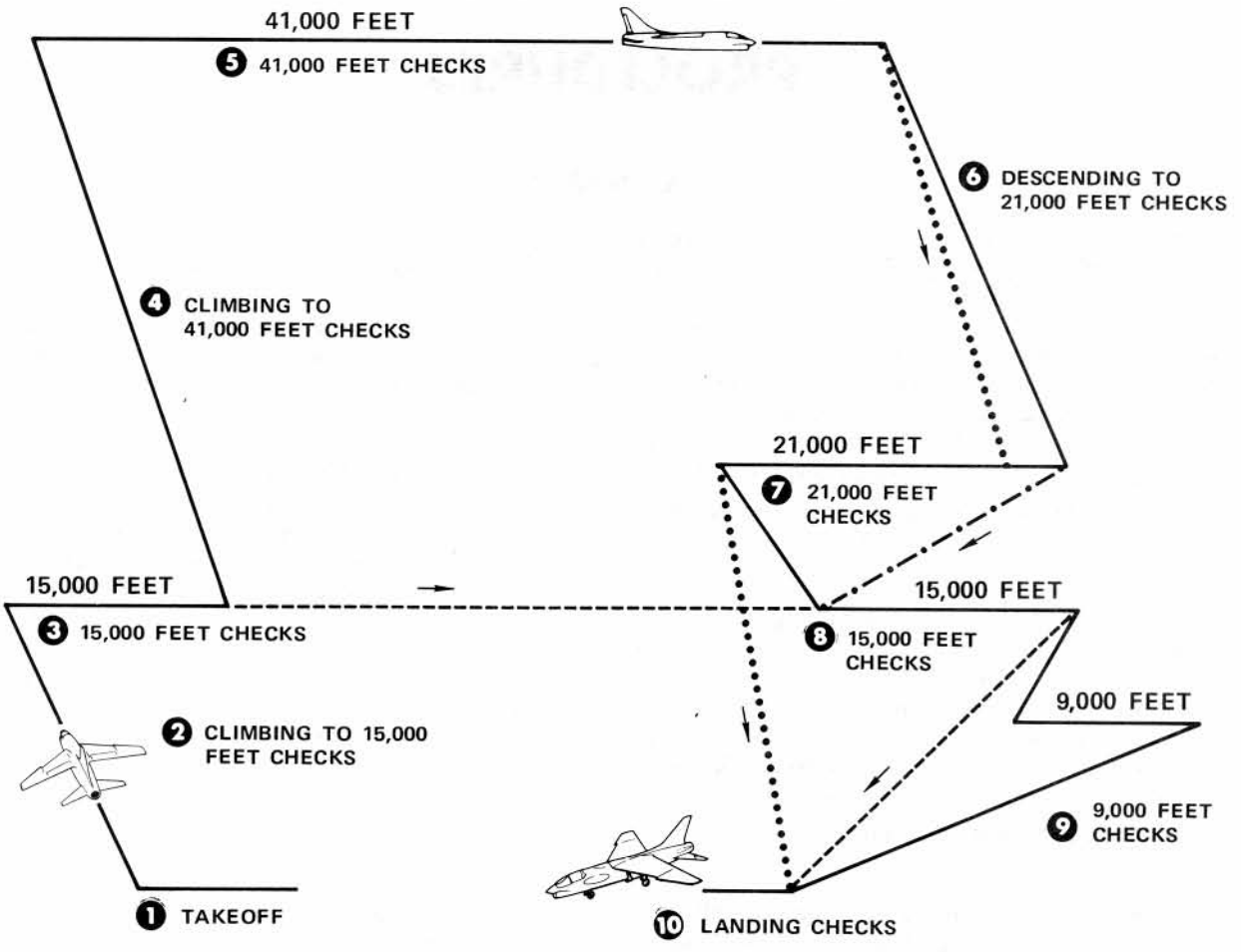
B. When movable flight surfaces have been installed, reinstalled, or rerigged: when flight control system components have been adjusted or replaced and improper adjustment or replacement of such components could cause an unsafe operating condition.

C. After installation or reinstallation of a major fuel system component, or any component which cannot be checked in ground operation.

D. After installation or reinstallation of the gas turbine engine.

E. After the completion of aircraft rework or at the completion of all phase D maintenance inspections.

FUNCTIONAL FLIGHT CHECK PROFILE (TYPICAL)



CHECKFLIGHT GROUND CHECKS

LEGEND

A. Fixed flight surfaces installed, reinstalled (Not Standard Profile, normally accomplished in conjunction with Operational mission)

B. Movable slight control surfaces/components adjusted/replaced ---------

C. Major fuel system component replaced, or any component that cannot be ground checked •—•—•—•

D. Engine removal/installation ••••••••••

E. Aircraft rework/phase D ————————

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Figure 3-2 (Sheet 1)

1 TAKEOFF

1. Brakes (E)
2. Manual Fuel Control (C,D,E)
3. Power plant (C,D,E)
4. Combat Rated Thrust (C,D,E)
5. Landing Gear (C,D,E)

2 CLIMBING TO 15,000 FEET CHECKS

1. Instrument Vibration (E)
2. Wing Fuel Dump (C,D,E)
3. Cockpit Depressurization (C,D,E,)

3 15,000 FEET CHECKS

1. Droop Operation (B,E)
2. Air Refueling (C,E)
3. IFF (E)
4. TACAN Operation (E)
5. TACAN Air-to-Air (E)
6. Aileron/Rudder (B,D,E)
7. Speed Brake (B,E)
8. MRT–V Max Trim (C,D,E)
9. Maximum EGT (C,D,E)
10. Fuel System (C,D,E)

4 CLIMBING TO 41,000 FEET CHECKS

1. Engine Instruments/Cockpit Pressurization (C,D,E)
2. Duct Bypass Door (E)
3. De-Fog System (D,E)
4. Afterburner Ignition (D,E)
5. Afterburner Modulation (D,E)

5 41,000 FEET CHECKS

1. Engine Instruments/Cockpit Pressurization (C,D,E)
2. Engine Deceleration (C,D,E)
3. Cabin Leakage at Idle and Engine Acceleration (C,D,E)
4. Supersonic Trim (E)
5. Supersonic Aileron Rolls (E)
6. Supersonic Stabilization (E)
7. Buffet Boundary (E)

6 DESCENDING TO 21,000 FEET CHECKS

1. Transfer Pump Light (C,E)
†2. Automatic Gain Changer (B,E)

7 21,000 FEET CHECKS

1. Four-g Turn/Anti-G Suit (E)
2. Cabin Temperature Normal (D,E) Control

8 15,000 FEET CHECKS

1. Stall Approach Buffet (B,E)
2. Emergency Spin Droop (B,E)
3. Land Droop (B,E)
4. Speed Brake Auto Retraction (B,E)
5. Rudder Slips (E)
6. Angle-of-Attack/APC (B,E)
7. Land/Cruise Droops (B,E)
8. EPP (C,E)

9 9,000 FEET CHECKS

1. Radar Altimeter (C,E)
2. AN/ARA-63 (After AFC 572)

10 LANDING CHECKS

1. Landing Checklist (A,B,C,D,E)
2. APC Operation (B,C,D,E)
3. Fuel Transfer/Low Fuel Level Warning (C,E)
4. Bearing Distance Heading Indicator (E)
5. Shut Down Engine IAW Part 3 and/or 4 (A,B,C,D,E)

† May be performed at 15,000 feet

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Figure 3-12 (Sheet 2)

PRETAKEOFF

PREREQUISITES

1. At the discretion of the Commanding Officer, functional flight checks required by the previous maintenance functions may be flown in combination with operational flights, if the operational portion is not conducted until the flight check requirements have been satisfied and the results have been entered on the flight check checklist. The general purpose code assigned to a combination check and operational flight will be the one that describes the primary purpose of the flight.

2. Pilots performing functional flight checks shall be qualified in accordance with OPNAVINST 3710.7 series, and this manual. Pilots will be provided a thorough briefing and a copy of the flight check checklist by the Maintenance officer or his designated representative (normally the QA officer). The briefing should describe the requirements for the particular flight. The flight check checklist should be marked so as to indicate the flight profile desired and the procedures which are required to complete the check.

NEW 3. Flight checks shall be conducted in accordance with the criteria established by OPNAVINST 3710.7 series.

4. Flight check checklist must be properly completed and returned to the Maintenance Department.

FLIGHT CHECK COCKPIT CHECKS

General

1. Windshield, canopy, and mirrors – CHECKED (E, B)

   - Cycle and check canopy counterbalance for damping and smooth, easy operation. Handle forces shall not exceed 50 pounds when locking the canopy with cabin pressurization off. Check the canopy lock indicator for proper indications in the open and closed positions. The handle should be spring-loaded to the closed position with the canopy open, should be capable of being stowed, and should remain stowed.

   - Glass and plastic should be checked for stone marks, image distortion, scratches, and cracks. The presence of paint, or anything that obstructs vision, is noted after flight.

Left Side

1. Catapult handgrip – CHECK (E)

   - No interference with other controls while in stowed or operating position, ease of extension to operating position.

2. Throttle friction wheel – CHECK (A, B, C, D, E)

Right Side

1. Arresting hook – EXTEND (A,B,C,D,E)

   - Free-fall without electrical or hydraulic power.

2. Cabin altimeter – CHECK (D,E)

   - The cabin altimeter is set to indicate zero feet at a pressure of 29.92 inches of mercury absolute. Between zero feet (sea level) and 5,000 feet on the indicator, the indicated reading is subject to a ±75-foot tolerance. If the cabin altimeter, when open to atmospheric pressure on the deck, is in error in excess of the tolerance noted previously, it is conceivable that a cabin pressurization discrepancy may be incurred during flight, even though the actual pressurization is satisfactory. The cabin altimeter may be given a simple check before flight by turning the sensitive altimeter to a setting of 29.92 inches of mercury and comparing the indications of the two altimeters. Allowing for possible errors in both instruments, the cabin altimeter should be within ±250 feet of the sensitive altimeter.

STARTING ENGINE

Start engine in accordance with part 3 and/or part 4 of this section. (A,B,C,D,E)

FLIGHT CHECK GROUND CHECKS

Initial Checks

1. DC power – CHECK (A,B,C,D,E)

   - Check that WHLS DOWN appears in landing gear position indicators.

2. AC power – CHECK (A,B,C,D,E)

   - Check primary attitude indicator for proper erection, OFF flag out of view.
   - Operate seat position motor.
   - Check for ON indication in generator indicating window.

With Wing Down

1. Interior/exterior lights – CHECK (A,B,C,D,E)

   - Interior/exterior lights for proper operation (plane captain, exterior).
   - Turn on anticollision lights, leave on for entire flight.
   - Taxi light for proper operation.

With Wing Up

1. Liquid oxygen quantity – CHECK (A,B,C,D,E)

   - With a fully serviced system, gage should indicate 5 liters. Do not takeoff with less than 3 1/2 liters indicated.

2. Liquid oxygen system – CHECK (E)

   - Connect hoses from seat cushion.
   - Turn on pilot's oxygen valve.
   - Don oxygen mask and check oxygen flow by breathing several times.
   - After pressure buildup, turn off pilot's oxygen valve; while holding mask tightly against face, check to see that the oxygen low-pressure warning light does not come on until pressure has been allowed to dissipate by breathing or redressing mask. If the warning light comes on, a leak is present in the system and must be corrected before flight.

3. Oxygen warning light – CHECK (A,B,C,D,E)

   - The low oxygen quantity and pressure warning light will glow any time the oxygen quantity is 1/2 liter or below or the oxygen pressure is 50 (±3) psi or below. The light will not go out until pressure increases to 57 (±3) psi, or above.

4. Cockpit emergency ventilation – CHECK (A,B,C,D,E)

   - Knob for ease of operation and security of locking. Ensure scoop is fully closed by feeling port on right side of aircraft.

5. Wingfold mechanism – CHECK (C,E)

   - If the wings are extended, cycle wings for evaluation, leave in extended position.

6. Ailerons – FULLY DROOPED (A,B,E)

   - Check that the ailerons are drooped full down, leading edge is drooped full down, droop position indicator indicates DN, wing/wheels/droop light is off, wingfold flags are retracted, and rudder pedal full throw force is approximately one-half the force required with the wing down. The nominal time for cycling the wing should be 3.5 to 5.5 seconds up, and 3.5 to 5 seconds down. Note that the pitch trim indicator shows 4.5 (±.5) units nose down trim change during wing up movement.

TAXIING (Flight Check)

1. TACAN – CHECK (A,B,C,D,E)

   - Turn TACAN to REC position, warm up for 3 minutes before selecting T/R (transmit and receive).

2. Command radio – CHECK (A,B,C,D,E)

   - Check UHF transmission and reception. Select ADF position and check indication.

3. Transponder (IFF) – TEST (A, B, C, D, E)

4. Rain removal and defog systems – CHECKED (D,E)

- Close and lock canopy.
- At 85% rpm, actuate the rain removal switch and the defog switch separately. Hot air should flow from the respective systems.
- Turn rain removal off.

5. Approach power compenstor (APC) – CHECKED (B,C,D,E)

- Place and hold angle-of-attack transducer vane in position to drive indicator pointer to the FULL DOWN/ZERO position.
- Place the APC temperature switch in position compatible with ambient conditions.
- Place the APC engage switch in the ON position, and hold. The engage light will come on if the system is operative.
- Engagement should result in an initial increase in rpm, and stabilization near APC idle rpm.
- Raise transducer vane slightly, throttle should advance. Lower vane to contact stop, throttle should move full aft, indicator should indicate 0 (±0.5) units, and rpm should stabilize at 70% (±1%) within 10 seconds.
- With transducer vane at zero units; pull aft on stick, note that throttle advances.
- Momentarily raise vane to contact stop, throttle should advance to MIL rpm.
- Release APC engage switch and transducer vane. Engage light should go out.
- The APC check should be accomplished in the turnup area or on the runway just before take off to preclude damage to surrounding equipment, danger to personnel, etc.

INFLIGHT

TAKEOFF

Complete takeoff checklist and follow takeoff procedures, part 3 and/or part 4 of this section.

1. Brakes – CHECKED (E)

- With a full fuel load and a dry runway, the brakes should hold military rated thrust before takeoff. Exceptions are: initial flights or after new brake pucks have been installed.

2. Manual fuel control – CHECKED (C,D,E)

- Place throttle in IDLE.
- Place fuel control switch in MANUAL.

Note

Idle N_2 rpm should fall between 60% and 74%; however, if the rpm tends to drop below 65%, throttle modulation is permissible to bring rpm up. Fuel flow need not be checked.

- EGT limits are the same as in normal fuel control.
- The engine should be capable of acceleration from idle power without overtemperature, provided normal caution is maintained.
- Advance throttle slowly to MRT. Fuel flow must be 6,650 pph to 8,150 pph.
- Record fuel flow.
- Subtract 150 pph from fuel flow values for each 1,000 feet above sea level.
- Check EGT for maximum stabilizing acceleration limits.

- Check rpm for maximum permissible and record.
- Return throttle to IDLE detent.
- Place fuel control switch in NORMAL.

3. Powerplant – CHECKED (C,D,E)

- Recheck engine parameters at MRT before commencing takeoff roll. Engine should accelerate from IDLE to MRT power in 10 seconds maximum. Record EPR, RPM, oil pressure, fuel flow and EGT.

4. Combat rated thrust (CRT) – CHECKED (C,D,E)

- EGT should not exceed the limits listed below:

Acceleration	Stabilized
720°C (mom)	670°C (4 min after accel)

- EGT should stabilize within the time as indicated after acceleration, including CRT operation.
- There should be no rpm change from MRT to CRT.
- Engine pressure ratio at CRT should be within +0.04, -0.01 units of the MRT pressure ratio.
- Oil pressure limits are the same as in MRT.

5. Landing gear – CHECKED (C,D,E)

- The gear should retract positively and indicate UP. There should be no appreciable trim change associated with raising the gear. Handle forces should not exceed 15 pounds when moved either up or down; nominally, handle force is 12 pounds UP and 8 pounds DOWN in the vicinity of the full travel detent.

CLIMBING TO 15,000 FEET CHECKS

1. Instrument vibration and jitter – CHECKED (E)

- The following cockpit instrument fluctuations or flutter are acceptable when at high aircraft vibration levels:
- N_2 RPM indicator – 0.7% from 60% to 105% rpm.
- EPR indicator – 0.10 units. Inflight fluctuation greater than 0.05 units should be noted for ground check.
- EGT indicator – any fluctuation less than 10°C is acceptable.
- Airspeed indicator – under most intense vibration conditions, needle jitter up to ±10 knots is acceptable.
- ID-249 course indicator – the TO-FROM indicator may be expected to jitter under high vibration environment.
- Fuel flow indicator – low range (up to 3,000 pph), a maximum of 50 pph is acceptable; high range (above 3,000 pph), a maximum of 380 pph is acceptable.
- PC and utility hydraulic pressure indicators – PC and utility pressures should be 3,000 (+100, -75) psi. A momentary surge in utility hydraulic pressure as high as 3,800 psi may be encountered with operation of one utility-supplied aircraft system, either during ground check or in flight. Pressure should remain no higher than 3,600 psi, and bleed slowly to normal system pressure. Pressure fluctuations up to ±150 psi are permissible only for short periods. Continuous fluctuations beyond ±150 psi are cause for pump rejection.

- Oil pressure limits are 40 to 55 psi. With confirmed guage error:
  37 to 58 psi is acceptable.
  ±10 psi in maneuvering flight is acceptable.
  ±5 psi in level flight at a constant power setting is acceptable.

2. Wing fuel dump system – CORRECT OPERATION (C,D,E)

- Place the fuel dump switch (momentarily) in FUEL DUMP. Check that fuel is dumped from both dump valves.
- Place fuel dump switch in OFF.
- Check that dumping stops.

3. Cockpit pressurization – CHECKED (C,D,E)

- The cockpit should start pressurizing at 8,000 feet and maintain 8,000 (+900, -1,000) feet until reaching 15,000 feet.

15,000-FOOT CHECKS

1. Droop operation – CHECKED (B, E)

   - Cruise to clean (250 KIAS)
   - In 1g flight, move cruise droop switch to UP. Droop retraction should be completed in 5 seconds maximum; LE droop indicator should show UP.
   - Clean to cruise (280 KIAS)
   - Maintain 280 KIAS. In 1g flight, move cruise droop switch to DN. Droop extension should be completed in 5 seconds maximum, LE droop indicator should show DN.
   - Accelerate to 350 KIAS, cycle cruise droop switch UP, then DN. Aircraft should not roll more than 10^{o}.

2. Air refueling – CRUISE CHECKED (C, E)

   - Check EMERG PROBE switch OFF
   - Extend probe (350 KIAS) – probe must extend in 7 to 10 seconds (maximum) and will cause a small directional trim change. The PROBE OUT light will come on as the probe is extended.
   - With the probe fully extended (IFR PROBE switch in OUT), cycle the speed brake. The probe must remain fully extended, with no tendency to retract.
   - Leave probe extended (switch OUT) sufficiently to determine that fuel transfer stops.
   - Retract probe; retraction should occur in 7 to 10 seconds. Check the PROBE OUT light off. Hold IFR PROBE switch IN for about 5 seconds after the PROBE OUT light goes off to ensure the probe door is locked.

3. IFF – CHECKED (C, E)

   - AN/APX-72 – Select NORM, Modes 3/A and c, and the appropriate code setting for Mode 3/A before entering area of positive control. Contact Air Traffic Control Center for verification that Mode 3/A is operating correctly. After notification and concurrence of the air traffic controller, the IDENT and EMER positions may be momentarily selected and checked. Modes 1, 2, and 4 (if installed) are for tactical use and must be checked with the appropriate military facilities.

4. TACAN operation – CHECKED (C, E)

   - During the climb, note satisfactory operation of the equipment. With T/R function selected, bearing, distance and identification signals should be received.
   - To determine the accuracy of the bearing and distance indications, fly over a predetermined geographic fix and check the bearing and distance to at least two TACAN stations. The azimuth tolerance (No. 2 needle) is $\pm 2.5^{o}$ for the bearing direction heading indicator and $\pm 4^{o}$ for the ID-249. The number 2 needle and the ID-249 should also agree within 1.5^{o}.

5. TACAN air-to-air – CHECKED (C, E)

   - If a cooperating airplane equipped with air-to-air TACAN has been provided, the accuracy of the A/A mode may be checked with the other airplane.
   - The air-to-air link is established when both mode selectors are set to A/A and the channels selected are set 63 channels apart (i.e., Channel 1 and 64, 2 and 65, etc.).
   - Only range information is provided in the air-to-air mode. The accuracy tolerance is ±2 miles.

6. Aileron/rudder interconnect – CHECK (B, D, E)

   Note

   Roll stab must be on.

   - At 0.85 IMN, turn yaw stab switch off. There should be no yaw. Perform half-stick aileron rolls from 60^{o} right to 60^{o} left. Rolls should be coordinated (no adverse yaw).
   - At 0.85 IMN, turn yaw stab switch on. Perform half-stick aileron rolls from 60^{o} right to 60^{o} left. There should be slight adverse yaw.

7. Speed brake – CHECKED (B, E)

   - At 450 knots, extend speed brake. A noseup trim change of approximately 5^{o} should occur, accompanied by light buffet.

8. MRT-V maximum trim – CHECKED (C, D, E)

   - Apply military rated power. Maintain straight and level flight. Aileron trim requirement should not exceed 0.75^{o} left or right from previous setting. Yaw trim should not require movement of the yaw trim knob more than 120^{o} left or 72^{o} right of center position.

9. Maximum EGT – CHECKED (C, D, E)

MRT	670^{o}C
CRT	670^{o}C

10. Fuel system – CHECKED (C, D, E)

    - Check that the transfer system supplies fuel as necessary to maintain (4,300 pounds) in the main system under steady state, wing down, level flight, positive g conditions within pitch attitude ranges of $+10^{o}$, -4^{o}.

- When the transfer system indication is approximately 3,300 pounds, the TURN PUMP OFF caution light should be on, and the fuel in the aft cell should be expended. Turn pump off when the light comes on steady.

CLIMBING TO 41,000 FEET CHECKS (0.85 to 0.90 IMN)

1. Engine instrument/cockpit pressure – CHECKED (C,D,E)

   - From 23,000 feet a differential pressure of 5.5 psi should be maintained until reaching 41,000 feet. While climbing, cockpit pressure surges of more than ±250 feet indicated on the cabin altimeter are unacceptable.

ALT	EGT	RPM	Oil Pressure	Fuel Flow	Cabin Altitude	
					Actual	Desired
23M						6,700 to 9,600
25M						7,800 to 10,810
35M						12,900 to 16,200

2. Defog system – CHECKED (D,E)

   - Actuate the defog switch momentarily during the climb. The defog system supplies hot air to the windshield panels to prevent fogging or to remove fog which has formed. Defogging is not necessary and the system should not be used during supersonic flight except during high rate descents.
   - At reduced power settings, the output of the defog system may not be sufficient to keep the windshield clear. It may, therefore, be necessary to advance the throttle to higher power settings to increase defog air flow periodically in order to clear the windshield. With the defog ON and temperature control in AUTO, cabin pressure surges should be below the sensitivity of the cabin altimeter.

Note

The defog system may be operated continuously above 30,000 feet at cruise power setting or less to maintain cockpit temperature at a comfortable level. Do not use manual control to obtain additional heating, since high temperature settings may cause cabin pressure surges.

3. Afterburner ignition – CHECKED (D,E)

   - While climbing through 40,000 feet at 0.80 IMN minimum and with the throttle at the forward stop, ignite the afterburner. Ignition should occur in one attempt using J-P5 fuel, or within two attempts using J-P4 fuel.
   - Cycle the engine to military power, then reignite the afterburner. The afterburner should relight satisfactorily with no pause using J-P5 fuel, or with a minimum pause of 5 seconds in MRT using J-P4 fuel. During nonafterburning operation with J-P4 fuel, the nozzle may cycle intermittently.

Note

The previous criteria is not applicable to operation with the throttle at a modulated position. If a yawing moment is experienced when afterburner ignition occurs, it is recommended that the check be repeated with yaw stabilization off, in order to isolate the cause.

4. Afterburner modulation – CHECKED (D,E)

   - Modulate the afterburner while climbing above 40,000 feet at 0.80 to 0.90 IMN. The afterburner modulation range should be 3% to 5% below maximum rpm. The afterburner should not blow out during modulation or nonmodulation up to 50,000 feet.

41,000 – FOOT CHECKS

1. Engine instrument/cockpit pressure – CHECKED (C,D,E)

ALT	EGT	RPM	Oil Pressure	Fuel Flow	Cabin Altitude	
					Actual	Desired
41M						15,000 to 19,000
41M	IDLE	IDLE				15,000 to 19,000

2. Engine deceleration – CHECKED (C,D,E)

   - With the aircraft in straight and level flight at 0.80 to 0.90 IMN, snap decelerate the engine from MRT to idle rpm. The engine should be stall free on snap or slow decelerations to IDLE, and there should be no rpm hangup during the deceleration. When retarding the throttle to IDLE, the fuel flow indicator may go to zero; however, advancing the throttle should cause the indicator to return to normal operation.

Note

Because of the tolerance of the bleed valve governor setting, bleed valve actuation rates and exhaust port vane angular tolerances, a slight yawing moment may be encountered with a bleed valve governor which actuates at the high end of its tolerance and a bleed valve which actuates very rapidly.

- If yaw input is experienced, repeat check with yaw stabilization system OFF to ascertain that malfunction of stabilization system does not exist.

Note

Some yaw is obtained within the design tolerances of the system and is considered acceptable.

3. Cabin leakage at IDLE/engine acceleration – CHECKED (C,D,E)

- Before retarding the throttle to IDLE, note the cabin altimeter reading at MRT power. Place the cabin temperature control at full hot and retard the throttle to the IDLE position for approximately 20 seconds to allow engine rpm to stabilize; the cabin altimeter reading should not increase more than 1,000 feet.

- Engine acceleration time from IDLE rpm (stabilized) to MRT should not exceed 20 seconds when at an airspeed above 150 KIAS (engine specification criteria). A mild, up to "three bang" nonsteady state acceleration stall is acceptable, provided no action is required for recovery, the generator does not drop out, and acceleration times are met. There should be no rpm hangups on accelerations.

DESCENDING TO 21,000 FEET CHECKS

1. Supersonic trim – CHECKED (E)

- At 1.2 IMN, the lateral trim should not exceed 3/4° right or left, and the directional trim knob setting should not exceed 120° left or 72° right.

2. Supersonic aileron rolls – PERFORM (E)

- At 1.2 IMN, perform a 360° aileron roll in each direction. A slight favorable yaw should be felt. Note the force required to overcome the 9.5° aileron stops and the approximate stick position at the stops. Stick force at the stops should be approximately 11 pounds.

3. Supersonic stabilization – CHECKED (E)

- Trim for level flight at 1.2 IMN. Perform rudder kicks using approximately one-half rudder with the stabilization systems on. Damping should be within one cycle laterally and 2 1/2 cycles directionally.

4. Buffet boundary – CHECKED (E)

- Decelerate to and trim for 0.95 IMN with cruise droop extended. Make a coordinated turn and note onset buffet; it should occur at approximately 2.2g. Retract cruise droops and repeat the turn. Onset buffet should occur at approximately 1.8g. Excessive rolling or sharp pitch up as moderate buffet occurs is not acceptable. Due to production g meter tolerances and inaccuracies, and variations in pilot technique, the above g values should be treated as approximations only. The "delta" noted between onset buffet g with cruise droops extended and retracted, however, should be constant (4g) for a given aircraft/pilot combination.

5. Transfer pump light – CHECKED ON (C,E)

- Transfer pump light will come on at approximately 3,300 pounds of fuel left in the transfer system. N S W

6. Automatic gain changer – CHECKED (B,E)§

- During the descent from 41,000 feet, induce several yaw transients at approximately 0.96 IMN. If one cycle per second oscillations or rudder kicks should occur, the following troubleshooting procedure should be followed:

  a. Repeat the check with yaw stabilization off.

  b. Determine the altitude and airspeed where condition is most severe.

  c. Note if the condition can be induced by climbing or diving between 18,000 and 41,000 feet, and if lateral stick position has any effect.

§ This check may be accomplished at 15,000 feet.

21,000-FOOT CHECKS

1. Four g turn and Anti-G suit – CHECKED (E)

   - With the aircraft trimmed for level flight at 0.85 IMN, perform a 4g symmetrical windup turn at constant mach number. The stick force should be approximately 20 pounds as the aircraft reaches 4g. The g suit should inflate and deflate properly in both HIGH and LO settings.

2. Cabin temperature manual control – CHECKED (D,E)

   - Adjust the temperature control rheostat to a setting of less than medium heat. Move the automanual toggle switch to MANUAL position. Cabin temperature should be controllable and should not go to full hot or full cold. Smoke should not be apparent unless the temperature control is set high enough to cause surges. Normally, pressure surges will be encountered only when the temperature control knob is positioned above medium heat. Full hot can be obtained in MANUAL at or above the 12:00 o'clock position of the knob.

15,000-FOOT CHECKS

Note

Stall speeds for the estimated gross weight of the aircraft at this point of the check should be determined before takeoff. Buffet speeds are predicated on the technique of reducing airspeed at the rate of one knot per second.

1. Stall approach buffet – CHECKED (B,E)

   - With 80% engine rpm and droops up, slowly reduce airspeed until buffet occurs. Buffet should occur at approximately 40 KIAS above the stall speed.
   - With 80% engine rpm and cruise droops extended, slowly reduce airspeed until buffet occurs. Buffet should occur at 25 to 30 KIAS above the stall speed.

2. Emergency spin droop – OPERATION CHECKED (B,E)

   - In 1g flight at 250 KIAS cruise droops up, extend leading edge droops to land position by placing EMERG SPIN DROOP switch in ON position. Visually check LE droops DOWN within 11 seconds maximum, and wing/wheel/droop warning light flashes. Retract leading edge droops to clean position by placing EMERG SPIN DROOP switch in OFF position. Check that LE droop indicator shows UP.

3. Land configuration – OPERATION CHECKED (B,E)

   - In 1g flight at 250 KIAS, extend cruise droops. Check that LE droop indicator shows DN. Reduce speed to 220 KIAS, lower the landing gear and raise wing. Check that LE droop indicator barberpoles momentarily, than shows DN. Droops should extend to land position in 11 seconds maximum.

4. Speed brake automatic retraction – CHECKED (B,E)

   - With the aircraft in the landing condition, place the speed brake override switch in OVERRIDE position and extend the speed brake, the speed brake warning light should flash. When speed brake has extended, place the OVERRIDE switch in NORMAL. The speed brake should retract.

5. Rudder slip damping – CHECKED (E)

   - In the landing condition at 180 KIAS, perform half-rudder sideslips. Release the controls abruptly. Directional damping action should occur within two cycles and wing should be level in three cycles.

6. Angle-of-attack/APC – CHECKED (B, E)

   - Fly the aircraft to obtain 13.5 units angle-of-attack. Check that airspeed is at the proper value for aircraft gross weight. Fly the aircraft through the entire range of indexer lights.

   - Engage APC, check engage indicator light comes on.
   - Establish optimum angle-of-attack and check that airspeed is at recommended value.
   - Climb and descend slightly. Observe throttle for proper operation.

   - Move stick FWD and AFT. Observe throttle movement for proper UHT input.

7. Land/cruise droops – OPERATION CHECKED (B,E)

   - Return aircraft to cruise condition. Check that APC disengages as gear is raised. Droops should retract from land to cruise position in 14 seconds maximum. Check that LE droop indicator barberpoles momentarily, then shows DN.
   - Place cruise droop switch in UP. LE droop indicator should immediately show UP. Droops should retract to clean position in 5 seconds maximum.

8. EPP – CHECKED (C, E)

- Extend the emergency power package at approximately 300 KIAS while maintaining level flight at 15,000 feet (a light airframe buffet will be associated with EPP deployment).
- Place the master generator switch in OFF and the emergency generator switch in ON. The emergency power warning light should come on and ac and dc power should be available (the yaw and roll stabilization systems will cut out).

- Extend the air refueling probe; check that PROBE OUT light comes on.

- As the aircraft is slowed below 220 KIAS, transition to the landing configuration; maintain 175 KIAS and note satisfactory operation of both stabilization systems and the COMMAND (UHF) radio. Notify the tower that the UHF radio will be inoperative for a short period. Place the emergency generator switch in LAND and slow to landing condition speed. Observe that the emergency power indicator light goes out and that ac and dc power continues to be available. The cabin temperature will go to full cold and subsequent loss of cabin pressure may be experienced. The roll stabilization system should remain operative (warning light out). The yaw stabilization system will be inoperative (warning light on). Emergency pitch trim should be actuated in the LAND position of the emergency generator switch to determine availability of emergency bus power.

Note

The TACAN set should operate with the emergency generator switch in the ON position.

9,000-FOOT CHECKS

1. Radar altimeter – CORRECT OPERATION (C,E)

- Allow a 12-minute warmup period for reliable indication.

- Note that the height indicator indicates the approximate tape line altitude.

- Set the bug to a slightly higher altitude than is indicated on the height indicator and note the limit light comes on.

- Turn the radar altimeter off.

2. AN/ARA-63 POWER switch – ON (E)
   - Observe that green power light comes on.
   - Place COURSE SELECT switch to ACLS position and observe movement of course indicator needles.

LANDING

LANDING CHECKS

1. Complete landing checklist – IAW part 3 and/or part 4 (A,B,C,D,E)

2. APC system – NORMAL OPERATION (B,C,D,E)
   - Make landing using the approach power compensator. Check for proper operation and that APC automatically cuts off at touchdown.

3. AN/ARA-63 approach – NORMAL OPERATION (E)
   - If ground equipment available, fly a precision approach.

4. Fuel transfer/low fuel level warning light – CHECKED (C,E)

- If main cell fuel level is 1050 (+100) pounds or less check that low fuel light is on.

- Place fuel transfer switch in PRESS DUMP and check that warning light is flashing.

Note

The warning light is operated independent of the fuel indicating system. It is not affected during press-to-test checks of the fuel quantity indicators. The light gives an accurate indication provided the aircraft is within ±25° of level flight with respect to pitch attitude.

6. Bearing distance heading indicator – CHECKED (E)

7. Shut down the engine – IAW part 3 and/or part 4 (A,B,C,D,E)

section IV

flight procedures and characteristics

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PART 1—FLIGHT PROCEDURES

This section standardizes general flight and operating procedures to minimize confusion, maintain air discipline, and to achieve maximum effectiveness in the air. The general briefing guide (section III, part 1) will be used to brief each flight. Any mission not covered by the briefing guide must be briefed by a qualified individual who has thorough knowledge of all aspects of the mission.

TRANSITION AND FAMILIARIZATION

The paragraphs below contain operational information which will be used in conjunction with normal procedures during the FAM stage of training.

BRIEFING

The familiarization briefing will be all-inclusive and will cover all emergency procedures contained in section V.

PREFLIGHT

The chase pilot, or another qualified pilot, will monitor the FAM pilot during his first preflight inspection.

START

The chase pilot, or another qualified pilot, will monitor the FAM pilot's first flight start and poststart checks.

TAXI

The FAM pilot should call for taxi instructions and lead the flight to the runway. Section taxi should not be attempted in FAM stage.

TAKEOFF

The FAM pilot will call for takeoff instructions when ready and will be the lead aircraft for the takeoff. He will utilize the center of the runway for his first takeoff.

INFLIGHT

During the FAM stage, the FAM pilot is required to call off the individual items of the 3-point checklist (Fuel Transfer Switch — ON, Wing — Down and Locked, and Cabin Pressurization — ON) when he reports completion of the checklist to the chase pilot.

The FAM pilot will perform all prebriefed maneuvers to obtain a general feel of the aircraft in both clean and dirty configurations.

FAM flights will be planned so that no less than 2,000 pounds of fuel remain upon return to the home field. Fuel remaining checks will be given by stating main fuel quantity first and transfer quantity second, e.g., four zero and four four (4,000 pounds main and 4,400 pounds transfer).

RETURN TO THE FIELD AND LANDINGS

The FAM pilot will lead the flight back to the home field and will make the required radio calls to the tower. The chase pilot will fly a wing position that enables him to closely monitor the FAM pilot's landing pattern and approach to coach him as necessary. A chase pilot, or a qualified RDO, must be available while a FAM pilot is practicing landings, and two-way radio contact must be maintained. If these conditions are not satisfied, the FAM pilot will make a final landing on the first acceptable approach. A final landing will be made when the FAM pilot's fuel state at the 180° position first reaches 1,200 pounds or less.

CONFIDENCE MANEUVERS

Aileron rolls, loops, Immelmann turns, and Cuban eights will be practiced as confidence manuevers. The airspace will be cleared before starting, and the chase pilot will maintain a position that allows adequate clearance between aircraft and affords observation of the surrounding airspace.

The minimum airspeed for all confidence maneuvers is 220 KIAS.

Plan the entry to any maneuver so that during recovery the aircraft is level or climbing at a minimum altitude of 10,000 AGL. Enter overhead maneuvers with 6,000 pounds or less of fuel, at 15,000 feet, and 500 KIAS with the cruise droop out. Use a 4g pullup. Use afterburner for the first half of the maneuver when fuel weight is 3,500 pounds or more. Enter rolls at a minimum airspeed of 350 KIAS.

Do not exceed the flight restrictions outlined in section I, part 4.

PARADE AND TACTICAL FORMATIONS

Note

Refer to section VII for formation visual signals.

PARADE FORMATIONS

Only the four basic parade formations (fingertip, echelon, diamond and column) and free cruise formation are covered. These formations are used for airshows, flybys, weather penetrations, rendezvous practice, nontactical point-to-point flight, and in traffic patterns.

FINGERTIP AND ECHELON

Fly the wing position on a line of bearing 35° to 40° aft the lead aircraft's beam, stepped down 5 to 8 feet, with a wingtip clearance of 5 feet (figures 4–1 and 4–2). When flying through weather, maintain the same wingtip clearance and stepdown, but hold a position 45° aft the lead aircraft's beam (figure 4–3). As visibility decreases, decrease lateral separation and increase stepdown as necessary to maintain visual contact with the lead aircraft.

DIAMOND

Fly the wing position on a line of bearing 45° aft the lead aircraft's beam, stepped down 8 to 10 feet, with a wingtip clearance of 5 feet. Fly the slot position in column on the lead aircraft, stepped down as necessary to avoid excessive jetwash. The slot position is equidistant, and on a 45° bearing, from each wingman (figure 4–4).

COLUMN

Fly directly behind and stepped down from the preceding aircraft. Maintain nose to tail clearance at all times, though distance between aircraft will vary with the type of maneuver being performed. For example, while parade column positions may be as close as 10 to 15 feet during a flyby, a separation of not less than 50 feet is maintained while maneuvering or in tail chase. Maintain sufficient stepdown to avoid excessive turbulence from jetwash (figure 4–5).

FREE CRUISE

The free cruise formation is primarily used for nontactical point-to-point flight for two or more aircraft. This formation facilitates cruise control, permits each pilot to look around, and allows considerable maneuvering. Free cruise positions require nose-to-tail clearance so that each aircraft can slide independently to maintain position (figure 4–6).

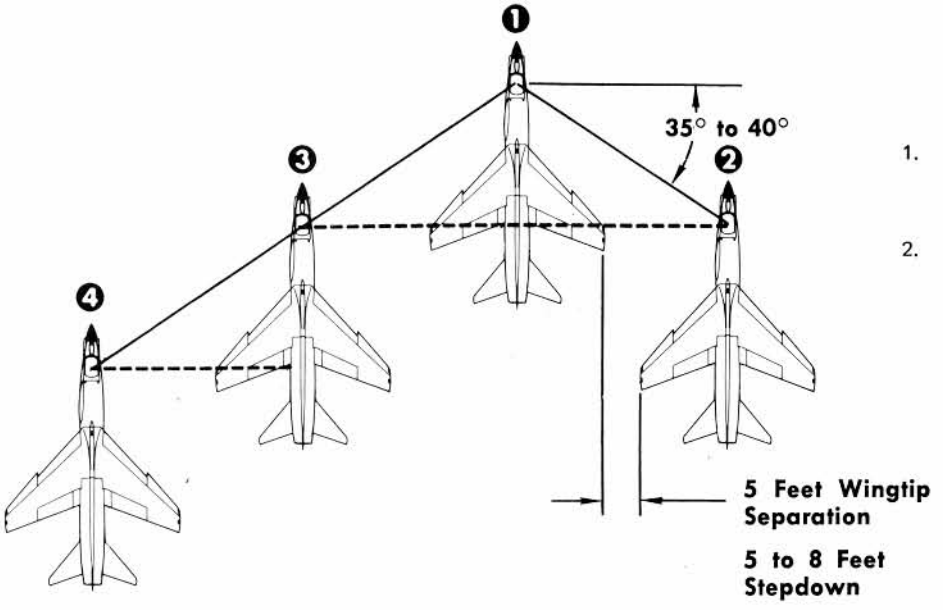
CROSS UNDER

When necessary to cross from one side of the leader to the other, adjust power to slide aft until nose-to-tail separation of 5 feet is attained. Maintain lateral separation and descend to obtain a vertical separation of 8 to 10 feet. Maintain vertical separation and cross under the leader's flight path. When proper lateral separation is obtained on the opposite side of the leader, move vertically until the proper step-down is attained and then move forward to the wing position.

TACTICAL FORMATIONS

Tactical formation is not an exact science. Both offensive and defensive techniques are involved, either at the same time or successively, in the overall offensive action. As such, there is not one solution to a specific tactical problem. Tactical formation is of necessity a compromise between maximum flexibility and maximum mutual support. Information concerning specific tactical maneuvers and doctrine may be found in classified Naval Warfare Publications and the F-8 Tactical Manual, NAVAIR 01-45HHA-IT (Confidential).

FINGERTIP PARADE



NOTES

1. Line up wingtip nav light with junction of trailing edge of the wing root and fuselage.
2. Number 4 man line up canopies to balance formation.

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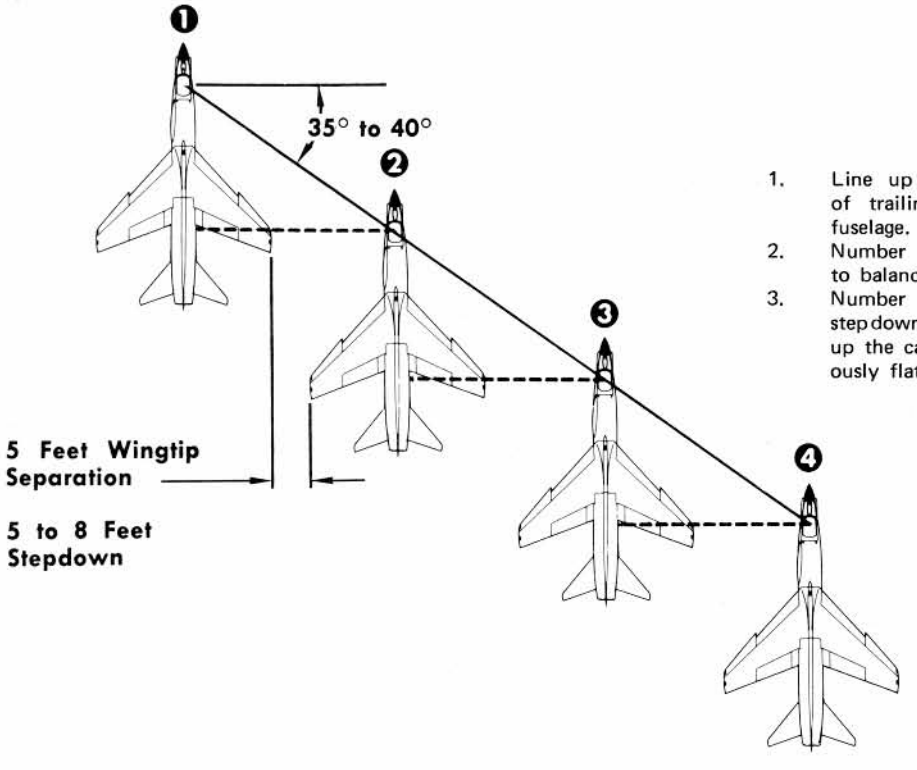
Figure 4-1

ECHELON PARADE



NOTES

1. Line up wingtip nav light with junction of trailing edge of the wing root and fuselage.
2. Number 3 and 4 men line up canopies to balance formation.
3. Number 2 man must maintain 10 feet stepdown to enable 3 and 4 men to line up the canopies without becoming dangerously flat in formation.

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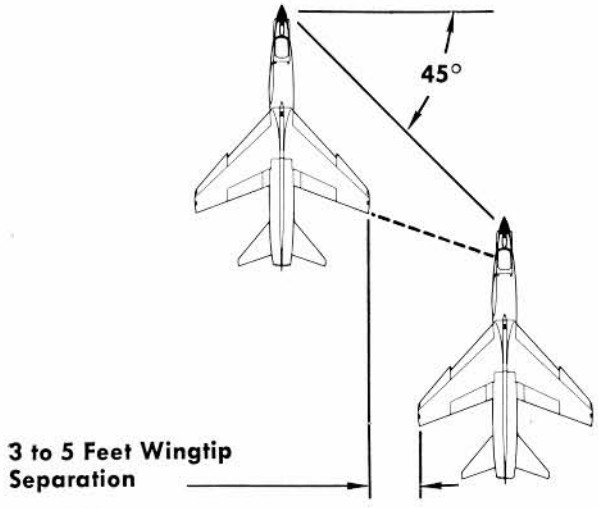
Figure 4-2

INSTRUMENT PARADE



NOTE

Bearing is maintained by flying on line with trailing edge of wing.

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Figure 4–3

DIAMOND PARADE

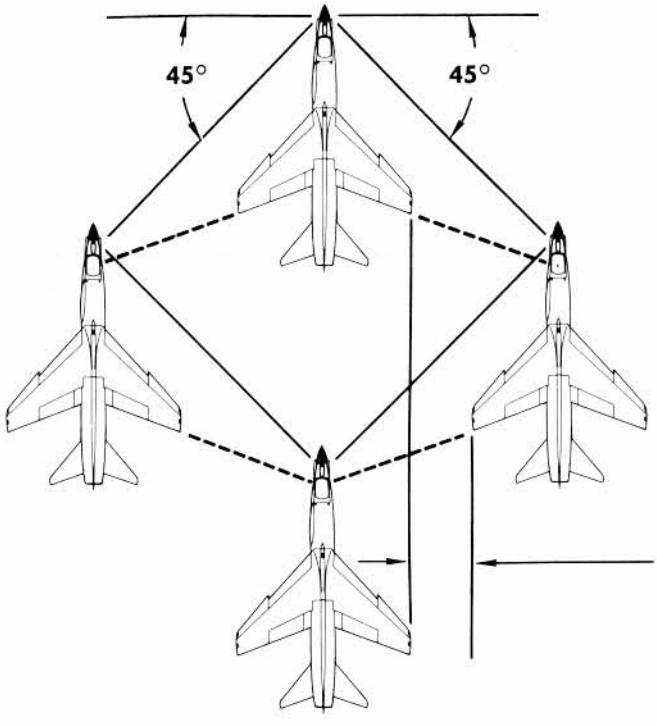

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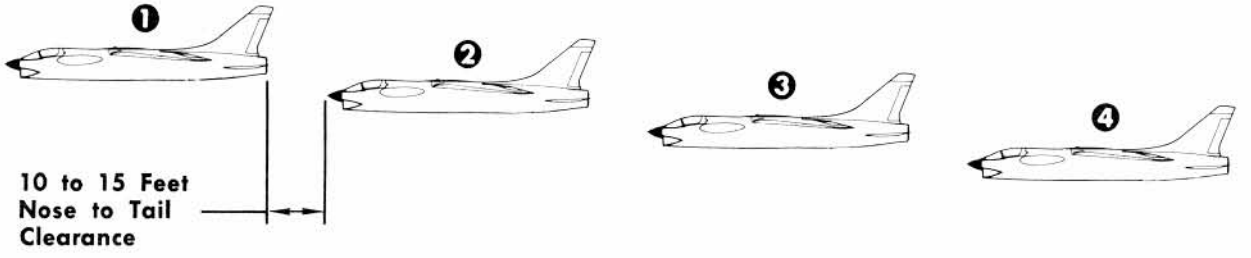
Figure 4–4

PARADE AND TAIL CHASE COLUMN

PARADE COLUMN

NOTE

Match lead aircraft's wing and stepdown to avoid excessive turbulence.



TAIL CHASE COLUMN

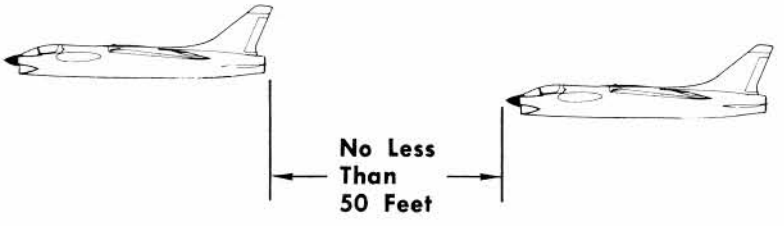


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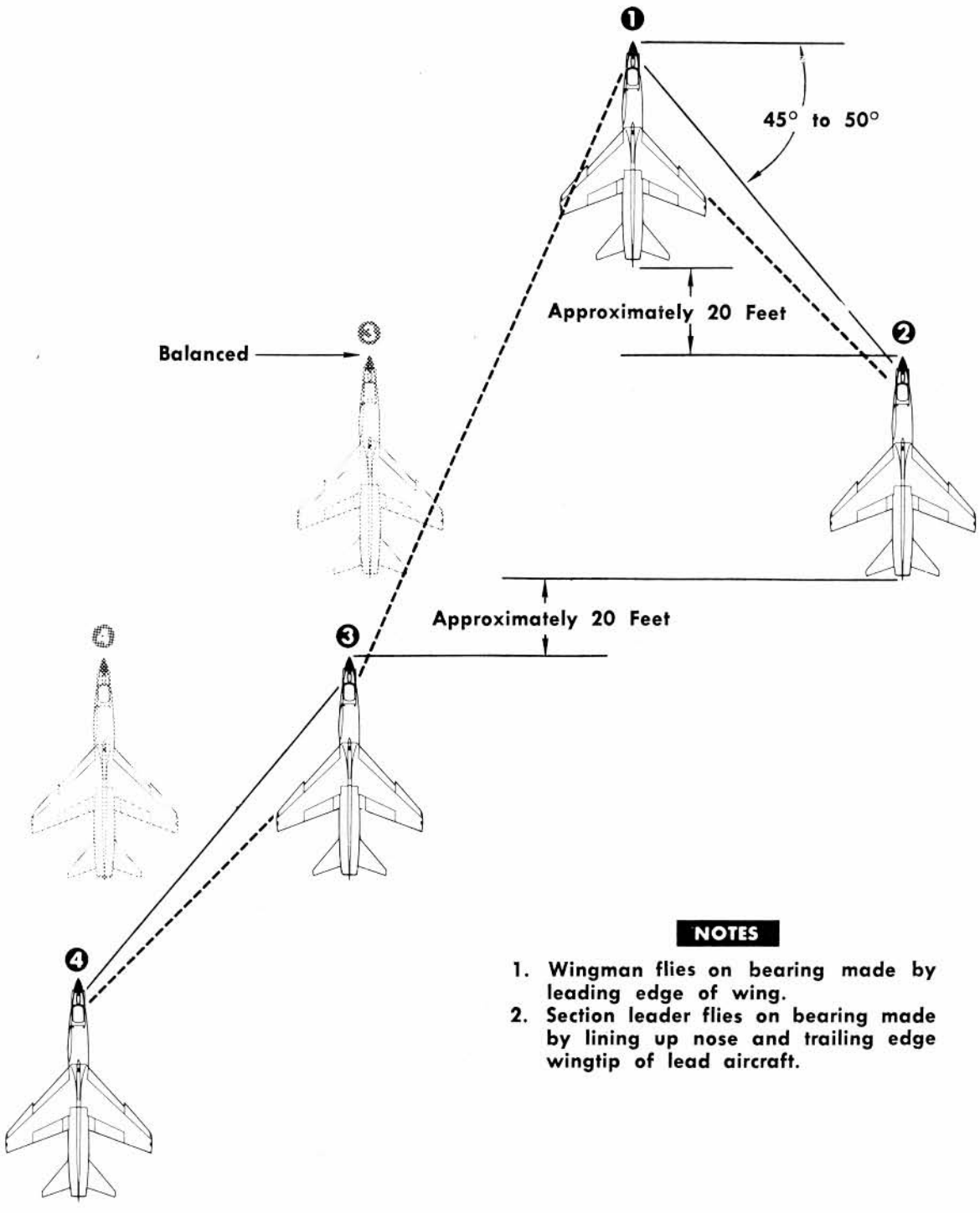
Figure 4–5

FREE CRUISE



NOTES

1. Wingman flies on bearing made by leading edge of wing.
2. Section leader flies on bearing made by lining up nose and trailing edge wingtip of lead aircraft.

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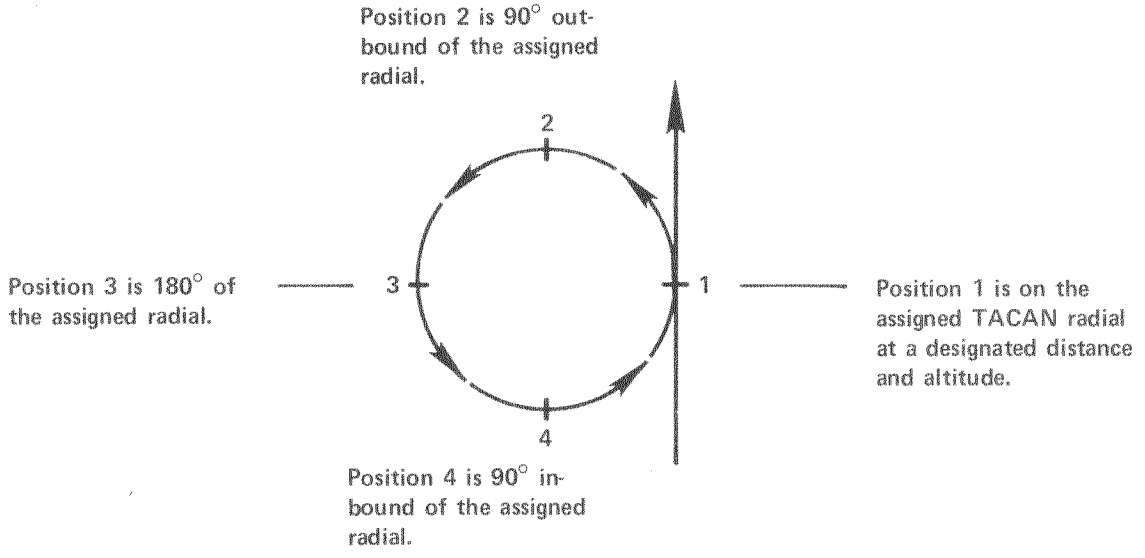
Figure 4-6

TACAN RENDEZVOUS



NOTES

1. Aircraft track outbound on designated radial.
2. Leader calls distance and altitude at which to begin joinup circle and when passing each position. This informs each pilot of the leader's actual position in the rendezvous circle.
3. All aircraft begin orbit at designated distance and altitude, and modify orbit as necessary to effect joinup.
4. Leader uses 30° bank and 300 KIAS to 30,000 feet and 0.86 IMN above.

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Figure 4-7

FORMATION RENDEZVOUS

CAUTION

On initial rendezvous after takeoff, rendezvous VFR should be made in parade or free cruise formation to enable pilots to visually check the other aircraft for loose panels, etc. This is not practical at night.

RUNNING RENDEZVOUS

This type of rendezvous is most effective when aircraft are launched within visual or radar range. Using a predetermined power setting, the leader flies a designated course or TACAN radial at 350 KIAS until the climb schedule is reached. The wingman accelerates to the applicable climb schedule using MRT (CRT only as necessary to expedite the rendezvous). The throttle is retarded when approaching the leader (or desired tactical position) to avoid using the speed brake to prevent overrunning. If tactical conditions dictate a CRT running rendezvous, the leader designates a base course or TACAN radial, uses reduced CRT, and maintains the climb schedule. Trailing aircraft will maintain the base course and use full CRT until rendezvous is effected. When the last aircraft calls "aboard," the leader advances power to full CRT.

TACAN RENDEZVOUS

This rendezvous is an expeditious method of joining aircraft under all VFR conditions. The flight leader specifies the TACAN facility, channel number, altitude, radial, and distance to be used. This establishes a point in space where the rendezvous is to be effected. The joinup is accomplished as shown in figure 4-7.

ADF RENDEZVOUS

The ADF is useful to join aircraft under all conditions, but is particularly effective for a straight course running rendezvous. Trailing aircraft select ADF position with the UHF control. The flight leader transmits a short count every minute and includes altitude if climbing. Trailing aircraft maneuver as necessary to keep the number one needle 5° left or 5° right of the nose position (the number 2 aircraft holds the leader 5° left, number 3 aircraft 5° right, etc.) until the leader is visually sighted.

If a circling rendezvous is to be made, the leader maintains a 30° bank at a prebriefed airspeed and altitude, transmitting a short count and heading every minute. Trailing aircraft correct heading as necessary to place the number one needle on the nose position each time the leader transmits. Proximity to the leader can be determined by the degree of change in azimuth of the number one needle. As distance to the leader decreases, the needle will change more degrees between counts, requiring larger corrections to keep the leader on the nose. When the leader is detected visually, a standard rendezvous is accomplished.

SAFETY DURING RENDEZVOUS

Keep the aircraft ahead in view constantly and join the formation in order. Reduce excess speed before reaching the wing position to avoid overshooting. Abort the rendezvous if necessary by leveling the wings, sighting all aircraft ahead, and moving to the outside of the formation.

Use only enough stepdown to ensure separation on the aircraft ahead.

Stop all relative motion prior to joining an inside wing position. A cross under to the outside may then be made.

Use caution during the final steps of joinup of a running rendezvous. Relative motion is difficult to discern when approaching from the rear.

AIR REFUELING

WARNING

Place helmet visor down before air refueling to avoid injury to the eyes in event the canopy is inadvertently broken by the drogue.

Refer to section I, part 2, for system description. A-7, A-3, A-4, A-6, KC-97, KC-130F, and KC-135 tankers are compatible for air refueling to the limits described under section I, part 3, AIRCRAFT SERVICING. The location of the refueling probe, which is 40 inches from the fuselage and abeam the pilot when extended, creates several problems. The probe is not within the pilot's peripheral vision upon engagement; the drogue is influenced by the airflow around the fuselage, tending to drift outboard during run-in; the drogue is in close proximity to the canopy creating a possibility of canopy damage on missed engagements.

LIMITATIONS

Dry hook-ups may be made from any airplane having a drogue arrangement that is compatible with the F-8 probe. Operational procedures must include proper techniques for using the nonretracting type drogue installation, if such is to be used. During wet hookups, transfer fuel pressure must not exceed 50 psi (normal Navy refueling pressure).

Receiver aircraft are limited to maximum internal fuel load of 9,000 pounds JP-4 or 9,500 pounds JP-5 when refueling from the KC-97 and KC-135.

When refueling from any operational fleet tanker or the KC-130F, all F-8 aircraft are cleared to completely refuel, including topping off. After complete system refueling is accomplished limit hookup with pressurized tanker hose to 15 minutes. If necessary to remain hooked up longer, ensure that the hose is depressurized then top off just before disconnect.

The above loadings and pressure limits must be observed to ensure that the surge characteristics of the refueler airplane will not damage the F-8 receiver airplane.

Airspeed and acceleration limitations applying to the air refueling probe are presented in section I, part 4.

PREREFUELING CHECK

CAUTION

If the wing tank is empty, no stop transfer check (wing cell pressure dump) is possible. Maximum internal fuel load should be limited to 8,000 pounds JP-5 or 7,500 pounds JP-4 if operational considerations permit. When tanking under these conditions from a KC-135, the limits are 7,000 lbs JP-5 or 6,500 lbs JP-4.

Prior to taking on fuel and depletion of wing transfer fuel, place the transfer switch in PRESS DUMP and note the transfer fuel quantity reading. Fuel transfer should cease immediately. Note the main and transfer quantities for a period of 3 minutes, allowing main fuel to burn down below the level of the main fuel transfer float (4,300 pounds maximum). Main fuel quantity should decrease and transfer quantity should remain constant. Return the fuel transfer switch to ON. When ready for refueling, place the IFR PROBE switch in OUT and note that fuel transfer stops. For the stop transfer check to be valid, the pressurization system must be functioning and a minimum of 500 pounds of fuel should be retained in the wing tank.

REFUELING PRECAUTIONS

WARNING

If at any time fuel is observed venting from the fuselage vent mast or starboard wing vent in significant amounts, immediately break away and secure air refueling. Fuel cell rupture could be imminent.

During air refueling, the main fuel quantity gage should increase to a maximum of 4,300 pounds and then continue filling to a full indication at a significantly reduced rate. The pilot should monitor the main fuel quantity gage closely during air refueling to ensure that main fuel quantity does not increase through 4,300 pounds without this obvious slowing. If no reduction is observed, cease refueling immediately.

AIR REFUELING TECHNIQUE

When available, another pilot will monitor the refueling and he will call clock position of missed engagements.

Whenever possible, conduct refueling in smooth air at optimum altitude and airspeed and with less than 50% receiver fuel remaining. To prepare the receiver aircraft, place the cruise droop out, turn off unnecessary electrical equipment, and extend the probe. Since canopies have been broken by the drogue during missed approaches, place the helmet visor down for protection.

Note

The permissible acceleration range with the probe extended is –1.0 g to 3.0 g.

Before sliding into position, call "lining up."

Line up behind the tanker with the probe 10 to 15 feet directly behind the drogue and trim the aircraft. The drogue will be slightly forward of the nose of the receiver aircraft. Check that the tanker amber ready light is on or obtain confirmation from the tanker pilot that he is ready for refueling before plugging in.

Execute the approach so that the drogue passes close to the fuselage. Any misalignment, sideways movement, or other deviation constituting a haphazard approach can result in a smashed canopy. Using the tanker and the hose as references, increase power to establish a 3 to 5 knot closure rate. This rate will minimize outboard drogue movement, receiver control problems, and will seat the probe smartly in the drogue coupling. The drogue will have a tendency to move to the left as the nose of the receiver passes it. **Do not fence with the probe. Concentrate on flying toward a reference point on the tanker.**

When engagement is made, a slight ripple of the hose will occur. Adjust power to remain in refueling position and fly formation on the tanker. After engaging the drogue, and the amber light goes out, call "contact."

Note

At high closure rates, hose whip will occasionally follow engagement.

If engagement does not occur, reduce power and move slightly to starboard of normal hose trail position, then down and straight back. Speed brakes may be used, but are generally not required.

Air Refueling Technique Landing Configurations

Air refueling with the wing down, landing gear extended, and EPP deployed has little effect on normal air refueling procedures. EPP extension has negligible effect; however, gear extension will increase power requirements approximately 5%. Air refueling procedures remain the same as for a clean aircraft.

Air refueling with the wing up, landing gear extended, and EPP deployed changes the aircraft attitude, requiring observation of the tanker store through the top of the canopy rather than front wind screen. Drogue positioning prior to plug-in and approach procedures remain the same as for a clean aircraft. An airspeed of 200 KIAS (minimum) to 220 KIAS (maximum) is recommended to ensure complete engagement of the probe and drogue for proper fuel passage.

BREAKAWAY

To break away from a successful engagement, reduce power and drop back at a rate of 3 to 5 knots. Maintain alignment and altitude. The probe/drogue connection will separate when the hose reaches full extension. After breakaway, when clear of the area behind the hose and drogue, call "clear."

OPERATION OF THE IFR PROBE SWITCH

CAUTION

Monitor main fuel gage if practicing dry plug-ins for an extended period. Fuel does not transfer to the main cell when the IFR PROBE switch is in the OUT position and the main cell fuel could be inadvertently depleted. Automatic fuel transfer will not occur with fuel transfer switch in the PRESS DUMP position if the IFR PROBE switch is in the OUT position.

Extend the probe prior to the initial run and leave the switch in the OUT position until all runs are completed. When retracting the probe, hold the switch IN for 5 seconds after the PROBE OUT light goes out, to ensure that the probe door locks. If, after releasing the IFR PROBE switch from the IN position the probe extends, repeat retract procedure and turn off generator before releasing IFR PROBE switch. Turn generator back on.

The IFR PROBE switch must be in the OUT position to actuate the emergency probe extension system in the event utility hydraulic system pressure is lost. Before placing the EMERG PROBE switch in EXT, airspeed shall be 275 KIAS or less. Once the emergency probe extension system has been actuated, the probe cannot be retracted inflight. With probe extended, range is reduced 12%. NEW

AIR REFUELING SIGNALS

Refer to section VII.

PART 2—FLIGHT CHARACTERISTICS

INTRODUCTION

Note

Refer to section I, part 4, for limitations and restrictions.

The Crusader's operating regime covers an extremely wide band of flight conditions ranging from the low speeds required for carrier operations, through the speeds required for long-range cruising flight, to high speed flight at low and high altitudes. Flight stabilization, stick variable gain, a two-position wing and fixed ventral fins (RF-8G) are utilized to permit satisfactory operation throughout the flight envelope.

DEFINITIONS

The following definitions are of terms employed frequently in this section:

Dynamic pressure (q) — The product of $\frac{1}{2}\rho v^2$, (sometimes called ram pressure).

Equivalent airspeed (EAS) — Calibrated airspeed corrected for compressibility factors. A constant equivalent airspeed maintains a constant dynamic pressure regardless of altitude. At sea level, true airspeed, calibrated airspeed and equivalent airspeed are all equal. At altitude, equivalent airspeed is always less than true airspeed.

Yaw during roll — The yaw which almost always accompanies any rolling maneuver of any aircraft. It is caused by aileron or spoiler drag and by moments on tail and fuselage caused by rolling velocity and flow effects from the ailerons.

Adverse yaw — During a roll, yaw which causes the nose to move in the direction opposite to the direction of roll.

Favorable yaw — During a roll, yaw which causes the nose to move in the direction of the roll.

Rolling pullout — A maneuver in which g is being pulled while the aircraft is rolling, such as in turn reversals.

Symmetrical pullout — A maneuver in which g is pulled without rolling. A symmetrical pullout may be accomplished in a steady turn.

Trim change — A tendency of the aircraft to pitch, yaw, or roll because of the influence of movable components or of changing flight conditions.

FLIGHT CONTROLS

GENERAL

All flight controls, ailerons and spoilers, unit horizontal tail, and rudder, are fully powered through dual power control systems in order to overcome the high airloads encountered in high-speed flight. Artificial feel is provided by springs in the lateral (roll) and directional (yaw) control systems and by springs, viscous dampers, and bobweights in the longitudinal (pitch) control system. This feel system provides a force reference against which the pilot may judge his control motions. Feel forces are kept low to make the aircraft pleasant to fly and easy to maneuver. Variable-gain linkages are provided in the pitch control system to permit very small control adjustments when the aircraft is near trimmed conditions. The ailerons and rudder may also be moved about by signals from the stabilization systems, but this occurs automatically without affecting stick or rudder positions or feel.

UNIT HORIZONTAL TAIL

The unit horizontal tail is effective from the stall to the highest Mach number at the highest altitude. Horizontal tail effectiveness, or the g per degree of tail movement, varies considerably with flight conditions, and is least in the landing configuration and in high-altitude supersonic flight and most in low altitude, high-speed subsonic flight. Adequate effectiveness is present to rotate the aircraft for takeoff or for landing (even to the extent of bumping the tail) and to pull limit g in supersonic flight at altitudes even above 45,000 feet. In the areas of greatest effectiveness, such as near Mach 0.95 at low altitudes, care must be taken to prevent overcontrolling. The variable-gain linkage reduces these tendencies in the areas of greatest horizontal tail sensitivity or effectiveness by introducing a band of insensitive control response near neutral stick. These characteristics are described more fully under MANEUVERING FLIGHT. Longitudinal stick forces (figure 4–8) are light and are determined by stick position away from trim, rate of stick motion, g load, and pitch acceleration.

AILERONS AND SPOILERS

The ailerons and spoilers work together to provide lateral control. The ailerons are effective through most flight conditions but become completely ineffective at the stall and almost so in high-speed low-altitude

STICK FORCES

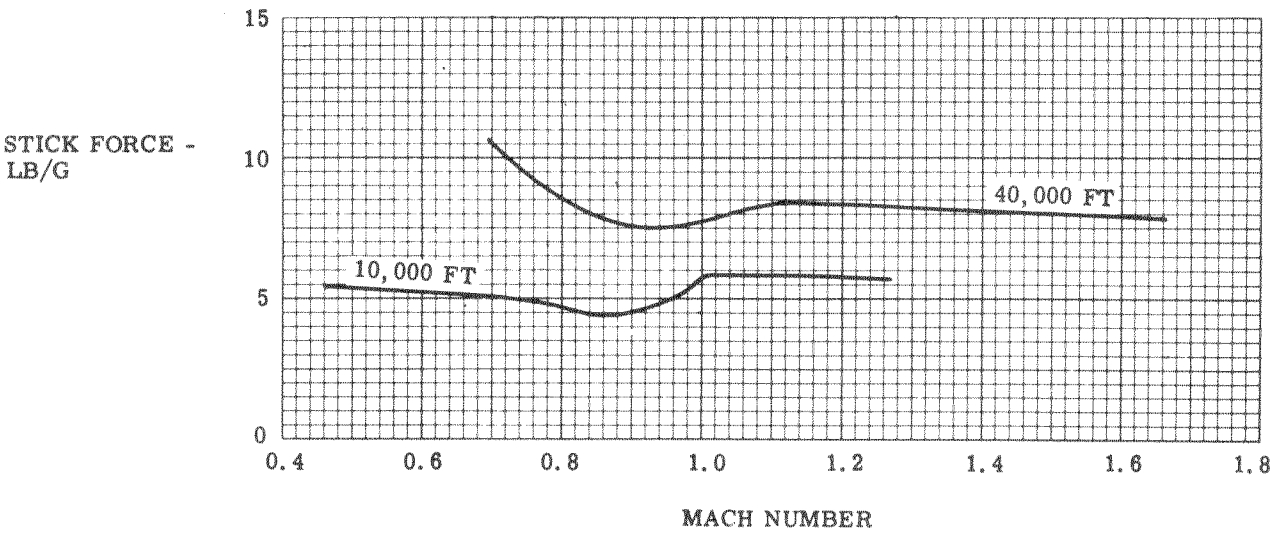


Figure 4–8

flight. The spoilers improve roll performance at high speeds but are ineffective at the stall. However, ailerons are the most effective control in inducing or recovering from a spin. Roll rate is the characteristic that is most affected by the addition of the spoilers, although a slightly greater pitch down is encountered in low-altitude rolls.

Lateral stick forces are light in both the landing and clean configurations. Clean configuration stops provide a reference for observation of roll restrictions.

RUDDER

The rudder becomes effective at about 60 KIAS on the takeoff roll and remains so through all flight conditions. It provides adequate directional control for crosswind landings. Pedal forces are light in the clean configuration and are reduced even more in the landing configuration.

POWER CONTROLS

The loss of either of the power control systems will produce only a slight reduction in maximum longitudinal control. This reduction occurs only at supersonic speeds between 22,000 and 42,000 feet altitude. The greatest reduction occurs at Mach 1.1 at an altitude of approximately 35,000 feet.

The loss of one of the power control systems results in a general decrease in response to maximum control inputs above 400 KIAS. Loss of response will generally not be apparent except at high airspeeds or during extreme maneuvers when PC 2 is inoperative.

The effects of the loss of one power control system on maximum lateral control vary significantly depending upon which system is inoperative, as follows:

- With PC 1 inoperative, there is no decrease in maximum lateral control effectiveness below 400 KIAS, but there is a decrease of up to 50% between 25,000 and 35,000 feet altitude at supersonic speeds. The decrease in effectiveness is less at other altitudes. In addition, roll stabilization is inoperative.

  The loss of PC 2, which is the only system that supplies pressure for operation of the spoilers, results in significant decreases in maximum lateral control effectiveness at speeds above 400 KIAS, but only minor decreases below that speed. At speeds above Mach 0.92 below 9,500 feet altitude, or at very high airspeeds (above 680 KIAS), lateral control may be inadequate to correct for an extreme lateral out-of-trim condition.

Directional control is not appreciably affected by loss of either power control system. However, yaw stabilization and aileron-rudder interconnect are lost with PC 2 inoperative. With loss of PC 2, acceleration restrictions governing loss of yaw stabilization apply.

EMERGENCY FLIGHT CONTROL SYSTEM

Note

Refer to FLIGHT CONTROLS of section I and HYDRAULIC SYSTEM FAILURES of section V for further discussion.

The emergency flight control system consists of a pneumatically-operated camlock to restrain the UHT at 4.75° trailing edge up and a pneumatically-operated rudder lock to prevent rudder flutter.

UHT LOCK

Flight may be sustained with the loss of hydraulic pressure from both the PC 1 and PC 2 systems provided the UHT lock is actuated with the UHT positioned at or more than 4.75° trailing edge up. With the stick pulled aft, the pilot activates the UHT lock system by pulling the EMERG BRAKE/UHT EMERG lock handle full aft and locking it in this position by flipping the lock latch outboard with the thumb. With the UHT at or beyond this position, restrictor valves installed near the UHT actuator cylinders restrict the rate of fluid bleed-off which permits the UHT camlock to engage. With UHT restrained the aircraft will seek a trim airspeed of approximately 260 KIAS with cruise droop retracted or approximately 315 KIAS with cruise droop extended (airspeed will vary slightly depending on gross weight). Since ailerons will be unpowered (failure of both PC systems) and will free float at the zero aerodynamic load position, roll control is provided by the use of the rudder (powered by the utility hydraulic system). Roll response is excellent with rudder only and pitch control is adequate utilizing throttle, rudder, and cruise droop. The speed brake is effective to reduce airspeed but is of limited value for pitch control. Steady state roll rates with full rudder deflection vary slightly with direction of roll. Generally, roll rate increases from approximately 30 degrees/second at 200 KIAS to a maximum of 90 degrees/second at 0.90 IMN. Roll rate decreases sharply above 0.95 IMN to approximately 25 to 30 degrees/second.

Provided the pilot positions the UHT at or more than 4.75° TEU before total pressure loss of both PC systems, the UHT lock is capable of capturing an unpowered UHT throughout the flight envelope up to 1.1 IMN. However, abrupt or rapid full rudder deflections produce dynamic loads that closely approach the UHT lock design limits and could exceed camlock capability. Smooth full rudder inputs in not less than 1 second result in loads well within UHT lock retention capability.

DIVE RECOVERY

Optimum dive recovery is effected by attaining and maintaining 500 KIAS or 0.90 IMN, whichever is less, with the cruise droop retracted. Approximately 3.0g is available for recovery. Figure 4–8A presents nominal altitudes required for dive recoveries when entered from various dive angles and initial airspeeds. A minimum radius turn may be performed by maintaining an airspeed near 500 KIAS.

Analytical data indicate that destructive wing-aileron flutter occurs at speeds greater than 400 KIAS and between 280 KIAS and 180 KIAS if sufficient hydraulic fluid has drained from both PC chambers of either or both aileron actuators. This should not be a consideration during initial lockup of the UHT and recovery to a stabilized flight condition. Extensive rolling or jerking will tend to pump the fluid out of the actuators.

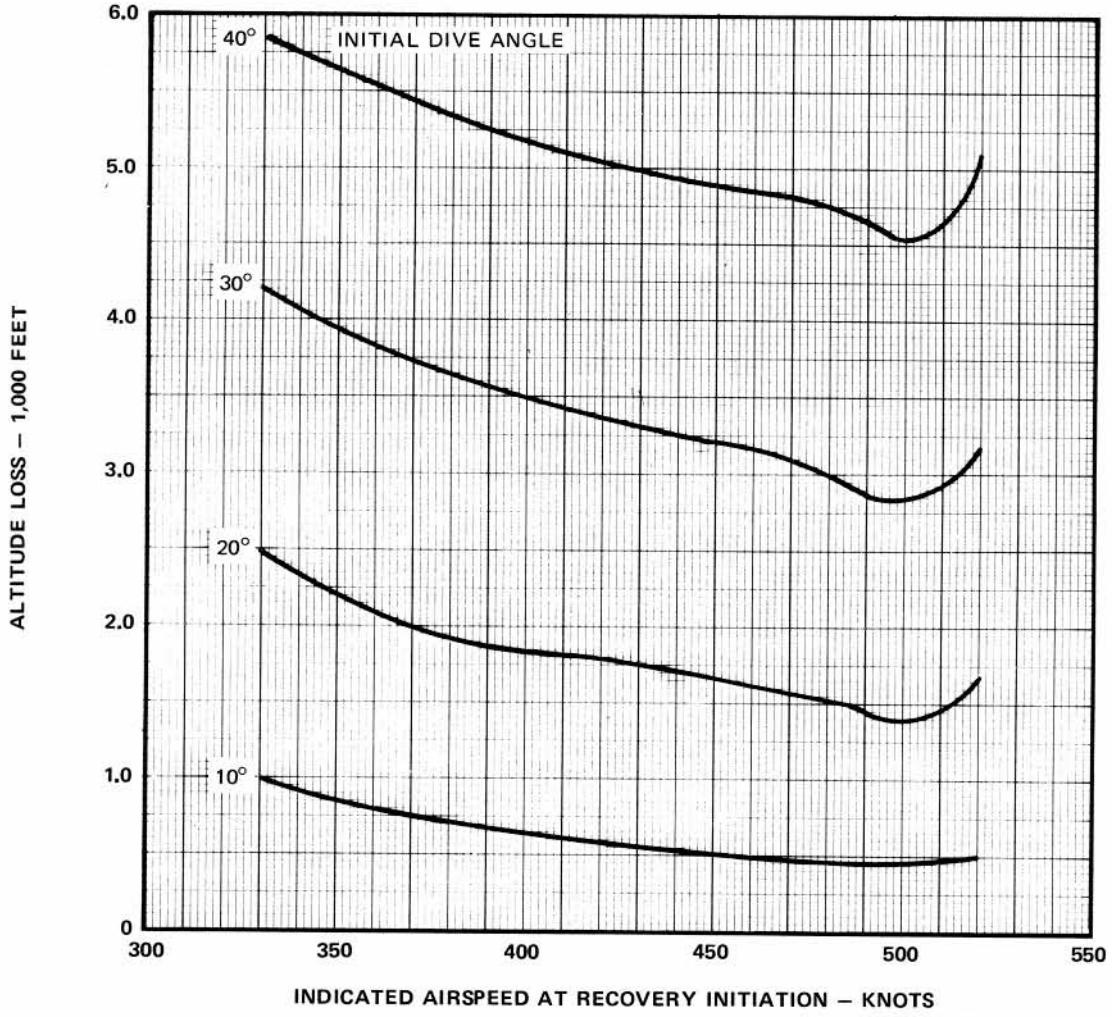
If desired, after recovery, a constant altitude can be maintained at airspeeds greater than 315 KIAS and a track made good by turns and reversals.

RUDDER LOCK

The rudder becomes an unpowered flight control surface with the failure of the PC 1 and utility hydraulic systems. Under these conditions, rudder flutter occurs at airspeeds in excess of 200 KIAS. Since rudder flutter adversely effects the structural integrity of the aircraft and safety of flight, a rudder lock is provided. Pulling the cockpit rudder lock handle to the aft detent pneumatically closes shutoff valves installed in the pressure and return hydraulic lines between the servo and actuator cylinder. When actuated the shutoff valves trap fluid in the actuator cylinder and locks the rudder. Internal actuator bleed-by allows the rudder to bleed slowly back to a zero aerodynamic load condition. Rate of bleed-off is dependent on rudder deflection and airspeed. See Section I, Part 4 for airspeed limitations.

EFCS DIVE RECOVERY ALTITUDES (TYPICAL)

PC 1 and PC 2 Inoperative, UHT Locked at 4.75° TEU
Gross Weight – 24,000 Lb, Cruise Droop – Retracted
Speed Brake – Retracted



NOTES

1. This data is estimated based on flight test and is typical. The altitude loss can vary depending on gross weight and pilot technique.
2. Recovery technique is to attain and maintain the optimum pullout speed of 500 KIAS or 0.90 IMN, whichever is less. Data shown includes the altitude loss while attaining these optimum conditions.
3. Weight effect is approximately 3% change per 1,000 lb.

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Figure 4-8A

SPEED BRAKE

The speed brake, functioning as a controllable high-drag device, provides a quick and effective means of making airspeed adjustments in tactical situations and of limiting airspeed in dives. Precise speed adjustments, such as those desired in formation flying, are difficult to make by use of the speed brake because of its high rate of motion. The brake will open to its full open position of 60° in about 1.5 seconds if the airspeed is below 475 knots EAS. Above this speed, the brake opens only an amount proportional to the speed because ram pressure overcomes the actuator. At 725 knots EAS, the brake will open only about 15° and has lost considerable effectiveness.

As the speed brake extends, it causes a nose-up trim change under all flight conditions. At subsonic speeds, this trim change is so small as to be negligible, but at supersonic speeds the magnitude increases gradually until, at 1.50 IMN, about 15 pounds of push force is required to offset the trim change.

CAUTION

Prolonged operation of the speed brake in the heavy buffeting regime can result in loosening of the ventral fins.

Full extension of the speed brake results in moderate buffeting that increases in intensity with increasing airspeed at subsonic speeds. Partially closing the speed brake will decrease or eliminate buffeting without causing an appreciable loss in speed brake effectiveness. No buffeting will be encountered with speed brake operation at supersonic speeds.

Because there is insufficient ground clearance to permit landing with the speed brake extended more than 30°, the brake is automatically closed as the wing is raised unless the speed brake override switch is used.

CRUISE DROOP

The cruise droop position of the wing leading edge provides a means of obtaining a more efficient wing under certain flight conditions. These conditions and the corresponding improvements obtained with the leading edge extended to the cruise droop position are:

Condition	*Improvement*
MRT and CRT climbs	Drag is decreased.
Subsonic turning flight, particularly above 30,000 feet.	Buffet is delayed and diminished.
Maximum cruise and loiter.	Drag is reduced.
Very low speed flight with the wing down, such as inflight refueling and two-position wing transitions.	Stall and buffet speeds decrease, thereby providing a greater safety margin. (To take advantage of this margin, cruise droop should be extended before takeoff and landing.)

Performance will be reduced to varying degrees under all other flight conditions if the leading edge is left extended to the cruise droop position with maximum speed as the most seriously affected item.

Within the operating limitations, there is a mild nose-down trim change when extending the leading edge and a nose-up change when retracting it. Small lateral trim changes also may occur during leading edge operation. General rule of thumb is to have the cruise droop when climbing, cruising, holding, or descending at airspeeds less than 350 KIAS.

EMERGENCY POWER PACKAGE

Extension of the emergency power package at airspeeds up to approximately 500 KIAS causes practically no trim change. In most cases a very slight vibration is the only indication that the unit is extended although sometimes small directional trim changes may occur as the speed brake is opened or closed with the power package deployed.

Above 500 KIAS, the aircraft tends to yaw left, roll right, and pitch down as the unit is extended. These trim changes increase in severity as the extension speed increases and become quite severe above 650 KIAS, constituting a serious handling problem. For this reason, it is imperative to reduce speed at least to the restriction limit and it is highly desirable to slow considerably more before extending the package in the case of electrical or power control hydraulic system failure. Fortunately, after all such failures (except for failure of both power control systems as in the unlikely case of a frozen engine), control power and basic aircraft stability remain adequate so that there is no immediate necessity to extend the emergency package. The aircraft can be and should be slowed to less than 600 KIAS while deciding whether to extend the package or not. The main consideration in making this choice is the considerable drag increase which results from the extended package and leads to a reduction in specific range of approximately 18%. Whenever possible, slow down first, then extend the package if desired. The unit has been proven structurally and functionally sound to 740 knots EAS.

Extension of the emergency power package in the landing configuration causes no trim changes and has no effect upon handling qualities, stall speed, or stall characteristics.

STABILIZATION

Automatic roll and yaw stabilization systems improve camera platform characteristics, permit greater maneuvering capabilities, and improve general handling qualities. With stabilization systems operative, the Crusader is a smooth, effective, and competitive flying and fighting machine throughout its flight envelope. Without stabilization, it still may be flown successfully through the same speed envelope but is subject to drastic reductions in permissible maneuvering and to a considerable reduction in its ability to perform smooth photographic runs.

In other words, flight stabilization improves the performance of the aircraft as a weapon by performing the following significant functions:

- Damping of undesirable roll and yaw motions caused by air turbulence or rough control usage.
- Stiffening the aircraft directionally, making it more prone to fly with zero yaw angle.
- Applying opposite rudder in all rolls so as to reduce the buildup of favorable yaw at high Mach numbers and altitudes.

Stabilization output is regulated by use of altitude yaw gain changers and by switching between clean configuration and landing configuration roll amplifier gains to give the best performance under all flight conditions. The net result is a steadier aircraft which does not develop excessive yaw angles during maneuvering flight. All stabilization effects are accomplished without effort on the part of the pilot and with no feedback into the controls except for an occasional minute roll "nibble" in the landing configuration.

In the clean configuration, yaw stabilization is the more important function since it is necessary to maintain the yaw angle as near zero as possible at all times. This factor accounts for the reduction in the operating envelope with yaw stabilization inoperative. If a failure should occur at a speed above the restriction speed, avoid abrupt maneuvers or control motions and reduce speed as rapidly as practicable.

In the landing configuration the basic roll damping of the aircraft is poor and roll stabilization accordingly is of major importance. Fortunately, basic damping improves as airspeed decreases so that loss of roll stabilization does not cause a serious approach or landing problem. With roll stabilization inoperative, roll damping will become marginal at airspeeds above 180 KIAS, so avoid abrupt maneuvers, reduce airspeed, or lower the wing.

TRIMMING

Use of trim will reposition any of the control surfaces without changing the neutral position of the stick or rudder pedals because the trim actuators move only the linkage downstream of the feel systems. Because of the variable gain linkage in the longitudinal system, flying the aircraft with force applied to the stick (aircraft not in trim) will cause increased sensitivity the further the control is held from neutral. By keeping the aircraft trimmed under high-speed flight conditions, full benefit is obtained from the variable-gain linkage in maintaining pitch attitude without increased control sensitivity.

Movements of the trim knobs will result in changes of aircraft attitude unless compensating movements of the stick or rudder are made. As trim is applied, relax pressure on the stick or rudder pedals to determine the effect of the amount of trim used. This will avoid overtrimming or unwanted changes of aircraft attitude. Until familiar with trimming, apply trim in small amounts to obtain the desired attitude.

Because of the rapidity with which flight conditions change at low altitudes with afterburner, precise trimming is difficult. Attempt minimum trimming during an afterburner climb below 20,000 feet until familiar with the trimming characteristics in this flight regime.

Since roll and yaw trimming is achieved with the same actuators used for stabilization, normal trimming will be lost if the stabilization system fails or is turned off. Remember that in such a case, any roll or yaw trim already applied will be removed since the actuators automatically return to neutral. Emergency pitch trimming is available if normal pitch trim circuits fail.

LEVEL FLIGHT

MAXIMUM SPEED

Figure 4–9 illustrates the maximum speed capabilities of the aircraft for military and maximum thrust in level flight. Do not expect to achieve the speeds shown under all operating conditions. Actual speed achieved in any flight may exceed or fail to reach the values shown, depending upon gross weight differences, atmospheric conditions, and the status of engine trim.

LANDING CONFIGURATION

Landing configuration characteristics are normal and satisfactory in all respects. The aircraft may be trimmed fairly easily during the approach and all controls operate smoothly and effectively.

Military thrust is sufficient for most waveoffs and enormous extra thrust is available from the afterburner for a desperation-type waveoff.

CLEAN CONFIGURATION — SUBSONIC

WARNING

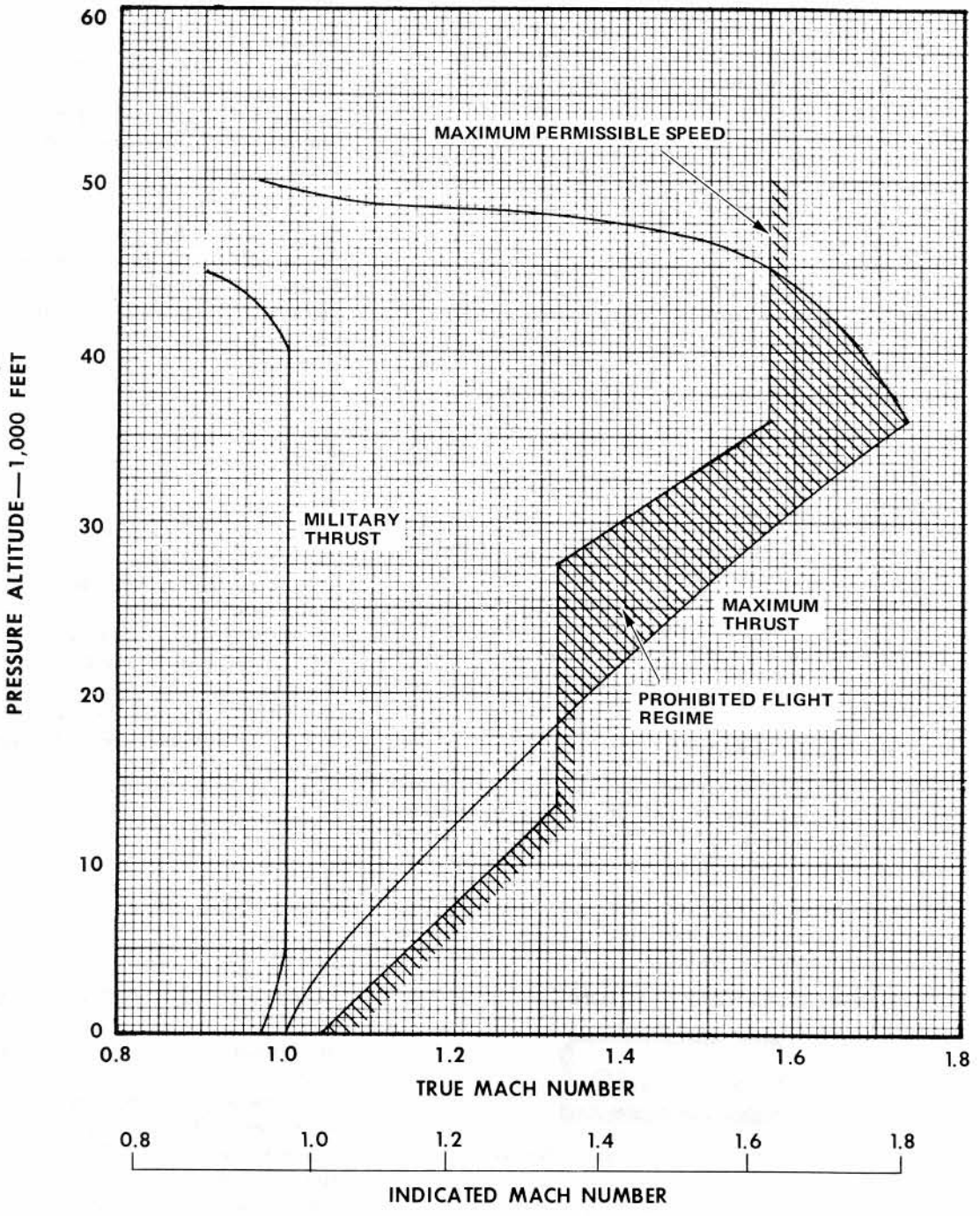
Lateral oscillations with amplitudes as large as 30 degrees in both directions may occur in the low altitude high subsonic speed range. These oscillations are likely to occur when performing "jinking" type maneuvers using rapid lateral stick inputs and can also be induced by turbulence. The oscillations may damp out when the stick is released, but the most positive means of recovery is to reduce airspeed as well as g if maneuvering.

The aircraft normally spends most of its flight time in the subsonic region and has quite conventional characteristics there. The afterburner gives it excellent acceleration characteristics under practically all conditions. Trimming generally is good except in the trim change region of about 0.90 IMN to 1.05 IMN, where attention to control is required if it is desirous to hold a given altitude. High-speed flight at low altitude in turbulent air is rather uncomfortable and disturbing because of the jostling experienced in the cockpit. Sensitive pitch control will be encountered in low-altitude flight at high subsonic speeds.

CLEAN CONFIGURATION — SUPERSONIC

Supersonic flight characteristics of the Crusader are excellent and enjoyable. Control response is smooth and precise in pitch, yaw, and roll, and trimming is at its best. There is a general reduction in noise and vibration as soon as the aircraft goes supersonic, particularly after the oil cooler door opens. The energy level is very high, enabling the aircraft to be zoomed to high altitudes or turned extensively while maintaining supersonic conditions. Acceleration in level flight is fairly slow as compared to acceleration at subsonic speeds, but in dives airspeed increases very rapidly. Take care to avoid exceeding restrictions. Deceleration is also relatively slow unless a combination of thrust reduction and speed brake is used.

MAXIMUM SPEED–LEVEL FLIGHT, J57-P-420 ENGINE



NOTES

1. Data based on standard day conditions using gross weight of 25,551 pounds.
2. Clean condition, J57-P-420 engine.

Figure 4–9

MANEUVERING FLIGHT

SYMMETRICAL PULLOUTS

Symmetrical pullouts may be performed in dive recoveries, steady-state turns, tail chases, "rat races," etc. Figure 4–8 indicates the stick force per g required for maneuvering flight at 10,000 and 40,000 feet. These curves show that the stick force per g required for low-altitude maneuvering is less than that required at higher altitudes. Between 0.80 IMN and 1.00 IMN at low altitudes, the stick force per g is approximately half of that needed for pullouts at higher altitudes. Horizontal tail effectiveness at high speeds and low altitudes is sufficient to inadvertently exceed the structural limits of the aircraft in abrupt pullups. Be particularly alert to this possibility during high-speed maneuvering at low altitudes, and avoid abrupt control applications. Pitch control is more sensitive with the aft center-of-gravity positions which occur with 1,000 pounds or less fuel in the main system, and caution must be exercised to avoid overcontrolling.

WARNING

Avoid abrupt pitching maneuvers at low altitude and high speed. Pullups at a rate which exceeds 5.0 g in less than 3 seconds are prohibited.

For normal operation at all altitudes, particularly below 20,000 feet, the aircraft should be flown as nearly in trim as possible. The control system is least sensitive when operated near trim where action of the variable-gain linkage results in relatively large stick deflections per unit deflection of the horizontal tail.

On missions requiring low altitude, high-speed pullouts, special care must be exercised to prevent overstressing the airplane. Horizontal tail effectiveness is very great.

Because of the rapidity with which flight conditions change at low altitudes with combat thrust, precise trimming is difficult. Recommend minimum trimming be attempted during a combat thrust climb below 20,000 feet until familiar with the trimming characteristics in this flight regime.

Be aware of the acceleration and deceleration resulting from using afterburner or speed brake at low altitudes and the consequent possibility of overcontrolling. Any oscillation resulting from overcontrolling will be satisfactorily damped by releasing the control stick. Supersonic pullouts are buffet free, and limit loads can be imposed on the aircraft even at the higher altitudes. It is recommended that the Crusader pilot become thoroughly familiar with the differences of stick force g required at all altitudes before utilizing the aircraft to its maximum capabilities.

ROLLS

Roll stability is positive throughout the flight envelope determined by the limitations listed in section I, part 4. At medium and high altitudes, satisfactory roll rates are available throughout the flight envelope. During rolls, the basic aerodynamic characteristics of the aircraft are such that adverse yaw develops at subsonic speeds, no yaw at transonic speeds and favorable yaw at supersonic speeds. The aileron-rudder interconnect introduces adverse rudder, and thus shifts these three yaw conditions to higher Mach numbers. However, at higher Mach numbers favorable yaw continues to build up during rolls and it is necessary to restrict permissible roll angles and aileron deflections in order to avoid roll coupling.

At Mach numbers above 1.25 at altitudes greater than 35,000 feet considerable apparent inertia in roll is developed, making rolls and rolling pullouts somewhat difficult to stop at the desired bank angle unless considerable opposite aileron is used. Since such rolls develop their maximum rate rather slowly and consequently also tend to lose it rather slowly, some overshooting may occur in attempting to establish a given bank angle or to roll to wings level. These effects are minor within the roll restrictions but familiarize yourself with them at or near 1.25 IMN before performing rolls or rolling pullouts at higher allowable Mach numbers. At low altitudes, roll rates are satisfactory at all speeds. The roll angle restrictions of section I, part 4 must be observed in order to avoid obtaining large bank angles which may require excessive times to roll back to level flight. Roll rate can be significantly improved in this flight area by reducing speed and by applying rudder in the direction of roll.

ROLLING PULLOUTS

The characteristics of Crusader rolling pullouts (rolling while pulling g) fall roughly into the following categories: low KIAS subsonic, high KIAS subsonic, and supersonic. These categories occur about as shown in figure 4–10, but the dividing lines are not as sharp as shown.

ROLLING PULLOUT REGIMES

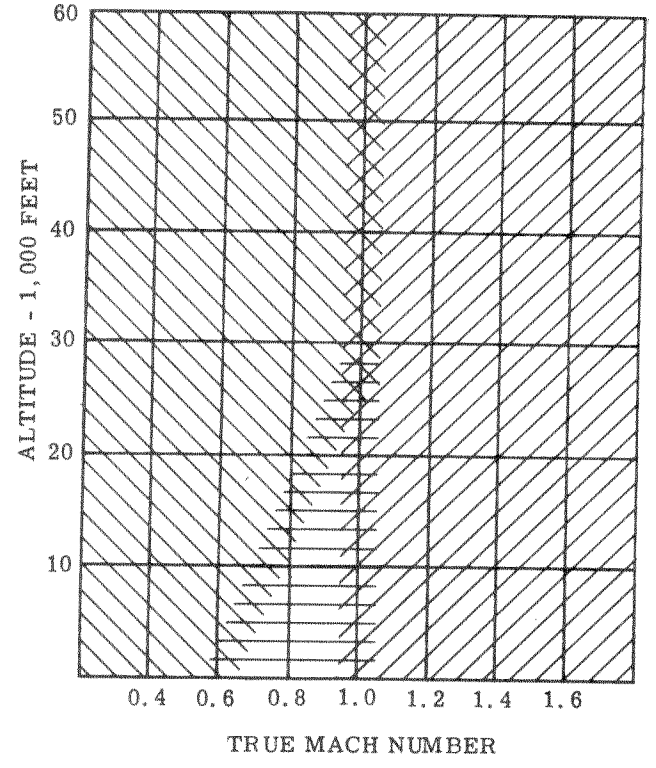


Figure 4–10

WARNING

To prevent exceeding rolling pullout acceleration limits at high KIAS and low altitude when rolling at load factors in excess of 3.0 g:

- Avoid rapid lateral stick movement which might lead to inadvertent aft stick movement.
- Do not exceed moderate rates of roll. Erroneous cockpit accelerometer indications and the aircraft pitching tendency while rolling both increase with an increase in rate of roll.

Because the accelerometer is located above the aircraft roll axis, the instrument indicates less than the true load factor during rolls. This erroneous indication is a function of the square of roll rate and the error may be as large as –1.0 g for full aileron rolls in the high KIAS subsonic region. Therefore, the acceleration limits of section I, part 4, can be exceeded without a verifying cockpit indication.

Low KIAS Subsonic Rolling Pullouts

Rolling pullouts at low g are fairly smooth and the rate of roll is quite high if full aileron is used. Some adverse yaw may be noticed. This adverse yaw decreases the rate of roll and tends to make the roll somewhat unsteady. If sufficient g's are pulled to cause buffeting during the rolling pullout, the adverse yaw increases markedly, further reducing the rate of roll. Further increases in g causes further reduction in rate of roll to the point where the aircraft may abruptly stop rolling or even start to roll in the opposite direction. Immediately recover from this condition by neutralizing controls. Failure to do so may precipitate a snap roll maneuver possibly followed by spin entry.

In this flight region it appears most efficient and tactically advantageous to perform rolling pullouts at low g to avoid buffeting, thereby taking advantage of higher rates of roll and maintaining a wide margin with respect to the point where snap maneuvers may be encountered.

High KIAS Subsonic Rolling Pullouts

Rolling pullouts in this region are affected by the same factors that prevail at low KIAS. However, at high KIAS the buffet boundary is so high that the structural limit of the aircraft is obtained before buffeting or adverse yaw become major factors. For this reason, rolling pullouts will be smoother and generally will be buffet-free.

An increase in positive load factor (g), without additional aft stick is also characteristic of rolling pullouts in this regime.

Supersonic Rolling Pullout

Supersonic rolling pullouts are extremely smooth and are accompanied by favorable yaw. No buffeting will be encountered at any speed or altitude within the g limits.

CLIMBS

When an afterburner climb is made following takeoff, establish the climb attitude approximately 0.05 Mach number short of the desired climb schedule in order to avoid overshooting the schedule. Acceleration to climb schedule is rapid, and the climb attitude is very steep. This attitude will flatten somewhat at altitude, and with experience the pilot will learn to anticipate this flattening in order to hold a more constant

climb schedule. Extend cruise droop in a climb as airspeed drops below 300 KIAS. Lead the level-off altitude by a few thousand feet except at extremely high altitudes.

Due to the rapid acceleration from brake release to climb schedule (approximately 1 minute) when in afterburner, very little time is available to thoroughly check the aircraft before obtaining high speeds. Accordingly, do not attempt afterburner climbs following takeoff until familiar with the aircraft.

Military thrust climbs following takeoff are comparable to maximum performance climbs in subsonic aircraft. Extend cruise droop in the climb as airspeed drops below 300 KIAS. Due to airspeed and attitude changes during climbs, a small amount of directional and lateral retrimming is required.

DIVES *(See figure 4–11.)*

The aircraft picks up speed quite rapidly in dives. Engine thrusts and dive angle are very influential in controlling speed during dives. Thrust reduction and pulling the nose up will be found more effective than speed brake extension when it is desired to reduce speed from very high values. Stability and control characteristics are generally good.

When dives to lower altitudes are required during missions, be especially cautious about target fixation.

As indicated under TRIMMING, malfunction of the yaw-stabilization system will result in the rudder immediately returning to neutral and the directional trim system becoming inoperative. If this malfunction occurs at high airspeed or where a large amount of rudder trim is required to maintain balanced flight an abrupt yaw will occur. Poor damping characteristics under these conditions make it easy to set up lateral-directional oscillation if abrupt, large lateral or directional control movements are used. In the event of stabilization failure in high speed dives, reduce speed immediately and effect recovery using small slow aileron or rudder movements if required.

Below 20,000 feet aileron effectiveness deteriorates at speeds near the extremes of the permissible flight envelope. Considerable retrimming of rudder and ailerons is usually necessary in high-speed dives. Unusual sounds, variously described as those produced by rapidly shooting a gun alongside the cockpit, the close passage of artillery shells, or the mooing of a cow may be encountered in this area. These sounds have proved to be of no consequence.

AEROBATICS

Aerobatics in the Crusader are typical of most contemporary jet aircraft. No special techniques or knowledge is required. Since loops and Immelmann turns develop considerable changes in altitude, start them at 15,000 feet with at least 500 KIAS and fuel status below 6,000 pounds until familiar with the aircraft. Afterburner may be used during these maneuvers either as a means of keeping the airspeed up or of increasing the altitude gain. If the airspeed gets low on top, allow the aircraft to "fly through" at a low g value. Avoid pulling into buffeting throughout the maneuver.

Satisfactory rolls may be performed at most speeds without attempting to coordinate rudder with ailerons, but coordination may be improved by use of rudder if desired. The best and smoothest rolls are obtained by putting in and taking out aileron rather slowly.

PHOTOGRAPHIC RUNS

Altitude is easily controlled during photographic runs throughout the flight envelope, except that some difficulty may be encountered in the longitudinal trim change region (0.90 to 1.05 IMN) at high altitude until experience with the aircraft is gained.

Satisfactory photographic runs can be obtained throughout the flight envelope at low altitude. Rough air at high speed does not impair picture quality even when the degree of roughness is considered maximum for safe flight. Rapid descents for low-altitude photographic runs must be accomplished with a minimum of 85% rpm in order to keep camera and viewfinder windows and lenses clear of condensation. High aircraft performance makes it possible to "run away" from flares during night photography and results in underexposed film. Avoid looking into the rear vision mirrors while ejecting flares; flare reflection will impair night vision.

DIVE RECOVERY

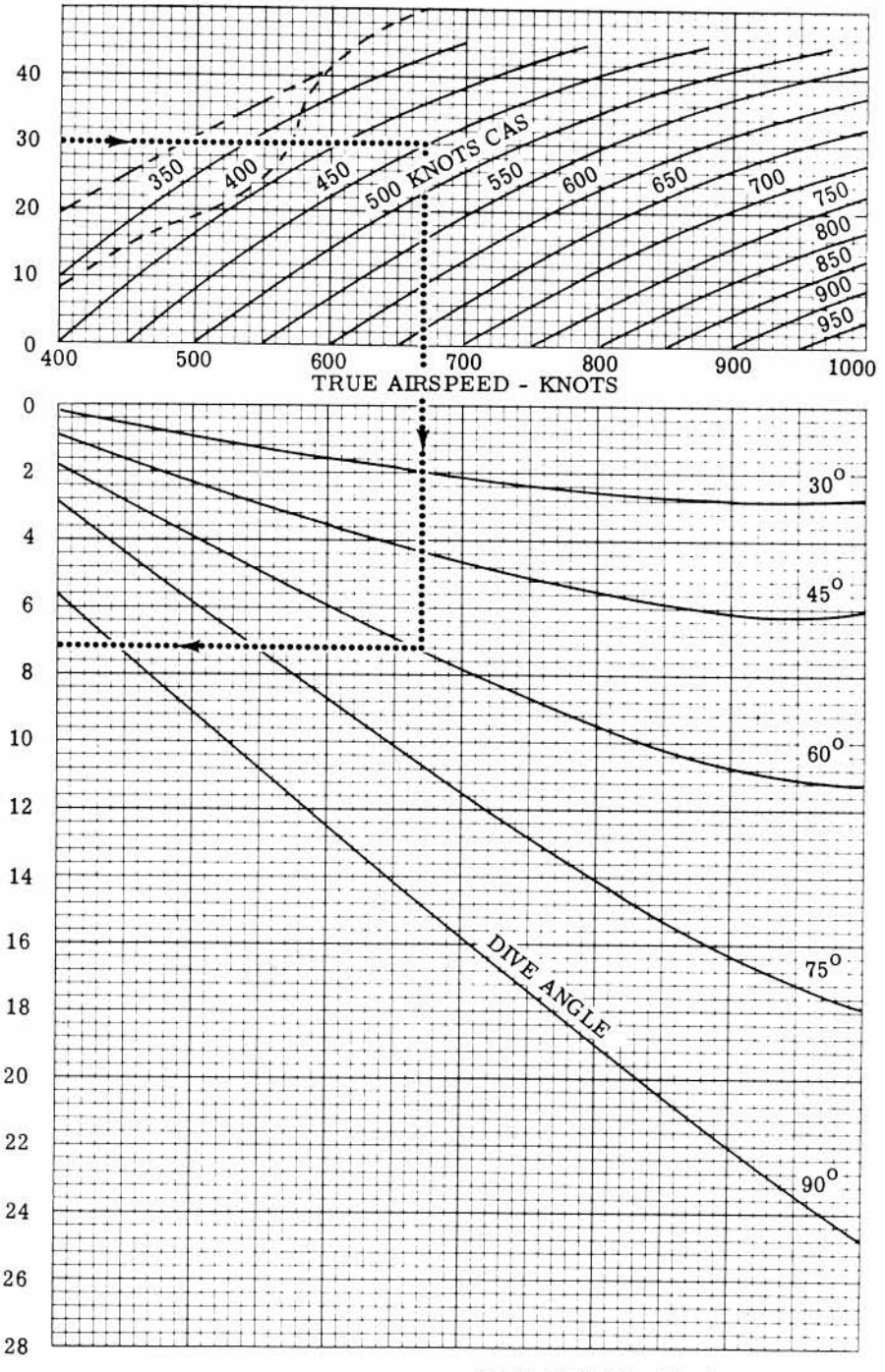
MODEL: RF-8G

NOTE

Refer to figure 1-50 for g limits.

STANDARD DAY
CONSTANT 4G PULLOUT

4-G



LEGEND

- - - - - APPROXIMATE BUFFET ONSET BOUNDARY WITH CRUISE DROOP

— - — - AVAILABLE LIMIT WITH CRUISE DROOP

DATA BASED ON: ESTIMATES
DATA AS OF: 31 JANUARY 1957

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

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Figure 4–11 (Sheet 1)

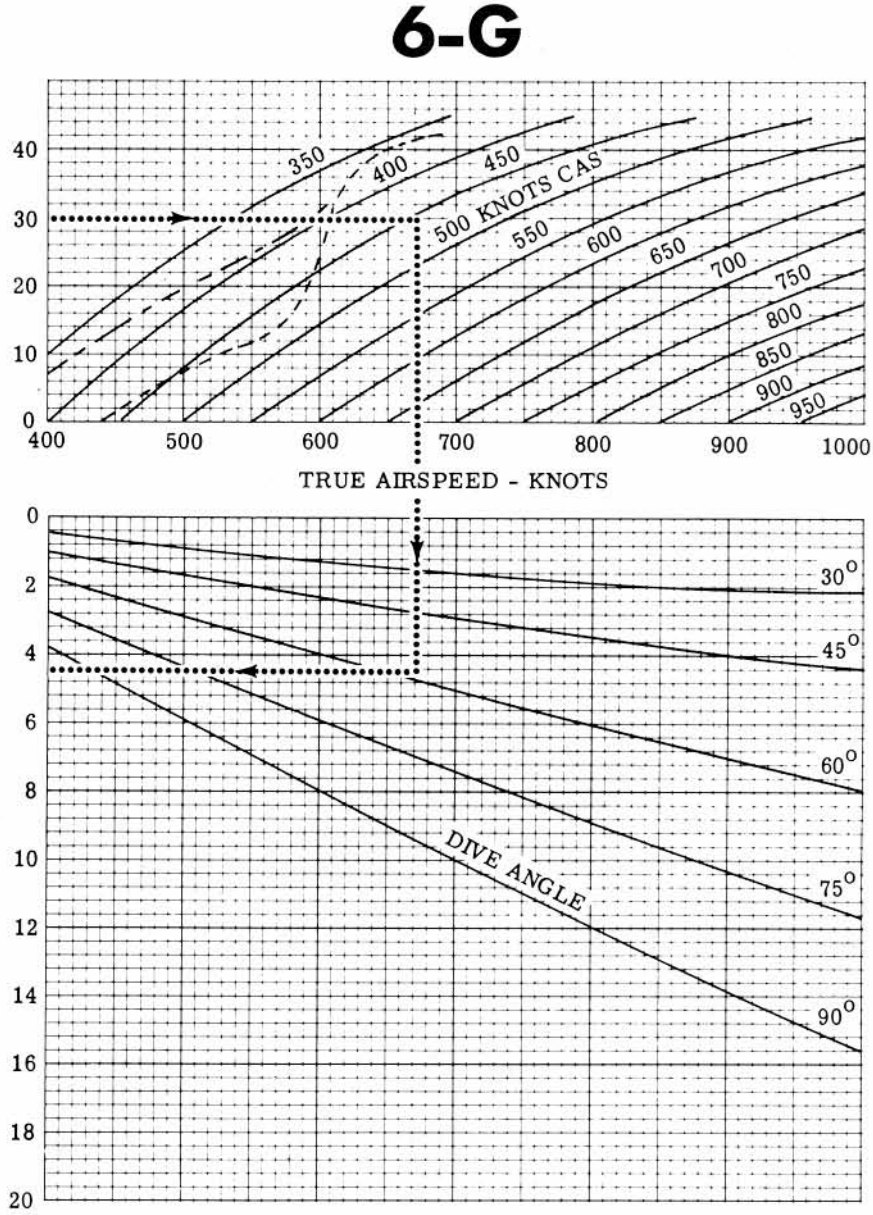
DIVE RECOVERY

MODEL: RF-8G

STANDARD DAY
CONSTANT 6G PULLOUT

NOTE

Refer to figure 1-50 for g limits



LEGEND

—— — AVAILABLE LIMIT WITH CRUISE DROOP

- - - - APPROXIMATE BUFFET ON-SET BOUNDRY WITH CRUISE DROOP

DATA BASED ON: ESTIMATES
DATA AS OF: 31 JANUARY 1957

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

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Figure 4–11 (Sheet 2)

STALLS

CHARACTERISTICS

(See figure 4–12 for stall speeds)

NORMAL OR 1g STALLS.

Landing Condition

Stall warning is first evidenced by prestall buffet commencing around 14.5 units indicated angle of attack, increasing in intensity to heavy buffeting, roll oscillations, porpoising or poor response to lateral control at about 17 units. The stall is marked by a definite wing drop, roll, or snap roll. The horizontal tail and rudder remain effective throughout the stall. Ailerons become ineffective as the stall is reached. Recovery is initiated by immediately neutralizing lateral and directional control, positioning the stick slightly forward of neutral (avoiding use of ailerons), and allowing airspeed to increase in whatever bank angle or pitch attitude exists until well out of buffet.

Clean Condition

Clean condition stall behavior is similar to the landing condition, with warnings and stall occurring at higher airspeeds. Buffet onset will occur at least 40 knots above the stall speed and increases to heavy buffet at the stall. At the stall, the wing drop will be more abrupt to approximately 45° but the condition can be aggravated into greater and faster roll departures by maintaining or increasing aft stick at or beyond the stall. With cruise droop extended, stall warnings will occur at airspeeds approximately 10 to 15 knots lower than with leading edge retracted. The stall will occur approximately 5 knots lower with cruise droop extended.

ACCELERATED STALLS.

Stalls in Pullouts or Turning Flight

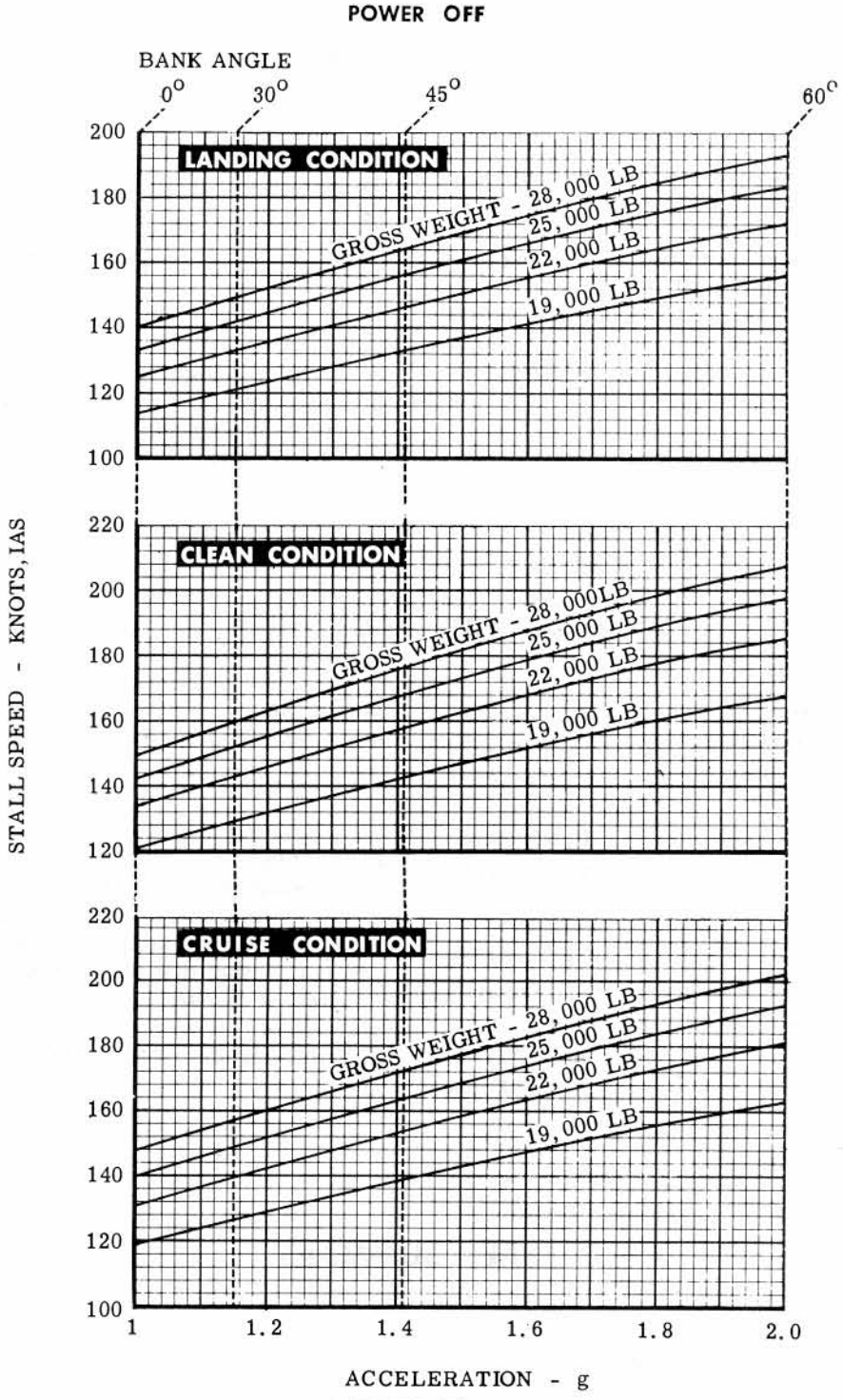
Accelerated stalls will occur whenever excessive aft stick is used for maneuvering at subsonic speeds such as in pullouts or turning flight.

In a gradual approach to an accelerated stall, warning of the stall occurs initially in the form of buffeting, which increases to heavy buffet at the stall. In addition, roll oscillations (up to 30° left and right) and porpoising will occur just prior to reaching the stall. At the stall a very abrupt roll will occur which can reach or exceed 180° of bank angle change. This can be accompanied by a marked increase in nose-up attitude, especially if ailerons are used to oppose the roll.

If the stall is approached rapidly, warning motions of the airplane prior to the stall will be less apparent, and behavior at the stall will be more violent. At low airspeed or Mach numbers, all stall warnings will be less intense, and greater cautions must be used to prevent inadvertent stalls.

An accelerated stall may result from holding a high g level while decelerating from supersonic speed. Particular care should be taken to maintain speed with adequate thrust or nose attitude while holding a high g level in turns at low supersonic speeds. The airplane can rapidly decelerate from these speeds to high subsonic speeds at which the stall boundary decreases and the tail effectiveness increases, making it more likely that an accelerated stall would be entered abruptly. During the deceleration, the time between warning (if felt) and actual stall can be as short as 2 seconds. To ensure against an accelerated stall occurring under such conditions, maintain speed while holding g's or reduce the g's before decelerating.

STALL SPEEDS



NOTE

Power-off stalling speeds are based on operation with the engine idling. Stalling speeds with the engine windmilling are essentially the same as presented for power-off. Since power-on stalling speeds are affected more by pilot technique than by thrust effects, power-on stalling speeds are not presented.

For information on accelerated stalls under tactical maneuvering conditions, refer to (confidential) F-8 Tactical Manual (U).

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Figure 4-12

Stalls in Turn Entries and Reversals

Accelerated stalls may also result from attempting aileron rolls at g loads below but close to the stall boundary, such as in turn entries, turn reversals or turn recoveries.

Rolls attempted under these conditions result in large yaw angles which can cause the airplane to stall. In such cases, the usual warnings of an accelerated stall may not be apparent. The most positive warning of a possible stall entered from a roll is indicated by the roll behavior of the airplane. If response to the ailerons is very sluggish, if the roll appears to be stopping while the ailerons are still deflected, or if there is no response at all to the ailerons, the roll is being attempted at too high a g loading or too low an airspeed. When any of these characteristics occur, ailerons should be neutralized immediately and g loading reduced.

If the ailerons are not neutralized immediately, the airplane may yaw and pitch into a stalled attitude, or an uncontrolled flight maneuver (similar to a snap roll) may occur.

To take advantage of the higher rates of roll and best behavior of the airplane, rolls through large bank angles such as in turn entries or turn reversals should be performed under buffet-free conditions.

Rolls initiated at buffet onset or above should be limited to small lateral stick deflections and small bank angle changes such as occur when tightening a turn or making tracking corrections. To avoid the possibility of entering uncontrolled flight, rolls should not be attempted above moderate buffet levels.

RECOVERY PROCEDURE

Upon first signs that the stall point has been reached or upon recognition from the roll behavior of the airplane that a stall is imminent, the following recovery action should be taken immediately:

1. Relax all stick and rudder forces, allowing controls to return to their neutral positions, then push stick forward of neutral as required to reduce angle of attack or g load.

2. Avoid use of ailerons and allow airspeed to increase in whatever bank angle or pitch attitude exists, even if inverted, until well out of buffet.

Never displace ailerons to raise a wing at or beyond the stall or to stop a snap roll. It is emphasized that the use of ailerons during stall or stall recovery will not produce the expected roll but will develop sufficient yaw to result in a spin.

Even though the airplane may be gyrating (snap rolling, yawing and pitching) or appears to be entering a spin, hold controls in neutral until either recovery or a spin is clearly indicated. Look at stick and rudder pedals to ensure that they are in neutral. *It should not be assumed that the airplane is in a spin until at least one yawing turn (not roll) has occurred without reversing, as described under "Recognition Of The Spin."*

STALL SUMMARY

1. Warning in the form of heavy buffeting, roll oscillations, porpoising, or poor response to ailerons always precedes the stall.
2. The stall is marked by abrupt wing drop, roll, or snap roll.
3. Recovery is initiated by immediately neutralizing controls.
4. Hold neutral controls (stick slightly forward) until either recovery occurs or a spin is clearly indicated.
5. Do not use ailerons to stop roll or correct bank angle at or beyond stall.
6. Do not attempt rapid rolls through large bank angles in buffet conditions.

SPINS

CHARACTERISTICS

GENERAL.

Regardless of the flight conditions, attitudes, gyrations or control manipulations leading to departure from controlled flight, and regardless of those imposed during uncontrolled flight, the airplane will perform only the one type of upright spin described below.

Crusader spins are characterized by large frequent changes in pitch attitude and bank angle in the first 2 to 3 turns. In these initial turns the pitch attitude may rapidly change from a nose-high position near or above the horizon, to 40° or 50° nose down, and then back to the nose-high position again. In the same period, the bank angle may vary from 45° wing down to 45° opposite wing down. The nose of the airplane returns to a high position once in each turn. These large motions gradually reduce in magnitude, and during the third turn may reach a level as little as one-half to one-fourth of the initial motions. The behavior of the spin appears considerably smoother to the pilot from this time on. After the third turn, average pitch attitude is relatively flat, with the nose 10° to 20° below the horizon. A complete turn occurs in 4 to 5 seconds. Average altitude loss is 1,400 feet per turn.

Occasionally, while in a spin, the airplane will roll outside wing down to an inverted attitude for a few seconds so that it describes part of a turn (as much as one-half turn) at a negative 1.0g. The airplane will continue to roll, in the same direction that created the inverted attitude, to an upright attitude and will continue in an upright spin regardless of how long the spin is maintained. The general rotation of the spin will remain in the same direction relative to the earth before, during and after the roll through the inverted position. It is possible that while the airplane is inverted, the pilot may have the sensation that a spin reversal has occurred. *However, this is not a reversal.* This inverted condition, when it occurs, usually does so in the latter part of the second turn and the first part of the third turn. However, it is not violent, nor does it affect ability of the pilot to select and apply proper recovery controls. The recovery does not appear to be lengthened or otherwise changed by this phenomenon.

The most violent airplane motion will be encountered in the initial departure from controlled flight at higher airspeeds in accelerated stalls. The airplane cannot be made to enter a spin at speeds in excess of 170 knots IAS; however, above this speed, uncontrolled flight (such as violent snap rolls) can be generated from which it is possible to effect recovery providing controls are immediately neutralized. *During uncontrolled flight, speed can be lost at very high rates up to 40 knots per second, which may result in speed very rapidly dropping below 170 knots.* If recovery from uncontrolled flight has not been effected before this time, the airplane will enter a spin with no break in the motion. In such entries the airplane may initially snap roll over the top or under the bottom before autorotation. Occasionally the airplane will perform, initially, a severe cartwheel type of maneuver in which the nose goes well above and below the horizon to near vertical attitudes. Independently of the manner in which the initial departure occurs, either through a snap roll or cartwheel, the resultant extreme attitudes will be reduced to the typical spin attitudes by the end of the second turn.

Although, the airplane may flip right side up and enter an upright spin as a result of loss of flying speed in inverted flight, it will not perform an inverted spin.

Spin characteristics and spin recovery procedures are not affected by extended landing gear and speed brake. Wind tunnel tests indicate that landing condition spins and recovery procedures are similar to those for the clean condition.

ENGINE BEHAVIOR IN SPINS

Because of the high angle of attack encountered in a spin, the ability of the duct to carry air to the engine is greatly reduced and engine compressor stalls may result. This will be evidenced by loud coughing and banging noises which can lead to excessive engine exhaust temperatures. To reduce the severity of compressor stalls and engine overtemperatures, the throttle must be retarded to IDLE if a spin is encountered.

Overtemperatures as high as 770°C have occurred during spins after IDLE was selected. However, in each case engine operation has remained normal.

On some occasions compressor stalls have persisted after idle thrust was selected, until 250 knots IAS and altitudes below 30,000 feet were achieved in the recovery dive.

As compressor stalls cease, engine exhaust temperatures will return to normal. No engine flameouts occurred during Crusader spin investigations.

RECOVERY CHARACTERISTICS AND PROCEDURES

RECOVERY PROCEDURE.

WARNING

Do not raise wing to aid spin recovery. Airspeed and/or g conditions that result during the spin maneuver may exceed the available strength of the airplane in the raised wing configuration, especially during the dive recovery phase.

As much as 11,500 feet of altitude could be required for complete spin recovery after actuation of appropriate controls. If a fully developed spin is entered below 11,500 feet AGL, abandon the aircraft immediately. If in a spin and rotation has not ceased passing 10,000 feet AGL, abandon the aircraft.

Recovery from a spin is obtained by using the following technique:

1. Retard throttle to IDLE.

2. Leading edge droop – extend to landing position.

NEW

Raise guard of EMERG SPIN DROOP switch and place in the ON position. If leading edge fails to extend, extend pneumatically.

WARNING

When selecting emergency droop pneumatically to aid spin recovery, do not unlock the wing. Extend by raising emergency droop and wing incidence guard and moving the WING INCIDENCE handle to the full forward position.

3. Place full rudder against spin; apply full aft stick and full lateral stick opposite to rudder (with the spin).

EXAMPLE

Control	*Right Spin*	*Left Spin*
Rudder	Full left	Full right
Stick	Full aft and full right	Full aft and full left

WARNING

Full lateral stick deflection must be applied since as little as ½-inch less than full deflection may add one additional turn to the recovery.

Spin recovery may take as long as 12 seconds, a period that may *seem* considerably longer to the pilot. Concentrated effort must be made to hold correct recovery controls until recovery is indicated.

4. As spin rotation stops, promptly neutralize ailerons and rudder, and push stick 2 to 3 inches forward of neutral.

WARNING

Failure to retract emergency spin droops (switch to OFF) will cause landing droops to retract if wing is raised hydraulically.

5. After recovery, retract land droops by placing the EMERG SPIN DROOP switch in the OFF position.

For this technique to be effective, the pilot must be aware of the behavior of the airplane during recovery from the spin. Incorrect interpretation of these characteristics can result in wrong use of recovery controls and failure to recover from the spin. The following paragraphs describe in more detail the recovery

behavior of the airplane and the appropriate actions for obtaining prompt recovery.

USE OF THROTTLE.

WARNING

To avoid inadvertent engine shutdown, maintain inboard pressure on the throttle when reducing the throttle toward idle.

Engine operation above IDLE during the period between radical departure from normal flight and entry into true spin rotation can be beneficial in recovery with neutral controls. Once the spin is entered, however, the throttle must be at IDLE to minimize the effects of compressor stall and overtemperature. IDLE power settings will prevent overtemperature below 37,000 feet, but compressor stalls may continue. If neutralizing the controls does not result in immediate arrestment of the departure from controlled flight, the throttle should be retarded to IDLE immediately. *When in doubt as to how far the stall has progressed towards a spin, retard the throttle to IDLE.*

RECOGNITION OF THE SPIN.

Spin recovery procedures should not be attempted until the pilot is certain that a spin exists. In the Crusader a spin differs from other stall gyrations in that the nose of the airplane will continuously yaw in one direction. *A spin should be assumed only if the yaw is continuous in one direction for at least one turn.*

DIRECTION OF ROTATION.

Direction of rotation must be positively established so that the rudder and aileron may be deflected in the proper direction to stop the spin.

Direction of rotation can easily be determined by observing traverse of terrain over the nose of the airplane. Spin direction can also be determined by use of the needle of the turn-and-bank indicator. Needle to the right indicates a right spin, and needle to the left, a left spin.

CAUTION

In a severe spin where the spin forces prelude observing the terrain and/or turn needle, radio calls from another aircraft may be the only source of turn information. It is therefore important that the helmet radio cord be shortened so that it does not become disconnected on survival gear from being too long. It is equally important that the direction of the spin be correctly determined by observers from transmitting.

RECOVERY BEHAVIOR.

When the leading edge is extended to landing droop and controls are placed to stop the spin, continuous rotation in the initial direction will cease within 2½ additional turns. The only positive means of recognizing that rotation has stopped is by closely watching the traverse of the terrain. As the apparent motion of the ground past the nose is stopping or when it has stopped, quickly neutralize rudder and ailerons and push stick 2 to 3 inches forward of neutral. Failure to neutralize controls promptly can cause a spin in the opposite direction.

As the rotation stops, a nose-down pitch will usually occur, followed by an increase in airspeed, and eventual recovery to normal flying speed in a 70° to 90° dive. A rolling tendency usually occurs early in the recovery dive just after controlled flight has been regained. This tendency should not be opposed with aileron as the motion will damp as airspeed increases. The use of aileron at this time may develop another spin.

USE OF LANDING DROOP.

The use of landing droop results not only in more positive spin recovery, but also results in more positive pilot recognition of the recovery phases. Therefore, landing droop should be selected immediately on rec-

ognition that a spin exists. The pilot should devote his full attention, if necessary, to actuation of the droop controls. Visually observe droop control actuation, and if need be, release the stick and use both hands to obtain proper actuation. Releasing the stick will not cause the airplane to enter any other type of maneuver or to fall or spin any faster. There are no restrictions with respect to extending leading edge to landing droop *during* a spin. If a reasonable attempt at droop extension is unsuccessful due to buffeting, the pilot should continue the spin recovery sequence, but not beyond altitude limits which would preclude successful ejection. Once recovery controls are applied, additional attempts at droop extension may be made.

TRIM SETTINGS.

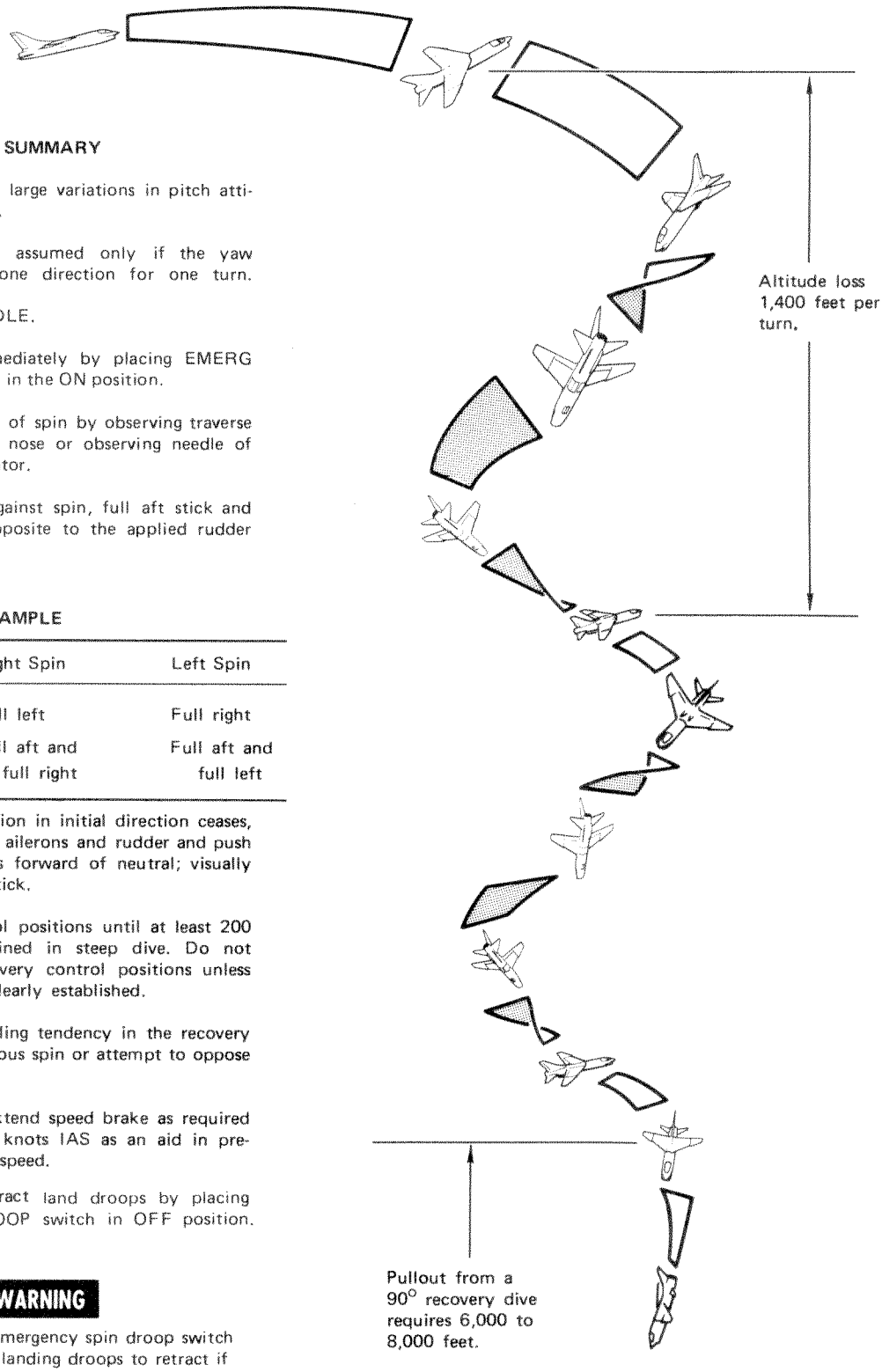
Under normal trim usage, trim settings will not have significant effect upon spin and recovery characteristics. Full directional or lateral trim settings will not be noticeable until considerable speed is picked up in the recovery dive. Since the longitudinal trim setting existing may not be known, recovery can be hastened by pushing the stick 2 to 3 inches forward of neutral, as the spin ceases, regardless of trim position. A slightly steeper recovery dive may result from this technique.

RECOVERY TO LEVEL FLIGHT.

To avoid progressive stalls, do not initiate pullout prior to reaching at least 200 knots IAS. Available g's will not permit rapid round out at low airspeeds, and high drag from a pullout started too early will retard buildup of speed to safer pullout speeds. The altitude loss from the point at which a controlled dive is reached to that at which level flight is achieved will be about 6,000 to 8,000 feet. Speed brake may be extended in the dive, after reaching at least 200 knots IAS, to prevent excessive airspeed buildup. Do not exceed landing droop restrictions in the recovery; the airspeed and g loadings will not exceed these restrictions during the spin.

SPIN SUMMARY

(See figure 4–13)



SPIN SUMMARY

1. Initial turns involve large variations in pitch attitude and bank angle.
2. A spin should be assumed only if the yaw is continuous in one direction for one turn.
3. Retard throttle to IDLE.
4. Extend droop immediately by placing EMERG SPIN DROOP switch in the ON position.
5. Determine direction of spin by observing traverse of terrain over the nose or observing needle of turn-and-bank indicator.
6. Place full rudder against spin, full aft stick and full lateral stick opposite to the applied rudder (with spin).

EXAMPLE

Control	Right Spin	Left Spin
Rudder	Full left	Full right
Stick	Full aft and full right	Full aft and full left

7. As continuous rotation in initial direction ceases, promptly neutralize ailerons and rudder and push stick 2 to 3 inches forward of neutral; visually check position of stick.
8. Hold neutral control positions until at least 200 knots IAS is obtained in steep dive. Do not revert to spin recovery control positions unless continuing spin is clearly established.
9. Do not confuse rolling tendency in the recovery dive with a continuous spin or attempt to oppose the tendency.
10. In recovery dive, extend speed brake as required after reaching 200 knots IAS as an aid in preventing excessive airspeed.
11. After recovery, retract land droops by placing EMERG SPIN DROOP switch in OFF position.

WARNING

Failure to return emergency spin droop switch to OFF will cause landing droops to retract if wing is raised hydraulically.

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Figure 4-13

section V

emergency procedures

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PART 1 — GROUND EMERGENCIES

ENGINE FIRE ON GROUND

Indications

Fire warning light — ILLUMINATED
Fire observed

Procedures

With external power and starter connected:

1. Throttle — OFF

If time permits:

- Engine master switch — OFF
- Master generator switch (after 2 seconds to allow main fuel shut-off valve to close) — OFF
- Give crank signal to plane captain.

2. Abandon aircraft.

- If aircraft is engulfed in fire and normal egress is impractical, ejection can be accomplished if equipped with a MK-F7 seat.
- During ground/deck operation, canopy must be closed to ensure initiation of ejection sequence.

3. Ground crew crank engine with external starter, if available.

When fire is out:

4. Discontinue cranking

If impossible to reconnect external power and starter:

1. Throttle — OFF

2. Engine master switch — OFF

- Operate switch before losing aircraft electrical power.

3. Master generator switch — OFF

4. Abandon aircraft.

- If aircraft is engulfed in fire and normal exit is impractical, ejection can be accomplished with the MK-F7 seat. Initiate ejection with the canopy fully closed.

WARNING

Canopy must be closed to ensure initiation of ejection sequence.

BRAKE FAILURE

Procedures

To obtain emergency (pneumatic) braking:

1. Emergency brake handle — PULL AFT SLOWLY

- **Pull handle slowly to avoid locking the brakes. This also allows pressure to be applied evenly to the wheels.**
- Brake pressure is directly proportional to distance handle is moved.
- Manipulate handle to obtain momentary braking action.
- Push handle full forward to release brakes.
- Differential braking is unobtainable.
- If necessary shut down engine to aid stopping.

2. If brake failure is realized before landing:

- Perform short field arrestment (if possible) or normal carrier arrestment.
- Refer to LANDING, USE OF EMERGENCY FIELD ARRESTING GEAR, this section, part 4, for short field arrestment procedure.
- After carrier arrestment, leave hook down during day and the arresting hook down and aircraft lights on at night.

HOT BRAKES

Hot brakes can be expected when:

Takeoff aborted
Excessive brakes used after a landing
Brakes dragging
Excessive section taxi as wingman

Note

Any of the above conditions could raise temperatures to a point where normal takeoff would heat a wheel enough to produce explosive failure.

Time-temperature histories indicate that normal taxiing using nose gear steering, military and afterburner takeoffs, FMLP and touch-and-go landings do not significantly increase wheel temperature.

Procedures

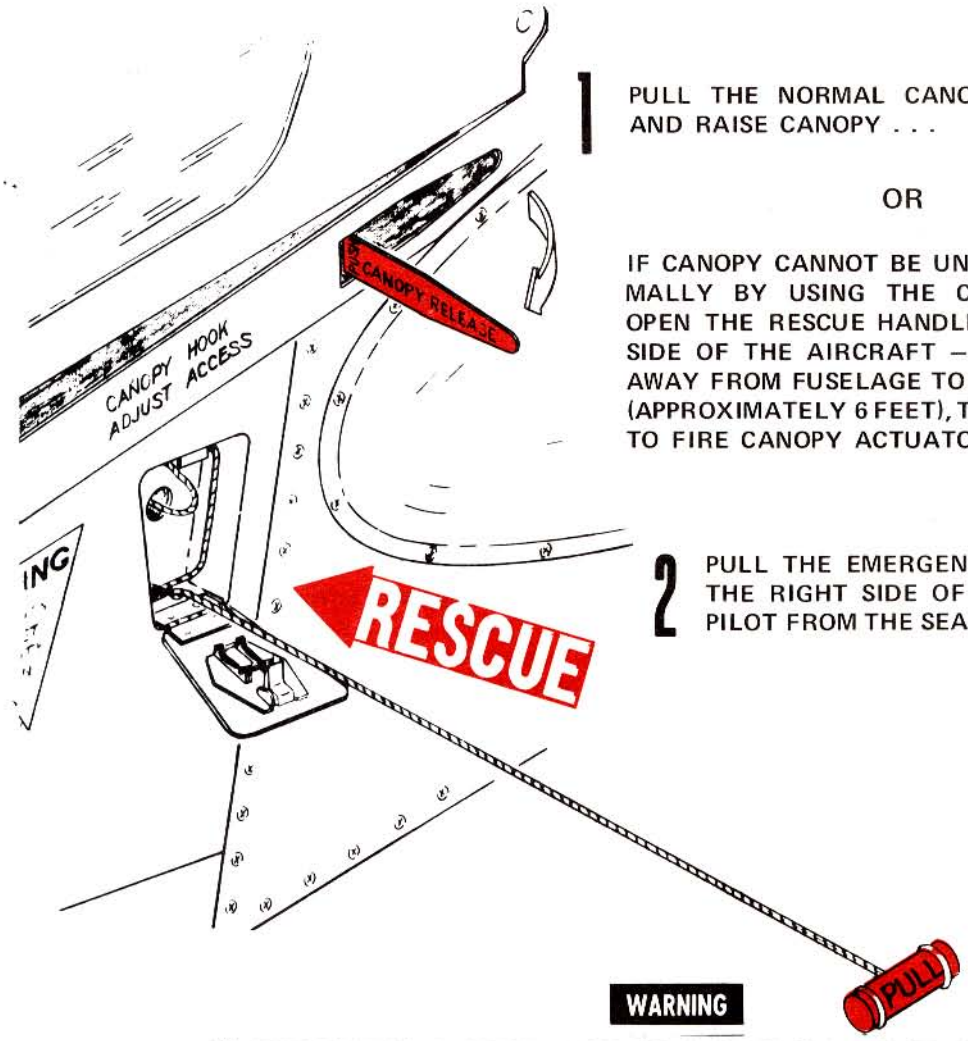
1. Taxi (or have aircraft towed) to nearest hot brakes area.
   - If hot brakes are discovered on the line, promptly taxi or have aircraft towed to an isolated position, and warn personnel to stay clear.
2. Notify tower to alert crash crew.
3. Park aircraft with wing down and wheel axis pointed in safe direction.
   - Tire/wheel failure usually occurs after returning to the line. This is because maximum transfer of heat from the brake discs to the wheel usually requires 15 to 20 minutes. Therefore, should it become necessary to approach the aircraft, personnel should move toward the aircraft from the front or rear, never from the sides.
   - Where hot brakes result in fire, the use of dry chemicals in preference to CO_2 and foam (as fire extinguishing agents on tires and brakes) is recommended due to metal stresses caused by the cooling action of CO_2.
   - The wheels require 45 to 60 minutes to get rid of 60% of the heat absorbed in a landing rollout or aborted takeoff. If an agent to accelerate cooling is necessary, use water by directing a stream to the brake in 10- to 15-second bursts (3 to 5 applications) with 30 to 60 seconds between applications.

EMERGENCY ENTRANCE

Refer to figure 5–1 for the procedure to be followed when entering the cockpit under emergency conditions.

EMERGENCY ENTRANCE

TO OPEN THE CANOPY AND REMOVE PILOT:



1 PULL THE NORMAL CANOPY RELEASE HANDLE AND RAISE CANOPY . . .

OR

IF CANOPY CANNOT BE UNLOCKED AND OPENED NORMALLY BY USING THE CANOPY RELEASE HANDLE, OPEN THE RESCUE HANDLE ACCESS DOOR ON EITHER SIDE OF THE AIRCRAFT – GRASP HANDLE AND PULL AWAY FROM FUSELAGE TO FULL LENGTH OF LANYARD (APPROXIMATELY 6 FEET), THEN PULL HANDLE SHARPLY TO FIRE CANOPY ACTUATOR CARTRIDGE.

2 PULL THE EMERGENCY RESTRAINT RELEASE ON THE RIGHT SIDE OF THE SEAT TO RELEASE THE PILOT FROM THE SEAT.

WARNING

BE EXTREMELY CAREFUL NOT TO INJURE THE PILOT WHEN FORCING ENTRY TO THE COCKPIT. BE EXTREMELY CAREFUL NOT TO PULL THE EJECTION SEAT FACE CURTAIN OR THE LOWER EJECTION HANDLE WHEN FORCING ENTRY TO THE COCKPIT AND WHEN REMOVING THE PILOT.

DO NOT USE RESCUE HANDLE IF SPILLED FUEL IS IN THE COCKPIT AREA. PULLING HANDLE FORCIBLY OPENS CANOPY BY FIRING EMERGENCY ACTUATOR CARTRIDGE WHICH CAN IGNITE FUEL. IF FUEL IS IN COCKPIT AREA, USE AXE TO FORCE ENTRY THROUGH CANOPY.

NOTE

IF IMPOSSIBLE TO OPEN CANOPY BY NORMAL OR EMERGENCY METHODS, BREAK CANOPY GLASS WITH FIRE AXE OR SIMILAR INSTRUMENT. FIRING OF THE EMERGENCY ACTUATOR OPENS THE CANOPY LOCKS AND FORCIBLY OPENS THE CANOPY. THE CANOPY WILL SEPARATE FROM THE AIRCRAFT WHEN JETTISONED.

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Figure 5-1

EMERGENCY EGRESS

Begin egress procedure *immediately* after aircraft comes to rest. Use the following procedure for either water or field emergency egress.

Procedures

Note

To obtain breathing oxygen supply before actually leaving the aircraft, pull emergency oxygen actuator.

1. Attempt to open canopy by normal means.

WARNING

To effect a successful canopy jettison, canopy must be down and locked.

- If canopy cannot be unlocked and opened normally by using the canopy release handle, use the canopy jettison handle.
- The canopy will separate from the aircraft when jettisoned without the benefit of wind blast.

2. Shoulder harness fittings – RELEASE

- Releases parachute and shoulder harness.

3. Emergency restraint release – PRESS BUTTON, ROTATE AFT

- Releases seat-harness connections.

4. Ensure separation of leg restraint line fittings.

5. Pilot's services connections – DISCONNECT AT PORT CONSOLE

- Disconnect oxygen and antiblackout lines, and/or lines from antiexposure coverall.

6. Abandon aircraft with survival equipment.

- As aircraft is abandoned, emergency oxygen bottle activates.
- If desired, release survival equipment after abandoning by releasing hip harness fittings from suit.

PART 2 — TAKEOFF EMERGENCIES

FIELD

ABORTS

Procedures

1. Throttle — IDLE or OFF

   - The engine produces 400 lbs of thrust at idle if nozzles are open. Shutting down the engine will decrease the rollout distance, but it will also result in loss of electrical power (nose gear steering) and hydraulics (normal brakes and rudder).

   CAUTION

   Moving throttle lever from afterburner detent directly to cutoff position may result in a residual engine fire. Be prepared to abandon aircraft.

2. Brakes — DEPRESS

   - If normal pedal braking is not sufficient, use emergency brake handle.

3. Hook — DOWN (if necessary)

   - Hook takes 8 seconds to fully extend (at 100 KIAS the aircraft will travel 1360 feet on runway; at 125 KIAS the aircraft will travel 1700 feet).

   - Engage arresting gear on centerline, if possible (figure 5-7A lists maximum recommended engaging speeds). If aircraft has already run beyond the arresting gear, engagement of the barrier is possible at facilities so equipped.

ENGINE FAILURE

Procedures

Before becoming airborne:

1. Abort or eject

Immediately after becoming airborne:

1. Eject (if possible).

   - Refer to EJECTION AND BAILOUT, part 3, to determine safe ejection envelope follo takeoff.

If unsafe to eject, land straight ahead. Perform as many of the following operations as possible:

2. Airspeed — 140 KIAS MINIMUM
3. Wing — AS IS
4. Throttle — OFF
5. EPP — EXTEND
6. Canopy — JETTISON

   - Pull emergency canopy jettison handle.

7. Landing gear — DOWN

AFTERBURNER FAILURES

Procedures

If afterburner fails to light:
Abort takeoff.

If afterburner blows out in early stages of takeoff roll:
Immediately abort takeoff using field arresting gear if necessary.

If afterburner blows out shortly before, during, or immediately after liftoff:

Deselect afterburner to close nozzle and continue takeoff in MRT.
Do not attempt to recycle the afterburner.

BLOWN TIRE

Procedures

1. Abort, conditions permitting.

   - If needed, use nose gear steering for maintaining directional control

2. *If unable to abort safely, continue takeoff.*

   - Do not raise the landing gear unless wingman is available to visually check the condition of the wheel and ascertain whether difficulties will be encountered if retracted into the wheel well.
   - If wheel can be safely retracted, continue with mission. Perform short field arrest as outlined in part 4 of this section upon return to field.
   - If wheel cannot be safely retracted, leave landing gear down. Burn down to light fuel weight as practical, observing cooling flow limitations outlined in section I, part 4. Perform short field arrest as outlined in part 4 of this section.

3. IF AIRCRAFT DEPARTS RUNWAY:
   A. THROTTLE OFF
   B. ENGINE MASTER SWITCH OFF
   C. MASTER GENERATOR SWITCH OFF

takeoff.

   - The 5-minute gear-down time is required for wheel/brake assembly cooling. An exploding wheel assembly can rupture the main fuel line in the wheel well.

CARRIER

CATAPULTING EMERGENCIES

Catapult emergencies are relatively rare. However, of all the different types of situations the carrier pilot may encounter, they require the most rapid and accurate recognition, decision, and action. It is impossible to outline rigid procedures to be followed in any given situation because of the infinite number of variables. Therefore, the pilot must be mentally alert to all possibilities on every catapult shot. Complacency resulting from the thousands of normal cat shots is dangerous. The following discussion of various types of mishaps which occurred in past may serve as a guide for pilot's action but is not intended to bind him to set procedures. It must be kept in mind that the final decision and its results must be borne by the pilot. He cannot restrict himself to any single course of action at the first sign of abnormality, but must be prepared to utilize his best judgement based upon experience, knowledge, and skill.

LANDING GEAR FAILURE

This type mishap may vary from a blown tire to loss of a main strut. Though the rate of this type accident is still low, it has occurred more than any other catapult malfunction involving structural components of the aircraft. In most cases the failure does not affect end speed. Therefore, with no other contributing factors, and assuming the aircraft remains attached to the shuttle, safe flight is likely. A controllability check at a safe altitude followed by a short field arrest ashore is recommended. If an associated failure separates the aircraft from the shuttle it is likely that proper end speed will not be attained, and ejection should be accomplished while still on deck or at less than 45° of bank.

Recognition

Abrupt wing drop during cat stroke. If no deceleration is apparent, end speed will normally be sufficient for safe flight. Afterburner will aid in overcoming drag from damaged wing components and will increase rate of climb to a safe altitude for investigation.

Procedures

Upon recognition of landing gear failure, with no apparent deceleration:

1. SELECT AFTERBURNER IMMEDIATELY.
2. If aircraft responds to lateral control inputs, fly to safe altitude and assess damage.
3. If aircraft does not respond to lateral control inputs, eject at less than 45° of bank.

KEEL FAILURE/BRIDLE SHED

Though the reasons causing a keel failure or a bridle shed may be quite unrelated, the results and the indications are the same. The hazard, and therefore the proper reaction, to this type malfunction is dependent upon the point in the shot sequence at which the failure occurs. There are several possibilities:

1. If the failure occurs at the initial stroke of the cat, the aircraft may not move at all, or may simply move ahead from its own thrust if the hold-back is broken. If this is the case, it should appear obvious to the pilot that he can stop the aircraft on deck.
2. If the failure occurs after the hold-back has broken and the aircraft has received the initial catapult acceleration, then it is likely that it will neither stop on deck nor attain flying speed.
3. If it occurs at or very near the end of the cat stroke, it is likely that proper pilot techniques can result in safe flight.

It should be recognized that the decision may not be as clear cut as might be indicated above. If doubt exists concerning either stopping or attaining flying speed, eject while still on deck or at less than 45° bank angle.

Recognition

Sudden loss of acceleration (sensation of deceleration) during cat stroke, followed by a bump or swerve of the nosewheel as it is hit by the shuttle. If failure occurs early enough in the stroke, pilot could also see a water/steam plume ahead as shuttle hits water brakes.

Procedures

If definite loss of catapult thrust is experienced very early in launch and decision is made to remain on deck:

1. Shut down engine.
2. Apply maximum braking.
3. If going over the side is a possibility, eject while still on deck.

If loss of catapult thrust is experienced at point after which stopping on deck or flying is not possible:

1. Eject immediately while still on deck or at less than 45° angle of bank.

2. If unable to eject, jettison canopy, shut down engine, and attempt to ditch in wings level, tail-low attitude.

3. If still above water, perform emergency egress. If submerged with canopy on aircraft, pull interrupter handle and eject through canopy.

If loss of catapult thrust occurs at point of marginal flying speed:

1. Select afterburner to aid in flight recovery and improve escape potential if ejection is necessary.

CATAPULT MALFUNCTIONS/PERSONNEL ERROR

Insufficient or marginal end speed may be the result of a material failure which causes what is commonly known as a "cold cat shot," or it may be caused by error on the part of the pilot and/or catapult personnel. Examples are: incorrect steam pressure, pilot acknowledgement of incorrect gross weight, or improperly installed equipment. It may be a situation which is obvious, such as attaining only 10 to 30 knots, or the aircraft may reach a speed just below that required for safe flight. In either case, if the situation can be recognized, immediate ejection (MK-F7) should be initiated while the aircraft is still on the deck, as the pilot will not be able to stop the aircraft no matter how slowly it is moving.

Recognition

The primary recognition feature is abnormally low acceleration force. It may be minimal, such as would occur with a premature hold-back failure, or it may be a significant decrease in acceleration during the shot itself.

Procedures

Obviously insufficient acceleration for normal end speed:

1. Eject while still on deck.

2. If unable to eject, jettison canopy, shut down engine and attempt to ditch in wings-level, tail-low attitude.

3. If still above water, perform emergency egress. If submerged with canopy on aircraft, pull interrupter handle and eject through canopy.

If marginal flying speed is attained:

1. Select afterburner to aid in flight recovery and improve escape potential if ejection is necessary.

ENGINE MALFUNCTIONS

Engine malfunctions during the cat stroke are almost impossible to detect unless they involve flameout. A more insidious failure is an afterburner blowout. In either case, the normal end speed is the same. For a flameout, there is not enough time for an airstart and immediate ejection is recommended. If an afterburner blowout is recognized quickly enough, simply bringing the throttle inboard and closing the nozzles should provide enough thrust for safe flight. Recycling the afterburner is also a possibility.

Recognition

Lack of acceleration just after catapult release and lower than normal EPR.

Procedures

Engine flameout during cat stroke:

1. Eject immediately while still on deck or with less than 45° bank angle.

2. If unable to eject, RAT out. Attempt to ditch in wings-level, tail-low attitude.

3. If still above water, perform emergency egress. If submerged, pull interrupter handle and eject through canopy.

Afterburner blowout during cat stroke:

1. Throttle inboard to close nozzles.

2. Verify nozzle position with EPR.

3. If nozzle remains open or level flight cannot be maintained, recycle afterburner.

4. If afterburner fails to light and descent continues, eject.

WARNING

Do not descend below safe ejection altitude while troubleshooting system.

All other engine malfunctions:

1. Aircraft will not accelerate or climb and flying speed cannot be maintained, eject.

2. If unable to eject, perform ditching procedure.

FLIGHT CONTROL MALFUNCTIONS

The flight regime immediately following the cat stroke is an area of relatively high angle of attack. Hard-over control surfaces caused by malfunctioning systems can produce yaw and/or roll which must be immediately and properly countered. Yaw and accompanying roll produced by a hard-over rudder, for example, should be countered with opposite rudder. Introducing large amounts of aileron can produce addtional adverse yaw, increase the amount of roll, and decrease the stall margin. The important consideration is not regaining wings level flight; it is stopping the yaw/roll at a point which will allow altitude gain and allow a stall margin. If ejection is to be attempted, it must be ascertained that the aircraft can be made to remain within the ejection envelope until the seat leaves the aircraft. This may necessitate use of the alternate handle while maintaining aircraft control with one hand. Prevention measures for this type mishap include a visual check for deflected control surfaces by maintenance personnel and a pilot check of trim indications including neutral lights and control freedom prior to each launch.

Recognition

Depends upon specific malfunction. First indication of yaw problem could be abnormal tail swerve in one direction during cat stroke. However, it is likely that the first indication will be rapid yaw/roll/wing-drop at cat release.

Procedures

Upon abnormal yaw/roll at cat release:

1. Counter roll and yaw with opposite rudder and judicious amount of aileron.

2. Select afterburner to aid in gaining altitude and/or airspeed.

3. Stabs off.

4. Be aware of seat roll envelope if ejection is to be attempted.

NEW NEW

PART 3 – INFLIGHT EMERGENCIES

ENGINE MALFUNCTIONS

TURBINE FAILURE

Indications

High EGT
Low RPM
Low EPR
Compressor stalls
Noticeable vibration

If indications persist and a turbine failure is suspected:

1. Throttle off to reduce chances of fire.
2. EPP out to provide flight controls in event of engine seizure.
3. If turbine has in fact failed, variations will continue to build in intensity. Regaining normal engine operation will be impossible. Abandon the aircraft.

ENGINE INSTABILITY

Indications

Erratic EGT

Rapid reduction or fluctuation in RPM at constant throttle

No increase in RPM when throttle advanced

EPR not responding to throttle movement

Physical sensation of power surges or vibrations (If no physical sensation, verify by at least two engine gage readings.)

Procedures

If engine flames out or must be shut down because limitations exceeded:

Perform FLAMEOUT procedure.

If operation unstable but not exceeding limitations:

1. Throttle setting – IDLE, time permitting

   • If surging engine stabilizes when RPM is reduced below 85%, the surging engine may have been caused by a faulty bleed valve governor cycling compressor air overboard. If the engine runs smooth below 85-90% RPM and surges above this power range, selection of manual fuel control will not correct the problem. Use power settings below this range as much as possible and land at the nearest suitable airfield.

2. Fuel control switch – MANUAL

   • Do not hesitate to select manual fuel control at any power setting if necessary.
   • The manual fuel control in the F-8 has proven extremely reliable, but when in manual the main fuel regulating valve is the throttle. Avoid abrupt throttle movements which may cause compressor stalls and flameout.

3. Land immediately at the nearest suitable field (precautionary approach recommended).

   • Refer to PRECAUTIONARY APPROACH, part 4.

COMPRESSOR STALLS

Indications

All or any combination of indications described under ENGINE INSTABILITY except power surges may be encountered with a compressor stall. These indications are usually experienced in conjunction with a loud bang.

If compressor stalls are encountered:

1. Throttle – Reduce power

2. Engine ignite microswitch – Actuate

3. G-load – Reduce

4. Electrical power – Extend EPP (if required)

5. If practical, increase airspeed.

If compressor stalls persist:

6. Fuel control – Manual

If they still persist or engine overtemps and conditions permit:

7. Throttle – OFF

8. EPP – Extend

9. Perform Airstart

   • Regardless of the duration of compressor stalls, abort the mission and land as soon as practical.

INCORRECT OR FLUCTUATING OIL PRESSURE

Indications

Oil pressure below 40 psi or above 55 psi.

- The cockpit oil pressure gage, because of gage/oil pressure transmitter error, may in some instances show oil pressure out of limits when actual engine oil pressure is within the required 40- to 55-psi range. Oil pressures outside the normal range are permissible if gage/transmitter error is confirmed as the cause or if the excursion is transient in nature (fluctuation limits: 37 minimum, 58 maximum).
- Engine/hydraulic oil pressure warning light comes on at or below 34 psi.

Oil pressure fluctuating more than 10 psi (5 during level flight at constant throttle setting) or oil pressure excursions below 37 spi or above 58 psi.

- Occasionally, air in the oil transmitting line will cause a rapid 3 to 5 psi fluctuation.

Procedures

1. Throttle – MOVE SLOWLY TO CRUISE SETTING (87% to 90%), or DESCENT SETTING (82% to 87%) as required.

Note

The cruise power setting is designed to provide minimum cruise power for the F-8 aircraft. The amount of time that unlubricated engine bearings will run depends greatly upon heat, RPM, bearing load, and time of flight. Heat, RPM, and time of flight can all be reduced with lower power settings whenever the aircraft must only descend rather than cruise to the field. A minimum RPM descent setting is recommended. In any case, once the power is set, it should be left in that position to avoid the bearing loads which accompany RPM changes. If power is set below the cruise setting, plan the approach to minimize engine acceleration on final. RPM settings should be increased one percent for each ten degrees Fahrenheit increase in ambient temperature above standard day conditions.

2. Extend EPP when range is no longer a consideration in order to provide control response in the event of engine seizure.
3. Avoid power changes, flight accelerations, and abrupt decelerations through use of speed brakes to reduce load on main engine bearings and possibility of engine seizure.
4. Land immediately at the nearest suitable field utilizing precautionary approach or alternate circling precautionary approach.

- There have been instances where the engine continued to run for as long as an hour without oil pressure, but the engine has also been known to fail in a matter of minutes. Because of this, it is of the utmost importance to land as soon as possible after an engine oil system malfunction is detected.
- Refer to PRECAUTIONARY APPROACH, part 4.
- After landing, shut down as soon as practical to prevent further engine damage.

STUCK THROTTLE OR ENGINE FAILS TO RESPOND TO THROTTLE MOVEMENT

Engine responds to approach power compensator

If the engine fails to respond to throttle movement in either normal or manual fuel, there is a possibility that control may be regained by engaging the APC. Attempt to engage the APC with the fuel control in normal. If successfully engaged, the APC will maintain approximately 13.5 units on the angle of attack which will be sufficient for either climbing, level, or descending flight. It will be necessary to hold the APC engage switch in ON until the landing gear is extended. Make a normal approach with short field arrestment. Turn off the engine master switch after arrestment.

WARNING

In the event the arrestment is missed, reengage the APC immediately and hold the switch in ON until airborne.

Engine fails to respond to the approach power compensator

If the engine fails to respond to the APC, it will be necessary to perform a stuck throttle approach (figure 5–1**A**). Utilize the longest runway available considering fuel status and power setting available for divert.

The optimum stuck throttle approach is started from a "hoop" position approximately 5,000 feet from the intended point of touchdown at 300 feet above ground level and 175 KIAS. These conditions are based upon an aircraft gross weight of 22,000 pounds, a 20-knot headwind, standard day conditions, and a 3½-degree glideslope. Add 5 knots airspeed per 1,000 pounds of fuel above 22,000 pounds aircraft gross weight. Other contingencies such as inability to obtain recommended approach airspeed are covered within the procedure.

Before reaching the hoop:

1. Proceed to the longest available runway in the area, 8,000 feet minimum. Do not attempt a carrier approach.
2. Burn down to 1,000 pounds of fuel.
3. Landing gear – DOWN
4. Wing – RAISE

STUCK THROTTLE APPROACH

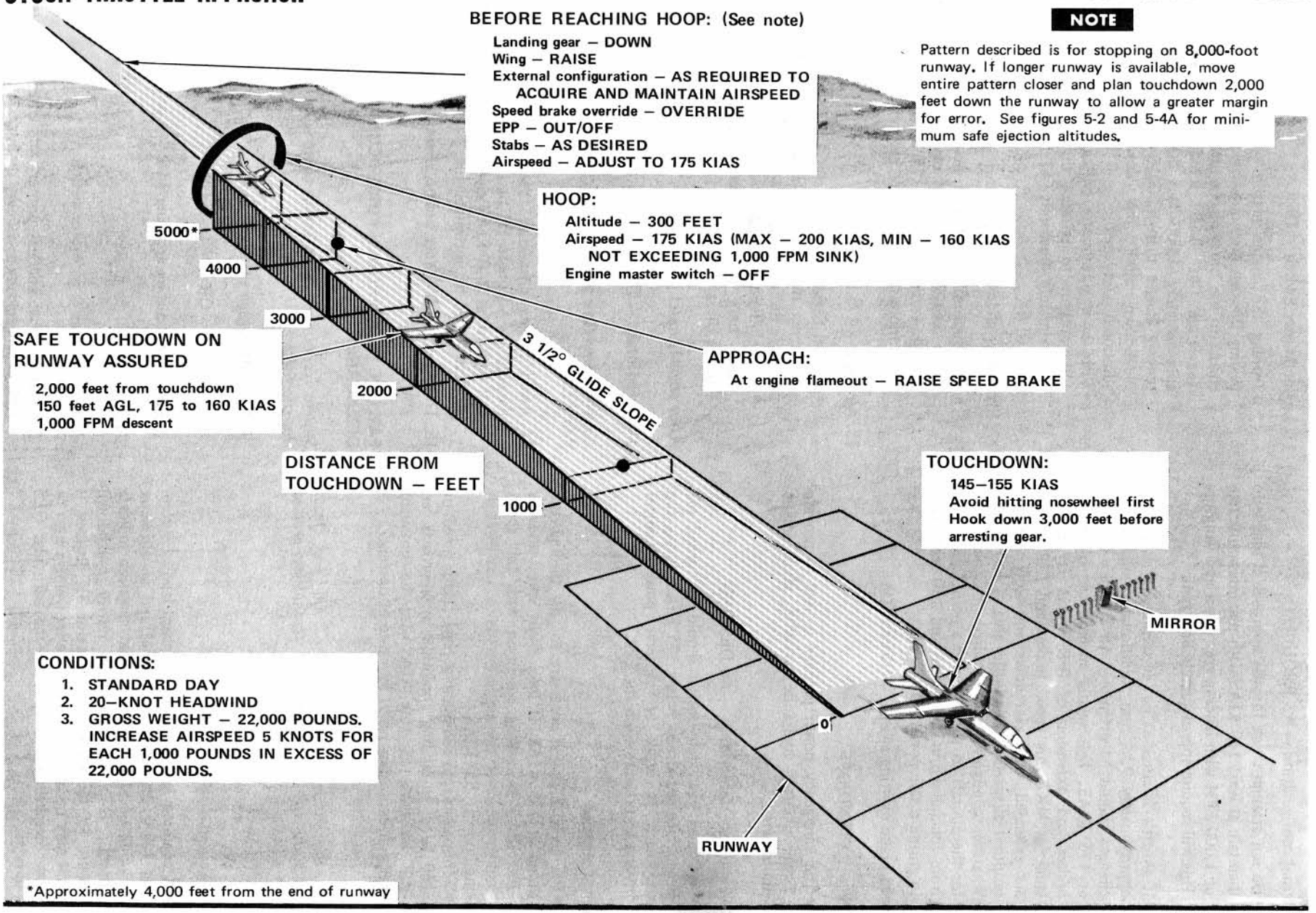


Figure 5–1A

5. External configuration – AS REQUIRED

- Do not attempt stuck throttle approach if unable to maintain at least 160 KIAS with maximum sink rate of 1,000 FPM with landing gear down and wing up. This will require approximately 86% rpm.

- If throttle is stuck at power settings in excess of approximately 92% rpm, additional configuration changes should be attempted to stabilize aircraft at 175 KIAS. This would include use of speed brakes and extension of IFR probe. If rpm is stuck at MRT, the speed brakes and IFR probe are extended, with gear down and wing up, the resultant airspeed will be in the area of 155 KIAS. Whatever configuration is required, it is necessary for the aircraft to pass through a point 2,000 feet from touchdown at 175 KIAS and 150 feet AGL to ensure a safe power off landing.

6. Speed brake override switch – OVERRIDE

7. EPP – EXTEND/OFF

- The emergency power package is used to provide power control hydraulic pressure after engine shutdown.

8. Roll and yaw stabilization – AS DESIRED

- Roll and yaw stabilization should be turned off when airspeed drops below 175 KIAS during the approach in order to conserve power control hydraulic pressure from the EPP.

9. Adjust airspeed

- Use speed brake as necessary to pass through the hoop at 175 KIAS. If level flight speed exceeds 200 KIAS in landing condition with full speed brake, maneuver the aircraft so as to pass through the hoop at 200 KIAS.
- If impossible to maintain a level flight speed of 160 KIAS in landing condition, an approach can still be made if 160 KIAS can be obtained without exceeding 1,000 fpm rate of descent.

Through the hoop (approximately 5,000 feet from intended point of touchdown, 300 feet above ground level, 175 KIAS):

10. Intercept glideslope

- A centered meatball (on an optical landing system set for a 3½-degree glideslope) and an altimeter reading of 300 feet above field elevation indicate aircraft is 5,000 feet from mirror touchdown point. (If the OLS is not set for 3½ degrees, it still may be used as a reference by flying a high or low meatball as dictated by the particular OLS setting.)

11. Engine Master Switch – OFF

- Turning the engine master switch to OFF upon passing through the hoop will provide time for the engine to use up available fuel and the aircraft to decelerate to 145 KIAS at touchdown, approximately 1,000 feet down the runway. If runway longer than 8,000 feet is available, plan touchdown 2,000 feet down the runway as additional safety factor.
- With the engine master switch in OFF, the engine will continue to produce thrust for a period of approximately 4 seconds (AT MRT) to 24 seconds (AT IDLE).

12. Fly proper glideslope approach

- This approach allows safe ejection before reaching 1,500 feet from the end of the runway at 150 feet above ground level, 175 KIAS, and sink rate of no more than 1,000 feet per minute.

13. Airspeed – 175 KIAS

- If level flight speed is above 175 KIAS, use speed brake to maintain as close to 175 KIAS as possible during the approach.
- If level flight speed is below 175 KIAS, use speed brake only to keep from exceeding 175 KIAS during the approach.

After engine stops:

14. Speed brake – IN

Touch down, flare slightly, and touch down smoothly at 145 KIAS:

15. Avoid hitting nosewheel first, which could lead to porpoising. Adequate PC pressure for flight controls will be lost at 140 KIAS and a porpoise below that airspeed would be uncontrollable.

16. Drop hook 3,000 feet before arresting gear for long gear arrest.

FAILURE OF APPROACH POWER COMPENSATOR TO DISENGAGE

System cannot be disengaged using 12- to 22-pound throttle force:

1. Turn off engage switch manually.

– OR –

2. Break shear pin by applying 34 to 46 pound force.

Shear pin cannot be broken:

1. Turn off master generator switch.

2. Extend EPP to energize primary and emergency buses. APC is powered by secondary dc bus.

System fails to disengage upon landing:

1. Apply normal override throttle force.

— OR —

2. Manually turn off engage switch.

— OR —

3. Turn off master generator switch.

   • With master generator off, nose gear steering will not be available.

FLAMEOUT

In the event of a flameout, the pilot must immediately evaluate:

The controllability of the aircraft

The time available for an airstart attempt

The possibility of an abbreviated airstart

In no situation attempt to regain power at less than 1,500 feet above terrain and 250 KIAS — EJECT IMMEDIATELY.

Immediately following recognition of an unprogrammed engine deceleration or flameout, place throttle in idle, thumb the ignitors, and engage APC (with gear up, APC switch must be held in the ON position). If loss of both PC systems is imminent, extend EPP.

Be prepared to engage UHT lock and proceed to a safe ejection area, if practical. If generator drops off the line before ignition, proceed with the following:

1. Throttle – OFF

   • To stop flow of fuel into the engine, to properly purge the fuel from the igniters, and prevent entry of air into the engine fuel system at nose-down attitudes, leave the throttle in this position until airstart is begun.

2. Ensure engine master switch ON, fuel transfer switch ON, and emergency generator switch OFF.

   • If a flameout occurred because main fuel cell ran dry, turning on transfer fuel system immediately may transfer enough fuel to permit an airstart. Once the main generator drops off, the line the transfer fuel pumps will not be available.
   • Emergency generator switch must be in OFF position to prevent a load from being placed on the emergency generators when the power package is extended. Extending the EPP with a load on the generators could prevent obtaining electrical power for an airstart.

3. Determine cause of flameout.

   • Pilot-induced flameouts are those caused by inadvertently moving engine master switch to OFF, failure to transfer fuel, low-speed high angle-of-attack flight resulting in compressor stalls, prolonged zero-g flight, and exceeding the recommended nose attitudes or operating limits with partial or complete electrical failure.

   • Troubleshooting the cause:

Note

No fuel flow, quantity gages, or warning lights will be available for troubleshooting unless EPP is extended and is in the ON position.

a. *Suspect throttle cable breakage* if the throttle loses tension and fuel flow drops to zero. Immediately activate ignition and engage the approach power compensator (APC) in an attempt to reposition the fuel control to an open position. The APC must be engaged prior to loss of main generator power as the APC is energized by the secondary bus.

Note

With the landing gear in the up position, the APC switch must be held in the ON position.

b. *Fuel boost pump failure* will be indicated by illumination of the boost pump warning light, unstable engine operation (climbing through 30,000 to 37,000 feet at high power setting), and subsequent flameout. The engine fuel pump light will illuminate as the flameout occurs. After electrical power has been regained by the EPP, the engine fuel pump light will be out if windmilling rpm is greater than 10% and the throttle is not in the OFF position. See figure 1-25A for engine windmilling speed.

c. *Main fuel exhaustion* may also have the same symptoms as a boost pump failure, but the main fuel quantity indication and fuel flow should be near zero. The engine fuel pump light should remain on with electrical power supplied and throttle in other than the OFF position. A relight is highly improbable.

d. *Complete engine-driven fuel pump failure* should be typified by the engine fuel pump light coming on and the engine flaming out. Airstart attempts will produce the same indications as main fuel exhaustion with the exception of the fuel quantity indication. A relight will be impossible.

e. *Normal fuel control failure* will most likely be indicated by unstable engine operation or rpm restriction before the flameout. The engine fuel

pump light may also come *on*. Relights in manual fuel control are highly probable.

f. *Engine oil system failure* with subsequent bearing failure will most likely be indicated by noticeable vibration, high EGT, loss of oil pressure and perhaps smoke in the cockpit. A relight is impossible.

4. Perform airstart (if practical).

AIRSTARTING

HIGH RPM AIRSTART

1. Throttle – IDLE
2. Igniters – THUMB
3. APC – ENGAGE

NORMAL AIRSTART

The fundamental starting ingredients for any airbreathing engine will always remain the same: air, fuel, and ignition. Be aware of what the engine instruments are reading, and the chances of success will be known in advance.

Procedures

1. Optimum airspeed - 190 to 250 KIAS (13 UNITS)

   Airstarts are obtained most consistently below 35,000 feet and between 190 and 250 KIAS, and 17% to 30% rpm. Successful airstarts may be obtained from airspeeds as low as 170 KIAS (below 25,000 feet) up to the limiting airspeed for the aircraft or EPP (if used). However, the speed range of 190-250 KIAS provides the greatest probability of a successful start on the first attempt. Starting attempts at lower airspeeds or at altitudes above 35,000 feet generally result in a hung start or hot start. The minimum airspeed at which adequate electrical power will be available from the EPP with the switch in the ON position is 175 KIAS, or if PC 1 is normal, the minimum airspeed is 160 KIAS.

2. Electrical power – AVAILABLE (extend EPP if required)

   • The emergency power package is normally used to provide electrical power for airstart ignition. However, it may be possible to obtain an airstart using main generator electrical power if engine windmilling rpm is sufficient (the generator drops off the line at 45% rpm). A high-rpm, high-altitude airstart may be attempted by placing the throttle in idle and thumbing the igniters. A high-rpm, low-altitude airstart may be attempted by thumbing the ignite microswitch and placing the fuel control switch in MANUAL without repositioning the throttle. Both procedures must be accomplished immediately following flameout and before generator dropping off the line.

AIRSPEED NECESSARY TO PRODUCE
45% WINDMILL RPM (N_2)
P-420 Engine
STANDARD DAY

ALT x1000	KIAS	IMN
55	270	1.17
50	284	1.12
45	297	1.05
40	321	1.02
35	345	0.99
30	373	0.96
25	400	0.94
20	429	0.92
15	457	0.89
10	484	0.86
5	510	0.84

   • If necessary to extend emergency power package, use the following procedure:

   a. Master generator switch – OFF (When selecting power source after extending EPP, master generator switch must be placed in OFF before emergency generator switch placed in ON or LAND to prevent complete loss of electrical power.)

   b. Emergency power handle – PULL (Do not extend the emergency power package with the emergency generator switch in ON or LAND.)

   c. Emergency power indicator light – ON

3. Fuel control switch – NORMAL OR MANUAL

   • If manual position is used for airstart and switch is left in this position for landing, do not engage approach power compensator during the landing approach. Automatic throttle movements associated with APC operation are rapid and could result in compressor stall and engine flameout.

4. Throttle – IGNITE momentarily, then gradually advance to a maximum point slightly above IDLE.
   - Monitor fuel flow and meter by use of throttle to obtain the desired airstart range of 700 to 750 pph.
   - The ignition timer fires continuously for 30 to 40 seconds. (The ignite switch should not be actuated more than once every 40 seconds since the timer cannot be reset until the cycle is complete.) Therefore, the throttle should be moved to the desired fuel flow setting after ignition is actuated. In most cases, firing of the igniters can be verified by noting a clicking sound in the pilot's earphones, especially if the UHF volume control is set at a high level.
5. Engine instruments – INDICATION OF START, WITHIN LIMITS
   - Monitor tachometer and exhaust temperature gages. These gages will give the first indication of a start.
   - Check oil pressure gage for normal indication as rpm approaches idle.
6. Throttle – DESIRED SETTING AFTER ENGINE STABILIZES
   - If loss of all fuel boost pumps is suspected as cause of flameout and no pumps are regained following airstart, descend below 30,000 feet before advancing throttle out of idle. Observe limitations described under FUEL BOOST PUMP FAILURE.
   - If loss of engine stage of engine fuel pump suspected as cause of flameout, use afterburner only in an emergency.
   - If operating in manual fuel control, move throttle slowly to avoid overtemperature, overspeed, or another flameout.
7. Emergency generator switch – OFF
8. Master generator switch – ON
9. Main generator indicator – ON
10. Attitude indicator – OFF NOT SHOWING
11. Roll and stab switches – OFF RESET, then ON
12. Roll and yaw stab warning lights – OFF

UNSATISFACTORY AIRSTART

Indications

Ignition does not occur within 20 seconds after throttle advanced to 700 to 750 pph fuel flow.

– OR –

Engine does not accelerate to idle speed within 45 seconds after ignition.

– OR –

Exhaust temperature exceeding 610°C

Throttle off and proceed immediately with the second airstart attempt.

SUBSEQUENT AIRSTART ATTEMPTS

Procedures

1. Throttle – OFF
2. Fuel control switch – REPOSITION
   - Move switch to different position than was used for first attempt.
3. Repeat AIRSTART procedure from step 4.
   - If all airstart attempts are unsuccessful, conform to the ejection/bailout doctrine under EJECTION AND BAILOUT. Do not attempt ditching or dead-engine approach unless the ejection seat malfunctions and unable to bailout. If dead landing is to be made, follow the procedure under DEAD-ENGINE LANDING, part 4.

If start not obtained on second attempt:

4. Depress ignite microswitch and repeat airstart procedure.

AFTERBURNER MALFUNCTIONS

AFTERBURNER FLAMEOUT OR FAILURE TO LIGHT

Indications

If afterburner flames out:

Thrust decreases (below 55,000 feet)

Procedures

1. Throttle – MOVE INBOARD IMMEDIATELY
   - Move throttle inboard to MRT position immediately to stop afterburner fuel flow and to close exhaust nozzle flaps.
2. Verify nozzle closure by noting EPR (or TOP) increase.
   - If JP-4 fuel is being used, before relight allow from 1 second at sea level to 15 seconds above 40,000 feet for afterburner igniter valve to recycle. If JP-5 fuel is being used, no delay is required.
3. If afterburner flameout is due to lack of fuel flow to the afterburner fuel nozzles, it could indicate a failure of the afterburner fuel pump and possible imminent failure of the associated main engine fuel pump and/or afterburner fuel line rupture. Indications of this problem would be no afterburner light and no dense fuel vapor streaming from the tailpipe with the throttle in the afterburner position. If this situation occurs, discontinue use and land as soon as possible.

AFTERBURNER FAILS TO CUT OFF

Indication

Afterburning continues after throttle moved inboard.

Procedures

1. Throttle – RETARD FOR MECHANICAL CUTOFF
   - Mechanical cutoff occurs in the 93.5% to 96% range (past afterburner aft detent stop).
2. Do not relight afterburner unless necessary.
   - Advancing throttle past aft detent stop will reignite afterburner.

THROTTLE STUCK IN AFTERBURNER POSITION

Procedure

Pull throttle inboard, using both hands, until burner detent pin breaks.

- Approximately 100 pounds of force using both hands is required to shear the afterburner detent pin, moving the throttle out of burner.

NOZZLE REMAINS OPEN

Indications

Abnormal lack of thrust (approximately 20%)

- Most probably noted during runup to MRT or after deselecting afterburner.
- If desired EPR for present flight condition is known and the nozzle is open, cockpit reading will be much lower than the desired figure.

Observation by wingman

Procedures

1. With sufficient altitude and airspeed (recommended: 5,000 feet, 300 KIAS), reduce power to idle momentarily and then advance throttle to military. Nozzles should close upon advancing the throttle forward from idle and remain closed at all power settings above idle provided afterburner is not reselected.

2. If no results, cycle afterburner to attempt to close nozzle.

If steps 1 and 2 do not accomplish closing of the nozzle:

3. Ensure adequate thrust for landing. If in doubt, perform slow flight at safe ejection altitude.

   - With an open nozzle, there is adequate thrust for a normal landing if the aircraft is at a reasonable gross weight. Throttle settings approximately 3% to 5% higher than normal will be required to maintain approach thrust.
   - Afterburner should still be available for recovery from a low and slow situation during the approach.

4. Burn down to a reasonable gross weight (if necessary) before landing.

NOZZLE REMAINS CLOSED

Indications

Upon selecting burner:

Instantaneous increase in EPR and thrust
— FOLLOWED BY —
Rise in EGT
Decrease in RPM (3% to 5%)
Decrease in thrust

Procedures

1. Deselect afterburner.
2. Observe and record maximum EGT and time involved for required maintenance criteria.
3. Do not relight afterburner.
   - Do not use afterburner again until engine has been ground checked for damage.
4. If 680°C was exceeded, land as soon as practical.

ASYMMETRICAL NOZZLE OPENING

Indication

As lightoff occurs:
Yaw and/or pitch

Procedure

Deselect and discontinue using afterburner.

FAILURE OF AFTERBURNER FUEL CONTROL MINIMUM PRESSURE SHUTOFF VALVE

Indications

Loss of thrust indicated by low EGT, low EPR, and high-than-normal RPM

- Loss of thrust (approximately 20%) due to failure of exhaust nozzle to close.

Fuel vapor coming out of tailpipe

Procedures

1. Attempt to cycle afterburner.

If attempt to relight fails, or condition remains uncorrected after cycling:

2. Land as soon as practical.

   - Fuel consumption may be as much as 10,000 pph.
   - Follow nozzle open landing procedure described in this section.

FUEL SYSTEM MALFUNCTIONS

FUEL CONTROL UNIT FAILURE

Indications

EPR, EGT, and RPM erratic at constant throttle
Unusual or no engine response to throttle movement
Excessive decrease in EGT and thrust with gain in altitude

Procedures

1. Throttle – IDLE, time permitting
2. Fuel control switch – MANUAL
   - Changeover to manual fuel metering is not automatic and can only be accomplished in this manner.
   - Fuel control unit changeover electrical power is supplied by the emergency dc bus.
3. Throttle – ADVANCE SLOWLY TO DESIRED SETTING
   - Advance throttle slowly to avoid flameout, overtemperature or overspeed.
4. Land as soon as practical.
5. Do not use approach power compensator in manual fuel control.
   - Abrupt movements of the throttle by APC may cause compressor stalls and flameout in manual fuel control.

NEW 6. Engine unstable, perform precautionary approach.

ENGINE FUEL PUMP FAILURE

Indications

Engine fuel pump warning light – ILLUMINATED

- Indicates insufficient fuel pressure from engine stage of fuel pump to sustain engine operation and possibly engine flameout. If engine continues to operate, afterburner stage is delivering fuel to engine.

– AND POSSIBLY –

Engine flameout

Procedures

If engine continues to operate, afterburner stage is delivering fuel to the engine:

1. Do not use afterburner, except in an emergency.
2. Land as soon as practical. Close association of afterburner and main engine fuel pump could mean imminent failure of the afterburner stage.

If engine flames out and no fuel flow indicated:

1. Indicates both main engine and afterburner stage have failed. If time allows, attempt restart but relight is improbable. Abandon aircraft at safe altitude.

Note

Engine fuel pump warning light will be on any time throttle is off and electrical power is being supplied by the emergency dc bus. This situation will occur in the beginning phases of a normal airstart attempt.

If engine flames out, but fuel flow is indicated:

Perform relight

- If fuel flow indicated, the afterburner stage of the fuel pump is delivering fuel to the engine and a relight may be obtained. When this condition exists, use the afterburner only in an emergency and land as soon as possible. Close association of the afterburner and main fuel pump stages could indicate imminent failure of the afterburner stage.

FUEL BOOST PUMP FAILURE

Indication

Fuel boost pump warning light – ILLUMINATED

- Warning light comes on when pressure in engine fuel feed line, between main cell boost pumps and engine pumps, has dropped below the pressure required to sustain engine and afterburner operation at high altitudes.
- This warning light is inoperative when emergency generator switch is in LAND. With the emergency generator switch in LAND, the boost pumps will not operate and flight operation must be restricted to avoid flameout.

Procedures

To prevent flameout because of loss of boost pump pressure:

1. Retard throttle to IDLE AND descend below 30,000 feet.

2. Observe the following limitations on return to base:
   - Use lowest possible thrust setting.
   - Do not exceed following nose-down attitudes for specified amount of main system fuel remaining: above 1,800 pounds, -15°; 800 to 1,800 pounds, -5°; less than 800 pounds, maintain level or nose-up attitude.
   - Do not use afterburner above 6,000 feet or 300 KIAS. If afterburner is used, obtain 2g or nose-up attitude before reducing power.
     Do not fly at negative g loads.

ALL TRANSFER FUEL SYSTEM FAILURES

Indications

Steady illumination of fuel transfer pump caution light with more than 3,500 pounds of transfer fuel remaining indicates failure of aft transfer pump.

Main fuel depleting with transfer fuel quantity remaining constant.

Main fuel quantity approximately 1,200 pounds and the fuel low level warning light flashing indicates that the automatic fuel transfer circuit has been activated and the fuel transfer switch is in PRESS DUMP.

Main fuel quantity indicator reading below 3,700 pounds with fuel remaining in the transfer system.

Main fuel quantity indicator reads in excess of 4,500 pounds when transfer fuel being depleted indicates transfer system shutoff failure. Proceed directly to TRANSFER SYSTEM SHUTOFF FAILURE.

Procedures

In all cases except transfer system shutoff failure:

1. Check proper positioning of fuel transfer, air refueling probe and fuel dump switches.
   - Check that fuel transfer switch is in ON or PUMP OFF (as applicable), inflight refueling probe switch is not in OUT position and fuel dump switch is in OFF.
   - A flashing low level warning light indicates that the main fuel cell has been permitted to drop below 1,200 pounds and the fuel transfer switch is in PRESS DUMP. Place the transfer switch in ON or PUMP OFF. After the switch is so positioned, the light will either go out if the fuel level is above 1,200 pounds or the light will come on steady until the fuel level increases past 1,200 pounds. The light will then go out.

If switches correct, but no transfer:

2. Cycle fuel transfer switch.
3. Cycle air refueling probe.
4. Induce positive and negative g.
5. Cycle speed brake, rock wings.
6. Cycle fuel dump switch.

If fuel still fails to transfer:

7. Proceed to FAILURE OF AFT TRANSFER PUMP or WING FAILS TO TRANSFER FUEL, as applicable.

FAILURE OF AFT TRANSFER PUMP

Procedures

If ALL TRANSFER FUEL SYSTEM FAILURES procedure fails to regain transfer of fuel from aft cells:

1. Plan remainder of flight to allow for unavailable (trapped) fuel.
   - When aft transfer pump fails, fuel remaining in aft transfer cells (as much as 1,200 pounds) will not be available.
   - Center of gravity can move aft of normal limits due to the trapped fuel in aft cells.
   - With full aft transfer fuel trapped, the normal center of gravity limit will be reached with 800 pounds of fuel remaining in the main system.
2. Fuel transfer switch — PUMP OFF
3. Fuel transfer pump caution light — OFF
4. Dump wing fuel before landing.
5. If possible, land with at least 1,000 pounds (1,200 pounds in wing-pod-equipped aircraft) of fuel in the main system.
   - The recommended center-of-gravity aft limits are based on gradual deterioration of flying qualities. As the center of gravity moves aft of the normal limits at landing approach speeds, less nose-up pitch trim is required. At 3% aft of the limits, the aircraft will not maintain hands-off longitudinal stick movement. While no severe difficulties have been encountered during simulated FCLP approaches and during landings with the center of gravity 3% aft of the limits, there is a tendency to overcontrol. Under normal loading (including landings with all photo equipment and with the wing pod attached), 3% aft of the limit will not be exceeded even with zero fuel remaining in the main system. Normal angle-of-attack and approach speeds are recommended.

WING FAILS TO TRANSFER FUEL

Procedures

If ALL TRANSFER FUEL SYSTEM FAILURES procedure fails to regain transfer of fuel from wing:

1. Plan remainder of flight to allow for unavailable wing fuel.
   - Wing fuel will not transfer by gravity.
2. Dump wing fuel before landing.

TRANSFER SYSTEM SHUTOFF FAILURE

Procedures

1. Fuel transfer switch – PRESS DUMP
   - Greatest danger of transfer system shutoff failure is that it allows main fuel cell to over-pressurize which can result in rupture of main cell and collapse of engine duct.
2. Monitor main cell level and adjust as required with transfer switch.

WARNING

The presence of intermittent fuel or vapor discharging from the vent mast during takeoff or maneuvering flight is normal. However, a steady discharge during level flight is indicative of malfunction of the main fuel cell pressure regulator valve. Place fuel transfer switch in PRESS DUMP, reduce power, and land as soon as practical.

- Maintain a close visual check on the main fuel quantity indicator and place fuel transfer switch to pump on or pump off as necessary to transfer wing fuel and fuselage transfer fuel.

3. Do not attempt air refueling.

Note

Due to location of the transfer fuel cutoff float valve, the main cell may fill to capacity during maneuvering flight.

FUEL LEAKS

Indication

High fuel consumption, but no fuel control malfunction indicated. *Observation by wingman.*

Procedures

1. Avoid using afterburner except in emergency.

Approach

WARNING

Reverse engine cooling occurs below 205 KIAS. Airspeeds below 205 KIAS could produce an inflight fire as a result of fuel vapor drawn back into the engine compartment.

2. Maintain a minimum of 220 KIAS clean configuration to the 135° position.
3. Extend EPP with emergency generator switch in OFF.
4. Place wing up and gear down at the 90° position. Maintain 175 KIAS.
5. Final approach point—1,500 feet from runway end, 175 KIAS, 150 feet altitude. Secure engine.
6. To preclude a possible fire from engulfing the forward fuselage area, do not use a short field arrest.
7. If arrest is necessary, utilize the upwind arresting gear following rollout.

ELECTRICAL SYSTEM MALFUNCTIONS

MAIN GENERATOR FAILURE

Indications

NEW Barberpole/main generator indicator

Procedures

1. With main generator failure the aircraft will change trim due to loss of roll and yaw stabilization. If operating in instrument conditions, primary emphasis must be placed on controlling the aircraft with reference to the turn and bank indicator, airspeed indicator, and altimeter until proper functioning of the EPP is assured and primary flight instruments are regained.

2. Mechanically stop afterburning (if required).
   - If the afterburner is lit at the time of electrical failure, mechanically stop afterburning by retarding the throttle past the afterburner aft detent stop. Movement of the throttle is then restricted to positions aft of the detent until power from the emergency power package closes the afterburner shuttle valve. Thereafter, do not use afterburner above 6,000 feet or 300 KIAS.

NEW 3. Master generator switch – OFF/RESET
   - Moving the switch to OFF and returning it to ON may in some cases restore electrical power.
   - Attempt to reset the main generator only if VMC. If IFR, proceed immediately with EPP deployment. Cockpit movements should be restricted as much as possible when flying partial panel instruments.

If failure occurs immediately following takeoff:

4. Raise landing gear.
   - A manual release is installed on the landing gear normal control system so that the landing gear may be raised in the event of main generator electrical power failure. To raise gear, proceed as follows:

     a. Locate the extended screw mounted on the stop assembly located beneath the forward end of the left console.

     b. Rotate the extended screw aft and hold in aft position while moving landing gear handle to WHEELS UP position.

   - Landing gear downlock solenoid operates on secondary dc electrical power

Note

The extended screw can be located by extending either hand around the leading edge of the left console vertical bulkhead, through the left control access approximately 6 inches below the lower edge of the instrument board. Extend fingers until the bare threads of the vertically extended screw are felt. Apply pressure to rotate screw aft.

If gear is up:

WARNING

Since the wing incidence handle solenoid is powered by the secondary bus, extreme caution must be observed when operating on EPP power to prevent knocking the wing incidence handle out of the detent after the wing has been raised for landing.

5. Extend EPP as needed.
   - Due to the 18% loss in range do not extend package.

   a. Emergency generator switch – CHECK OFF
      - Do not extend the EPP with the emergency generator switch in ON or LAND. Extending the package with a load on the generator could prevent voltage buildup to rated values.

   b. EPP handle – PULL

   c. Master generator – OFF

   d. Emergency generator switch – ON or LAND

• Minimum airspeeds for EPP operation are:

	Airspeed KIAS
Wing UP and PC 1 operating normal	
LAND –	130
ON –	160
Wing down or PC 1 inoperative	
LAND –	145
ON –	175

e. Emergency power indicator light – ILLUMINATED

• Failure of the emergency generator light to come on within approximately 3 seconds after the EPP is extended and the ON position is selected is an indication that the generator has not build up to speed. If the LAND position is selected, the emergency generator light will not be actuated. The attitude indicator power off flag will be an indication of EPP performance with switch in the LAND position. If indications of power do not occur, place the emergency generator switch in OFF and allow about 3 seconds for the generator to build up. Then return the emergency generator switch to ON or LAND. If the generator still fails to operate, residual magnetism is insufficient to allow generator buildup. Increase airspeed and try again.

NEW 6. Land as soon as practicable.

• **The aft transfer fuel pump and all but the forward main fuel boost pump are lost with main generator failure and cannot be regained on EPP power. (The forward main fuel boost pump will continue to operate with the emergency generator switch in ON.) Determine quantity of fuel in aft cells by monitoring the transfer fuel quantity gage. Refer to the Failure of Aft Transfer Pump procedure.**

• The transfer pump caution light is on the secondary dc bus and will not indicate the fact that the aft transfer pump is inoperative on emergency generator power.

• **Do not fly at negative g loads.**

• **If emergency ac generator is lost, instrument lights are not available. Turn emergency light switch ON.**

7. Be prepared to carry out the EMERGENCY DEPRESSURIZATION procedure.

• With loss of primary ac bus power, the cockpit air-conditioning temperature will go full cold (temperature control bypass valve will fully close). Fog in the cockpit may obscure vision. The defog system may be partially effective in preventing this condition.

• Place DEFOG switch in ON to eliminate fog.

8. Actual instrument approach on EPP power.
   a. EPP in ON position.

   b. If external lights are required, select external master on and place wing light switch in DIM position. This combination is required to obtain any wing lights. The steady approach light will be available to the LSO in the day position regardless of the position of the day/night switch, but the flashing feature will be disabled.

   c. After transitioning to approach configuration, maintain 160 KIAS to provide UHF and pitot heat. NEW

   d. Turn cabin pressurization off below 8,000 MSL to avoid fog in the cockpit when LAND position is selected.

   e. When the landing area is in sight, turn off roll stab and switch EPP to LAND.

Note

Roll stab is automatically engaged with the EPP switch in the LAND position unless the roll stab switch is placed in off. If airspeed is allowed to drop below 130 KIAS on approach, irregular electrical inputs from the EPP may occur. This could effect the roll and pitch trim systems and consequently aircraft control. Turning the roll stab off will eliminate any uncalled for aileron. If uncalled for pitch maneuvers are encountered, pulling the emergency pitch trim T-handle will disconnect the pitch trim amplifier. Yaw stab, UHF/IFF/ADF, MA-1 compass, fuel quantity indicators, pitot heat, and the emergency generator warning light are all disabled as the EPP is switched to LAND. Attempting to complete the approach in the ON position may result in an irregular source of power and eventually complete electrical failure as the airspeed drops below 160 KIAS provided the PC 1 is operating normally. NEW NEW NEW

If EPP fails:

9. Perform COMPLETE ELECTRICAL FAILURE procedure.

TRANSFORMER-RECTIFIER FAILURE

Indication

Loss of all dc-powered systems and indicators

Procedure

Proceed as for MAIN GENERATOR FAILURE.

So few systems will remain in operation that the same procedures as used for main generator failure should be used.

COMPLETE ELECTRICAL FAILURE

If the main system fails and no power is obtained from the EPP with the emergency generator switch in ON, try the LAND position. Even partial restoration of electrical power, such as the emergency dc bus, will provide some useful services. If proper power is not obtained from the EPP:

1. Throttle – IDLE until below 30,000 feet; then lowest possible thrust setting.

   - Only pressure-operated flight instruments and the tachometer will function. If this failure occurs above 30,000 feet and at a high power setting, there is a possibility of a flameout occurring due to lack of boost pressure and a relight would be impossible.

2. Observe limitations.
   - Do not exceed following nose-down attitudes for specified amount of main system fuel remaining: above 1,800 pounds, –15°; 800 to 1,800 pounds, –5°; less than 800 pounds, maintain level or nose-up attitude.
   - Do not use afterburner above 6,000 feet or above 300 KIAS. Afterburner will light any time throttle advanced forward of afterburner aft detent stop if burner was in operation at time of failure. If burner used, obtain 2 g or nose-up attitude before reducing power.
   - Do not fly at negative g loads.
3. Land as soon as possible at nearest suitable field.
   - No further transfer from aft fuel cells will be available.
   - Consider inability to dump wing fuel when computing maximum landing weight.
   - Landing gear down-and-locked indications will not be available.
   - Unless pilot proficiency is extremely high, IFR, partial panel approaches should not be attempted. Well-qualified pilots should keep themselves within a safe ejection envelope if attempting a partial panel approach and eject immediately if disorientation occurs.
4. Be prepared to carry out the EMERGENCY DEPRESSURIZATION procedure.
   - With loss of primary ac bus power, the cockpit air-conditioning temperature will go full cold (temperature control bypass valve will fully close). Fog in the cockpit may obscure vision. The defog system may be partially effective in preventing this condition.
5. Primary attitude indicator will be inoperative and frozen without emergency bus ac electrical power. Even though the warning off flag appears upon loss of electrical power, the standby attitude indicator should provide emergency attitude reference (within 6°) for 9 minutes.

HYDRAULIC SYSTEM FAILURES

Indications

Engine oil/hydraulic pressure warning light – ON. PC 1, PC 2 or utility hydraulic pressure gage(s) indicates low or zero pressure.

– AND POSSIBLY –

Loss of pitch and roll control (failure of PC 1 and PC 2 systems).

Loss of directional control (failure of PC 1 and utility systems).

CAUTION

Rapid, continuous cycling of the stab systems can result in depletion of the PC systems pressure to the point where flight control is lost. This phenomenon will not occur in light turbulence. However, it can occur if landing directly into the jet/prop wash of another aircraft. Take a safe, proper interval. Waveoff immediately if severe turbulence is encountered on final approach. If necessary to attempt landing under these conditions, secure the stab systems.

FAILURE OF PC 1 AND PC 2 SYSTEMS

1. Pull stick aft and actuate UHT LOCK.

   - Immediately pull stick sufficiently aft to ensure achieving the required UHT angle before complete loss of both PC systems.

   - Hold the aft stick position to assure the check valves installed at the UHT actuator will restrict fluid bleed-off (UHT TED motion) to a slow rate.

WARNING

If aircraft does not respond to aft stick input and nose down pitchover continues to increase, immediate ejection must be accomplished before negative g forces limit the pilot's capability to initiate ejection.

   - Actuate and manually latch the UHT lock handle as soon as an impending loss of pressure in both systems is detected.

   - With the UHT at or more than 4 3/4° TEU, bleedoff, with corresponding loss of UHT TEU angle, will continue until the UHT horn engages the camlock. Bleed-off can be relatively slow and, depending on initial UHT position, as much as 30 seconds may be required for lock indication. Engagement of the camlock may be expedited by slowly releasing aft stick pressure.

2. Extend the EPP

   - The EPP must be extended in an effort to regain PC pressure.

If EPP restores pressure:

   - The emergency generator switch should be left in the OFF position to allow the EPP pump to furnish maximum PC pressure. With EPP supplying both PC 1 pressure and minimum electrical power (switch in LAND position), the minimum safe airspeed for adequate flight control is 145 KIAS. If EPP is supplying PC 1 pressure only, the minimum safe airspeed for adequate flight control is 140 KIAS.

   - A landing is not recommended unless the EPP provides a stabilized PC 1 pressure of 1,500 psi or greater. The UHT lock should be disengaged as soon as PC 1 pressure is restored to avoid overloads on the PC 1 system when overriding the camlock. A transition to landing configuration and straight-in approach with consideration for an arrested landing utilizing first available gear (not to interfere with the PPA flight profile) should be accomplished as soon as possible after restoration of PC 1 pressure by the EPP. Closely monitor PC 1 pressure. Normal brakes may be spongy, weak, or locked due to actuation of emergency brake handle. Refer to LANDING WITH HYDRAULIC SYSTEMS FAILURE.

If EPP fails to restore PC 1 pressure and the aircraft is in a dive:

- See figure 4–8A for altitude required to recover from various dive angle/airspeed entry conditions. If there is insufficient altitude for recovery, eject.

3. Apply rudder to attain and maintain an upright attitude.

   - Rudder power is supplied by the utility hydraulic system.

WARNING

Full rudder deflection rolls are permitted when UHT is locked; however, avoid abrupt inputs. Abrupt rudder deflection can result in dynamic load buildup during aircraft roll which may cause one UHT to exceed the camlock load limit, resulting in loss of that UHT lock.

4. Retract the cruise droops, if extended.

   - With cruise droops retracted, additional positive g is available for dive recovery with a fixed UHT.

5. Adjust throttle and speed brake as necessary.
   - Utilize the throttle and/or speed brake as necessary to attain and maintain 500 KIAS or 0.90 IMN, whichever is less, until dive recovery is effected to level or climbing flight. Once level or climbing flight is attained, adjust power to maintain stable flight between 300 KIAS and 400 KIAS. Refer to FLIGHT CHARACTERISTICS, Section IV.

If EPP fails to restore PC 1 pressure and the aircraft is in level or climbing flight:

6. Extend the cruise droops, if retracted.

   - The aircraft will seek a trim airspeed of 315 KIAS.

7. Apply rudder as necessary to control roll attitude.

   - Rudder power will be supplied by the utility hydraulic system.

WARNING

Avoid abrupt rudder deflections when UHT is locked. Abrupt deflections can create a dynamic load buildup which may cause one UHT to exceed the camlock load limit, resulting in loss of that UHT lock.

8. Adjust longitudinal trim to approximately one unit ANU on trim wheel.

   - With both PC systems inoperative and the UHT locked, the trim position should be at or more ANU than the UHT lock angle (4 3/4° TEU). This will preclude pressure surges in one of the systems from forcing the UHT horn out of the camlock in the TED direction from which it cannot be recovered.

9. IFF – squawk emergency.

10. Abandon the aircraft.

    - Immediately if, for any reason, the UHT fails to lock

    - When in a suitable area with UHT locked.

11. Observe flight limitations (see Section 1, Part 4).

    - Refer to Section IV for flight characteristics.

FAILURE OF ONE PC SYSTEM

Procedures

1. Secure both stabs.
   - Cause of failure may be located in one stab system and securing that stab may stop or reduce loss of fluid. The remaining stab should be secured to conserve all available hydraulic pressure for pilot actuation of flight controls.
   - Securing roll stab will result in the loss of aileron trim and roll damping. Securing yaw stab will result in loss of rudder trim and yaw damping.

2. Determine which PC system has failed.
   - Hydraulic pressure gage of failed system will indicate low or zero pressure.

Note

With one PC system failed, any flight control inputs made by the pilot will cause increased pressure fluctuations in the remaining PC system. This effect will be more noticeable in the landing configuration due to larger movements of the flight control surfaces.

With PC 1 inoperative:

3. Extend EPP (optional). If desired, EPP may be extended any time before landing.
   - Consider approximate 18% reduction in range with power package extended. The package is not retractable in flight. If maximum range performance is required, defer extension of the package until descent and approach at destination.

With PC 2 inoperative

4. Monitor PC 1 system pressure and extend EPP only if needed.
   - The EPP has been known to cause failure of the PC 1 system due to vibrational effect on connecting lines.
   - Refer to PC 1 INOPERATIVE for range considerations with EPP extended.

Limitations with either system inoperative

5. Observe flight restrictions:
   - Maximum airspeed – 600 KIAS or 1.0 IMN, whichever is less.
   - (Recommended airspeed - corresponding to 1 unit nose up on trim wheel in clean configuration and 6 units nose up on trim wheel in landing configuration to remain within limit of UHT camlocks.)
   - Maximum permissible airspeed with either stab out – 180 KIAS.
   - Maximum acceleration – Same as yaw stab inoperative (refer to Section I, Part 4)
   - Bank angle change not to exceed 90°.
   - No abrupt flight control movements
   - No slipping or skidding
   - Minimum airspeed with EPP extended to provide adequate PC 1 pressure for flight control with
6. Emergency generator – OFF, UNLESS EPP ELECTRICAL POWER IS ESSENTIAL FOR FLIGHT
7. Return to base immediately or land at the nearest suitable field.
   - Go easy on the controls during the approach. An approach should be planned to utilize the least amount of flight control deflections.
8. Proceed to LANDING WITH HYDRAULIC SYSTEMS FAILURE

FAILURE OF PC 1 AND UTILITY SYSTEMS

1. Actuate EMERG RUD LOCK – ROTATE HANDLE AFT
   - Locking of rudder prevents rudder flutter at airspeeds above 200 KIAS.
   - If locked out of trim, actuator internal leakage permits rudder to assume a trail condition. At airspeed below 200 KIAS rudder may be unlocked and relocked as necessary to adjust in-trail position.
2. EPP – OUT (Optional)
   - Deployment of EPP should be deferred until prior to landing.
3. Observe flight limitations; see Section I, Part 4.
4. Proceed to FAILURE OF UTILITY SYSTEM.

FAILURE OF UTILITY SYSTEM

Indications

Engine oil/hydraulic pressure warning light illuminated
–AND–
Utility hydraulic pressure gage indicates low or zero pressure

Field Procedures

If failure detected before all pressure lost:

1. Attempt to extend gear and raise wing (if practical).
   - If fuel remaining is sufficient to reach base in the landing configuration, immediately attempt to extend the landing gear first and then raise the wing, using normal procedures.
2. Lower the hook.

CAUTION

Obtain positive indications that all three gear are down and locked and that the wing is up prior to lowering the hook.

3. Land as soon as practicable.
4. Refer to LANDING WITH HYDRAULIC SYSTEMS FAILURE.

If all pressure lost:

1. Return to base.
   - Return to base early enough so that sufficient fuel remains to allow for field preparations or in case other difficulties are encountered.

- If air refueling required, extend probe pneumatically as follows:

a. Extend airspeed – 275 KIAS maximum

b. IFR PROBE switch – OUT

c. EMERG PROBE switch – EXT

d. Maximum airspeed with probe fully extended pneumatically – 350 KIAS or 0.92 IMN

- Once probe has been extended pneumatically, it cannot be retracted inflight. Reduction in range is approximately 12%.

- Speed brake warning light will come on as speed brake drops to trail position.

2. Extend landing gear pneumatically.

- Always extend the landing gear before attempting to raise the wing.

- Extend landing gear as follows:

a. Airspeed – 220 KIAS MAXIMUM

b. Landing gear handle – WHLS DOWN, push in, rotate clockwise, and pull aft (Landing gear handle must be placed in WHLS DOWN to provide nose gear mechanical downlock and a wheel indication.)

c. Landing gear position indicators – WHEELS VISIBLE (If nose gear down and locked but main gear indicators show barberpole, accelerate to maximum speed permissible (220 KIAS) to increase the aerodynamic locking force on the main gear. If main gear still not locked, apply positive g.)

3. Extend leading edge and raise wing pneumatically (if leading edge fails to attain at least the cruise droop position, do not raise wing).

- Extend droops and raise wing as follows:

a. Airspeed – 220 KIAS MAXIMUM

b. Down-lock handle – UNLOCK (If landing configuration not achieved or desired before complete loss of pressure and unable to unlock wing, reduce speed to 220 KIAS or less and push over to one-half negative g to apply compression load on actuating cylinder and allow wing to unlock. After unlocking, wing can be raised with emergency air while in level flight. However, if all attempts to unlock wing fail, do not attempt to raise wing. Wing cylinder locks will bind and all further attempts to raise wing will be unsuccessful.)

c. Wing incidence handle – DN (Failure to place the wing incidence handle in DN before the emergency droop and wing incidence guard is raised will result in the detent plate swinging outboard and binding the wing incidence handle. If this occurs, push the detent plate inboard with index finger while pushing the wing incidence handle outboard and forward with palm of hand.)

d. Emergency droop and wing incidence guard – RAISED

e. Wing incidence release switch – DEPRESSED

f. Wing incidence handle – Full forward to extend leading edge droop. Observe extension to the landing droop position; then move handle aft in the inboard slot to EMERG UP position to raise wing. If cruise droop is the maximum droop attainable, the wing still should be raised. Do not, however, raise the wing clean. Raising the wing clean would result in higher-than-normal approach speeds and possible nosewheel-first touchdown. Nosewheel-first touchdowns can lead to porpoising and possible overloading of the nose gear. In this case, or if unable to raise the wing, refer to LANDING WITH WING DOWN.

If for any reason the wing is blown up without first obtaining land or cruise droop, then before landing, and at a safe altitude, investigate the handling characteristics at and below the speed which gives a donut on the indexer. Complete stalls are not recommended. It is expected that the normal approach angle of attack will provide an approach speed that is satisfactory.

4. Lower the hook.

CAUTION

Obtain positive indications that all three gears are down and locked and that the wing is up prior to lowering the hook.

5. Land as soon as practicable.

6. Proceed to LANDING WITH HYDRAULIC SYSTEM FAILURES.

Carrier Procedures

If failure detected before all pressure lost:

1. Lower hook.
2. Attempt to extend gear and raise wing (if practical).
   - If fuel remaining is sufficient to reach carrier in the landing configuration and a ready deck is known to be available, immediately attempt to extend the landing gear first and then raise the wing, using normal procedures.
3. Land as soon as practical.

If all pressure lost:

1. Lower the hook.
   - If hook will not extend, consideration should be given to diverting to a field landing if available. Pneumatic actuation of the gear and the wing is irreversible and if accomplished prior to obtaining a positive hook check, the pilot may be committed to a barricade arrestment or a dirty bingo.
2. Return to carrier
   - If air refueling required, extend probe pneumatically as follows:
     a. Extend airspeed – 275 KIAS maximum
     b. IFR PROBE switch – OUT
     c. EMERG PROBE switch – EXT
     d. Maximum airspeed with probe fully extended pneumatically – 350 KIAS or 0.92 IMN
   - Once probe has been extended pneumatically, it cannot be retracted inflight. Reduction in range is approximately 12%.
   - Speed brake warning light will come on as speed brake drops to trail position.
3. Extend landing gear pneumatically.
   - Always extend the landing gear before attempting to raise the wing.
   - Extend landing gear as follows:
     a. Airspeed – 220 KIAS MAXIMUM
     b. Landing gear handle – WHLS DOWN, push in, rotate clockwise, and pull aft (landing gear handle must be placed in WHLS DOWN to provide nose gear mechanical downlock and a wheel indication.)
     c. Landing gear position indicators – WHEELS VISIBLE (If nose gear down and locked but main gear indicators show barberpole, accelerate to maximum speed permissible (220 KIAS) to increase the aerodynamic locking force on the main gear. If main gear still not locked, apply positive g.)
4. Extend leading edge and raise wing pneumatically (if leading edge fails to attain at least the cruise droop position, do not raise wing).
   - Extend droops and raise wing as follows:
     a. Airspeed – 220 KIAS MAXIMUM
     b. Down-lock handle – UNLOCK (If landing configuration not achieved or desired before complete loss of pressure and unable to unlock wing, reduce speed to 220 KIAS or less and push over to one-half negative g to apply compression load on actuating cylinder and allow wing to unlock. After unlocking, wing can be raised with emergency air while in level flight. However, if all attempts to unlock wing fail, do not attempt to raise wing. Wing cylinder locks will bind and all further attempts to raise wing will be unsuccessful.)
     c. Wing incidence handle – DN (Failure to place the wing incidence handle in DN before the emergency droop and wing incidence guard is raised will result in the detent plate swinging outboard and binding the wing incidence handle. If this occurs, push the detent plate inboard with index finger while pushing the wing incidence handle outboard and forward with palm of hand.)
     d. Emergency droop and wing incidence guard – RAISED
     e. Wing incidence release switch–DEPRESSED
     f. Wing incidence handle – Full forward to extend leading edge droop. Observe extension to the landing droop position; then move handle aft in the inboard slot to EMERG UP position to raise wing. If cruise droop is the maximum droop attainable, the wing still should be raised. Do not, however, raise the wing clean. Raising the wing clean would result in higher-than-normal approach speeds and possible nosewheel-first touchdown. In this case, or if unable to raise the wing, refer to LANDING WITH WING DOWN.

If for any reason the wing is blown up without first obtaining land or cruise droop, then before landing, and at a safe altitude, investigate the handling characteristics at and below the speed which gives a donut on the indexer. Complete stalls are not recommended. It is expected that the normal approach angle of attack will provide an approach speed that is satisfactory.

5. Land as soon as practicable.
6. Proceed to LANDING WITH UTILITY HYDRAULIC FAILURE.

LATERAL CONTROL MALFUNCTIONS

Procedures

1. Secure roll stab and yaw stab.

Indications

Ailerons binding
Rolling tendency
Suspected malfunction due to airframe or system damage

Before raising wing:

2. Climb to at least 10,000 feet.

If uncontrollable with wing raised:

3. Lower wing and perform wing-down landing.
   - Refer to LANDING EMERGENCIES for wing down landing procedure.

TRIM AND STABILIZATION SYSTEM FAILURES

Few complications result from stabilization system failures. Landings without stabilization present no problem. Observe the clean and wing-up configuration limitations listed for the particular failure.

FAILURE OF YAW TRIM AND STAB SYSTEM

Indications

Inability to trim
Yaw stab warning light illuminated
Yaw oscillations

Procedures

1. Yaw stab switch – OFF RESET until out of oscillation speed range, then ON
   - Yaw oscillations of varying intensities are common with a malfunctioning yaw stabilization system, but can be eliminated by turning the stab switch off. These oscillations are often associated with a particular speed area, and if desired, attempts should be made to reset the stab when out of the suspect range.

If warning light remains lit:

2. Yaw stab switch – OFF RESET
   - Yaw trim and stab are inoperative and rudder will return to neutral.
3. Observe applicable limitations.
   - Refer to section I, part 4 for trim and stabilization system operating limitations.

FAILURE OF ROLL TRIM AND STAB SYSTEM

Indications

Inability to trim
Roll stab warning light illuminated

Procedures

1. Roll stab switch – OFF RESET, then ON

If warning light remains lit:

2. Roll stab switch – OFF RESET
   - If the EPP is in use and the roll stab switch is inadvertently left in ON, the roll trim and stab system will automatically reset itself when the emergency generator switch is placed in LAND. Energizing a previously malfunctioning system in this situation could produce a dangerous roll maneuver. For more detailed information refer to figure 1–13 (sheet 1).
3. Observe applicable limitations
   - With roll stab inoperative, do not exceed 180 KIAS in the landing configuration.
   - Aircraft becomes susceptible to pilot induced oscillations above 180 KIAS because of roll damping.

PITCH TRIM FAILURE

Trim malfunctions are relatively rare, but on occasion, certain aircraft may become afflicted with a recurring "pitch oscillation." This oscillation is normally mild, but may increase in intensity if allowed to continue. The following procedure will supply emergency trim and should stop the oscillation.

Indications

Inability to trim

Pitch oscillation

Procedures

Emergency pitch trim T-handle RAISE

- Normal pitch trim is inoperative and emergency pitch trim is available by movement of the emergency pitch trim handle to NOSE DOWN or NOSE UP.
- Raising the emergency pitch trim emergency T-handle should stop the oscillation. With the handle raised, however, there will be no automatic retrim when wing is raised or lowered.

INFLIGHT FIRES/COCKPIT SMOKE AND FUMES

Normally, there is adequate time in the F-8 to analyze a fire warning indication and to take appropriate action.

ENGINE OR ENGINE COMPARTMENT FIRE

Indications

Fire warning light — ILLUMINATED

Other Possible Indications

Rapid rise in EGT
Unusual vibration
Smoke and/or flames emitting from tailpipe
Loss of fuel or hydraulic pressure
Loss of flight controls
Hook light (momentary or steady)
External blistering or scorching of paint

Procedures

1. Throttle — IDLE, immediately
   - If in afterburner, simply deselecting the afterburner may cause the fire warning light to go out and indicate a possible afterburner fuel leak.
2. Investigate for further evidence of fire.
   - Conditions permitting, ask wingman to check fuselage thoroughly. If alone, turn aircraft sharply and look for smoke. Look for more positive evidence of fire before deciding to shut down or eject.
   - Remember, smoke in the cockpit is rarely an indication of fire in the F-8.
   - Failure of the air-conditioning turbine may be mistaken for engine explosion or fire. Failure of this turbine may be accompanied by a muffled explosion and smoke in the cockpit. A suspected engine fire under these conditions should be confirmed.

If fire not positively indicated:

Return to base using minimum power.

If engine fire does exist:

Shut down engine or eject.

- If fire exists, shutting down the engine is a reasonable course of action. After engine shutdown, the EPP should be extended and the ON position selected to reenergize the fire warning system, UHF, and IFF.
- If fire warning light goes out after engine shutdown, any decision to relight rests strictly with the pilot.
- If fire persists, eject.

WHEEL WELL FIRE

Indications

Smoke or fire emitting from wheel well
Explosion in wheel well area

Procedure

If wheel well fire does exist:

Eject.

- This particular kind of fire is usually caused by overheated wheel assemblies exploding after gear retraction following takeoff with overheated brakes and wheels.
- If fire ensues following a carrier ramp strike/landing and the aircraft bolters, select afterburner, climb to a safe altitude and eject.

ELECTRICAL FIRE

Procedures

1. Attempt to isolate fire by de-energizing affected equipment.

If unable to isolate fire:

2. Master generator switch – OFF
3. Emergency generator – EXTEND/LAND
4. All unnecessary equipment – OFF

If fire extinguished:

5. Emergency generator – ON
6. Reselect vital equipment

If fire reignites:

7. Emergency generator – LAND

If fire persists:

8. Emergency generator – OFF
9. Perform COMPLETE ELECTRICAL FAILURE procedure

COCKPIT SMOKE AND FUMES

Procedures

1. Check oxygen mask as tight as possible.

To eliminate smoke and fumes from cockpit:

2. Throttle – RETARD (as practical to reduce pressurized airflow into cockpit)
3. Temperature knob – DECREASE
4. Defogger switch – OFF

If condition persists:

5. Perform emergency depressurization.
   - Emergency depressurization procedure is presented under AIR-CONDITIONING SYSTEM FAILURES.
6. If unable to see flight instruments or other dire situation arises, jettison the canopy.

AIR-CONDITIONING SYSTEM FAILURES

COMPLETE FAILURE

Indications

Loss of cockpit pressurization and temperature control

Loss of windshield defogging and rain removal

Reduction in cockpit noise level and/or airflow.

- If indication is loss of pressurization (most immediate indication at high altitude) or reduction in cockpit noise level/air flow (most immediate indication at low level), problem could be due to a failure in the engine compressor bleed air line to the air-conditioning unit. This failure could permit high temperature air to contact electrical components and wiring with subsequent complications such as electrical malfunctions or loss of main generator.

Procedures

1. Descend to lower altitude (if possible).
   - In planning remainder of flight, consider the following (in addition to items under preceding INDICATIONS).
   - Integrated electronic package pressurization is lost
   - Electronic compartment is cooled by ram air.
   - Ram air is automatically admitted to maintain pressurization of fuselage fuel cells. Wing tank fuel can be dumped at a reduced rate. Wing tank fuel transfer is negligible.
2. Perform EMERGENCY DEPRESSURIZATION.
3. Land as soon as possible.

ERRATIC TEMPERATURE CONTROL

Procedures

If air-conditioning system will not maintain desired temperature:

1. Manual override switch – MAN

Note

Aircraft BUNO 145631 and subsequent aircraft have the manual override switch.

2. Temperature knob – AS DESIRED

   - Pressure fluctuations when using manual temperature control indicate that the temperature knob is set too high. Move the knob toward COLD to stop the fluctuations.

COCKPIT OVERTEMPERATURE

Procedures

If cockpit temperature goes full hot and cannot be controlled automatically or manually:

1. Throttle – CRUISE POSITION

2. Cockpit pressure switch – CABIN DUMP (on as required to defog canopy)

3. Cockpit emergency ventilation knob – AS DESIRED

   - When the emergency ventilation port is open, do not rely on angle-of-attack indications or attempt to use the approach power compensator system. Airflow over the angle-of-attack vane is disturbed by the vent port door, resulting in erroneous angle-of-attack indications and faulty operation of the approach power compensator system.
   - If wearing anti-exposure coverall, turn pressure suit vent valve OFF.

4. Canopy – JETTISON IF REQUIRED

   - If unable to control cockpit temperature using preceding steps, it may be necessary to jettison the canopy.

EMERGENCY DEPRESSURIZATION

Procedures

When it is necessary to depressurize the cockpit or when the air-conditioning system fails, proceed as follows:

1. Cockpit pressure switch — CABIN DUMP

   - Dumping cockpit pressure above 43,000 feet may lead to adverse physiological effects.
   - Selecting CABIN DUMP with normal system operation will not depressurize the wing fuel cell.

2. Defogger switch — OFF

3. Cockpit emergency ventilation — AS DESIRED

   - When the emergency ventilation port is open, do not rely on angle-of-attack indications or attempt to use the approach power compensator system. Airflow over the angle-of-attack vane is disturbed by the vent port door, resulting in erroneous angle-of-attack indications and faulty operation of the approach power compensator system.

OXYGEN SYSTEM EMERGENCIES

LOW OXYGEN PRESSURE OR QUANTITY

If oxygen low pressure warning light illuminated:

Continue flight if positive pressure noticeable and breathing normal. See figure 1–40.

If low quantity indicated:

Monitor quantity closely and do not allow supply to become exhausted.

- Normal oxygen consumption rate is one liter per hour. Consider rates higher than this a potential emergency.
- If desirable to reduce oxygen consumption, increase cockpit altitude by opening the cockpit emergency air vent. *Do not increase cockpit altitude to more than 25,000 feet* because of the physiological effects.

OXYGEN SYSTEM FAILS OR MAIN SUPPLY EMPTY

Indications

Oxygen warning light — ON
Gage indication
Oxygen delivery fails
Difficulty in breathing
Hypoxia symptoms

Procedures

1. Check security of regulator.
2. Check hose connections on both sides of seat pan.
3. Check that oxygen valve shows ON.
4. Check oxygen quantity.
5. Activate emergency oxygen bottle.
   - Emergency oxygen lanyard – PULL
   - If mask breathing continues to be difficult after pulling the lanyard, remove mask.
6. Descend below 10,000 feet (cockpit altitude).
   - Refer to EMERGENCY DESCENT for rapid descent information.

CONTAMINATED OXYGEN

Indication

Peculiar odor in oxygen system
Dizziness
Nausea

Procedures

1. If cockpit altitude is more than 10,000 feet, activate the emergency oxygen bottle. If cockpit altitude is less than 10,000 feet, remove the mask.
2. Oxygen (Normal) valve — OFF
3. Descend to below 10,000 feet MSL (5,000 feet MSL at night)
   - An emergency or operational necessity may require remaining at a cockpit altitude of 10,000 (5,000 feet at night) or above after the emergency oxygen supply is depleted. In such cases, descend to below 10,000 feet MSL as soon as possible and continue with the procedure from step 4.
4. Cockpit pressure switch — CABIN DUMP
5. Emergency ventilation port — OPEN
   - Due to the possibility of engine bleed air contamination, depressurize the cockpit. Ram air vent should be open at all times when not on oxygen.
   - When the emergency ventilation port is open, do not rely on angle-of-attack indications or attempt to use the approach power compensator system. Airflow over the angle-of-attack vane is disturbed by the vent port door, resulting in erroneous indications and faulty operation of the approach power compensator system.
6. Remove mask.

EJECTION OR BAILOUT

EJECTION/BAILOUT DOCTRINE

High altitude:

If the aircraft is descending out of control, abandon it at an altitude not lower than 10,000 feet above the terrain. Below 10,000-feet, if uncontrolled flight is entered (from which recovery cannot be effected) don't hesitate; abandon the aircraft. If the aircraft is in controlled flight and you decide to eject, head the aircraft out to sea or away from populated areas and abandon it.

Low altitude:

If power lost, but sufficient time exists before ejection, turn the aircraft away from any populated area and attempt a high-rpm low-altitude airstart (refer to AIRSTARTING procedure this section, part 1). *In no situation attempt to regain power at less than 1,500 feet above the terrain and 250 KIAS;* EJECT IMMEDIATELY. Prior to ejection from a flyable or controllable aircraft, it is the pilot's responsibility to do everything reasonable to ensure that his abandoned craft will inflict the least possible damage on impact.

PREPARING TO EJECT

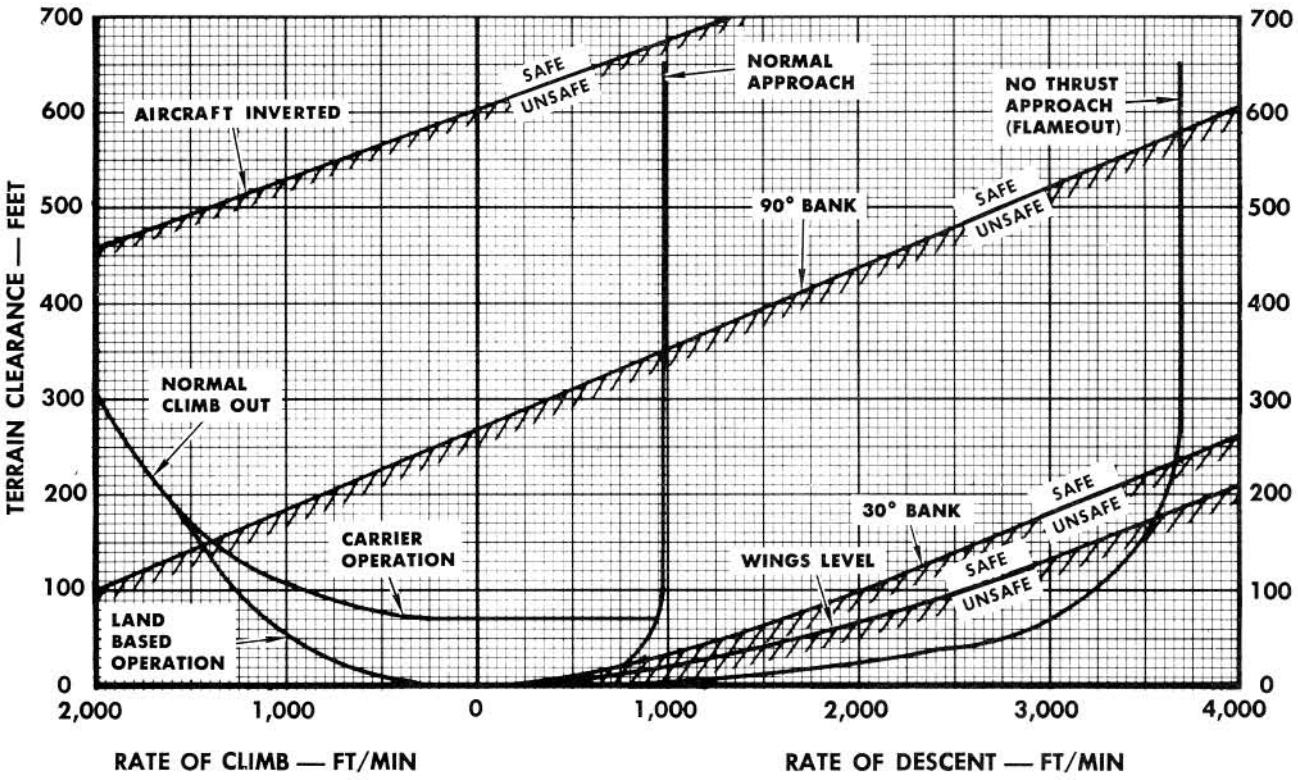
Procedures

1. Pull up, if at low altitude and with sufficient airspeed.
   - A "pullup" maneuver may be performed as an aid to successful ejection at low altitudes. The pullup increases the margin of safety in a low-altitude ejection by increasing the time available for seat separation and parachute deployment. However, flight test demonstrations have shown that attempting a power-off "pullup" outside of certain airspeed limits will result in a loss of altitude rather than a gain. Variations in flight path, weight, and wing position can vary the minimum airspeed required for an effective pullup from 160 KIAS to 200 KIAS. In gliding flight, the maximum effective airspeed can vary from 210 to 230 KIAS. When above this airspeed in a glide, more altitude is lost during the flare than can be regained during pullup. See figure 5–2 for effect of rate of descent on ejection capability.

     Upon loss of power following takeoff with full fuel load, 180 KIAS is required with the wing up and 190 KIAS with the wing down in order to convert airspeed into altitude. This assumes no rate of descent at the time of pullup. If a descent has begun after power loss, a minimum of 210 KIAS and a maximum of 230 KIAS, wing up or down, is required.

     During landing approach, airspeed will normally be approximately 150 KIAS at the 180° position decreasing to 135 KIAS on final. If power is lost anywhere during the approach, rate of descent will increase rapidly, and a pullup will not be effective. See figure 5–3 for power off pullup and ejection capability during takeoff and landing.
   - To perform a power-off pullup, apply light to moderate aft stick force, increasing the pitch attitude steadily until reaching the ejection point 10 to 20 knots above stall speed.
   - Do not pull excessive g. Accelerations above 1.2 g will decrease possible altitude gains by causing the stall to occur earlier (at a higher airspeed).
   - Aircraft pitch attitude and flight path can reach as high as 25° during the pullup. Time for effective completion of a pullup maneuver will be at least 6 seconds at minimum airspeed and can exceed 15 seconds when starting above 220 KIAS.
   - Minimum safe ejection altitudes with zero sink rate are contained in the ejection seat descriptions, section I, part 2.
2. Reduce speed (if necessary).
   - The risk of bodily injury due to airloads or striking the tail increases with airspeed as follows.
     a. From 0 to 400 KIAS – safe – minor forces on body
     b. 400 to 500 KIAS or Mach equals 0.92, whichever is greater – more hazardous – appreciable forces on body
     c. Above 500 KIAS and Mach equals 0.92 – extremely hazardous – excessive forces on body, seat performance limitations probably exceeded.
   - Altitude required for safe ejection increases greatly as dive angle or dive airspeed increases. Figure 5–4 shows these effects for the MK-F7 seat.
3. Actuate emergency IFF.
4. Transmit Mayday and give position.
5. Stow loose gear.
6. Manually lock shoulder harness.
7. Place helmet visor down.
8. Adjust seat height so thighs are firmly on the seat pan with feet on the rudder pedals.

EFFECT OF RATE OF DESCENT ON EJECTION CAPABILITY (MK-F7)



NOTES

1. Normal ejection capability based on:
   a. 2-second reaction time
   b. Maximum operational ejected weight
   c. Appropriate angle of attack
   d. 5,000-foot terrain
2. Normal approach curve based on 140 KIAS with power.
3. No-thrust curve based on 170 KIAS wing up.

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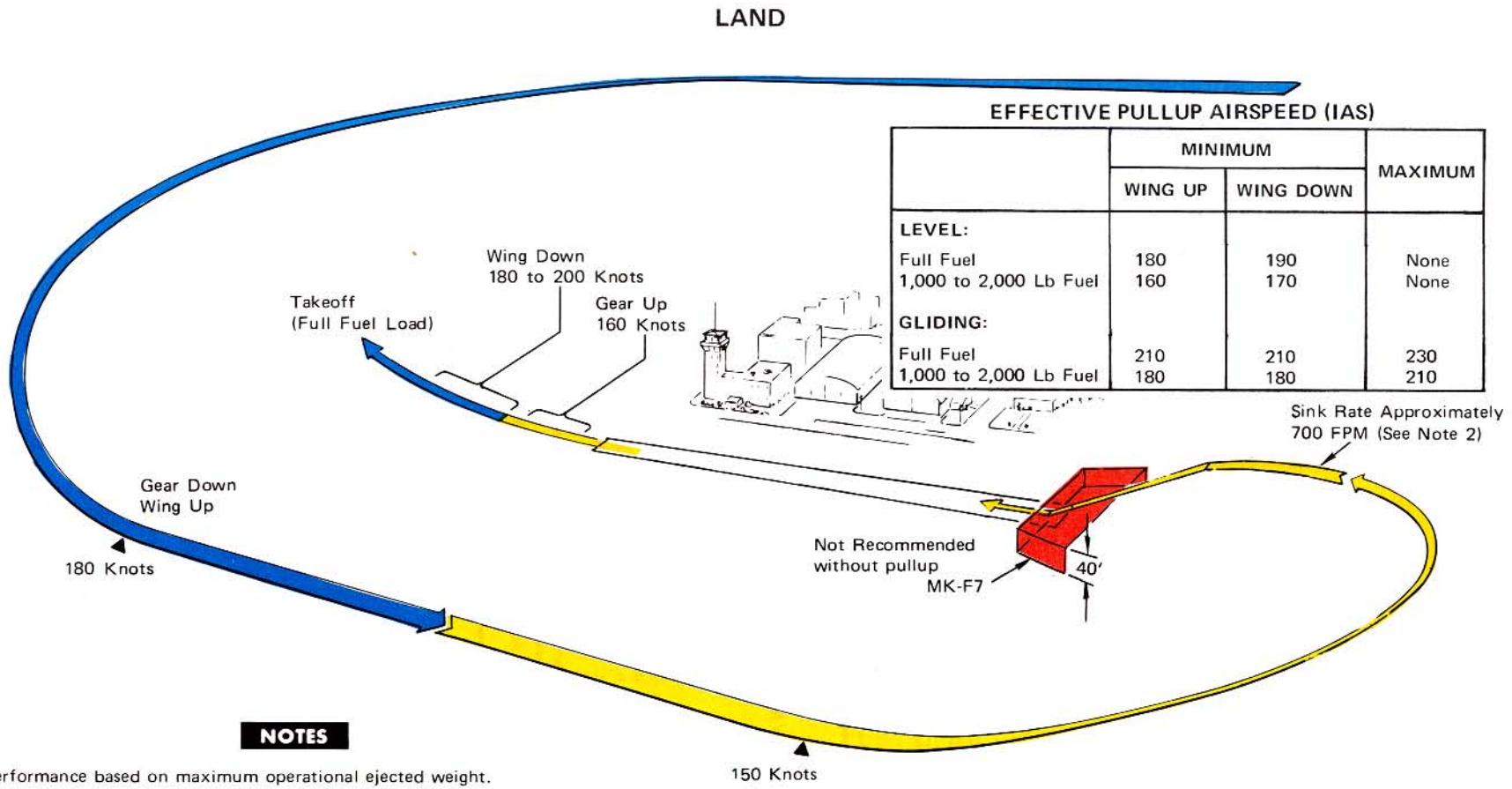
Figure 5–2



EFFECTIVE PULLUP AIRSPEED (IAS)

	MINIMUM		MAXIMUM
	WING UP	WING DOWN	
LEVEL:			
Full Fuel	180	190	None
1,000 to 2,000 Lb Fuel	160	170	None
GLIDING:			
Full Fuel	210	210	230
1,000 to 2,000 Lb Fuel	180	180	210

NOTES

1. Performance based on maximum operational ejected weight.
2. MK-F7 ejection seat envelope extends to 40 feet above ground with a 2-second reaction time.
3. Pullup capability based on complete power failure regardless of seat type.

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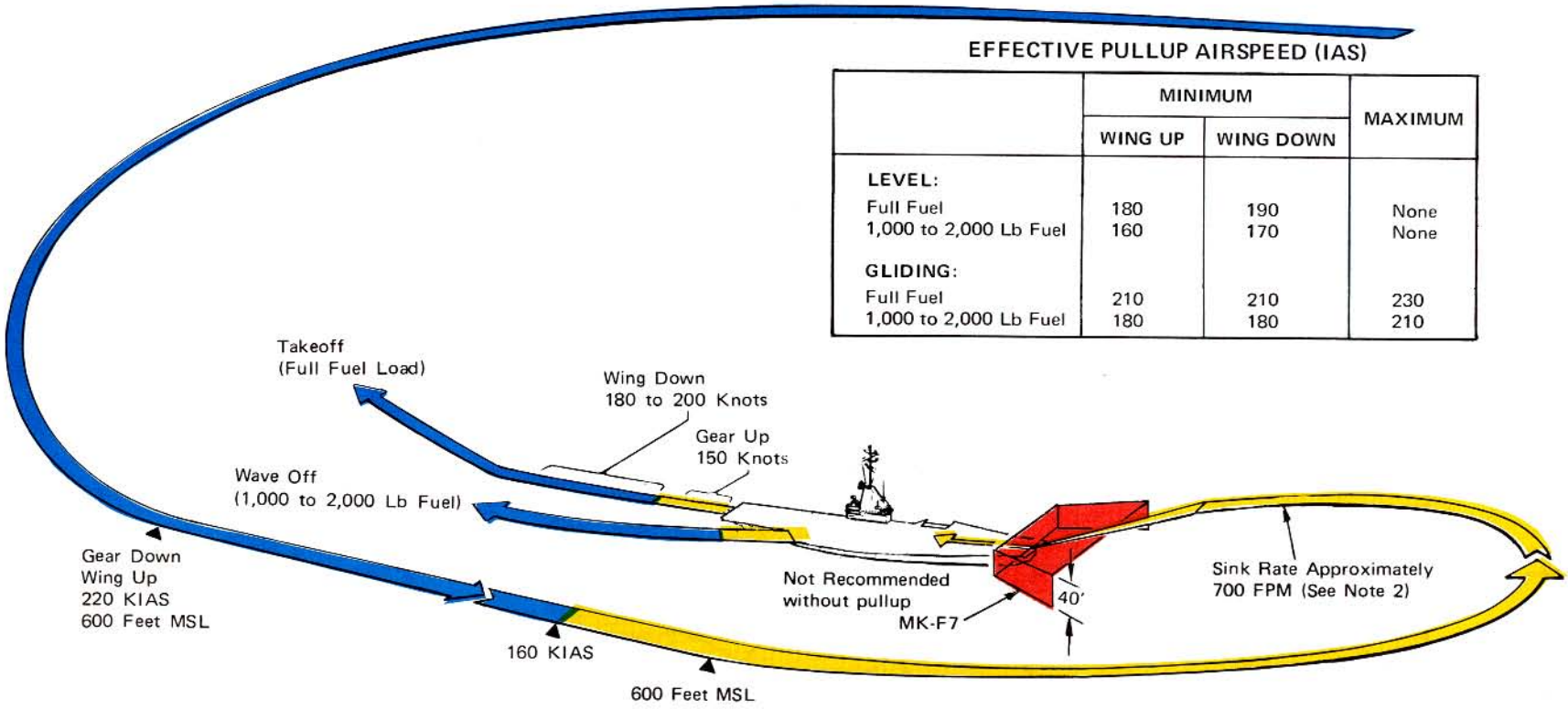
Figure 5–3 (Sheet 1)

TAKEOFF AND LANDING EJECTION CAPABILITY AND EFFECTIVE PULLUP SPEED

CARRIER



EFFECTIVE PULLUP AIRSPEED (IAS)

	MINIMUM		MAXIMUM
	WING UP	WING DOWN	
LEVEL:			
Full Fuel	180	190	None
1,000 to 2,000 Lb Fuel	160	170	None
GLIDING:			
Full Fuel	210	210	230
1,000 to 2,000 Lb Fuel	180	180	210

NOTES

1. Performance based on maximum operational ejected weight.
2. MK-F7 ejection seat envelope extends to 40 feet above deck with a 2-second reaction time.
3. Pullup capability based on complete power failure regardless of seat type.

Pullup Effective
Pullup Not Effective
Outside Ejection Seat Envelope – MK-F7

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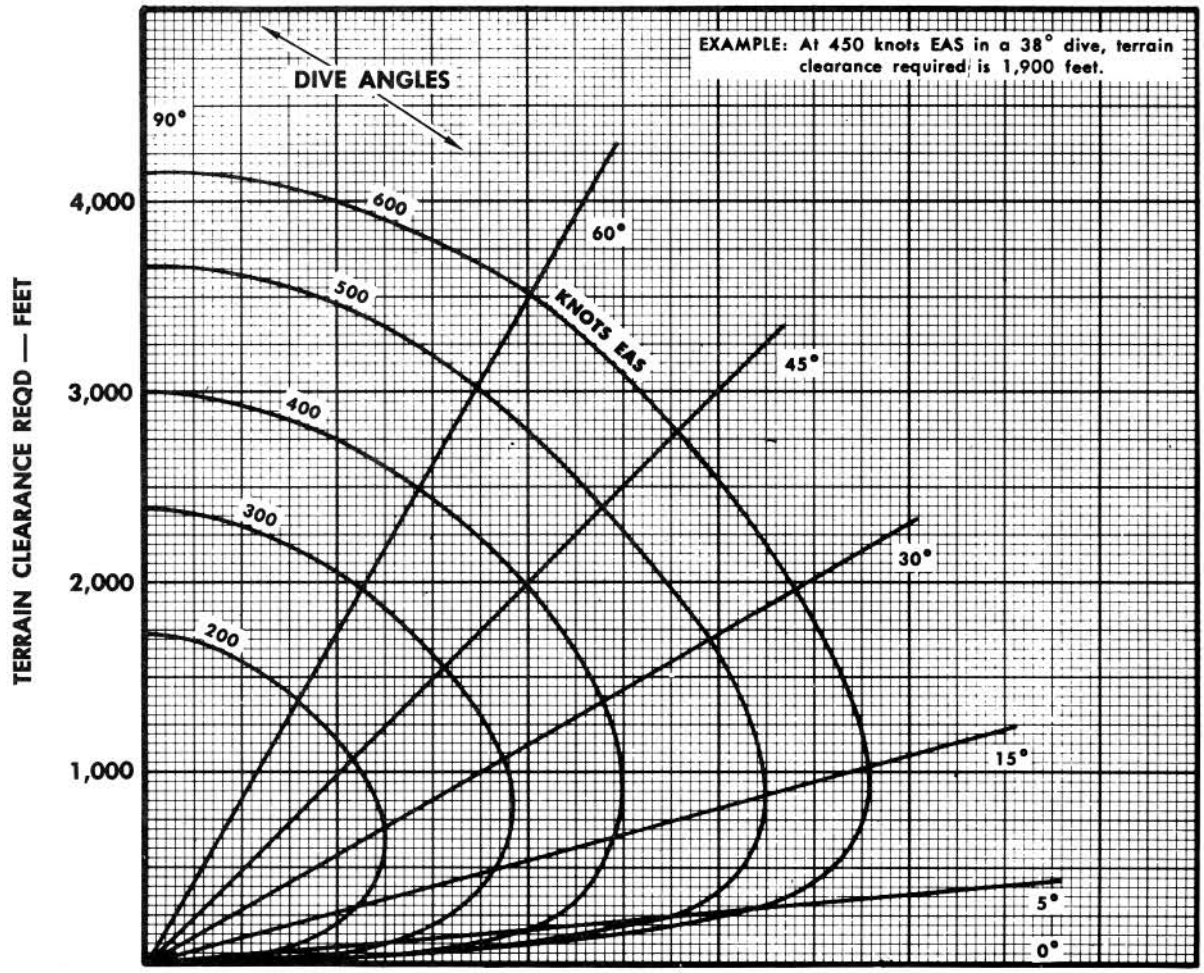
Figure 5–3 (Sheet 2)

DIVE EJECTION CAPABILITY (MK - F7)



NOTES

1. Curves include a 2-second pilot reaction time.
2. Curves are based on:
   a. Maximum operational ejected weight
   b. Wings level bank attitude with appropriate angle of attack
   c. 5,000-foot terrain (conservative for lower terrain)

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Figure 5-4

EJECTION

The ejection procedure is presented in figure 5–5 and the after-ejection procedure is presented in figure 5–6. The ejection sequence (timed firing of seat, chute, etc) is described and illustrated in figure 1–45. All pilot actions required before pulling the face curtain are presented in detail under PREPARING TO EJECT.

BAILOUT

Procedures

If all attempts to eject have failed, but canopy jettisoned:

1. Landing gear — UP
2. Wing — LANDING CONDITION PREFERRED
3. Airspeed — MINIMUM WITHOUT STALLING
4. Emergency restraint release – PRESS BUTTON, ROTATE AFT
5. Ensure separation of leg restraint lines.
6. Pilot services – DISCONNECT AT CONSOLE
7. Full aileron trim in one direction, hold wings level.
   - Perform only if surface trim available.
   - Inverted attitudes are not advised for bailout. To maintain inverted flight, the tail must be placed several additional feet below the cockpit, increasing the hazard of striking the aircraft.
8. While holding wings level, crawl into crouching position in seat.
9. Release stick and dive over side opposite low wing trim.
   - If no trim available, dive over either side.
10. Parachute ripcord – PULL (below 10,000 feet)
    - Pull parachute ripcord immediately if below 10,000 feet. If above 10,000 feet, delay until reaching a safe breathing altitude. Remember that the parachute will not open automatically.

WARNING

To ensure full travel of the parachute ripcord lanyard, hold the left front riser with left hand and pull parachute ripcord with the right hand. If chute does not deploy after parachute ripcord actuation, grasp the risers and pull the chute pack down where it can be held by hand. Open the top flap, pull out the small drogue chute, and throw it into the windstream. Normal chute opening will then occur.

FUEL DUMPING

Procedure

To dump fuel from wing:

Fuel dump switch – DUMP

- The fuel dump switch may be actuated at any time in flight to obtain rapid dumping of part or all of the wing tank fuel through the wing tip dump ports.
- The rate of wing fuel dumping is reduced with loss of wing tank pressurization.
- There is no provision for dumping fuel from fuselage cells.
- Optimum dumping of wing fuel is obtained with the fuel transfer switch in the PUMP ON or PUMP OFF position with the nose slightly raised.

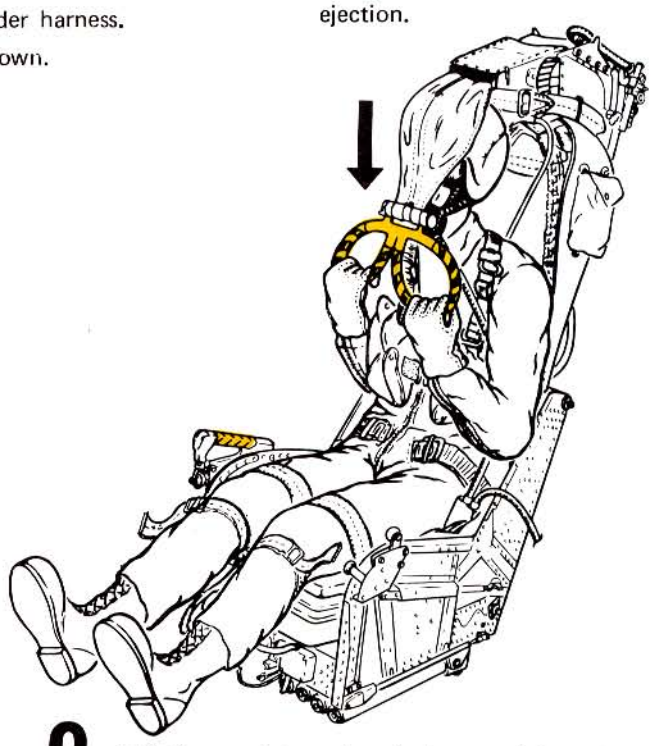
EJECTION PROCEDURE

IF TIME AND CONDITIONS PERMIT

- Pull up, if at low altitude.
- Reduce speed.
- Actuate emergency IFF.
- Adjust seat height
- Transmit May Day and give position.
- Stow loose gear.
- Manually lock shoulder harness.
- Place helmet visor down.

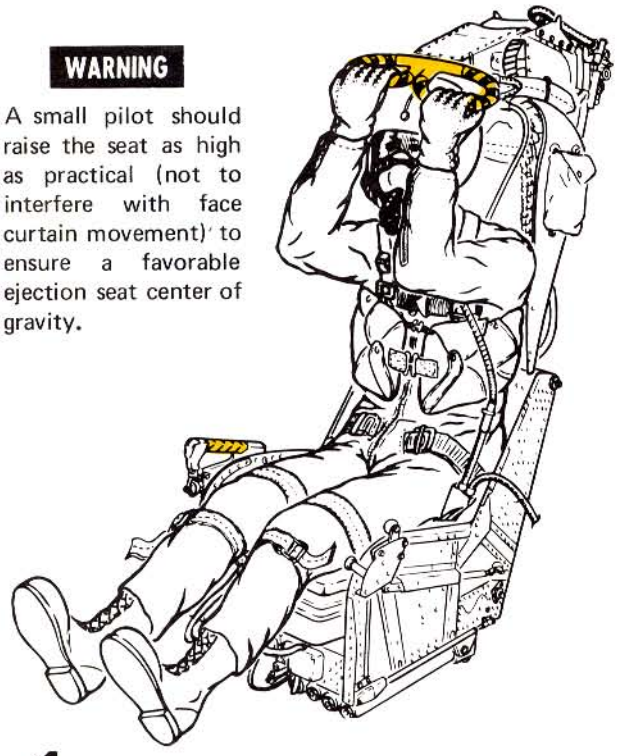
WARNING

Do not pull emergency restraint release before ejection.



WARNING

A small pilot should raise the seat as high as practical (not to interfere with face curtain movement) to ensure a favorable ejection seat center of gravity.



1 Sit erect in seat, buttocks against backrest, head firmly against headrest, spine straight, thighs firmly against seat pan, legs extended forward with feet on rudder pedals. Harness properly adjusted and tight. Grasp face curtain with both hands, elbows in, thumbs outboard.

2 Pull face curtain out and downward in one firm, continuous motion. Canopy will be jettisoned. A slight delay in curtain travel might be noticed during canopy jettisoning. Continued pulling on face curtain will eject the seat.

WARNING

If in high positive or negative g flight, it may be impossible to reach or obtain the proper force vector on the face curtain. Use lower ejection handle.

IF IMPOSSIBLE TO USE FACE CURTAIN

- Grasp lower ejection handle with right hand.
- Grasp right wrist with left hand.
- Pull handle straight up sharply.
- Seventy lb of tension and approximately 8 inches of travel are required to actuate the ejection system

IF IMPOSSIBLE TO SIT ERECT IN SEAT DUE TO SEAT BEING STUCK IN FULL-UP POSITION OR OTHER SIMILAR PROBLEM

- Jettison the canopy manually
- Position the body properly and pull lower ejection handle.

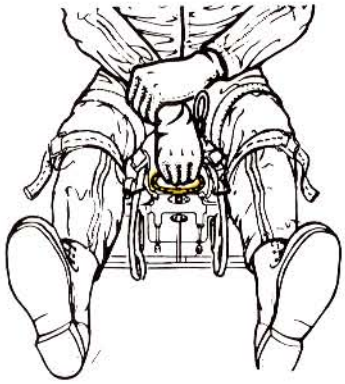


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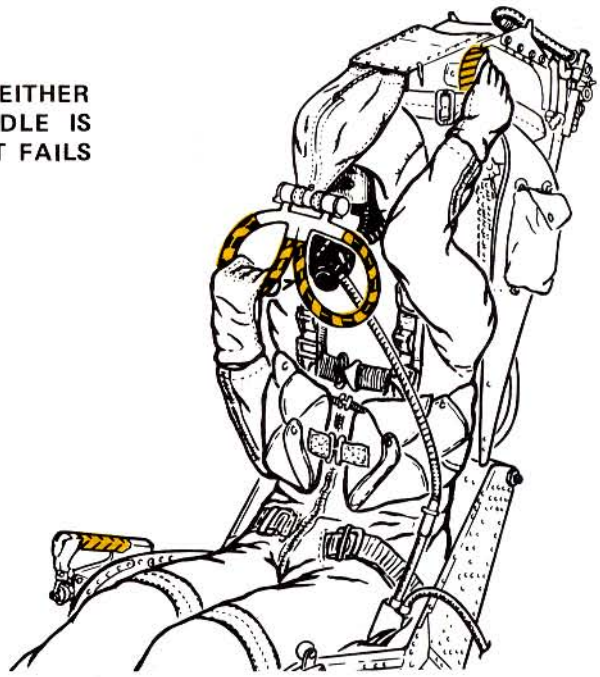
Figure 5–5 (Sheet 1)

EJECTION PROCEDURE



IF CANOPY FAILS TO BE JETTISONED WHEN EITHER FACE CURTAIN OR LOWER EJECTION HANDLE IS PULLED OR IF CANOPY JETTISONS BUT SEAT FAILS TO EJECT

Hold face curtain or lower ejection handle with right hand.

Pull canopy interrupter release handle with left hand.

Continue to pull ejection control with both hands.

Note

If canopy jettisons and seat remains in aircraft, the canopy interrupter must be pulled to continue ejection sequence.

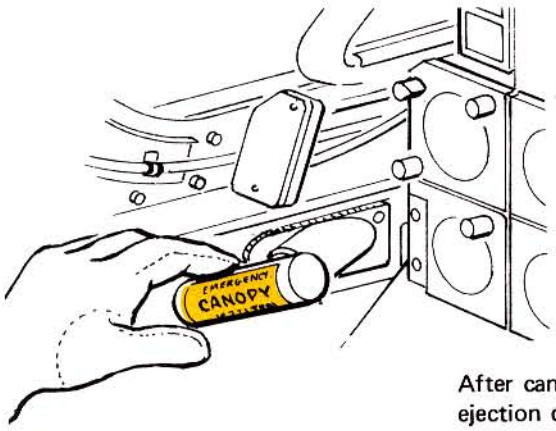
WARNING

Do not release the face curtain after it has been pulled. If one hand must be freed to aid ejection, grip face curtain tightly with other hand. The purpose of the face curtain is to protect the pilot from windblast and from flying glass if ejection is through the canopy.

IF CANOPY FAILS TO BE JETTISONED AND UNABLE TO ACTUATE CANOPY INTERRUPTER RELEASE HANDLE

WARNING

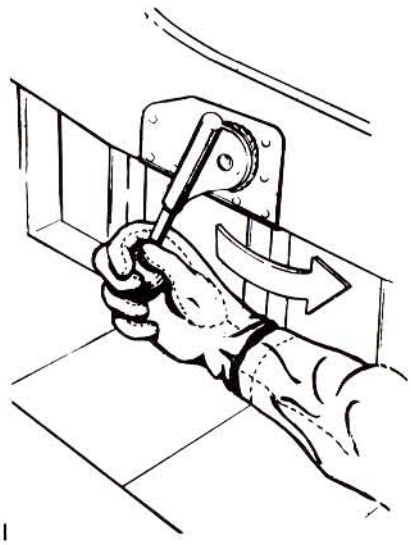
A small pilot may have difficulty reaching the canopy interrupter release handle if utilizing the MK-F7 seat and RSSK-6B seat pan with seat full down. Position seat in a high as practical position to overcome this problem and to ensure a proper center of gravity for the seat.



Pull emergency canopy jettison handle

OR

Manually open canopy locks



After canopy separates, continue to pull ejection control to eject seat.

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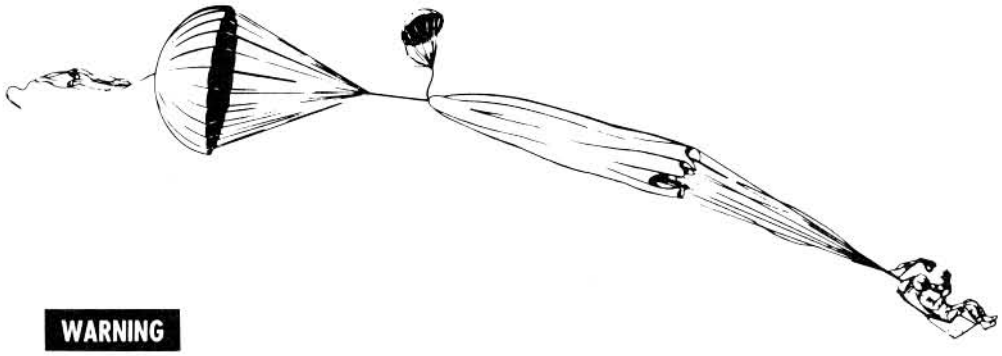
Figure 5–5 (Sheet 2)

AFTER EJECTION

WITH RIGID SEAT SURVIVAL KIT (RSSK-6B)



WARNING

During ejection, the seat is drogue stabilized. If the drogue chute does not deploy (characterized by continuous tumbling of the seat), manually separate from the seat.

When ejecting above 13,000 feet and drogue chute deploys, allow time for the altitude-time-delay-g mechanisms to function. If the personnel chute does not automatically deploy at 11,500 feet, manually separate from the seat. When ejecting below 11,500 feet, be prepared to manually separate from the seat immediately if automatic release fails to occur.

NOTE

The minimum altitude at which barostatic opening of the parachute occurs is 11,500 feet. With the MK-F7 seat there is no g-limiter and consequently no delay due to high speed ejection.

TO MANUALLY SEPARATE FROM THE SEAT:

- Pull the emergency restraint release
- Lunge forward to release parachute from support post
- Push free from seat
- Pull the parachute ripcord

WARNING

To ensure full travel of the parachute ripcord lanyard, the pilot should hold the left front riser with his left hand and pull the parachute ripcord with his right. If chute does not deploy after parachute ripcord actuates, grasp the risers and pull the chute pack down where it can be held by hand. Open the top flap, pull out the small drogue chute and throw it into the windstream. Normal chute opening will occur.

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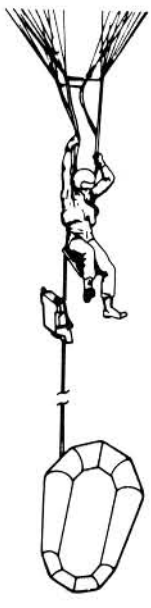
Figure 5–6 (Sheet 1)

Remove the oxygen mask before landing or at any time breathing becomes difficult. This action provides better visibility and reduces the possibility of suffocation following injury or depletion of emergency oxygen supply.

After contact, release the parachute canopy by disconnecting the shoulder fittings. Release the seat pan by disconnecting the hip fittings.



OVERWATER EJECTION PRECAUTIONS

When utilizing RSSK-6 seat pan, actuate the raft release on the right side of the seat pan to deploy the raft prior to entering the water. Leave both hip fittings attached.

Immediately after entering the water, release the parachute canopy by disconnecting the shoulder fittings. Rapid release is desirable to prevent entanglement with the shroud lines.

Completely release parachute and seat pan before entering a helicopter rescue sling.

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Figure 5–6 (Sheet 2)

JETTISONING CANOPY

Procedures

1. Emergency canopy jettison handle – PULL

If canopy fails to jettison:

2. Canopy locks – OPEN MANUALLY

EMERGENCY DESCENT

Procedures

To get aircraft down as rapidly as possible:

1. Throttle – IDLE
2. Speed brake – EXTEND FULLY
3. Cockpit heat – INCREASE
4. Defogger switch – DEFOG
   - Placing the defogger switch in DEFOG upon initiating dive may be helpful in preventing fogging of windshield.
5. Dive aircraft as steeply as desired.
   - Refer to MANEUVERING section IV, part 2, for information on dive recovery.
   - Monitor airspeed and altitude closely during dive and begin pullout with adequate altitude for recovery.

STALLS, SPINS AND UNCONTROLLED FLIGHT

Characteristics and recovery procedures for stalls, spins, and uncontrolled flight are contained in section IV, part 2.

It is difficult to recognize uncontrolled maneuvers. First action should be to move the controls to neutral. The three major errors of technique associated with spins in the F-8 are:

- Getting into the spin initially.
- Not using proper recovery technique.
- Not abandoning the aircraft at 10,000 feet AGL when recovery unsuccessful.

All of these errors are easily avoided by eliminating the first one.

LOSS OF AIRSPEED INDICATOR

In the event of an airspeed indicator failure, the angle-of-attack indicator is sufficient to perform the following maneuvers. The values are accurate only in 1 g flight.

FLIGHT CONDITION	ANGLE OF ATTACK – UNITS
Takeoff	
Start wing down	9.0
Wing locked by	14.0
MRT Climb (cruise droop out)	
0 to 10,000 feet	8.0–9.0
10,000 to 20,000 feet	9.0–9.5
20,000 to 30,000feet	9.5–10.5
30,000 to 40,000 feet	10.5–11.5
Above 40,000 feet	11.5
Max Endurance	
Cruise droop out	13.0
Max Range (cruise droop out)	
Sea level	9.5
40,000	11.5
Penetration (cruise droop out)	
Speed brake down, 82%, 4,000 to 6,000 FPM rate of descent	13.0
Landing	
Gear extension (wing down, cruise droop out)	12.0–13.0
Wing raising	14.0
Carrier pattern and approach	13.5
GCA pattern (landing configuration)	13.5
GCA pattern (final)	13.5
Field landing	13.5
Wing down landing (cruise droop out or stuck in the retracted position)	17.0 (carrier) 16.0 (field)
Stall Warning	
Clean (cruise droop in)	15.5
Clean (cruise droop out)	17.0
Clean (land droop out)	20.0
Landing configuration	14.5
Airspeed vs. Angle of Attack	
Inflight check: Clean, 3,000 pounds fuel, 300 KIAS, cruise droop out (add 7 knots for each additional 1,000 pounds fuel; deduct 7 knots for each 1,000 pounds less)	10.0
Inflight check: Landing configuration 3,000 pounds fuel, 150 KIAS (add 4 knots for each additional 1,000 pounds fuel; deduct 4 knots for each 1,000 pounds less)	11.0

PART 4 — LANDING EMERGENCIES

ALL LANDING EMERGENCIES

Landing emergency information is summarized for ready reference in figure 5–7.

Procedures

Before entering traffic pattern:

1. Dump wing fuel.

Before landing:

2. Expend fuselage transfer fuel.
3. Fuel dump switch — OFF
   - Place fuel dump switch in OFF before touchdown, even if fuel dumping has not been completed, to make sure electrical power is available to close the dump valve.
4. Fuel transfer switch — PRESS DUMP
5. Canopy — JETTISON IF DESIRED
   - Jettison canopy in flight if the seriousness of a specific emergency requires it. Do not jettison the canopy if a barricade engagement is to be made.

After landing:

6. Perform emergency egress if necessary.
   - EMERGENCY EGRESS procedure is found in this section, part 1.

LANDING WITH GEAR OUT OF POSITION

In all cases of failure of the landing gear to extend normally, try to extend the gear pneumatically before attempting to land with the gear out of position.

ALL LANDING GEAR UP

Field Procedures

Execute controlled ejection

— OR —

If ideal conditions exist; i.e., minimum crosswind, experienced pilot, foamed runway, etc:

1. Perform normal landing approach using optimum approach angle of attack.
2. Assure minimum sink rate on touchdown.
3. Throttle off at touchdown.
4. Engine master switch – OFF
5. Master generator switch – OFF

Carrier Procedures

Execute controlled ejection

NOSE GEAR TRAILING OR UP

Field Procedures

1. If possible, retain aft transfer fuel and burn main cell down to 1,000 pounds to provide aft cg.
2. Execute normal landing without arrestment.
   - Use brakes only if necessary to avoid obstacles.
   - Fly nose onto runway before losing pitch control to avoid sudden dropping (approximately 100 KIAS dependent upon cg location).
   - Have runway arresting wires removed in landing roll-out area to prevent engagement of aircraft duct by wires.

Just before losing pitch control:

3. Throttle – OFF
4. Engine master switch – OFF
5. Master generator switch – OFF

Refer to Part IV, Landing Emergencies, for additional information.

Description of Failure	*Recommended Action*	
	Shore	*Ship*
All landing gear up	Controlled ejection; or, if conditions ideal, normal landing with minimum sink rate at touchdown.	Controlled ejection.
Nose gear trailing or up	Normal landing. No arrestment. Secure engine after landing. Fly nose onto runway before losing pitch control. CG as far aft as practical.	Barricade arrestment with hook down;** normal arrestment optional.‡**
Main gears up	Short field arrestment.††	Divert to shore for short field arrestment. If unable, execute controlled ejection or place hook down and make barricade arrestment.
One main gear up or trailing	Short field arrestment.††	Barricade arrestment with hook down;** normal arrestment optional.‡**
One main gear and nose gear up or trailing	Short field arrestment.††	Barricade arrestment with hook down.**
Nose gear canted	Short field arrestment. Turn generator switch off just before touchdown.	Normal arrested landing.
Gear barberpole	Treat as corresponding gear up unless determined to be down.	Treat as corresponding gear up unless determined to be down.
Nosewheel missing	Normal landing. No arrestment. Fly nose onto runway before losing pitch control. CG as far aft as possible.†	Barricade arrestment with hook down.**
Main gears severed on landing (carrier, aircraft bolters)	Continue rollout attempting to maintain directional control.	Select afterburner and climb. If control lost, eject.

†Remove runway arresting wires in landing rollout area to prevent engagement of aircraft duct by wires.
‡High sink rates on landing must be avoided.
**Divert to suitable field, if possible, and execute appropriate shorebase emergency landing.
††Runway should be foamed if time permits.

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Figure 5-7 (Sheet 1)

Refer to Part IV, Landing Emergencies, for additional information.

Description of Failure	*Recommended Action*	
	Shore	*Ship*
One main wheel missing	Short field arrestment.††	Perform a barricade arrestment in accordance with the Barricade Bulletin for the ship class involved.
Any landing gear failure with failure of wing to raise	Landing appropriate to particular gear failure.‡‡	Divert to suitable field and make landing appropriate to particular gear failure.‡‡ If not possible, execute controlled ejection.
Arresting hook failure/unsafe	Normal landing.	Barricade arrestment.**
Blown tires	Short field arrestment.	Normal arrestment.
Wing down	Secure engine after landing. Long field arrestment. Approach speed for wing-down landing—corresponding to 16 units (160–175 KIAS).	Normal arrestment without barricade. Approach speed — corresponding to 17 units (150–160 KIAS).
Utility hydraulic failure	Normal arrestment. Aircraft must be towed out of arresting gear. Will be unable to fold wings or raise hook. No normal wheel brakes available. No nose gear steering.	Normal arrestment. Aircraft must be towed out of arresting gear.
Main generator failure	Normal landing. Tow in from runway.	Normal arrestment. Aircraft must be towed out of gear. Will be unable to fold wings or raise hook. No nosewheel steering.

**Divert to suitable field, if possible, and execute appropriate shorebase emergency landing.
††Runway should be foamed if time permits.
‡‡Damage to arresting gear can be anticipated due to high engaging speeds.

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Figure 5–7 (Sheet 2)

Carrier Procedures

If unable to divert to suitable field:

1. Extend arresting hook.
2. Avoid high sink rate on landing.
3. Perform barricade arrestment (normal arrestment optional).
   - Refer to BARRICADE ARRESTMENT for arrestment techniques.

BOTH MAIN GEAR UP

Field Procedures

1. Have runway foamed if time permits.
2. Perform short field arrestment.
   - Refer to LANDING — USE OF EMERGENCY FIELD ARRESTING GEAR for short field arrestment techniques.

Carrier Procedures

If unable to divert to suitable field:

Execute controlled ejection.

— OR —

1. Extend arresting hook.
2. Perform barricade arrestment.
   - Refer to BARRICADE ARRESTMENT for arrestment techniques.

ONE MAIN GEAR UP OR TRAILING

Field Procedures

1. Perform short field arrestment.
   - Refer to FIELD ARRESTMENTS for short field arrestment techniques.

Just before losing roll control:

2. Throttle — OFF
3. Engine master switch — OFF
4. Master generator switch — OFF

Carrier Procedures

1. Extend arresting hook.
2. Perform barricade arrestment (normal arrestment optional).
   - Refer to BARRICADE ARRESTMENT for arrestment techniques.

ONE MAIN GEAR AND NOSE GEAR UP OR TRAILING

Field Procedures

1. Have runway foamed if time permits.
2. Perform short field arrestment.
   - Refer to FIELD ARRESTMENTS for short field arrestment techniques.

Carrier Procedures

If unable to divert to suitable field:

1. Extend arresting hook.
2. Perform barricade arrestment.
   - Refer to BARRICADE ARRESTMENT for arrestment techniques.

NOSE GEAR CANTED

Field Procedures

1. Plan minimum rate of descent touch and go landing.

2. Secure main generator, extend EPP, EPP switch ON or LAND.
   - With no secondary bus, nose gear is free to caster.
   - In VMC condition, use EPP in ON position even at approach speed to retain UHF.
   - In IMC conditions or if EPP power is lost in ON position at approach speed, use LAND position.

3. Secure stabs prior to approach for landing.

4. Fly a minimum rate of descent landing, ease nose down to deck, rotate, and go around.

5. Use generator or EPP in ON position to obtain UHF and get visual check of gear.
   - If gear appears normal, make another minimum rate of descent landing, as described to a full stop.
   - If gear still canted, make the approach as described above to a short field arrestment.

Carrier Procedures

1. Normal arrestment with EPP out and ON/LAND.

   • Possibility of nose gear damage exists. Clear the flight deck forward of all unnecessary personnel.

GEAR INDICATOR BARBERPOLE

Note

In VFR conditions, cycle the generator to try to obtain positive gear indications before exercising emergency system.

Field Procedures

1. Execute a "minimum rate of descent" touch-and-go landing to determine if the applicable gear is down and locked.

   • Following a minimum descent touch-and-go, repositioning of the main gear could provide a down-and-locked position.

CAUTION

Do not actuate brake pedals while airborne. Actuation of the brake pedals following pneumatic extension of the landing gear could result in locked or dragging brakes.

2. Attempt to obtain a safe indication of the landing gear by pneumatically actuating the gear.
3. Treat as corresponding gear up or trailing emergency regardless of indication.

Carrier Procedure

1. Treat as corresponding gear up or unsafe indication emergency.

LANDING WITH DAMAGED LANDING GEAR/HOOK

NOSEWHEEL MISSING

Field Procedures

1. Execute normal landing without arrestment.
   • If possible, retain aft transfer fuel and land with 1,000 pounds in the main tank to move cg aft.
   • Use brakes only if necessary to avoid obstacles.
   • Fly nose onto runway before nose falls through (approximately 100 KIAS, dependent upon cg position).
   • Have runway arresting wires removed in landing roll-out area to prevent engagement of aircraft duct by wires.

Just before losing pitch control:

2. Fly nose onto runway.
3. Throttle — OFF
4. Engine master switch — OFF
5. Master generator switch — OFF

Carrier Procedures

1. Extend arresting hook.
2. Perform barricade arrestment.
   • Refer to BARRICADE ARRESTMENT for arrestment techniques.

BOTH MAIN GEAR SEVERED ON LANDING (CARRIER — AIRCRAFT BOLTERS)

Field Procedure

Continue rollout, attempting to maintain control.

Carrier Procedures

1. Select afterburner.
2. Climb.

If loss of control experienced:

3. Eject.

ONE MAIN WHEEL MISSING

Field Procedures

1. Have runway foamed if time permits.
2. Perform short field arrestment.
   • Refer to LANDING — USE OF EMERGENCY FIELD ARRESTING GEAR for short field arrestment techniques.

Carrier Procedures

If unable to divert to suitable field:

1. Extend arresting hook.
2. Perform a barricade arrestment in accordance with the Barricade Bulletin for the ship class involved.

ANY LANDING GEAR FAILURE WITH FAILURE OF WING TO RAISE

Field Procedure

Use landing procedures appropriate to particular gear failure.

   • Anticipate damage to arresting gear due to high engaging speed.

Carrier Procedure

If unable to divert to suitable field:

Execute controlled ejection.

ARRESTING HOOK FAILURE/INDICATING UNSAFE

Field Procedure

Execute normal landing.

Carrier Procedure

If unable to divert to suitable field:

1. If indicating unsafe, obtain airborne check if possible. If unsafe, attempt recycle.
2. If hook visually checked unsafe, or if indicating unsafe and no visual check possible, or if the hook is damaged: perform barricade arrestment.
   - Refer to BARRICADE ARRESTMENT for techniques.

BLOWN TIRES

Field Procedure

1. If tire blows on touchdown or immediately thereafter, waveoff and perform short field arrestment.
   - Refer to LANDING – USE OF EMERGENCY FIELD ARRESTING GEAR for short field techniques.

2. If tire blows on rollout, maintain directional control with rudder and opposite brake. Avoid blowing the other tire. Speed permitting, utilize nosewheel steering to avoid swerving off the runway. Exercise caution as nosewheel steering is very sensitive at speeds above normal taxi.

Carrier Procedure

Perform normal arrestment.

LANDING WITH WING DOWN

Emergency wing down carrier landings are feasible under ideal conditions. Such things as adverse weather, pitching deck, darkness, and pilot proficiency must be taken into account in assessing the possibility of a successful wing down carrier landing. If a field landing can be accomplished, a carrier landing should not be attempted with the wing down because of the probability of aircraft damage. Do not use APC during the approach. The compensator would produce an excessively fast approach if operated with the wing down because it bases the throttle setting on optimum AOA with the wing up.

CAUTION

If committed to a wingdown landing with the hook down, consideration shall be given to having shortfield arresting cables removed if landing speeds will exceed published engagement speeds.

Field Procedure

1. Burn down fuel to attain as low a gross weight as possible compatible with the operational situation.

2. Cruise droop — EXTEND IF POSSIBLE
   - If the land droop has not been blown, and if utility hydraulic pressure is still available, use the cruise droop configuration for slower approach speeds; however, any droop setting is acceptable.

3. Approach speed — corresponding to 16 units (160 to 175 KIAS)

4. Shut engine down on touchdown.

5. Perform long field arrestment. Use brakes judiciously. Excessive aerodynamic braking will cause tailpipe to drag on the runway.

Carrier Procedure

(To be used only when field landing cannot be accomplished)

1. Wind over deck — HIGHEST POSSIBLE UP TO 45 KNOTS
   - WOD above 45 knots will result in excessive burble.

2. OLS setting — 4° (to give good visibility and hook-to-ramp clearance)

3. No barricades since the airplane has a bolter capability.

4. Reduce aircraft gross weight.
   - Burn down fuel to attain as low a gross weight as compatible with the operational situation.

5. Cruise droop — EXTEND IF POSSIBLE
   - If the land droop has not been blown, and if utility hydraulic pressure is still available, use the cruise droop configuration for slower approach speeds. If cruise droop is not available, extend the emergency landing droop if possible.

6. Fly a wide pattern or a straight-in approach for a comfortable 1½-mile straightaway.
7. Approach speed — CORRESPONDING TO 17 UNITS (150 TO 160 KIAS)

CAUTION

Maximum published engaging speed limit of ship's arresting gear should not be exceeded.

The approach speed at 17 units will be approximately 12 knots less than the speed corresponding to 16 units. At 17 units the visibility is reduced such that the mirror will only be visible through the side windshield panel.

Tail cone damage can be expected during any wing down carrier landing. The flying qualities are satisfactory at 18 units for the cruise or land droop configuration. Buffet commences at 17 units angle of attack for the cruise droop configuration and 20 units for the land droop configuration with stabilized flight possible to 19 and 22 units respectively.

In the event of a bolter, be prepared to rotate the aircraft to the attitude required to maintain level flight as the angled deck bow is passed. (Remember, fuselage attitude will be higher than usual.)

Barricade engagements resulting from the wing down condition alone are not required or recommended. If, however, for other compelling reasons a barricade recovery is required, a successful barricade engagement may be made with the wing down, using the technique described in this procedure.

LANDING — USE OF EMERGENCY FIELD ARRESTING GEAR

There are several types of field arresting gear. These types include the anchor chain cable, water squeezer, and Morest-type equipment. All of these types require engagement of the arresting hook in a cable pendant rigged across the runway. Location of the pendant in relation to the runway will classify the gear as follows:

1. Midfield gear. Located near the halfway point of the runway. Usually requires prior notification in order to rig for arrestment in the direction desired.
2. Abort gear. Located 1,500 to 2,500 feet short of the upwind end of the duty runway and usually will be rigged for immediate use.
3. Overrun gear. Located shortly past the upwind end of the duty runway. Usually will be rigged for immediate use.

Some fields will have all of these types of gear, others none. For this reason, it is imperative that all pilots be aware of the type, location, and compatibility of the gear in use with the aircraft, and the policy of the local air station with regard to which gear is rigged for use and when.

The approximate maximum permissible engaging speed, gross weight, and off-center engagement distance for field arrestment of aircraft are listed in figure 5–7A.

WARNING

Under no circumstances should pilot decision to abort a takeoff be delayed because of knowledge that an emergency arresting gear is available at the end of the runway. Decision to abort should be based on the usual parameters of remaining runway and distance required for stopping, using wheel brakes. The arresting gear will then serve as an assist to stop the aircraft from rolling off the runway onto unprepared surfaces.

If off center just prior to engaging arresting gear, do not attempt to go for center of runway. Continue straight ahead parallel to centerline.

As various modifications to the basic types of arresting gear are made, exact speeds will vary accordingly. Certain aircraft service changes may also affect engaging speed and weight limitations.

Severe damage to the aircraft is usually sustained if an engagement is made in the wrong direction into the chain gear.

EMERGENCY FIELD ARRESTMENT DATA

TYPE OF ARRESTING GEAR	MAXIMUM ENGAGING SPEED KNOTS (a)			MAXIMUM OFF-CENTER ENGAGEMENT FEET
	SHORT FIELD LANDING GROSS WEIGHT UP TO 22,000 LBS (b,c)	LONG FIELD LANDING GROSS WEIGHT UP TO 26,000 LBS (d)	ABORTED TAKEOFF GROSS WEIGHT UP TO 34,000 LBS (f)	
M-2	122	115	103	20
E-14-1	160	160	160	50
E-27	165	160	153	35
E-15 (200' SPAN)	180	180	180	35
E-15 (300' SPAN)	180	180	180	40
M-21	160	160	150	10
E-28	180	180	180	40
E-5 (STD CHAIN)	150	150	150	(e)
E-5-1 (STD CHAIN)	165	165	159	(e)
E-5 (HEAVY CHAIN)	150	150	150	(e)
E-5-1 (HEAVY CHAIN)	165	165	165	(e)
BAK-6	160	160	159	15
BAK-9	160	160	160	30
BAK-12	160	160	160	50

NOTES

(a) All engaging speeds limited by arresting gear capacity.
(b) Maximum of 3.0 degree glide slope.
(c) Consult appropriate section for recommended approach speed.
(d) Flared or minimum rate of descent landing.
(e) Off-center engagement may not exceed 25% of the runway span.
(f) Data provided in the aborted take-off column may be used for emergency high gross weight arrestments.

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Figure 5–7A

The following recommendations are made; however, depending upon the existing emergency condition, runway conditions, weather, time, fuel remaining, and other considerations it may be impractical or impossible to adhere strictly to the following general recommendations.

In an emergency situation, first determine the extent of the emergency by whatever means are possible (instruments, other aircraft, LSO, RDO, tower, or other ground personnel). Next, determine the most advantageous arresting gear available and the type of arrestment to be made under the conditions which prevail. Whenever deliberate field arrestment is intended, notify control tower personnel as much in advance as possible and state estimated landing time in minutes. If gear is not rigged, it will probably require 10 to 20 minutes to prepare it for use. If foaming of the runway or area of arrestment is required or desired, it should be requested by the pilot at this time.

In general, the arresting gear is engaged on the centerline at as slow a speed as possible. Burn down to 1,500 pounds of fuel or less. While burning down, make practice passes to accurately locate the arresting gear. Engagement should be made with feet off the brakes, shoulder harness locked, and with the aircraft in a 3-point attitude. After engaging the gear, good common sense and existing conditions now dictate whether to keep the engine running or to shut it down and abandon the aircraft.

SHORT FIELD ARRESTMENTS

If at any time before landing it is known that a directional control problem exists or a minimum rollout is desired, a short field arrestment should be made and the assistance of an LSO requested. He should be stationed near the touchdown point and equipped with a radio. Inform the LSO of the desired touchdown point. A constant glide slope approach to touchdown is permitted (mirror or Fresnel Lens Landing Aid utilized) with touchdown on centerline at or just before the arresting wire with the hook extended. The hook should be lowered while airborne and a positive hookdown check should be made, if possible. If midfield gear or Morest type is available, it should be used. If neither is available, use abort gear. Use an approach speed commensurate with the emergency experienced. Landing approach power will be maintained until arrestment is assured or a waveoff is taken. Be prepared for a waveoff if the gear is missed. After engaging the gear, retard the throttle to IDLE or secure engine and abandon aircraft, depending on existing conditions.

LONG FIELD ARRESTMENTS

The long field arrestment is used when a stopping problem exists with insufficient runway remaining (i.e., aborted takeoffs, icy or wet runways, loss of brakes after touchdown, etc). Lower the hook, allowing sufficient time for it to extend fully before engagement. Lower the hook, allowing sufficient time for it to fully extend before engagement (8 seconds – 100 KIAS at 1360 feet; 125 KIAS at 1700 feet). Do not lower the hook too early and weaken the hook point. Line up the aircraft on the runway centerline. Inform the control tower of your intentions to engage the arresting gear, so that aircraft landing behind you may be waved off. If no directional control problem exists (crosswind, brakes out, etc), secure the engine.

ABORTED TAKEOFF

Where an aircraft takeoff must be aborted, a roll-in type engagement of all arresting gear is recommended to prevent overrun. The aircraft is cleared up to the maximum takeoff gross weight specified in the Aborted Takeoff column of figure 5–7A. Additionally, the data provided in the Long Field Landing column may be used for light weight aborted takeoff, where applicable.

Note

The taxi light may be of use in locating arresting/abort gear at night.

BARRICADE ARRESTMENT

Do not jettison the canopy for barricade arrestment. The nose section and canopy are designed to pass beneath the top cable of the barricade, but it is recommended that the canopy be kept closed as an additional safeguard against injury inflicted by the top cable.

Procedures

1. Burn down fuel as required.
   - Burn down fuel to attain lowest aircraft gross weight compatible with the operating situation.
2. Execute normal approach on meatball.
   - Maintain precise lineup and speed control. A late wave-off cannot be given.
   - Be under positive control of the LSO and follow his instructions explicitly, including a "cut" if it is given. Green cut lights are a "no radio" LSO signal for power to jet aircraft.

Upon engaging the barricade:

3. Throttle – OFF
4. Engine master switch – OFF
5. Master generator switch – OFF
6. Evacuate aircraft as soon as possible.

LANDING WITH HYDRAULIC SYSTEMS FAILURE

FAILURE OF UTILITY SYSTEM

Field Procedure

Perform short field arrestment.

CAUTION

Actuation of the pneumatic system following utility hydraulic failure can possibly lead to air bleeding into the wheel brake system and a locked or dragging brake. A short field arrested landing should be made after actuation of the pneumatic system unless other associated landing emergency dictates otherwise.

- The brake accumulator may provide enough hydraulic pressure for several normal brake applications. However, when the pressure is lost, the pneumatic brakes (and field arresting gear) must be relied upon for aircraft braking. Refer to BRAKE FAILURE, this section, Part 1, for emergency braking techniques.
- Refer to HYDRAULIC SYSTEM FAILURES, this section, Part 3, for procedures on emergency (pneumatic) operation of wing incidence and leading edge droop system and landing gear.

Carrier Procedure

Execute normal arrestment.

- Have aircraft towed out of gear. Hook will not retract, wings will not fold, and nose gear steering and normal wheel brakes will not be available.

FAILURE OF UTILITY AND PC 1 SYSTEMS

Field Procedure

Perform short field arrestment.

- Approach and landing may be performed with the rudder locked or unlocked, provided airspeed remains at 200 KIAS or below while operating in the unlocked condition.
- If unable to perform short field arrestment, consideration must be given to crosswind and other field conditions before making decision to land as nose steering and normal hydraulic brakes will be inoperative.

Carrier Procedure

Perform normal arrestment.

FAILURE OF PC 1 AND PC 2 SYSTEMS

The following is applicable only if the UHT restraint has been employed and the EPP restores PC 1 pressure.

- A landing is not recommended unless the EPP provides a stabilized pressure of 1,500 psi or greater. The UHT lock should be disengaged as soon as PC 1 pressure is restored to avoid overloads on the PC 1 system when overriding the camlock.

Field Procedure

Land immediately at nearest suitable field.

- Perform straight-in precautionary approach to a mid or long field arrestment.
- Closely monitor PC 1 pressure and use least possible amount of flight control deflection. Minimum safe airspeed for adequate flight control is 140 KIAS with the emergency generator switch in OFF.

Carrier Procedure

The authorization for landing aboard carrier with PC 1 powered by the EPP (PC 2 inoperative) shall be determined by the LSO or appropriate commander.

Perform normal arrestment.

- Go easy on the controls during the approach. An approach should be planned to utilize the least amount of flight control deflections.

DEAD-ENGINE LANDING

If impossible to abandon the aircraft, perform the dead-engine landing as described and illustrated in figure 5–8. Figure 5–9 shows the maximum power-off glide distances. Simulated flameout approaches are prohibited.

LANDING WITH MAIN GENERATOR FAILURE

Field Procedure

1. Land as soon as practicable
2. Execute normal landing
3. Clear the runway, shut down the aircraft, and have aircraft towed to the line.

It is significant that exterior lights, UHF and nose gear steering will be lost during landing rollout.

Carrier Procedure

1. Execute normal landing.
2. Have aircraft towed out of gear; hook will not retract, wings will not fold, and nose gear steering will not be available and radios will not operate.

LANDING WITH COMPLETE ELECTRICAL FAILURE

1. Land as soon as possible.
   - Since fuel cannot be dumped, the landing may have to be a minimum rate of descent landing.
   - Angle of attack is not available. Fly airspeed.
   - Nose gear steering is not available for emergency directional control during landing rollout.
   - A visual check of landing gear will be needed to assure gear are down and locked.

DEAD-ENGINE LANDING
(TYPICAL)

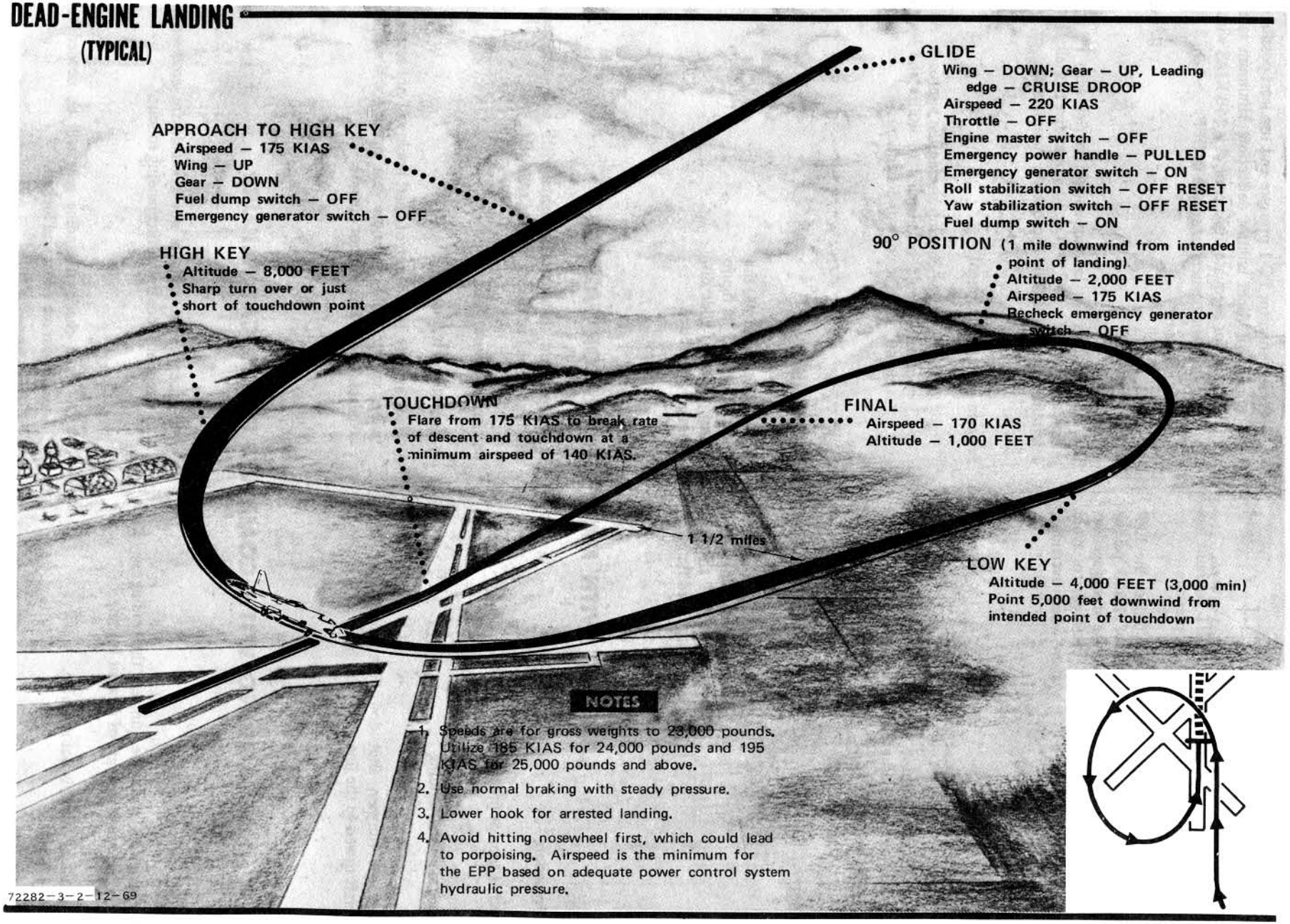
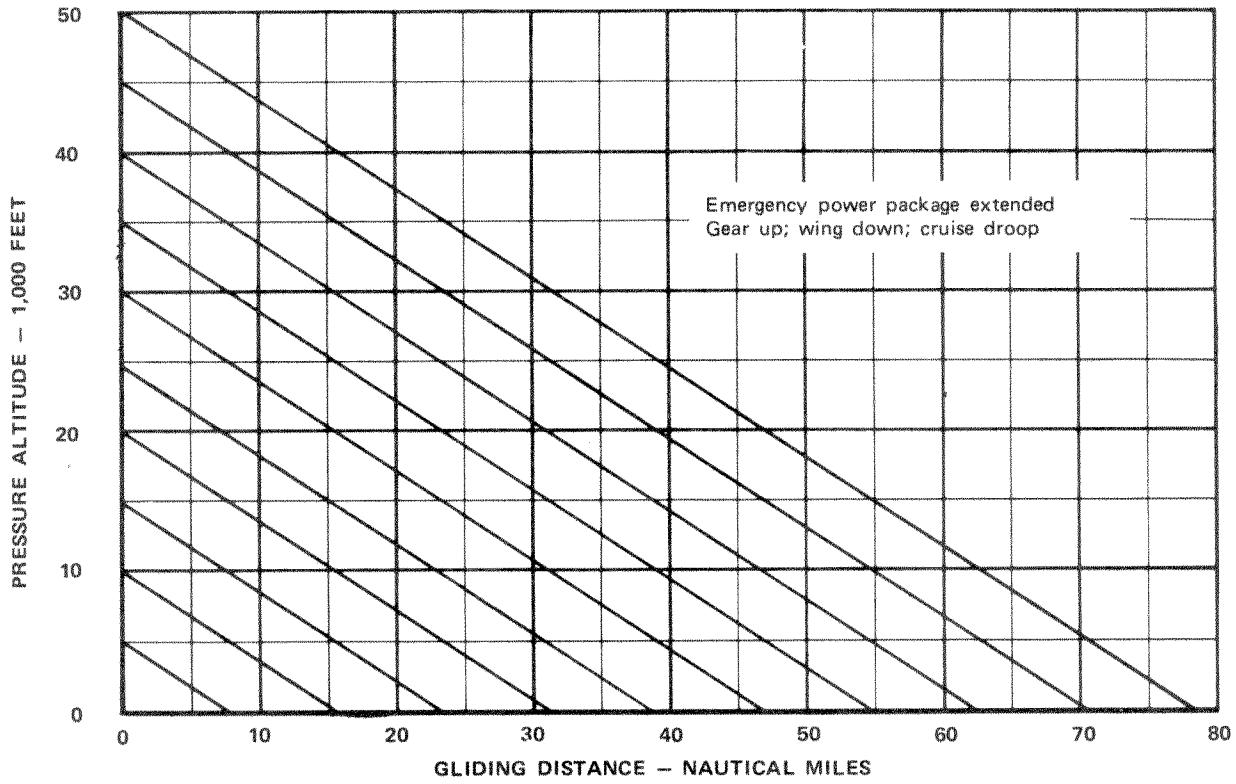


Figure 5–8

GLIDING DISTANCE–NO THRUST

GLIDE SPEED: 220 KNOTS IAS



GLIDE SPEED – 175 KIAS (SEE NOTE 1)

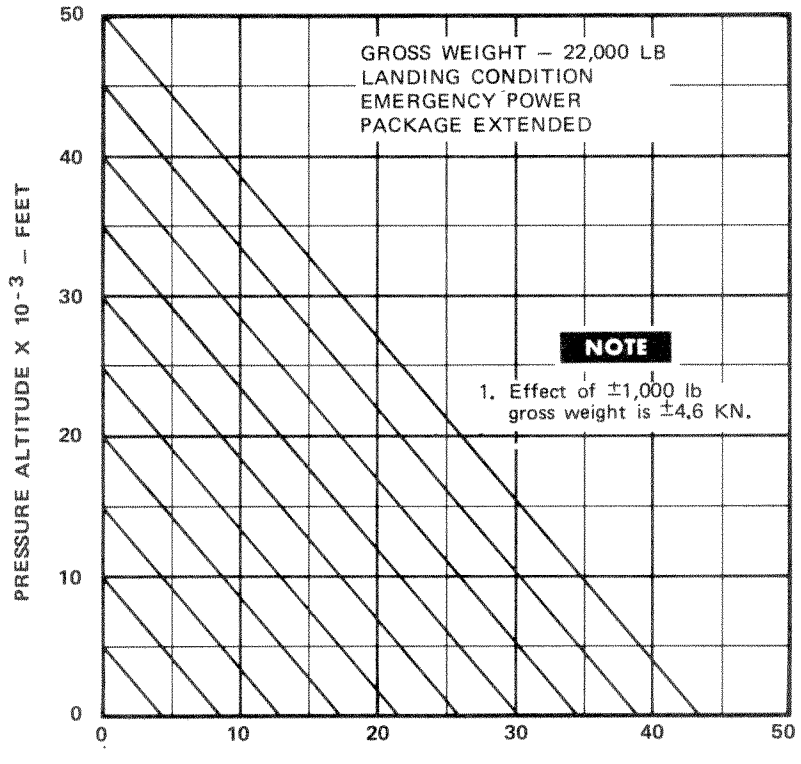


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Figure 5–9

DITCHING

Procedures

If impossible to abandon the aircraft:

1. Perform radio distress procedure.

2. Wing – AS IS (if down, deploy leading edge landing droops by placing EMERG SPIN DROOP switch in the ON position)

   - Do not change wing position for ditching. Ditching with the wing in the down position will attain a nose-high attitude at touchdown speed. Normally, the wing will be up only during takeoff or landing. Lowering the wing under these conditions would produce a high rate of sink which could not be arrested before touchdown.

3. Canopy – JETTISON

   In any ditching situation, pull emergency canopy release handle before contact.

4. Landing gear – WHEELS UP

5. Speed brake – RETRACT

6. Shoulder harness – LOCKED

7. Glide speed – 170 KIAS desirable

   - If EPP extended, the minimum indicated airspeed for adequate power control hydraulic pressure from the package is 145 KIAS with the emergency generator switch in LAND. With the switch in OFF, the minimum speed is 140 KIAS.

Just before contact:

8. Engine master switch – OFF

9. Throttle – OFF

10. Touchdown – NOSE HIGH (Airspeed dependent on configuration and fuel weight.)

    - Flare the aircraft just before contact. Immediately after the forward motion stops, abandon the aircraft.
    - If the aircraft is ditched in a near-level attitude, it will probably dive violently after contact.

Refer to EMERGENCY EGRESS in part 1 of this section for egress procedures.

ROUGH-FIELD LANDING

Procedures

If aircraft must be landed on an unprepared field:

1. Landing gear – EXTEND
2. Wing – UP
3. Shoulder harness – LOCK

Just before contact:

4. Canopy – JETTISON
5. Engine master switch – OFF
6. Throttle – OFF

PRECAUTIONARY APPROACH

Simulated flameout approaches are prohibited. A precautionary approach is recommended when (but not limited to):

Engine oil system malfunctioning
Both PC systems lost; operation on EPP PC 1 pressure alone
- Straight-in approach recommended

Engine persistently unstable

Procedures

1. Extend EPP.

Extension of EPP can be determined by:

- Pilot detects increase in outside noise as EPP door opens (noise level is decreased in intensity in landing configuration).
- Turn MASTER generator switch to OFF position. Emergency generator switch to ON, and check that emergency generator light is on.
- A slight increase in yaw as EPP extends.

2. Use arresting gear (if available) and consider best approach path.

   - Make approach to runway equipped with arresting gear, if possible, and perform a long field arrestment (refer to LANDING – USE OF EMERGENCY FIELD ARRESTING GEAR for long-field arrestment techniques). Consider population density, surrounding terrain, weather, runway length, and other associated factors. For maximum stopping effect, shut down engine on touchdown.

3. Final approach point – 1,500 feet from runway end, 175 KIAS, 150 feet altitude, approximately 86% to 88% rpm.

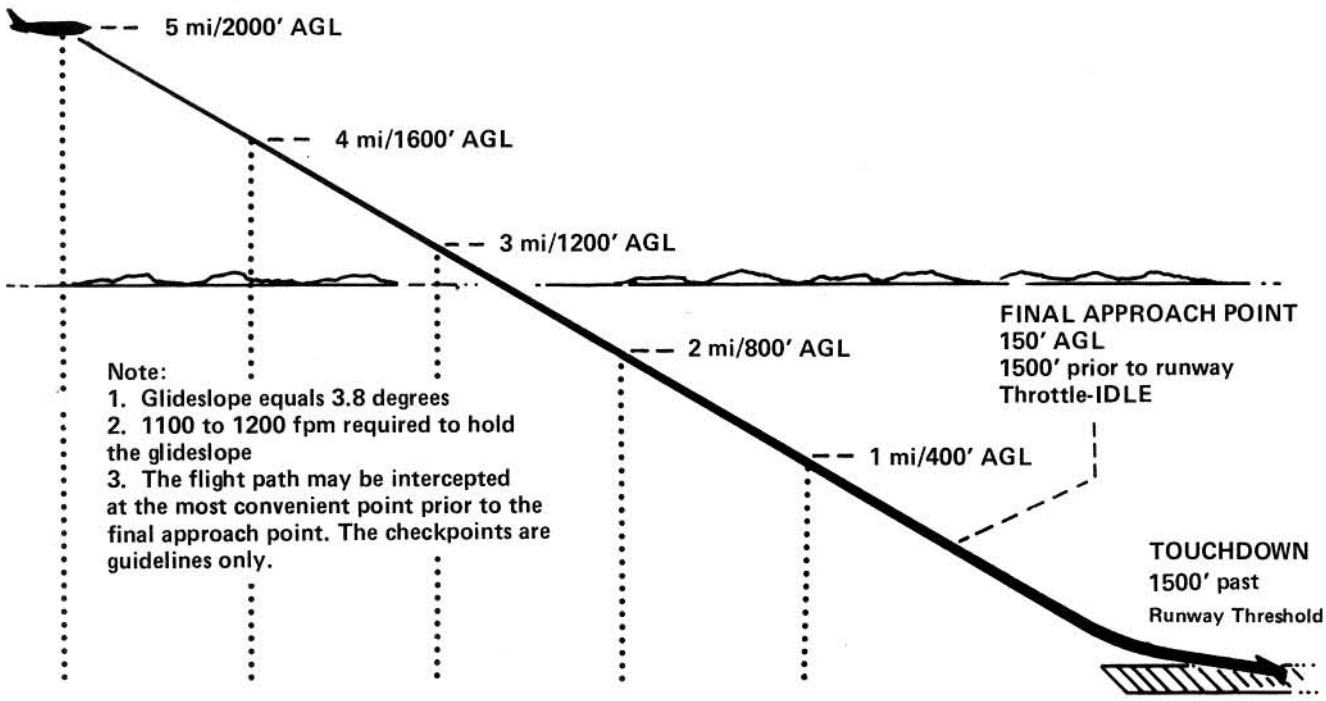
   - The pilot has an alternative of a straight-in or circling approach to reach the final approach point. At this point, the throttle may be reduced to IDLE. Approximately 3,000 feet will be required to flare and touch down 1,500 feet down the runway at approximately 140 KIAS.
   - This approach allows the pilot to stay in the ejection envelope until a safe landing on the runway is certain.
   - During an approach necessitated by low or fluctuating oil pressure (oil system malfunction), keep throttle movements and changing g loads to a minimum.
   - It is necessary to maintain a constant rate of descent and proper angle of attack to execute a correct approach to a final landing.
   - If engine flameout or loss of control is experienced before reaching final approach point, eject immediately while still within safe ejection envelope.

See figures 5-10 and 5-11 for precautionary approaches.

PRECAUTIONARY APPROACH

INITIAL POINT
2400 AGL
6 Miles from touchdown
175 KIAS
Gear-DOWN
Wing-UP
EPP-OUT, OFF

Throttle 86 to 88%



Note:
1. Glideslope equals 3.8 degrees
2. 1100 to 1200 fpm required to hold the glideslope
3. The flight path may be intercepted at the most convenient point prior to the final approach point. The checkpoints are guidelines only.

Figure 5-10

ALTERNATE CIRCLING PRECAUTIONARY APPROACH

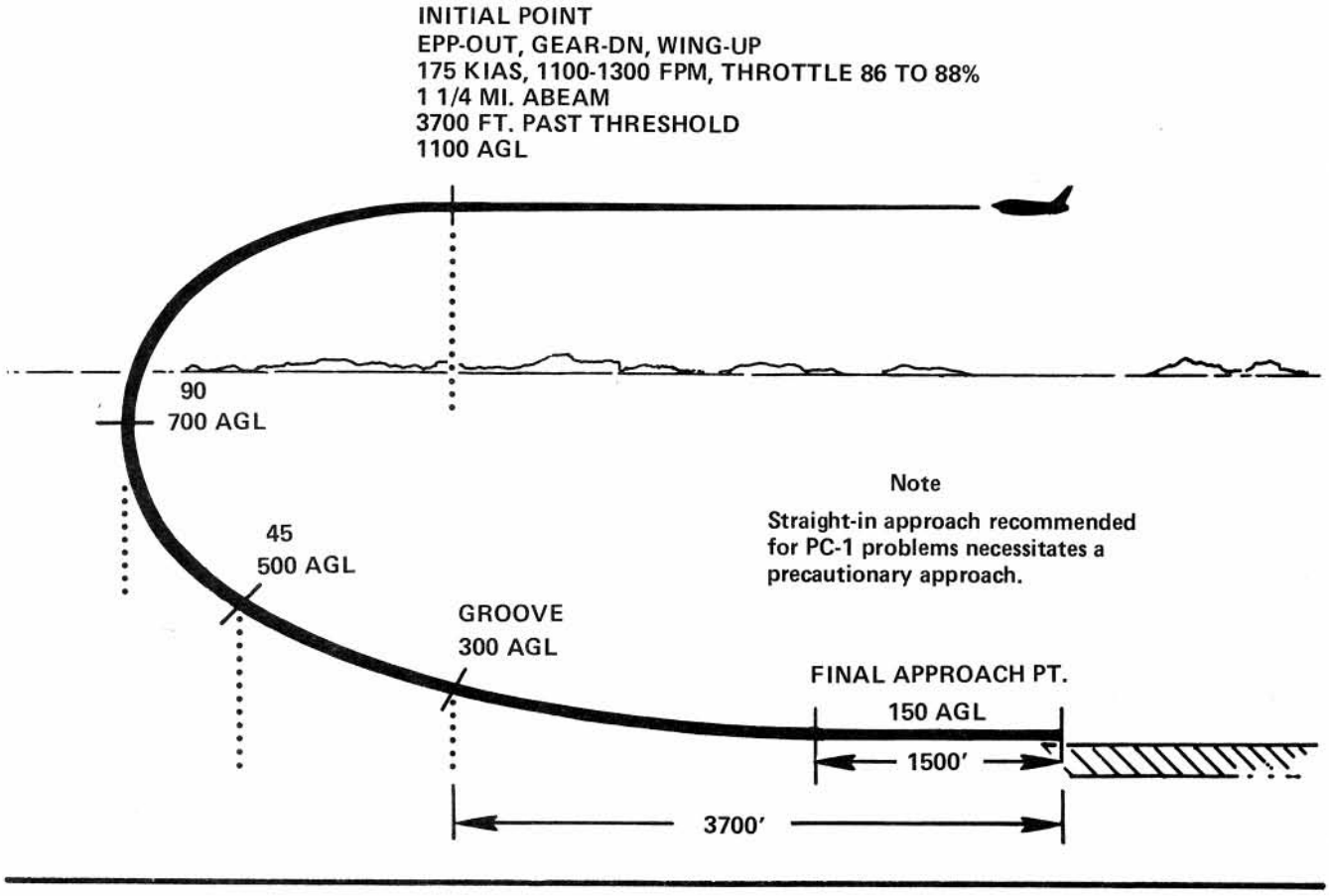


Figure 5-11

section VI

all-weather operation

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PART 1—SIMULATED INSTRUMENT PROCEDURES

Practice of simulated instrument patterns and procedures develops and maintains the skills necessary for safe, professional instrument flight. Make good use of the time allotted for this practice.

SAFETY PRECAUTIONS

1. No hood or other means of obstructing outside vision will be used. When above the specified minimum altitudes, the pilot practicing simulated instruments will rely entirely on the flight instruments for aircraft control.
2. No pilot will practice simulated instrument flight without a chase pilot unless under positive radar control. When available, a chase pilot will act as flight monitor and will ensure that the flight is clear of all other aircraft at all times, but this does not relieve the pilot of his VFR collision avoidance responsibilities. The chase position should be 500 feet aft of, and 500 feet either side of, the lead aircraft. On GCA the chase will fly the free cruise position but not descend below 100 feet AGL. He shall closely monitor the lead aircraft altitude and airspeed and make precautionary calls when necessary. The lead aircraft will go contact at 500 feet AGL in the approach.
3. The lead aircraft will not go entirely on instruments until cleared by radio call from chase and not before reaching 2,000 feet AGL on climbout.
4. Radio checks will be exchanged between aircraft at least once every 5 minutes. Lead aircraft shall report "on gages" and "contact" as appropriate.
5. If radio contact is lost, go contact immediately and remain so until radio contact is reestablished. If necessary, the chase pilot will pass to the right and pull ahead as a signal to go contact. The afterburner may be lighted when passing to ensure gaining attention.
6. Always establish radio contact immediately before and after any channel or frequency change.
7. Immediately go contact if chase pilot calls for a hard turn or a break maneuver. These are only called when necessary to avoid another aircraft.
8. Unless under positive radar control, call indicated altitudes to the chase pilot at each 5,000-foot interval during descent and at level off.

CONFIDENCE MANEUVERS (INSTRUMENT AEROBATICS)

Vertigo and unusual attitudes caused by turbulence are probably the most disconcerting experiences encountered during instrument flight. A pilot trained to fly through unusual attitudes will more readily believe his instruments and will be better prepared to return his aircraft to normal flight with timely, positive corrections. Aerobatic maneuvers, modified slightly to meet instrument capabilities and limitations, provide the necessary training. Variations of these maneuvers can be performed, but those discussed are considered minimal for indoctrination. Use a routine scan pattern and practice maneuvers to the left and to the right.

AILERON ROLL

Start the maneuver at 350 KIAS at 20,000 feet with the throttle set at 90% rpm. Apply gradual back pressure on the stick until a 15° nose-up attitude (VGI) is attained. Relax stick back pressure and apply aileron. The rate of roll must be slow enough so that the aircraft is inverted as the nose passes through the horizon. Continue the roll without stopping and recover at the starting altitude, airspeed, and heading.

TWO-POINT ROLL

Perform this roll in the same manner as the aileron roll. However, increase the rate of roll slightly so that the aircraft is inverted when the nose is 5° above the horizon. Momentarily stop the roll when the aircraft is inverted, then immediately apply aileron to continue the roll. The nose should be 5° below the horizon when the roll is continued. Hold only enough stick back pressure to remain comfortably seated.

FOUR-POINT ROLL

This roll closely resembles the two-point roll except that momentary stops are made at each 90° of roll. The maneuver requires a good instrument scan, accurate stick control, and a good sense of timing. The major points that determine performance are the rate of roll, wing and nose position at the inverted point, and the heading, airspeed and altitude at the completion of the recovery.

WINGOVER

Start the wingover at 20,000 feet, 350 KIAS, with 90% rpm. Apply gradual stick back pressure until a nose-up attitude of approximately 30° (VGI) is attained. Relax back pressure and at 280 KIAS apply aileron to roll at the rate necessary to obtain a 90° angle of bank and 220 KIAS at the top of the maneuver. At this time, the nose will start to fall through the horizon. Using the attitude gyro for reference, stop the nose-down movement when the high wing of the miniature airplane approaches the horizon bar. Hold the wingtip on the horizon bar and begin a gradual recovery to level flight at the original altitude and airspeed. A heading change of about 120° will occur.

PART 2 — ACTUAL INSTRUMENT PROCEDURES

PLANNING

Aircraft handling characteristics and stability are good and should not present a problem during instrument flight. Most difficulties encountered will be those caused by inadequate preflight planning and preparation. Plan carefully and make allowances, insofar as possible, for unusual circumstances such as unexpected departures, dog-legging to avoid severe weather areas, and en route or terminal holding. IFR flight plans will ensure adequate fuel to proceed from point of departure to approach fix for destination at filed altitude, plus fuel required for 20 minutes holding at expected approach fix altitude, plus fuel required for published instrument approach to destination, plus provide a minimum of 1,000 pounds at touchdown. Pilots shall ensure possession of applicable IFR enroute publications and VFR navigational charts of the entire route. Suitable emergency fields enroute will be determined before takeoff. Study the instrument approach plates for both destination and alternate before takeoff. If weather forecasts indicate a possibility of a missed approach at destination, the appropriate missed approach routing to the alternate shall be determined and studied.

Note

The anticollision lights should be turned off during flight through clouds when the rotating lights reflect into the cockpit. (The effect can be vertigo-producing.)

BEFORE TAKEOFF

Obtain a complete weather briefing and check NOTAMS before filing clearance. Whenever practical, obtain the ARTC clearance before starting the engine. While monitoring the tower, observe the radio ground operating limitations (section I, part 2). After receiving the clearance, start the engine and thoroughly check the instruments and navigation equipment. If the canopy is covered with frost or ice, turn the cockpit temperature control to full hot and the defog switch to DEFOG. After the canopy is cleaf, turn the defog switch OFF and readjust the cockpit temperature as desired.

Perform normal pretakeoff checks ensuring use of pitot heat. Use rain removal/repellent as required to ensure takeoff visibility.

TAKEOFF

Follow the ARTC clearance exactly as given. If unable to comply, notify the controlling agency immediately.

Do not attempt section takeoffs if weather is below circling minimums. If a formation section makes individual takeoffs, accomplish a prebriefed rendezvous either before entering the weather, or after reaching an altitude on top. The leader will ensure that each pilot checks pitot heat, navigation lights, and VGI when possible, before entering actual weather.

When lowering the wing in instrument conditions, maintain a positive rate of climb. Lower the wing at 180 KIAS at an altitude of not less than 300 feet.

If the rain removal system was used during takeoff, turn it off prior to reaching 200 KIAS or the windshield may overheat.

CLIMB

On instrument departures, maintain 350 KIAS until intercepting the climb schedule.

PRIOR TO DESCENT

Contact approach control at least 5 minutes (or as directed by ARTC) prior to reaching the holding fix. Conform to the provisions of section two, FLIGHT PLANNING DOCUMENT. Three minutes from the holding fix, reduce power to arrive at the fix at 250 KIAS. Enter the holding pattern in the manner prescribed.

Obtain the latest weather information for the destination, and for the alternate if required. If leading a flight and turbulence, low ceiling, inability to attain landing configuration VFR, or runway conditions are such that a successful section penetration is doubtful, break up the flight and make individual penetrations.

Refer to figure 6–1 for illustration of typical jet penetration and TACAN approach.

Before the penetration:

- Check pitot heat on.
- Correct the altimeter setting.
- Check alignment of the RMI with the magnetic compass in level flight.
- Set desired course in the course line indicator (TACAN penetration).
- Squawk IFF/SIF mode and code as directed by controlling agency.
- Know the missed approach procedure.
- To avoid the consequences of a 40° lock-on, either compare TACAN azimuth and DME with that of a wingman or if a UHF homer is near the TACAN installation, utilize the Command Radio ADF to cross-check TACAN azimuth.
- Cockpit temperature and defog as required.

PENETRATIONS

STANDARD

When ready to begin penetration, retard throttle to 82% rpm, extend speed brake fully and lower the nose to maintain 250 KIAS. Make minor throttle adjustments to maintain a 4,000 to 6,000 foot-per-minute rate of descent.

Note

If approaching minimum fuel, make an idle penetration. Retard the power to idle stop then advance it slightly to close the nozzle. Hold airspeed at 250 KIAS and use partial speed brakes to adjust rate of descent to 4,000 to 6,000 feet per minute. Due to danger of the wingman overrunning, do not attempt idle penetrations in section if actual instrument conditions exist.

If leading a section, avoid configuration changes (including use of speed brake) when actually in the weather. Whenever possible, attain landing configuration in VFR conditions. Signal or call all power and configuration changes to the wingman. To help the wingman hold position, do not retard the throttle below 80% at anytime during the approach.

LANDING CONFIGURATION

If a penetration is to be made with the landing configuration, advise approach control of the nonstandard approach speed.

If leading a section, slow to less than 220 KIAS when approaching the penetration fix and give appropriate signals before lowering the landing gear and raising the wing. As the fix is reached, retard the throttle to 78% to 80% and lower the nose to maintain 180 KIAS. The attitude will seem extremely nose low. Make throttle adjustments as necessary to maintain approximately a 3,500 foot-per-minute rate of descent. Initiate roundout to reach GCA pickup or TACAN gate altitude at 150 to 160 KIAS.

UHF/ADF

A functioning ADF shall be available before an actual instrument or night flight. During instrument conditions, use of the UHF/ADF for penetration should be considered an emergency measure. When the UHF Command Radio is used for direction information, voice communication is lost. When used for voice communication, direction information is lost. This is a very unsatisfactory arrangement.

If a UHF/ADF penetration must be made, notify approach control that radio communications will not be possible during most of the approach. Tell the controller where during the approach position reports will be made, and explain that during the rest of the approach the homer frequency will be monitored. Complete a radio check on the homer frequency before starting the approach.

If the penetration is being made in section, the wingman may either remain on the approach control frequency, or on the homer frequency, as dictated by local policy.

Note

Refer to section VII for visual signals to be used for penetration/instrument approach in the event of radio failure.

RADAR CONTROLLED

Radar controlled penetrations and approaches are basically the same as those previously described. The controlling activity will normally ask for turns or specific IFF/SIF squawks for positive identification, and will transmit headings and turns which will produce the desired flight path. The controlling activity will provide distance from destination and will direct descent to lower altitudes when traffic and terrain permit.

LOST WINGMAN PROCEDURE

Before entering the weather during daylight hours, the leader and wingman will ensure their lights are on bright. During night operations, wingman lights should be bright and leader's lights adjusted to wingman's desires.

During climbout or cruise, the leader will allow the wingman at least 2% rpm excess power to retain position. Leader should never reduce power below 80% when IFR. Use of afterburner in IFR conditions is not recommended.

If wingman loses sight of leader on climbout, he should turn 30° away from the leader's last heading with a 30° angle of bank and level off. Hold this heading and altitude for 1 minute, then resume climb on original heading. Establish voice communication and ensure adequate altitude separation in the climb until on top or leveled off at separate altitudes. Do not attempt an IFR rendezvous. If visual contact is lost when cruising, turn away as before and request different altitude assignment immediately. If visual contact is lost on penetration, the same procedure applies as for the climbout except the wingman will level off and contact the controlling agency.

GCA (PAR) APPROACH

The aircraft handles exceptionally well in the GCA pattern. It is very stable directionally and is responsive to minor corrections about all axes. See figure 6–2 for illustration of typical ground controlled approach. Do not begin approaches at gross weights exceeding 26,000 pounds. Do not touch down at gross weights of more than 24,000 pounds unless an emergency exists.

Descend to GCA pickup altitude and establish the landing configuration when directed. Compute your airspeed to optimum AOA for your gross weight. (Figure 3-11.) Slow to 150 to 160 knots, which will requires 88% to 90% rpm and approximately 4° to 6° nose up trim. Slowly decelerate to optimum airspeed as previously computed, cross checking both AOA and airspeed to ensure they correspond. Fly the donut, adjusting pitch attitude as necessary to maintain the desired airspeed and/or angle-of-attack.

When advised to begin normal rate of descent, retard power to 86% to 88% rpm. While holding attitude constant, make smooth, but positive, throttle adjustments to hold the desired rate of descent. After starting descent, use a bank angle of not more than 10° for heading corrections. Heading corrections up to 3° may be made with rudder alone. Bring the runway into your instrument scan pattern when approaching minimum. If the runway environment is not in sight at decision height, execute the missed approach procedure. If the runway is in sight, take over visually and complete the landing.

Use of the approach power compensator for a single aircraft instrument GCA approach is encouraged. If utilized, engage the APC after transitioning to the landing configuration and closely monitor angle of attack and power response to ensure proper operation.

A section GCA will not be attempted when the weather is below minimums unless dictated by operational necessity or an emergency exists (radio, nav-aid, or flight instrument failure). If a section approach is made to a runway not suitable for a safe section landing, the wingman will land and the leader will enter a box pattern for another approach.

If you are leading a section approach, the wingman will assume a position on the side opposite the missed approach turn. The wingman will then follow all your configuration changes. Slow to 150 KIAS on final. Do not use APC with a wingman. When you see the runway, pass the lead to the wingman with the appropriate signal. This is the signal for the wingman to begin flying his own approach. After passing the lead, turn away from the wingman, then back to the final approach heading and wave off. Observe the wingman's progress. In case of a waveoff and a VFR pattern is not feasible, the wingman will rejoin you for another approach.

If leading a section approach to a section landing, the wingman will maintain a flat instrument wing position to touchdown. Each aircraft will land and roll out in the middle of his half of the runway.

To preclude the danger of a decelerating approach or of flying into the leader's jetwash, no attempt will be made to establish interval on final.

WARNING

If section landings must be made, or when significant crosswinds exist, extreme caution must be exercised during lineup, touchdown, and rollout.

To enter a GCA pattern from other than a penetration, contact approach control for instructions. Fly the downwind leg at 160 KIAS. After completing the turn to final, slow to 150 KIAS (section) or fly the angle-of-attack donut if alone. Normal GCA final approach procedures then apply.

CCA APPROACH

The pattern and procedures for carrier controlled approaches are set forth in the CVA/CVS NATOPS manual and section III. Do not begin approaches with gross weights above 26,000 pounds.

CCA approaches are normally made by individual aircraft. However, a section approach may occasionally be required to assist an aircraft that has experienced radio, nav-aid, or instrument failure.

If you are leading a section during a CCA approach, the wingman will assume a position on your right wing. If the approach is at night, the position is attained before wing transition. The wingman will follow all your configuration changes. See section VII for visual signals. Slow to 145 KIAS on final. Do not use APC. When the OLS is sighted, pass the lead to the wingman. This is the signal for the wingman to begin flying his own approach. After passing the lead, turn away from the wingman, then back to the final approach heading. Observe the wingman's progress. In case of a waveoff or bolter and a VFR pattern is not feasible, the wingman will rejoin you for another approach. If the wingman's landing is successful, execute the normal CCA waveoff procedure and await vectoring and landing instructions.

UNUSUAL ATTITUDES

Unusual attitudes may result from any number of factors ranging from turbulence or spatial disorientation to flight instrument failure. Recovery procedures should be instigated as soon as the unusual attitude occurs. If the aircraft is descending out of control through 10,000 feet AGL, abandon the aircraft.

Nose low – Evidenced by nose low indications on attitude indicator, altimeter decreasing, and airspeed increasing.

1. If airspeed is increasing through 300 KIAS, retard the throttle to 80% rpm. Extend speed brakes if airspeed continues to increase.
2. Roll wings level to an upright attitude.
3. Pull nose up to horizon and readjust the power as required.

Nose high – Evidenced by nose high indication on the attitude indicator, altimeter increasing, and airspeed decreasing.

1. If airspeed is decreasing through 200 KIAS, advance throttle to MRT.
2. Avoid excessive control stick pressures while attempting to maintain 1g flight.
3. Roll wings shortest way to obtain 90° angle of bank. Utilize rudder for roll; actuation of aileron in extremely slow airspeed regions can result in a spin.
4. As the nose falls through the horizon, roll wings level and adjust power as required.

JET PENETRATION AND TACAN APPROACH

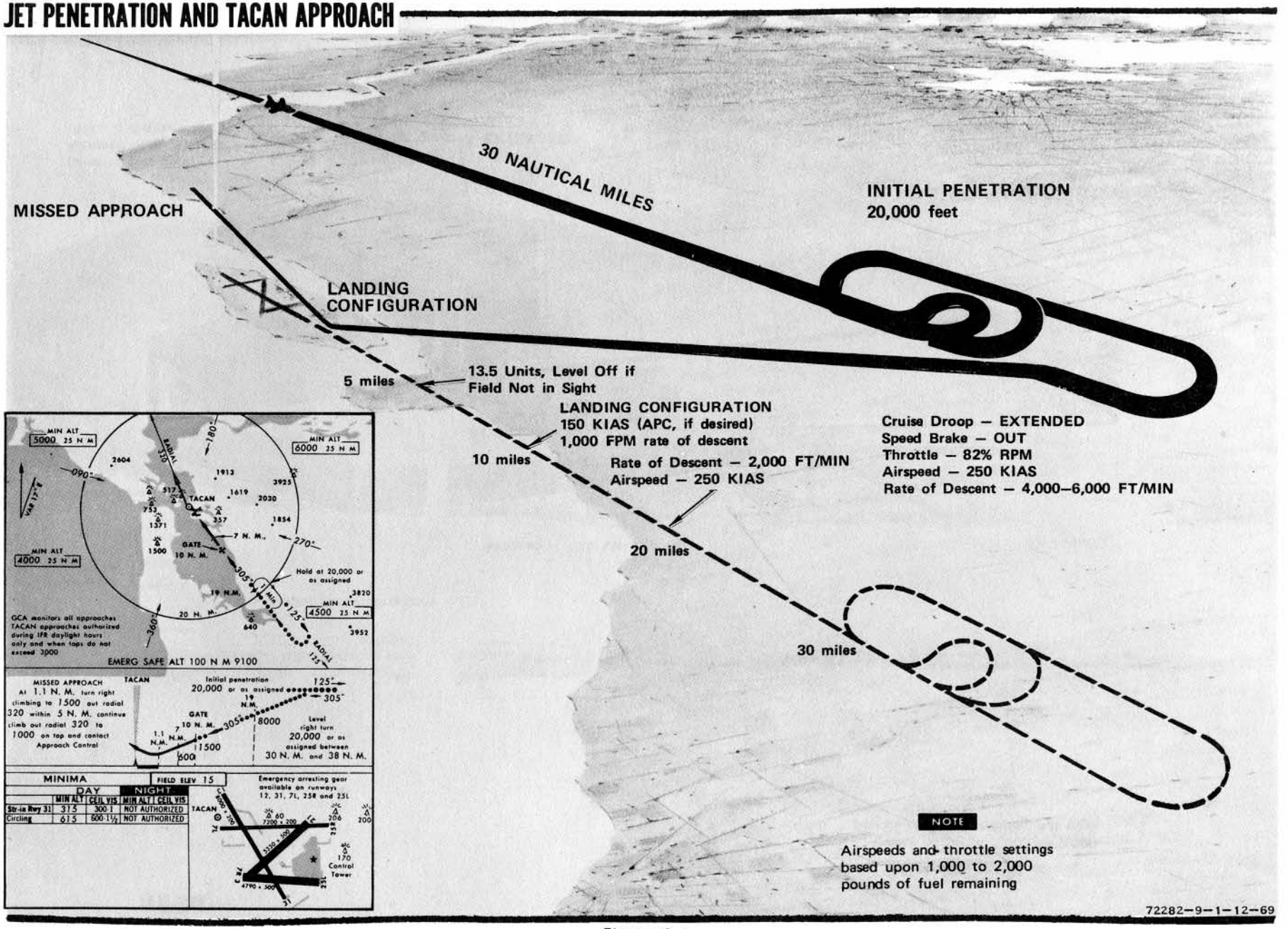


Figure 6–1

GROUND CONTROLLED APPROACH (TYPICAL)

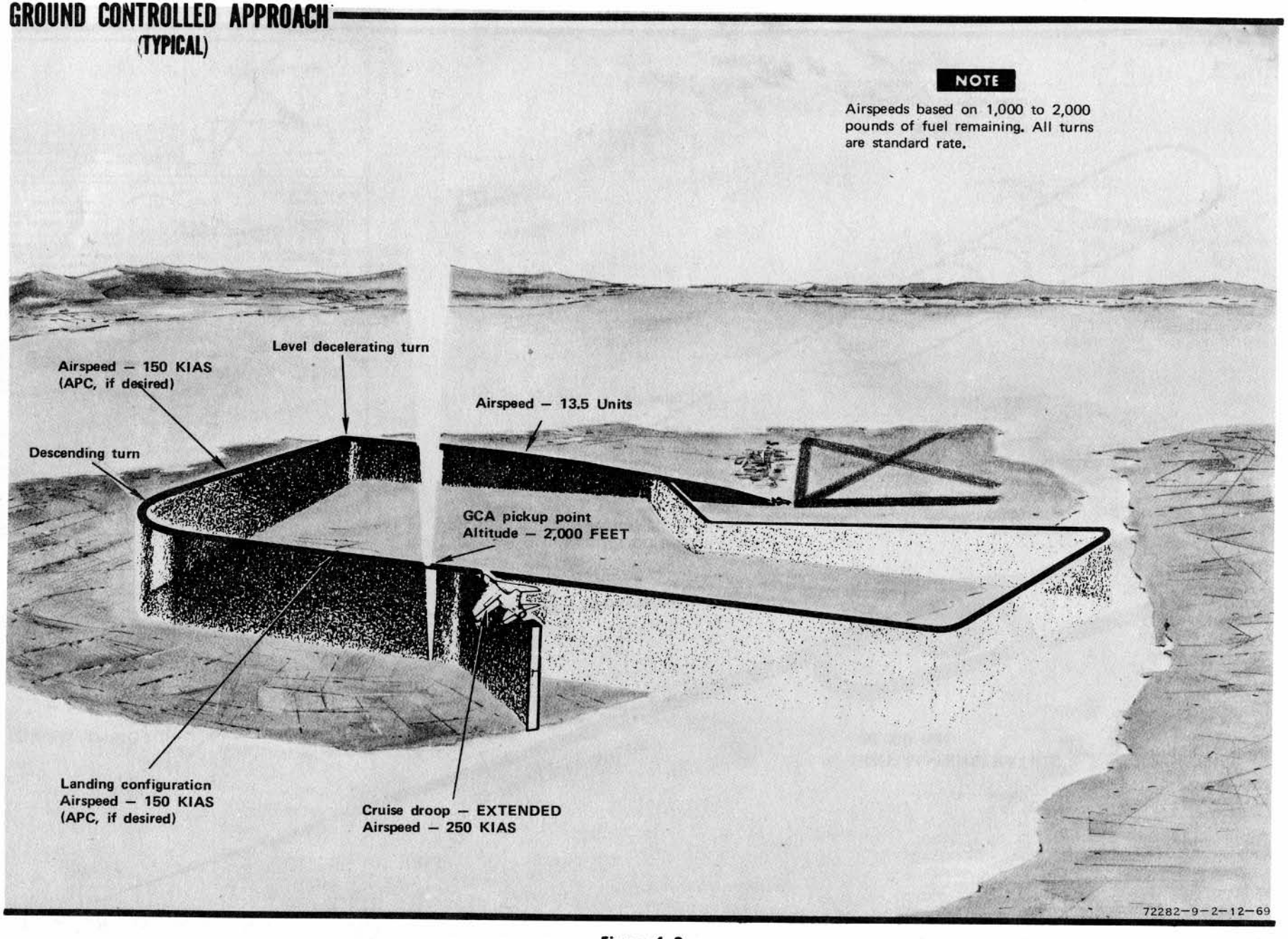


Figure 6-2

PART 3 — WEATHER PROCEDURES

ICING, RAIN, AND SNOW

ICING

Turn pitot heat on immediately after starting the engine if there is a possibility of encountering ice during the flight. To combat windshield and canopy icing, turn defog switch on to direct hot airflow to windshield and side panels, and increase the air-conditioning temperature setting to direct hotter air to the canopy. The rain removal system is effective against external ice on the left windscreen.

The first indication of inlet icing during cruising flight is a drop in engine pressure ratio. Be alert to the possibility of a subsequent compressor stall or engine overtemperature. The aircraft does not have an anti-icing system, so avoid prolonged flight at known icing levels.

When landing on an ice-covered runway, make a normal touchdown and use aerodynamic braking during the roll-out. After the nose falls through, tap brakes lightly; this will dissipate energy/speed without locking wheels or blowing tires. Maintain directional control with rudder and nose gear steering. If necessary, shut down engine to aid stopping or perform field arrestment. Ground roll may be twice that experienced with ideal runway conditions.

RAIN

Whenever rain is encountered, icing is possible. Ensure pitot heat is on. Use rain removal for takeoffs and landings. Refer to RAIN REPELLENT for use during approaches and landing. Perform the landing approach using mirror OLS if available (rain on windscreen gives the illusion of being high). Use landing techniques described for landing on ice.

SNOW

During flight in snow, follow the procedures recommended for flight under icing conditions. Avoid taxiing in deep snow or slush before takeoff. Frozen landing gear microswitches may result, giving a false gear warning when the gear is extended for landing.

THUNDERSTORMS AND TURBULENCE

Avoid thunderstorms whenever possible. The conditions of precipitation and turbulence inside a thunderstorm or towering cumulus cloud cannot be determined by external appearance. A towering cumulus cloud which has not reached high altitude can frequently contain more severe ice, hail, lightning, and turbulence than an extremely rough looking thunderstorm. Thunderstorms which appear to be dissipated can contain heavy precipitation, while some fully developed thunderstorms contain very little precipitation and turbulence. While flying through stable instrument conditions, be alert to the possibility of suddenly encountering conditions of turbulence severe enough to throw the aircraft out of control momentarily.

Be prepared for instrument failures. Pitot tube icing, which can take place even with pitot heat on, will cause erroneous airspeed indications not easily detected until they become large. The angle-of-attack indicator may be used, but attention to level attitude on the attitude gyro, with the necessary rpm for desired airspeed, has proven the best method for flight through a storm.

Put the visor of your helmet down for protection in the event of windshield or canopy breakage. The dark visor is also useful to minimize the blinding effects of lightning strikes.

Severe turbulent air at high altitudes may cause the inlet airflow distribution to exceed acceptable limits of the engine, thereby inducing compressor stalls. To avoid compressor stalls, maintain 250 to 300 KIAS at all altitudes. If attempting to top thunderstorms at high altitudes, this airspeed range must be maintained even if it requires use of afterburner. Higher speeds cause buffeting which will result in extreme pilot discomfort. If severe compressor stalls are encountered, reduce throttle setting to IDLE and lower the nose to increase airspeed. Compressor stalls are generally accompanied by increased exhaust gas temperature. If temperature exceeds allowable limits, shut down the engine and accomplish an airstart as soon as practical.

Operational instrument flights may require penetration of thunderstorms and areas of extreme turbulence. If necessary to do so, proceed as follows:

1. Lower seat.
2. Maintain 250 to 300 KIAS.
3. Extend cruise droop.
4. Ensure pitot heat on.
5. Secure loose equipment.
6. Tighten lap belt, lock shoulder harness, and pull down helmet visor.
7. Turn cockpit lights on bright and place panel lights on. Turn anticollision lights off.
8. Fly the attitude and heading indicators while in extreme turbulence, because airspeed indicator and altimeter will fluctuate.

COLD WEATHER

Follow the applicable procedures recommended for flight during icing and snow. With the exception of decreased takeoff roll and an increased initial climb performance, characteristics of the aircraft are not affected by cold weather. Additional ground operating procedures are discussed below.

BEFORE ENTERING AIRCRAFT

1. Check that surfaces are clear of snow, ice, or frost.
2. Check that all overboard vent lines are clear.
3. Check that pitot tube, airstream detector, and static ports are clear.
4. Check that tires are not frozen to the surface.

STARTING ENGINE

No special procedure for cold weather starting is necessary. If the engine fails to accelerate above 55% rpm and a warmup period of 2 to 3 minutes is not possible, proceed as follows:

1. Throttle — IDLE
2. Fuel control switch — MANUAL
3. Throttle — Advance slowly to 80% rpm.
   - Monitor EGT.
4. Fuel control switch — NORMAL

GROUND TESTS

If the engine has cooled to an ambient temperature of −35°C (−31°F) or below, a warmup period of 2 to 5 minutes with the throttle in idle should be allowed before engine runup. Carefully check operation of flight controls and actuate hydraulic systems.

BEFORE LEAVING AIRCRAFT

Shut the engine down in the normal manner. If the aircraft is to be parked for any length of time, ensure that the canopy cover, intake and tailpipe plugs, and proper battens are placed on the aircraft. Make certain that the aircraft is refueled immediately after a flight to minimize condensation in the fuel tanks. The airframe water drains should be drained once every 24 hours or on preflight.

HOT WEATHER AND DESERT

Hot weather operation does not differ appreciably from normal operation except for the items discussed below.

TAKEOFF

Greater runway distance and more acceleration time are required in hot weather, because the air is less dense. A noticeable decrease in thrust will occur at all power settings. The EGT will not increase appreciably due to the higher ambient temperatures. Check takeoff distances carefully. A CRT takeoff will be made at higher elevations, where available thrust for an MRT takeoff is so reduced that the distance required for takeoff may exceed the runway length. Utilize CRT for all field takeoffs when ambient air temperatures exceed 85°F.

DESCENT AND LANDING

If descending into warm, humid conditions, abrupt canopy fogging can occur. To prevent this condition, turn heat control to increase and the defog switch on before descent. Defog output is dependent upon engine rpm; therefore in areas of high humidity, use higher than normal engine rpm, controlling descent with speed brake, to achieve maximum defogging.

BEFORE LEAVING AIRCRAFT

In desert locations, keep the canopy and all vents and ducts covered to prevent blowing sand from entering. If not located in an area of blowing sand or dust, leave the canopy open during the day for ventilation.

HYDROPLANING ON WET RUNWAYS

At a certain critical speed, hydrodynamic lift resulting from the built-up pressure under the tire will equal the weight of the vehicle riding on the tire. When this occurs, hydroplaning speed has been reached. Any increase in speed above this critical value will lift the tire completely off the pavement leaving it supported by the fluid alone. This is termed total tire hydroplaning.

The velocity at which tire hydroplaning occurs is predictable and has been expressed in a mathematical formula:

$$V_h = 9\sqrt{P}$$

where V_h is the tire hydroplaning speed in knots and P is the tire inflation pressure in pounds per square inch.

From this formula, the hydroplaning speed of the F-8 with a tire pressure of 300 pounds per square inch, is 156 knots. Since the F-8 has a normal landing speed of 135 to 140 knots and a relatively narrow tire, hydroplaning as defined, is not considered to be a significant problem in a wet runway landing. However, the friction coefficient problem still remains with the wet or slushy runway and it must be realized that stopping distances will be increased considerably.

The recommended technique for wet runway landing in the F-8 is:

1. Land at minimum safe approach speed.
2. Make runway contact as early as possible.
3. Power to idle for minimum thrust. In extreme cases, shutting down engine will decrease stopping distance; however, hydraulic boosted brakes and rudder control will be lost.
4. Utilize maximum aerodynamic braking full back stick even after nose wheel has made runway contact will produce additional drag which is independent of normal braking action).
5. Do not initiate wheel braking above 90 KIAS. Initial braking should be a light pumping action to preclude locking brakes. Gradually increase braking pressure as aircraft slows.
6. Be aware of last available arresting gear and if it is doubtful that aircraft can safely stop prior to leaving the runway, extend the hook and engage arresting gear.

section VII
communications procedures

CONTENTS

Introduction 7–3
Radio Communications 7–3
Hand Signals 7–3

INTRODUCTION

Communications is the process of transmitting and receiving information. Transmission must be clear and concise to be effective, and standardized phraseology, or signals must be used. Communications procedures and terminology are standardized by NWPs 4, 32, 37 and 41. Review these publications frequently and adhere to the instructions contained therein. NEW

RADIO COMMUNICATIONS

RADIO DISCIPLINE

Maintain strict radio discipline at all times. Know what you are going to say before you depress the mike button, and transmit clear, concise, correct information on the first attempt. Use the following operating techniques to ensure the best results from the UHF COMMAND radio:

Note

NEW Speech security equipment is installed in RF-8G aircraft. Refer to Section I, Supplemental NATOPS Flight Manual for information on this system.

1. Allow a minimum warmup time of 1 minute prior to pressing the transmitter button.
2. Adjust sensitivity control to assure maximum reception (refer to section I, part 2).
3. After depressing the mike button, pause momentarily before speaking to avoid cutting out the first word.
4. Know the proper procedure for presetting (or resetting) frequencies (refer to section I, part 2).

RADIO PROCEDURES

1. During formation flight, use the following procedure for changing radio channels:
   - The formation leader will call "Graycap (or assigned call sign) Flight, this is Graycap One, go channel six." Division and section leaders will wait until wingmen have made the channel change and are heads up in the cockpit before changing channels.
   - After allowing sufficient time for the change, the leader will call "Graycap Flight, check in." The number 2 aircraft in the formation will respond with "Graycap Two." All other aircraft will similarly acknowledge in sequence. The formation leader will check with those aircraft that do not check in. If contact is not established within 1 minute after a channel change, return to the channel of last contact and attempt to reestablish communication.
2. Guard channel (EMERGENCY) will be monitored at all times, but will be used only during an emergency.
3. In close formation, one aircraft will handle IFF/SIF procedures. Other aircraft in the formation will have equipment on STANDBY, but will be prepared to take over the IFF/SIF responsibility (refer to section I, part 2, for IFF/SIF operation).

HAND SIGNALS

Hand and other visual signals are presented in figures 7–1 through 7-10

AIRCRAFT STARTING AND PRE-TAXI SIGNALS

1

CONNECT AUXILIARY POWER UNIT – Hold extended index finger of right hand against the flat palm of vertical left hand. Plane captain repeats signal and connects power.

2

MAIN FUEL SHUTOFF VALVE CHECK – Pilot raises fist with thumb extended in drinking position. Plane captain goes to starboard wheel well and checks operation of the main fuel shutoff valve as the pilot turns the engine master switch ON/OFF/ON.

3

PITOT HEAT ON/OFF AFTER CHECK – Plane captain grasps index and middle fingers of left hand with right hand at eye level. Pilot turns pitot heat switch ON. Plane captain checks for proper warming.

4

COMMENCE ENGINE CRANKING – Pilot holds extended index and middle fingers of right hand against the flat palm of vertical left hand. Plane captain relays signal to ground crew to begin engine cranking with external air.

5

DISCONNECT AIR STARTING UNIT – Pilot signals reverse of signal # 4 at idle rpm.

DISCONNECT AUXILIARY POWER UNIT – Pilot signals reverse of signal # 1 at idle rpm.

6

FUEL PUMPS PRESSURES CHECK – Plane captain gives drinking signal (same as # 2). Pilot checks master generator switch ON.

7

DOWNLOCKS REMOVED – After checking utility pressure at 3,000 psi (±200), Pilot holds left arm vertical and clasps left wrist with right hand. Plane captain removes downlocks and positions them where Pilot can see them.

8

EMERGENCY PITCH TRIM "IN" – Plane captain forms "T" with hands at waist level and raises hands smartly in that position. Pilot raises pitch trim handle.

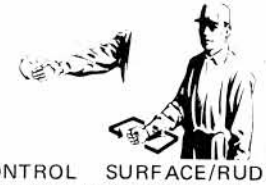
9

PITCH TRIM – Plane captain extends one arm in front with hand held vertically. Moves hand up and down for elevator trim. Pilot actuates "T" handle while monitoring the pitch trim indicator, using both trim channels to obtain full elevator throw in each direction.

10

EMERGENCY PITCH TRIM "OUT" – Plane captain gives reverse of signal # 8. Pilot stows "T" handle.

11



CONTROL SURFACE/RUDDER AILERON INTERCONNECT – Plane captain moves right hand, with fist clenched, in a rectangular pattern at waist level. Indicates rudder trailing edge motion with open right hand. Pilot moves stick in a rectangular pattern, ensuring that all lateral and longitudinal stops are contacted.

12

CRUISE DROOP EXTEND – Plane captain holds hands facing forward, fists clenched, arms bent 45° at elbows, wrists straight, then bends wrists forward. Pilot extends cruise droop.

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Figure 7-1 (Sheet 1)

AIRCRAFT STARTING AND PRE-TAXI SIGNALS

13

RAISE WING – Hands flat, raise arms from extended position. Reverse signal to lower wing.

14

FUEL LEAK CHECK – Plane captain signals for hands out of cockpit.

RUDDER-AILERON INTERCONNECT – Plane captain checks for disconnect. Same as signal #11.

15

RUDDER TRIM CHECK – Arm held vertical, elbow cupped in other hand, palm flat. Twist hand left and right to indicate desired trim deflection. Pilot actuates trim on signal.

16

AILERON TRIM CHECK – Plane captain holds right forearm vertical and grasps elbow with left hand. Swings forearm left, then right to indicate desired aileron trim change. Pilot actuates trim on signal.

17

NORMAL PITCH TRIM CHECK – Plane captain gives same signal as #9.

18

VISCOUS DAMPER CHECK – With opened right hand, strike clenched left fist, held near stomach, two sharp blows. Pilot executes damper check.

19

RUDDER THROW – Plane captain raises both arms to his cheeks and extends clenched fists horizontally to indicate first left rudder, then right rudder. Pilot checks full throw of pedals.

20

HOOK DOWN – Right fist, thumb extended downward into horizontal palm of left hand.

21

AIR REFUELING PROBE OUT – Hold arm straight ahead with fist clenched, then swing 90° to side position. Reverse procedure for probe in. Pilot actuates probe on signal.

22

EXHAUST NOZZLE CHECK – With forearm horizontal and fist closed, extend arm and open fist simultaneously. Fingers are extended and separated.

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Figure 7–1 (Sheet 2)

AIRCRAFT STARTING AND PRE-TAXI SIGNALS

23

HOOK UP – Right fist, thumb extended upward, raised suddenly to meet horizontal palm of left hand.

24

AIR REFUELING PROBE IN – Plane captain gives the IN signal from # 22.

25

BRAKES CHECK – Both arms extended horizontally, fists clenched. Open and close hands rapidly. Pilot pumps brake pedals, then releases them.

26

FOLD WINGS – Arms straight out at sides, then swept forward and hugged around the shoulders.

SPREAD WINGS – Reverse fold wings procedure.

27

WING LOCK CHECK – Plane captain hits right elbow with palm of left hand.

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Figure 7-1 (Sheet 3)

GENERAL SIGNALS

WARNING

When utilizing external lights for signaling at night, ensure the master switch is returned to the ON position.

Signal		*Meaning*	*Response*
Day	*Night*		
Thumbs up, or nod of head.	Flashlight moved vertically up-and-down repeatedly.	Affirmative. ("Yes," or, "I understand.")	
Thumbs down, or turn of head from side to side.	Flashlight moved horizontally back-and-forth repeatedly.	Negative. ("No," or, "I do not understand.")	
Hand cupped behind ear as if listening.		Question. Used in conjunction with another signal, this gesture indicates that the signal is interrogatory.	As appropriate
Hand held up, with palm outward.		Wait.	
Hand waved back and forth in an erasing motion in front of face, with palm turned forward.		Ignore my last signal.	
Employ fingers held vertically to indicate desired numerals 1 through 5. With fingers horizontal, indicate number which added to 5 gives desired number from 6 to 9. A clenched fist indicates 0. (Hold hand near canopy when signaling.)		Numerals as indicated.	A nod of the head. ("I understand"). To verify numerals, addressee repeats. If originator nods, interpretation is correct. If originator repeats numerals, addressee should continue to verify them until they are understood.
Make hand into cup shape, then make repeated pouring motions.		I am going to dump fuel.	
Slashing motion of index finger across throat.		I have stopped dumping fuel.	

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Figure 7-2

TAKEOFF, INFLIGHT, BREAKUP AND LANDING SIGNALS

Signal		*Meaning*	*Response*
Day	*Night*		
1. Section takeoff-leader raises either forearm to vertical position.		1. I have completed my takeoff checklist and am ready for takeoff.	1. Stands by for reply from wingman, holding arm up until answered.
2. Wingman raises forearm.		2. I have completed my takeoff checklist and am ready for takeoff.	2. Wingman lowers arm and stands by for immediate takeoff.
3. Leader lowers arm.		3. Takeoff path is clear, I am commencing takeoff.	3. Execute section takeoff.
4. Sharp head nod to left after releasing brakes on takeoff.		4. Select afterburner.	4. Execute.
5. Sharp head nod to right after takeoff.		5. Deselect afterburner.	5. Execute.
6. Arm and hand held straight, parallel to, and slightly above canopy rail, pivoted elbow and raised and lowered in short order.		6. Prepare to raise or lower wing (NOTE: Not normally used for takeoff transition).	6. Unlock wing and prepare to move wing handle.
7. Pronounced, smooth, back to front and front to back head nod while airborne.		7. Leader is moving wing incidence handle at the same rate as head nod to lower or raise the wing respectively.	7. Execute.
1. Leader pats self on the head, points to wingman.	2. Lead aircraft flashes lights once then turns them to bright.	Leader shifting lead to wingman.	1. Wingman pats head and assumes lead. 2. Wingman places lights on DIM and assumes lead.
Pilot blows kiss to leader.		I am leaving formation.	Leader nods ("I understand") or waves goodby.
Leader blows kiss and points to aircraft.		Aircraft pointed out leave formation.	Wingman indicated blows kiss and executes.
Leader points to wingman, then points to eye, then to vessel or object.		Directs plane to investigate object or vessel.	Wingman indicated blows kiss and executes.
Division leader holds up and rotates two fingers in horizontal circle, preparatory to breaking off.		Section break off.	Wingman relays signal to section leader. Section leader nods ("I understand") or waves goodbye and executes.
Leader describes horizontal circle with forefinger.	Series of "I's" in code, given by external lights.	Breakup (and rendezvous).	Wingman take lead, pass signal after leader breaks, and follow.
Landing motion with open hand:		Refers to landing of aircraft, generally used in conjunction with another signal.	
1. Followed by patting head.		1. I am landing.	1. Nods. ("I understand") or waves goodbye.
2. Followed by pointing to another aircraft.		2. Directs indicated aircraft to land.	2. Aircraft indicated repeats signal, blows a kiss and executes.

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Figure 7-3

FORMATION SIGNALS

Signal		*Meaning*	*Response*
Day	*Night*		
Open hand held vertically and moved forward or backward, palm in direction of movement.		Adjust wing-position forward or aft.	Wingman moves in direction indicated.
Open hand held horizontally and moved slowly up or down, palm in direction of movement.		Adjust wing-position up or down.	Wingman moves up or down as indicated.
Open hand used as if beckoning inboard or pushing outboard.		Adjust wing-position laterally toward or away from leader.	Wingman moves in direction indicated.
Hand opened flat and palm down, simulating dive or climb.		I am going to dive or climb.	Prepare to execute.
Hand moved horizontally above glareshield, palm down.		Leveling off.	Prepare to execute.
Head moved backward.		Slow down.	Execute.
Head moved forward.		Speed up.	Execute.
Head nodded right or left.		I am turning right or left.	Prepare to execute.
Thumb waved backward over shoulder.		Take cruising formation or open up.	Execute.
1. Holds up right (or left) forearm vertically, with clenched fist or single wing-dip. 2. Same as above, except with pumping motion or double wing-dip.		1. Wingman cross under to right (or left) echelon or in direction of wing-dips. 2. Section cross under to right (or left) echelon or in direction of wing-dips.	1. Execute. 2. Execute.
Triple wing-dip.		Division cross under.	Execute.
Series of zooms.		Close up or join up; join up on me.	Execute.
Rocking of wings by leader.		Prepare to attack.	Execute preparation to attack.
Rocking of wings by any other member of flight.		We are being, or are about to be, attacked.	Standby for and execute defensive maneuvers.
Lead plane swishes tail.		All aircraft in this formation form step-down column in tactical order behind column leader.	Execute. Leader speeds up slightly to facilitate formation of column.
Shaking of ailerons.		Execute signal; used as required in conjunction with another signal.	Execute last signal given.

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Figure 7–4

ELECTRONIC COMMUNICATIONS AND NAVIGATION SIGNALS

Signal		*Meaning*	*Response*
Day	*Night*		
Tap earphones, followed by patting of head, and point to other plane.		Take over communications.	Repeat signals, pointing to self and assume communications lead.
Tap earphones, followed by patting of head		I have taken over communications.	Nod ("I understand").
Tap earphones and indicate by finger-numerals, number of channel to which shifting.		Shift to radio frequency indicated by numerals.	Repeat signal and execute.
Tap earphones, extend forearm vertically, and rotate fingers, formed as if holding a grapefruit, followed by 4 numbers		Manually set up ARC-27 on frequency indicated.	Repeat signal and execute.
Tap earphones, followed by question signal.		What channel (or frequency) are you on?	Indicate channel (or frequency) by finger-numerals.
Tap earphones and point to plane being called, followed by finger-numbers indicating frequency.		You are being called by radio on channel indicated by finger numbers.	Repeat numbers. Check receiving frequency and switch to channel indicated by originator. Dial in manually, if necessary.
Vertical hand, with fingers pointed ahead and moved in a horizontal sweeping motion, with four fingers extended and seperated.		What is bearing and distance to the tacan station?	Wait signal, or give magnetic bearing and distance with finger-numerals. The first three numerals indicate magnetic bearing and the last two or three, distance.
Vertical hand, with 4 fingers extended and separated, pointed ahead in a fore-and-aft chopping motion, followed by a question signal.		What is bearing to tacan station?	Repeat signal and give bearing in three digits.
Arm and vertical hand, with 4 fingers extended and separated, moved ahead in a fore-and-aft circular motion, followed by question signal.		What is distance to tacan station.	Repeat signal and give distance in two or three digits.
Tacan bearing or distance signal, followed by thumbs up or down.		Tacan bearing or distance, up or down.	Thumbs up or nod ("I understand").

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Figure 7-5 (Sheet 1)

ELECTRONIC COMMUNICATIONS AND NAVIGATION SIGNALS

Signal		*Meaning*	*Response*
Day	*Night*		
Tacan-bearing signal, followed by finger-numerals.		Switch to Tacan station indicated.	Repeat and execute.
Hand held up. First and fourth fingers extended, moved in fore-and-aft chopping motion, followed by: 1. 4 numbers. 2. Question signal. 3. Up or down signal.		1. Set up UHF/ADF on frequency indicated. 2. What is UHF/ADF bearing? 3. My UHF/ADF is up or down.	1. Repeat signal and execute. 2. Repeat chopping motion, followed by wait, or three numerals indicating magnetic bearing. 3. Thumbs up or nod ("I understand").
Two fingers pointed toward eyes (meaning IFF/SIF signals), followed by: 1. "CUT". 2. 3-digit numerals.		1. Turn IFF/SIF to "STANDBY". 2. Set mode and code indicated: first numeral mode, second and third numerals - code.	Repeat, then execute.
1. Open hand held up, fingers together, moved in fore-and-aft chopping motion (by leader). 2. Followed by question signal. 3. Followed by three-finger numerals.		1. Course to be steered is present compass heading. 2. What is your compass heading? 3. My compass heading is as indicated by finger-numerals.	1. Nod of head ("I understand"). 2. Repeat signal and give compass heading in finger-numerals. 3. Nod or clarify, as appropriate.

72282-7-21(2)NE

Figure 7-5 (Sheet 2)

AIRCRAFT AND ENGINE OPERATION SIGNALS

Signal		*Meaning*	*Response*
Day	*Night**		
Raise fist with thumb extended in drinking position.		How much fuel have you?	Repeat signal, then indicate fuel in hundreds of pounds by finger-numbers.
Rotary movement of clenched fist in cockpit as if cranking wheels.	2 dashes w/external lights.	Lower or raise landing gear, as appropriate.	Execute when leader changes configuration.
Leader lowers hook.		Lower arresting hook.	Wingman lower arresting hook. Leader indicates wingman's hook is down with thumbs-up signal.
Open and close four fingers and thumb.	3 dashes w/external lights.	Crack speed brakes.	Execute upon head-nod from leader or when leader's speed brakes extend/retract.

*When using flashlight, turn off anticollision lights. Use white light only.

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Figure 7-6

EMERGENCY SIGNALS BETWEEN AIRCRAFT

VISUAL EMERGENCY SIGNALS (AIR TO AIR)

General

Signal		*Meaning*	*Response*
Day	*Night*		
Arms bent across forehead weeping.	Horizontal motion of flashlight shone at other aircraft.	General emergency signal meaning, I am in trouble.	Carry out squadron doctrine for escort of disabled aircraft.
Landing motion with open hand.	Circular motion of flashlight shone at other aircraft.	I must land immediately.	Assume lead if indicated and return to base or nearest suitable field.
Point to pilot and give series of thumb down movements.	Flash series of dots with exterior lights.	Are you having difficulty?	Thumbs up: I am all right. Thumbs down: I am having trouble. Lights off once, then on steady: I am all right. Flash series of dots: I am having trouble.

'HEFOE' SIGNALS
(Preceded by General Emergency Signal)

Signal		*Meaning*	*Response*
Day	*Night*		
One Finger	One Flash	Hydraulic Trouble	Nod of Head: I Understand
Two Fingers	Two Flashes	Electrical Trouble	
Three Fingers	Three Flashes	Fuel Trouble	
Four Fingers	Four Flashes	Oxygen Trouble	Series of Flashes: I Understand
Five Fingers	Five Flashes	Engine Trouble	

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Figure 7-7

ARMING AND SAFING SIGNALS

ARMING SIGNALS

Signal		*Meaning*	*Response*
Day	*Night*		
1. Arming supervisor: Hands over the head with fingers touching.	Red wands over the head with tips touching.	Pilot: Check all armament switches OFF or SAFE.	Pilot: Raise both hands into view of arming supervisor after checking switch positions. (Hands remain in view during check and hook-up.)
2. Arming supervisor: Points at crewmember (used if applicable).	Same as day only with red wand.	Crew: Perform stray voltage checks.	Arming crew: Execute. Give arming supervisor thumbs up if no stray voltage exists. Thumbs down if exists. Night: Vertical sweep with flashlight indicates no stray voltage. Horizontal sweep indicates stray voltage.
3. Arming supervisor: Raise fist, thumb extended upward to meet horizontal palm of other hand.	Form a Tee with red wands.	Arming crew: Arm weapons (as applicable).	Arming crew: Execute. Give arming superviosr thumbs up when arming completed and clear immediate area. Thumbs down if a malfunction exists. Night: same as step 2 above.
4. Arming supervisor:		Pilot:	Pilot:
a. Thumbs up.	a. Vertical sweep with red wand.	a. Aircraft is armed and all personnel and equipment clear of area.	a. Acknowledge with similar signal.
b. Thumbs down.	b. Horizontal sweep with red wand.	b. Aircraft is down for weapons.	b. Acknowledge with similar signal.

SAFING SIGNALS

1. Safing supervisor: Hands over the head with fingers touching.	Red wands over the head with tips touching.	Pilot: Check all armament switches OFF or SAFE.	Pilot: Execute. Raise both hands into view of safing supervisor after checking switch positions. (Hands remain in view during safing.)
2. Safing supervisor: Points at crew member.	Same as day only with red wand.	Crew: Safe weapons (as applicable).	Crew: Execute.
3. Safing supervisor: Thumbs up.	Red vertical wand.	Pilot: Aircraft is safed and crew and equipment are clear.	Pilot: Acknowledge with similar signal.

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Figure 7-8

EMERGENCY GROUND CREW TO PILOT SIGNALS

Signal		Meaning	Response
Day	Night		
1. Describe a large figure eight with one hand and point to the fire area with the other hand.	1. Same except with wands.	Information signal for external aircraft fire.	Throttle OFF, abandon aircraft.
2. Emergency hold signal followed by wiping brow then pointing to brakes.	2. Same except with wand.	Your aircraft has hot brakes.	Comply with local hot brakes procedures.

72282-7-29-06-72

Figure 7-9

FLIGHT SIGNALS BETWEEN AIRCRAFT

PENETRATION / INSTRUMENT APPROACH (NO RADIO)

Signal		Meaning	Response
Day	Night		
Crack speed brakes.	3 dashes w/external lights.	Extend speed brakes, commencing approach.	Execute when leader extends speed brakes.
Rotary movement of clenched fist in cockpit as if cranking wheels.	2 dashes w/external lights.	Extend wheels and raise wing.	Execute when leader extends wheels and raises wing.
Pointing index finger toward runway/ship in stabbing motion, repeatedly, followed by lead change signal.	1 dash w/external lights followed by leader switching lights to bright and moving out to side.	Landing runway/meatball and ship in sight.	Ashore: Break off and land. Carrier: Break off and land.

Note: Configuration change should be executed promptly after completion of the signal.

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Figure 7-10

section VIII

reconnaissance systems

CONTENTS

Photographic System 8–1
Normal Procedures 8–11
Electronic Countermeasures 8–18

PHOTOGRAPHIC SYSTEM

DESCRIPTION

General

The airborne NCCS-4 Navy Camera Control System is used in performing both day and night photographic missions. The camera control system provides the following:

- A central means of starting and stopping camera operation.
- Means of controlling flare ejection.
- Means of controlling camera operation automatically or by manual settings.
- Indication of light intensity and manual control of exposure.
- A viewfinder.

System controls and indicators are shown in figures 8–1 and 8–2. Technical information on cameras and their operation are contained in the NCCS-4 handbooks. Figure 8–3 indicates the camera stations in which the various combinations of cameras may be installed. Camera control equipment is listed in figure 8–4. An operate light and a ready light for each camera station provide indications of photographic system functioning. The operate lights flash for each exposure made. A flare failure light, flare ready light and a flare remaining counter provide operating indications for the flare ejector circuits.

RF-8G Aircraft

Camera station 1 may use a KA-45A (prior to AFC 613), KA-51A, or DBM-4 or -5C (MOPIC) camera mounted in a forward oblique depression angle of 15°, which is not adjustable in flight. This station is used only for day missions. The KA-51A camera, when mounted in station 1, will accept LA-135 cassettes only.

Camera station 2 accepts only the KA-66A low altitude panoramic camera, mounted in the vertical position.

Prior to AFC 610, camera stations 3 and 4 can be equipped with the KA-45A, KA-51A, and KA-53A in rotatable mounts; or the KA-45A,KA-51A,KA-53A, or KA-62A serial frame cameras in fixed mounts. The serial frame cameras, KA-xx series, may be used for day and night missions. For day missions, these cameras may be used to take split vertical photography. For night missions, the KA-xx series 4.5-inch format cameras may be used for sequential or simultaneous photography. In sequential operation the cameras are pulsed alternately so that one is being recycled while the other is making an exposure. In simultaneous operation, station 3 and 4 cameras are both operated from a single flare pulse.

When KA-53A cameras are installed in stations 3 and 4 in rotatable mounts, limit switches prevent placing the cameras at a depression angle of less than 30° concurrently. Camera station 4 also accomodates the KA-68A fixed mounted panoramic camera with its control unit. The KA-68A is for day missions only.

After AFC 610, camera stations 3 and 4 are equipped with the KS-87 series camera bodies using 3, 6, and 12-inch focal length lens cones in rotatable mounts. The KS-87 series cameras may be used for day and night missions. For day missions, these cameras may be used to take split vertical photography. In night mode, station 3 and 4 cameras are both operated from a single flare pulse. The KA-68A is for day missions only.

CAMERA CONTROLS AND INDICATORS

Nomenclature	*Function*
Camera master operation switch (7, figure 8–1)	On – provides continuous camera operation in stations that are set for master mode of operation.
Camera trigger switch (23, figure 8–1)	Depressed – provides camera operation in stations that are set for stick mode of operation.
Extra picture switch (24, figure 8–1)	Cycles KA series cameras at approximately 2 PULSE exposures per second, regardless of mode switch setting. May be used any time when station control switch is in MASTER or STICK, except when using chaff system. After AFC 610, this switch will cycle the KS series cameras once each time the switch is depressed.
Mode switch (used with KA-45, -51A, -53A, and -62A cameras) (26, figure 8–1)	AUTO – exposures are made automatically at IMC film speed with 60% overlap. PULSE – exposures are made at rate of pulses received from camera control system. There is no IMC in this mode. IMC PULSE – film moves through camera at IMC rate and exposures are made at rate of pulses received from camera control system. Pulse rate determines overlap.
Mode switch (used with KS-87 cameras)	PULSE – camera trips upon receiving a pulse from the central computer. No FMC in this mode. Maximum rate is 6 exposures per second. Pulse rate determines overlap. PULSE FMC – upon receiving a pulse from the central computer the camera starts to FMC and then trips when FMC speed is reached. Maximum exposure rate is 6 per second. Pulse rate determines overlap.
Grid illumination knob (8, figure 8-1)	Positioned between OFF and BRT – controls brightness of the viewfinder traveling grid when wide angle viewing is selected.
View selector switch (9, figure 8–1)	FWD MAG – adjusts the viewfinder for narrow-angle viewing. WIDE ANGLE – adjusts the viewfinder for wide-angle viewing.
Drift correction switch (6, figure 8–1)	Adjusts drift reticle in viewfinder to the right or left to determine drift angle of airplane.
Photo power switch (14, figure 8–1)	ON – energizes photo system circuits.

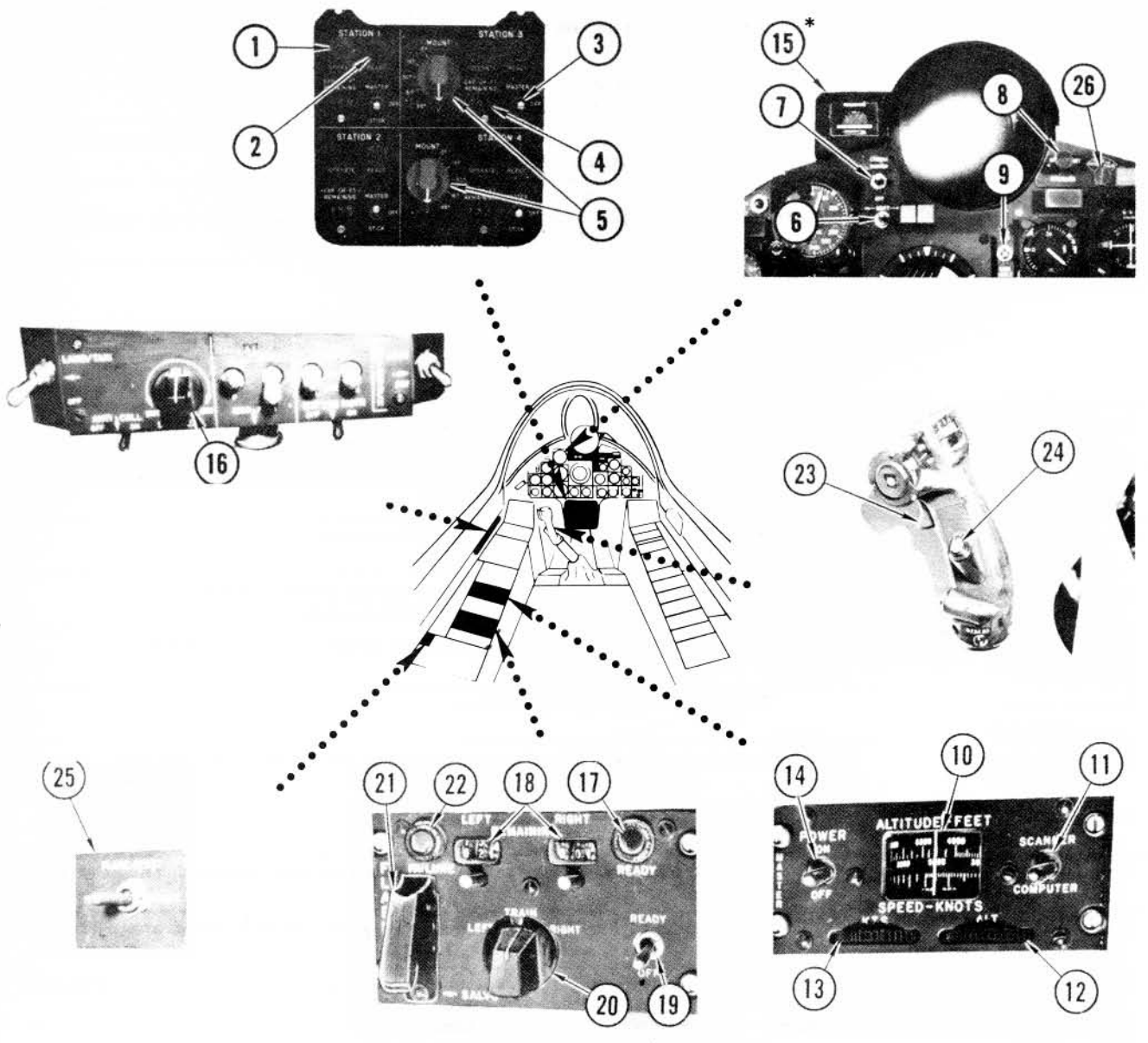
CAMERA CONTROLS AND INDICATORS *(Continued)*

Nomenclature	*Function*
Altitude-speed indicator (10, figure 8-1)	Indicates altitude and speed settings of knots and altitude controls.
Knots control (13, figure 8-1)	Rotated to supply ground speed data (V) to manual computer when master control switch is set to "COMPUTER."
Altitude control (12, figure 8-1)	Rotated to supply altitude data (H) to manual computer when master control switch is set to "COMPUTER."
NEW Scanner-computer switch (11, figure 8-1)	$\frac{V}{H}$ **SCANNER — permits — ratio to be determined automatically through operation of scanner for day operation (viewfinder traveling grid movement automatically synchronized with movement of ground objects). $\frac{V}{H}$ COMPUTER — permits — ratio to be determined by manual settings of knots and altitude controls (traveling grid manually synchronized with movement of ground objects).
Station operate lights (1, figure 8-1)	On steadily, indicates camera not operating properly or out of film. Flashing at proper interval, indicates normal camera operation.
Station ready lights (2, figure 8-1)	On, indicates camera station is energized.
Film counters (4, figure 8-1)	Indicate number of exposures remaining in cameras.
Station control switches (3, figure 8-1)	MASTER — permits operation with camera master operation switch. STICK — permits operation with camera trigger switch.
Mount knobs (5, figure 8-1)	Adjust depression angle of rotatable camera mounts in stations 3 and 4.
NEW Exposure control* (16, figure 8-1)	Adjusts exposure on KA-45A cameras.
NEW Exposure indicator* (15, figure 8-1)	Indicates amount of light reflected by the terrain, for KA-45A camera use only.
Flare salvo switch (21, figure 8-1)	Provides for rapid ejection of all flares.
Flare failure light (22, figure 8-1)	On, indicates ejector failure or that all flares have been expended. (Refer to figure 8-8.)
Flare ready light (17, figure 8-1)	On, indicates night photography circuits energized and flare ejectors armed (landing gear up). (Refer to figure 8-8.)
Flare ready switch (19, figure 8-1)	READY — energizes night photography circuits and arms flare ejectors (landing gear up).
Flare counters (18, figure 8-1)	Indicate number of flares remaining in ejectors.
Flare selector switch (20, figure 8-1)	LEFT — selects operation from left flare ejector. RIGHT — selects operation from right flare ejector. TRAIN — selects ejection of all left flares followed by all right flares.
Flare reset switch (25, figure 8-1)	RESET — resets flare ejector stepping switches.
Recorder switch (1, figure 8-2)	On, energizes tape recorder drive motor when recorder on-off lever is in ON.
Recorder on-off lever (2, figure 8-2)	ON — energizes recorder amplifier and directs power from recorder switch to drive motor.

NEW

*Prior to AFC 613.
**This mode is inoperative after AFC 613.

PHOTOGRAPHIC SYSTEM CONTROLS
(TYPICAL)



1. Station operate light (typical)
2. Station ready light (typical)
3. Station control switch (typical)
4. Film counter (typical)
5. Mount knobs
6. Drift correction switch
7. Camera master operation switch
8. Grid illumination switch
9. View selector switch
10. Altitude - speed indicator
11. Scanner - computer switch
12. Altitude Control
13. Knots control
14. Photo power switch
15. Exposure indicator*
16. Exposure control*
17. Flare ready light
18. Flare counters
19. Flare arming switch
20. Flare selector switch
21. Flare salvo switch
22. Flare failure light
23. Camera trigger switch
24. Extra picture switch
25. Flare reset switch
26. Mode switch

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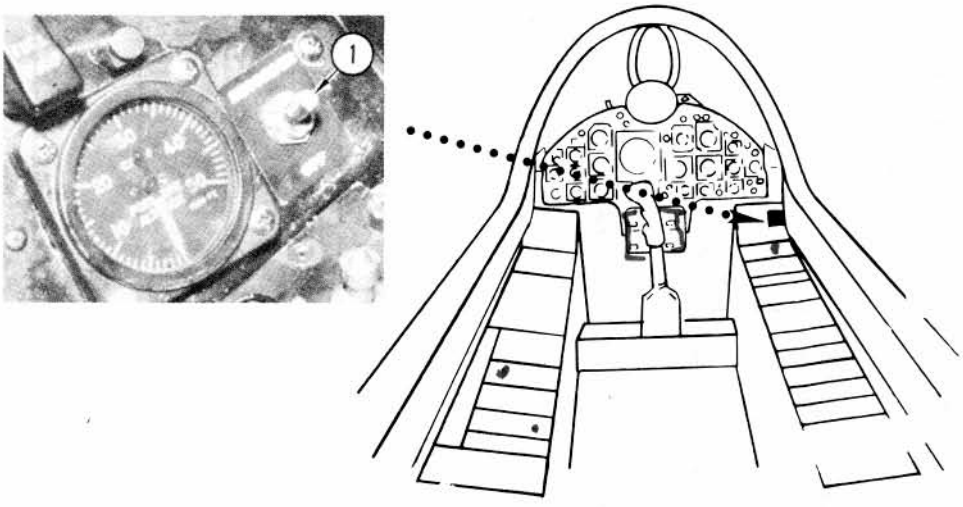
*Prior to AFC 613.

Figure 8-1

TAPE RECORDER



1. Recorder switch

72282-A-1-1NC

Figure 8-2

CAMERA INSTALLATIONS

(PRIOR TO AFC 610)

CAMERA	FOCAL LENGTH (INCHES)	FORMAT	MAGAZINE	FILM CAPACITY (FEET)	MAXIMUM EXPOSURES	STATION INSTALLED	MOUNT	REMARKS
KA-45A	6	4.5x4.5"	LA-135	150	360	1*	15° Forward oblique.	
			LA-141	350	840	3 and 4	Rotatable mount – 90°, 86°, 81°, 30°, 15°, or 5° left or right.	
KA-51A	6	4.5x4.5"	LA-135	150	360	1	15° Forward oblique.	KA-51A in station 1 will accept only LA-135 Cassettes.
			LA-141	350	840	3 and 4	Rotatable mount – 90°, 86°, 81°, 30°, 15°, or 5° left or right.	
KA-53A	12	4.5x4.5"	LA-135	150	360	3 and 4	Rotatable mount – 90°, 86°, 81°, 30°, 15°, or 5° left or right.	When KA-53A cameras are installed in stations 3 and 4 the mounts may be rotated to all angles, but not concurrently below the 30° depression angle.
			LA-141	350	840			
KA-62A	3	4.5x4.5"	LA-135	150	360	3 and 4	Universal mount fixed in: 90°, 81°, 15°, or 5° left or right.	
			LA-141	350	840			
KA-66	3	2.25x10"	KA-66A	350	420	2	Vertical only	
KA-68	3	4.5x9.25"	KA-68A	700	930	4	Vertical only	
DBM 5C	1, 2, or 3	16MM	Integral	400	10 Minute run time	1	15° Forward oblique	Motion picture-32 FPS
DBM 4	1, 2, 3	16MM	Integral	300 & 500	2½ - 5 Minute	1	15° Forward oblique	Motion picture

* Before AFC 613.

Figure 8-3 (Sheet 1)

CAMERA INSTALLATIONS

(AFTER AFC 610)

CAMERA	FOCAL LENGTH (INCHES)	FORMAT	MAGAZINE	FILM CAPACITY (FEET)	MAXIMUM EXPOSURES	STATION INSTALLED	MOUNT	REMARKS
KA-45A	6	4.5x4.5"	LA-135	150	360	1	15° Forward Oblique	Deleted after AFC 613.
KA-51A	6	4.5x4.5"	LA-135	150	360	1	15° Forward Oblique	Accepts only LA-135 cassettes.
KS-87B	3, 6, or 12	4.5x4.5"	LA-3548	700	2100	3 & 4	Rotatable mount 90°, 86°, 81°, 30°, 15°, or 5° left or right	
KA-66	3	2.25x10"	KA-66A	350	420	2	Vertical only	
KA-68	3	4.5x9.25"	KA-68A	700	930	4	Vertical only	Camera will be mounted on rotatable mount, but will be stationary.
DBM 4	1, 2, 3	16MM	Integral	300 & 500	2½ - 5 Minute	1	15° Forward Oblique	Motion picture.
DBM 5C	1, 2, or 3	16MM	Integral	400	10 Minute run time	1	15° Forward Oblique	Motion picture.

Figure 8-3 (Sheet 2)

CAMERA CONTROL EQUIPMENT

Nomenclature	*Function*
Viewfinder	Provides wide-angle view of area being photographed. In normal flight attitude view is from 10^{o} below horizon to 5^{o} aft of airplane vertical axis. Provides narrow-angle view of area being photographed. In normal flight attitude view is from 8^{o} below horizon to 38^{o} below horizon. Provides method of determining true ground speed, angle of drift, correct $E\frac{V}{H}$ and proper overlap of exposures for manually operated pulse cameras. Provides format reference marks on reticles to define field of coverage for vertically mounted cameras and forward oblique cameras.
NEW Scanner*	Generates an output signal with a frequency that is proportional to the ratio of airplane ground speed to altitude.
NEW Scanner-Converter*	Converts scanner output signal frequency into dc voltage proportional to the ratio of airplane ground speed to altitude ($E\frac{V}{H}$).
Central computer	Provides pulse signals for control of camera installations. Synchro information control movement of viewfinder traveling grid. Supplies 150-volt dc power to manual computer in master control panel.
Flash detector/daylight monitor	On day missions, converts light reflected from terrain into dc voltage proportional to light intensity. ** With night photo circuits energized, transmits an electrical pulse to operate cameras as each flare ignites.
Night timer unit and overrun control	Operates night cameras by amplifying the pulse received from flash detector overrun control. Maintains operation for 6 seconds to ensure that camera magazines are still operating when last flare ignites.
NEW RDA servo power unit***	Supplies image motion compensation (IMC) drive power to KA- series cameras and exposure control to KA-45 cameras.
NEW Station 1 servo power unit*	Provides exposure control for KA-45 camera installed in station 1.
Viewfinder dehydrator	Dehumidifies and circulates air in the viewfinder.
Air filter	Cleans air circulated through the viewfinder.
Oblique sights	Provides means for locating optical center of area being photographed by the side oblique cameras.
NEW Signal converter unit****	Provides forward motion compensation (FMC) signal information to the KS-87 cameras.

*Removed by AFC 613. ***Removed after AFC 610.
**Inoperative after AFC 613. ****Added after AFC 610.

72282-8-1-06-72

Figure 8-4

V/H RATIO

In order to operate the cameras in each station successfully, it is necessary to regulate either the frequency of picture taking or the amount of image motion compensation necessary to cancel image movement during exposure. The camera control system permits such regulation to be made manually by adjustment of a control voltage ($E\frac{V}{H}$) to a level directly proportional to the ratio of aircraft ground speed to height above the terrain ($\frac{V}{H}$ ratio).

In the computer mode, manual settings are made on the master control unit for speeds from 150 knots to 1,000 knots and for altitudes from 100 feet to 50,000 feet. The master control unit provides a $\frac{V}{H}$ ratio range of 0.0045 to 4.5. A nomograph for determining altitude and velocity relationships is presented in figure 8-5.

TAPE RECORDER

The tape recorder is used to record the pilot's comments during the photographic run. Pilot's speech is recorded when the recorder is turned on and the UHF function switch is in any position other than OFF. Radio transmissions are recorded with the mike button depressed. Radio reception is automatically recorded when the UHF control knob is set for audibility.

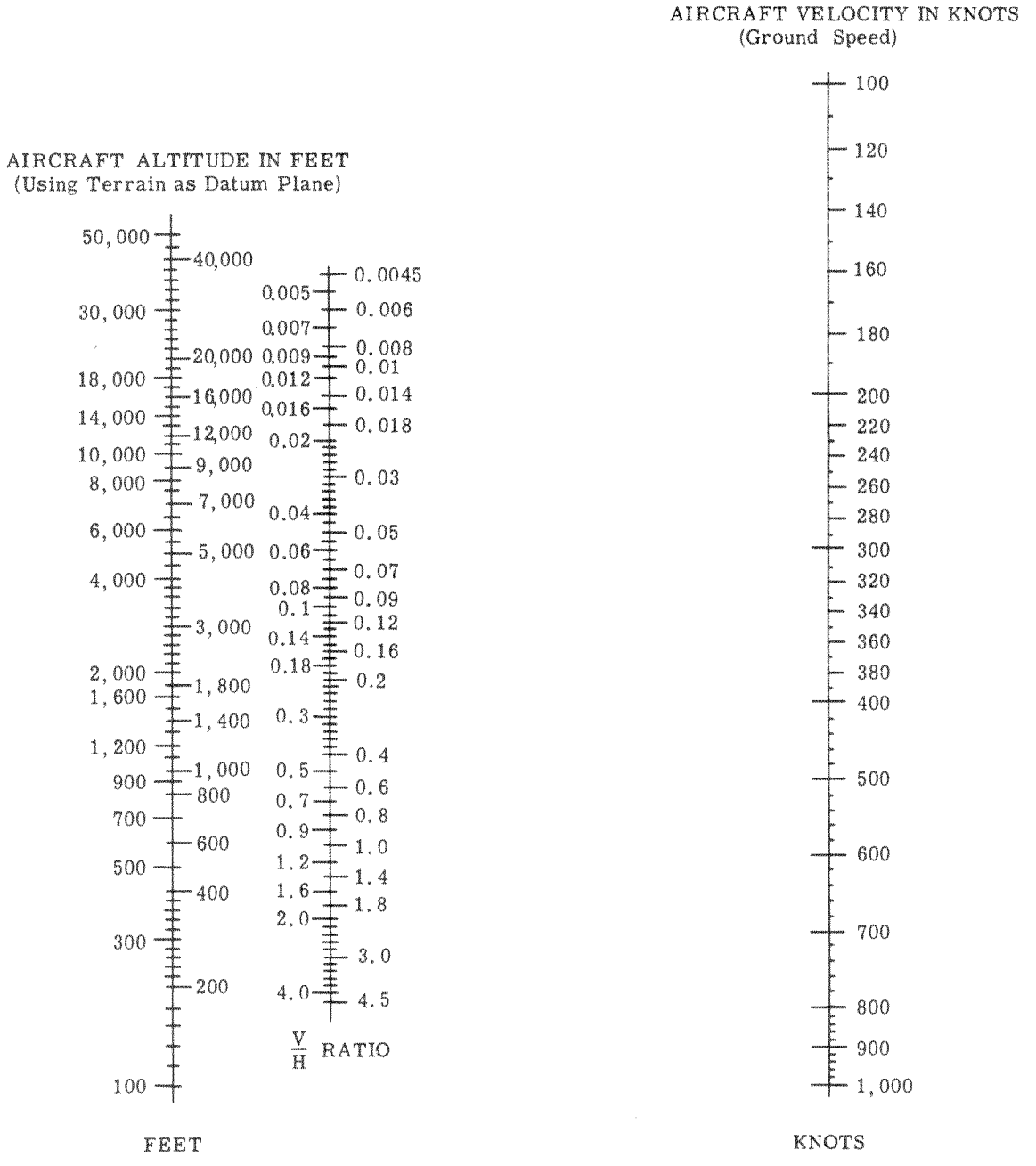
The recorder is located in camera bay 2. Only one tape cartridge, capable of one hour of continuous recording, can be used on a particular flight. Inflight cartridge reloading is not possible due to the remote location of the recorder. The recorder receives power from the secondary ac and dc buses through a recorder switch on the right forward (sloping) console. The recorder switch is connected in series with a switch operated by an on-off lever on the recorder so that both switch and lever must be ON in order to record.

Note

Ensure that maintenance personnel have placed the recorder on-off switch in ON before taking off so that the recorder will be available in flight.

With the recorder on-off lever in ON, the tape drive is controlled by the recorder switch. To avoid needlessly expending tape, the recorder switch should not be on prior to actual recording. After flight, the recorder lever should be placed in OFF to prevent flattening of the tape rollers.

ALTITUDE—VELOCITY RELATIONSHIPS



NOTE

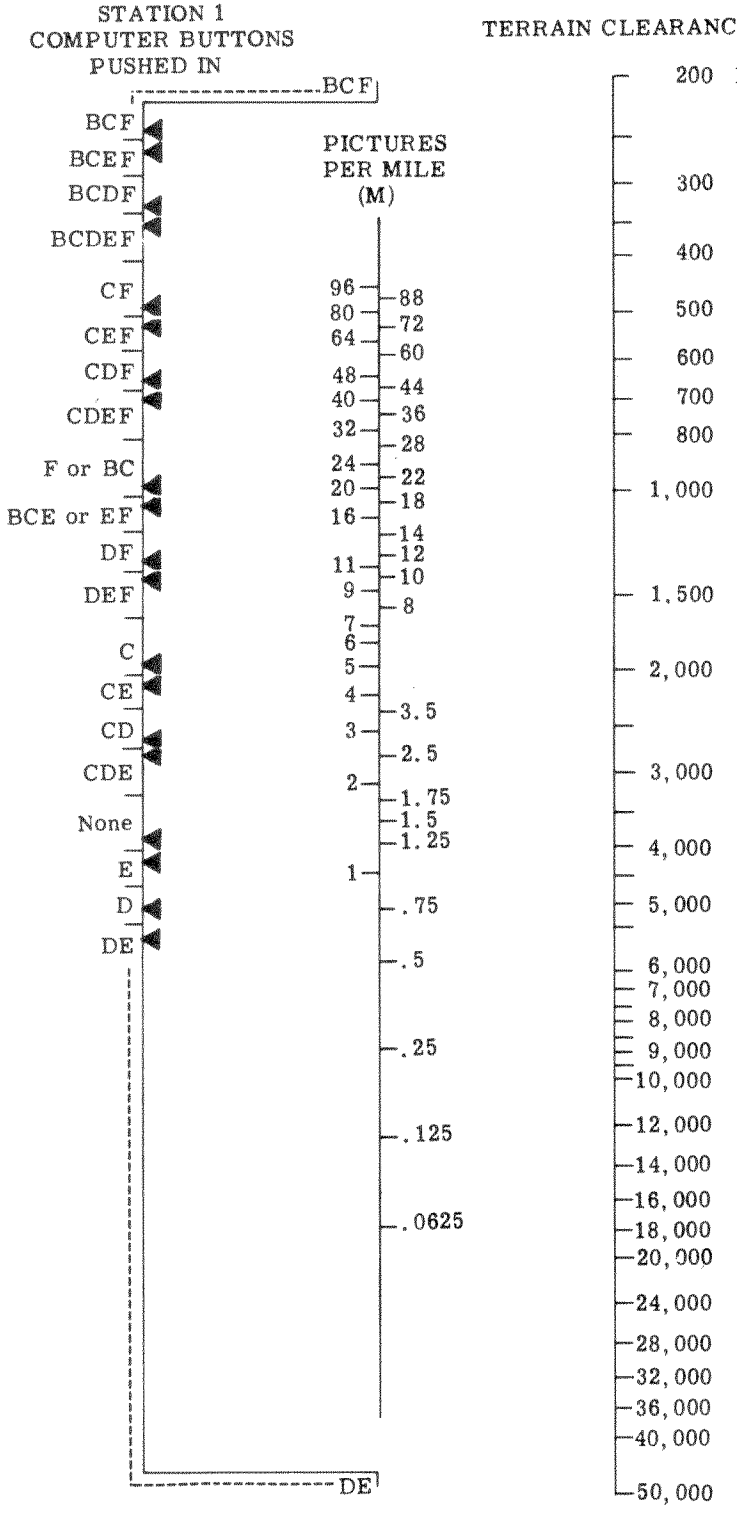
To determine $\frac{V}{H}$ ratio for a given velocity and altitude, place a straight-edge on the given values and read value at intersection of straight-edge and $\frac{V}{H}$ scale.

72282-7-8

Figure 8-5

STATION 1 COMPUTER SETTINGS

PICTURES-PER-MILE



NOTE

This nomograph may be used only for camera station 1 (forward oblique) in determining preflight settings for desired pictures-per-mile or for changing the pictures-per-mile rate in flight.

TO DETERMINE PREFLIGHT SETTINGS:

1. Computer button selection is made using values for the desired number of pictures per mile (M) and planned mission altitude (H). Place straight edge on values for altitude and pictures per mile. Select the computer buttons indicated by the straight edge.
2. When the master control is used to obtain desired pictures per mile (SCANNER-COMPUTER switch in "COMPUTER"), the ALT control must be set to an altitude compatible with the actual computer gear ratio obtained by depressing buttons selected in step 1. To obtain the altitude setting, place straight edge on triangular mark beside selected computer buttons and desired pictures per mile. Set the ALT control to the altitude indicated by the straight edge.

TO CHANGE PICTURES-PER-MILE SETTING IN FLIGHT:

Place straight edge on triangular mark for computer buttons selected and new pictures-per-mile rate. Reset ALT control to value indicated by straight edge. KTS control is set to actual ground speed.

72282-7-9-4-67

Figure 8-5A

NORMAL PROCEDURES

GENERAL

The following procedures will be helpful in successfully completing photographic missions:

1. Turn on camera station power 1 minute before actual operation to give equipment sufficient warmup time.

2. When taking oblique photographs, avoid shooting into the sun. Handle oblique sights carefully to prevent damage.

3. If possible, avoid rain squalls or clouds with heavy moisture content as the lens may fog.

4. When rotating camera mounts, ensure that mount is firmly seated in selected position (ready light on) before selecting new position.

*5. With KA-53A cameras in both stations 3 and 4, the depression angle of one camera cannot be decreased if the other is in a 5° or 15° position. For example, if a 30° position must be selected first. Wait until the ready light indicates the first camera mount is in the selected position before rotating the second camera.

6. Visualize the angle of view of the camera being operated. This is particularly important in air-to-air photography.

7. Check drift before arrival over target and adjust flight line heading accordingly.

8. Allow for terrain altitude in computing flight altitude for the desired scale.

9. Be alert for targets of opportunity. These often provide more valuable intelligence than those targets whose existence is known.

DAY MISSIONS

Before takeoff, operate the photographic system using applicable portions of Cockpit Checks, Before Target and On Target procedures.

Cockpit Checks

1. Flare salvo switch — OFF
2. Flare ready switch — OFF
3. Camera power switch — OFF
4. Knots control — PLANNED SPEED
5. Altitude control — PLANNED ALTITUDE
6. Scanner-computer switch — COMPUTER
**7. Exposure control — 10:30 POSITION
8. Station control switches — OFF
9. Mount knobs — V
10. Film counter — AMOUNT OF FILM LOADED
11. Station ready and operate lights — PRESS TO TEST
12. Camera master operation switch — OFF
13. Viewfinder lens cover — CHECK
14. Grid illumination switch — DESIRED INTENSITY
15. Mode switch — AS DESIRED
16. Recorder switch — OFF
17. Instrument lights switch — CHECK
18. Recorder lever — ON
19. Chaff switch — OFF

Before Target

To avoid damaging camera shutters, always turn camera master operation and camera trigger switches off before repositioning any camera station control switch or the camera power switch.

1. Photo power switch — ON
2. Scanner-computer switch — COMPUTER
   - The viewfinder traveling grid lines will start to move 45 seconds after power is applied. Synchronize grid lines and image motion by adjusting knobs or altitude controls.
3. Mount knobs — DESIRED DEPRESSION ANGLES (for rotatable mounts)
   - Station ready lights go out as mounts move and are lighted when mount reaches the correct position.
4. Station control switches — MASTER or STICK (for each station to be used)
5. Station ready lights — ON
6. Drift correction switch — AS REQUIRED
   - Switch is actuated to align viewfinder track line with ground image.

*Before AFC 610.
**Prior to AFC 613.

On Target

1. Recorder switch – AS REQUIRED
2. *Exposure control (KA-45 only) – ADJUSTED FOR OPTIMUM READING ON EXPOSURE INDICATOR
3. Camera master operation switch – ON
   or
   Camera trigger switch – ON
   or
   Extra picture switch – DEPRESSED

CAUTION

The extra picture switch is intended for emergency use only. Depressing this switch automatically shifts the system into runaway pulse operation regardless of position of the mode select switch. Use of this switch causes maximum taxation of camera electromechanical components. After AFC 610, station one continues to operate the same. Stations 3 and 4 will cycle KS-87 cameras once each time the extra picture switch is depressed.

Turning Cameras Off

To avoid damaging camera shutters, always turn camera master operation and camera trigger switches off before repositioning any camera station control switch or the camera power switch.

To turn system off, proceed as follows:

1. Camera master operation switch — OFF
2. Mount knobs — V
3. Station control switches — OFF
4. Photo power switch – OFF
5. Recorder switch — OFF

Viewfinder Operation

The viewfinder provides the pilot with a view of the area being photographed. Format reference marks, drift scales and moving grid lines permit the pilot to determine picture-taking interval, drift and true ground speed (figure 8–6).

Exposure interval and true ground speed may be determined by using the viewfinder reticle markings. Pulse cameras may be actuated by depressing the extra picture switch at intervals determined by using the viewfinder. The nadir point may be used to center a desired photograph with pulse cameras.

To determine exposure interval, proceed as follows:

1. View selector switch — WIDE ANGLE
   - Allow viewfinder to complete cycle before selecting different view angle.
2. Drift connection switch — AS REQUIRED
   - Switch is actuated to align viewfinder track line with ground image.
   - Time the traverse of a ground object from the overlap reference marks to the nadir on the track line of the wide angle reticle. This time is the correct interval between exposures at 60% overlap for the applicable camera focal length.

To determine true ground speed, proceed as follows:

1. Scanner-computer switch — COMPUTER
2. Drift correction switch — AS REQUIRED
   - Switch is actuated to align viewfinder track line with ground image.
3. Altitude control — SET AT TRUE ALTITUDE
4. Knots control — ADJUST
   - Rotate until traveling grid matches image motion. The knots dial of the altitude-speed indicator then reads true ground speed.

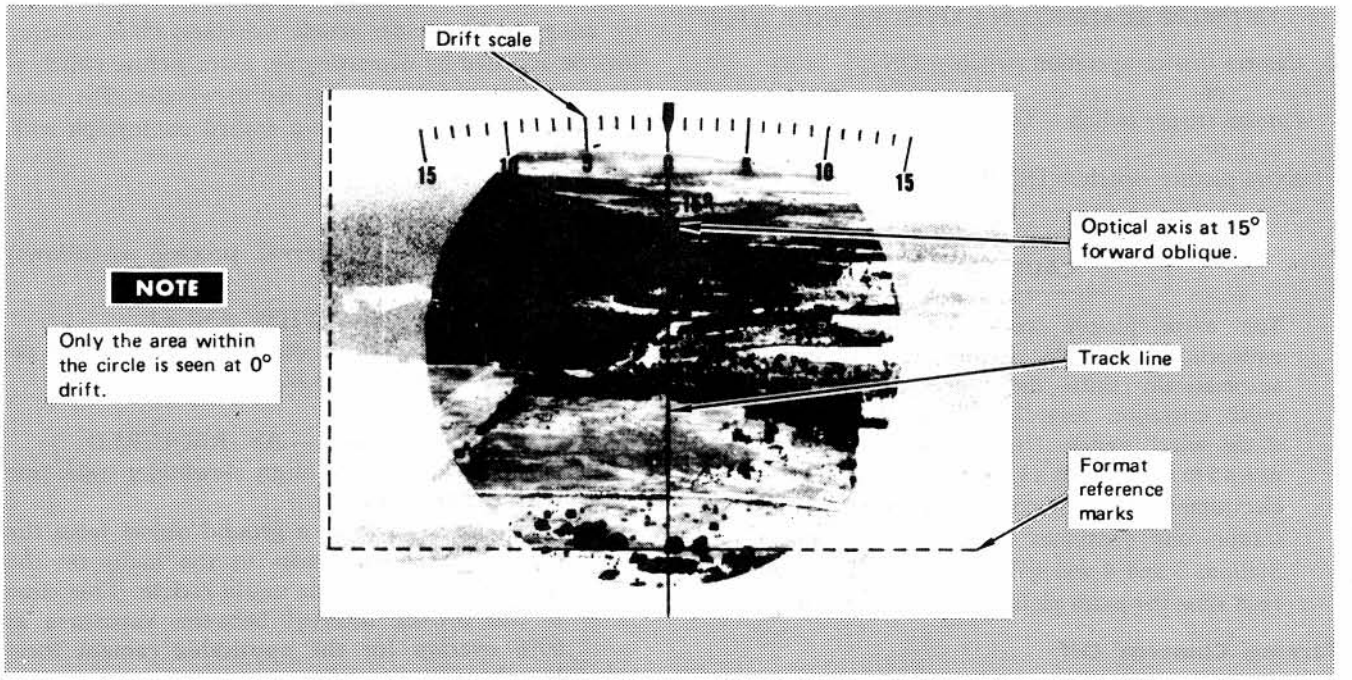
Inflight Troubleshooting

Refer to figure 8–7.

*Before AFC 613.

VIEWFINDER RETICLES

NARROW ANGLE RETICLE
(View selector switch in FWD MAG)



WIDE ANGLE RETICLE
(View selector switch in WIDE ANGLE and grid illumination switch in GRID ILLUM)

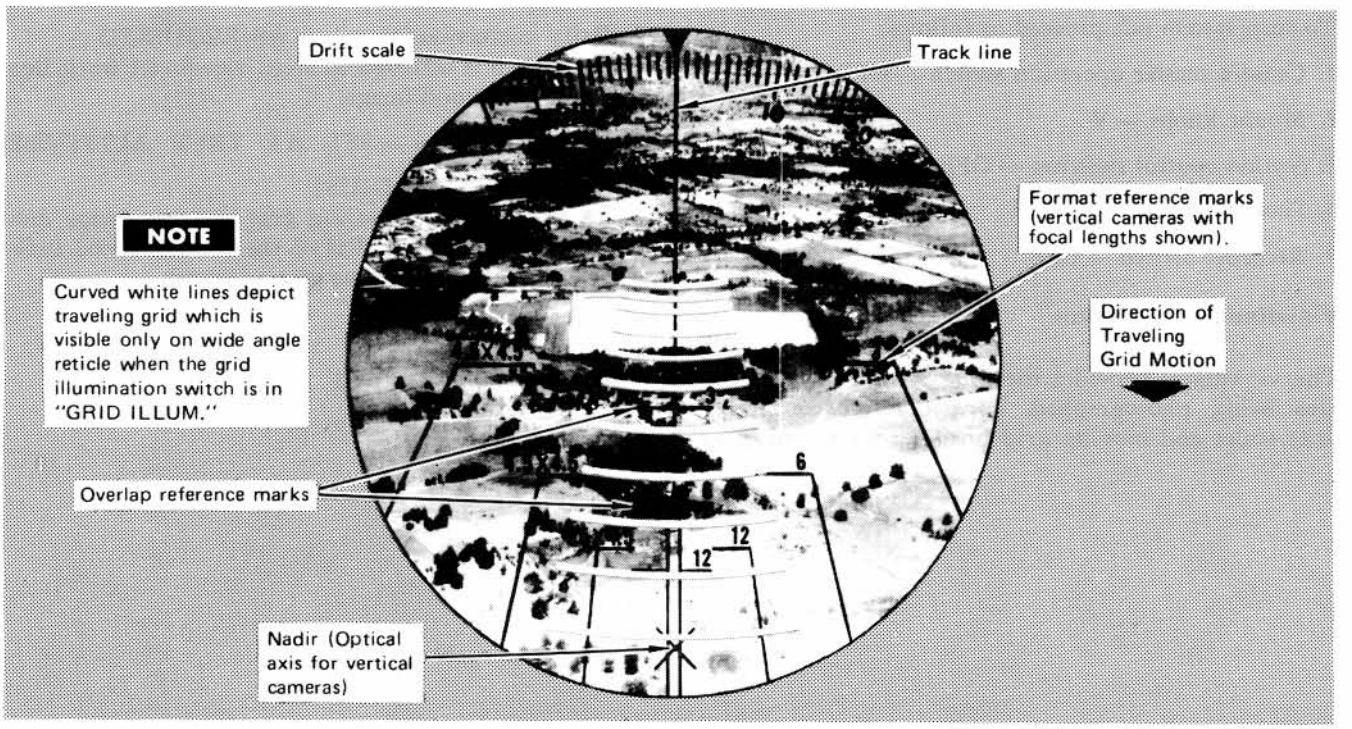


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Figure 8-6

INFLIGHT TROUBLESHOOTING-DAY OPERATION

Trouble	*Action Required*
Operate light of any station burns steadily.	Turn station control switch to OFF. Station is not usable because of a film failure.
NEW Ready light of any station does not light when photo power switch is ON and the station control switch is set to MASTER or STICK.	Check the press-to-test feature of ready light. If lamp lights, turn the station control switch to OFF. If lamp does not light, proceed with normal operation of the station.
Ready light of station 3 or 4 goes out when mount knob is turned and does not come back on.	Check press-to-test feature of ready lights. If lamp lights, the mount is out of position. Try to bring mount back into position by turning mount knob to one extreme position or the other (V or 5°) then set to desired position. If this fails, turn station control switch to OFF.
When scanner-computer switch is set to SCANNER, viewfinder traveling grid has an obvious error in synchronization with the ground image.	Turn the scanner-computer switch to COMPUTER and set in $\frac{V}{H}$ — by manual setting of knots and altitude controls to synchronize traveling grid.
Operation of any camera station ceases.	Press the extra picture switch and time exposure intervals by using viewfinder. If extra picture switch does not operate a particular camera station, turn station control switch OFF.
Exposure meter does not indicate exposure properly.	*Estimate the brightness of the objective terrain and set exposure control accordingly. NEW
Ready and operate lights do not light. Film counter does not operate (only station 2).	Check press-to-test feature of ready and operate lights. If lamps light, turn station control switch to OFF. Station not usable because of power failure.
NEW Ready and operate lights dim.	Turn off console light dimming switch. NEW
Viewfinder traveling grid is not illuminated with selector switch in WIDE ANGLE and grid illumination switch in BRT.	Position viewfinder selector switch to FWD MAG, wait for cycle to complete, then switch back to WIDE ANGLE. Repeat if necessary. This procedure sometimes frees stuck microswitch in viewfinders.

NEW *Before AFC 613.

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Figure 8-7

NIGHT MISSIONS

A check of photographic system operation is made before flares are loaded. If a flare ejector test set is available, the system is tested by performing applicable portions of Cockpit Checks, Before Target and On Target procedures. Check for correct operating indications.

Cockpit Checks

1. Flare reset switch — RESET
2. Flare salvo switch — OFF
3. Flare ready switch — OFF
4. Flare counters — NUMBER OF FLARES
5. Flare failure and ready lights — PUSH TO TEST
6. Camera power switch — OFF
7. Knots control — PLANNED SPEED
8. Altitude control — PLANNED ALTITUDE
9. Scanner-computer switch — COMPUTER
10. Station control switches — OFF
11. Mount knobs — V
12. Film counters — AMOUNT OF FILM LOADED
13. Station ready and operate lights — PUSH TO TEST
14. Camera master operation switch — OFF
15. Viewfinder lens cover — CHECK
16. Grid illumination switch — OFF
17. Mode switch — AS DESIRED
18. Recorder switch — OFF
19. Instrument lights switch — CHECK

Flare Loading

MK-123 A1 PHOTOFLASH CARTRIDGE LOADING IN THE AIRCRAFT

To load photoflash cartridges in the aircraft, proceed as follows while the aircraft engine is turning:

1. Main generator switch – MAIN
2. Photo master power switch – ON
3. Camera station power switch – ON
4. Camera master operate switch – ON
5. Flare ready switch – ON
6. Pilot removes hands from cockpit
7. Perform zero voltage check of the electro firing pins.
8. Flare ready switch – OFF
9. Camera station power switch – OFF
10. Photo master power switch – OFF
11. Camera master operate switch – OFF
12. Main generator switch – OFF
13. Pilot removes hands from cockpit
14. Perform stray voltage check
15. If the voltage check reads ZERO, the photoflash cartridges are ready to load in the aircraft, the pilot's hands remain out of the cockpit until the cartridges have been completely loaded.
16. Main generator switch – MAIN
17. Flare fail light – OFF FOR ALL SELECTOR POSITIONS
18. Flare selector switch – AS DESIRED.

Before Target

1. Camera power switch — ON
2. Station control switches — MASTER or STICK
   - Select same mode for stations 3 and 4.
3. Station ready lights — ON
4. Scanner-computer switch — COMPUTER
5. Flare reset switch – HOLD APPROX 5 SEC. -REPEAT
6. Flare ready switch — READY
7. Flare ready light — ON
8. Flare failure light — OFF
9. Flare selector switch — AS DESIRED
10. Side mirrors — DEFLECTED

On Target

1. Camera master operation switch — ON
   — or —
   Camera trigger switch — ON
2. Flare counters — COUNTING DOWN
   - Observe operating indications for stations 3 and 4.

Note

In night operation, extra picture fires one flare each time it is depressed.

Stopping Flare Ejection

To stop flare ejection and turn system off, proceed as follows:

1. Camera master operation switch — OFF
   — or —
   Camera trigger switch — OFF
   - Overrun circuits will keep camera shutter(s) open and magazines operating for an additional 6 seconds.
2. Station control switches — OFF
   - Turn off when overrun cycle is completed.
3. Camera power switch — OFF

Flare Salvo

To salvo flares, proceed as follows:

1. Flare salvo switch — ON
   - Hold on until flare failure light comes on.
2. Flare counters — NO FLARES REMAINING
3. Flare arming switch — OFF

Note

When mission is complete, pilot should energize flare reset switch and then salvo to clear racks of possible hung flares.

Inflight Troubleshooting

Refer to figure 8–8.

INFLIGHT TROUBLESHOOTING-NIGHT OPERATION

Trouble	*Action Required*
Operate light on any station burns steadily.	Turn station control swtch to OFF. Station is not usable because of a film failure.
Ready light of any station does not light when camera power switch is ON and the station control switch is set to MASTER or STICK.	Check the press-to-test feature of ready light. If lamp lights, turn the station control switch to OFF. If the lamp does not light, proceed with normal operation of the station.
Ready light is on but operate light and film counter do not operate when flares burst.	Turn photographic system off. System not usable because of a faulty flash detector.
With flare selector switch in LEFT or RIGHT, failure light comes on and flares stop ejection, but counters indicate that not all selected flares are expended.	Switch selector to opposite side and use these flares. If flares are expended before mission is completed, switch back to flares originally selected. Place flare reset switch in RESET for 3 seconds, then attempt normal flare ejection. If flares still are not ejected, turn system off.
With flare selector switch in TRAIN, failure light comes on and counters indicate that not all left or right flares are expended.	Attempt operation with selector in LEFT or RIGHT, depending upon counter indication of flares remaining. If flares are not ejected from either side, place flare reset switch in RESET for 3 seconds, then release switch and again attempt to eject flares.
With flare salvo switch ON, flare failure light comes on and flare ejection stops, but counters show that not all flares are expended.	Release salvo switch and position flare reset switch to RESET for 3 seconds. Place salvo switch in ON and hold until failure light comes on. (During this procedure, flare counters will have counted beyond zero.)
Flares are not ejected when flare salvo switch is ON.	Release salvo switch and position flare ready switch to READY. Set flare selector switch to TRAIN and employ one of the following procedures: Turn knots and altitude controls to maximum speed and minimum altitude settings. Turn the camera power and the camera master operation switches on. Keep switches on until the flare counters indicate zero and the flare failure lamp is lit. Alternate: Turn the camera master operation and camera trigger switches off and eject flares with the extra picture switch. The flare ready switch must be in READY and the flare ready light must be lighted.

72282-8-3 NC

Figure 8-8

ELECTRONIC COUNTERMEASURES

Note

The ALE-29A chaff dispenser is installed on RF-8G aircraft. A description of the chaff dispenser follows. Refer to (Confidential) F-8 Tactical Manual (U), NAVAIR 01-45HHA-1T and the (Secret) Supplement to the F-8 Tactical Manual (U), NAVAIR 01-45HHA-1T (A) for the remainder of the ECM writeup.

ECM

DESCRIPTION

The AN/ALE-29A Chaff Dispenser System is a countermeasure system for ejecting chaff or other decoys into the atmosphere during flight to decrease the effectiveness of enemy radar. Two chaff dispensers are installed in the aft engine access door on the bottom of the fuselage. Each dispenser contains 30 tubes for individual payload units which are ejected by gas pressure generated by an electrically inititiated impulse cartridge.

ECM

The system is controlled by a chaff control panel in the left-hand console, a chaff manual fire button on the left-hand longeron, and a chaff programmer in the right main landing gear well. The programmer controls the modes in which the dispenser stores are dispensed. These controls and their functions are presented in figure 8-9. The contents of one dispenser tube is a burst. The number of bursts selected comprise a salvo.

While the aircraft is on the deck, a safety pin is placed in the chaff firing power disable switch located in the right main landing gear well. The system is in a ready status when the chaff firing disable switch pin is removed, the landing gear handle is in WHLS UP and the chaff select switch is in FWD, AFT, or BOTH. The system is powered by the secondary dc bus.

Chaff Dispenser System Controls and their functions are presented in figure 8-9.

MANUAL OPERATION

If no automatic sequence is in progress when the chaff manual fire button is depressed, one salvo will be dispensed as selected on the programmer. For example, assume control settings on the programmer as follows: bursts switch set to "4" and bursts interval switch set to "0.3" seconds; the chaff select switch in the cockpit is set to select the AFT dispenser; and the chaff manual fire button is depressed momentarily. This will release one dispenser tube of chaff from the aft dispenser and 0.3 seconds later another tube, etc, until four tubes, or bursts, have been expended. This is termed one salvo. The manual cycle is then complete until the button is again depressed. If the chaff select switch in the cockpit is moved to BOTH, then the previously described cycle will occur in both the forward and the aft dispensers simultaneously when the manual fire button is depressed.

If an automatic sequence is in progress when the manual fire button is depressed, extra bursts will be dispensed until a salvo has been completed or until the automatic pulse coincides with the manual pulse. When a manual pulse coincides with an automatic pulse, only the automatic ejection will occur.

AUTOMATIC OPERATION

The type of automatic release obtained when the autofire button is depressed depends entirely upon the setting of the chaff selector switch in the cockpit and the (preflight) setting of the programmer switches. For example, assume the chaff selector switch is set to FWD and programmer switches are positioned as follows: salvo interval set to 2 seconds, burst interval set to 0.4 seconds, burst switch set to 3, and the salvos switch set to 16.

When the autofire switch is momentarily depressed, automatic release is initiated. Three dispensers tubes will be emptied with a 0.4 second delay between each tube. After a delay of 2 seconds, another salvo of three dispenser tubes will be emptied, etc, until 16 salvos or 48 dispenser tubes have been emptied. The 30 tubes in the forward dispenser will empty their contents first, then 18 tubes in the aft dispenser go next (when the selected dispenser is empty the programmer automatically switches dispensers). However, if the BURST switch is set on C (continous), the payload units will be expended at a rate of one burst every 0.4 second until the entire payload is expended or until dispensing is terminated by turning off power to the system. When C is selected on the BURST switch, the setting on the SALVO or SALVO INTERVAL switches are meaningless.

If the C position is selected on the SALVO switch, salvos will be dispensed repeatedly until all payload units are expended or until dispensing is terminated by turning off power to the system. The number of bursts per salvo, the burst interval, and the salvo interval will be established as determined by settings of their respective switches.

With the chaff selector switch in BOTH, chaff is dispensed automatically from both dispensers in the manner previously described for one dispenser.

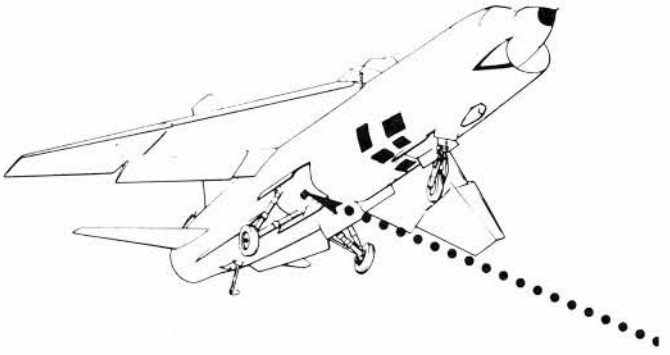
RESETTING

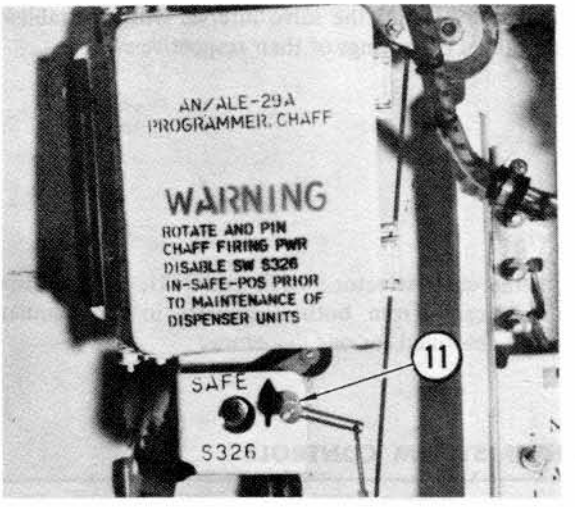
Two reset switches, one in the cockpit and one on the programmer panel, are provided for resetting the sequence switches. The cockpit reset switch, located on the left side above the longeron panel, is spring loaded to the NORMAL position. The programmer reset switch is located on the programmer panel in the left main gear well. With electrical power on the aircraft system, the cockpit reset switch must be held in the RESET position at least six seconds to reset the sequence switches to their beginning position (top of firing order). With electrical power applied to the chaff system and the ALE-29A function switch in any position except OFF, the programmer reset switch must be actuated and held at least six seconds to reset the sequence switches to their beginning position (top of firing order).

CHAFF SYSTEM CONTROLS

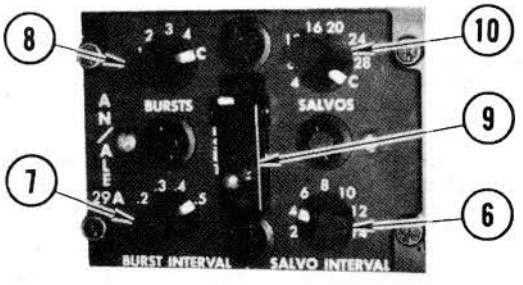
Nomenclature	*Function*
Chaff manual fire button (1, figure 8–9)	Pressed and released when automatic sequence not in progress, dispenses on salvo. Number of bursts comprising salvo and time between bursts is determined by programmer (preflight) settings. Pressed and released when automatic sequences in progress, dispenses one extra burst from dispenser selected. If manual pulse coincides exactly with a pulse from the automatic programming, only one burst will be dispensed.
Chaff select switch (2, figure 8–9)	OFF — deenergizes chaff system. Stops dispensing in progress. Resets the programmer to the starting position of the automatic dispensing sequence as determined by setting of burst and salvo switches. AFT — selects aft chaff dispenser and arms autofire button and chaff manual fire button. FWD — selects forward chaff dispenser and arms autofire button and chaff manual fire button. BOTH — selection permits simultaneous chaff release dispensions from FWD and AFT dispensers and arms autofire button and chaff manual fire button.
Auto fire button (3, figure 8–9)	Depressed and released, initiates automatic dispensing as determined by settings on programmer.
Subtractive counters (4, figure 8–9)	Indicates number of unfired chaff packages remaining in FWD and AFT dispensers.
Counter set knobs (5, figure 8–9)	Set subtractive counters to number of chaff packages in each dispenser.
Salvo interval switch (6, figure 8–9)	Selects the interval (in seconds) between salvos. (For automatic dispensing only.)
Bursts interval switch (7, figure 8–9)	Selects the interval (in tenths of a second) between bursts.
Bursts switch (8, figure 8–9)	Selects the number of bursts to be fired in each salvo.
Programmer reset button (9, figure 8–9)	Repositioned and held for 6 seconds with chaff system power and function switch in any position except OFF to reset sequence switches.
Salvos switch (10, figure 8–9)	Selects the successive number of salvos to be automatically dispensed.
Firing power disable switch (11, figure 8–9)	Pin installed — prevents inadvertent actuation of chaff system during deck operation. Pin removed — completes chaff system electrical circuitry.
Cockpit reset switch (12, figure 8–9)	Held to RESET position for 6 seconds with electrical power on aircraft resets sequence switches.

CHAFF SYSTEM CONTROLS

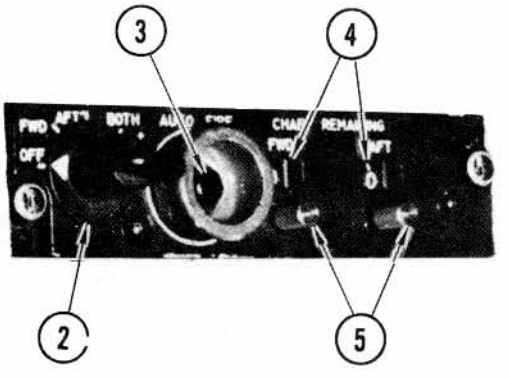




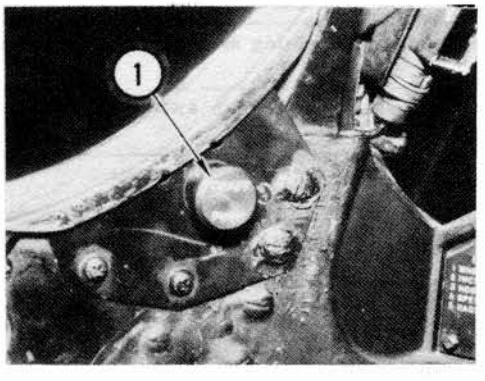
PROGRAMMER AND DISABLE SWITCH
(See Detail A for Programmer Panel)



DETAIL A



CHAFF CONTROL PANEL



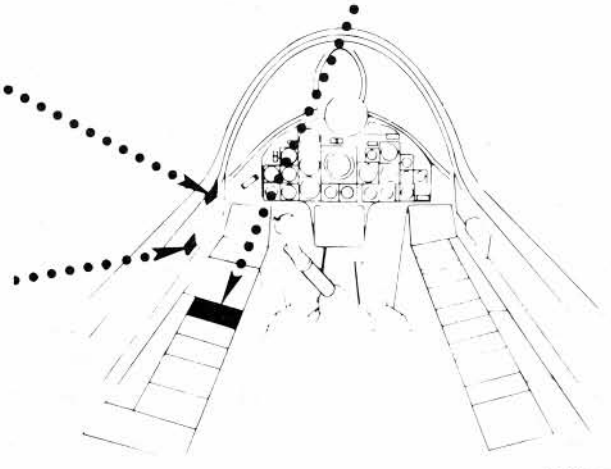


Figure 8–9

CHAFF SYSTEM CONTROLS

Nomenclature	*Function*
	CHAFF CONTROL PANEL
Chaff switch (1, figure 8–11)	OFF — deenergizes chaff system. AFT — selects aft chaff dispenser for manual operation and arms autofire button and extra picture switch. FWD — selects forward chaff dispenser for manual operation and arms autofire button and extra picture switch.
Autofire push button (2, figure 8–11)	Momentarily depressed, initiates programmed chaff dispensing.
Subtractive counters (3, figure 8–11)	Indicates number of chaff packages remaining in forward and aft dispensers.
Counter setting knobs (4, figure 8–11)	Set subtractive counters to number of chaff packages in each dispenser.
Extra picture switch (24, figure 8–1)	Depressed, releases one chaff package from selected dispenser. Will not actuate cameras when chaff switch is in AFT or FWD position.
	SELECTOR PANEL (Located in Right-Hand Gear Well)
Burst interval timer (1, figure 8–11)	1–10, selects time interval in seconds between bursts (for automatic dispensing).
Burst selector (2, figure 8–11)	6–36, selects number of bursts each time autofire switch is depressed. Actual number of packages dispensed will be this number, or twice this number, depending on the setting of the type burst switch.
Type burst switch (3, figure 8–11)	Single-double, selects one or two packages to be released each burst.
Reset switch (4, figure 8–11)	Pushed, resets programmer before flight.

section IX
flight crew coordination

(not applicable)

section X
NATOPS evaluation

CONTENTS

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CONCEPT

The standard operating procedures prescribed in this manual represent the optimum method of operating the aircraft. The NATOPS Evaluation is intended to evaluate compliance with NATOPS procedures by observing and grading individuals and units. This evaluation is tailored for compatibility with various operational commitments and missions of both Navy and Marine Corps units. The prime objective of the NATOPS Evaluation program is to assist the unit Commanding Officer in improving unit readiness and safety through constructive comment. Maximum benefit from the NATOPS Evaluation Program is achieved only through the vigorous support of the program by commanding officers as well as the flight crewmembers.

DEFINITIONS

The following terms, used throughout this section, are defined as to their specific meaning within the NATOPS program.

NATOPS EVALUATION

A periodic evaluation of individual pilot or flight crewmember standardization consisting of an open book examination, a closed book examination, an oral examination, and a flight evaluation.

QUALIFIED

That degree of standardization demonstrated by a very reliable flight crewmember who has a good knowledge of standard operating procedures and a thorough understanding of aircraft capabilities and limitations.

CONDITIONALLY QUALIFIED

That degree of standardization demonstrated by a flight crewmember who meets the minimum acceptable standards. He is considered safe enough to fly as a pilot in command or to perform normal duties without supervision but more practice is needed to become Qualified.

UNQUALIFIED

That degree of standardization demonstrated by a flight crewmember who fails to meet minimum acceptable criteria. He should receive supervised instruction until he has achieved a grade of Qualified or Conditionally Qualified.

AREA

A routine of preflight, flight or postflight.

SUBAREA

A performance subdivision within an area, which is observed and evaluated during an evaluation flight.

CRITICAL AREA/CRITICAL SUBAREA

Any area or subarea which covers items of signifcant importance to the overall mission requirements, the marginal performance of which would jeopardize safe conduct of the flight.

EMERGENCY

An aircraft component, system failure, or condition which requires instantaneous recognition, analysis, and proper action.

MALFUNCTION

An aircraft component or system failure or condition which requires recognition and analysis, but which permits more deliberate action than that required for an emergency.

IMPLEMENTATION

The NATOPS evaluation program shall be carried out in every unit operating Naval aircraft. Replacement squadrons shall ensure that pilots have successfully completed a NATOPS evaluation before their completion of the course of instruction. However, in instances where it is impractical to NATOPS qualify these individuals, the formal course of replacement training shall be considered as having conditionally satisfied NATOPS requirements for a period of 1 year from the individual's completion date, provided all required phases of instruction are completed. An entry shall be made in the individuals log book stating that the individual is NATOPS conditionally qualified utilizing a format similar to OPNAV FORM 3510-8(8-65). Pilots desiring to attain/retain qualification in the aircraft shall:

1. Receive an evaluation within 6 months after reporting to a unit if not currently qualified in model.
2. Hold current evaluation in model aircraft. Renewal evaluation shall be valid for 12 months from expiration date of current evaluation, if accomplished within 60 days preceding expiration of current evaluation. Pilots returning from duties where a validation could not be performed shall be granted a period of 3 months in which to complete the evaluation.

The NATOPS Coordinators, Evaluators, and Instructors shall administer the program as outlined in OPNAVINST 3510.9 series. Evaluees who receive a grade of Unqualified on a ground or flight evaluation shall be allowed 30 days in which to complete a reevaluation. At the discretion of the Commanding Officer, the reevaluation need only to consist of those areas/subareas in which a grade of unqualified was assigned. A maximum of 60 days may elapse between the date the initial ground evaluation was commenced and the date the evaluation flight is satisfactorily completed.

GROUND EVALUATION

Before starting the evaluation flight, an evaluee must achieve a minimum grade of Qualified on the open book and closed book examinations.

The oral examination is also part of the ground evaluation but may be conducted as part of the evaluation flight. To assure a degree of standardization between units, the NATOPS Instructors may use the bank of questions contained in this section in preparing portions of the written examinations.

OPEN BOOK EXAMINATION

Up to 50% of the questions used may be taken from the question bank. The number of questions on the examination will not exceed 100 or be less than 50. The purpose of the open book examination portion of the written examination is to evaluate the pilot's knowledge of appropriate publications and the aircraft. The maximum time for this examination should not exceed 4 hours.

CLOSED BOOK EXAMINATION

Up to 50% of the closed book examination may be taken from the question bank and shall include questions concerning normal procedures and aircraft limitations. The number of questions on the examination will not exceed 100 or be less than 50. Questions designated critical will be so marked. An incorrect answer to any question in the critical category will result in a grade of unqualified being assigned to the examination.

ORAL EXAMINATION

The questions may be taken from this manual and drawn from the experience of the Instructor/Evaluator. Such questions should be direct and positive and should in no way be opinionate[1].

OFT/WST PROCEDURES EVALUATION

An OFT may be used to assist in measuring the pilot's efficiency in the execution of normal operating procedures and his reaction to emergencies and malfunctions. In areas not served by the OFT facilities, this may be done by placing the pilot in a cockpit and administering appropriate questions.

GRADING INSTRUCTIONS

Examination grades shall be computed on a 4.0 scale and converted to an adjective grade of Qualified or Unqualified.

Open Book Examination.

To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.5.

Closed Book Examination.

To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.3.

Oral Examination and OFT Procedure Check. (If conducted).

A grade of Qualified or Unqualified shall be assigned by the Instructor/Evaluator.

EVALUATION FLIGHT

NEW

The number of flights required to complete the evaluation flight should be kept to a minimum; normally one flight. An OFT/WST may be used for flight evaluation phase in lieu of actual flight. The areas, critical areas and critical subareas to be observed and graded on an evaluation flight are outlined in the grading criteria with critical areas marked by an asterisk(*). Subarea grades will be assigned in accordance with the grading criteria. These subareas shall be combined to arrive at the overall grade for the flight. Area grades, if desired, shall also be determined in this manner.

EVALUATION FLIGHT GRADING CRITERIA

The following procedure shall be used in determining the final grade:

1. A grade of unqualified in any critical area or critical subarea will result in an overall grade of unqualified for the flight.

2. Evaluation flight (or area) grades shall be determined by assigning the following numerical equivalents to the adjective grade for each subarea. Only the numerals 0, 2, or 4 will be assigned in subareas. No interpolation is allowed.

   Unqualified 0.0
   Conditionally qualified 2.0
   Qualified 4.0

3. To determine the numerical grade for each area and the overall grade for the flight, add all the points assigned to the subareas and divide this sum by the number of subareas graded. An adjective grade will be assigned to each area and to the overall evaluation on the basis of the following scale:

   Unqualified ..... 0.0 to 2.19
   Conditionally qualified ..... 2.2 to 2.99
   Qualified ..... 3.0 to 4.0

EXAMPLE: (Add subarea numerical equivalents)

$$\frac{4+2+4+2+4}{5} = \frac{16}{5} = 3.20 \text{ qualified}$$

MISSION PLANNING/BRIEFING

FLIGHT PLAN

Qualified	Completed the flight plan and clearance in accordance with governing instructions. Special factors, if required by the mission or aircraft configuration, are computed and recorded where applicable. Completed flight planning without error. Fuel consumption was properly computed. Ensured that maps and charts were available. Weather factors and NOTAMS were used in planning the mission. Departure procedures were obtained if required, and planned accordingly.
Conditionally Qualified	Same as "qualified," but with minor discrepancies which did not adversely affect successful completion of the mission or jeopardize safety.
Unqualified	Flight planning was incomplete or resulted in discrepancies which would possibly prevent successful completion of the mission.

BRIEFING

Qualified	Briefing conducted in accordance with the NATOPS Briefing Guide and/or requirements of the mission. Applicable mission card used. Thorough knowledge of the assigned mission was exhibited. Sufficient time was allowed for the briefing and questions by members of the flight. Flight responsibilities were outlined for each member of the flight.
Unqualified	Briefing not conducted in accordance with the NATOPS Briefing Guide and/or requirements of the mission, and factors affecting mission accomplishment were omitted. Insufficient time allowed for briefing. Flight member responsibilities were not defined.

PERSONAL FLYING EQUIPMENT

Qualified	Had all required items of personal equipment necessary for the mission and area over which the flight was to be conducted.
Unqualified	Did not possess all items of personal flying equipment.

PREFLIGHT/LINE OPERATIONS

AIRCRAFT ACCEPTANCE

Qualified	Checked the ten previous flights (if available) for previous discrepancies and corrective action taken. Checked fuel load, armament load, pertinent aircraft data, and aircraft status before accepting the aircraft.
Conditionally Qualified	Same as "qualified," but omitted checking minor pertinent data and corrective action taken and/or aircraft status data.
Unqualified	Failed to inspect previous flights for discrepancies and corrective action taken and/or aircraft status data.

PRETAXI PROCEDURES

Qualified	Used correct R/T procedures, standard visual signals, and pretaxi checks with the flight as briefed with no unnecessary deviations, omissions, or delays.
Unqualified	Failed to use correct R/T procedures, standard visual signals, and pretaxi checks with the flight. Deviated and omitted procedures as briefed to extent that misunderstanding resulted in unnecessary delays in departing on the mission.

TAXI AND TAKEOFF

TAXI

Qualified	Taxi clearance was obtained prior to departing flight line/deck spot area. Taxiing was accomplished as briefed and in accordance with safe speed and interval requirements. Proper positioning on the catapult was accomplished without delay and with proper response to plane director's signals. Aircraft systems were operated at prescribed intervals and manner during normal taxi and extended ground operation.
Conditionally Qualified	Minor difficulties were experienced in obtaining taxi clearance. Taxiing was accomplished as briefed and in accordance with speed and interval requirements. Positioning on the catapult was accomplished with minor delays in responding to plane director's signals. Operation of systems was completed but at greater intervals than recommended.
Unqualified	Departed flight line/deck spot area without taxi clearance and taxied contrary to instructions from controlling agency. Taxi speed unsafe for field/deck conditions. Improper response to catapult director's signals, causing excessive delays in aircraft launching operations. Aircraft systems not operated.

ATC CLEARANCE

Qualified	Required minimum transmissions to understand clearance. Read back correctly.
Conditionally Qualified	Required repeat transmissions to understand clearance. Transmissions required additional questions and calls.
Unqualified	Proceeded without being certain of clearance. Required repeated transmissions. Was unable to communicate and give information without excessive delay and words. Poor radio discipline.

TAKEOFF

Qualified	Received and acknowledged takeoff clearance. Executed engine runup, instrument checks, and necessary visual signals. Brake release was smooth, and good directional control was maintained. For catapult launch, the brakes were released and UHT was properly trimmed prior to launch. Lift-off was accomplished as required by field/WOD conditions, and a smooth transition was accomplished to the clean condition with aircraft in positive climbing attitude and safe separation above the ground/water.
Conditionally Qualified	Same as "qualified," except for minor deviations in procedure and technique not detrimental to flight safety.
Unqualified	Did not receive and acknowledge takeoff clearance. Failed to use signals or used improper signals. Exhibited poor or unsafe technique on directional control, catapult launch, lift-off, transition, and climb attitude.

DEPARTURE

Qualified	Departure executed in accordance with local traffic rules and/or traffic clearance. Level off is accomplished as briefed.
Conditionally Qualified	Same as "qualified" except for minor deviations.
Unqualified	Departure not in accordance with traffic rules and/or traffic clearance.

RENDEZVOUS*

Qualified	Executed and facilitated rendezvous in accordance with procedures as briefed or currently prescribed.
Conditionally Qualified	Executed and facilitated rendezvous, except for minor procedural errors and delay. Rendezvous accomplished so as not to be detrimental to mission completion.
Unqualified	Rendezvous executed in a manner that indicated a lack of knowledge of required procedure. Resulting delay caused mission accomplishment as briefed to be adversely affected or delayed.

IFR PROCEDURES EN ROUTE

Qualified	Conducted flight as briefed or as cleared by controlling agency. Observed good radio discipline. Gave position reports clearly and in proper sequence.
Conditionally Qualified	Conducted flight as briefed or cleared, except for minor deviations not affecting limits of clearance.
Unqualified	Did not conduct flight as briefed or cleared.

VFR PROCEDURES EN ROUTE

Qualified	Conducted flight as briefed and/or as dictated by the mission/tactical situation. Formation was maintained to facilitate optimum tactical employment, lookout doctrine and flight progress to the operation area/ destination.
Conditionally Qualified	Same as "qualified," except for minor deviations, but not to the extent of precluding successful completion of the mission.
Unqualified	Did not conduct flight as briefed and/or as dictated by the mission tactical situation, resulting in poor tactical employment and/or lookout doctrine to the detriment of mission completion or safety.

*Critical area

MISSION

Those sections of the mission areas which are covered in this manual, Weapons System Tactical Handbook, and NWP/NWIP's will be conducted and evaluated in accordance with the procedures contained in the applicable publications and the criteria outlined below.

Qualified	Performed assigned or alternate mission, as briefed, in accordance with required procedures. Was thorough in the proper selection, conduct and execution of those aspects of the mission or tactical situation, culminating in safe and efficient mission accomplishment.
Conditionally Qualified	Same as "qualified," except for minor deviations, indicating a lack of required knowledge or adherence to required procedures, not adversely affecting successful mission accomplishment.
Unqualified	Lack of knowledge or adherence to required procedures resulted in unsuccessful mission accomplishment.

RECOVERY

RECOVERY SHORE BASED/SHIP BASED*

Qualified	Pattern entry was made as prescribed by local course rules, and/or instructions received. Landing check list completed. Break pattern and altitude at the 180° position as prescribed. Final approach speed at optimum. Touch down between first 500 and 1,000 feet of runway or on mirror touchdown deck area.
Conditionally Qualified	Same as "qualified," except for minor deviations at break, pattern, or altitude at the 180° position. Final approach speed within limit. Touchdown between first 500 and 1,500 feet of runway or on mirror touchdown deck area.
Unqualified	Exceeded the above limits. Landing gear and wing transitioned above airspeed limits. Did not complete landing check. Touched down before first 500 feet or past 1,500 feet down the runway, or disregarded LSO instructions.

COMMUNICATIONS

R/T PROCEDURES

Qualified	Complied with procedures prescribed by military and FAA regulations. Transmissions were made correctly on the proper frequency in minimum time, and without interruption of other transmissions. Monitored frequencies at appropriate time. Transmissions were received, understood, properly acknowledged and complied with in minimum time. Familiar with communications equipment and facilities. Utilized backup facilities without hesitation.
Conditionally Qualified	Same as "qualified," except for minor deviations or delays which indicated a lack of thorough familiarity with procedures and equipment, but which did not preclude successful completion of mission or jeopardize safety.
Unqualified	Failed to transmit or receive mandatory reports through omission or lack of familiarity with equipment or procedures. Violation of military/FAA regulations, culminating in a flight violation.

*Critical area

COMMUNICATIONS *(Continued)*

VISUAL SIGNALS

Qualified	Used standard visual signals correctly and without confusion. No delay due to questionable signals.
Conditionally Qualified	Same as "qualified," except for minor deviations or delay.
Unqualified	Used improper signals, resulting in misinterpretation and confusion. Excessive delay or noncommunication caused by questionable signals.

IFF/SIF PROCEDURES

Qualified	Used proper route codes facilitating timely compliance with all interrogation instructions.
Unqualified	Failed to use equipment properly, resulting in confusion and undue delay.

EMERGENCY PROCEDURES*

Qualified	Properly analyzed the emergency situation (if any actually occurred) and took appropriate action without deviation, error, or omission.
Conditionally Qualified	Properly analyzed the emergency situation and accomplished all required action safely, but not necessarily in the proper sequence.
Unqualified	Not up to standards of "conditionally qualified."

POSTFLIGHT PROCEDURES AND DEBRIEFING

AIRCRAFT SHUTDOWN, INSPECTION AND RECORDS

Qualified	Aircraft shutdown procedures as prescribed. Aircraft postflight inspection and yellow sheet completed without error or omission.
Conditionally Qualified	Same as "qualified," except for minor deviations and omissions not affecting continued flight safety.
Unqualified	Errors or omissions in shutdown check/inspections or yellow sheet entries that could jeopardize safety of personnel and/or the aircraft.

FLIGHT DEBRIEFING

Qualified	Provided thorough information in chronological order of events occurring during mission. Debriefed the flight and gave error analysis with definite corrective action indicated.
Conditionally Qualified	Same as "qualified," except for minor deviations and omissions not affecting value of mission debriefing. Debriefed the flight with adequate error analysis.
Unqualified	Unfamiliarity with debriefing requirements. Inadequate flight debriefing. No error analysis or corrective action given. Totally inadequate information for other pilots in the flight.

*Critical area

FINAL GRADE DETERMINATION

The final NATOPS Evaluation grade shall be the same as the grade assigned to the Evaluation flight. An evaluee who receives an Unqualified on any ground examination or the flight evaluation shall be placed in an Unqualified status until he achieves a grade of Conditionally Qualified or Qualified on a reevaluation.

RECORDS AND REPORTS

A NATOPS Evaluation Report (OPNAV Form 3510-8) shall be completed for each evaluation and forwarded to the evaluee's commanding officer. This report shall be filed in the individual flight training record and retained therein for 18 months. In addition, an entry shall be made in the pilot flight log book under "Qualifications and Achievements" as follows:

Qualification			*Date*	*Signature*	
NATOPS EVAL.	(Aircraft Model)	(Crew Position)	(Date)	(Authenticating Signature)	(Unit which Administered Eval.)

NATOPS EVALUATION QUESTION BANK

The following bank of questions is intended to assist the unit NATOPS Instructor/Evaluator in the preparation of ground examinations and to provide an abbreviated study guide. The questions from the bank should be combined with locally originated questions as well as questions obtained from the Model Manager in the preparation of ground examinations.

CLOSED BOOK

1. To maintain currency in F-8 aircraft, a pilot must meet what requirements?
2. Any pilot not flying the F-8 for a two-week period will be required to complete what prior to any F-8 night flying?
3. How can the operation of the rudder-aileron interconnect be checked from the cockpit?
4. What should the pilot check when stowing the "T" handle after checking emergency trim?
5. What is desired when performing a "VISCOUS DAMPER CHECK"?
6. What should be accomplished prior to folding the wings?
7. In what position should the rudder be prior to actuating nose-gear steering?
8. How often should the wing and control surfaces be cycled on the deck to prevent over-heating of hydraulic fluid and pumps?
9. How long does it take for the hook to cycle full down after actuation of the handle?
10. Why should engine be operated at approximately 75% RPM for 30 seconds before shutdown?
11. What is the minimum airspeed and altitude for lowering the wing, day/VFR?
12. How many times should the pilot attempt to light the afterburner on takeoff?
13. What procedure should be followed if an uncontrolled lurch in either direction occurs as the nose wheel touches down on landing?
14. What is the maximum recommended speed at which normal braking can be commenced?
15. What is the maximum recommended crosswind component for landing the F-8?
16. What position should the fuel transfer switch be in prior to catapulting?
17. What is the minimum altitude above the terrain, during IFR conditions, that radio channel changes will be made?
18. What is the recommended RPM, airspeed, and rate of descent for penetration?
19. What is the only absolute indication of a locked canopy?
20. What action should be taken if the wing incidence handle moves without depressing the release switch?
21. How can positive determination that wings are locked after spreading be made?
22. What does an illuminated transfer pump light indicate?
23. What indicated airspeed should be used on SIDs below 10,000 feet with no arcing necessary?
24. Why must the cockpit emergency ventilation port be closed for accurate angle-of-attack indications and proper operation of the approach power compensator system?
25. What is the maximum fuel weight for entering the GCA pattern?
26. What is the maximum airspeed/runway remaining requirements for safely stopping the F-8 with full fuel load?

*27. What is the maximum indicated airspeed that the F-8 will enter a spin condition?

28. The approach power compensator will not retard the throttle below what setting?
29. What actions will override or disengage the approach power compensator?
30. Why should the helmet visor always be down for inflight refueling?

*31. The limiting airspeed for extending or retracting the cruise droop is_____IAS?

*32. The limiting airspeed with the cruise droop extended is_____IAS?

33. What are the operating pressures and limits of the:

    a. PC-1 System_____lb_____lb.

    b. PC-2 System_____lb_____lb.

    c. Utility System_____lb_____lb.

34. Maximum allowable temperature during ground starting is_____?
    For what period of time?_____

35. What speed restrictions must be observed with a loss of the roll stab system? (Landing Configuration)

36. What speed restriction must be observed with loss of yaw stabilization? (clean configuration)

*37. What is the maximum allowable rolling pullout G load? _____

38. What are the limiting airspeeds for actuation of the following:

    a. Landing gear_____

    b. Wing_____

    c. Wing lock_____

    d. EPP_____

*Indicates critical questions.

*e. Landing droop_____

*39. What is the maximum allowable airspeed (IMN) at:

a. SL to 10,000 feet_____?

b. 25,000 feet_____?

c. 35,000 feet_____?

d. 45,000 feet_____?

*40. What is the maximum allowable symmetrical "G" load at:

a. 30,000 feet_____?

b. 40,000 feet_____?

c. 50,000 feet_____?

*41. What is the negative "G" load limit of the airplane_____?

*42. Rolls in excess of_____degrees are prohibited.

43. What are the limits of the acceleration range in the landing configuration?

*44. What are the acceleration and airspeed limitations with the landing droop extended_____?

45. The normal oil pressure range is_____psi to _____psi.

46. Give the maximum gross landing weights and operating weights for the following situations?

a. Field takeoff_____

b. Field landing_____

c. Catapulting_____

d. Arresting_____

47. The permissible acceleration range and speed range with the inflight refueling probe extended is_____to_____"G" and_____IAS.

48. What rectriction is placed on continuous negative "G" operation?

*49. Give the following engine speeds:

a. Absolute maximum RPM_____

b. Sea level idle RPM_____

*50. Temperature limits for maximum thrust and military thrust are:

a. MAXIMUM _____
MILITARY _____

51. At airspeeds 1.50 IMN or 600 knots IAS what thrust setting should be maintained and why?

52. The minimum oil pressure at idle RPM is _____?

53. What are the RPM and temperature limits for maximum continuous engine operations?

54. What are the EGT and oil pressure limits for zoom climbs above 50,000 feet?

*55. List the fundamental steps for obtaining an airstart under the following conditions. The flameout has just been experienced and was other than pilot induced. Engine windmill RPM too low to sustain main generator operation and altitude may not permit more than one attempt.

56. What constitutes an oil system failure?

57. What is the proper procedure for handling an oil system failure including an approach to a field?

*58. Approximately how long will the engine continue to produce thrust at its established setting, at sea level, after placing the engine master switch to "OFF"? From_____seconds at idle power to_____seconds at MRT.

59. Why is it more desirable to leave the Emergency Generator Switch in the "ON" position during an attempted airstart even though a given F-8 provides current for ignition in "LAND"?

60. What instrument provides the most rapid indication of an airstart taking place?

61. Illumination of the engine fuel pump light means?

62. Aircraft fuel boost pump failure will likely cause a flameout when using a high power setting above _____feet?

63. How soon should ignition occur during an airstart?

64. The engine should accelerate to idle speed within _____ seconds after ignition during an airstart.

65. After selecting "MANUAL" fuel control, a complete electrical failure is experienced. What mode will the fuel control be in until electrical power is regained?

66. If afterburning continues after the throttle is moved inboard, how may it be secured otherwise?

67. Outline the procedures to be followed upon illumination of the FIRE warning light while airborne, with and without a wingman.

*Indicates critical questions.

68. Does the actuation of the cockpit pressurization switch also control wing fuel cell pressurization?

69. What are the procedures/precautions when the pilot suspects oxygen contamination?

70. Describe the procedure for executing a "No Nose Gear" field landing.

71. Describe the procedure for executing a field landing with one main gear retracted.

72. When operating on EPP electrical power in the LAND position, what is the minimum airspeed to ensure adequate electrical power?

73. What is peculiar to a bolter after an attempted wing down carrier landing?

74. Describe the most desirable cockpit emergency egress procedure.

75. List the steps in normal ejection.

76. If the canopy does not jettison when the face curtain is pulled the pilot should then _____?

77. Describe the bailout procedure.

78. Why is it not advisable to roll inverted and fall or drop out of the cockpit vice the recommended bailout method?

79. What is the minimum/maximum airspeed in gliding flight which will permit an effective (altitude gain) pullup, power off, in the clean condition?

80. What does an illuminated engine fuel pump warning light indicate?

81. What is the minimum airspeed at which the EPP can be expected to supply both electrical power in the land condition and PC 1 hydraulic pressure?

82. Outline the procedure for switching to manual fuel control in flight.

83. If the engine fuel pump light comes on in flight and the engine continues to function normally, the likely cause is _____.

84. If the EPP is extended with the Emergency Generator Switch in the ON position, what must the pilot do to regain proper EPP electrical power?

85. While performing a supersonic dash at 38,000 feet a generator failure is experienced. Will the aircraft flameout? Why/why not?

86. If electrical power is being supplied by the EPP can the landing gear be retracted? If so, in what positions of the emergency generator switch?

87. Outline the procedure for extending the landing gear and raising the wing after experiencing a utility hydraulic failure.

88. What are the procedures after the main gear are extended but one indicates barberpoled?

89. Should the wing be raised if the cruise droop or landing droop cannot be extended with a utility failure?

90. When, if at all, should the EPP be extended after experiencing loss of PC-1?

91. A _____% loss of range should be anticipated with the EPP extended.

92. What is the minimum airspeed for adequate hydraulic pressure from the EPP with no electrical load?

93. When Emergency Pitch Trim is in use, will the UHT automatically retrim when the wing is raised?

*94. List the steps for stall and spin recovery; include spin recognition and recovery recognition.

*95. When should a precautionary type approach be made?

96. What can the pilot do to close the exhaust nozzle if he has determined it has stuck open when afterburner was deselected?

97. What general steps should be taken to correct continuous compressor stalls in flight?

98. The nose gear is observed cocked well off to one side. What procedure should the pilot follow for landing?

*99. During a high speed (0.92 IMN) descent the aircraft begins a tail wagging oscillation which is apparently increasing in intensity. How should this be combated?

*100. What is the desired fuel flow for an airstart?

101. Describe the precautionary landing pattern.

---

*Indicates critical questions.

102. After experiencing smoke in the cockpit a pilot elects to dump cockpit pressure by use of the emergency RAM air vent. During a subsequent letdown he encounters icing and his airspeed indicator fails. Undaunted he switches to his angle-of-attack instruments and continues his approach. He dirties up and he picks up the "Donut" (A/AO). At the top of the glide slope the plane yaws violently and enters a spin. What happened?

103. Serious wheel overheating problems arise after an aborted takeoff or from stopping after a normal landing. Why does the tire/wheel failure not occur until 15 to 20 minutes later?

*104. Explain the landing procedures required for both ship and shore for the following conditions.

a. Main gear tire blown:

(1) SHORE
(2) SHIP

b. One main wheel missing — strut intact:

(1) SHORE
(2) SHIP

c. Nose gear up or trailing:

(1) SHIP
(2) SHORE

d. One main gear up or missing:

(1) SHIP
(2) SHORE

e. All gear up:

(1) SHIP
(2) SHORE

*105. List the preparations, configuration, final speed, fuel weight and roll out procedures for a field wing down landing.

OPEN BOOK

1. Give maximum range speed (IMN) for the following altitudes:

10,000_____ 15,000_____ 25,000_____

35,000_____ 45,000_____

2. Give maximum endurance speeds (IMN and CAS) for the following altitudes:

	IMN	CAS
SL		
15,000		
20,000		
30,000		
40,000		

3. Complete the following range and endurance computations:

	(1)	(2)	(3)	(4)	(5)
Altitude	SL	10,000	20,000	30,000	40,000
Fuel Remaining (pounds)	1,500	2,000	2,000	2,500	2,500
Range this altitude					
Range at optimum altitude					
Endurance at this altitude					
Endurance optimum altitude					
Optimum altitude for range					
Optimum altitude for endurance					

4. Solve the following maximum range problem

Given: Aircraft configuration_____, and flight altitude of 30,000.

Find: Flight Mach No. _____

True Airspeed _____

Fuel Flow _____

Distance and duration w/3700 lb fuel _____ _____

Fuel and time required for 50 nmi _____ _____

*Indicates critical questions.

5. Combat Radius Problem.

Given: The distance to a combat area is 370 nmi. Climb using MRT power under standard conditions. Cruise out and back at maximum range altitude and airspeed. Wind conditions are 45 knots headwind on cruise out and 60 knots tailwind on cruise back. Use no wind for climb and descent. Fuel is full load of JP-5 at 6.8 lb per gallon. Allow 2,500 lb for combat and 250 lb for start and taxi.

Find: Using configuration_____or Standard (photo) find the fuel, distance, time and flight speeds for the flight phases as depicted in the chart below.

6. Combat operations at military thrust? (Use planning data in Supplement Flight Manuals)

Mach No.	*Altitude*	*Time*	*Fuel*
0.90	5,000	———	1,600 lb
0.96	———	24.5 min	2,000 lb
0.80	10,000	———	2,500 lb
0.85	30,000	5.5 min	———

SOLUTION TO COMBAT RADIUS PROBLEM

PHASE	*Alt.*	*Fuel*	*Fuel Remaining*	*Distance*	*Time*	*Mach No. or CAS*	*TAS*	*Wind*	*GS*
Start Taxi									
Climb (MRT)									
Cruise Out									
Combat and Climb									
Cruise Back									
Descent									

7. Combat operations at maximum thrust? (Use planning data in Supplement Flight Manuals)

Mach No.	*Altitude*	*Time*	*Fuel*
0.90	5,000	———	1,500 lb
1.0	15,000	7 min	———
0.90	20,000	———	2,000 lb
1.4	45,000	10.5 min	———

8. Combat radium MRT climb? (Use planning data in Supplement Flight Manuals)

Cruise Out Altitude	*Distance*	*Combat Fuel*
———	450 nmi	2,000 lb
40,000	470 nmi	———
35,000	———	1,000 lb
30,000	370 nmi	———

9. Fighter mission combat radius: (Use planning data in Supplement Flight Manuals)

Given	*Find*
Combat area 400 nmi from base of operations	Fuel each phase
Average MRT combat time of 8 minutes at 20,000 feet and 0.94 IMN	Time enroute
5 minutes at CRT at an average altitude of 15,000 feet, flight speed of 0.90 IMN	Flight speed/altitude enroute
Standard day with full load of JP-5 fuel, weight — 6.8 pounds per gallon	

10. What is the cruise power setting for an oil system malfunction emergency? Descent power?

11. What is the warmup time for the MA-1A compass system?

12. If you are at 35,000 feet and 200 KIAS in burner coming over the top of a tactical maneuver which is going to place you in an excellent position at your opponent's "six". Your generator fails and you flame out. What probably caused it?

13. What are the functions of the AN/APX-72 IDENT/MIC switch?

14. What mode of the AN/APX-72 must be operating to utilize the altitude reporting system?

15. How is servoed operation used in the AAU-19A/A altimeter?

16. When should the standby attitude gyro be caged and locked?

17. What is the purpose of the RDA servo power unit?

18. What does the tape recorder record?

19. When utilizing two KA-53 cameras in station three and four, can one camera be rotated out of vertical if the other is already at 5^{O}? Why?

20. During flare loading, in what position should the main generator switch be?

21. The KA-51 camera in station 1 is mounted at what depression angle?

22. The extra picture switch cycles the KA series cameras at _____ exposures per second regardless of mode switch setting.

23. What two systems override the extra picture function of the switch?

24. The exposure control must be used in conjunction with what type of camera?

25. The flare reset switch must be held for _____ seconds to ensure resetting the flare ejector stepping switches.

26. The chaff manual fire button releases _____, the extra picture switch releases _____, and the auto fire push button releases _____ of chaff.

27. What is the airspeed restriction when extending the IFR probe pneumatically?

28. What are the acceleration limitations of the aircraft with the yaw stab system inoperative at sea level?

    At 30,000 feet?

29. At what altitude should the turn downwind be commenced following a night bolter?

30. What are the steps for using the air-to-air feature of the TACAN?

31. What are the airspeed restrictions when operating on the EPP with:

    PC-1 pressure out?

    PC-1 pressure out and operating the electrical system with the emergency generator in LAND?

    PC-1 pressure out and operating the electrical system with the emergency generator in ON?

    Only using EPP for electrical power in LAND?

    Only using EPP for electrical power in ON?

    Using the EPP for any purpose with the wing down?

32. Pullup at a rate which exceeds _____ g in less than _____ seconds are prohibited?

33. The G valve puts out _____ psi in HI and _____ psi in LO.

34. Flight in the landing condition above _____ is limited to _____ minutes. Flight in the clean condition below _____ is limited to _____ minutes.

35. No intentional slips or skids are permitted below 35,000 feet during afterburner operation with less than _____ pounds of main fuel.

36. After having been trapped and signaled that you are going down No. 1 elevator, at what point do you open the canopy and remove your helmet?

37. What is the catapult officer's signal for afterburner during daylight hours?

38. On the cat, what is the correct "down aircraft" signal for both day and night?

39. What is the correct pilot procedure after receiving the burner signal from the cat officer? (List the three steps.)

40. What is minimum altitude for lowering the wing after a night cat shot?

41. What is the minimum altitude for switching lights to bright and flashing after a night cat shot?

42. The proper numerical angle-of-attack setting for an F-8 carrier approach is_____units.

43. How many degrees of nose-up attitude are set on the gyro-horizon immediately after a night cat shot?

44. Nosegear steering should not be used in taxiing out of the ship's arresting gear until forward motion is established. Why not?

45. What lights are *off* for a night carrier approach?

46. Following a night shipboard arrestment, at what point are all exterior lights turned off?

47. If the nose gear fails to retract after a catapult shot, return the handle to *wheels down*. What is the probable cause and how is it rectified?

48. A cross check of airspeed and angle of attack should be made at the 180° position to ensure that they coincide. True_____False_____

49. Give the correct procedure for a carrier wing-down landing.

50. Barricade engagements resulting from a wing-down condition alone are not required or recommended. True_____False_____

51. Should a wing-down landing with the leading edge in the landing droop position be attempted?

52. To what extent can the F-8 be refueled using the inflight refueling system?

53. Proper operation of the probe switch is: Just prior to the initial run, the probe shall be extended and the switch left in the_____position. Upon completion of the runs after the probe is retracted hold the switch in the_____position for 5 seconds after door light goes out to ensure that the probe door locks.

54. What are the steps in the airborne prefueling check?

55. When ready for air refueling, placing the probe switch to_____position will also stop fuel transfer.

56. In the event the refueling probe will not retract when switch is placed in the *in* position, it will be necessary to place the switch in_____position to begin fuel transfer.

57. To minimize drogue and receiver control problems, it is recommended that the receiver pilot maintain a closure rate of_____to_____knots.

58. Why is aerial refueling conducted with the helmet visor down?

59. Continuous negative G flight is limited to_____seconds.

60. The first indication of an air start is usually noted on the_____.

61. During static ground conditions, engine acceleration for idle to *military* should be accomplished within_____.

62. During military thrust check before takeoff, the _____provides the most reliable indication of proper engine operation.

63. What mil specification engine oil is used in the J57 engine?

64. Over filling of the engine oil system may result in_____and_____.

65. What is the capacity of the engine oil tank?

66. What is the rated thrust of the basic engine? With A/B?

67. The tachometer records_____rpm.

68. Maximum rpm is_____%.

69. Operating in manual fuel control, to what altitude will altitude compensation be provided?

70. For ground operation, A/B is limited to_____minutes.

71. When the engine fuel pump warning light is on, afterburner operation is restricted to_____.

72. What is the correct procedure to overcome a runaway overtemp condition in the cockpit pressurization system?

73. The indication of a fuel transfer shutoff failure is_____.

74. The engine fuel pump warning light in the cockpit indicates_____.

75. How is wing fuel transferred?

76. How many fuel booster pumps work on emergency electrical power?

77. How may the engine fuel shutoff valve be opened or closed without electrical power?

78. During fuel transfer in flight, the main fuel quantity indicator will normally read between _____ and _____ pounds.

79. How does the cabin pressure switch effect the aircraft fuel system?

80. Utility hydraulic system provides hydraulic power for the operation of what systems?

81. Utility hydraulic pressure may surge to _____ pressure when actuating any of the systems.

82. How are hydraulic failures indicated to the pilot?

83. Roll stabilization operates off of what hydraulic system?

84. Yaw stabilization operates off of what hydraulic system?

85. In the event of PC hydraulic failure, what system is regained by deploying the EPP, assuming no fluid has been lost?

86. Will the low hydraulic pressure warning light go off when the EPP is supplying hydraulic pressure to the PC-1 system?

87. What are the maximum deflections of the aileron and unit horizontal tail that can be obtained by the pilot?

88. What is the maximum deflection of the rudders that can be obtained by the pilot?

89. The roll stab has previously failed. With the EPP deployed for electrical power, what position should the roll stab switch be in before switching the generator to the LAND position? Why?

90. With loss of either PC-1 or PC-2, what action should be taken?

91. Can the tail hook be lowered with a utility hydraulic failure?

92. Roll stabilization signals are automatically initiated by _____ _____ _____.

93. Yaw stabilization and stiffening signals are initiated by _____.

94. Why should the roll stab be placed off if the system is malfunctioning and the aircraft emergency generator switch is placed in the LAND position?

95. The yaw _____ moves the rudder power control cylinder linkage to reposition the rudder in the direction required to _____ the aircraft or provide yaw _____ and _____.

96. In the clean condition, the yaw _____ _____ _____ modifies signals from the accelerometer as altitude changes. Gain is _____ in the landing condition.

97. When is the rudder aileron interconnector actuated?

98. The _____ _____ potentiometer initiates signals to the amplifier for rudder aileron interconnect actuation.

99. Does movement of the three trim knobs displace the control stick?

100. Roll trim and damping operate from what electrical bus?

101. Yaw trim and damping operate from what electrical bus?

102. In the event of pitch trim failure, what emergency method may be used to regain pitch trim?

103. What is the maximum speed restrictions with no yaw stab? Roll stab?

104. The *off* flag in the window of the gyro horizon indicates _____ power is not connected to the _____ bus, or that _____ has failed.

105. A *barberpole* in the window of the generator control panel indicates that _____ power is not connected to the _____ bus(es) or that _____ has failed.

106. Placing the emergency generator switch in the on position supplies power to the _____ and _____ buses (with EPP extended).

107. Placing the emergency generator switch in the land position supplies power to the _____ and _____ buses (with EPP extended).

108. The emergency power indicator light on the generator control panel shows that

It will be illuminated with the emergency generator switch in the following positions _____ only, _____, _____, (with EPP extended).

109. Name the buses Emergency, Primary, or Secondary which supply the power for the operation of the following:

(1) Fire control system_____

(2) Transfer fuel pump(s)_____

(3) Roll trim and stabilization_____

(4) IFF _____

(5) Yaw trim and stabilization_____

(6) ARA-25 _____

(7) Engine master switch_____

(8) Wing fuel dump_____

(9) Main fuel quantity_____

(10) Tacan _____

(11) Tail hook retraction_____

(12) Fuel flow_____

(13) Gyro Horizon_____

(14) Engine ignition and timer_____

(15) A/B electrical operation_____

(16) In-flight refueling capability_____

(17) Wing pressurization_____

(18) Fire detection_____

110. Name the 10 cockpit instruments which will remain operative with no electrical power

(1)_____ (2)_____ (3)_____

(4)_____ (5)_____ (6)_____

(7)_____ (8)_____ (9)_____

(10)_____

111. Actuation of the following controls will produce normal results with no electrical power (up and down, on and off).

	True	*False*
(1) Landing gear handle	_____	_____
(2) Wing-fold actuating lever	_____	_____
(3) Hook handle	_____	_____
(4) Wing incidence handle	_____	_____
(5) Cockpit pressure and dump switch	_____	_____
(6) Defog control switch	_____	_____
(7) Cruise droop switch	_____	_____
(8) Exposure suit vent control	_____	_____
(9) G suit control	_____	_____
(10) Changing preset UHF frequency	_____	_____

112. When operating on emergency electrical power, what steps must be taken to illuminate external aircraft lights?

113. Explain what occurs when the canopy actuator cartridge fires.

114. Immediately after ejection, the_____drogue withdraws the_____drogue.

115. Explain the function of the timed release mechanism.

116. Explain the function of the barometric altitude limiter. What does it activate?

117. Ejection at airspeeds from stalling to_____ results in relatively minor forces exerted on the body.

118. With loss of power from 180° position to landing, would a pull-up prior to ejection be effective?

119. At 175 knots on takeoff and wing-up, you experience a complete power failure. Would a pull-up prior to ejection be effective?

120. On an ejection attempt the canopy fails to jettison. What steps are now necessary to eject?

121. If ejection is not possible, what is the correct bail-out procedure?

122. What are the necessary procedures if the automatic ejection functions do not occur by 10,000 feet?

123. The capacity of the aircraft's LOX system is_____?

124. At what system capacity does the LOX low level warning light illuminate?

125. If it becomes desirable to decrease oxygen consumption, what action is required?

126. If contamination is suspected in the main LOX System, what action should be taken? Why?

127. How is the LOX System capacity checked?

NATOPS EVALUATION FORMS

In addition to the NATOPS Evaluation Report (figure 10–1), a NATOPS Flight Evaluation Worksheet is/are provided for use by the Evaluator/Instructor during the evaluation flight. All of the flight areas and subareas are listed on the worksheet with space allowed for related notes.

NATOPS EVALUATION REPORT FORM

NATOPS EVALUATION REPORT
OPNAV FORM 3510-8 (8-65) 0107-723-0000

NAME (Last, first initial)	GRADE	SERVICE NUMBER
SQUADRON/UNIT	AIRCRAFT MODEL	CREW POSITION
TOTAL PILOT/FLIGHT HOURS	TOTAL HOURS IN MODEL	DATE OF LAST EVALUATION

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
*EVALUATION FLIGHT				

FLIGHT DURATION	AIRCRAFT BUNO.	OVERALL FINAL GRADE

REMARKS OR EVALUATOR/INSTRUCTOR

☐ CHECK IF CONTINUED ON REVERSE SIDE

GRADE, NAME OF EVALUATOR/INSTRUCTOR	SIGNATURE	DATE
GRADE, NAME OF EVALUEE	SIGNATURE	DATE

REMARKS OF UNIT COMMANDER

RANK, NAME OF UNIT COMMANDER	SIGNATURE	DATE

*WST, OFT, COT, or cockpit check in accordance with OPNAVINST 3510.9 (effective edition).

72282-10-1NE

Figure 10-1

section XI
performance data

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PART 1—STANDARD DATA

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PART 1—STANDARD DATA

Standard data consists of the following charts:

- Position Error Correction
- Airspeed-Mach Number Conversion
- Density Altitude
- Standard Atmosphere
- Crosswind

DEFINITIONS

Clean condition – Landing gear retracted, wing down, wing leading edge retracted

Cruise condition – Landing gear retracted, wing down, wing leading edge in cruise droop position

Landing condition – Landing gear extended, wing up, wing leading edge in landing droop position and BLC as specified

EPR	Engine pressure ratio
FT	Feet
GS	Ground Speed
HW	Headwind
LB	Pound(s)
MN	Mach number
NMI	Nautical miles
SL	Sea level
TW	Tailwind
$1/\sqrt{\sigma}$	Inverse of the square root of density ratio

IAS – Indicated airspeed; indicator reading corrected for instrument error

CAS – Calibrated airspeed; IAS corrected for position error (figure 11–1)

TAS – True airspeed; CAS corrected for altitude and temperature (figure 11–2)

EAS – Equivalent airspeed; TAS corrected for atmospheric density effects (figure 11–4)

POSITION ERROR CORRECTION

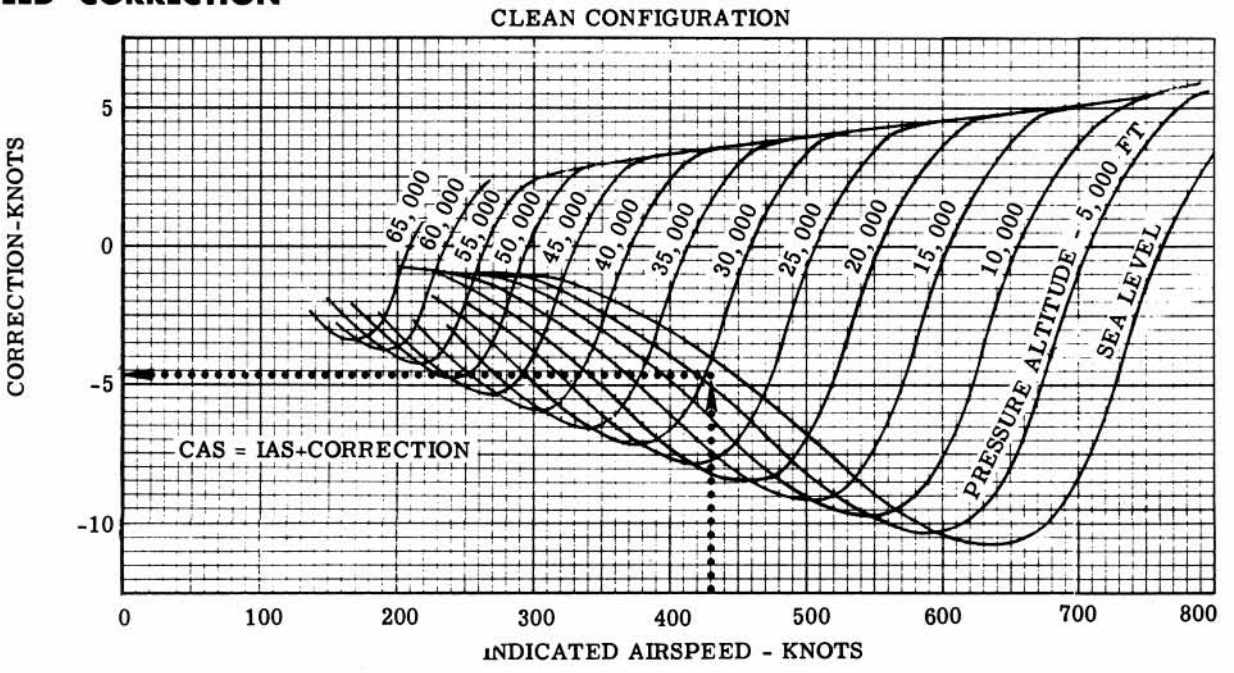
These charts (figure 11-1) present the corrections that must be added to indicated airspeed, altitude, and Mach number to obtain calibrated airspeed, pressure altitude, and true Mach number. Figure 11–1A presents altitude corrections for the AAU-19A/A altimeter in the subsonic speed range. Correction charts for supersonic speed ranges are not available at this time. For example, assume an indicated airspeed of 430 knots at an indicated altitude of 30,000 feet with the aircraft in the clean condition. Enter the clean condition altitude correction chart (sheet 2) at the 30,000-foot indicated altitude curve. From this intersection, project horizontally to the left to obtain an altimeter correction of – 600 feet. Subtract 600 feet from 30,000 feet to obtain a pressure altitude of 29,400 feet. Using the 430-knot indicated airspeed and the pressure altitude of 29,400 feet, enter the airspeed correction chart (sheet 1) in a similar manner to obtain an airspeed correction of approximately – 5 knots. Subtract 5 knots from 430 knots to obtain a calibrated airspeed of 425 knots. Mach number corrections and landing condition altitude and airspeed corrections are obtained by reading the appropriate charts in a similar manner.

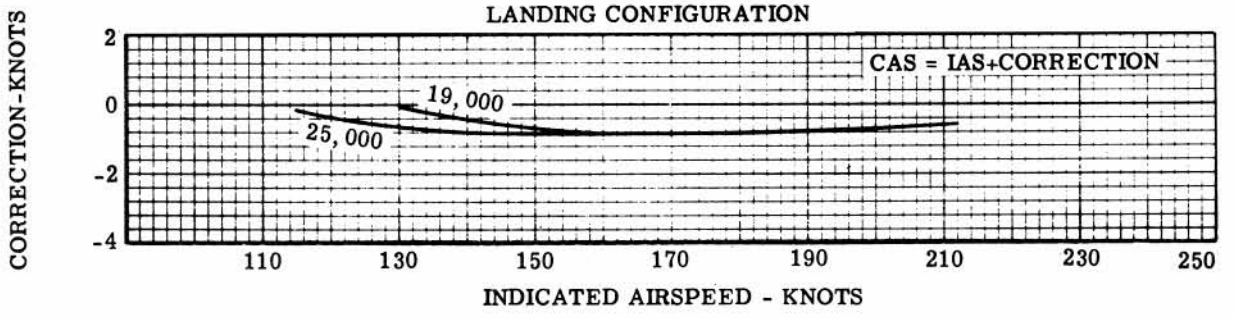
POSITION ERROR CORRECTION

MODEL: RF-8G

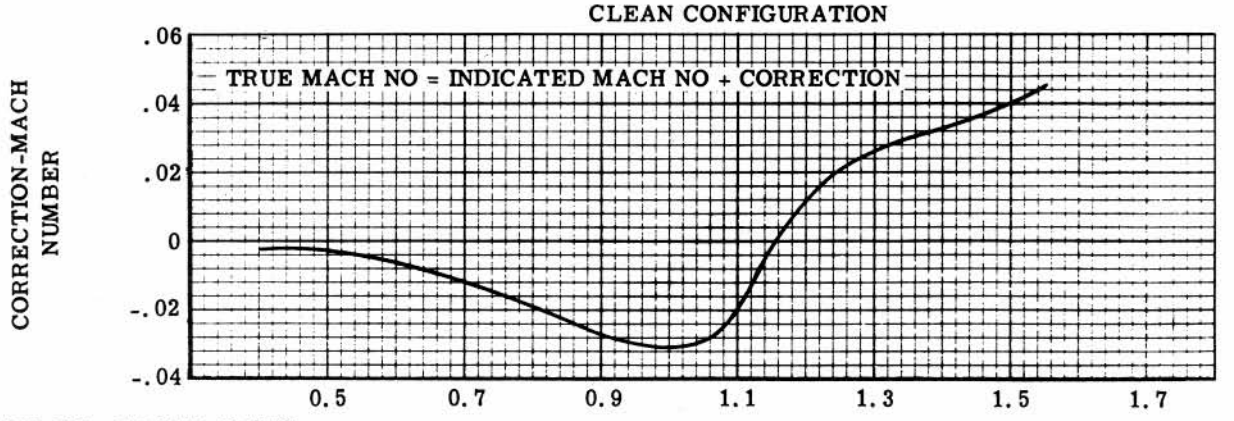
STANDARD DAY

AIRSPEED CORRECTION





MACH NUMBER CORRECTION



DATA BASED ON: FLIGHT TESTS
DATA AS OF: 1 FEBRUARY 1959

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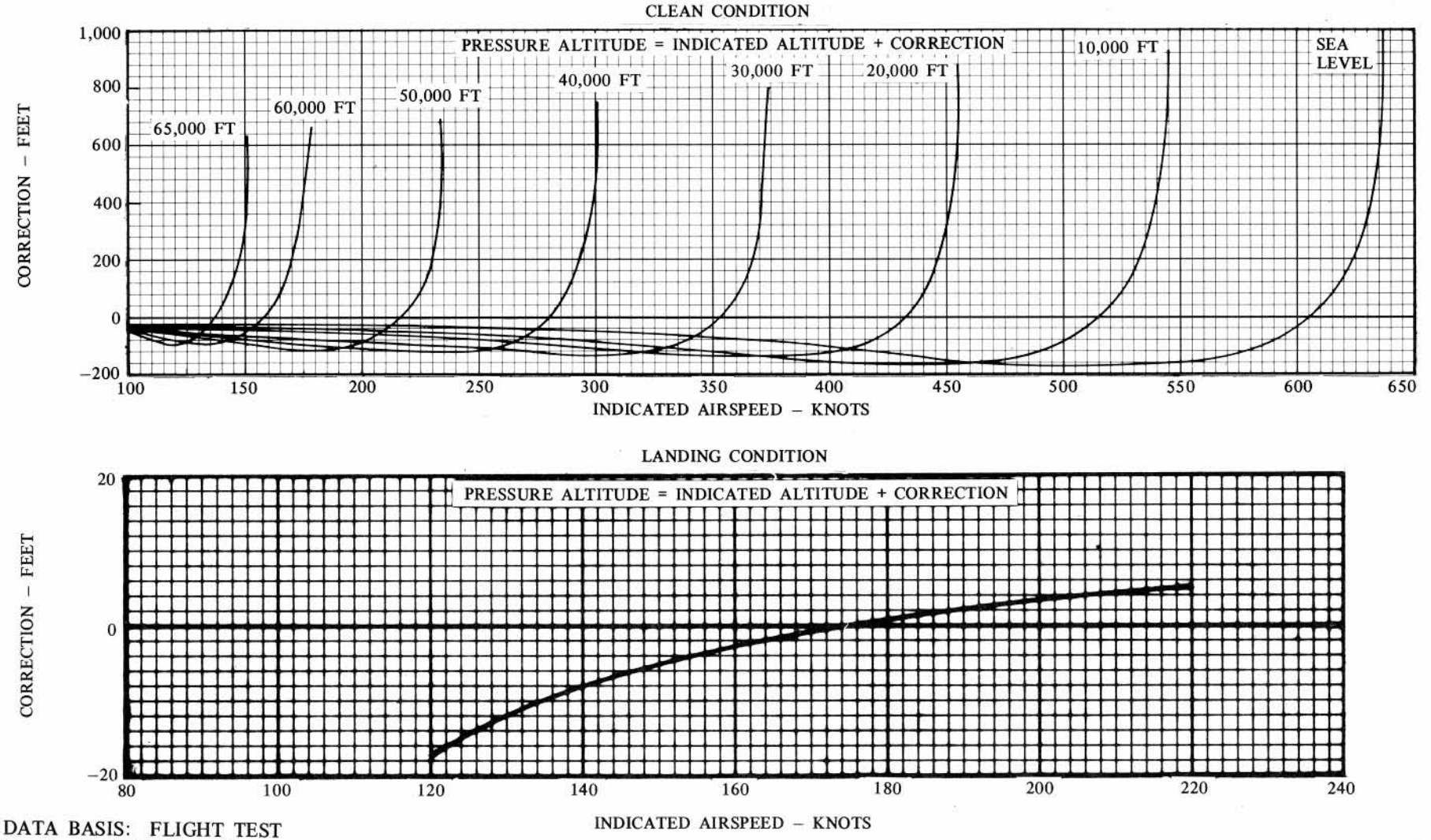
Figure 11-1

POSITION ERROR CORRECTION

MODEL: SERIES F-8

ALTITUDE CORRECTION FOR STANDBY MODE, SUBSONIC FLIGHT



DATA BASIS: FLIGHT TEST
DATE: SEPTEMBER 1971

72282–11–34–06–72

Figure 11–1A

AIRSPEED-MACH NUMBER CONVERSION

This chart (figure 11–2) gives the true Mach number, calibrated airspeed, and true airspeed for standard and nonstandard atmospheric temperatures. For example, assume a CAS of 425 knots at an altitude of 40,000 feet with a free air temperature of –35°C. Enter the chart at the 425-knot CAS line and project vertically to the 40,000-foot TRUE PRESSURE ALTITUDE curve. At this intersection, project horizontally to the left to obtain a true Mach number of 1.31 Following the TRUE AIRSPEED curve from the CAS and altitude intersection to the right and downward will give a standard atmosphere TAS of 753 knots. If the temperature is not standard for the altitude (figure 11–5), project horizontally to the right, from the CAS and altitude intersection, to the sea level curve, then downward to the –35°C FREE AIR TEMPERATURE curve and horizontally to the right to obtain a corrected TAS of 785 knots.

TEMPERATURE CORRECTION

This chart (figure 11–3) is used to convert indicated air temperature to free air temperature. For example, assume an altitude of 35,000 feet, airspeed of 375 knots (CAS), and an indicated air temperature of –40°C. Enter the chart at 375 knots on the airspeed scale and project vertically to the 35,000-foot altitude curve. From this intersection, project horizontally to the left to obtain a temperature correction of approximately –35°C. Subtract 35°C from –40°C to obtain a free air temperature of –75°C.

DENSITY ALTITUDE CHART

This chart (figure 11–4) is used to obtain $1/\sqrt{\sigma}$ (factor used to convert true airspeed to equivalent airspeed) and the density altitude when the pressure altitude and ambient temperature are known. The standard day temperature-altitude relationship is shown by the line from 22° at the bottom of the chart to –55° at the pressure altitude of 35,000 feet, then vertical to the top of the chart. To use the chart, enter at the known temperature, project vertically to known pressure altitude, and ready density altitude to the left of this intersection or the $1/\sqrt{\sigma}$ to the right. For example, assume a pressure altitude of 30,000 feet and an ambient temperature of –30°C line and project vertically to the 30,000-foot PRESSURE ALTITUDE curve. Reading to the left of this intersection gives a density altitude of 31,800 feet and to the right gives a value of 1.69 for $1/\sqrt{\sigma}$. Dividing TAS by $1/\sqrt{\sigma}$ gives EAS.

AIRSPEED-MACH NUMBER CONVERSION

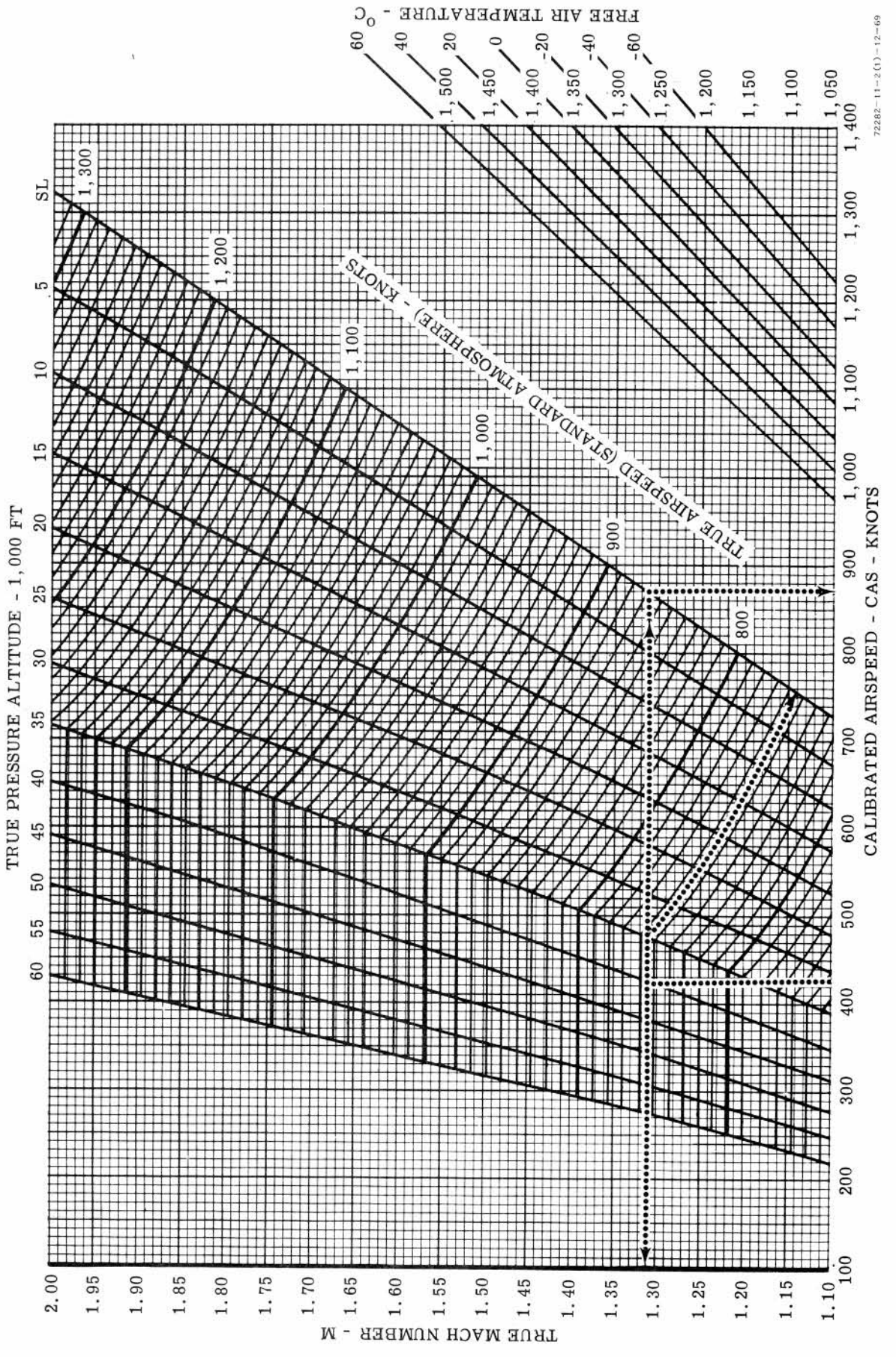
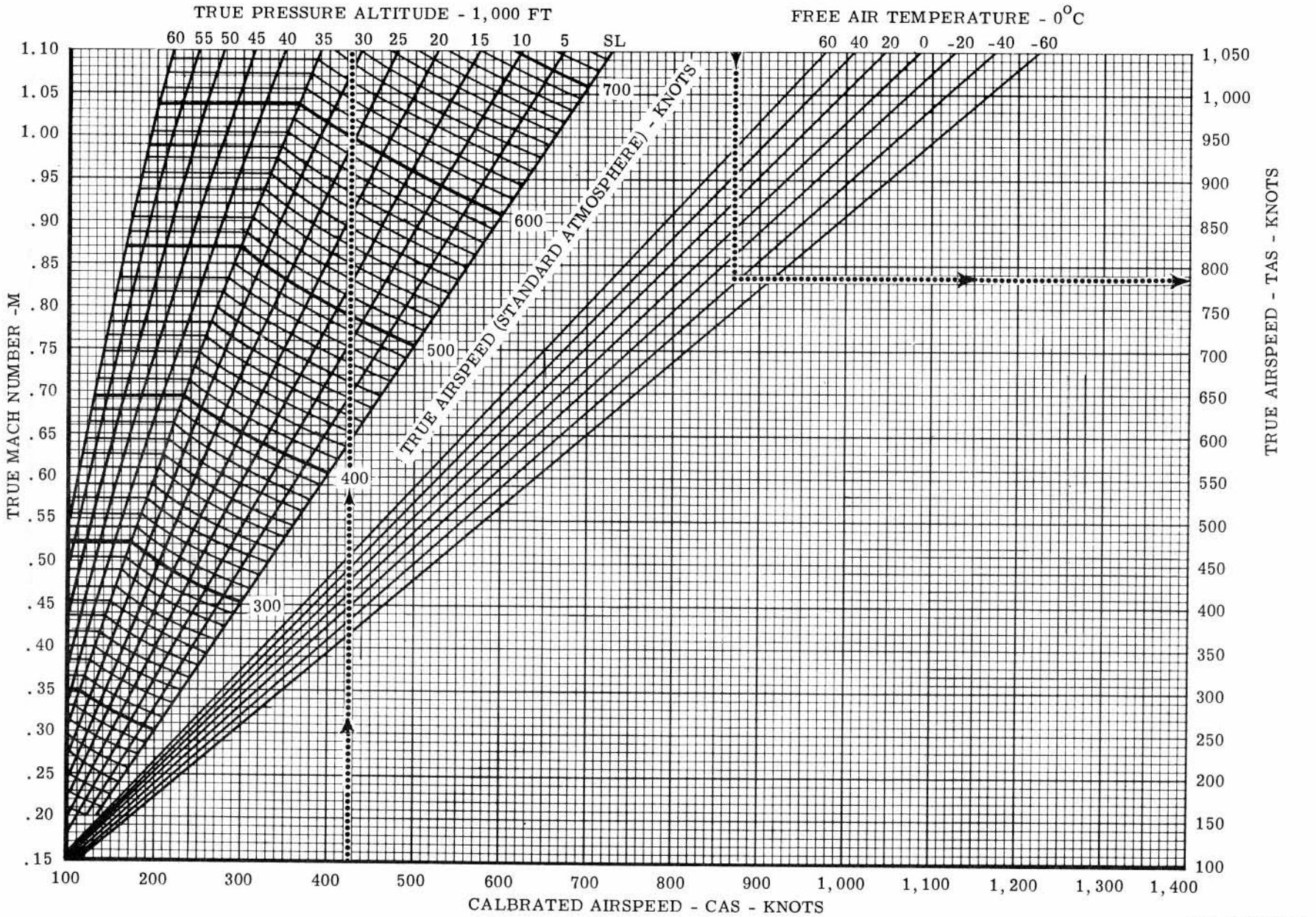


Figure 11-2 (Sheet 1)

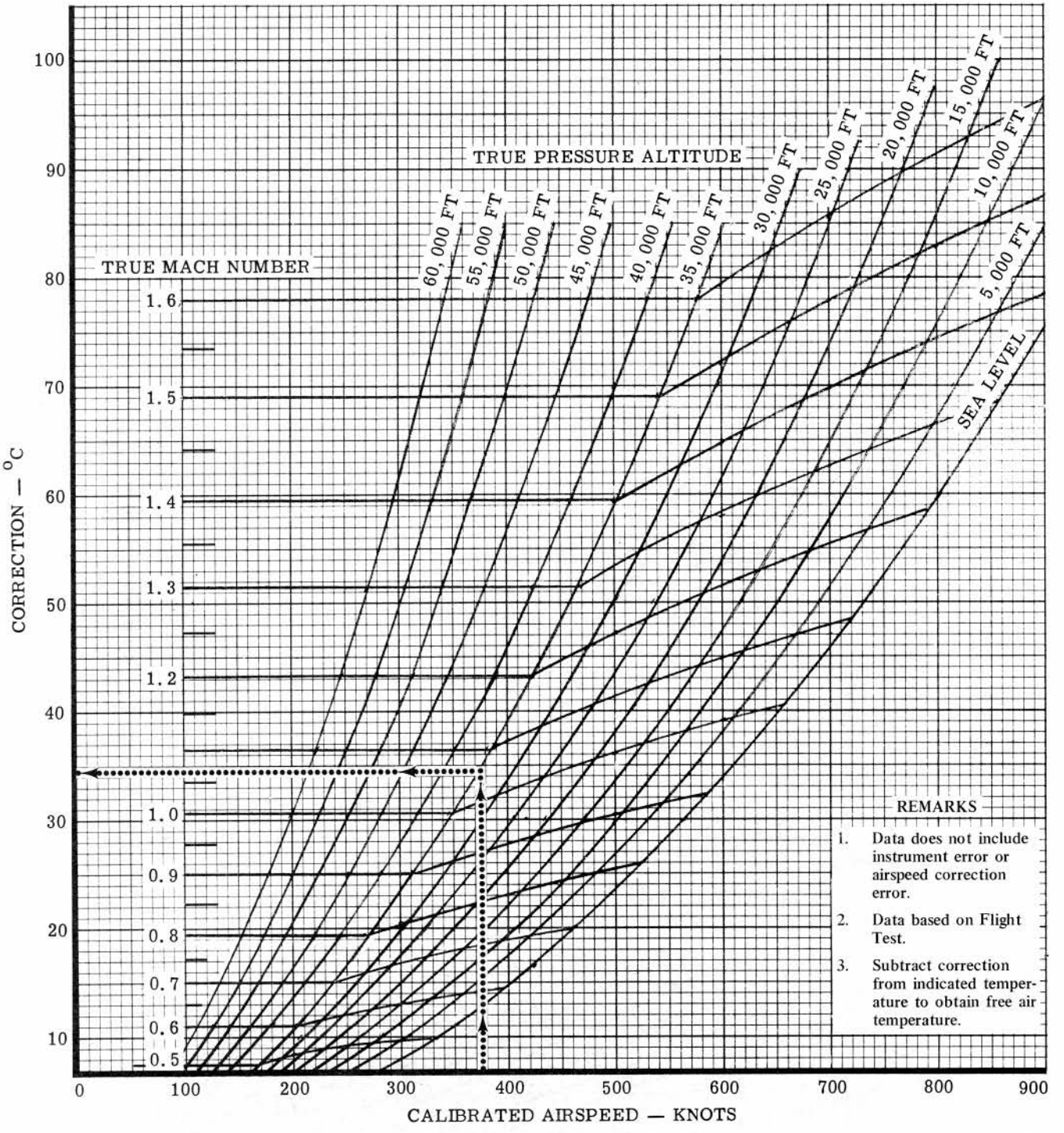
AIRSPEED - MACH NUMBER CONVERSION



72282-11-2(2)-12-69

Figure 11-2 (Sheet 2)

TEMPERATURE CORRECTION



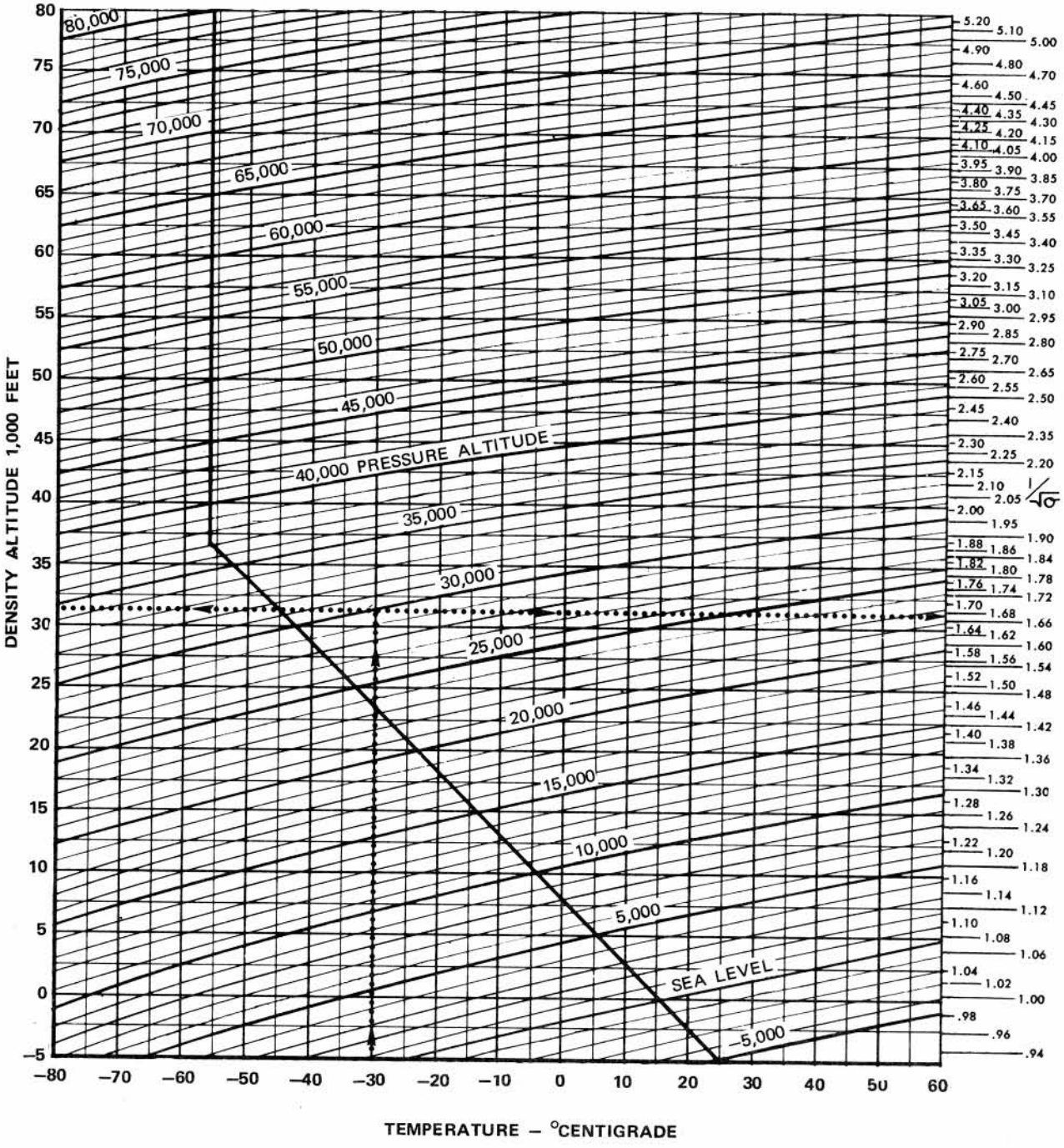
72282-11-3-12-69

Figure 11–3

DENSITY ALTITUDE CHART

ICAO STANDARD DAY

STANDARD DATA



72282–11–4–12–69

Figure 11–4

STANDARD ATMOSPHERE TABLE

This table (figure 11–5) gives the standard day conditions at various altitudes for density ratio, $1/\sqrt{\sigma}$, temperature, speed-of-sound ratio, atmospheric pressure, and pressure ratio. To find the value of any item on a standard day, read figure to the right of the altitude in the appropriate column.

CROSSWIND CHART

This chart (figure 11–6) permits determination of runway headwind and crosswind components when local wind conditions are known. For instance, assume that the wind over the runway is 40 knots from 35° relative to the runway and it is desired to find the headwind component for use in reading the takeoff distance chart. Read up to 35° radius line to the 40-knot wind line. From this point, project horizontally to the RUNWAY COMPONENT scale to obtain 32.5 knots. The chart is read in the same manner to find tailwind component by using the angle between the reciprocal of runway heading and the local wind.

STANDARD ATMOSPHERE

ICAO STANDARD DAY

Standard SL Conditions

Temperature – 15° C (59° F)
Pressure – 29.921 In. Hg; 2116.216 Lb/Sq Ft
Density – .0023769 Slugs/Cu Ft
Speed of Sound – 1116.89 Ft Sec; 661.7 Knots

Conversion Factors

1 In. Hg – 70.727 Lb/Sq Ft
1 In. Hg – 0.49116 Lb/Sq In.
1 Knot – 1.151 MPH
1 Knot – 1.688 Ft/Sec

Altitude Feet	Density Ratio σ	$\frac{1}{\sqrt{\sigma}}$	Temperature °C	Temperature °F	Speed of Sound Knots	Pressure In. Hg	Pressure Ratio δ
0	1.0000	1.0000	15.000	59.000	661.7	29.921	1.0000
1,000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2,000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3,000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4,000	.8881	1.0611	7.076	44.735	652.6	25.842	.8637
5,000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6,000	.8359	1.0938	3.113	37.603	648.7	23.978	.8014
7,000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8,000	.7860	1.1279	– 0.850	30.471	643.3	22.225	.7428
9,000	.7620	1.1456	– 2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	– 4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	– 6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	– 8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	– 10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	– 12.737	9.074	629.0	17.577	.5875
15,000	.6292	1.2606	– 14.718	5.508	626.6	16.886	.5643
16,000	.6090	1.2815	– 16.699	1.941	624.2	16.216	.5420
17,000	.5892	1.3028	– 18.680	– 1.625	621.8	15.569	.5203
18,000	.5699	1.3246	– 20.662	– 5.191	619.4	14.942	.4994
19,000	.5511	1.3470	– 22.643	– 8.757	617.0	14.336	.4791
20,000	.5328	1.3700	– 24.624	– 12.323	614.6	13.750	.4595
21,000	.5150	1.3935	– 26.605	– 15.889	612.1	13.184	.4406
22,000	4976	1.4176	– 28.587	– 19.456	609.6	12.636	.4223
23,000	.4806	1.4424	– 30.568	– 23.022	607.1	12.107	.4046
24,000	.4642	1.4678	– 32.549	– 26.588	604.6	11.597	.3876
25,000	.4481	1.4938	– 34.530	– 30.154	602.1	11.103	.3711
26,000	.4325	1.5206	– 36.511	– 33.720	599.6	10.627	.3552
27,000	.4173	1.5480	– 38.492	– 37.286	597.1	10.168	.3398
28,000	.4025	1.5762	– 40.474	– 40.852	594.6	9.725	.3250
29,000	.3881	1.6052	– 42.455	– 44.419	592.1	9.297	.3107
30,000	.3741	1.6349	– 44.436	– 47.985	589.5	8.885	.2970
31,000	.3605	1.6654	– 46.417	– 51.551	586.9	8.488	.2837
32,000	.3473	1.6968	– 48.398	– 55.117	584.4	8.106	.2709
33,000	.3345	1.7291	– 50.379	– 58.683	581.8	7.737	.2586
34,000	.3220	1.7623	– 52.361	– 62.249	579.2	7.382	.2467
35,000	.3099	1.7964	– 54.342	– 65.816	576.6	7.041	.2353
36,000	.2981	1.8315	– 56.323	– 69.382	574.0	6.712	.2243
36,089	.2971	1.8347	– 56.500	– 69.700	573.7	6.683	.2234
37,000	.2843	1.8753				6.397	.2138
38,000	.2710	1.9209				6.097	.2038
39,000	.2583	1.9677				5.811	.1942
40,000	.2462	2.0155				5.538	.1851

72282–11–5(1)–12–69

Figure 11–5 (Sheet 1)

STANDARD ATMOSPHERE

ICAO STANDARD DAY

STANDARD DATA

Standard SL Conditions:
Temperature – 15° C (59°F)
Pressure – 29.921 In. Hg; 2116.216 Lb/Sq Ft
Density – .0023769 Slugs/Cu Ft
Speed of Sound – 1116.89 Ft/Sec; 661.7 Knots

Conversion Factors:
1 In. Hg – 70.727 Lb/Sq Ft
1 In. Hg – 0.49116 Lb/Sq In.
1 Knot – 1.151 MPH
1 Knot – 1.688 Ft/Sec

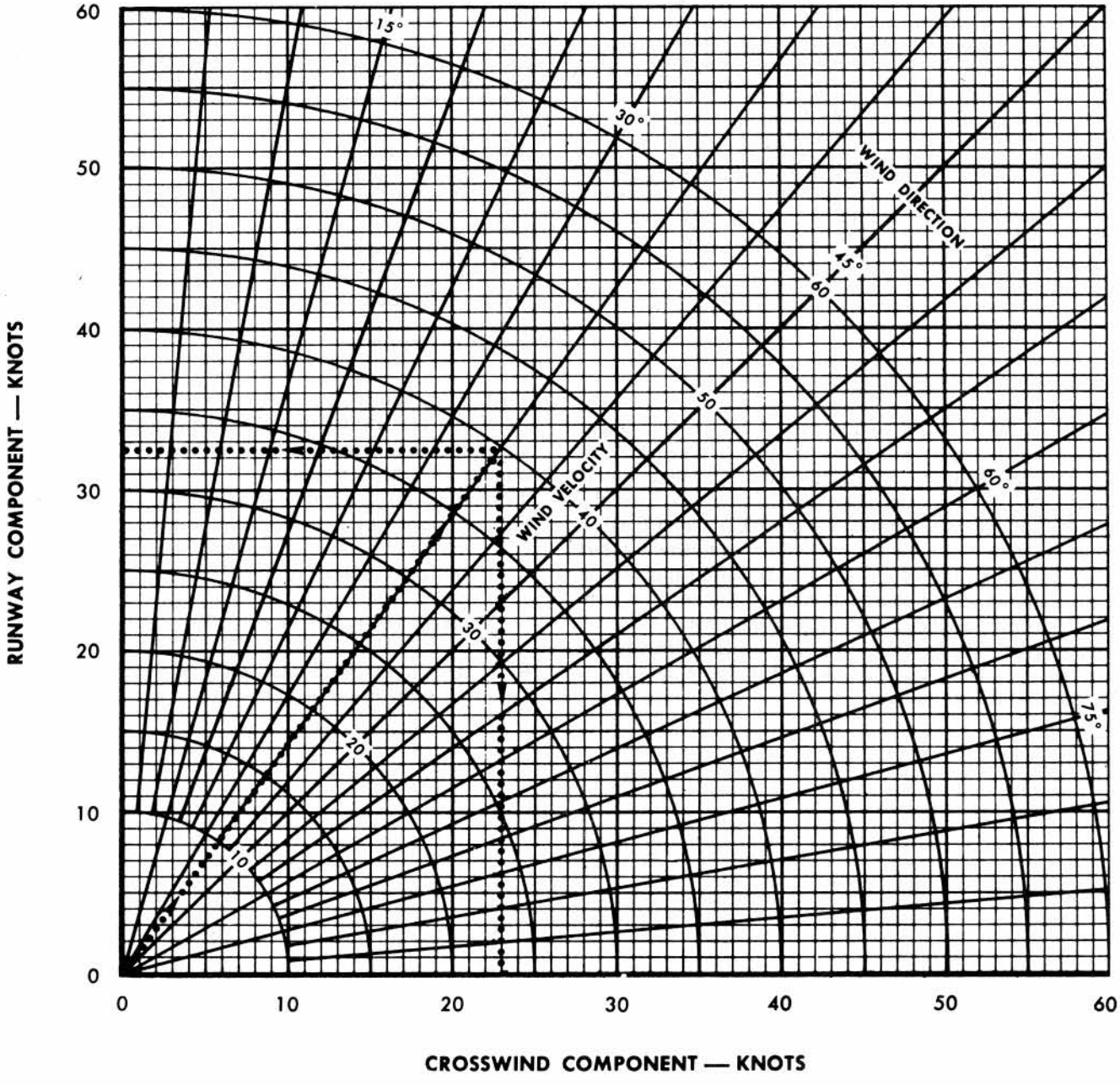
Altitude Feet	Density Ratio σ	$\frac{1}{\sqrt{\sigma}}$	Temperature °C	Temperature °F	Speed of Sound Knots	Pressure In. Hg	Presssure Ratio δ
41,000	.2346	2.0645	−56.500	−69.700	573.7	5.278	.1764
42,000	.2236	2.1148				5.030	.1681
43,000	.2131	2.1662				4.794	.1602
44,000	.2031	2.2189				4.569	.1527
45,000	.1936	2.2728				4.355	.1455
46,000	.1845	2.3281				4.151	.1387
47,000	.1758	2.3848				3.956	.1322
48,000	.1676	2.4428				3.770	.1260
49,000	.1597	2.5022				3.593	.1201
50,000	.1522	2.5630				3.425	.1145
51,000	.1451	2.6254				3.264	.1091
52,000	.1383	2.6892				3.111	.1040
53,000	.1318	2.7546				2.965	.09909
54,000	.1256	2.8216				2.826	.09444
55,000	.1197	2.8903				2.693	.09001
56,000	.1141	2.9606				2.567	.08578
57,000	.1087	3.0326				2.446	.08176
58,000	.1036	3.1063				2.331	.07792
59,000	.09877	3.1819				2.222	.07426
60,000	.09414	3.2593				2.118	.07078
61,000	.08972	3.3386	−56.500	−69.700	573.7	2.018	.06746
62,000	.08551	3.4198				1.924	.06429
63,000	.08150	3.5029				1.833	.06127
64,000	.07767	3.5881				1.747	.05840
65,000	.07403	3.6754				1.665	.05566
66,000	.07055	3.7649				1.587	.05305
67,000	.06724	3.8564				1.513	.05056
68,000	.06409	3.9502				1.442	.04819
69,000	.06108	4.0463				1.374	.04592
70,000	.05821	4.1447				1.310	.04377
71,000	.05548	4.2456				1.248	.04171
72,000	.05288	4.3488				1.190	.03976
73,000	.05040	4.4545				1.134	.03789
74,000	.04803	4.5633				1.081	.03611
75,000	.04578	4.6738				1.030	.03442
76,000	.04363	4.7874				0.982	.03280
77,000	.04158	4.9039				0.935	.03126
78,000	.03963	5.0231				0.892	.02980
79,000	.03777	5.1454				0.850	.02840
80,000	.03600	5.2706				0.810	.02707

72282–11–5(2)–12–69

Figure 11–5 (Sheet 2)

CROSSWIND

STANDARD DATA



72282-11-6-12-69

Figure 11-6

REST COMPUTER

DESCRIPTION

The universal range, endurance, speed, and time (U-REST) computer is a circular slide rule type device used for preflight and inflight cruise control computations. It presents takeoff, climb, cruise, and descent information in a simple, easy to use form. The computer is made up of three concentric disks which are held together at the center by a spring-type clasp. The top and bottom disks (referred to as the housing) are identical for all aircraft types, hence the name universal. The center disk (referred to as the insert disk) is removable and is unique in that it presents data for a specific airplane in a specific configuration. Insert disk design varies to suit the mission requirements of each aircraft, and specific instructions are packaged with each computer.

Data Basis

Most data for U-REST computers are derived from flight tests, the majority of which are conducted at the Naval Air Test Center, Patuxent River, Maryland. Computer insert disks that are produced from actual test data have the words FLIGHT TEST printed on the back face of the disk together with the date the tests were completed. Insert disks based on contractor estimates and wind tunnel data are so labeled. In all cases the data are the best fuel consumption data available anywhere at the time of printing. When better data become available, and the original data are found to be in error by more than 5%, a new disk is produced and distributed.

Gross Weight Assumptions

Since fuel consumption is proportional to the gross weight of the aircraft, it changes as fuel is consumed. To account for the continuously varying gross weight, an average weight is used to compute the data presented on the computer. Hence, the actual fuel consumption is initially slightly higher than that given by the computer and is slightly lower toward the end of the mission.

Instructions For Use

Each U–REST computer is distributed with a set of instructions which includes sample problems. It is advantageous for each pilot to be proficient in the use of the computer, particularly the emergency range and the endurance section on the back face.

PROCUREMENT

U-REST computers are designed and distributed by the Naval Air Test Center (NATC). The initial distribution of computers for a new aircraft model is 250% of the number of airplanes assigned to each activity. The initial distribution is automatic and subsequent requirements may be satisfied by letter request to:

Commander, Naval Air Test Center
Code FT2124
Patuxent River, Maryland 20670

Refer to current Naval Air Test Center Universal REST Computer Bulletin for available disks.

PART 3 - PERFORMANCE CHARTS - J57-P-420

GENERAL

Performance charts are organized in the following groups:

Takeoff charts	Landing charts
Inflight charts	Emergency charts

Refer to Definitions, part 1, for meanings of abbreviations and other terms used in part 3. Following the performance charts are mission planning sample problems.

TAKEOFF CHARTS—J57-P-420

The takeoff data charts provide distance and speed data for various phases of the takeoff operation, including normal takeoffs, minimum run (short field) takeoffs, and takeoffs performed to clear obstacles. Takeoff data are based on the takeoff techniques described in Section III. The information provided makes possible preflight determination of normal or minimum ground run distance, obstacle clearance distance, takeoff speed, speed or distances for checking takeoff acceleration during ground roll, maximum refusal speed, emergency braking velocity, and the effects of runway conditions.

TAKEOFF GROUND ROLL DISTANCE

These charts (figures 11-34 and 11-35) permit the determination of the primary and adjusted ground run distance considering gross weight, temperature, and runway pressure altitude under zero wind conditions. The takeoff ground roll effects chart (figure 11-35) provides a way of determining the effects of wind, runway slope, and CG.

DISTANCE TO CLEAR OBSTACLE

These charts (figures 11-36 and 11-37) permit the determination of the primary and adjusted distance necessary to clear obstacles of 50 to 200 feet considering the effects of wind, runway slope, and CG.

TAKEOFF SPEED

This chart (figure 11-38) permits the determination of normal and minimum run takeoff speed considering aircraft gross weight and CG.

VELOCITY DURING TAKEOFF GROUND ROLL

This chart (figure 11-39) permits the determination of the airspeed that should be attained at any predetermined distance during the takeoff ground run. The distance that should be attained at any given airspeed during the takeoff can also be obtained by entering the chart from the airspeed scale. In using this chart, no allowance is made for winds. Add headwind to indicated airspeed to determine check speed.

MAXIMUM REFUSAL SPEED

These charts (figures 11-40 and 11-41) permit the determination of the primary and adjusted refusal speed when the aircraft gross weight, field pressure altitude, runway air temperature, and usable runway length are known. The refusal speed is the maximum speed to which the aircraft can accelerate and then stop in the available runway length.

LIMIT BRAKING VELOCITY FOR REFUSAL

These charts (figures 11-42 and 11-43) permit the determination of the maximum speed to which the aircraft can accelerate on takeoff roll and then be stopped without consideration of tire and brake destruction. To correct for wind effect, add headwind velocity to, or subtract tailwind velocity from, limit braking velocity.

EFFECT OF RUNWAY CONDITION READINGS – RCR

Runway condition reading (RCR) provide the means of correcting the maximum refusal speed and the limit braking velocity for changes in braking efficiency caused by

variations in runway surface conditions. An RCR of 21 represents heavy braking on a dry, hard-surfaced runway, while an RCR of 23 represents maximum continuous braking performance. An RCR less than 21 represents a decrease in braking efficiency from that for average dry, hard-surfaced runway conditions. Runway condition readings are included as a part of the takeoff and landing charts.

TAKEOFF GROUND ROLL DISTANCE - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

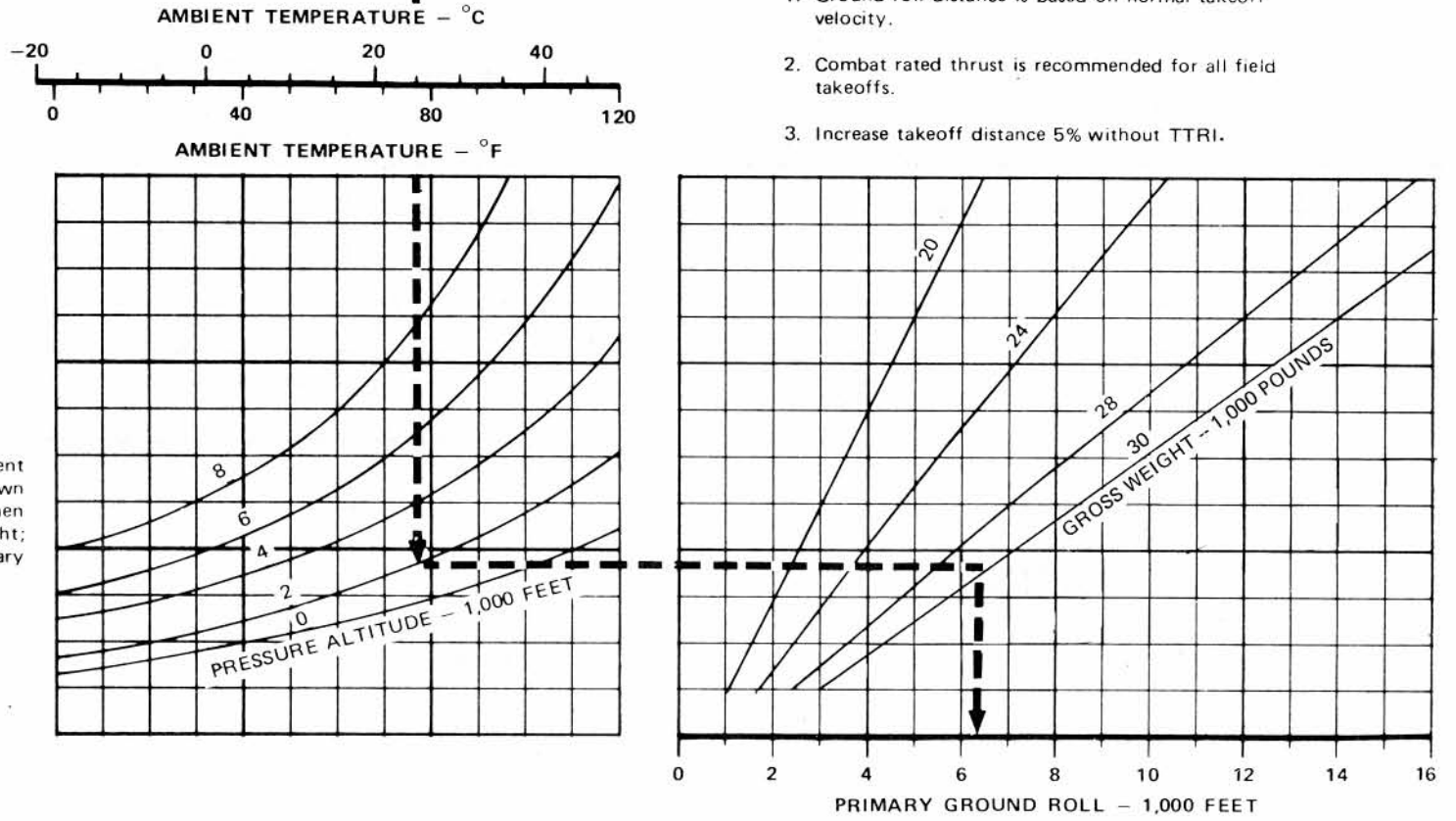
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION
CG: 20% MAC
ZERO WIND
ZERO RUNWAY SLOPE

EXAMPLE: For temperature of .25°C, pressure altitude of 2,000 feet, and gross weight of 29,500 pounds; the primary ground roll is 6,400 feet.

NOTE

1. Ground roll distance is based on normal takeoff velocity.
2. Combat rated thrust is recommended for all field takeoffs.
3. Increase takeoff distance 5% without TTRI.



how to use chart

Enter top with ambient temperature; trace down to pressure altitude; then right to gross weight; then down to primary ground roll.

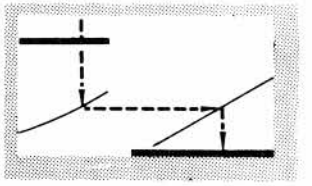
Figure 11-34 (Sheet 1)

TAKEOFF GROUND ROLL DISTANCE – J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION
CG: 20% MAC
ZERO WIND
ZERO RUNWAY SLOPE



how to use chart

Enter top with ambient temperature. Trace down to pressure altitude; then right to gross weight; then down to primary ground roll.

NOTE

1. Ground roll distance is based on normal takeoff velocity.
2. Combat rated thrust is recommended for all field takeoffs.
3. Increase takeoff distance 5% without TTRI.

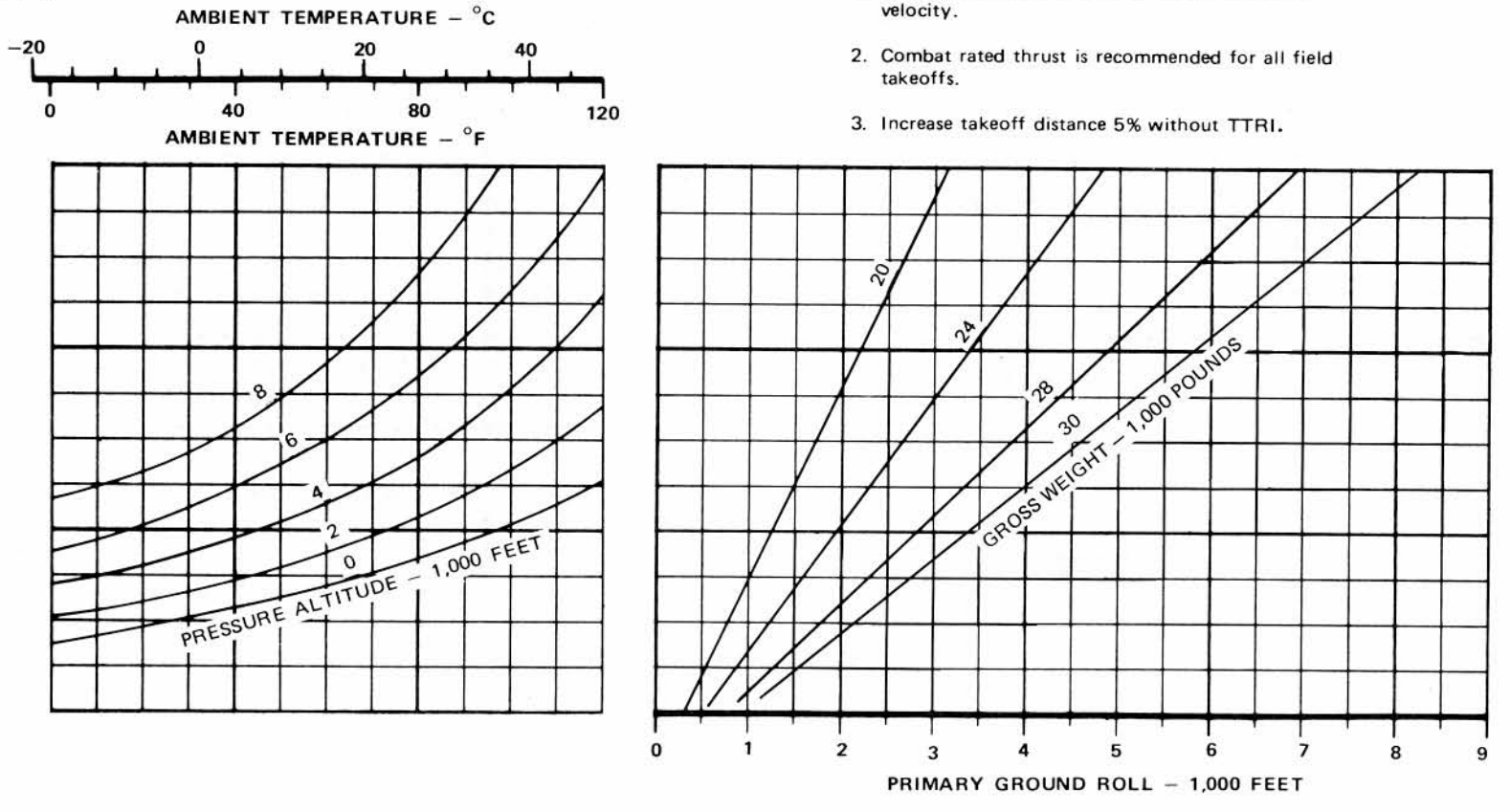


Figure 11-34 (Sheet 2)

TAKEOFF GROUND ROLL DISTANCE EFFECTS – J57-P-420

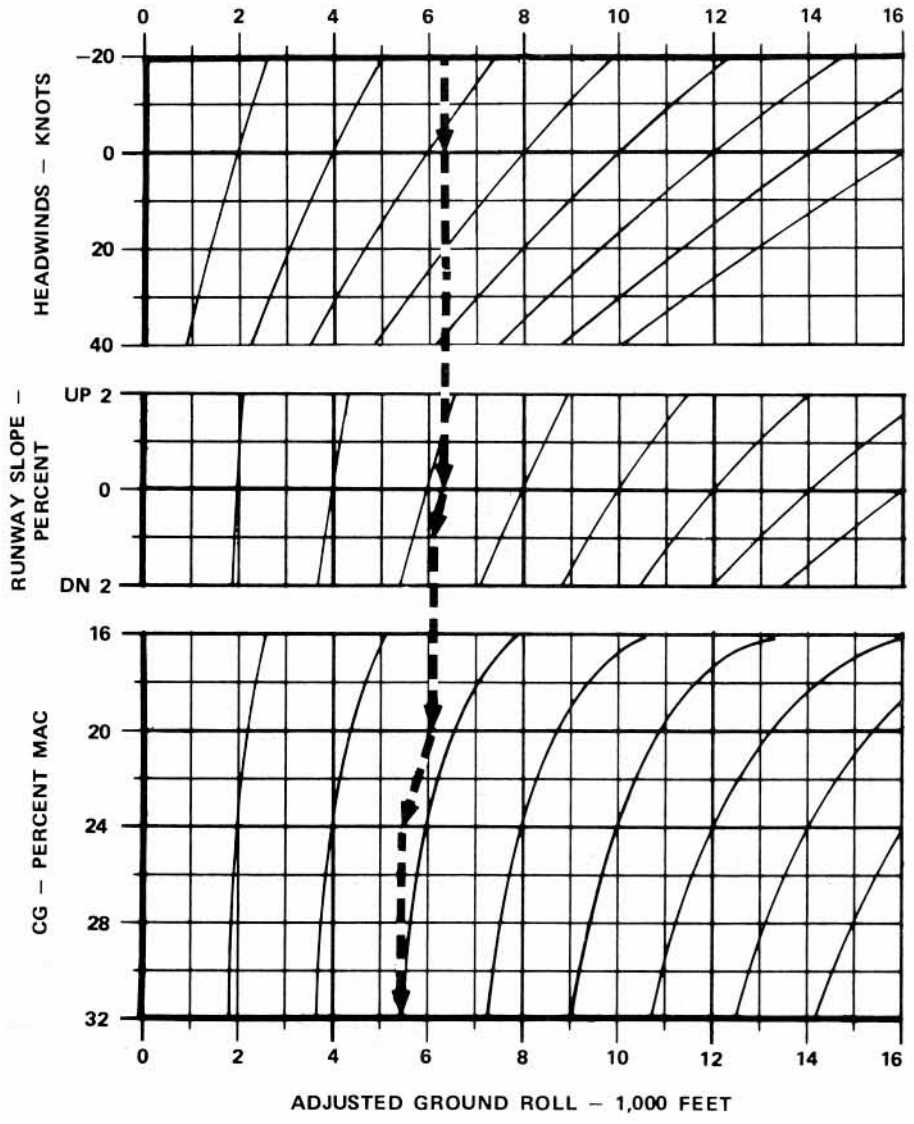
WIND, RUNWAY SLOPE, CG EFFECTS

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION

EXAMPLE: Primary ground roll 6,400 feet; headwind 0 knots; runway slope 1% down; CG 24%; adjusted ground roll is 5,500 feet.



how to use chart

Enter top of chart with primary ground roll. Trace down to zero headwind line; follow guidelines to effective headwind. Trace down to zero runway slope; follow guidelines to slope percent. Trace down to CG% (20) baseline; follow guidelines to effective CG%. Trace down to adjusted ground roll.

Figure 11-35 (Sheet 1)

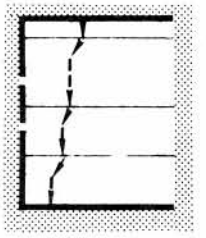
TAKEOFF GROUND ROLL DISTANCE EFFECTS - J57-P-420

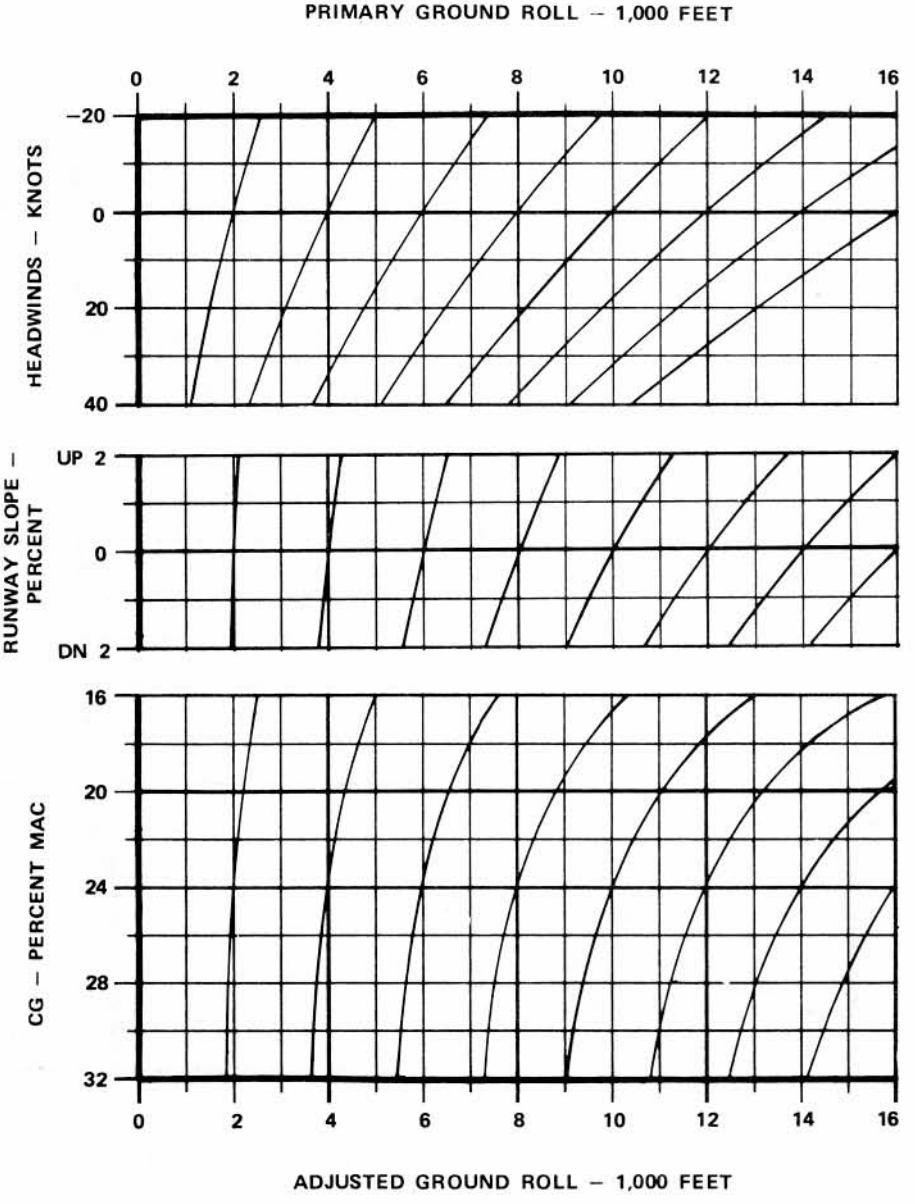
WIND, RUNWAY SLOPE, CG EFFECTS

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION
CG: 20% MAC
ZERO WIND





how to use chart

Enter top of chart with primary ground roll. Trace down to zero headwind line; follow guidelines to effective headwind. Trace down to zero runway slope; follow guidelines to slope percent. Trace down to CG% (20) baseline; follow guidelines to effective CG%. Trace down to adjusted ground roll.

Figure 11-35 (Sheet 2)

DISTANCE TO CLEAR OBSTACLE - J57-P-420

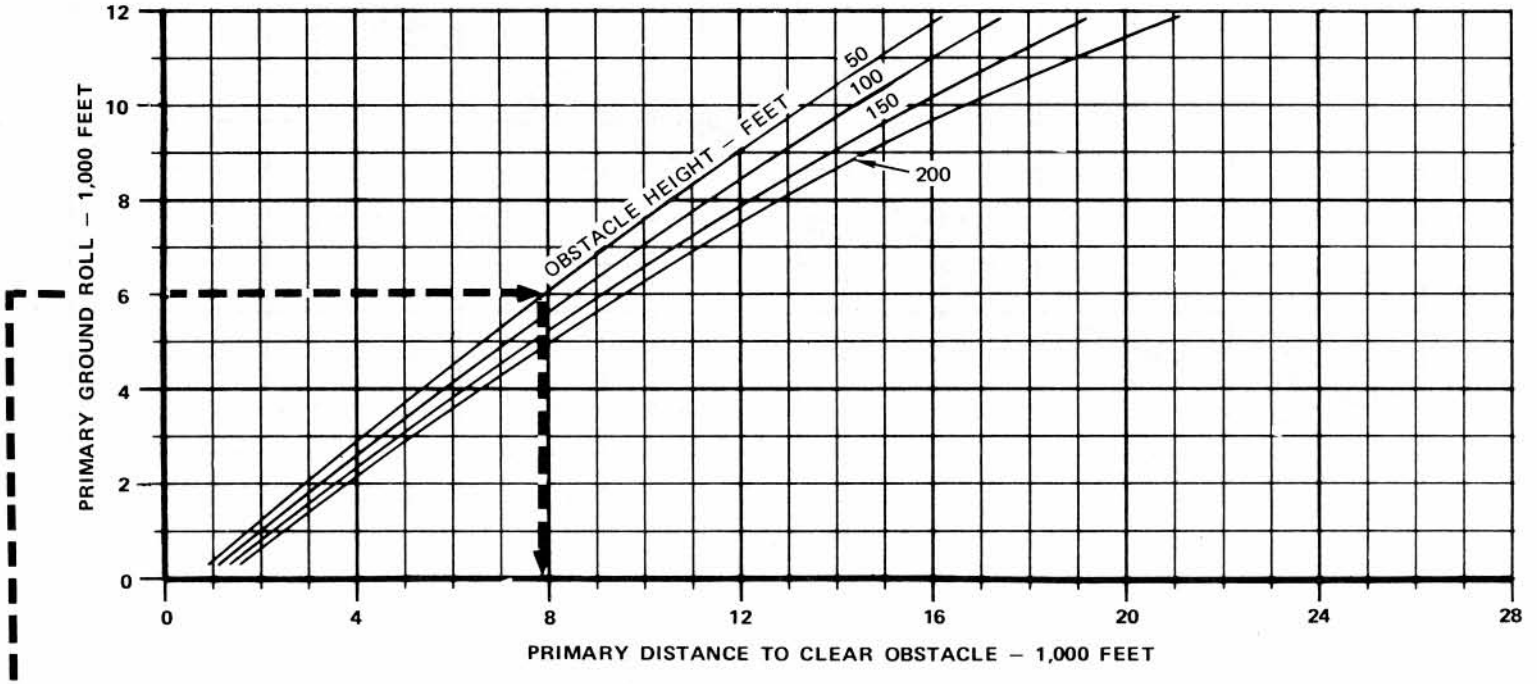
MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION
CG: 20% MAC
ZERO WIND
ZERO RUNWAY SLOPE

how to use chart

Enter left side of chart with primary ground roll. Trace right to obstacle height; trace down to primary distance to clear obstacle.



EXAMPLE: Primary ground roll 6,000 feet, obstacle height 50 feet. Primary distance to clear obstacle is 7,900 feet.

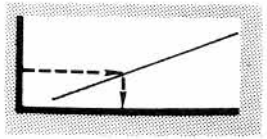
Figure 11-36 (Sheet 1)

DISTANCE TO CLEAR OBSTACLE – J57-P-420

MODEL: RF–8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION
CG: 20% MAC
ZERO WIND
ZERO RUNWAY SLOPE



how to use chart

Enter left side of chart with primary ground roll. Trace right to obstacle height; trace down to primary distance to clear obstacle.

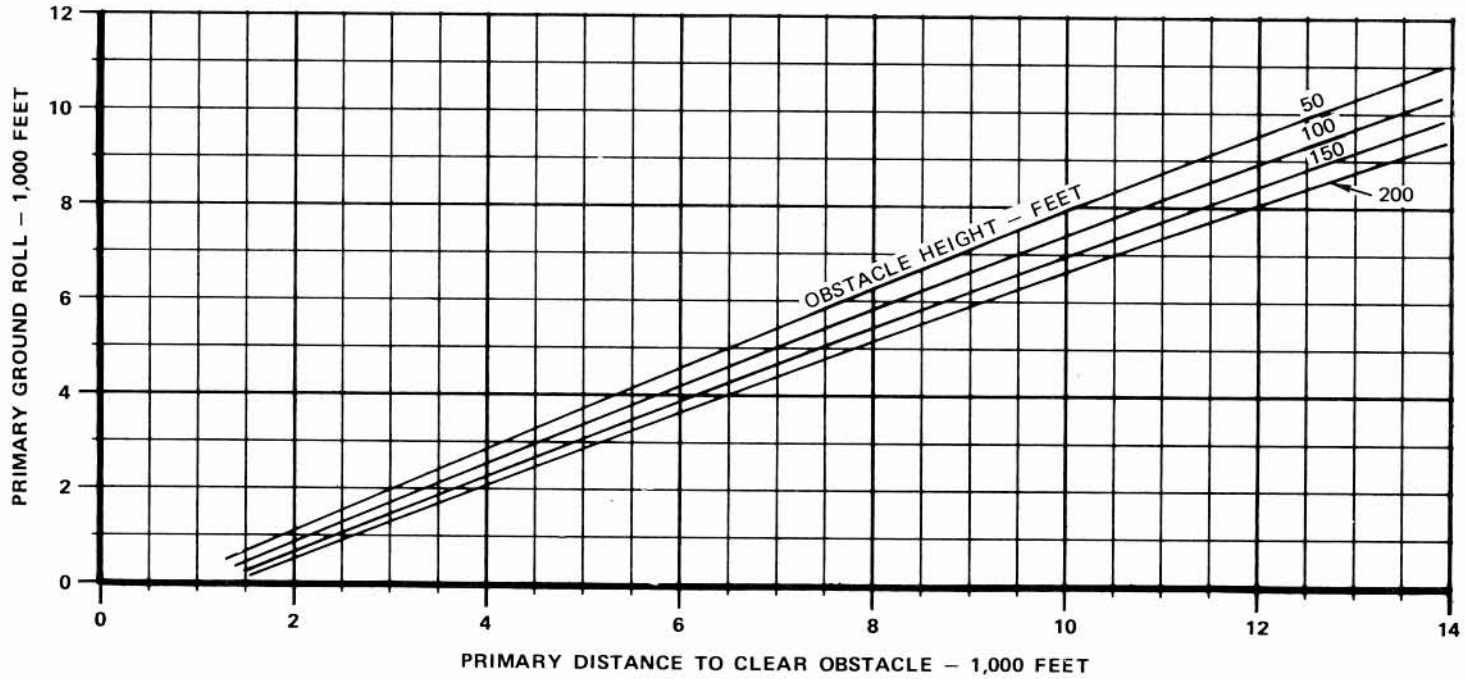


Figure 11-36 (Sheet 2)

DISTANCE TO CLEAR OBSTACLE EFFECTS - J57-P-420

WIND, RUNWAY SLOPE, CG EFFECTS

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION

EXAMPLE: Primary distance to clear obstacle 8,000 feet, headwind 20 knots, runway slope 1%, CG 24%; adjusted distance to clear 50 foot obstacle is 5,800 feet.

how to use chart

Enter top of chart with primary distance to clear obstacle. Trace down to zero headwind line; follow guidelines to effective headwind. Trace down to zero runway slope; follow guidelines to slope percent. Trace down to CG% baseline (20); follow guidelines to effective CG%. Trace down to adjusted distance to clear obstacle.

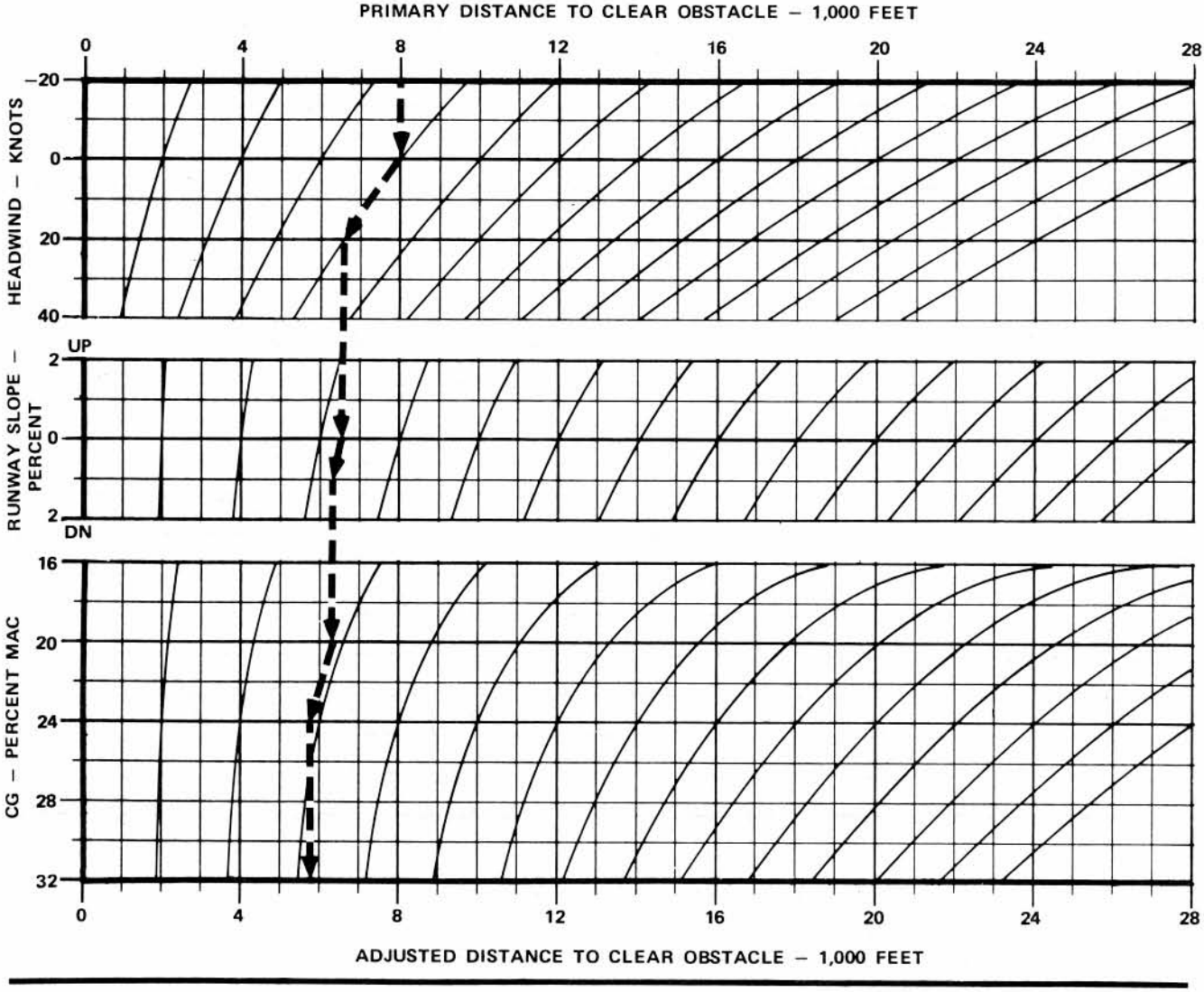


Figure 11-37 (Sheet 1)

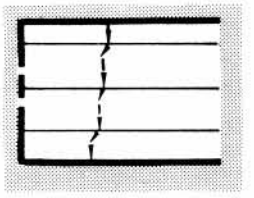
DISTANCE TO CLEAR OBSTACLE EFFECTS - J57-P-420

WIND, RUNWAY SLOPE, CG EFFECTS

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION



how to use chart

Enter top of chart with primary distance to clear obstacle. Trace down to zero headwind line; follow guidelines to effective headwind. Trace down to zero runway slope; follow guidelines to slope percent. Trace down to CG% baseline (20); follow guidelines to effective CG%. Trace down to adjusted distance to clear obstacle.

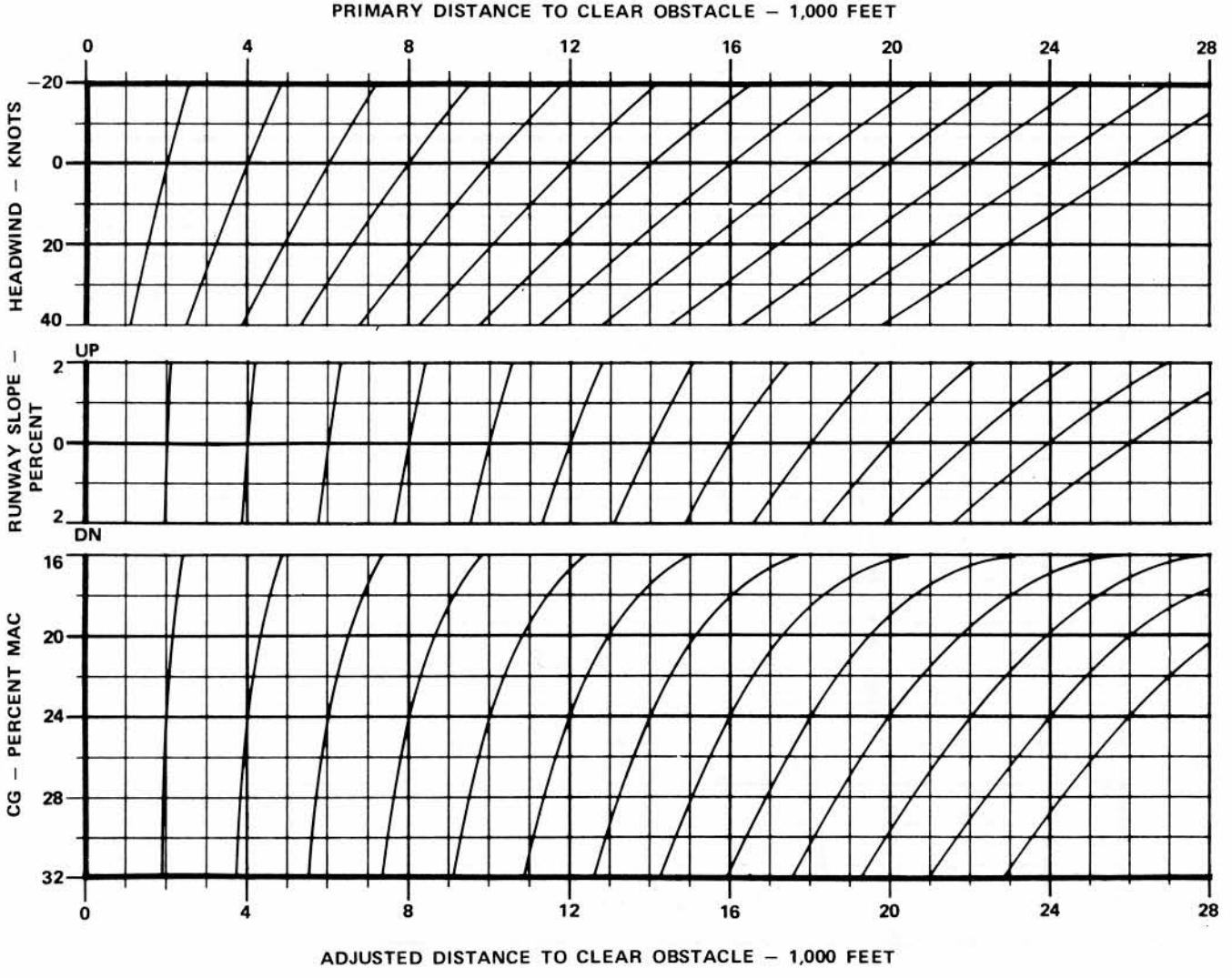


Figure 11-37 (Sheet 2)

TAKEOFF SPEED - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420

CONDITIONS:
MILITARY THRUST
LANDING CONDITION
CG: 20% MAC

how to use chart

Enter bottom at gross weight. Trace up to minimum distance takeoff, normal takeoff and obstacle speed lines. At each of these points trace left to speed scale.

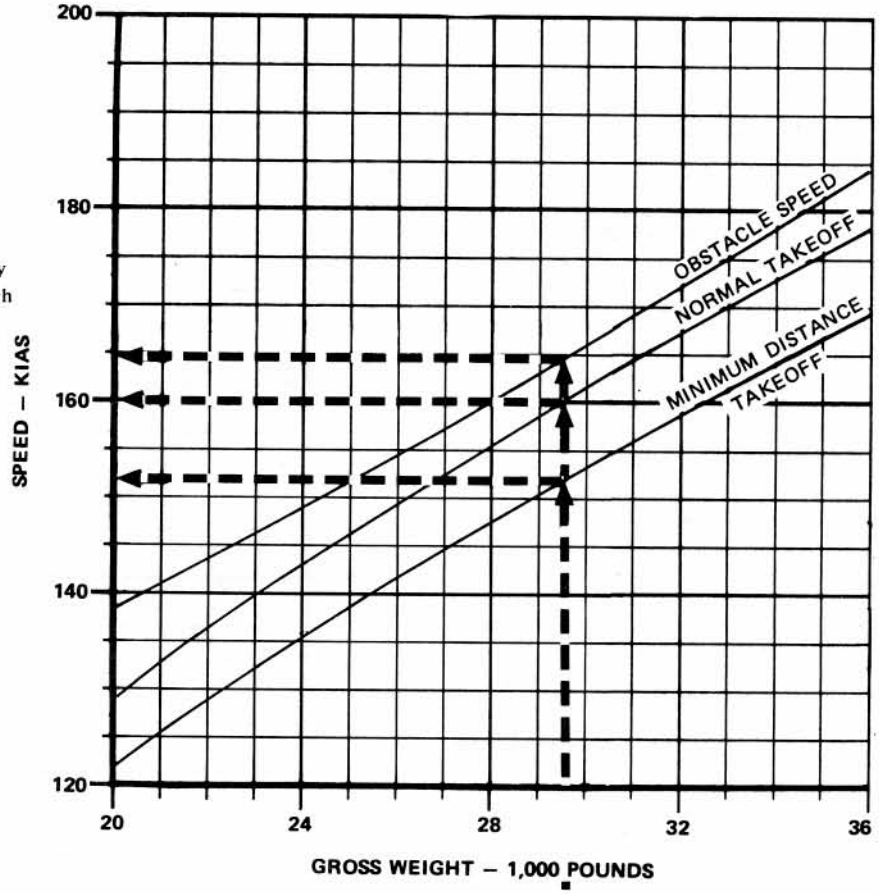
NOTE

1. Takeoff speeds are for sea level, standard day conditions. Increase takeoff 0.6 knot for each 1,000 feet above sea level. Increase/decrease takeoff speed 0.1 knot for each degree (centrigrade) above/below standard day temperature (15°).

2. CG effect: For each 1% of MAC aft of 20% MAC subtract 1.3 knots, (for 22% MAC subtract 2.6 knots). For each 1% of MAC forward of 20% MAC add 2.5 knots, (for 18% MAC add 5 knots).

3. Takeoff speed is defined as speed at break-ground. Normal run takeoff speed is 10% greater than the speed corresponding to 0.9 C_L max with takeoff power on. Minimum run takeoff speed is 10% greater than the stalling speed with takeoff power on.

4. Minimum distance takeoff speed decreases takeoff distance by 13%.



EXAMPLE: Gross weight of 29,500 pounds, minimum distance takeoff speed is 151 KIAS, normal takeoff speed is 160 KIAS and obstacle speed is 164 KIAS.

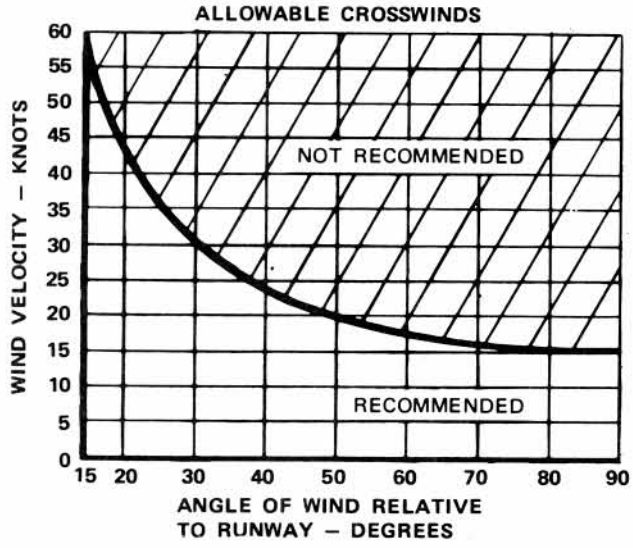


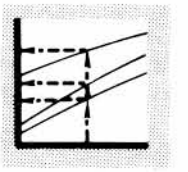
Figure 11-38 (Sheet 1)

TAKEOFF SPEED – J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420

CONDITIONS:
MAXIMUM THRUST
LANDING CONDITION
CG: 20% MAC



how to use chart

Enter bottom at gross weight. Trace up to minimum distance takeoff, normal takeoff and obstacle speed lines. At each of these points trace left to speed scale.

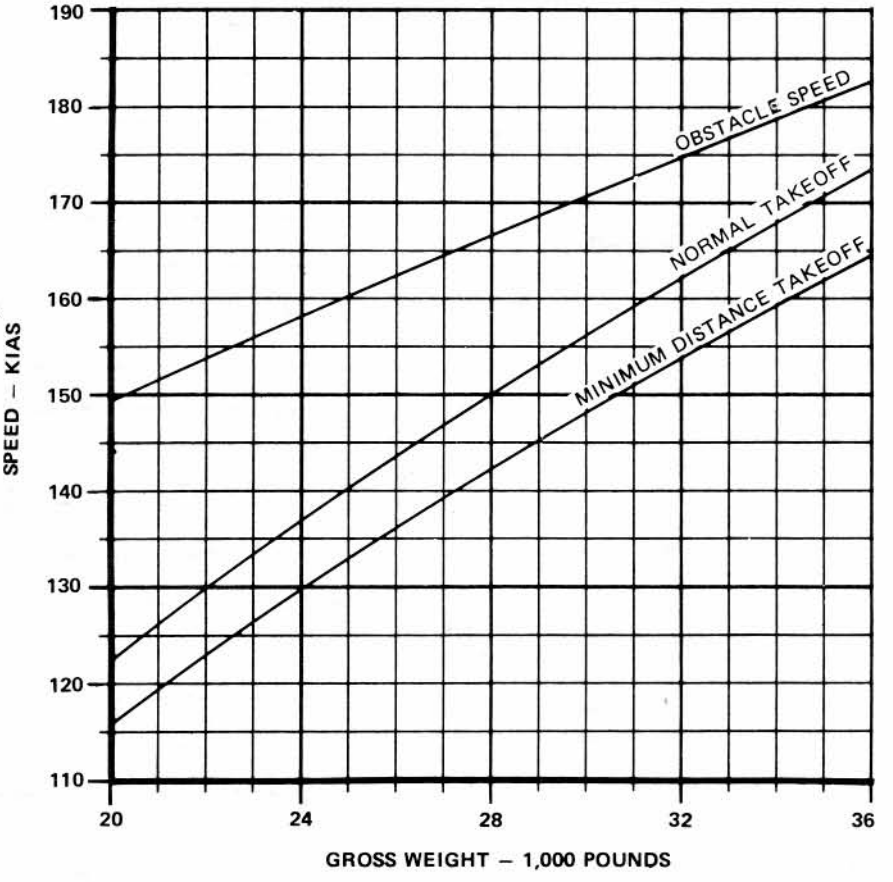
NOTE

1. Takeoff speeds are for sea level, standard day conditions. Increase takeoff 0.6 knot for each 1,000 feet above sea level. Increase/decrease takeoff speed 0.1 knot for each degree (centrigrade) above/below standard day temperature (15°).

2. CG effect: For each 1% of MAC aft of 20% MAC subtract 1.3 knots, (for 22% MAC subtract 2.6 knots). For each 1% of MAC forward of 20% MAC add 2.5 knots, (for 18% MAC add 5 knots).

3. Takeoff speed is defined as speed at break-ground. Normal run takeoff speed is 10% greater than the speed corresponding to 0.9 C_L max with takeoff power on. Minimum run takeoff speed is 10% greater than the stalling speed with takeoff power on.

4. Minimum distance takeoff speed decreases takeoff distance by 11%.



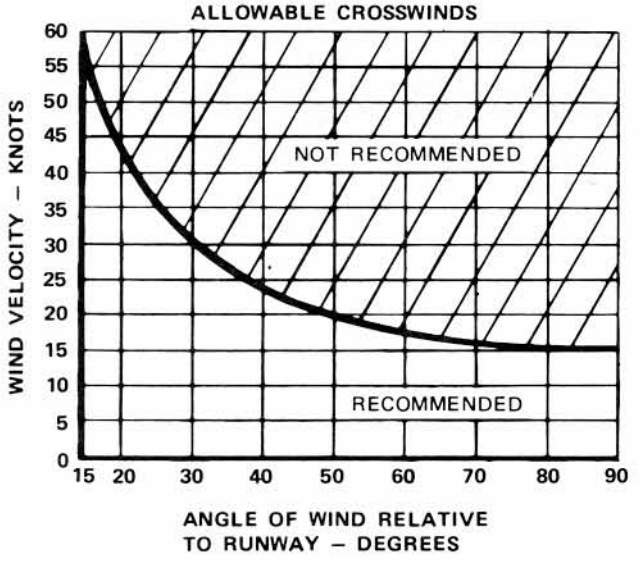


Figure 11-38 (Sheet 2)

VELOCITY DURING TAKEOFF GROUND ROLL - J57-P-420

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION

NOTE

Add headwind to or subtract tailwind from indicated airspeed for refusal.

how to use chart

Enter bottom of chart with adjusted ground roll and trace up. Enter left side of chart with normal takeoff indicated airspeed and trace right. At the point of intersection, follow guidelines left to acceleration check distance. Trace left to acceleration check speed.

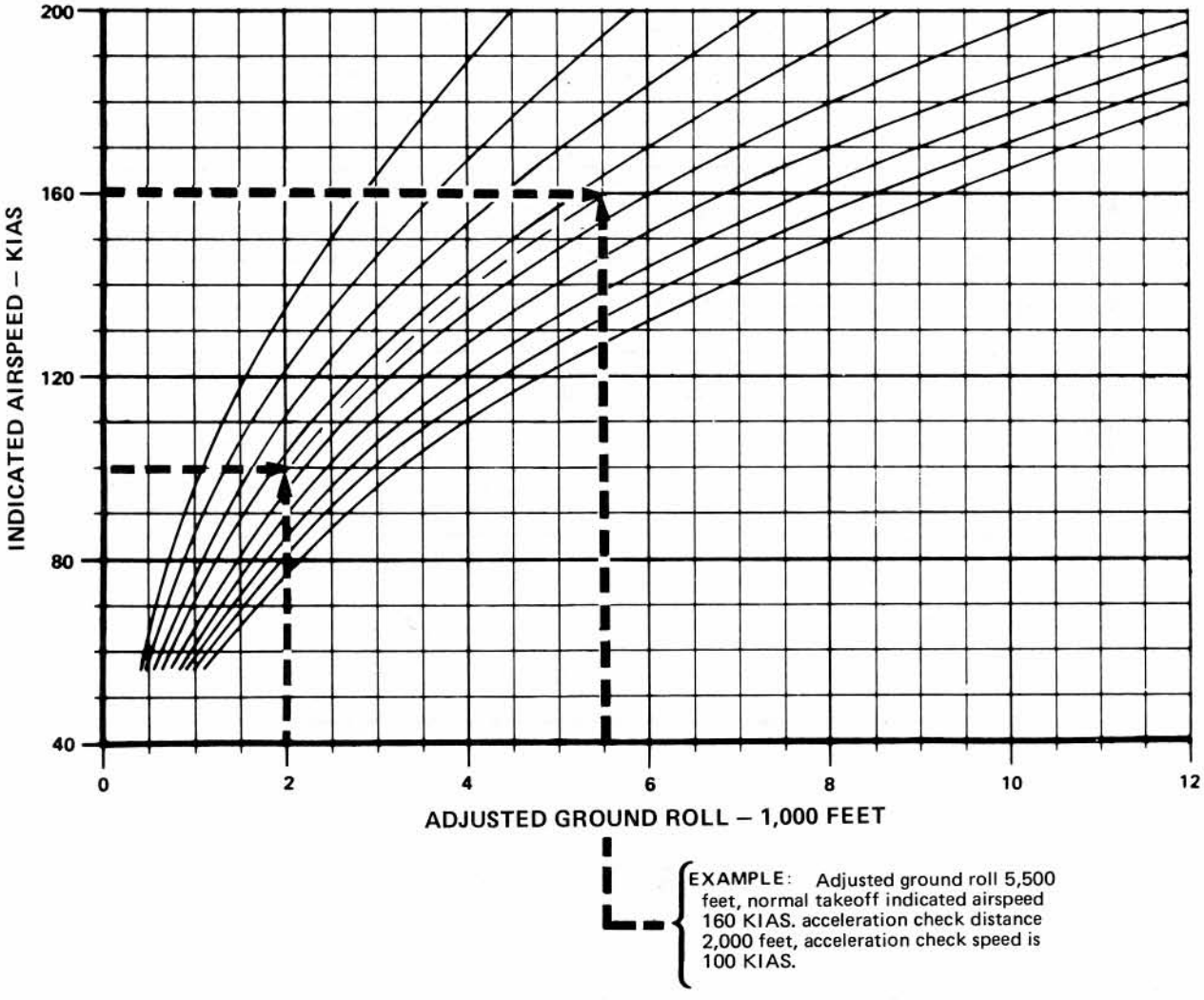
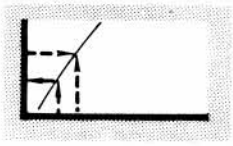


Figure 11-39 (Sheet 1)

VELOCITY DURING TAKEOFF GROUND ROLL - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

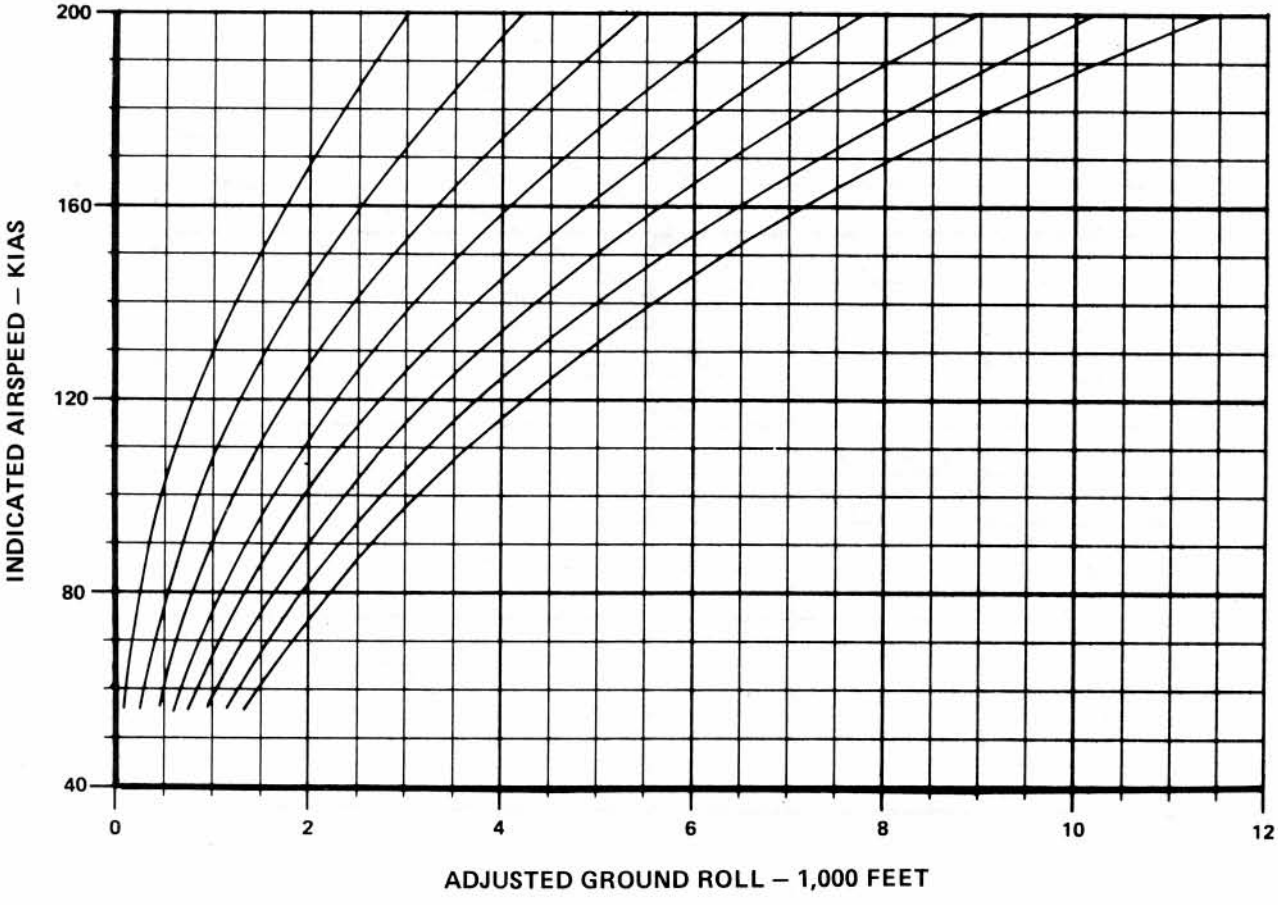
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.



CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION

how to use chart

Enter bottom of chart with adjusted ground roll and trace up. Enter left side of chart with normal takeoff indicated airspeed and trace right. At the point of intersection, follow guidelines left to acceleration check distance. Trace left to acceleration check speed.



NOTE

Add headwind to or subtract tailwind from indicated airspeed for refusal.

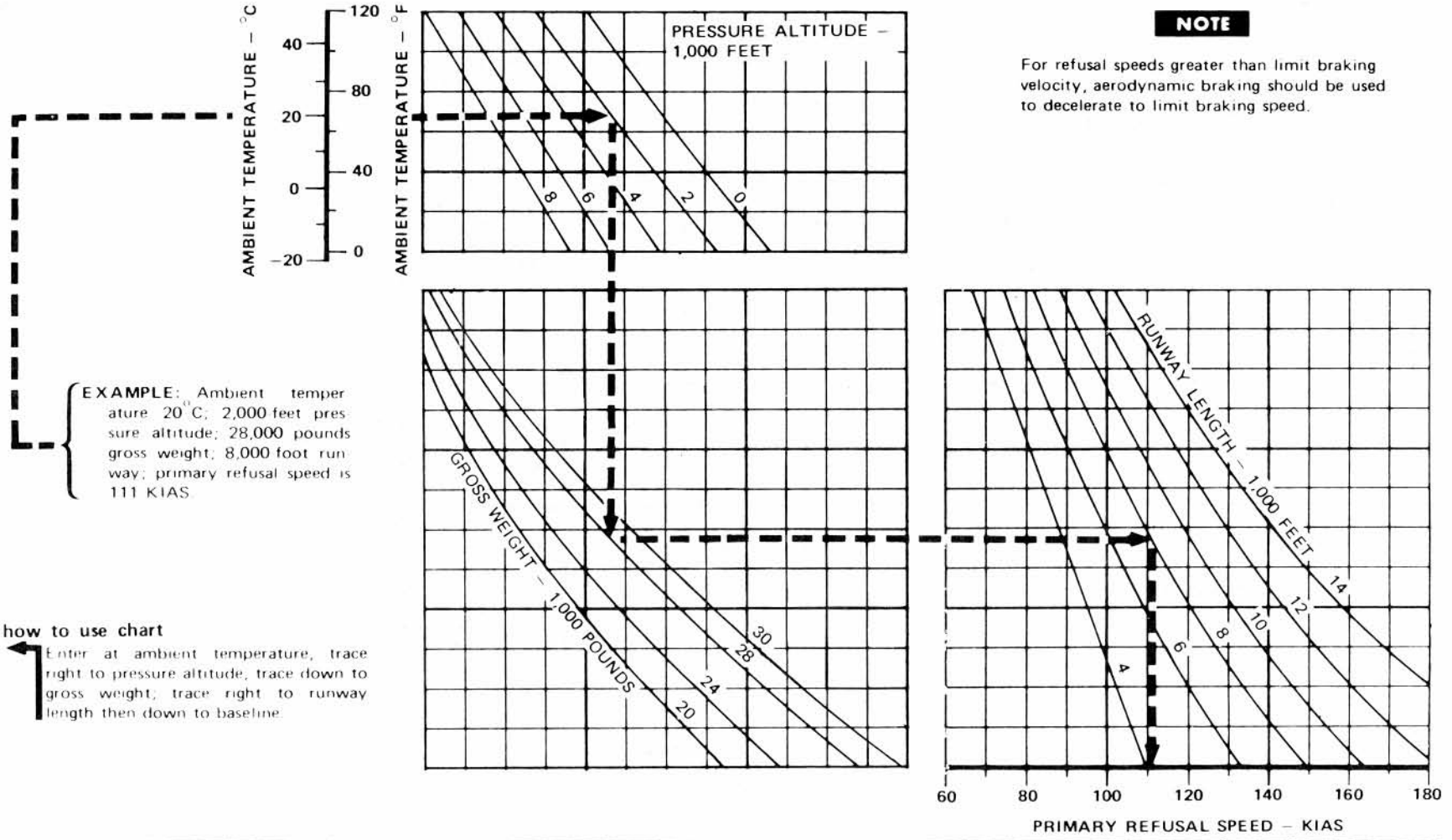
Figure 11-39 (Sheet 2)

MAXIMUM REFUSAL SPEED – J57-P-420

MODEL: RF 8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57 P 420
FUEL GRADE: JP 5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MILITARY THRUST
LANDING CONDITION
CG: 20.0% MAC
ZERO WIND
ZERO RUNWAY SLOPE
23 RCR



NOTE

For refusal speeds greater than limit braking velocity, aerodynamic braking should be used to decelerate to limit braking speed.

EXAMPLE: Ambient temperature 20°C; 2,000 feet pressure altitude; 28,000 pounds gross weight; 8,000 foot runway; primary refusal speed is 111 KIAS.

how to use chart

Enter at ambient temperature, trace right to pressure altitude, trace down to gross weight, trace right to runway length then down to baseline.

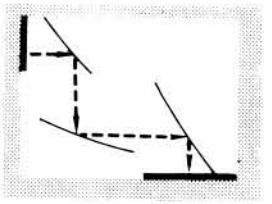
Figure 11-40 (Sheet 1)

MAXIMUM REFUSAL SPEED - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

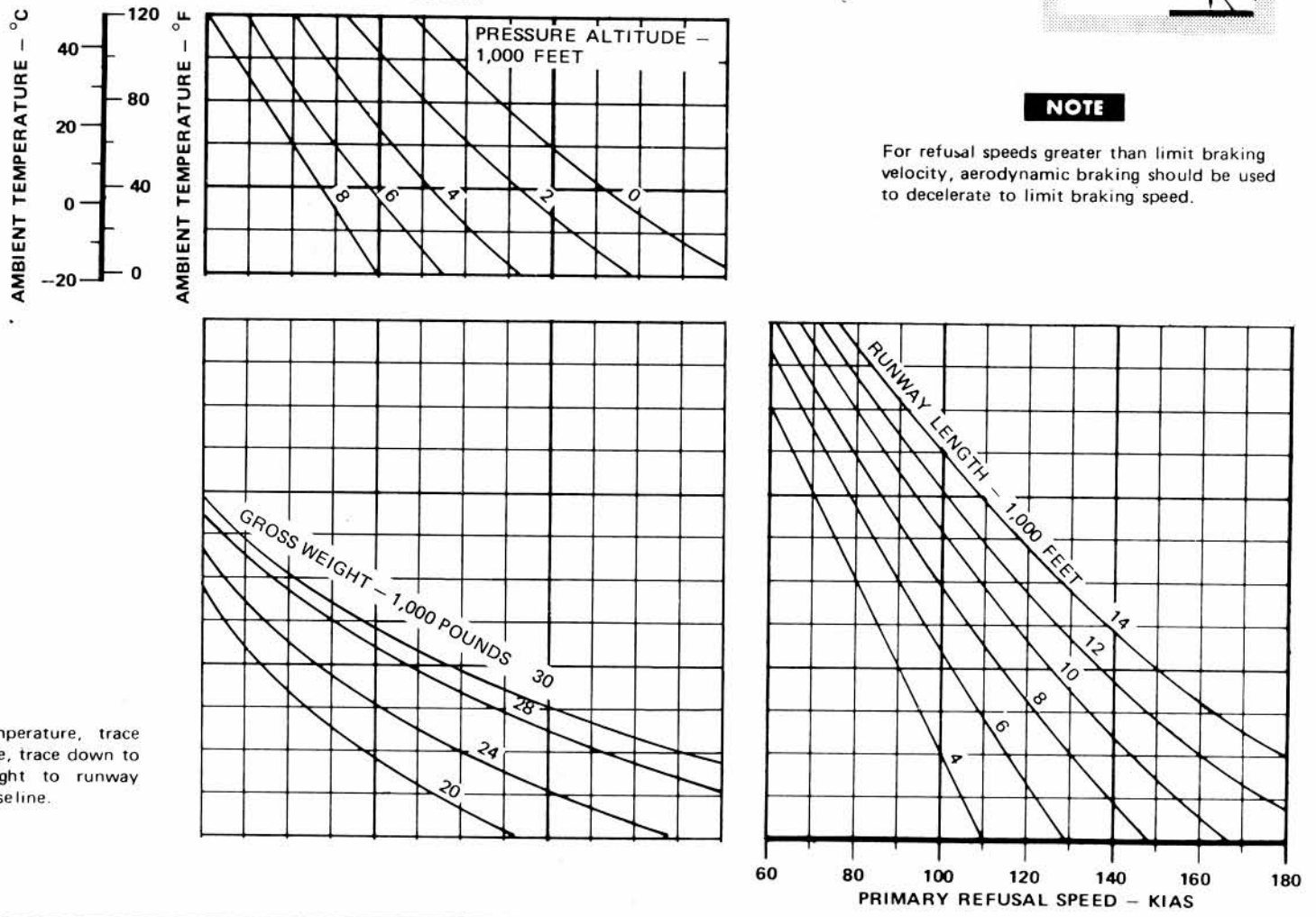
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
MAXIMUM THRUST
LANDING CONDITION
CG: 20.0% MAC
ZERO WIND
ZERO RUNWAY SLOPE
23 RCR



NOTE

For refusal speeds greater than limit braking velocity, aerodynamic braking should be used to decelerate to limit braking speed.



how to use chart

Enter at ambient temperature, trace right to pressure altitude, trace down to gross weight; trace right to runway length then down to baseline.

Figure 11-40 (Sheet 2)

MAXIMUM REFUSAL SPEED EFFECTS - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
MILITARY THRUST

EXAMPLE: Primary refusal speed 111 KIAS; headwind 20 knots; runway slope 2% down; RCR reading 8; adjusted refusal speed is 110 KIAS.

how to use chart

Enter top at primary refusal speed; trace down to zero headwind line, follow guideline to effective wind condition. Trace down to zero runway slope, follow guideline to slope percent. Trace down to RCR baseline (23), follow guideline to existing RCR reading; then straight down to obtain adjusted refusal speed.

NOTE

CG location has negligible effect.

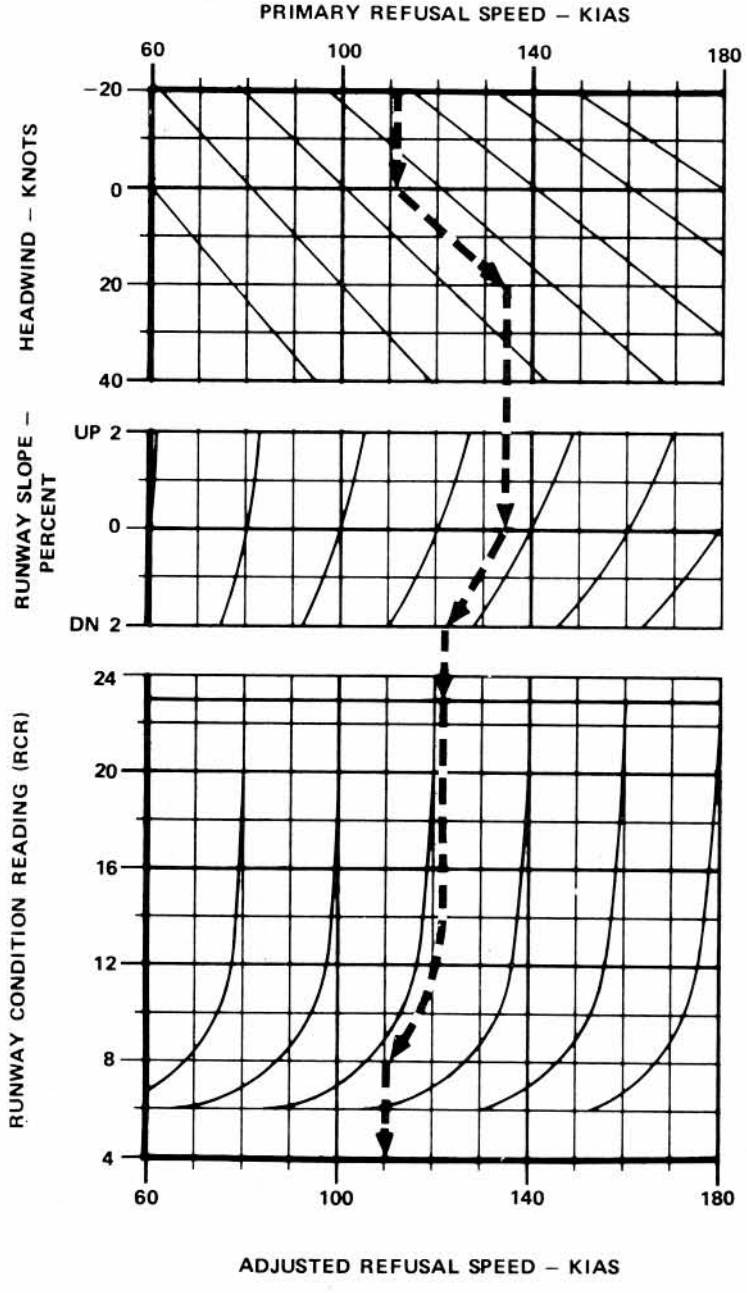


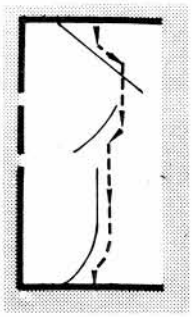
Figure 11-41 (Sheet 1)

MAXIMUM REFUSAL SPEED EFFECTS - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

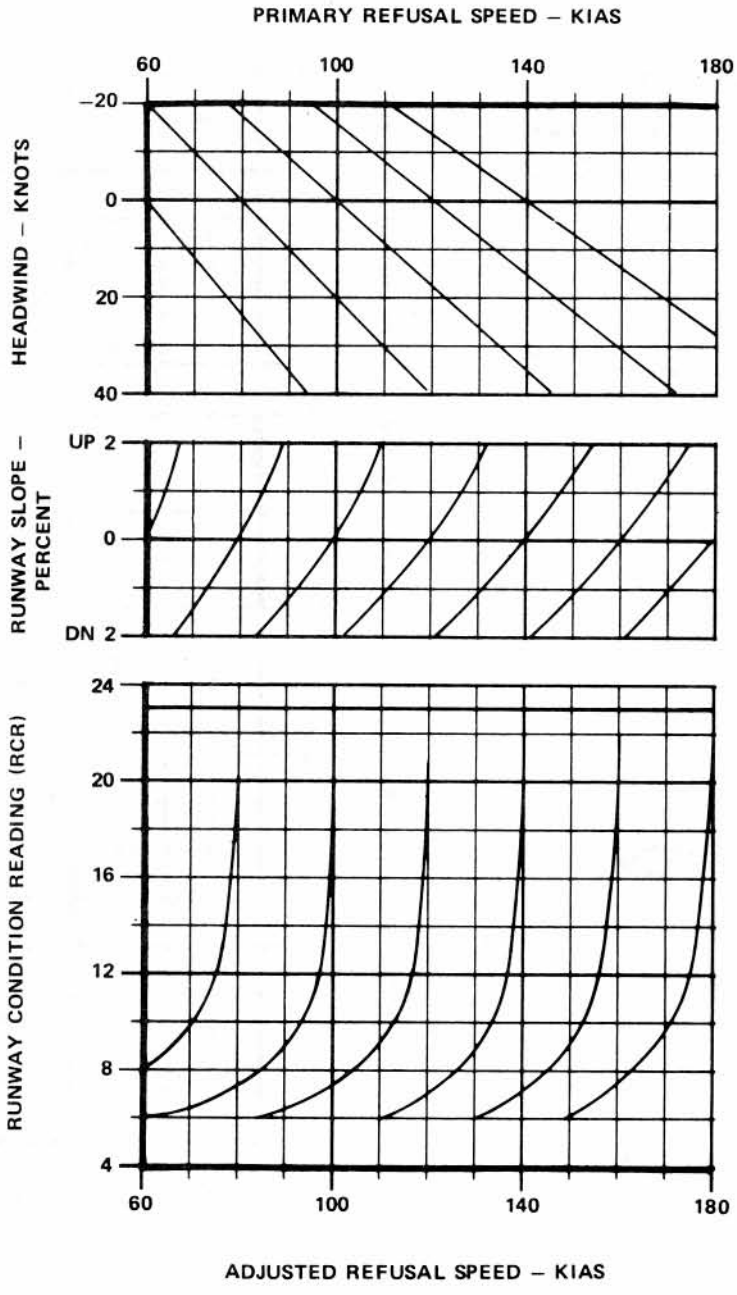
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
MAXIMUM THRUST



how to use chart

Enter top at primary refusal speed; trace down to zero headwind line; follow guideline to effective wind condition. Trace down to zero runway slope, follow guideline to slope percent. Trace down to RCR baseline (23), follow guideline to existing RCR reading; then straight down to obtain adjusted refusal speed.



NOTE

CG location has negligible effect.

Figure 11-41 (Sheet 2)

LIMIT BRAKING VELOCITY FOR REFUSAL - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

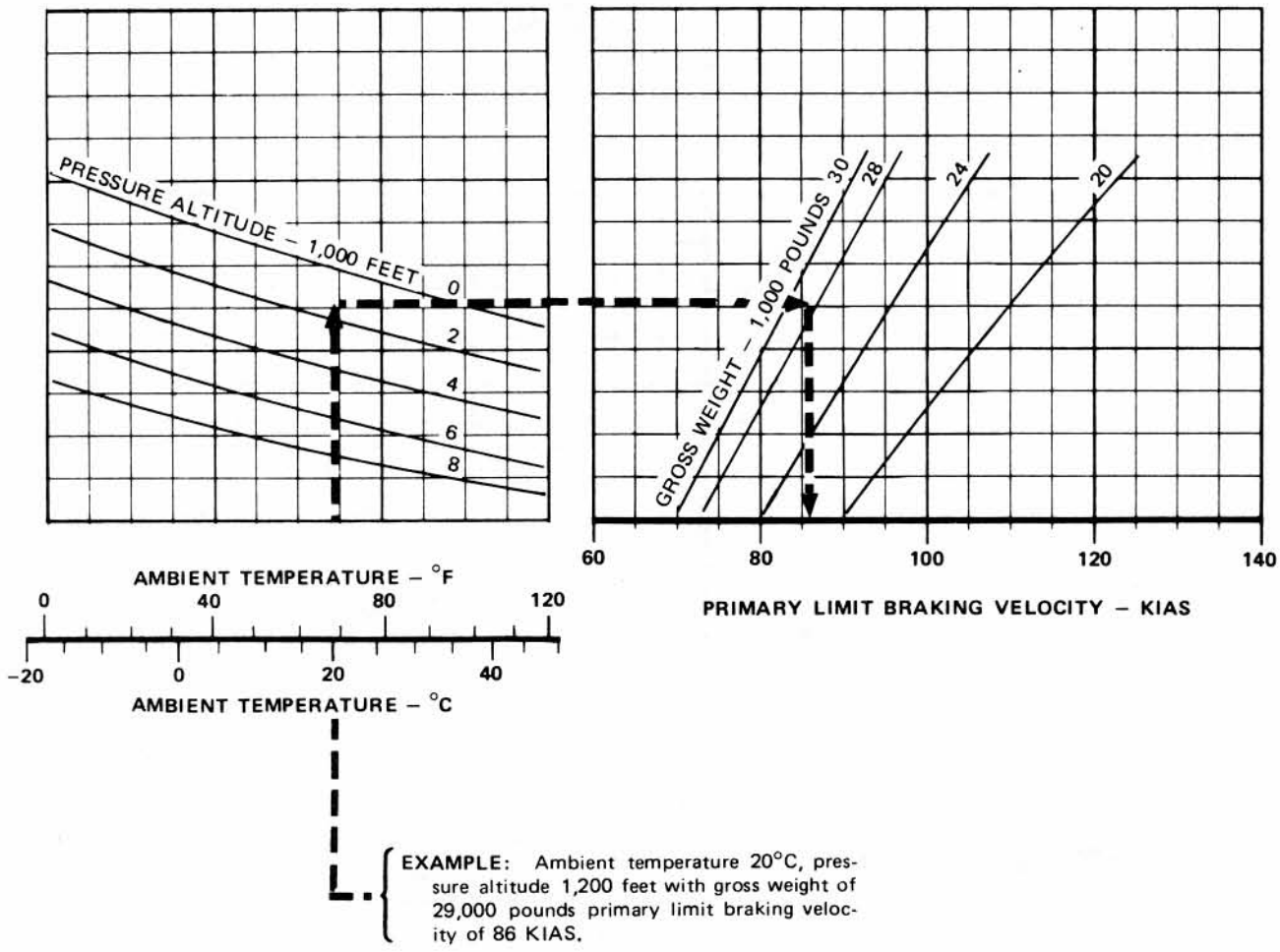
CONDITIONS:
HARD SURFACE RUNWAY
CG: 20.0% MAC
LANDING CONDITION
ZERO WIND
IDLE THRUST
ZERO RUNWAY SLOPE
23 RCR

NOTE

Decelerate to limit braking velocity before applying brakes.

how to use chart

Enter at ambient temperature, trace up to pressure altitude; trace across to gross weight then trace down to bottom for primary limit braking velocity.



EXAMPLE: Ambient temperature 20°C, pressure altitude 1,200 feet with gross weight of 29,000 pounds primary limit braking velocity of 86 KIAS.

Figure 11-42

LIMIT BRAKING VELOCITY FOR REFUSAL EFFECTS - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Primary limit braking velocity 86 KIAS; headwind of 16 knots; runway slope 1% up; runway condition reading of 16 resulting in adjusted limit braking velocity of 110 KIAS.

how to use chart

Enter top at primary limit braking velocity; trace down to zero headwind line, follow guideline to effective wind condition. Trace down to zero runway slope, follow guideline to slope percent; trace down to RCR baseline (23), follow guideline to existing RCR reading then down to bottom for adjusted limit braking velocity.

NOTE

CG location has negligible effect.

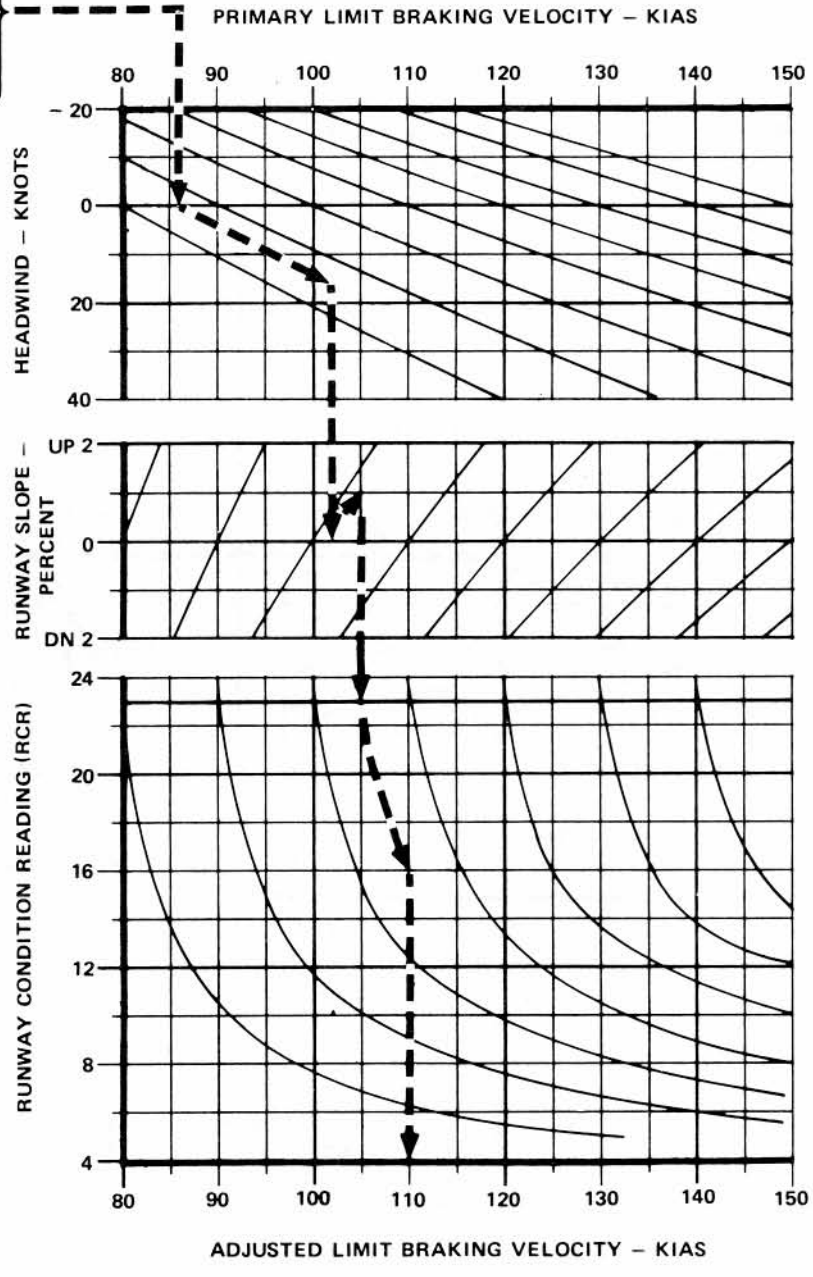


Figure 11-43

INFLIGHT CHARTS—J57-P-420

There are two types of inflight charts: those requiring the determination of a drag index number, and those not requiring a number. Charts requiring the determination of a drag index number are the climb, cruise endurance, and descent charts. Charts which do not require the determination of a drag index number are the combat allowance and range and endurance decision charts. The two types are interspersed within the inflight chart grouping.

The drag index number represents aerodynamic drag created by any aircraft configuration except the clean configuration. For the RF-8G configuration, the drag index number is always 0. The extension of the air refueling probe creates a drag index number of 40.

CLIMB SPEED SCHEDULE

The climb speed schedule chart (figure 11-44) provides military and maximum thrust climb speed in KIAS below 20,000 feet and IMN above 20,000 feet. These schedules were devised to be easy to fly and are an approximation to the speed schedule that gives maximum rate of climb at each altitude.

MILITARY AND MAXIMUM THRUST CLIMB

The military and maximum thrust charts (figures 11-45 and 11-46) each consist of a time, fuel and distance to climb chart and are based on the climb speeds of figure 11-44. The charts show the time (sheet 1), fuel (sheet 2) and distance to climb (sheet 3) for variations in gross weight and temperature.

BEST CRUISE ALTITUDE

The best cruise altitude chart is presented in the upper portion of figure 11-47. Pressure altitude for best cruise vs weight is plotted for a drag index range of 0. In order to fly the best cruise altitude path, allow the aircraft to climb in accordance with figure 11-47 as fuel is depleted.

BEST ENDURANCE ALTITUDE

The best endurance altitude chart is presented in the lower portion of figure 11-47. Pressure altitude for best endurance vs weight is plotted for a drag index range of 0. In order to fly the best endurance altitude path, allow the aircraft to climb in accordance with figure 11-47 as fuel is depleted.

COMBAT CEILING

Combat ceilings are presented in the upper portion of figure 11-48, sheet 1, for military thrust and in the upper portion of figure 11-48, sheet 2, for maximum thrust. Pressure altitude vs gross weight is plotted for a drag index range of 0.

SERVICE CEILING

Service ceilings are presented in the lower portion of figure 11-48, sheet 1, for military thrust and in the lower portion of figure 11-48, sheet 2, for maximum thrust. Pressure altitude vs gross weight is plotted for a drag index range of 0.

COMBAT ALLOWANCE DATA

The combat allowance charts (figures 11-49 and 11-50) present the fuel consumption and time for combat at various altitudes and Mach numbers for either full military thrust or maximum thrust. Generally, it is necessary to use estimates of the average Mach number and average altitude expected for a planned mission. The greatest variation in fuel consumption occurs with changes in altitudes, but a significant variation also is encountered with wide differences in speed for a given thrust setting.

CRUISE PERFORMANCE

The cruise performance is presented in four phases, figure 11-51, sheets 1 through 4. Phase I (sheet 1) is the determination of the clean aircraft transfer number and the best cruise Mach number for a known aircraft gross weight, altitude and 0 drag index. The clean aircraft transfer number may also be determined for any desired Mach number at any altitude lower than or equal to the clean aircraft best cruise altitude. The Mach number above which clean condition should be selected instead of cruise condition to obtain lowest drag performance for a given aircraft gross weight and altitude may also be obtained from phase I. Phase II (sheet 2) provides a means of determining that the power setting required for cruise at conditions other than best cruise conditions is less than military thrust. Phase III (sheet 3) yields the value of pounds of fuel per nautical mile for the cruise Mach number found or chosen in phase I and the reference number obtained in phase II. Phase IV (sheet 4) is simply a conversion from pounds of fuel per nautical mile to fuel flow for various outside air temperatures. Pounds of fuel per nautical mile and corresponding fuel flow can be determined for any possible aircraft configuration, gross weight, altitude, and air temperature.

MAXIMUM RANGE CRUISE AT CONSTANT ALTITUDE

Time and Speed

The maximum range cruise time and speed chart (figure 11-52, sheet 1) presents the variation of best cruise Mach number with gross weight for a constant cruise altitude. Groundspeed and time to travel a specified distance are presented with temperature and wind velocity as variables.

Fuel Required

The maximum range cruise at constant altitude fuel required chart (figure 11-52 , sheet 2) graphically presents the values of fuel flow for maximum range throughout the entire range of aircraft gross weight, pressure altitude, and drag index. The chart presents the amount of fuel required to fly for a known time interval under maximum range conditions or, when used in an inverse manner, presents the time in flight for a given amount of fuel.

MAXIMUM ENDURANCE

Speed

The maximum endurance speed chart (figure 11-53, sheet 1) presents the calibrated airspeed recommended for maximum endurance throughout the range of aircraft gross weight and pressure altitude for bank angles from 0 to 60 degrees.

Fuel Required

The maximum endurance fuel required chart (figure 11-53, sheet 2) presents minimum fuel flow throughout the range of aircraft gross weight and pressure altitiude for bank angles from 0 to 60 degrees, and deviations from standard day temperature up to $\pm 20^{o}C$. It also presents the amount of fuel required to fly for a known time interval under maximum endurance conditions or, when used in an inverse manner, presents the time for a given amount of fuel.

MAXIMUM RANGE DESCENT

Descent Speed

The maximum range descent speed chart (figure 11-54, sheet 1) is a plot of calibrated airspeed vs gross weight.

Time, Fuel, and Distance to Descend

The time, fuel and distance to descend charts (figure 11-54, sheets 2, 3 and 4) are presented for a drag index range of 0. These charts are based on the descent speed shown in sheet 1.

CLIMB SPEED SCHEDULE - J57-P-420

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

NOTE

Climb speed based on cruise droop extended or retracted as required to provide best rate of climb, See Part 3, Section 3.

MAXIMUM THRUST

DRAG INDEX	KIAS, Below 20,000 Feet	IMN, Above 20,000 Feet
0	514	0.93
Increase KIAS by 1.0 Knot for each degree C above Standard (15° C). Decrease KIAS by 1.0 Knot for each degree C below Standard (15° C).		

MILITARY THRUST

DRAG INDEX	KIAS, Below 20,000 Feet	IMN, Above 20,000 Feet
0	403	0.87
Increase KIAS by 0.7 Knot for each degree C above Standard (15° C). Decrease KIAS by 0.7 Knot for each degree C below Standard (15° C).		

Figure 11-44

MILITARY THRUST CLIMB - J57-P-420

TIME REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds; pressure altitude 35,000 feet, drag index 0; temperature deviation from standard day −10°C; Time to Climb is 5.4 minutes.

how to use chart

Enter at initial gross weight; trace right to pressure altitude; then down to drag index line; trace left to temperature baseline; follow guideline to temperature deviation; trace left to find Time to Climb.

NOTE

For time from release of brakes in field takeoff add 2.0 minutes.

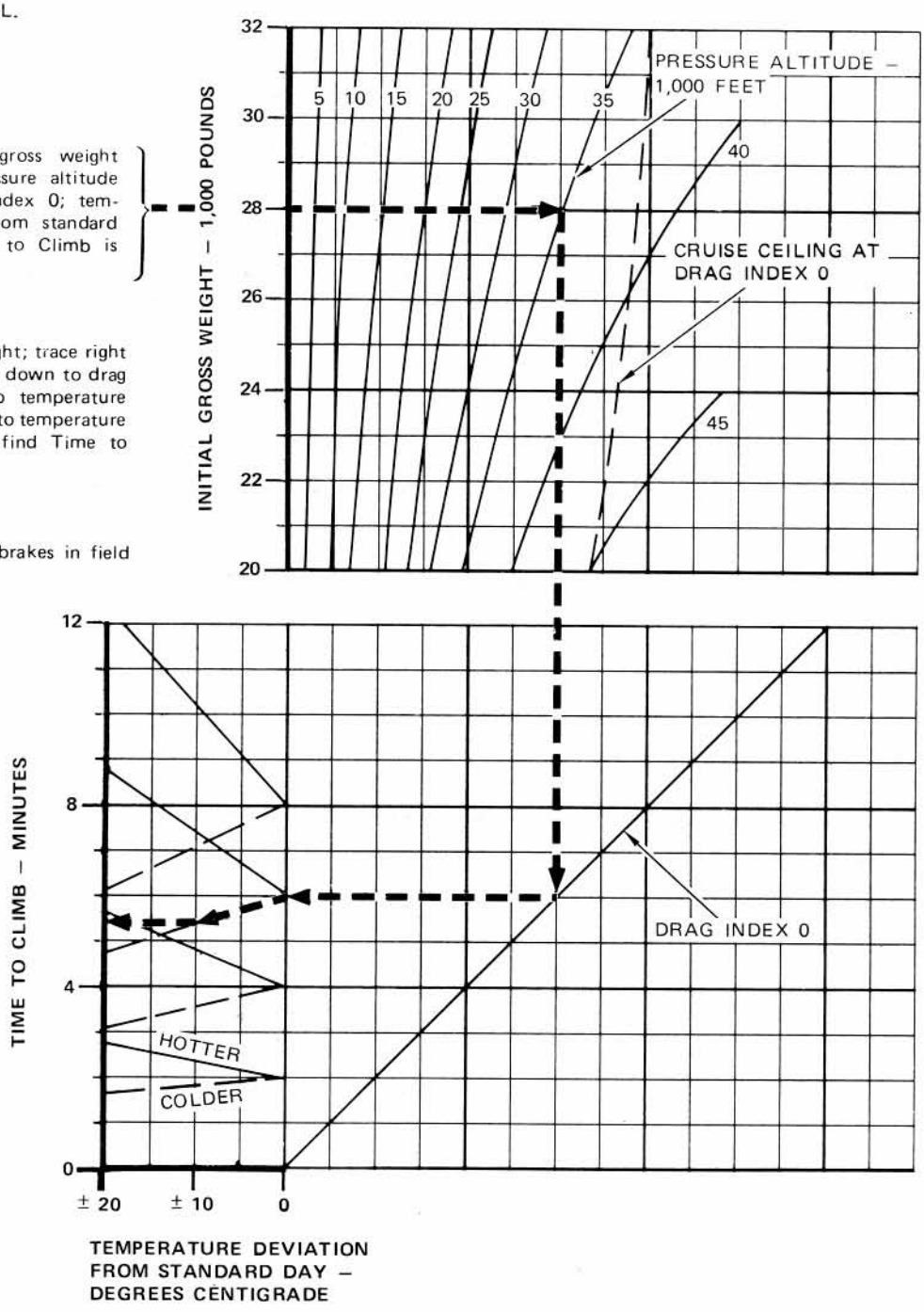


Figure 11-45 (Sheet 1)

MILITARY THRUST CLIMB – J57-P-420

FUEL REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF–8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds; pressure altitude 35,000 feet; drag index 0; temperature deviation from standard day –10°C; fuel required for climb 710 pounds.

how to use chart

Enter at initial gross weight, trace right to pressure altitude; trace down to drag index line; trace left to temperature baseline then follow guideline to temperature deviation; trace left to find fuel required to climb.

NOTE

Add 300 lb from release of brakes for field takeoff.

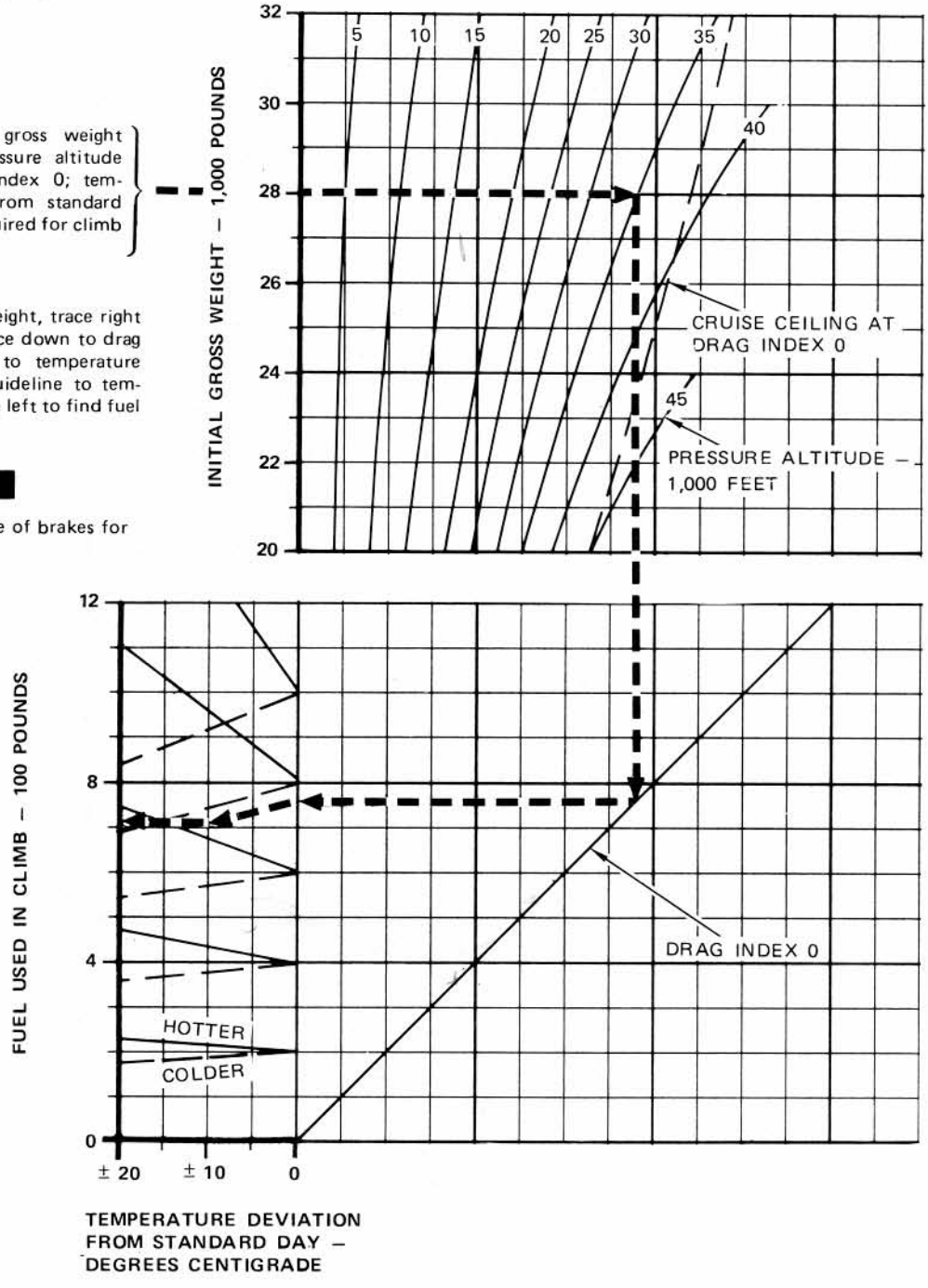


Figure 11-45 (Sheet 2)

MILITARY THRUST CLIMB - J57-P-420

DISTANCE REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds; pressure altitude 35,000 feet; drag index 0; temperature deviation from standard day −10°C. Distance in climb is 42 nm.

how to use chart

Enter at initial gross weight; trace right to pressure altitude; trace down to drag index line; trace left to temperature baseline; follow guideline to temperature deviation; trace left for distance required for climb.

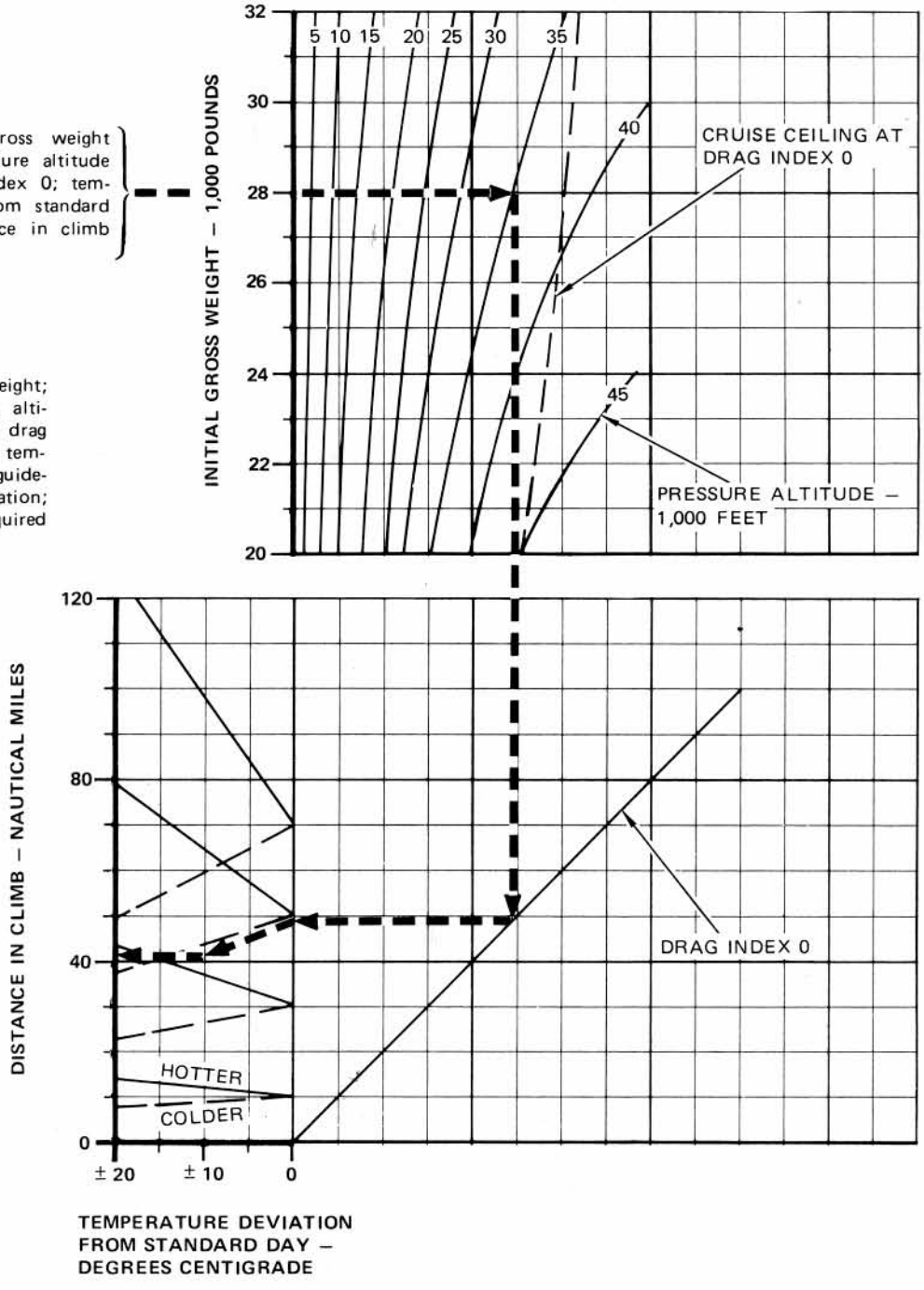


Figure 11-45 (Sheet 3)

MAXIMUM THRUST CLIMB – J57-P-420

TIME REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds, pressure altitude of 35,000 feet, drag index 0, temperature deviation from standard day –10°C. Time to Climb is 1.6 minutes.

how to use chart

Enter at initial gross weight; trace right to pressure altitude; then down to drag index line; trace left to temperature baseline. Follow guideline to temperature deviation, then trace left to find time to climb.

NOTE

For time from release of brakes in field takeoff add 1.0 minute.

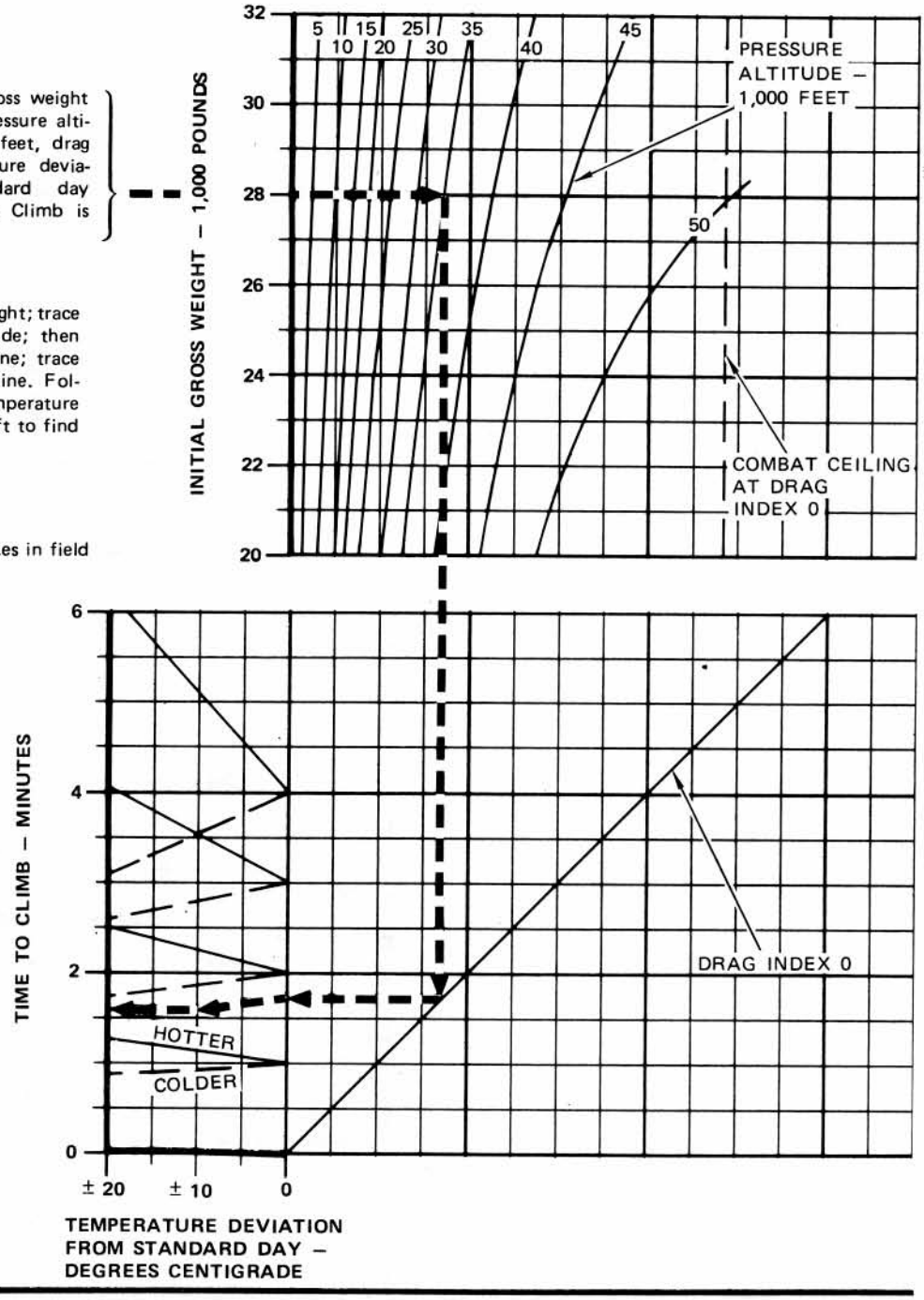


Figure 11-46 (Sheet 1)

MAXIMUM THRUST CLIMB – J57-P-420

FUEL REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds, pressure altitude of 35,000 feet, drag index 0; temperature deviation from standard day –10°C. Fuel required for climb 900 pounds.

how to use chart

Enter at initial gross weight; trace right to pressure altitude; then down to drag index line; trace left to temperature baseline. Follow guideline to temperature deviation, then trace left to find fuel required to climb.

NOTE

Add 500 lb fuel from release of brakes for field takeoff.

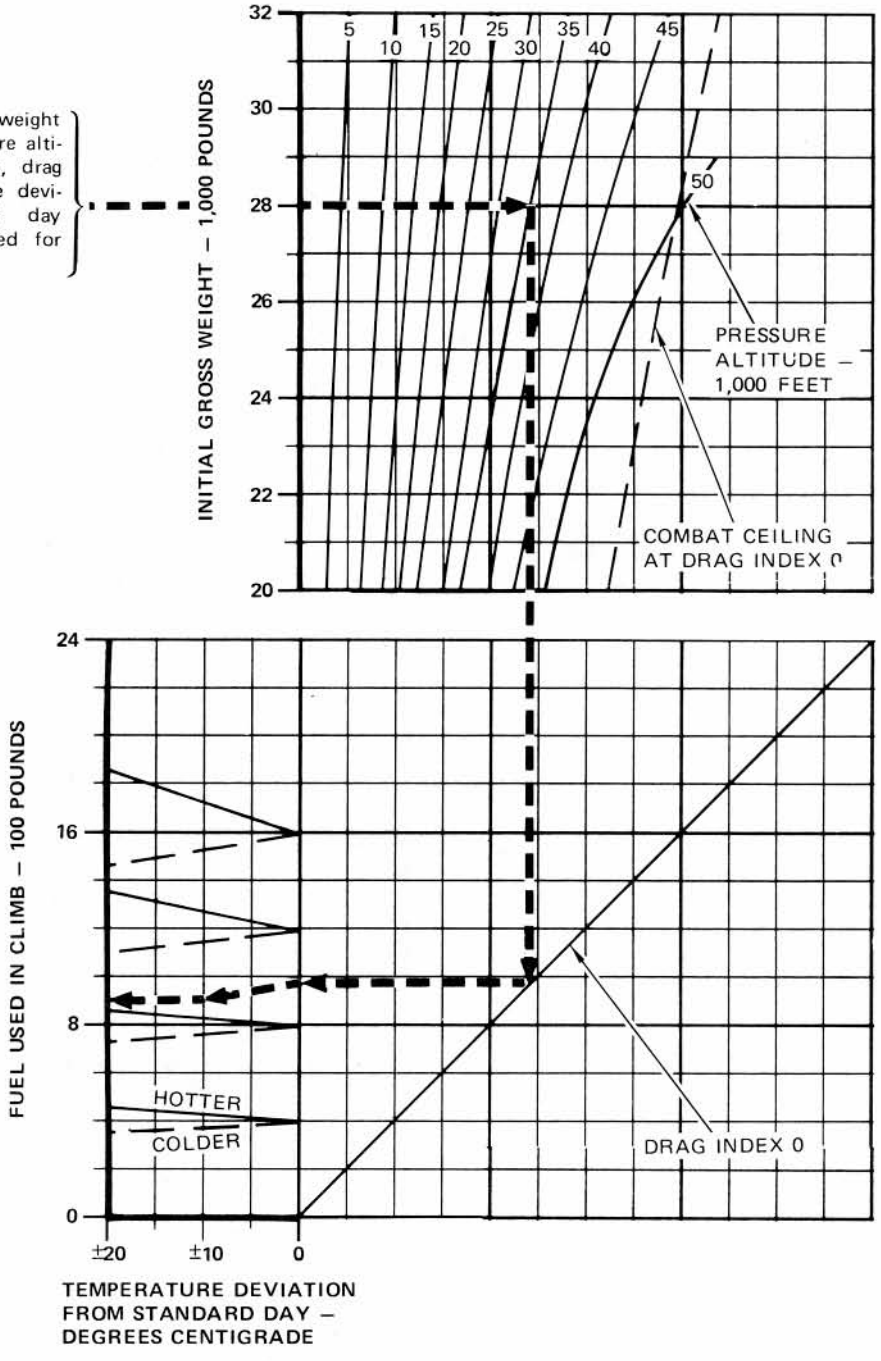


Figure 11-46 (Sheet 2)

MAXIMUM THRUST CLIMB – J57-P-420

DISTANCE REQUIRED TO CLIMB FROM SEA LEVEL TO SELECTED ALTITUDE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Initial gross weight 28,000 pounds, pressure altitude 35,000 feet, drag index 0, temperature deviation from standard day –10°C. Distance in climb is 12 nm.

how to use chart

Enter at initial gross weight; trace right to pressure altitude; then down to drag index line; trace left to temperature baseline. Follow guideline to temperature deviation, then trace left to find distance required for climb.

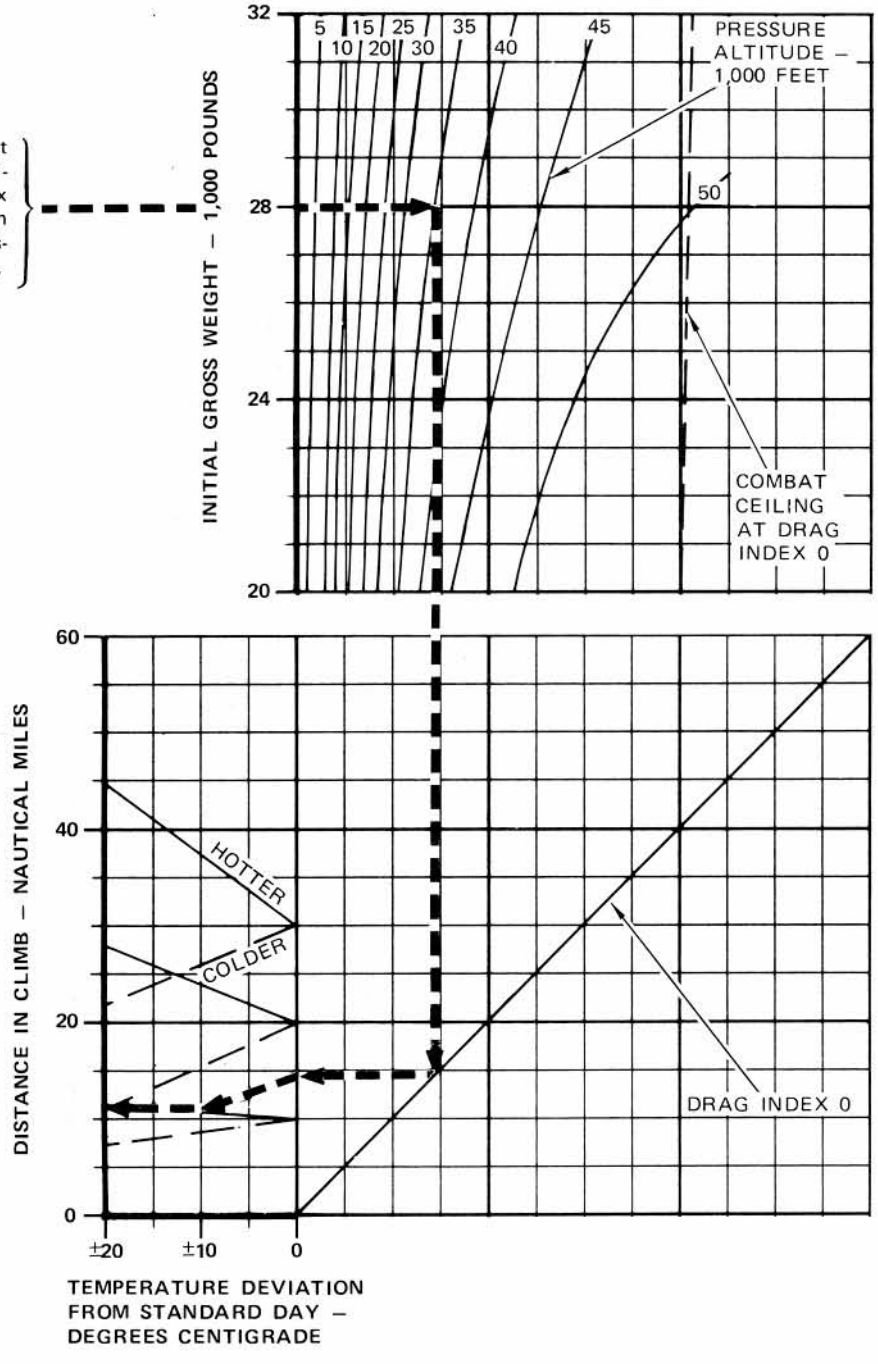


Figure 11-46 (Sheet 3)

BEST CRUISE ALTITUDE AND BEST ENDURANCE ALTITUDE – J57-P-420

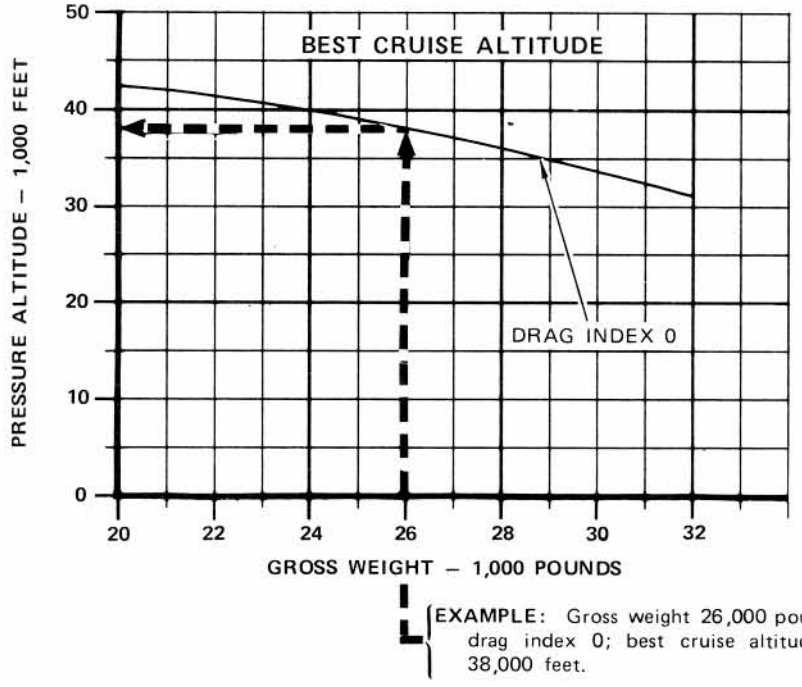
MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

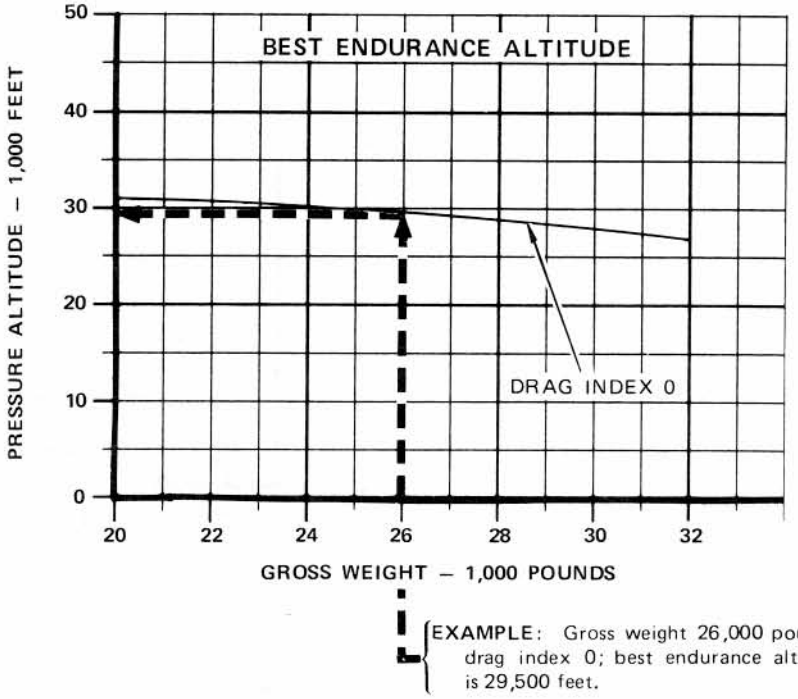
CONDITIONS:
STANDARD DAY
CRUISE CONDITION

how to use chart

Enter at aircraft gross weight; trace vertically upward to drag index line; proceed horizontally to left side for cruise / endurance altitude.



EXAMPLE: Gross weight 26,000 pounds; drag index 0; best cruise altitude is 38,000 feet.



EXAMPLE: Gross weight 26,000 pounds; drag index 0; best endurance altitude is 29,500 feet.

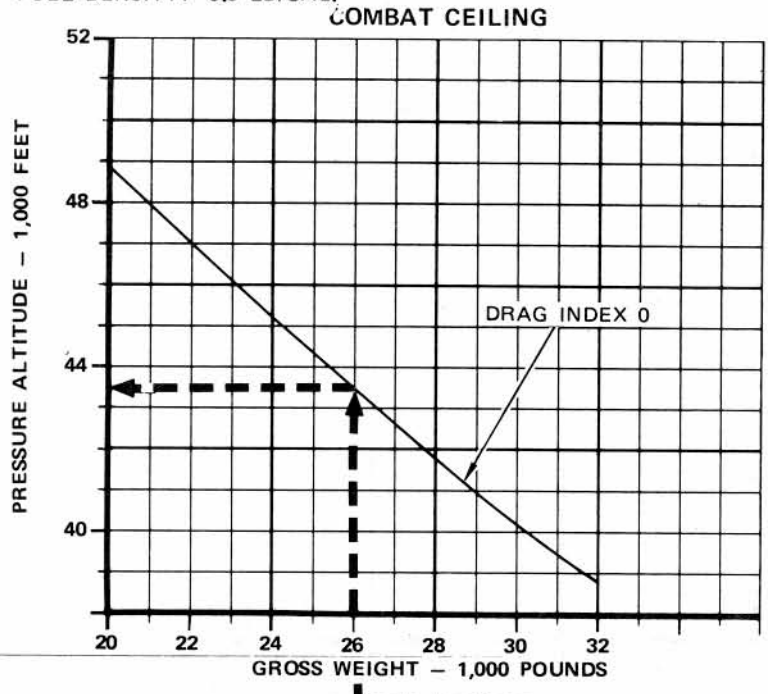
Figure 11-47

COMBAT AND SERVICE CEILING – J57-P-420

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
MILITARY THRUST
CRUISE CONDITION



how to use chart

Enter appropriate chart at gross weight. Trace up to drag index line; trace left to pressure altitude to find combat/service ceiling.

EXAMPLE: Gross weight 26,000 pounds; drag index 0; combat ceiling is 43,500 feet. (Use same procedure to find service ceiling.)

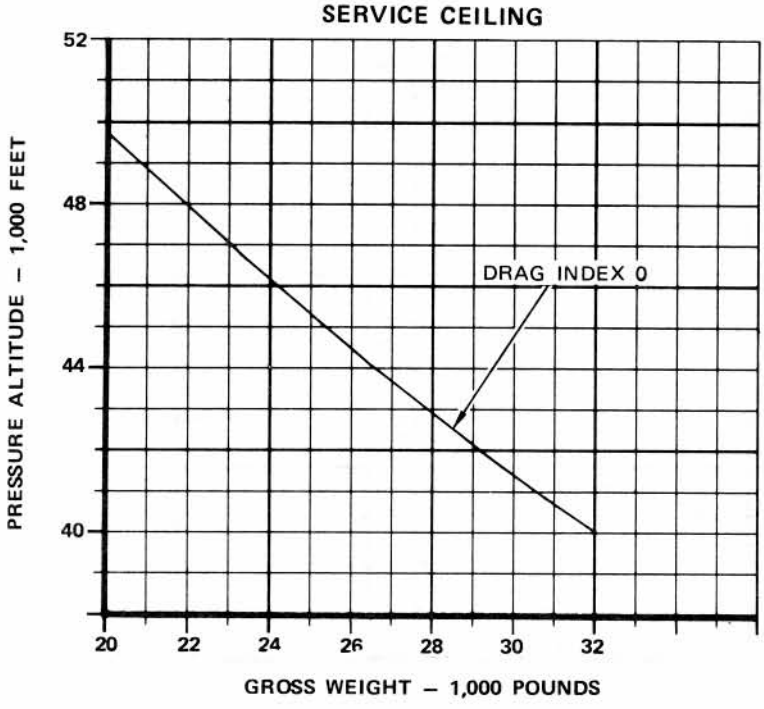


Figure 11-48 (Sheet 1)

COMBAT AND SERVICE CEILING – J57-P-420

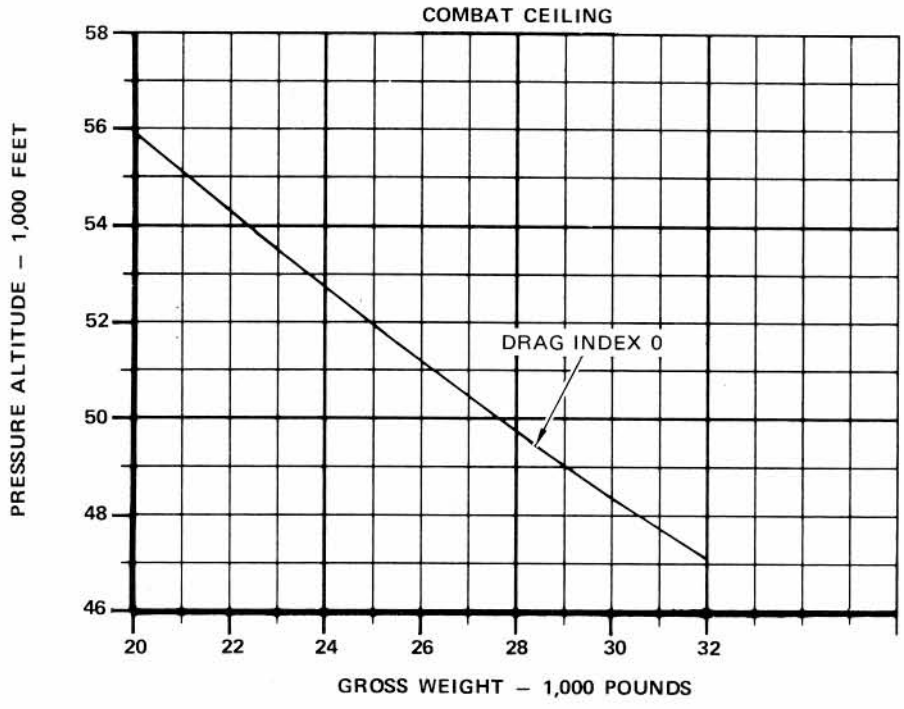
MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
MAXIMUM THRUST
CRUISE CONDITION

how to use chart

Enter appropriate chart at gross weight. Trace up to drag index line, then trace left to pressure altitude to find combat ceiling or service ceiling.



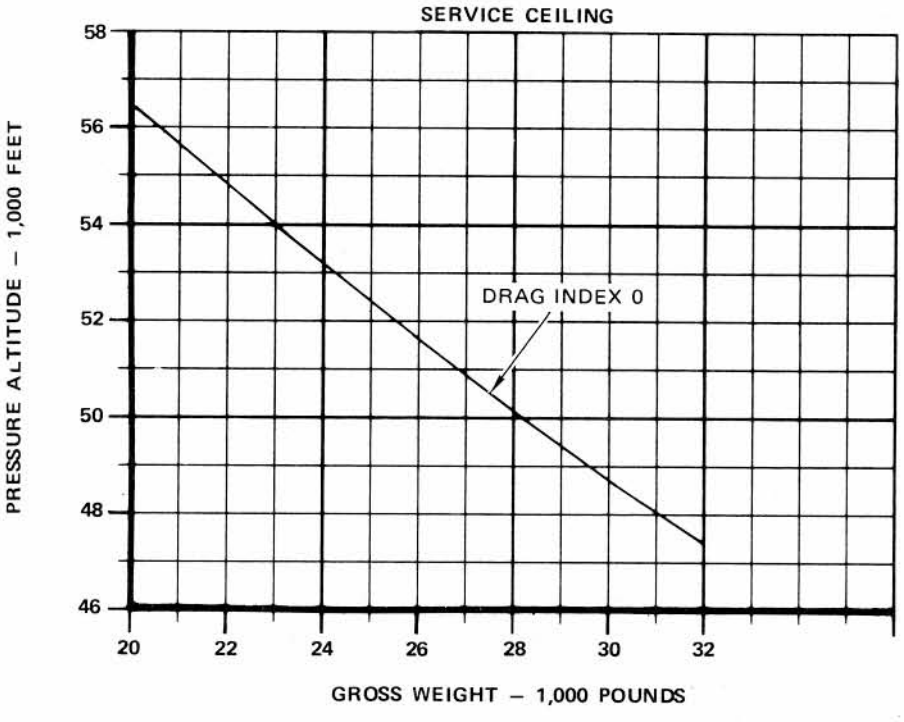


Figure 11-48 (Sheet 2)

COMBAT ALLOWANCE, MILITARY TRUST - J57-P-420

ALL CONFIGURATIONS

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

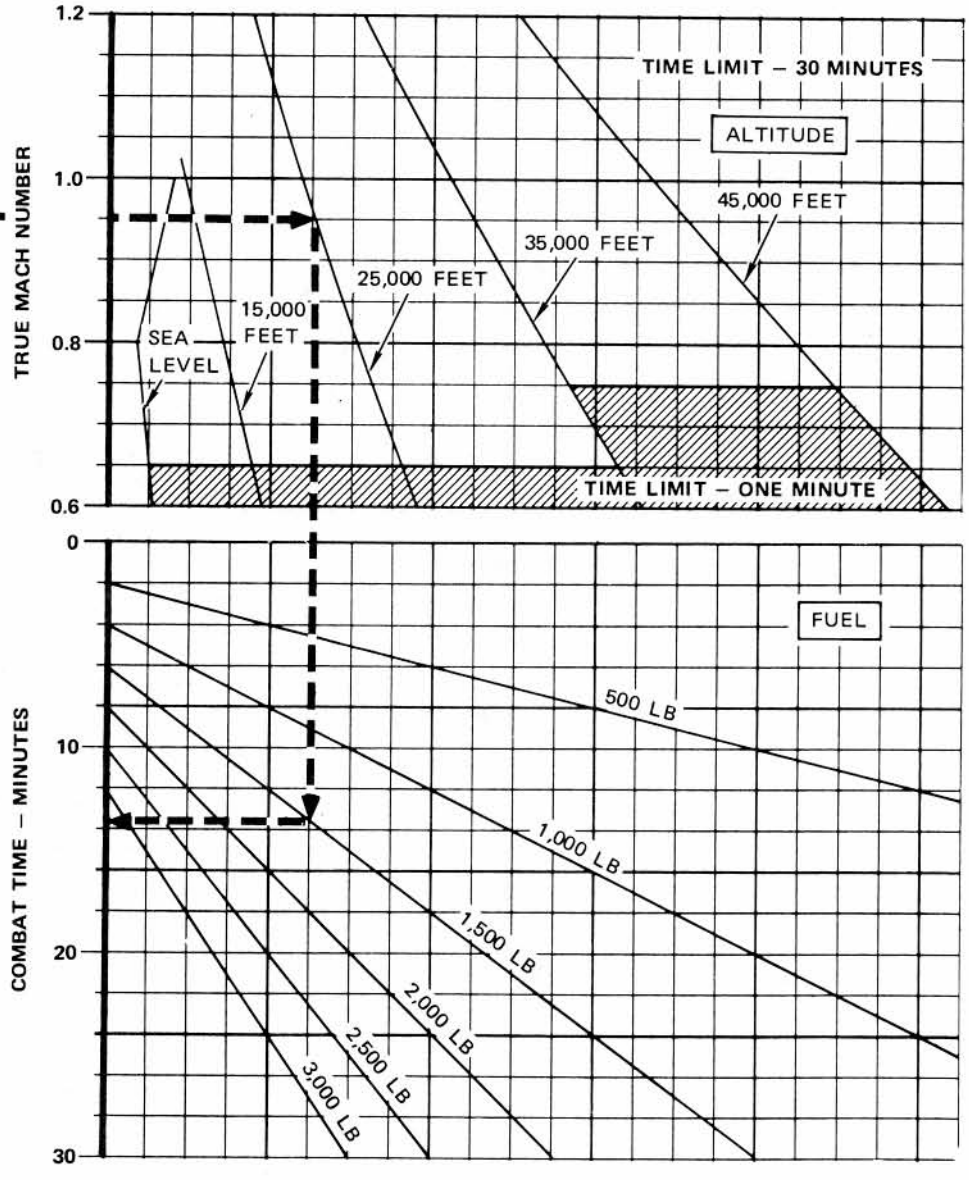
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY

how to use chart

Enter at true Mach number, trace right to altitude; then vertically downward to fuel available for combat; trace left to determine combat time in minutes.

EXAMPLE: True Mach number 0.95, altitude 25,000 feet with 1,500 pounds fuel for combat. Combat time is 13.7 minutes.



NOTE

Refer to Section I Part 4 for engine exhaust temperature limits.

Figure 11-49

COMBAT ALLOWANCE, MAXIMUM THRUST – J57-P-420

ALL CONFIGURATIONS

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

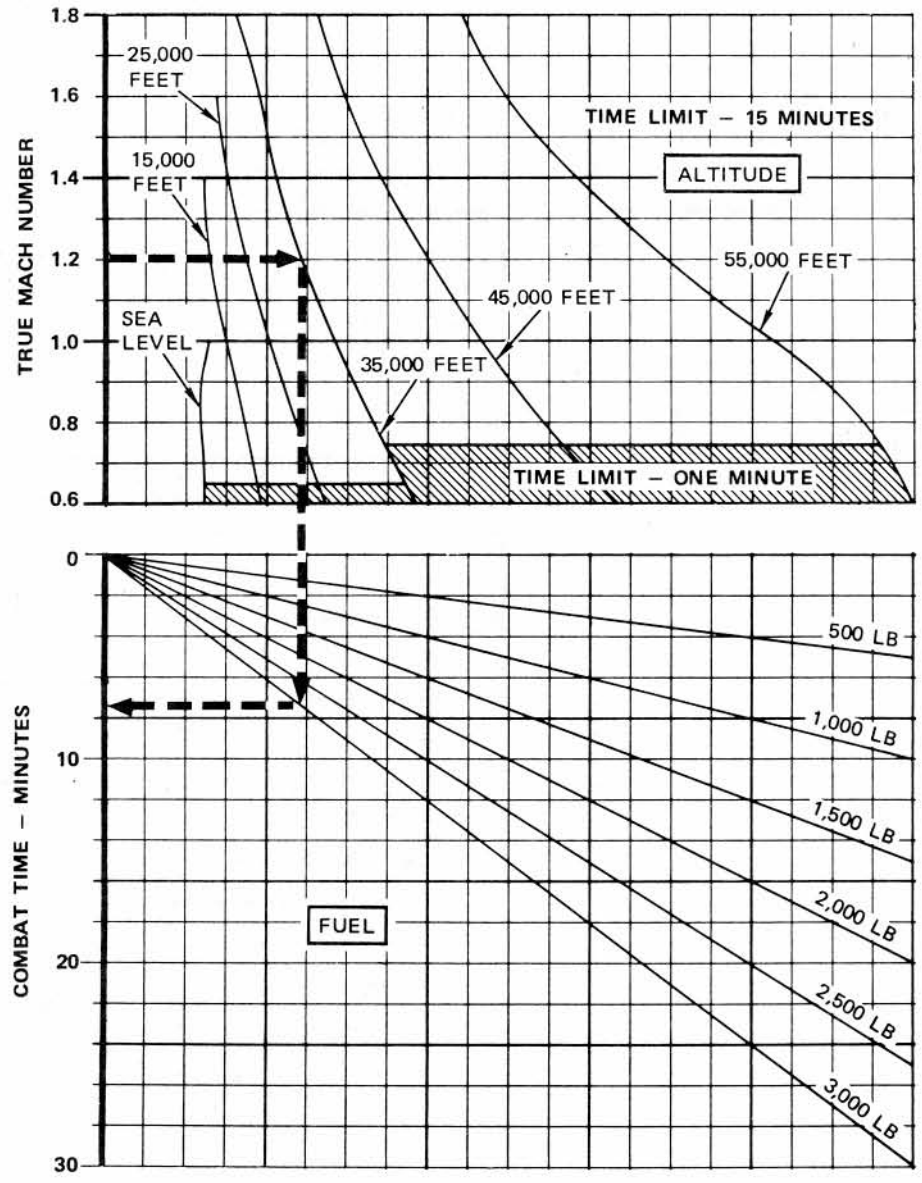
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY

how to use chart

Enter at true Mach number; trace right to altitude; then vertically downward to fuel available; trace left to determine combat time in minutes.

EXAMPLE: True Mach number 1.20 altitude 35,000 feet with 3,000 pounds fuel for combat. Combat time is 7.5 minutes.



NOTE

Refer to Section I Part 4 for engine exhaust temperature limits.

Figure 11-50

CRUISE PERFORMANCE - J57-P-420

PHASE I – CLEAN AIRCRAFT TRANSFER SCALE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

how to use chart

Phase I – Enter left side of chart at gross weight. Trace right to desired altitude. If cruise is to be at optimum altitude, proceed instead to the drag index (broken line). Trace up to zero drag index. Note true mach number at chart entry. If it is desired to fly at a predetermined Mach number, then follow guidelines from the zero drag index line to a vertical line projected up from desired Mach number. Trace left to obtain transfer scale.

EXAMPLE: Gross weight 26,000 lb, desired pressure altitude 30,000 ft, drag index 0, the recommended Mach number is 0.787 and clean transfer scale is 7.6.

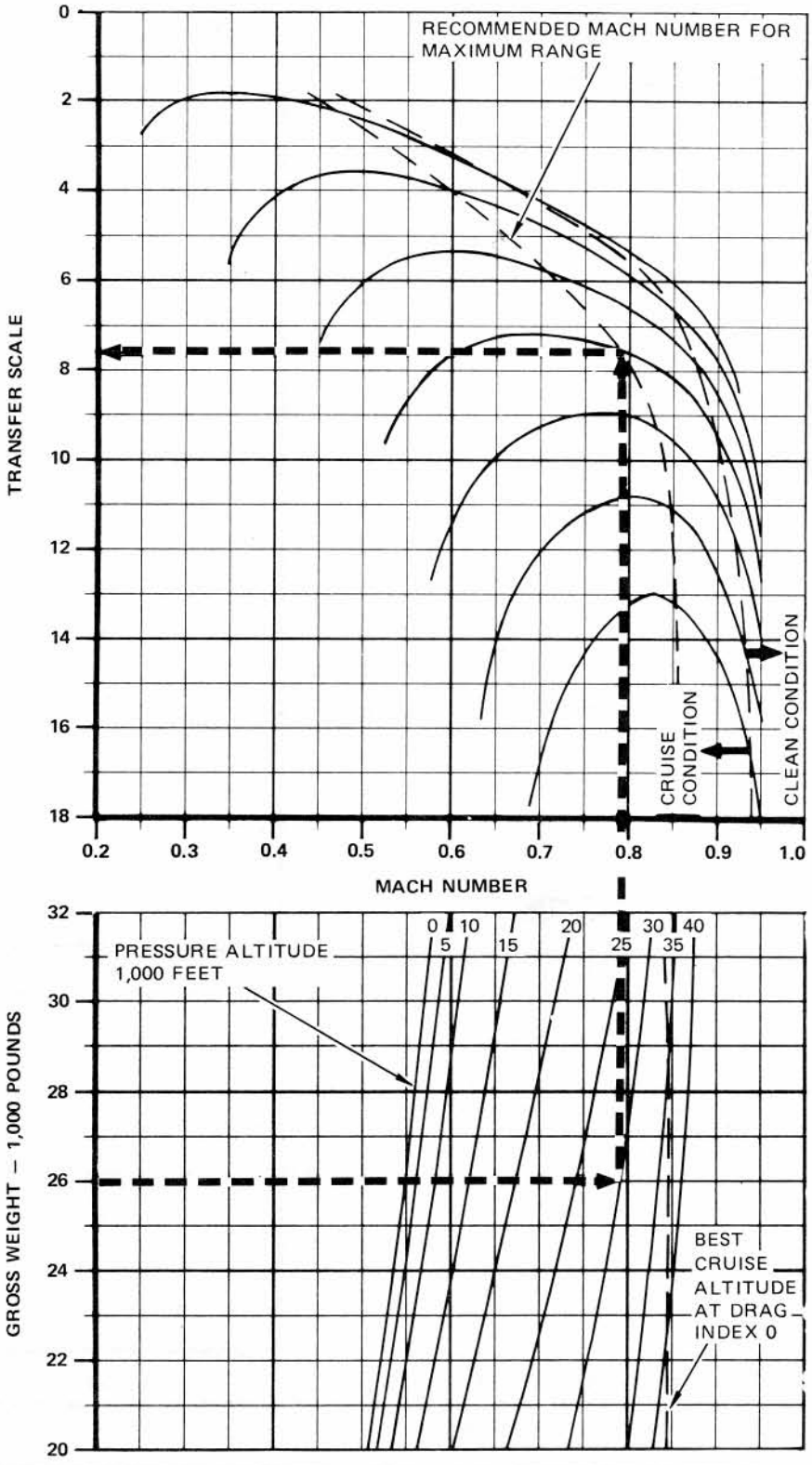


Figure 11-51 (Sheet 1)

CRUISE PERFORMANCE - J57-P-420

PHASE II – MILITARY THRUST REFERENCE NUMBER

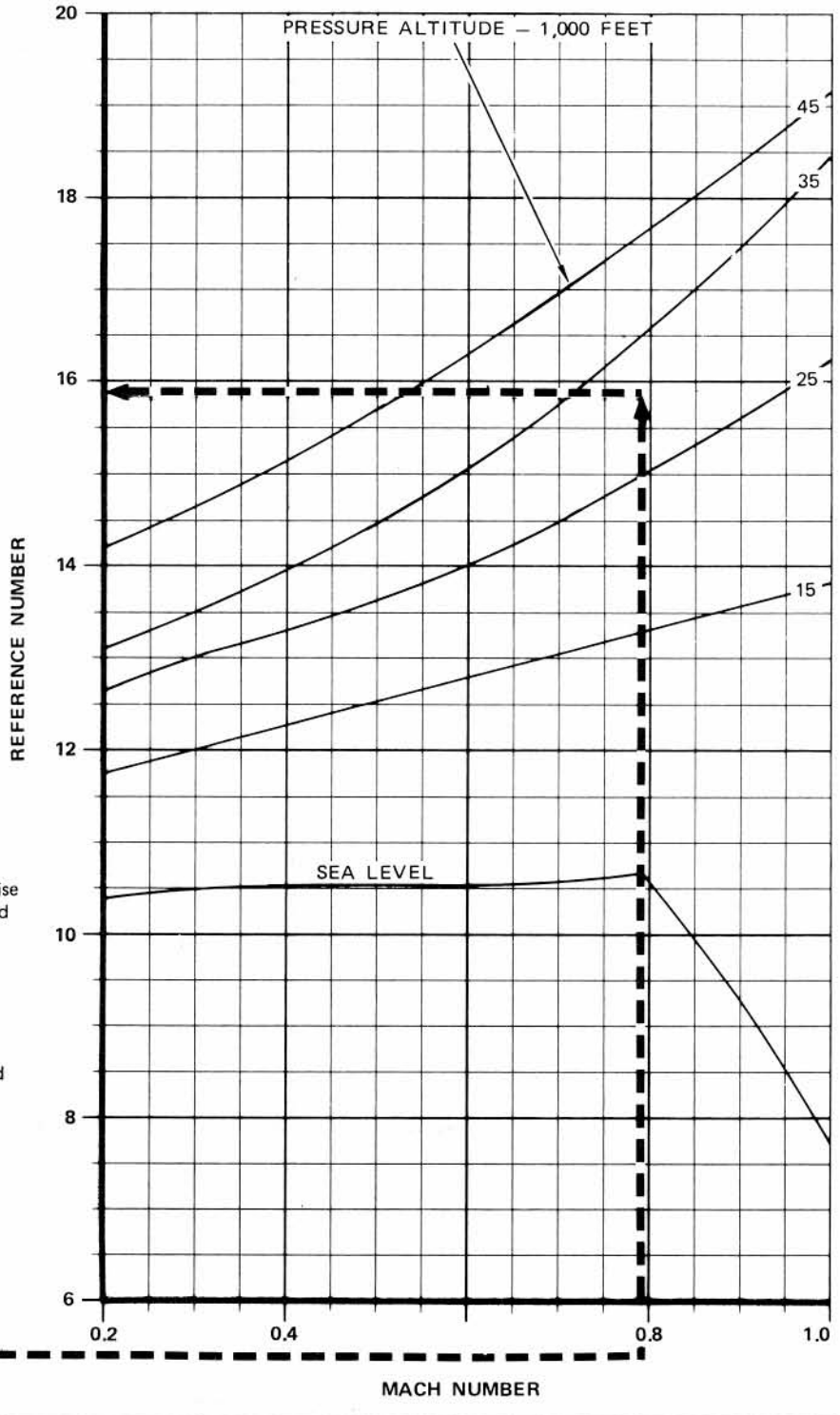
MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARY DAY

how to use chart

Enter at Mach number derived from Phase I, trace vertically upward to the cruise altitude. Trace to left edge to obtain the military thrust reference number.



NOTE

1. This chart need not be used when cruise is at other than best cruise altitude and speed.
2. If the military thrust reference number is smaller than transfer scale number from phase I, a power setting greater than military thrust is required, a different cruise altitude or speed should be selected by repeating phase I.

EXAMPLE: Recommended Mach number 0.79, desired altitude 30,000 feet, the military thrust reference number is 15.8.

Figure 11-51 (Sheet 2)

CRUISE PERFORMANCE - J57-P-420

PHASE III – POUNDS OF FUEL PER NAUTICAL MILE

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

how to use chart

Enter chart at the cruise Mach number and trace right to the aircraft transfer scale from Phase I. Then proceed vertically to intercept altitude line then to left edge to read pounds of fuel per nautical mile.

EXAMPLE: Recommended Mach number 0.79, transfer scale number 7.6, altitude 30,000 feet, the pounds of fuel per nautical miles is 6.0.

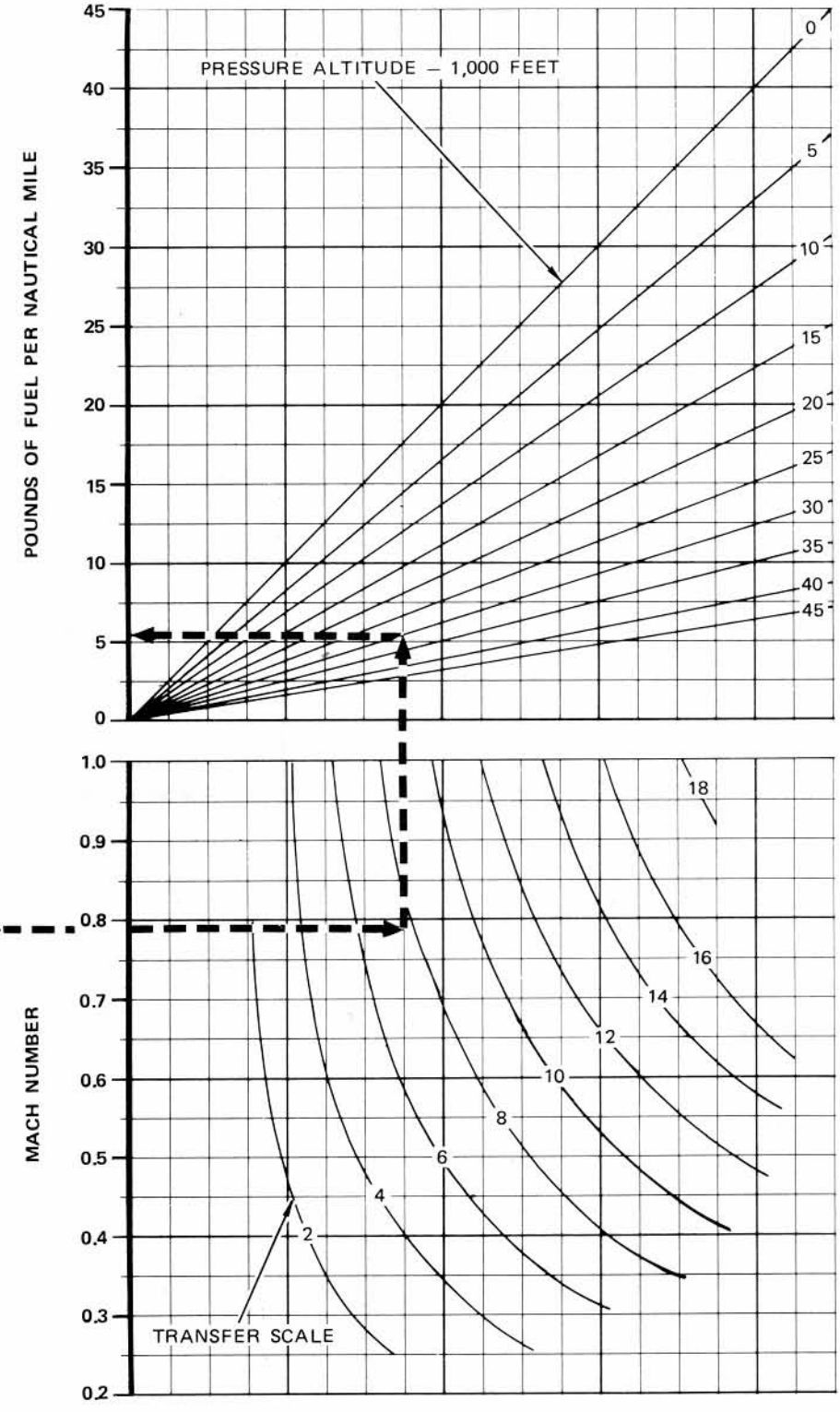


Figure 11-51 (Sheet 3)

CRUISE PERFORMANCE - J57-P-420

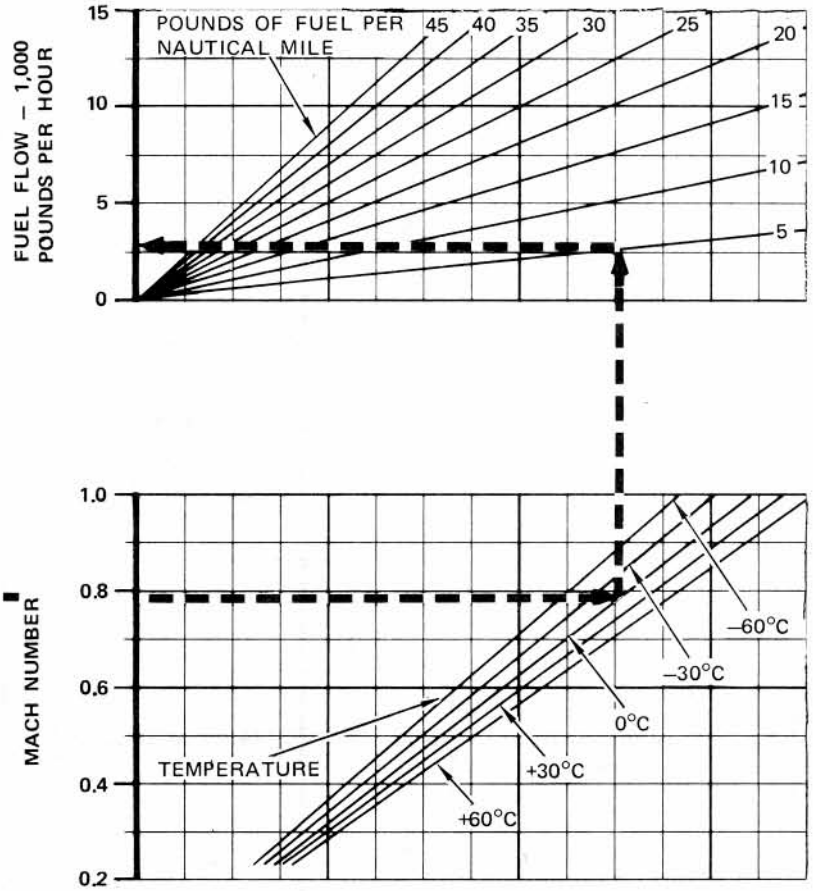
PHASE IV – FUEL FLOW

MODEL: RF-8G
DATE BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

how to use chart

Enter at Mach number and trace right to temperature line. Proceed vertically to the value of pound per nautical mile from Phase III. Then to left edge to obtain fuel flow.



EXAMPLE: Mach number 0.79, outside air temperature –5°C, pounds of fuel per nautical mile 5.6, fuel flow is 2,800 lb/hr.

Figure 11-51 (Sheet 4)

MAXIMUM RANGE CRUISE AT CONSTANT ALTITUDE – J57-P-420

TIME AND SPEED

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
CRUISE CONDITION

how to use chart

Enter with average gross weight. Trace right to pressure altitude, trace down to drag index, trace right to temperature baseline, follow guideline to outside air temperature. Trace right to zero wind then to bottom baseline to obtain true airspeed. Trace either right or left to existing wind condition. Trace upward to distance guideline (Note ground speed). Trace left to find time to travel a specific distance.

EXAMPLE: Average gross weight 28,000 pounds; pressure altitude 30,000 feet; drag index 0; outside air temperature –0° C; 50 knot tailwind. True airspeed is 520 knots; ground speed is 570 knots; time to travel 400 nautical miles is 42 minutes.

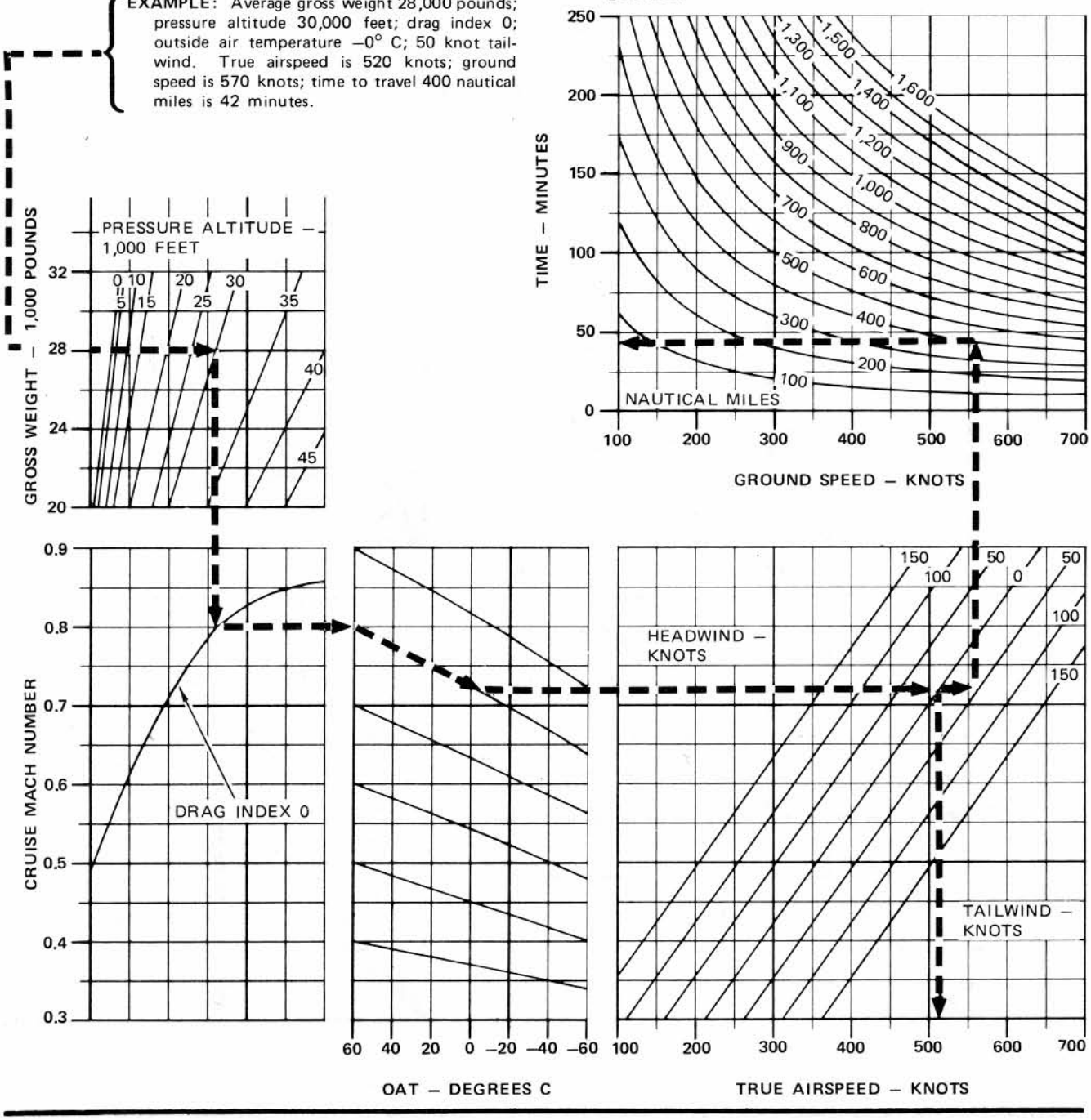


Figure 11-52 (Sheet 1)

MAXIMUM RANGE CRUISE AT CONSTANT ALTITUDE – J57-P-420

FUEL REQUIRED

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
CRUISE CONDITION

EXAMPLE: Average gross weight 28,000 pounds; pressure altitude 35,000 feet; drag index 0; maximum true airspeed 520 knots; time to travel 40 minutes. Pounds of fuel per nautical mile is 5.6. Fuel flow 2,900 pounds per hour. Fuel required is 2,000 pounds.

how to use chart

Enter with average gross weight. Trace right to pressure altitude, trace down to drag index, trace left to find pounds of fuel per nautical mile. Trace right to maximum range true airspeed, trace down to find fuel flow in pounds per hour. Trace up to time to travel, trace left to find pounds of fuel required.

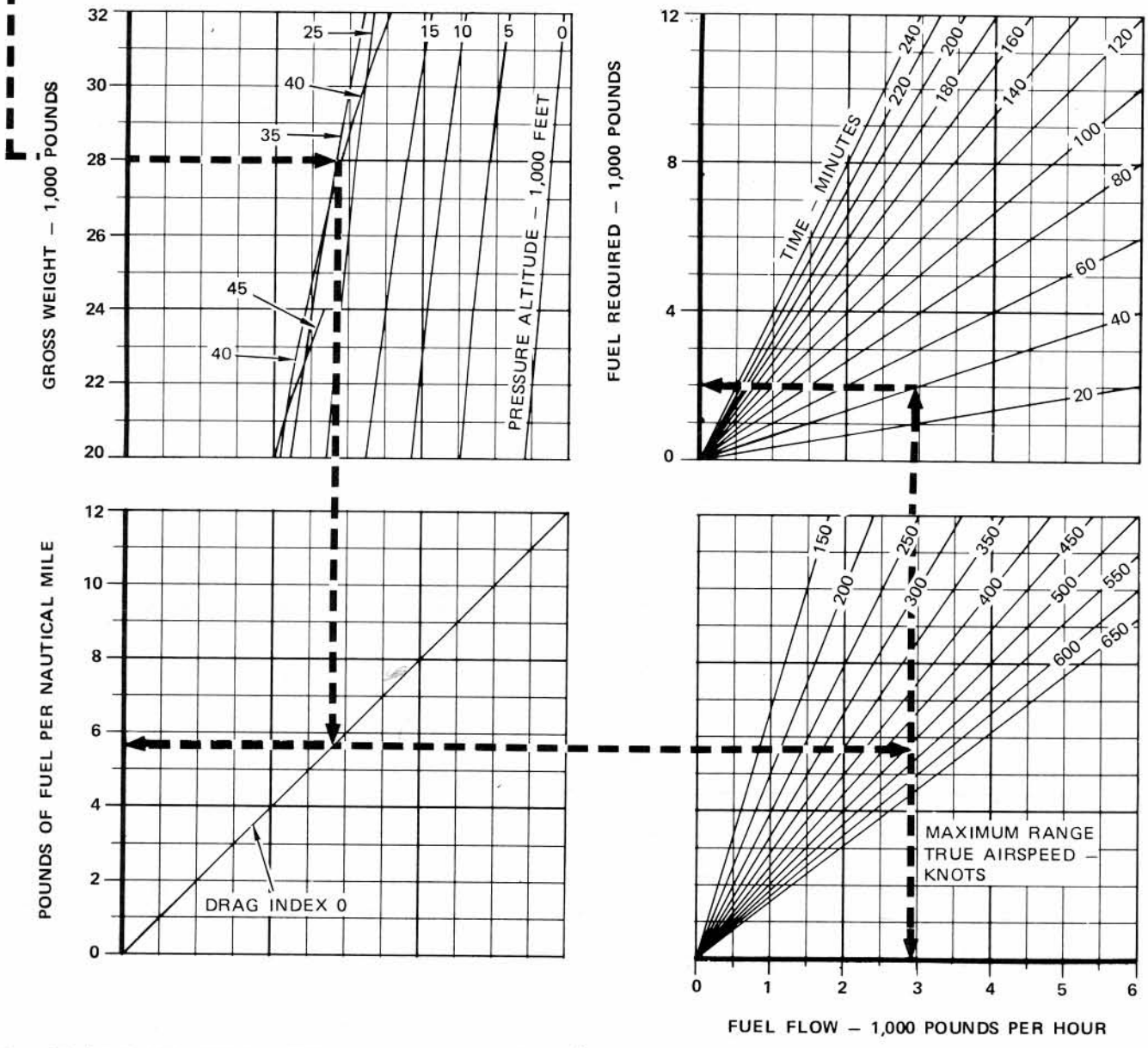


Figure 11-52 (Sheet 2)

MAXIMUM ENDURANCE - J57-P-420

SPEED

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
CRUISE CONDITION

how to use chart

Enter with average gross weight. Follow guidelines to desired bank angle; trace left to best endurance altitude. Trace down to drag index then right to pressure altitude for best endurance; trace down for airspeed.

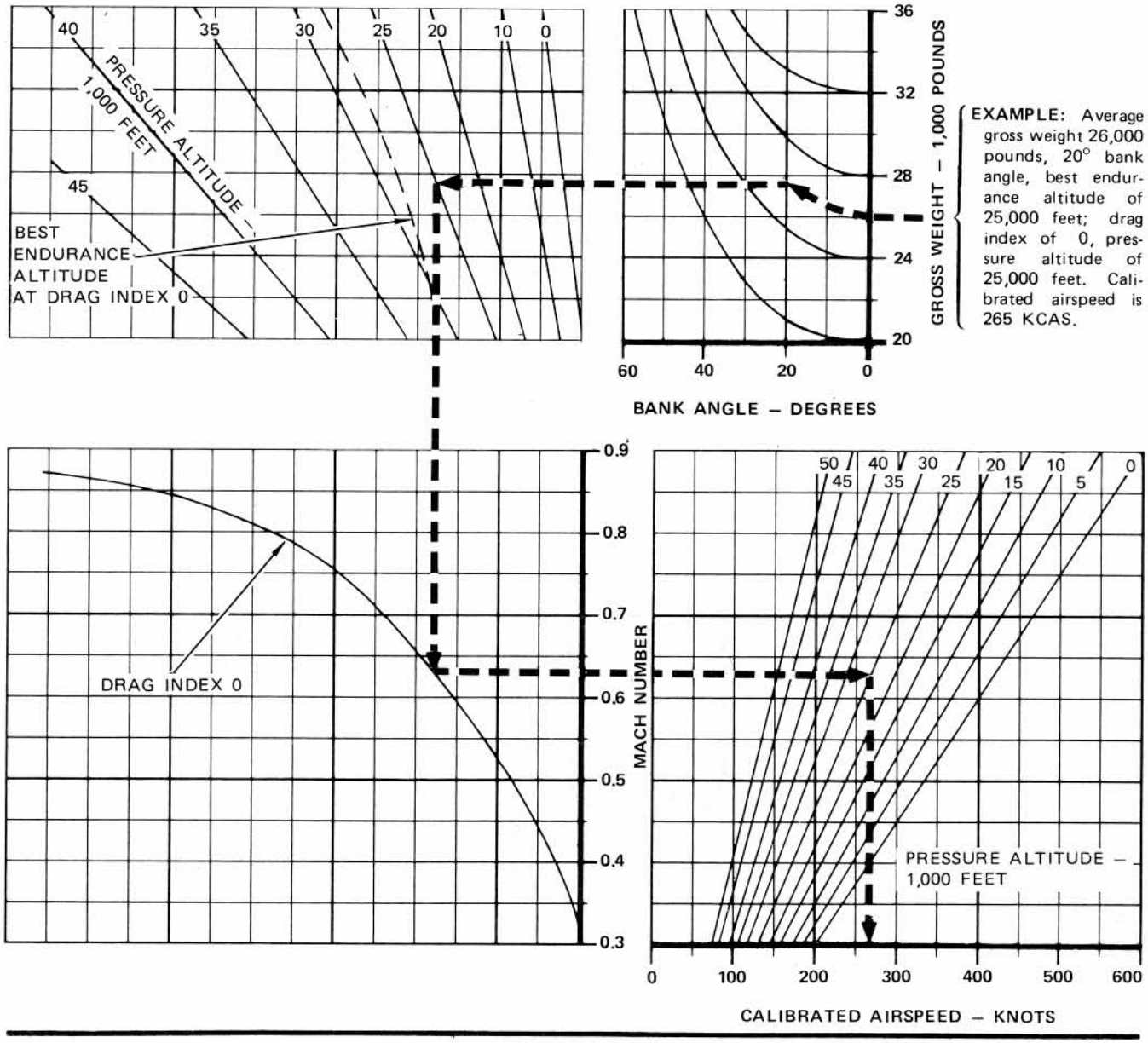


Figure 11-53 (Sheet 1)

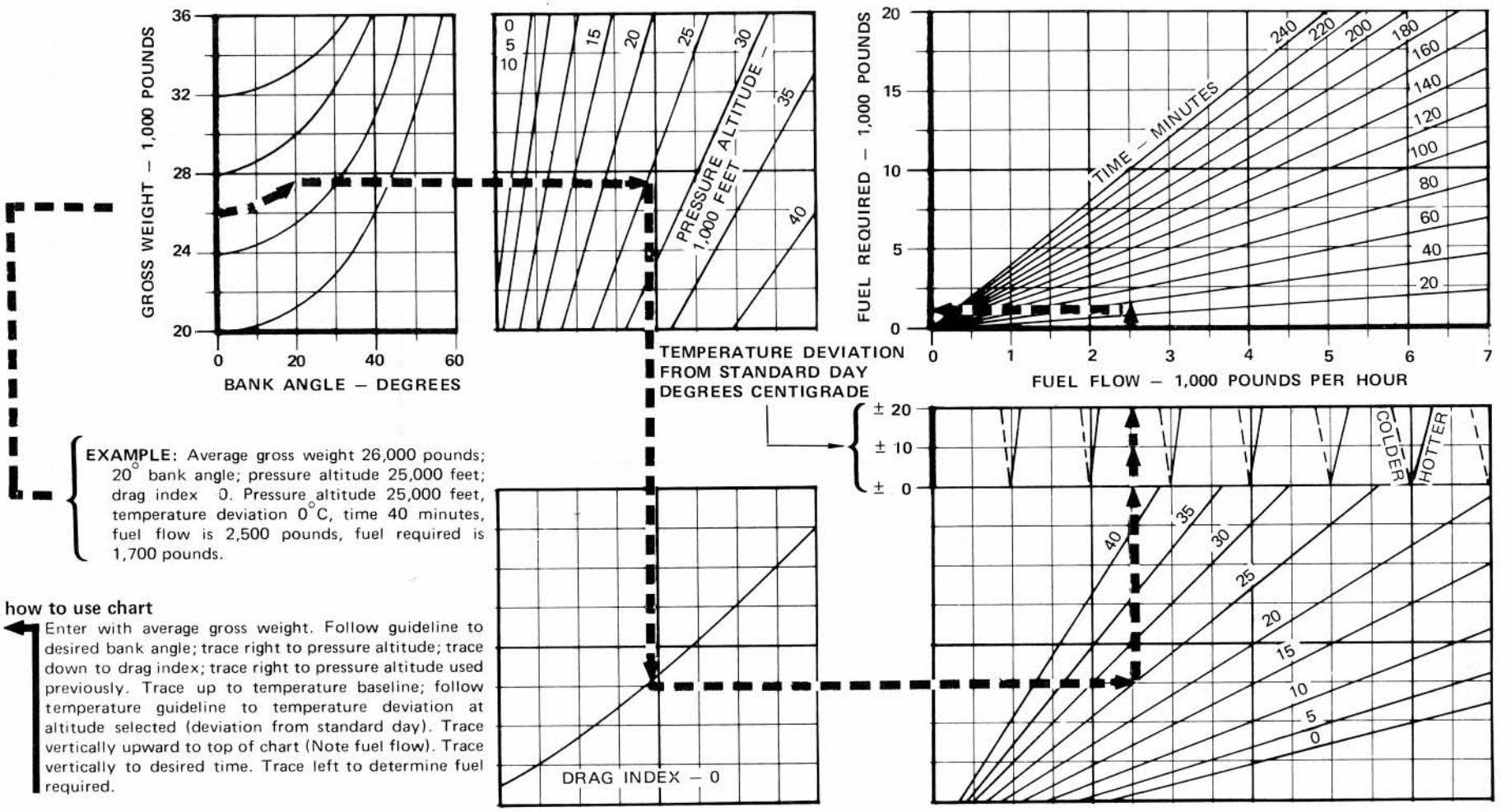
MAXIMUM ENDURANCE – J57-P-420

FUEL REQUIRED

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
CRUISE CONDITION



EXAMPLE: Average gross weight 26,000 pounds; 20° bank angle; pressure altitude 25,000 feet; drag index 0. Pressure altitude 25,000 feet, temperature deviation 0°C, time 40 minutes, fuel flow is 2,500 pounds, fuel required is 1,700 pounds.

how to use chart

Enter with average gross weight. Follow guideline to desired bank angle; trace right to pressure altitude; trace down to drag index; trace right to pressure altitude used previously. Trace up to temperature baseline; follow temperature guideline to temperature deviation at altitude selected (deviation from standard day). Trace vertically upward to top of chart (Note fuel flow). Trace vertically to desired time. Trace left to determine fuel required.

Figure 11-53 (Sheet 2)

MAXIMUM RANGE DESCENT - J57-P-420

DESCENT SPEED

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
IDLE THRUST
CRUISE CONDITION

how to use chart

Enter chart at gross weight and trace vertically to guideline, trace left to base to determine descent speed.

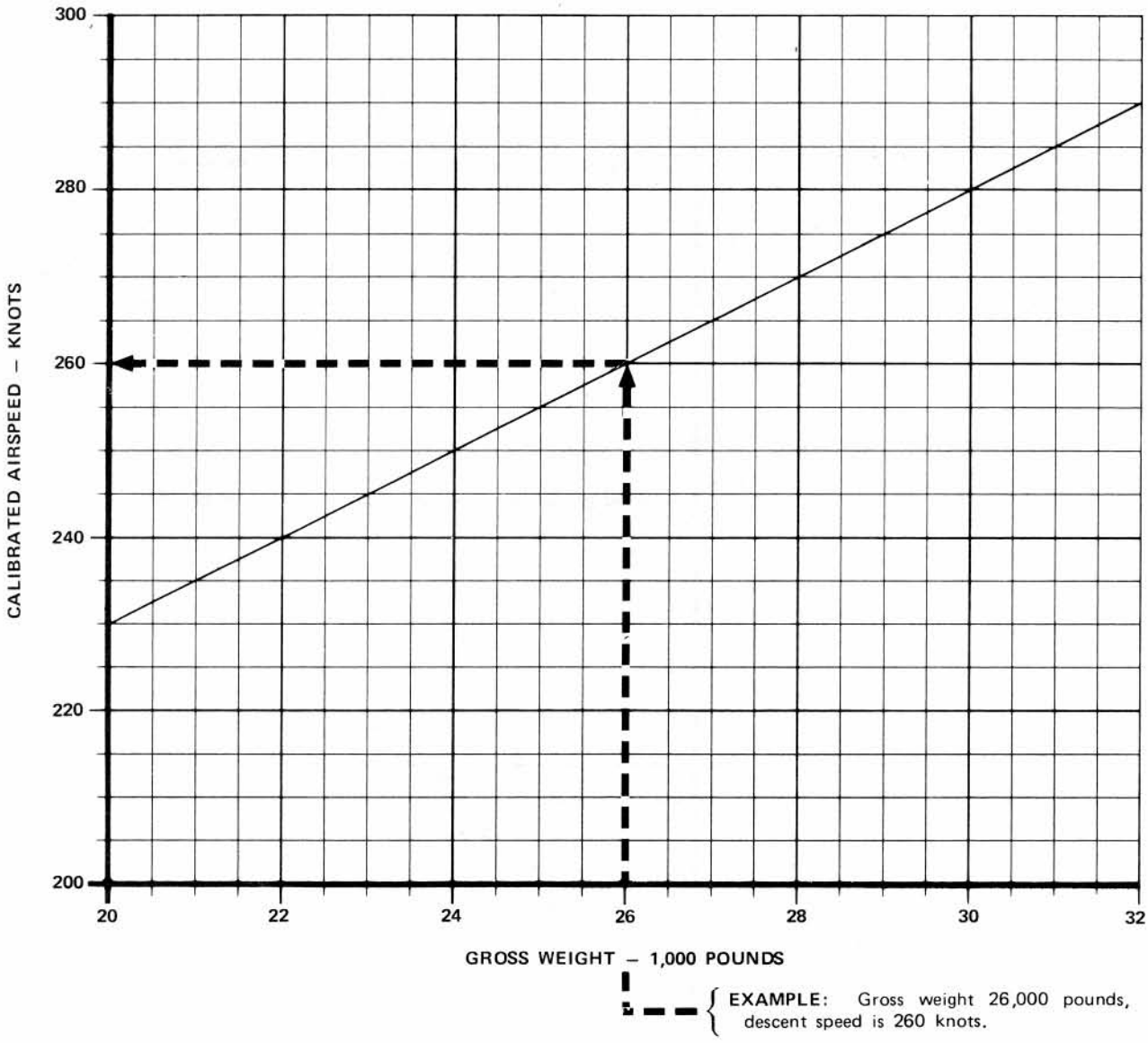


Figure 11-54 (Sheet 1)

MAXIMUM RANGE DESCENT - J57-P-420

TIME REQUIRED TO DESCEND TO SEA LEVEL

MODEL: RF-8G
DATA BASIS: ESTIMATED
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
IDLE THRUST
CRUISE CONDITION

how to use chart

Enter at gross weight at time of descent, trace right to altitude line; trace down to drag index line then straight to left edge for descent time.

EXAMPLE: Descent gross weight 24,000 pounds, initial altitude 45,000 feet, drag index 0, descent time is 15.3 minutes.

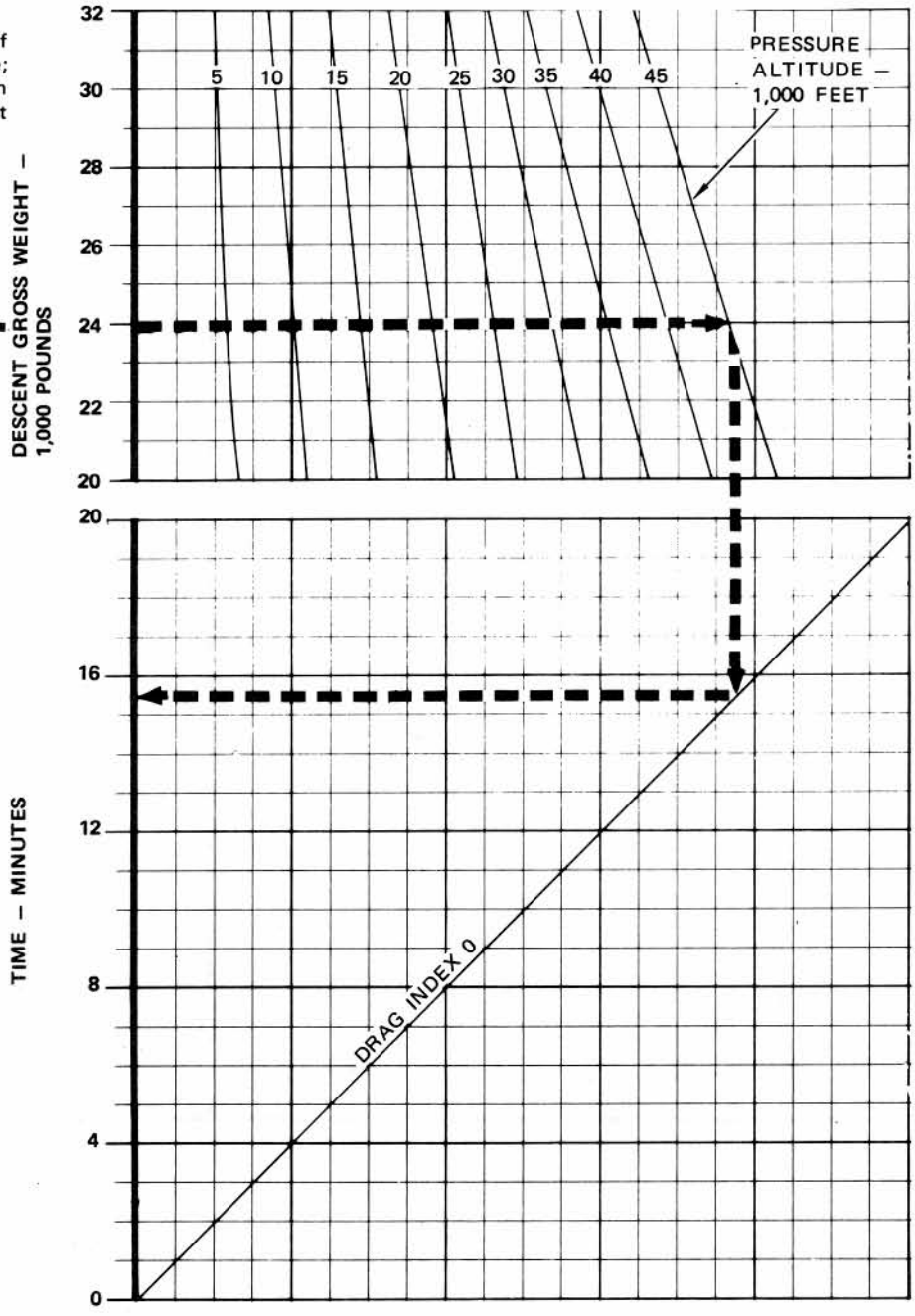


Figure 11-54 (Sheet 2)

MAXIMUM RANGE DESCENT – J57-P-420

FUEL REQUIRED TO DESCEND TO SEA LEVEL

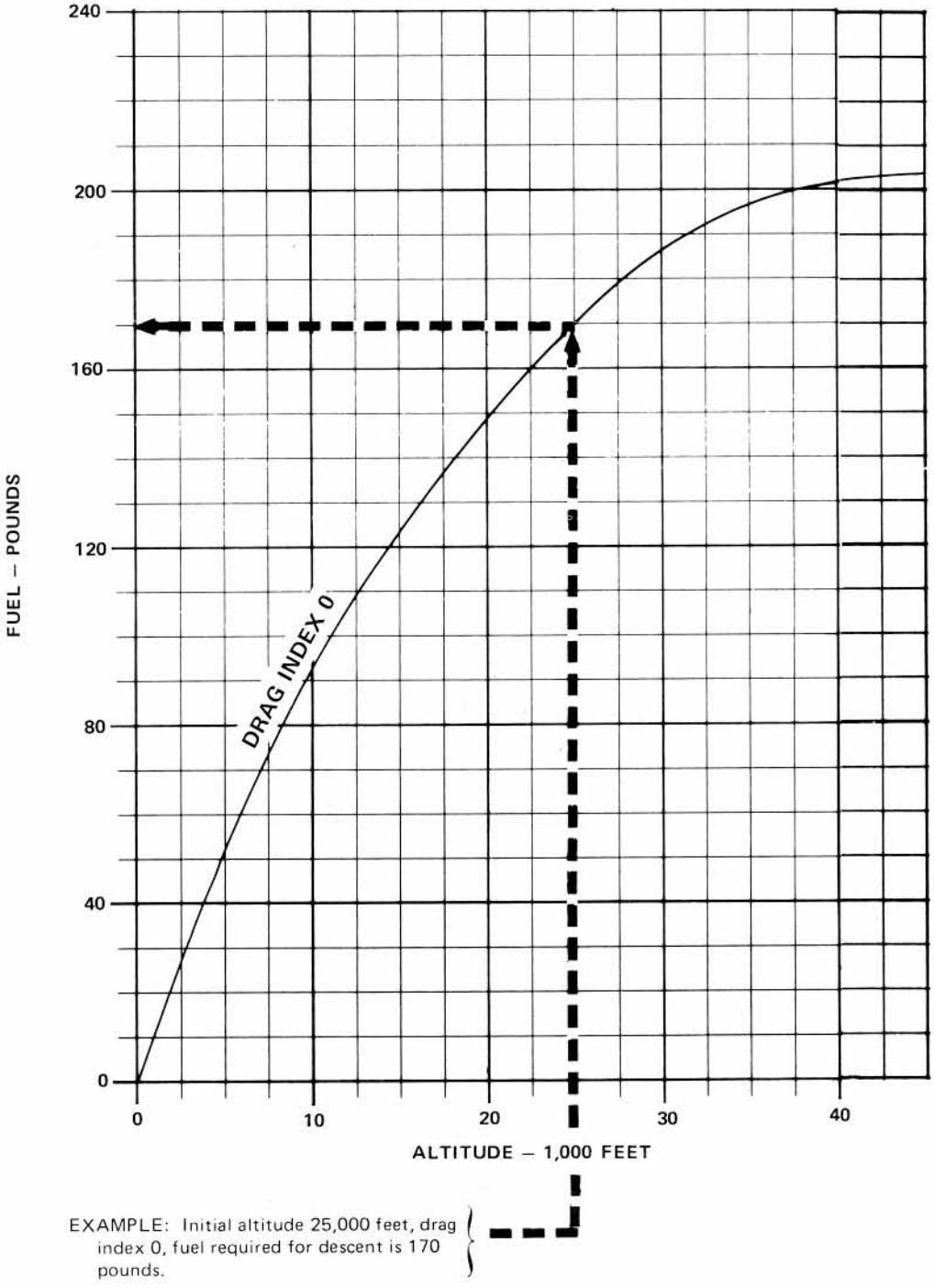
MODEL: RF-8G
DATA BASIS: **FLIGHT TEST**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

how to use chart

Enter at initial altitude, trace vertically to drag index, then straight to left edge to determine fuel for descent.

CONDITIONS:
STANDARD DAY
IDLE THRUST
CRUISE CONDITION



EXAMPLE: Initial altitude 25,000 feet, drag index 0, fuel required for descent is 170 pounds.

Figure 11-54 (Sheet 3)

MAXIMUM RANGE DESCENT - J57-P-420

DISTANCE TO DESCEND TO SEA LEVEL

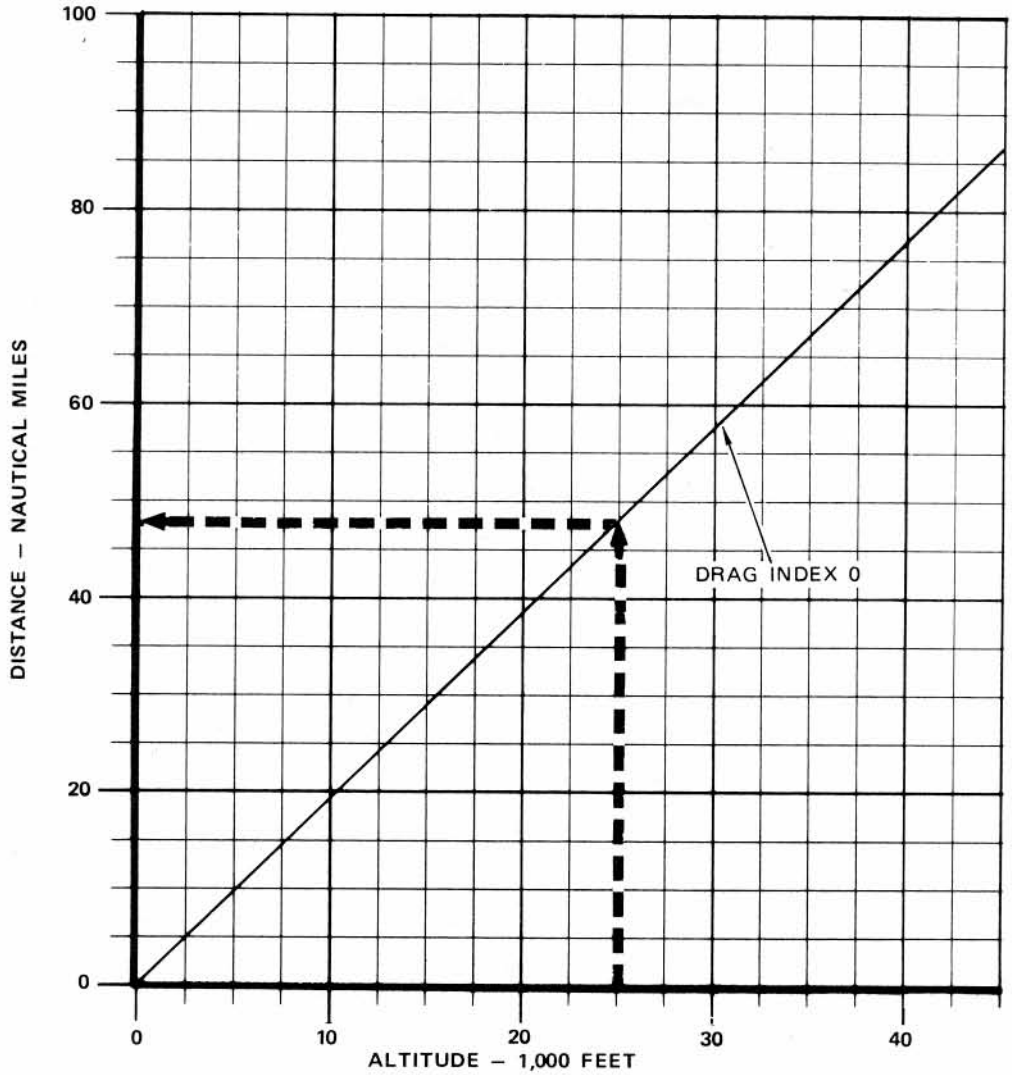
MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
IDLE THRUST
CRUISE CONDITION

how to use chart

Enter at initial altitude, trace vertically to drag index then to left edge to determine distance to descend.



EXAMPLE: Initial altitude 25,000 feet, drag index 0, distance required to descend is 47.5 miles.

Figure 11-54 (Sheet 4)

LANDING CHART—J57-P-420

LANDING SPEED

The landing speed chart (figure 11-55) provides for the recommended approach and landing speed and the initial stall warning speed. Also available is an allowable crosswind chart.

LANDING GROUND ROLL DISTANCE

When the ambient temperature, pressure altitude, and landing gross weight are known the Landing Ground Roll Distance chart (figure 11-56) provides for determination of the primary ground roll distance. When the primary ground roll, runway winds, runway slope and the runway condition reading (RCR) are known the Landing Ground Roll Distance Effects chart (figure 11-57) provides for the determination of the adjusted ground roll distance.

LIMIT BRAKING VELOCITY FOR LANDING

When the ambient temperature, pressure altitude and landing gross weight are known, the Limit Braking Velocity chart (figure 11-58) provides for determination of the primary braking velocity. When the primary braking velocity, runway winds, runway slope and runway condition reading (RCR) are known, the Limit Braking Velocity For Landing chart (figure 11-59) provides for the determination of the adjusted braking velocity.

RANGE AND ENDURANCE DECISION

Use

These charts (figures 11-60 and 11-61) present maximum endurance and maximum range data in convenient form for rapid reading in making decisions concerning the diversion of aircraft to alternate destinations. Data are presented in tabulations of endurance and range at either initial altitude or optimum altitude for a representative range under conditions of fuel remaining and initial altitude. A minimum practical fuel reserve of 600 pounds has been considered in preparing the data, but approximate readings for greater or smaller amounts of reserve fuel can be made by decreasing or increasing the fuel remaining figure by the desired change in reserve fuel. The data include time and distance for a maximum range descent to sea level. Climb performance is included for cases in which climb to optimum altitude is required.

Sample Problem

Assume that it is desired to determine for what period an aircraft can loiter in the vicinity of a carrier while the flight deck is cleared of an obstruction. Consider that flight is at 20,000 feet with 1,600 pounds fuel remaining. The desired fuel reserve is 1,000 pounds instead of the 600-pound allowance included in the table. Enter the endurance decision chart (figure 11-61) on the IF YOU ARE AT 20,000 FEET block, at the adjusted fuel remaining of 1,200 pounds (actual fuel remaining minus 400 pounds additional reserve fuel desired). The endurance at 20,000 feet with descent to sea level is 21.9 minutes. The optimum altitude is 30,000 feet, and the endurance at optimum altitude with descent to sea level is 23 minutes. Descent should be initiated when fuel remaining is 1,187 pounds, (787 pounds plus 400 pounds additional reserve fuel desired).

LANDING SPEED - J57-P-420

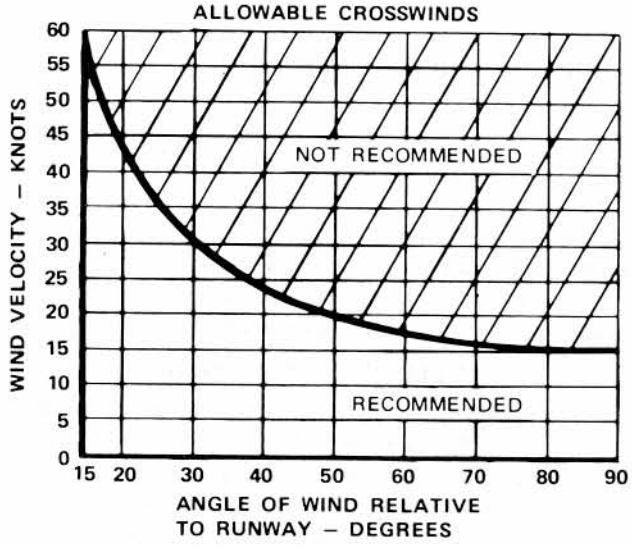
MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: JANUARY 1977

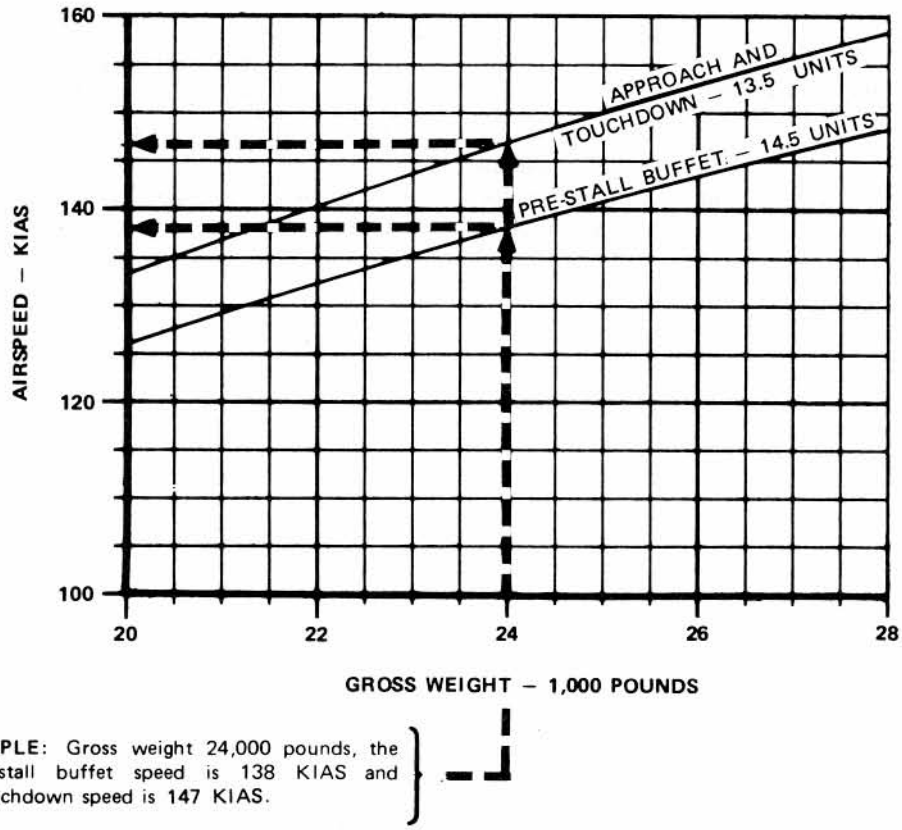
ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
LANDING CONDITION

how to use chart

Enter at aircraft gross weight; trace vertically to pre-stall buffet line then vertically to touchdown line. From both lines extend straight to left edge to determine pre-stall and touchdown speed.





EXAMPLE: Gross weight 24,000 pounds, the prestall buffet speed is 138 KIAS and touchdown speed is 147 KIAS.

Figure 11-55

LANDING GROUND ROLL DISTANCE - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
HARD SURFACE RUNWAY
LANDING CONDITION
CG: 21.0% MAC
ZERO WIND
IDLE THRUST
ZERO RUNWAY SLOPE
23 RCR

how to use chart

Enter with ambient temperature; trace up to pressure altitude; trace right to gross weight; trace down to find primary ground roll (no wind).

NOTE

1. For total distance over the 50 foot obstacle add the following distances to the ground roll: 955 feet for a 3° glide slope or 717 feet for a 4° glide slope.
2. 20% reduction in ground roll may be obtained by deflecting UHT full up after braking is started.

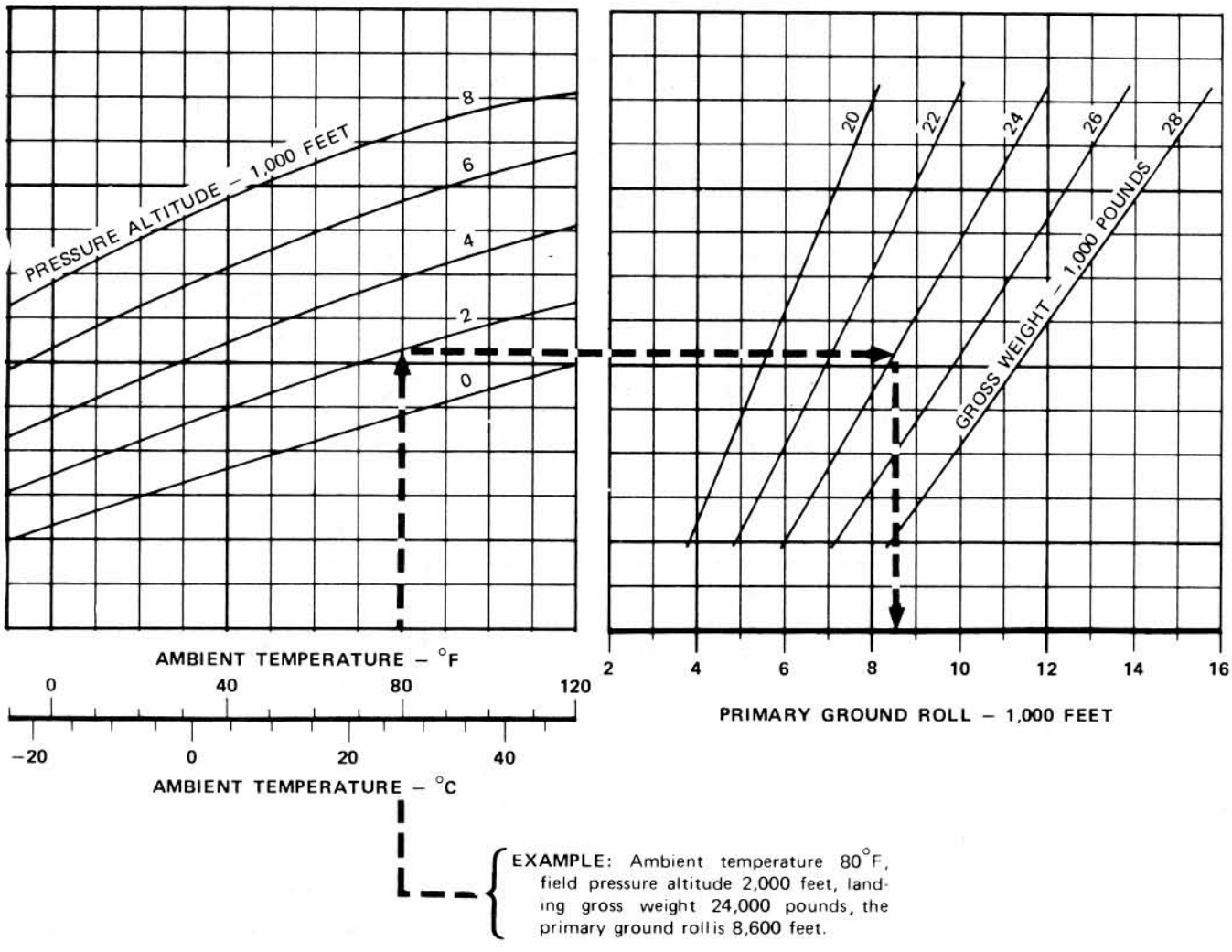


Figure 11-56

LANDING GROUND ROLL DISTANCE EFFECTS - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

how to use chart

Enter with primary ground roll (from ground roll distance chart, no wind); trace down to zero headwind baseline; follow guidelines to effective headwind; trace down to runway slope zero baseline, follow guidelines to effective runway slope; trace down to runway condition reading baseline (23); follow guidelines to effective runway condition; trace down to find adjusted ground roll.

NOTE

CG location has negligible effect

EXAMPLE: Primary landing ground roll 8,600 feet, headwind 20 knots, runway slope 1% up, RCR 16, adjusted ground roll is 6,000 feet.

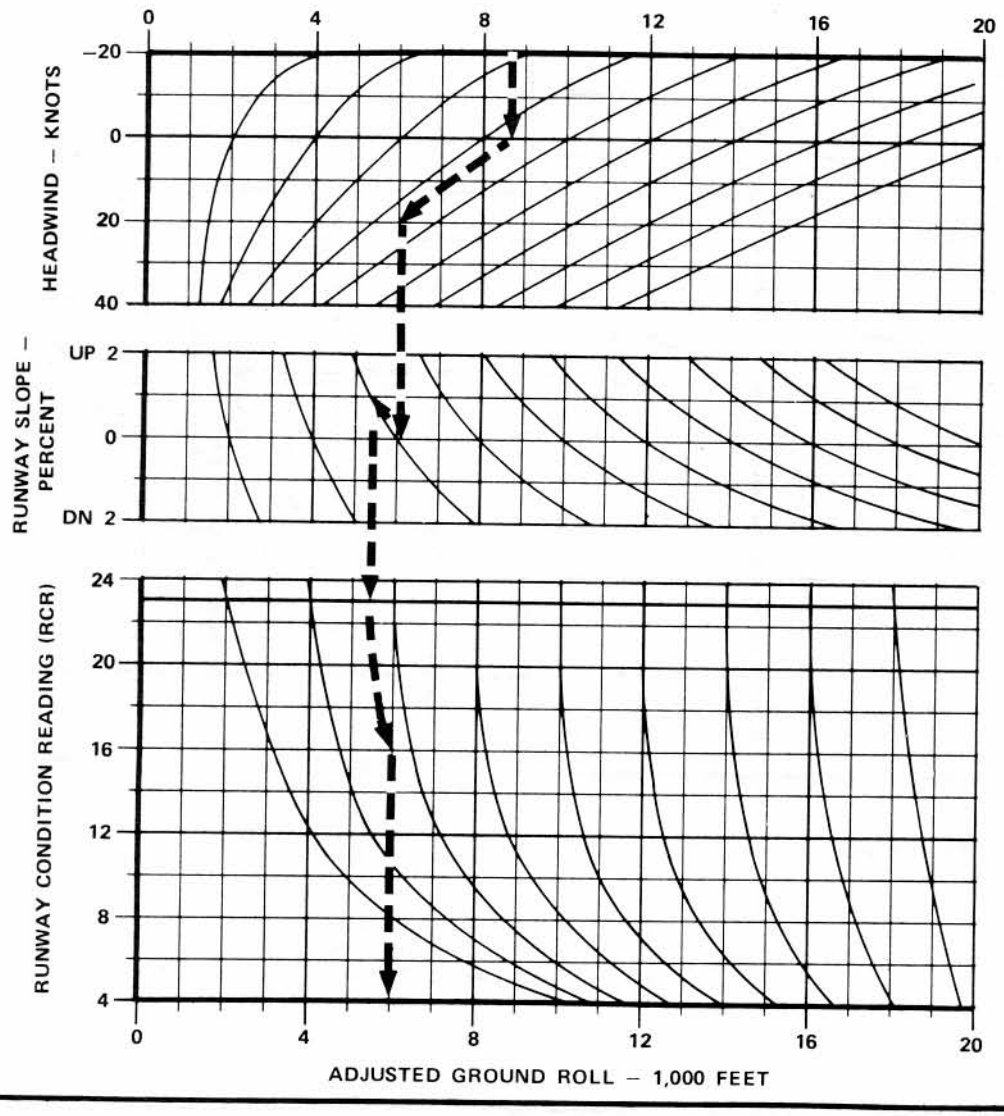


Figure 11-57

LIMIT BRAKING VELOCITY FOR LANDING - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

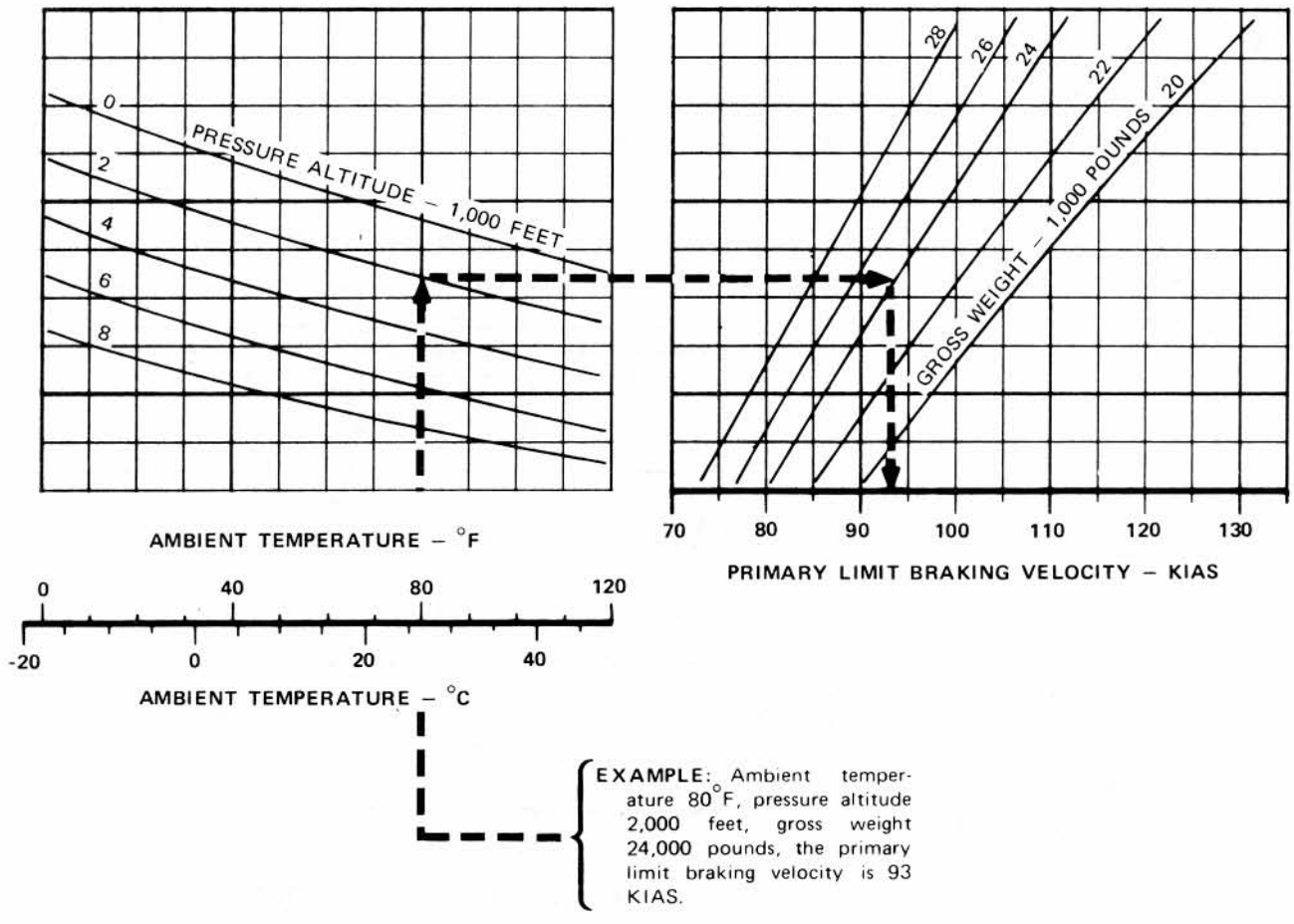
CONDITIONS:
HARD SURFACE RUNWAY
CG: 21.0% MAC
LANDING CONDITION
ZERO WIND
IDLE THRUST
ZERO RUNWAY SLOPE
23 RCR

NOTE

Decelerate to limit braking velocity before applying brakes.

how to use chart

Enter bottom of chart with ambient temperature; trace up to runway pressure altitude; trace right to gross weight; trace down to find primary limit braking velocity.



EXAMPLE: Ambient temperature 80°F, pressure altitude 2,000 feet, gross weight 24,000 pounds, the primary limit braking velocity is 93 KIAS.

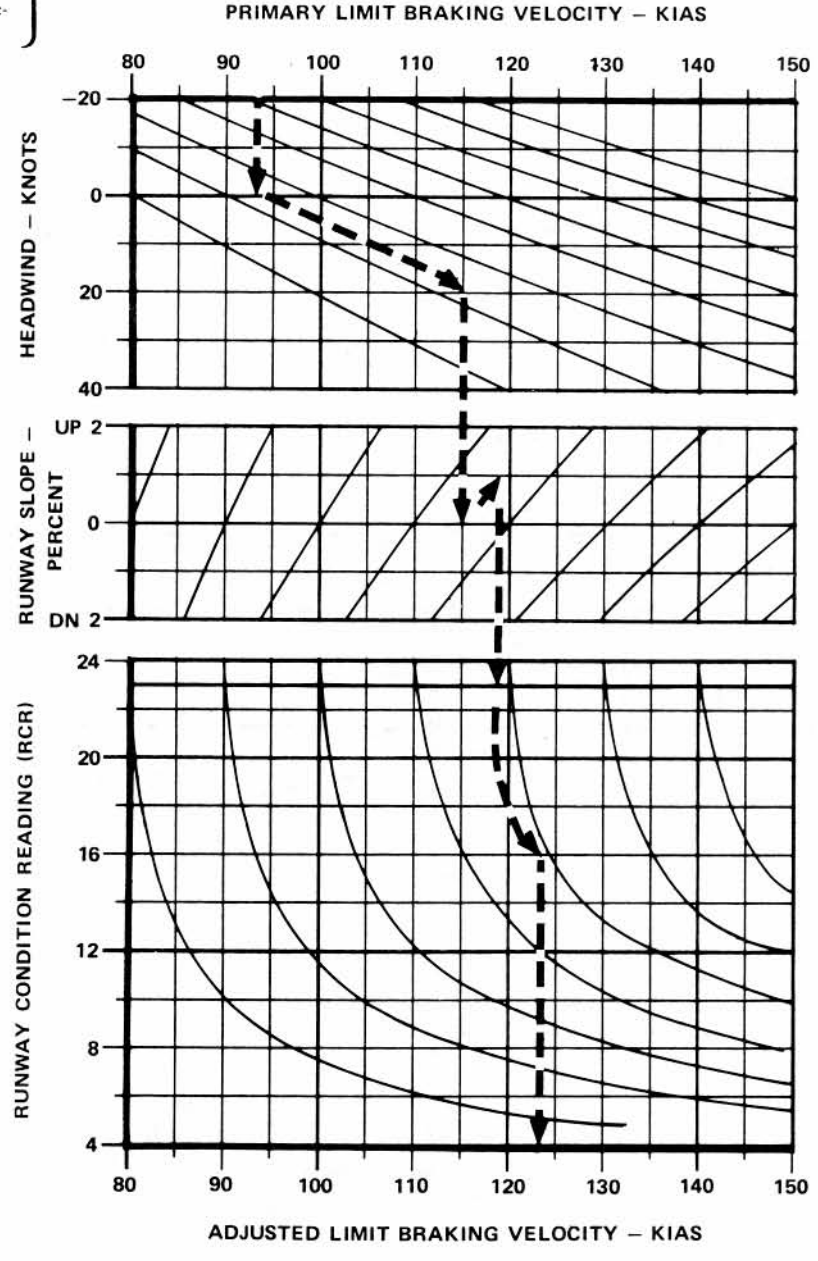
Figure 11-58

LIMIT BRAKING VELOCITY FOR LANDING EFFECTS - J57-P-420

MODEL: RF-8G
DATA BASIS: **ESTIMATED**
DATE: JANUARY 1977

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EXAMPLE: Primary limit braking velocity 93 KIAS, headwind 20 knots, runway slope 1% up, RCR reading 16, the adjusted limit braking velocity is 124 KIAS.



how to use chart

Enter top of chart with primary limit braking velocity (from limit braking velocity for landing chart, no wind); trace down to headwind zero baseline; follow guidelines to effective headwind; trace down to runway slope zero baseline; follow guidelines to effective runway slope; trace down to runway condition reading baseline (23); follow guidelines to effective runway condition; trace down to find adjusted limit braking velocity.

NOTE

CG location has negligible effect.

Figure 11-59

RANGE DECISION - J57-P-420

MODEL: RF-8G
DATA BASIS: Estimated
DATE: January 1977

Cruise Condition At All Airspeeds
Range in Nautical Miles

ENGINE: J57-P-420

MILITARY THRUST CLIMB

ALT	IMN	IAS
SL	.62	403
10	.73	405
20	.87	408
30	.87	326
35	.87	296
40	.87	265
41	.87	253

BEST RANGE SPEED

ALT	IMN	IAS
SL	.48	321
10	.55	308
20	.64	293
30	.78	289
35	.82	276
40	.85	258
41	.86	253

MAXIMUM RANGE DESCENT -
IDLE THRUST - NOZZLE OPEN
See Note 8
ALL ALTITUDES - 240 KCAS

IF YOU ARE AT SEA LEVEL

FUEL ON BOARD-LB	RANGE AT SL	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	18	—	—	—
1000	36	8	45	680
1200	55	15	76	720
1600	91	35	165	800
2000	128	37	255	805
2400	164	38	344	805

IF YOU ARE AT 10,000 FEET

FUEL ON BOARD-LB	RANGE AT 10,000	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	35	10	—	690
1000	61	14	65	720
1200	86	16	95	730
1600	138	36	197	800
2000	189	38	288	805
2400	240	38	377	805

IF YOU ARE AT 20,000 FEET

FUEL ON BOARD-LB	RANGE AT 20,000	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	50	20	—	750
1000	83	32	93	795
1200	116	35	138	800
1600	182	37	229	805
2000	247	38	320	805
2400	311	39	410	805

IF YOU ARE AT 30,000 FEET

FUEL ON BOARD-LB	RANGE AT 30,000	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	66	30	—	790
1000	106	34	111	800
1200	147	36	156	800
1600	228	37	248	805
2000	307	38	338	805
2400	386	39	427	805

IF YOU ARE AT 35,000 FEET

FUEL ON BOARD-LB	RANGE AT 35,000	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	75	35	—	800
1000	119	35	119	800
1200	163	36	165	800
1600	250	38	257	805
2000	336	38	347	805
2400	421	39	436	805

IF YOU ARE AT 40,000 FEET

FUEL ON BOARD-LB	RANGE AT 40,000	OPT ALT	RANGE AT OPT ALT	DESCEND WHEN FUEL REACHES
800	87	*	—	*
1000	131	42	132	810
1200	177	42	179	810
1600	268	41	270	810
2000	357	41	360	810
2400	445	41	449	810

*Descend immediately. Fuel reserve will be 592 pounds upon reaching sea level.

NOTE

1. Range figures include distance for climb to optimum altitude and for descent to sea level.
2. Provides 600 pounds reserve fuel upon return to sea level; for greater fuel reserve, use figures for correspondingly less fuel on board; for smaller fuel reserve, use figures for correspondingly more fuel on board.
3. Use schedules shown for climb, cruise and descent.
4. Distance covered in descent from 42,000 feet is 82 nautical miles.
5. Applicable for non-standard conditions when recommended IAS is maintained.
6. Add 5 knots for each 1,000 pounds of weight over 22,000 pounds.
7. Subtract 5 knots for each 1,000 pounds of weight less than 22,000 pounds.
8. Improvement in range will be noted with nozzle closed.

Figure 11-60

ENDURANCE DECISION – J57-P-420

MODEL: RF–8G
DATA BASIS: Estimated
DATE: January 1977

Cruise Condition
Time in Minutes

ENGINE: J57-P-420

MILITARY THRUST CLIMB

ALT	IMN	IAS
SL	.62	403
10	.73	405
20	.87	408
30	.87	326
35	.87	296
40	.87	265

LOITER SPEED AT ALTITUDE

ALT	IMN	IAS
SL	.334	223
10	.410	226
20	.477	228
30	.625	232
35	.711	234
40	.801	243

MAXIMUM RANGE DESCENT –
IDLE THRUST – NOZZLE OPEN
See Note 7
ALL ALTITUDES – 240 KCAS

IF YOU ARE AT SEA LEVEL

FUEL ON BOARD–LB	TIME AT SL	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	4.4	0	4.4	600
1000	8.7	10	9.6	690
1200	13.0	14	15.0	735
1600	21.5	23	26.5	776
2000	29.8	33	38.3	794
2400	38.1	33	50.0	796

IF YOU ARE AT 10,000 FEET

FUEL ON BOARD–LB	TIME AT 10,000	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	7.8	10	— —	690
1000	13.0	13	13.5	707
1200	18.2	15	18.7	725
1600	28.5	30	30.7	787
2000	38.6	30	42.5	787
2400	48.7	30	54.1	787

IF YOU ARE AT 20,000 FEET

FUEL ON BOARD–LB	TIME AT 20,000	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	10.6	20	— —	748
1000	16.3	20	— —	748
1200	21.9	30	23.0	787
1600	33.1	30	35.0	787
2000	44.3	30	46.7	787
2400	55.3	30	58.4	787

IF YOU ARE AT 30,000 FEET

FUEL ON BOARD–LB	TIME AT 30,000	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	13.2	30	—	787
1000	19.5	30	—	787
1200	25.5	30	—	787
1600	37.6	30	—	787
2000	49.4	30	—	787
2400	61.0	30	—	787

IF YOU ARE AT 35,000 FEET

FUEL ON BOARD–LB	TIME AT 35,000	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	14.6	35	—	800
1000	20.8	35	—	800
1200	26.6	35	—	800
1600	38.8	35	—	800
2000	50.5	35	—	800
2400	62.0	35	—	800

IF YOU ARE AT 40,000 FEET

FUEL ON BOARD–LB	TIME AT 40,000	OPT ALT	TIME AT OPT ALT	DESCEND WHEN FUEL REACHES
800	16.3	*	—	*
1000	22.1	40	—	809
1200	28.0	40	—	809
1600	39.8	40	—	809
2000	51.3	40	—	809
2400	62.5	40	—	809

*Descend immediately. Fuel reserve will be 592 pounds upon reaching sea level.

NOTE

1. Endurance figures include time for climb to optimum altitude and for descent to sea level.
2. Provides 600 pounds reserve fuel upon return to sea level; for greater fuel reserve, use figures for correspondingly less fuel on board? for smaller reserve, use figures for correspondingly more fuel on board.
3. Use schedules for climb and descent; loiter at recommended IAS.
4. Time required for descent from 40,000 feet is 14.7 minutes.
5. Add 5 knots for each 1,000 pounds of weight over 22,000 pounds.
6. Subtract 5 knots for each 1,000 pounds of weight less than 22,000 pounds.
7. Improvement in endurance will be noted with nozzle closed.

Figure 11-61

EMERGENCY CHARTS —J57-P-420

EMERGENCY RANGE ENDURANCE DECISION

These charts (figures 11-63 through 11-71) present maximum range and endurance data to cover possible aircraft malfunctions involving wing, droops, landing gear, emergency power package, and inflight refueling probe.

Use

To use the charts, first enter figure 11-63 to find the range or endurance index number for the applicable configuration. Then proceed to figure 11-64 for emergency range, or to figure 11-65 for emergency endurance. These charts provide notes which serve as a guide to the other charts which must be used to obtain the desired information.

Sample Problem

Solve two emergency range and endurance problems; one involving an aircraft at sea level, the other involving an aircraft at 20,000 feet. Figure 11-62 presents answers to the problems in tabular form.

Assume (for both problems)

Configuration – Wing down, landing droop extended, landing gear up, EPP retracted

Fuel on board – 2,000 pounds

Fuel reserve desired – 600 pounds

Find (for both problems)

Emergency Range

Range at initial altitude

Optimum altitude

Range at optimum altitude

Fuel quantity at start of descent

Distance covered in descent

Time for descent

MRT climb speed

Cruise speed

Descent speed

Emergency Endurance

Endurance at initial altitude

Optimum altitude

Endurance at optimum altitude

Fuel quantity at start of descent

Distance covered in descent

Time for descent

MRT climb speed

Loiter and descent speed

Emergency range – initial altitude sea level

1. From figure 11-63, the range index number is 9.0 and the endurance index number is 5.0.

2. From figure 11-64, sheet 1, the range obtainable by remaining at sea level is 75 nautical miles.

3. Optimum altitude is found to be 25,000 feet from the optimum range altitude chart in figure 11-66.

4. If maximum range is required, it is necessary to climb to optimum altitude (25,000 feet). Maximum range obtainable at 25,000 feet is determined by reading up to the range at optimum altitude curve in figure 11-64, sheet 1. The answer is 100 nautical miles. This range includes distance for MRT climb from sea level and idle thrust descent to sea level.

5. The descent is initiated when the fuel level reaches reserve (600 pounds) plus fuel used in the descent (figure 11-71). By reading up to an interpolated 25,000-foot curve, fuel used in descent is found to be 95 pounds. Start descent when fuel remaining is 600 + 95 = 695 pounds.

6. Distance and time for descent are found by reading up to the other curves in figure 11-71 and are found to be 25 nautical miles, and 7.5 minutes, respectively.

7. MRT climb speed varies with altitude. From figure 11-67, it is seen that it is necessary to decrease airspeed from 240 KCAS at sea level to 205 KCAS at 25,000 feet.

8. Cruise speed from figure 11-68 is 250 KCAS at sea level and 225 KCAS at 25,000 feet.

9. Loiter speed from figure 11-69 at 25,000 feet is 175 + 15 = 190 KCAS.

10. Descent speed from figure 11-70 is a constant 190 KCAS.

Emergency range – initial altitude 20,000 feet

1. From figure 11-63, the range index number is 9.0 and the endurance index number is 5.0.

2. Range obtainable by remaining at 20,000 feet is the range at sea level (75 nautical miles) plus an incremental range of 69 nautical miles from the incremental range for cruise at initial altitude curve in figure 11-64, sheet 3, or 144 nautical miles.

3. Optimum altitude is found to be 25,000 feet from the optimum range altitude curve in figure 11-66.

4. Range at optimum altitude is determined by taking the range at optimum altitude for an initial altitude of sea level from figure 11-64, sheet 1, 100 nautical miles, and adding the incremental range for cruise at optimum altitude from sheet 2, 70 nautical miles. The answer is 170 nautical miles.

5. The descent from optimum altitude is initiated when the fuel level reaches reserve (600 pounds) plus fuel used in the descent. By reading up to an interpolated 25,000-foot curve (figure 11-71), fuel used in the descent is found to be 95 pounds. Start descent when fuel remaining is 600 + 95 = 695 pounds.

6. Distance and time for descent are found by reading up to the other curves in figure 11-71, and are found to be 25 nautical miles, and 7.5 minutes, respectively.

7. MRT climb speed varies with altitude between 210 KCAS at 20,000 feet to approximately 205 KCAS at 25,000 feet from figure 11-67.

8. Cruise speed from figure 11-68 is 225 KCAS at 20,000 feet and approximately 225 KCAS at 25,000 feet.

9. Descent speed from figure 11-70 is a constant 190 KCAS.

Emergency endurance – initial altitude sea level

1. From figure 11-63, the endurance index number is 5.0 and the range index number is 9.0 (the range index number is needed for obtaining descent information).

2. From the endurance at sea level curve in figure 11-65, sheet 1, the sea level endurance is 18 minutes.

3. Optimum altitude is found to be 6,000 feet from the optimum endurance altitude curve in figure 11-66.

4. If maximum endurance is required, it is necessary to climb to optimum altitude (6,000 feet). Maximum endurance obtainable at 6,000 feet is seen to be 21 minutes from the endurance at optimum altitude curve of figure 11-65, sheet 1.

5. The descent is initiated when the fuel level reaches reserve (600 pounds) plus fuel used in the descent. By reaching up to an interpolated 6,000 foot curve, fuel used in the descent is found to be 40 pounds. Start descent when fuel remaining is 600 + 40 = 640 pounds (figure 11-71). Note that the range index number is used when entering the descent curves, rather than the endurance index number.

6. Distance and time for the descent are found by reading up to the other curves in figure 11-71 and are found to be six nautical miles and three minutes, respectively.

7. MRT climb speed varies with altitude between 240 KCAS at sea level to approximately 230 KCAS at 16,000 feet from figure 11-67.

8. Descent speed from figure 11-70 is a constant 190 KCAS.

Emergency endurance – initial altitude 20,000 feet

1. From figure 11-63, the endurance index number is 5.0 and the range index number is 9.0 (the range index number is needed for obtaining descent information).

2. Endurance obtainable by remaining at 20,000 feet is the endurance at sea level (18 minutes) plus an incremental endurance of 6.5 minutes from the incremental endurance for loiter at initial altitude curve in figure 11-65, sheet 2, or 24.5 minutes.

3. From figure 11-66, it is seen that 6,000 feet is the computed optimum altitude. (Note that the 2,500 pounds of fuel is used because of note 1.) However, because of note 3, initial altitude (20,000 feet) is maintained rather than descending to the lower computed optimum altitude.

4. The descent is initiated when the fuel level reaches reserve (600 pounds) plus fuel used in the descent. By reading up to the 20,000-foot curve, fuel used in the descent is found to be 79 pounds. Start descent when fuel remaining is 600 + 79 = 679 pounds. Note that the range index number is used when entering the descent curve, rather than the endurance index number.

5. Distance and time for descent are found by reading up to the other curves in figure 11-71 and are found to be 20 nautical miles and 6 minutes, respectively.

6. Loiter speed from figure 11-69 is 175 + 12 = 187 KCAS because of the note.

7. Descent speed from figure 11-70 is a constant 190 KCAS.

EMERGENCY RANGE AND ENDURANCE SAMPLE PROBLEMS – J57-P-420

MODEL: RF-8G
DATA BASIS: Flight Tests
DATE: December 1976

NOTE

Refer to text for sample problem conditions

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

EMERGENCY RANGE

RANGE INDEX NUMBER	INITIAL ALTITUDE 1000 FT	FUEL ON BOARD LB	RANGE AT INITIAL ALT – NMI (From Fig. 11 – 64)	OPT ALT 1000 FT (From Fig. 11–66)	RANGE AT OPT ALT NMI (From Fig. 11–64)	START DESCENT WHEN FUEL REACHES (From Fig. 11–71)	DESCENT DISTANCE (From Fig. 11–71)	TIME FOR DESCENT (From Fig. 11–71)
9.0	SEA LEVEL	2,000	75.0 (FROM SHEET 1)	25	100.0 (FROM SHEET 1)	695	25	7.5
9.0	20	2,000	144.0 (FROM SHEET 3)	25	170 (FROM SHEET 2)	695	25	7.5

SPEEDS

ALTITUDE 1000 FT	MRT CLIMB – KCAS (From Fig. 11–67)	CRUISE – KCAS (From Fig. 11–68)	DESCENT – KCAS (From Fig. 11–70)
SEA LEVEL	240	250	190
10	225	232	190
20	210	225	190
25	205	225	190

EMERGENCY ENDURANCE

ENDURANCE INDEX NUMBER	INITIAL ALTITUDE 1000 FT	FUEL ON BOARD LB	ENDURANCE AT INITIAL ALT – MIN (From Fig. 11–65)	OPT ALT 1000 FT (From Fig. 11–66)	ENDURANCE AT OPT ALT – MIN (From Fig. 11–65)	START DESCENT WHEN FUEL REACHES (From Fig. 11–71)	DESCENT DISTANCE (From Fig. 11–71)	TIME FOR DESCENT (From Fig. 11–71)
5.0	SEA LEVEL	2,000	18 (FROM SHEET 1)	6.0	21.0	640	6.0	3.0
5.0	20	2,000	24.5 (FROM SHEET 2)	20	–	679	20	6.0

SPEEDS

ALTITUDE 1000 FT	MRT CLIMB – KCAS (From Fig. 11–67)	DESCENT – KCAS (From Fig. 11–70)	LOITER – KCAS (From Fig. 11 – 69)
SEA LEVEL	240	190	175
10	225	190	181
20	209	190	187

Figure 11–62

EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS - J57-P-420

MODEL: RF-86
DATA BASIS: Flight Test
DATE: December 1976

POSSIBLE EMERGENCY CONFIGURATIONS ENGINES: J57-P-420

				IFR PROBE RETRACTED See note 4	
WING POSITION	DROOP POSITION	GEAR POSITION	EPP POSITION	RANGE INDEX NUMBER	ENDURANCE INDEX NUMBER
(1) DOWN	CRUISE	UP	RETRACTED	21.4	10.5
			EXTENDED	17.4	9.0
		DOWN	RETRACTED	10.0	5.9
			EXTENDED	9.3	5.6
(2)	CLEAN	UP	RETRACTED	19.2	9.6
			EXTENDED	15.7	8.3
		DOWN	RETRACTED	9.5	5.7
			EXTENDED	8.9	5.4
	LANDING CONDITION	UP	RETRACTED	9.0	5.0
			EXTENDED	8.0	4.6
		DOWN	RETRACTED	7.0	3.0
			EXTENDED	6.6	2.7
UP	CRUISE	UP	RETRACTED	14.2	8.5
			EXTENDED	12.3	7.9
		DOWN	RETRACTED	8.5	6.1
			EXTENDED	8.0	5.8
	CLEAN	UP	RETRACTED	13.1	8.2
			EXTENDED	11.7	7.6
		DOWN	RETRACTED	8.2	5.9
			EXTENDED	7.7	5.8
	LANDING CONDITION	UP	RETRACTED	7.3	4.8
			EXTENDED	6.8	4.6
(3)		DOWN	RETRACTED	6.2	3.3
			EXTENDED	5.9	3.2

(1) BASIC CRUISE CONDITION
(2) BASIC CLEAN CONDITION
(3) BASIC LANDING CONDITION
(4) FOR IFR PROBE EXTENDED, REDUCE RANGE INDEX NUMBER OR ENDURANCE INDEX NUMBER BY 12%

Figure 11-63

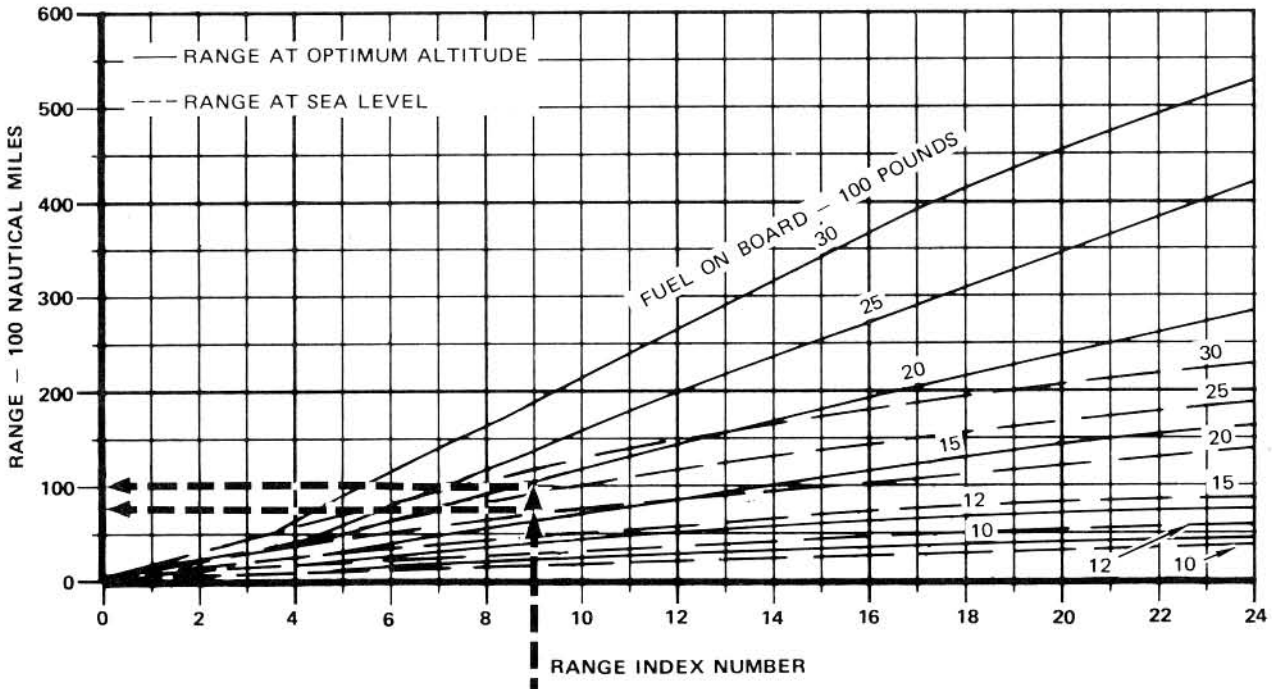
EMERGENCY RANGE – J57-P-420

INITIAL ALTITUDE – SEA LEVEL

MODEL: RF-8G
DATA BASIS: FLIGHT TESTS
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY
(See Note 9)



how to use chart

Enter bottom on range index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBER chart. Trace vertically upward to fuel on board (see notes) then trace across to determine range in nautical miles.

EXAMPLE: Wing down, landing droop extended, gear up, EPP retracted; the range index from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart is 9.0. With 2,000 lb fuel range at sea level is 75 nm; range at optimum altitude is 100 nm.

NOTE

1. Range at optimum altitude includes distance for military thrust climb from sea level to optimum altitude and for idle thrust descent to sea level.
2. Provides 600 pounds reserve fuel upon return to sea level; for larger fuel reserve read chart at less fuel on board.
3. For range for initial altitude higher than sea level, add the incremental range from sheet 2 or 3 of this figure.
4. Obtain optimum altitude from figure 11-66.
5. Obtain climb schedule from figure 11-67.
6. Obtain cruise speed from figure 11-68.
7. Obtain descent schedule from figure 11-70.
8. Obtain fuel state at which to start descent to sea level from figure 11-71.
9. Applicable for nonstandard conditions when recommended IAS is maintained.

Figure 11-64 (Sheet 1)

EMERGENCY RANGE - J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TESTS
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY

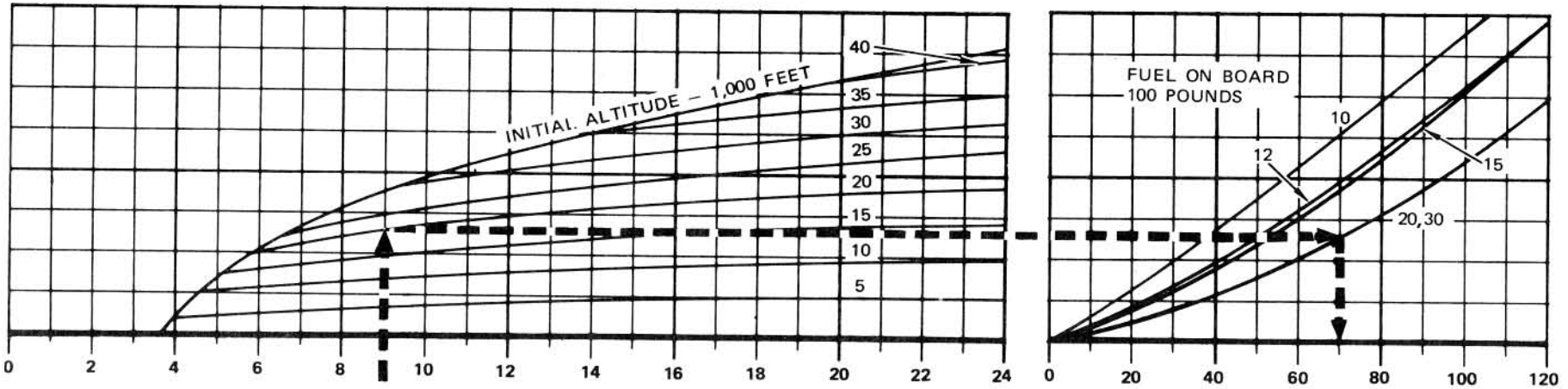
INCREMENTAL RANGE FOR CRUISE AT OPTIMUM ALTITUDE
(Add to Range at Optimum Altitude from Sheet 1 of this Figure)

how to use chart

Enter bottom on range index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically to initial altitude line, trace right to fuel on board then down to baseline for incremental range at optimum altitude.

NOTE

Based on 600 pounds fuel reserve at sea level; for larger fuel reserve read charts at less fuel on board.



EXAMPLE: Range index 9.0; initial altitude 20,000 feet; 2,000 pounds fuel on board; incremental range at optimum is 70 nm.

Figure 11-64 (Sheet 2)

EMERGENCY RANGE - J57-P-420

MODEL: RF-8G
DATA BASIS: **FLIGHT TESTS**
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS
STANDARD DAY

INCREMENTAL RANGE FOR CRUISE AT INITIAL ALTITUDE
(Add to Range at Sea Level from Sheet 1 of this Figure)

how to use chart

Enter bottom on range index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically to initial altitude line, trace right to fuel on board then down to baseline for incremental range at initial altitude.

NOTE

Based on 600 pounds fuel reserve at sea level; for larger fuel reserve read charts at less fuel on board.

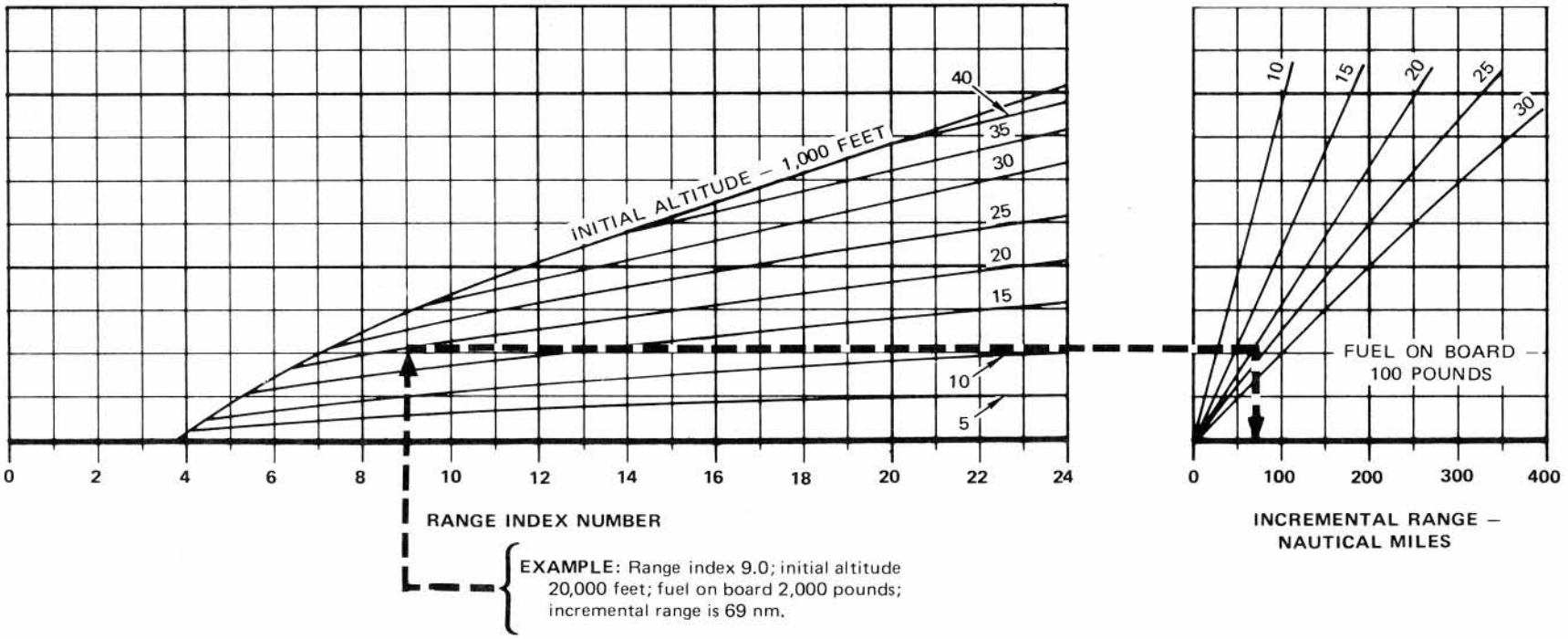


Figure 11-64 (Sheet 3)

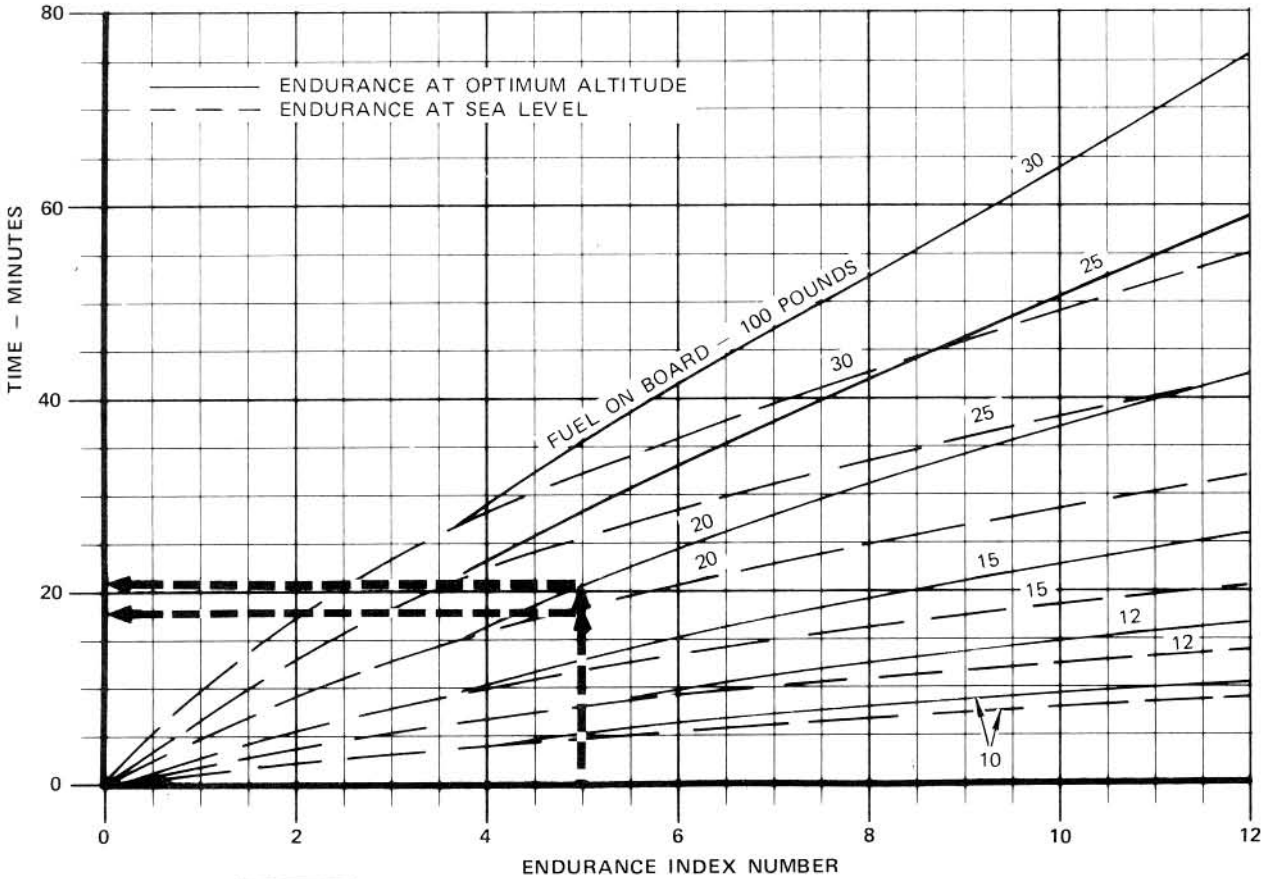
EMERGENCY ENDURANCE – J57-P-420

INITIAL ALTITUDE – SEA LEVEL

MODEL: RF-8G
DATA BASIS: FLIGHT TESTS
DATE: DECEMBER 1976

CONDITIONS:
STANDARD DAY

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.



NOTE

1. Endurance at optimum altitude includes time for military thrust climb from sea level to optimum altitude and for idle thrust descent to sea level.
2. Provides 600 pounds reserve fuel upon return to sea level; for larger fuel reserve read chart at less fuel on board.
3. For endurance for initial altitude higher than sea level, add the incremental endurance from sheet 2 of this figure.
4. Obtain optimum altitude from figure 11-66.
5. Obtain climb schedule from figure 11-67.
6. Obtain loiter speed from figure 11-69.
7. Obtain fuel state at which to start descent to sea level from figure 11-71.
8. Obtain descent speed from figure 11-70.

EXAMPLE: Endurance index number of 5.0; 2,000 pounds fuel on board, endurance at sea level is 18 minutes; optimum altitude endurance is 21 minutes.

how to use chart

Enter bottom on endurance index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically to fuel on board line for either optimum altitude or sea level, trace to left baseline for endurance in minutes.

Figure 11-65 (Sheet 1)

EMERGENCY ENDURANCE - J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

CONDITIONS:
STANDARD DAY

NOTE

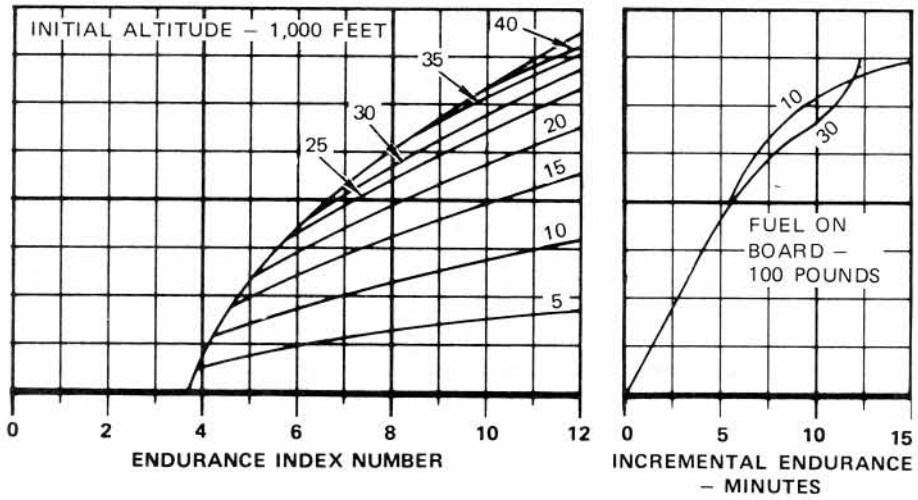
Based on 600 pounds fuel reserve at sea level, for larger fuel reserve read charts at less fuel on board.

INCREMENTAL ENDURANCE FOR LOITER AT OPTIMUM ALTITUDE

(Add to Endurance at Optimum Altitude from Sheet 1 of this Figure)

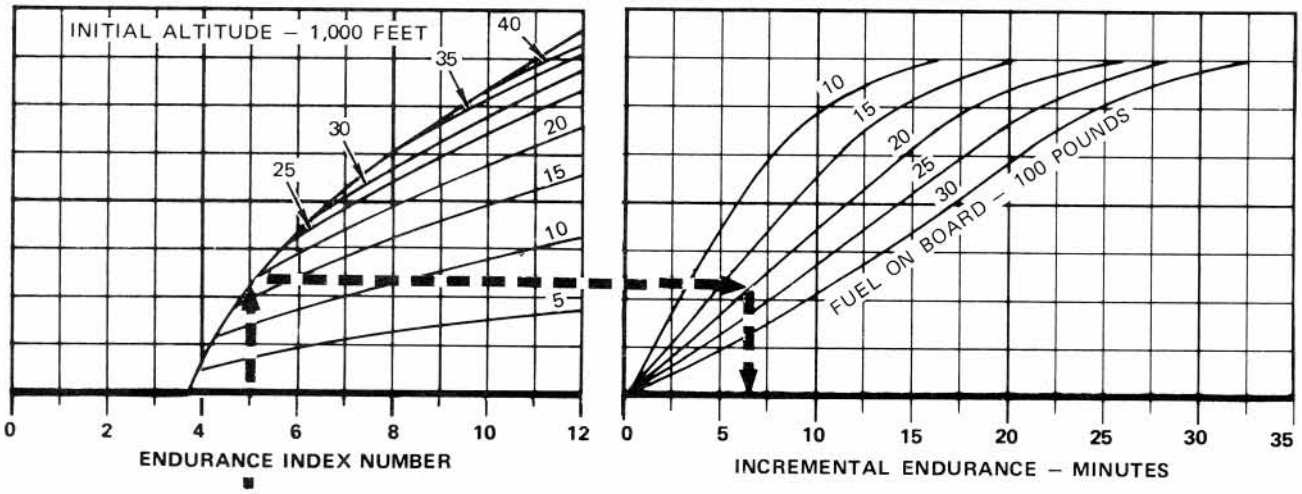
how to use chart

Enter at index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically to initial altitude line; trace right to fuel on board line; then vertically downward to baseline for incremental endurance.



INCREMENTAL ENDURANCE FOR LOITER AT INITIAL ALTITUDE

(Add to Endurance at Sea Level from Sheet 1 of this Figure)



EXAMPLE: Endurance index number 5.0; initial altitude 20,000 feet; 2,000 pounds fuel on board, the incremental endurance is 6.5 minutes.

Figure 11-65 (Sheet 2)

EMERGENCY RANGE AND ENDURANCE ALTITUDES – J57-P-420

MODEL: RF-8G
DATA BASIS: **FLIGHT TEST**
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSITY: 6.8 LB/GAL.

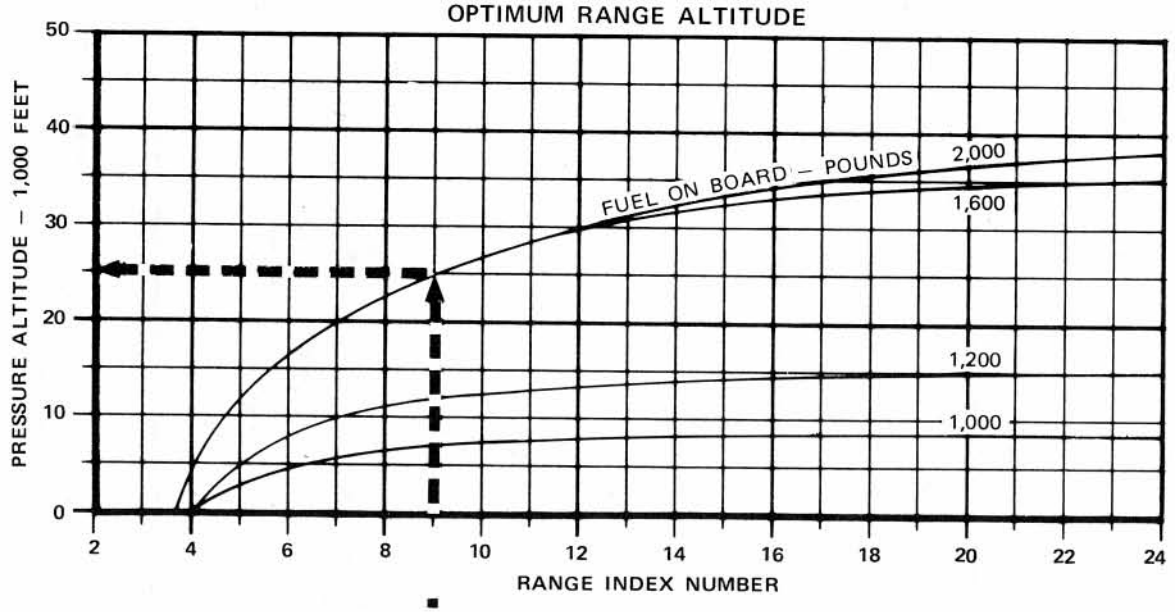
CONDITIONS:
INITIAL ALTITUDE –
SEA LEVEL
STANDARD DAY

how to use chart

Enter bottom of chart at selected index number from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically upward to fuel on board line then straight to left baseline for range/endurance.

NOTE

1. For initial altitude higher than sea leve, read the charts at 250 pounds more fuel on board for each 10,000 feet of initial altitude
2. Based on 600 pounds fuel reserve at sea level, for larger fuel reserve read chart at less fuel on board.
3. If the optimum altitude is less than the initial altitude, stay at the initial altitude.



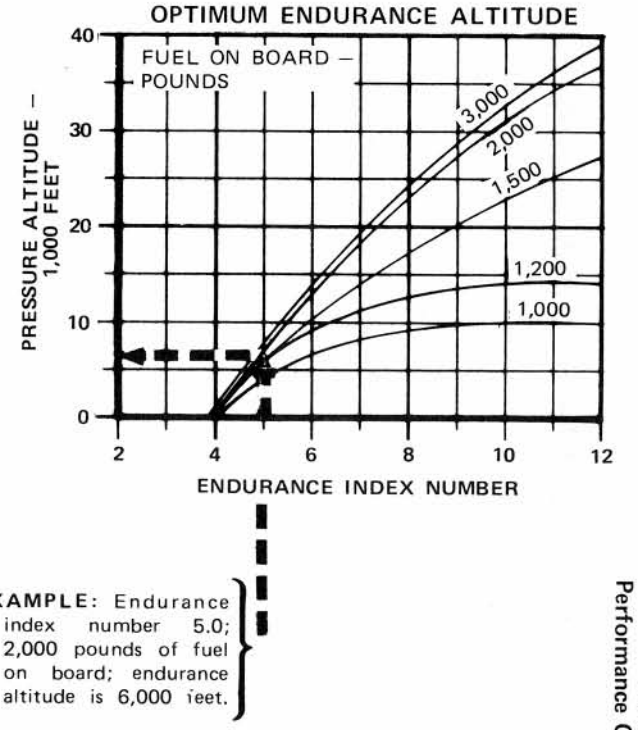


Figure 11-66

EMERGENCY RANGE AND ENDURANCE CLIMB SPEEDS - J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420

CONDITIONS:
MILITARY THRUST CLIMB SPEED
STANDARD DAY

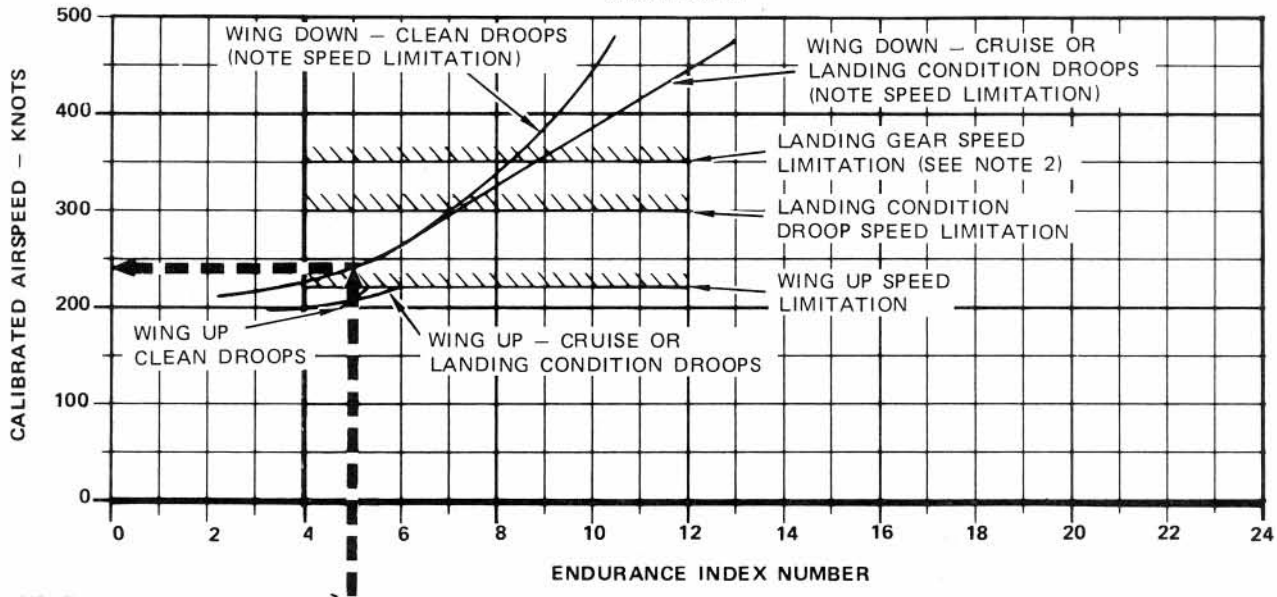
how to use chart

Enter appropriate altitude chart on the index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically up to aircraft condition line; trace to left baseline for climb speeds.

NOTE

1. To obtain climb speeds for use with emergency endurance or range charts, use the endurance index number.
2. Exceeding the landing gear speed limitation (220 KIAS) may result in damage to the landing gear doors. No damage to the landing gear is anticipated at or below 350 KIAS.

SEA LEVEL



EXAMPLE: Endurance index number 5.0; Wing down, landing droops. Climb speed at sea level is 240 KIAS.

15,000 FEET

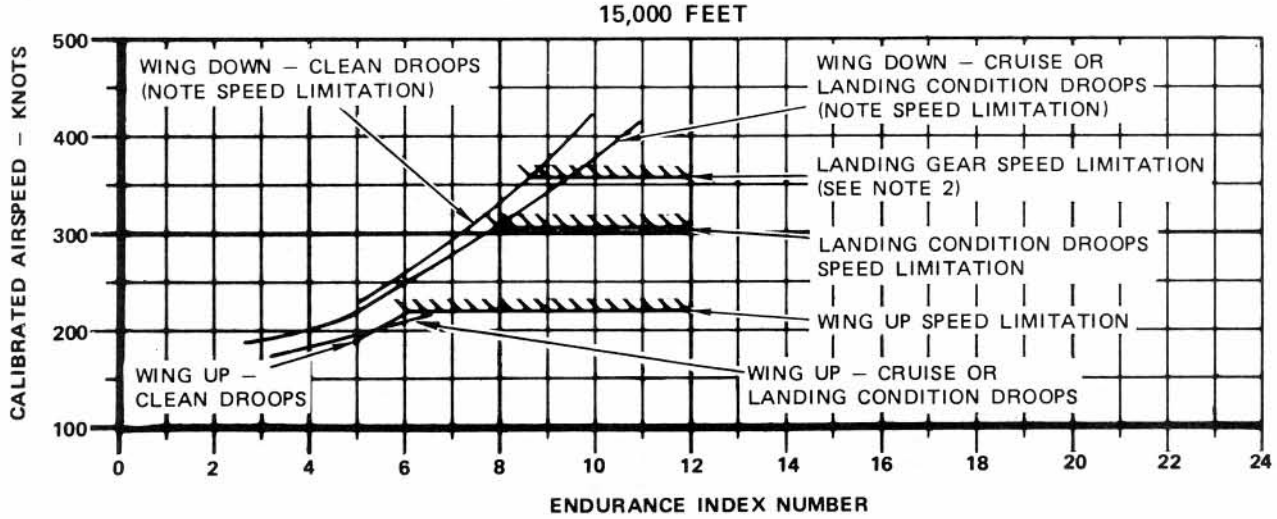


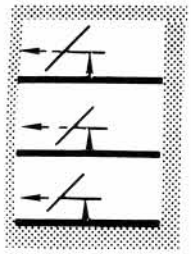
Figure 11-67 (Sheet 1)

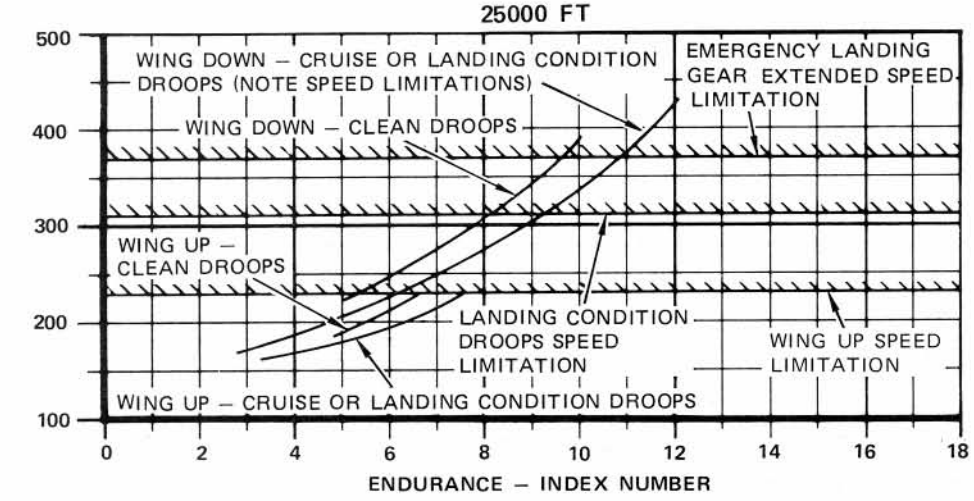
EMERGENCY RANGE AND ENDURANCE CLIMB SPEED – J57-P-420

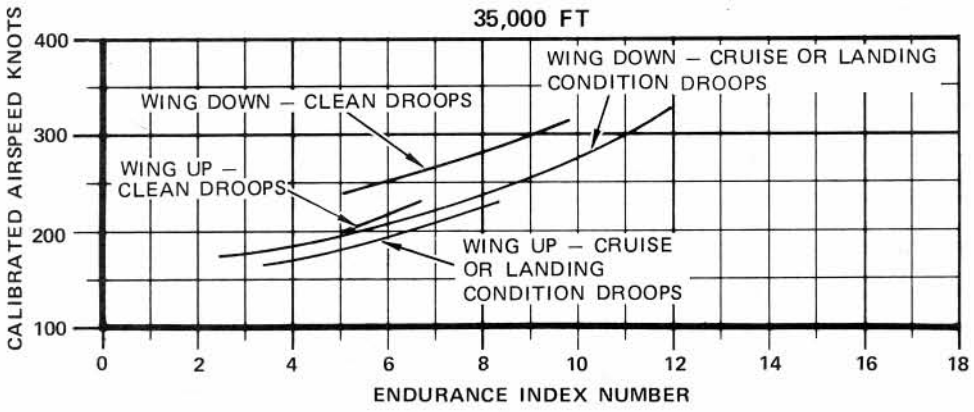
MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

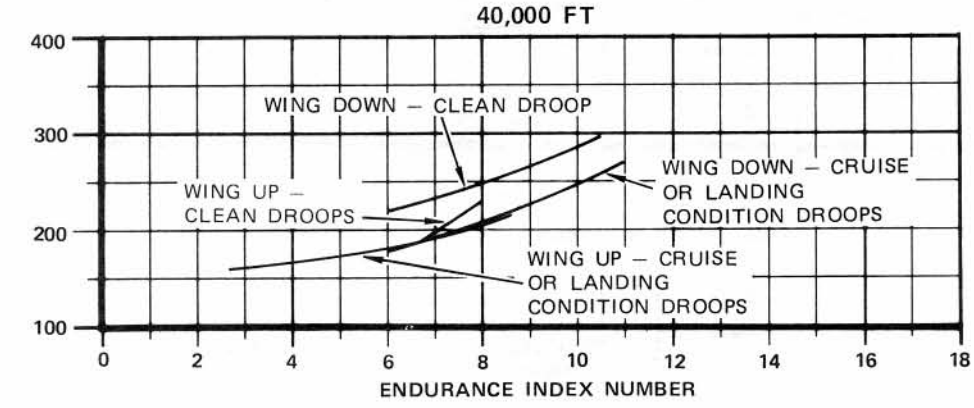
ENGINE: J57-P-420

CONDITIONS:
MILITARY THRUST CLIMB SPEED
STANDARD DAY









how to use chart

Enter appropriate altitude chart on the index number selected from EMERGENCY RANGE AND ENDURANCE INDEX NUMBERS chart; trace vertically up to aircraft condition line; trace to left baseline for climb speeds.

NOTE

1. To obtain climb speeds for use with emergency endurance or range charts, use the endurance index number.
2. Exceeding the landing gear speed limitation (220 KIAS) may result in damage to the landing gear doors. No damage to the landing gear is anticipated at or below 350 KIAS.

Figure 11-67 (Sheet 2)

EMERGENCY RANGE CRUISE SPEEDS – J57-P-420

MODEL: RF-8G
DATA BASIS: **FLIGHT TEST**
DATE: DECEMBER 1976

ENGINE: J57-P-420

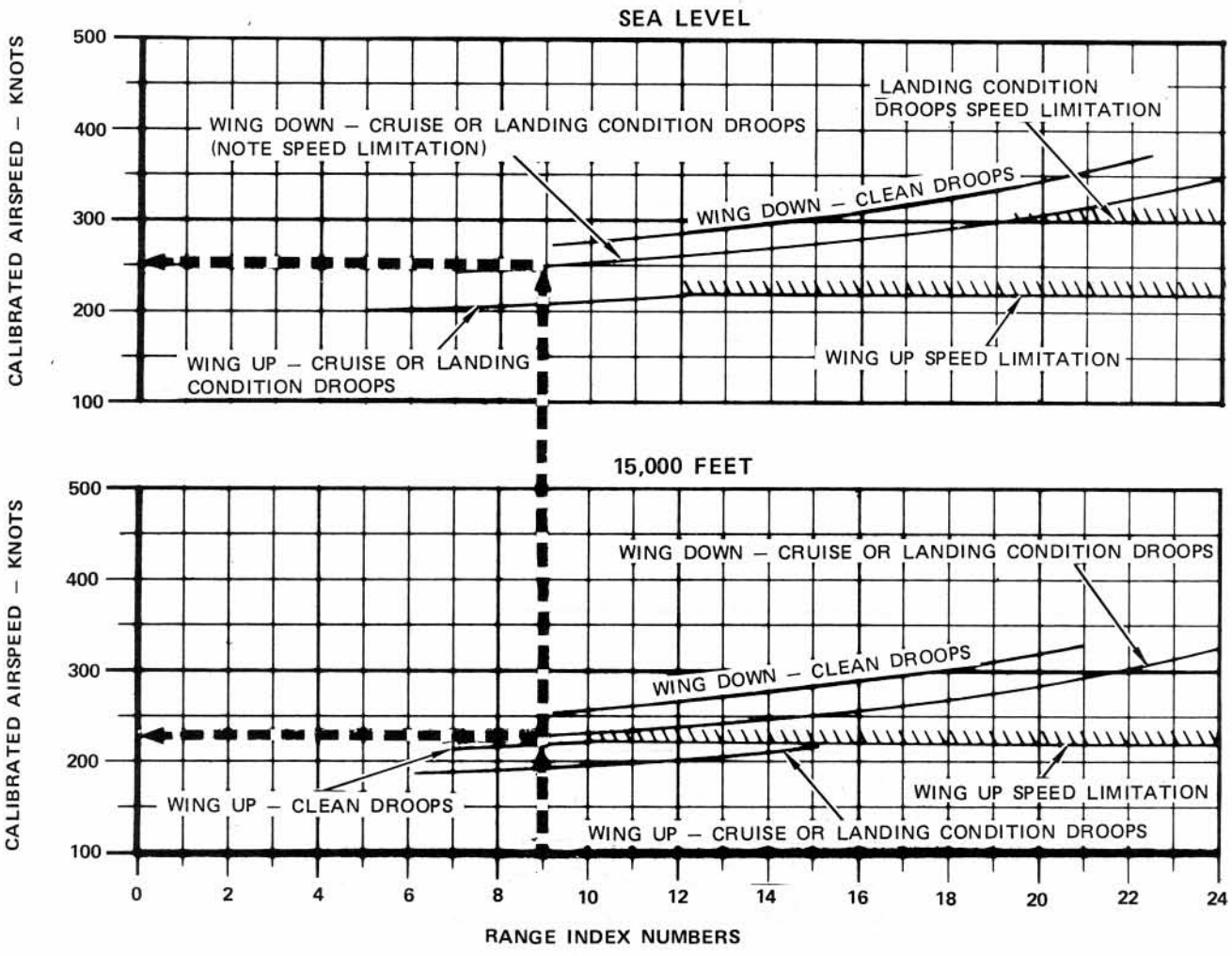
CONDITIONS:
STANDARD DAY

NOTE

For wing up – clean droops, cruise speed is 220 KCAS

how to use chart

Enter appropriate altitude chart with selected range index number. Trace vertically upward to aircraft condition; trace left to read cruise speed.



EXAMPLE: Range index number 9.0; wing down, landing droops out; cruise speed is 250 KCAS at sea level; or 230 KCAS at 15,000 feet.

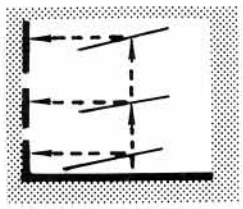
Figure 11-68 (Sheet 1)

EMERGENCY RANGE CRUISE SPEEDS – J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420

CONDITIONS:
STANDARD DAY



how to use chart

Enter appropriate altitude chart with selected range index number. Trace vertically upward to aircraft condition; trace left to read cruise speed.

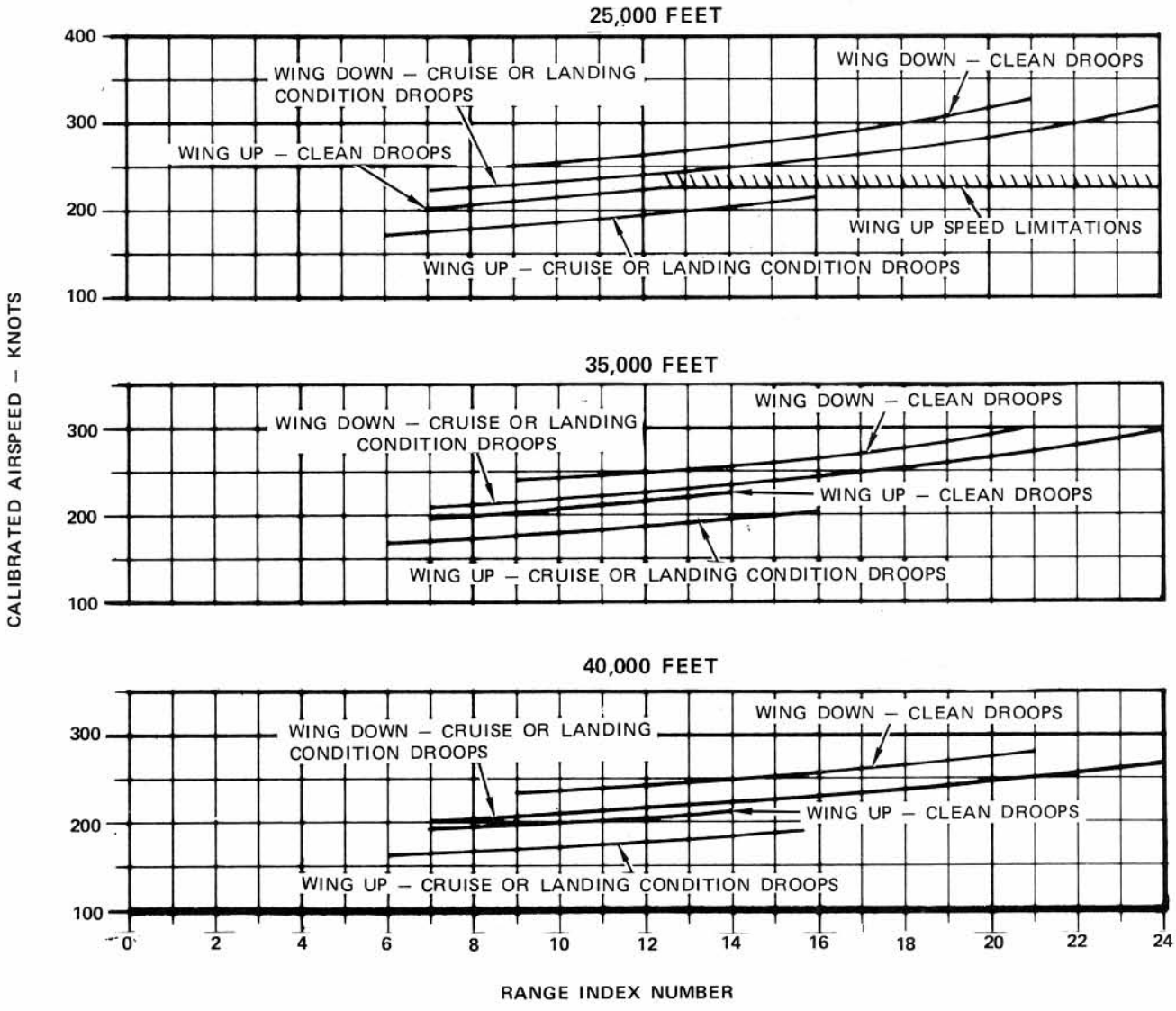


Figure 11-68 (Sheet 2)

EMERGENCY ENDURANCE LOITER SPEED – J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420

CONDITIONS:
STANDARD DAY

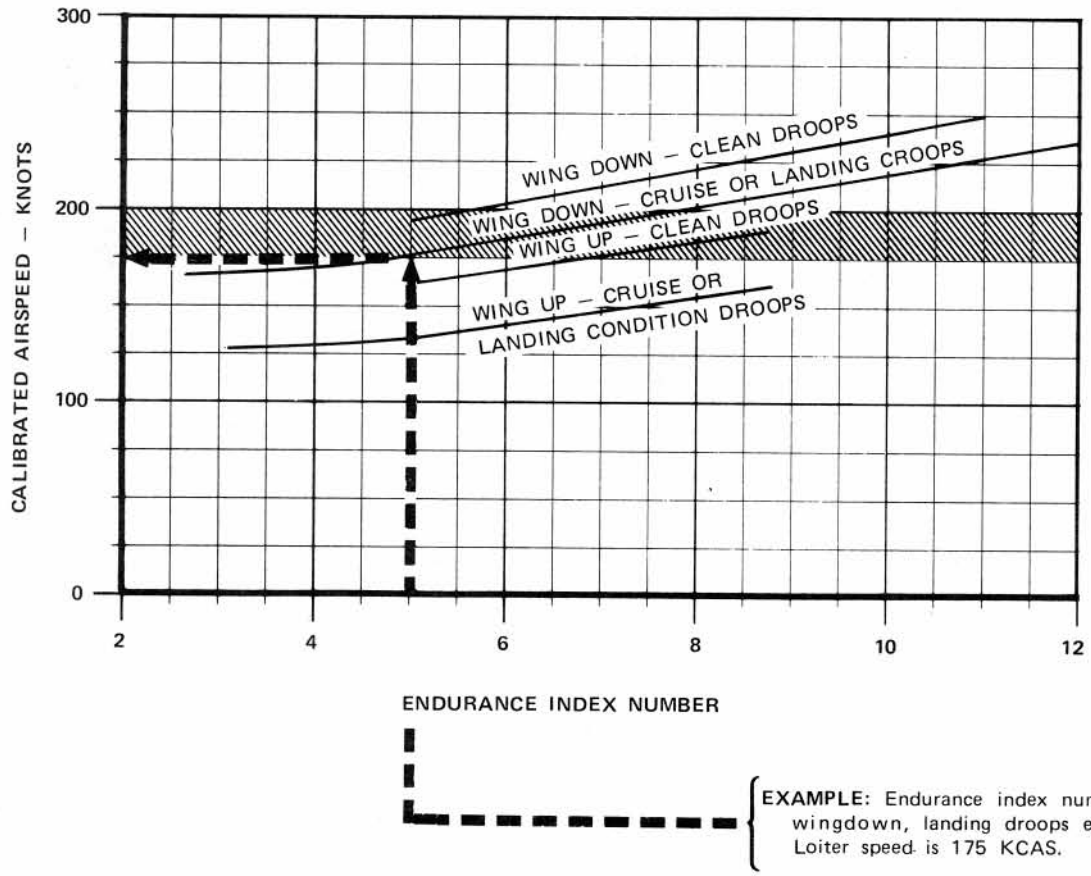
how to use chart

Enter at selected endurance index number. Trace vertically upward to aircraft condition line. Trace left to determine speed.

NOTE

To obtain loiter speed for use with emergency endurance or range charts, use the endurance index number. Increase loiter speed by 6 KCAS for each 10,000 feet above sea level.

– REFER TO COOLING FLOW RESTRICTIONS Part 4, Section I.



EXAMPLE: Endurance index number 5.0 wingdown, landing droops extended. Loiter speed is 175 KCAS.

Figure 11-69

EMERGENCY RANGE AND ENDURANCE DESCENT SPEED – J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420

CONDITIONS:
STANDARD DAY

how to use chart

Enter at selected endurance index number. Trace vertically upward to aircraft condition line. Trace left to determine speed.

NOTE

To obtain descent speed for use with emergency endurance or range charts, use the endurance index number.

– REFER TO COOLING FLOW RESTRICTIONS PART
Part 4 Section I

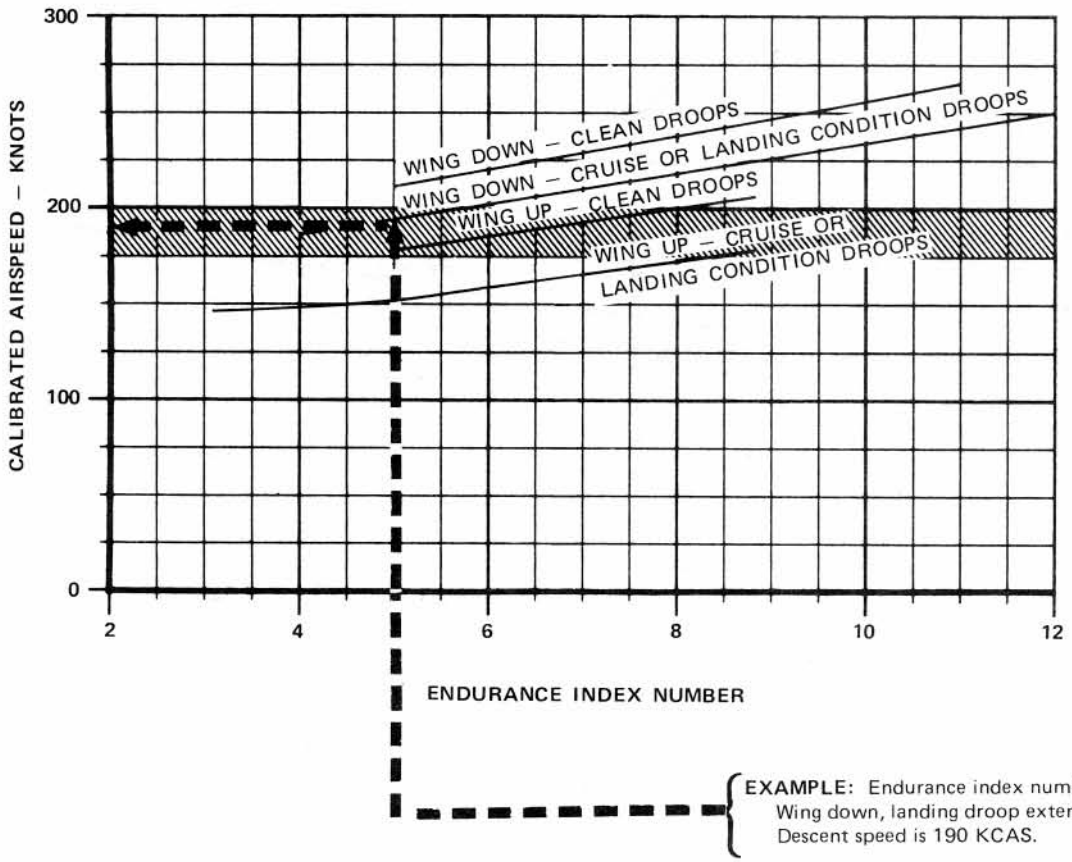


Figure 11-70

EMERGENCY RANGE AND ENDURANCE DECENT – J57-P-420

MODEL: RF-8G
DATA BASIS: FLIGHT TEST
DATE: DECEMBER 1976

ENGINE: J57-P-420
FUEL GRADE: JP-5
FUEL DENSIRY: 6.8 LB/GAL.

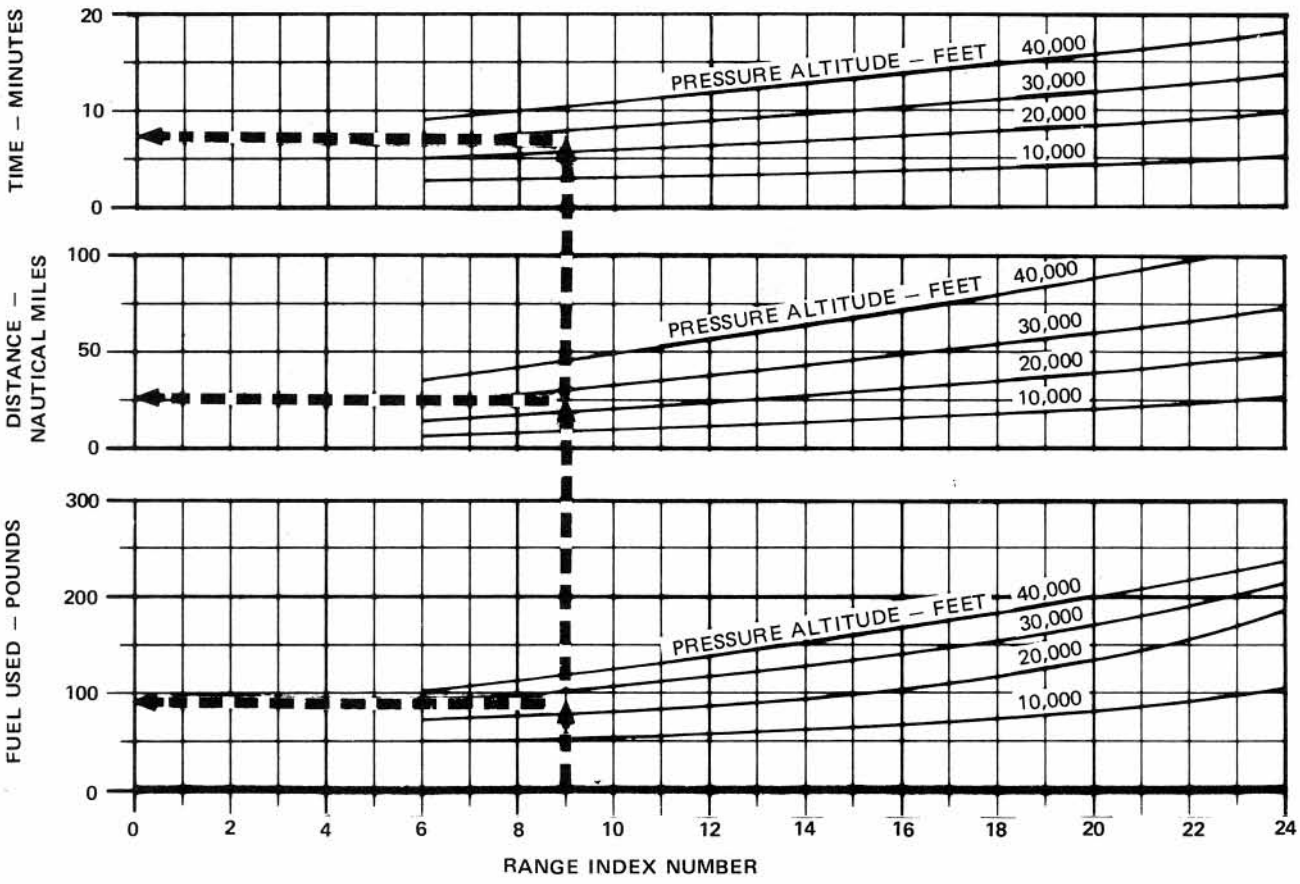
CONDITIONS:
IDLE THRUST DESCENT
STANDARD DAY

NOTE

To find fuel state at which to start descent, add fuel reserve to fuel used in descent.

how to use chart

Enter at selected range index number. Trace vertically upward to pressure altitude line of each graph. Trace left to determine either fuel used, distance or time as required.



EXAMPLE: Range index number 9.0; Pressure altitude 25,000 feet; fuel used is 95 pounds; distance traveled is 25 nautical miles; time to descend 7.5 minutes.

Figure 11-71

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