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FLIGHT HANDBOOK

USAF Series

F-84F AIRCRAFT

PUBLISHED UNDER AUTHORITY
OF THE SECRETARY OF THE AIR FORCE
AND THE CHIEF OF THE BUREAU OF AERONAUTICS

Commanders are responsible for bringing this publication to the attention of all Air Force personnel cleared for operation of subject Aircraft.

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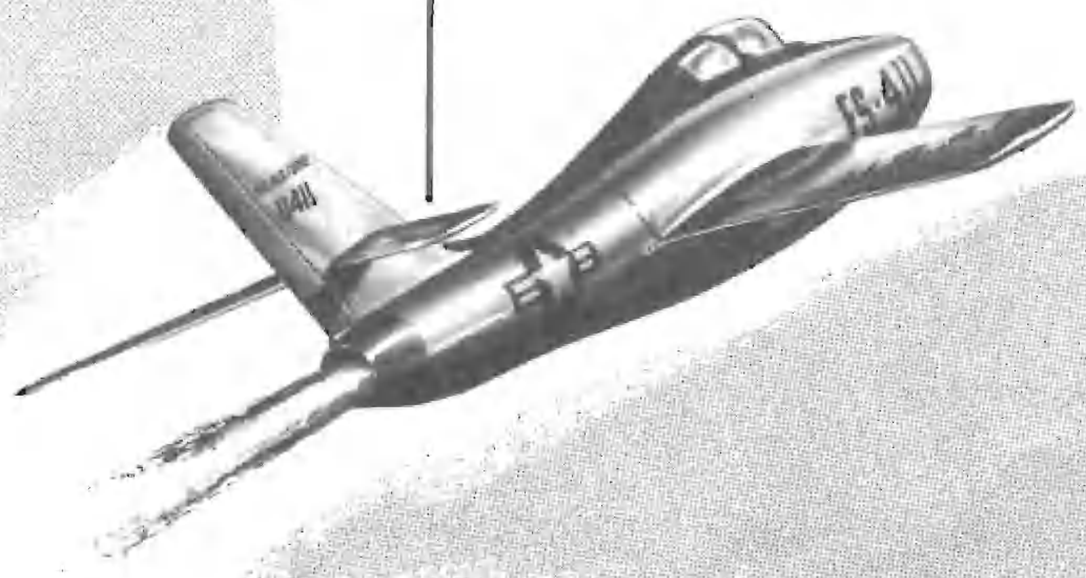


IMPORTANT

In order that you will gain the maximum benefits from this handbook it is imperative that you read this page and the following page carefully.

This Flight Handbook is applicable to F-84F-1 and subsequent airplanes designed by Republic Aviation Corporation and manufactured by both Republic Aviation and General Motors Corporation. Unless otherwise specified, information is applicable to all airplanes. However, where information applies to specific airplanes, these airplanes will be identified by code letters which appear at the top right corner of the paragraph. The code letter assigned to aircraft series are as follows:

A	*F-84F-1RE up to F-84F-20RE*
B	*F-84F-1RE and up*
C	*F-84F-1GK and up*
D	*F-84F-20RE and up*

NOTE

The suffix letters RE identify airplanes manufactured by Republic Aviation Corporation while the suffix letters GK identify airplanes manufactured by General Motors Corporation.

THIS handbook contains all the information necessary for safe and efficient operation of the F-84F series airplanes. These instructions do not teach basic flight principles, but are designed to provide you with a general knowledge of the airplane, its flight characteristics, and specific normal and emergency operating procedures. Your flying experience is recognized, and elementary instructions have been avoided.

The only source of technically accurate and constantly current operating instructions is your Flight Handbook. These instructions are based on the technical knowledge of the Aircraft Manufacturer and the Air Force as well as the experience of the using commands. You would never recognize these new books as your old familiar, undesirable -1 Technical Order. These new books have considered your specific problems and have therefore been made attractive, accurate, current, and very easy to use. Not all of the books have been prepared to the new requirements, but you can tell the old from the new very easily. The new type Handbook has a full page cover illustration whereas the old book has a small "spot" illustration.

Each flight crew member *except those attached to an administrative base* is entitled to have a personal copy of the Flight Handbook while he is stationed at a given base. Don't let anyone tell you different! *Air Force regulation 5-13*, issued 11 August 1953 specifically makes that provision.

You would be surprised at how well the Technical Order distribution system will work if you just do your part. Order your required quantity of Handbooks before they are needed instead of waiting until the need arises. If you order them early, the Air Force will print enough to cover your requirements. If you delay, you will probably be kept waiting a long time when you do order because sufficient copies may not have been originally printed to cover your request – sometime it takes a discouraging long time to get new printing.

The Technical Order system is very easy to cope with. *Technical Order 00-5-2* explains, in just a few pages, the easy means by which you can set the automatic machinery into motion. Actually, all you have to do is reflect your required quantities on the *Publications Requirements Table (T.O. 00-3-1)* and all the revisions, reissues, and supplements will be automatically forwarded to you in the same quantities. Talk to your Base Supply Officer–he should know all about the system since it is his job to fulfill your Technical Order requests. Of course, each base must develop a system of feeding these books and related data to their flight crew members so that no one will be using an obsolete book.

One more thing – we admit it takes a long time to revise the Flight Handbook. Since the time lag is excessive for safety of flight information, a new program has been put into effect to get such information to you in a hurry. This is done by means of Safety of Flight Supplements which use the same number as your Flight Handbook except for the addition of a suffix letter. Supplements covering loss of life will get to you in 48 hours; those concerning serious damage to equipment will make it in 6 days. And what do you have to do to get these supplements? Absolutely nothing! If you have ordered your Flight Handbook on the publications requirements table, you will automatically receive all supplements pertaining to your aircraft. Technical Order 00-5-1 covers some additional information regarding these supplements.

Your comments and questions regarding any phase of the Flight Handbook program are invited and should be directed to the Wright Air Development Center, Attn: WCS.

Section I. DESCRIPTION. This section describes the aircraft and all its systems and controls which contribute to the physical act of flying the aircraft. Also included is a description of all emergency equipment which is not part of the auxiliary equipment.

Section II. NORMAL PROCEDURES. This section presents the steps of procedure to be accomplished from the time the aircraft is approached by the pilot until it is left parked after accomplishing one complete non-tactical flight under normal conditions.

Section III. EMERGENCY PROCEDURES. This section describes the procedure to be followed in meeting any emergency (except those in connection with the auxiliary equipment) that could reasonably be expected.

Section IV. DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT. This section includes a description, normal operation and emergency operation, of all equipment not directly contributing to flight such as armament equipment, oxygen system, communication equipment, etc. Instructions concerning the operation of auxiliary equipment peculiar to this aircraft have been emphasized.

Section V. OPERATING LIMITATIONS. This section lists all operating limitations of the aircraft.

Section VI. FLIGHT CHARACTERISTICS. This section describes the flight characteristics of the aircraft.

Section VII. SYSTEMS OPERATION. This section discusses the operation of the various aircraft systems.

Section VIII. CREW DUTIES. This section is not applicable to this aircraft.

Section IX. ALL WEATHER OPERATION. This section covers the proper technique and procedure to apply when operating under conditions of instrument flight and approach, turbulent air flight, extreme cold and hot weather and desert operation.

Appendix I. OPERATING DATA. This section contains all operating data charts necessary for preflight and inflight mission planning, including explanatory text on the use of the data presented.

F-84F THUNDERSTREAK

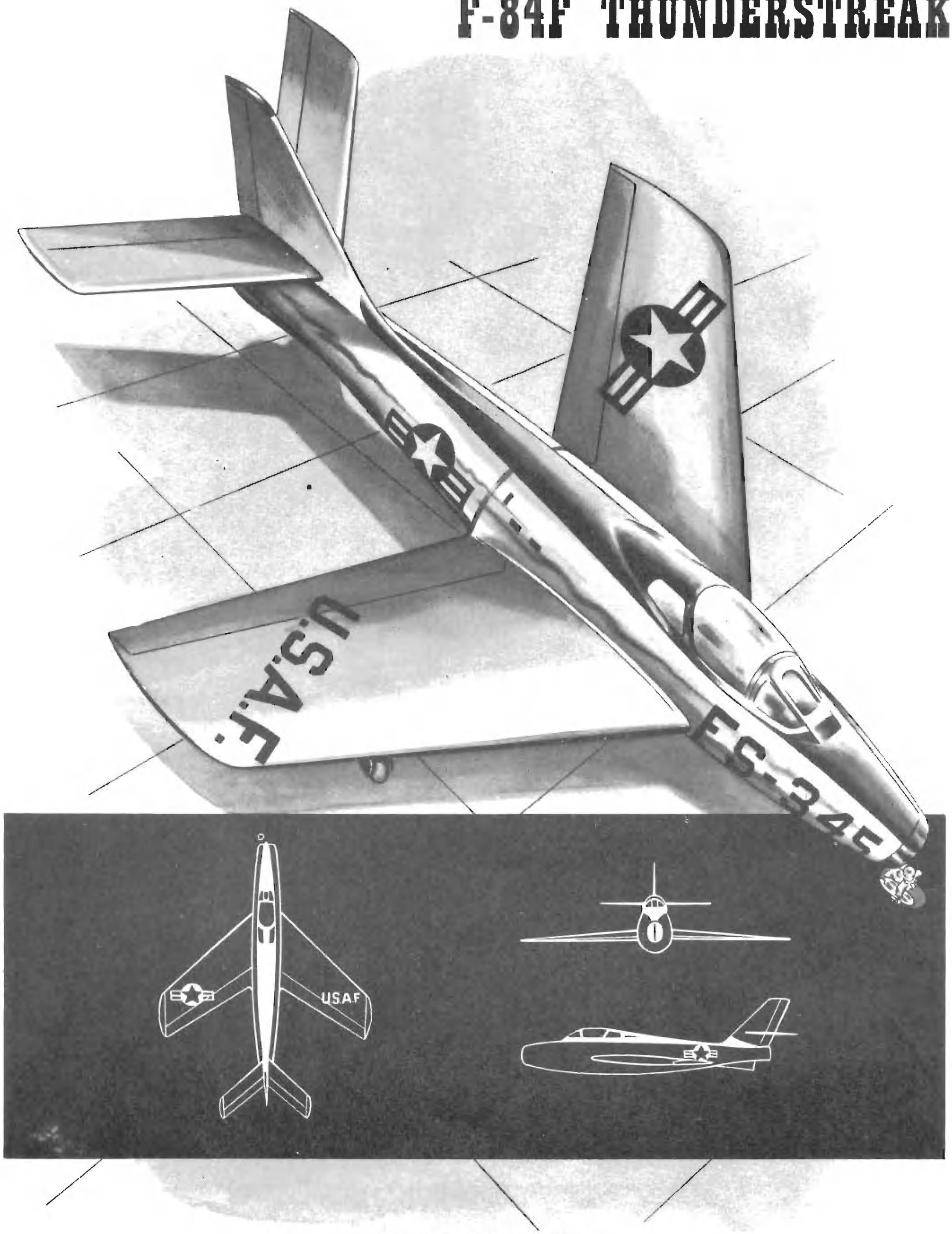


Figure 1—1. F-84F Airplane

Section I DESCRIPTION

AIRCRAFT.

The Republic Aviation Corporation F-84F is a single place, swept-back fighter designed for flight in the subsonic and sonic speed ranges at high altitude. It is powered by a high thrust turbojet engine and lends itself readily to fighter-bomber and long range characteristics. It can carry exceptionally large external loads and yet retain its high speed performance and stability.

Outstanding design features are flight refueling, automatic pilot, pneumatic-type landing gear systems and hydraulic actuator controls.

Pilot comfort is assured by providing greater quantities of air at comfortable temperatures and cabin pressurization at lower effective altitude. Visibility is improved by use of a double wall canopy and a dry air circulating system for anti-fogging purposes and a flat front windshield.

AIRPLANE GROSS WEIGHT.

The gross weight of the airplane averages from 18,500 lbs. for the clean airplane to 25,380 lbs. for the clean airplane plus four external tanks.

ENGINE.

The airplane is powered by an axial flow jet propulsion engine, AF Model YJ65-W-1, or -1A, each rated at 7200 pounds thrust. Air enters an intake in the nose of the airplane and through a 13 stage compressor. After compression the air passes into the combustion chamber where it is heated by the combustion of fuel. The hot exhaust then passes through a two stage turbine producing a high velocity jet in the tailpipe. An ignition and a fuel priming system is provided for starting the engine. The air inlet, to the engine compressor, is provided with a retractable screen to prevent foreign objects from entering the compressor during ground operation. Supplementary thrust, for take-off, is supplied by externally hung ato units.

ENGINE FUEL CONTROL SYSTEM.

The engine fuel control system (figure 1–3) is designed

AIRPLANE DIMENSIONS

Approximate overall dimensions are as follows:

LENGTH (including stabilizers) 43.3 ft
WING SPAN . . . . . 33.6 ft
HEIGHT (to top of fin) . . . . 14.5 ft
TREAD . . . . . 20.4 ft

TABLE 1–1. AIRPLANE DIMENSIONS

to control the rate of fuel flow to the engine so that it will maintain engine operating conditions as selected by the throttle. The system is entirely automatic. Regulated fuel flow is accomplished by action of the main fuel pump by-pass valve which is hydraulically operated. Hydraulic pressure to relieve the pump by-pass valve is regulated by an acceleration and a throttle unit. The acceleration unit senses engine compressor pressures and the throttle unit senses air density; these units are designed to vary fuel flow so as to preserve constant engine rpm with altitude and to limit engine rpm acceleration and deceleration rates so as to prevent excessive temperatures and/or flame outs. The main fuel pump incorporates an engine overspeed governor which also controls the action of the pump by-pass valve. A shut-off is incorporated to permit complete fuel cut-off to the engine when the throttle is fully closed. The engine fuel control system does not include an emergency fuel pump or an alternate fuel control system.

CAUTION

The design of the governor permits the engine to overspeed during a fixed throttle climb. Therefore, the throttle must be adjusted as the rpm increases during this maneuver.

THROTTLE CONTROL.

Engine power is selected by the throttle control (18 figure 1–14) whose extreme positions are marked CLOSED and OPEN. Operation of the throttle is designed so that neither ignition nor fuel will be supplied when the start switch is actuated unless the throttle is opened to the idle or above position. In the throttle CLOSED position, fuel is mechanically cut off and the ignition and priming circuits, which are actuated by the start switch, are interrupted. (Throttle position does not affect the starter circuit or the priming and ignition circuits which are controlled by the air start switch.) When the throttle is at idle or above, the fuel cut off is fully open and the priming and ignition circuits, which are controlled by the start switch, are closed. The throttle quadrant is supplied with an IDLE STOP position which must be bypassed by thumb pressure in order to return the throttle to the CLOSED position. Clockwise rotation of the throttle grip provides manual ranging for the gun-bomb-rocket sight. The grip is spring loaded to the counterclockwise (maximum range) position. The throttle control incorporates a microphone press-to-talk button (black button) and a red button which serves two purposes. During normal operation, the red button is an electrical caging button for the gun-bomb-rocket sight but after the flight refueling door has been opened, the red button then becomes a flight refueling nozzle disconnect. This allows the pilot to effect a nozzle disconnect without removing his hand from the throttle control. The throttle is prevented from creeping by tightening the throttle friction lock (21 figure 1–14).

PRIMING SYSTEM.

Since the engine fuel system prevents fuel from passing to the engine until a pressure of approximately 100 psi is built up by the main fuel pump, the engine is started by a priming system which by-passes the main fuel system. Fuel pressure for the priming system is provided by the booster pump in the selected fuel tank and the engine driven booster pump. The tank booster pumps are energized from the secondary bus and power to these pumps is not available on a battery start. Therefore, during a battery start fuel pressure for starting is supplied solely from the engine driven booster pump. Fuel is supplied through a normally closed solenoid operated primer valve to nine primer jets around the engine where it is ignited by igniters. The primer valve is energized to open from the primary bus through an automatic timing device. The timer opens the primer valve for a period of 20 seconds when the starter switch is actuated for a period of 20 seconds when the starter switch is actuated and the throttle is at idle or above position. The timer is also energized to open the primer valve for 20 seconds if the air start switch is depressed regardless of the throttle position; however, fuel will not flow to the engine unless the fuel cut-off is opened by the throttle in the idle or above position. In either case the timer circuit

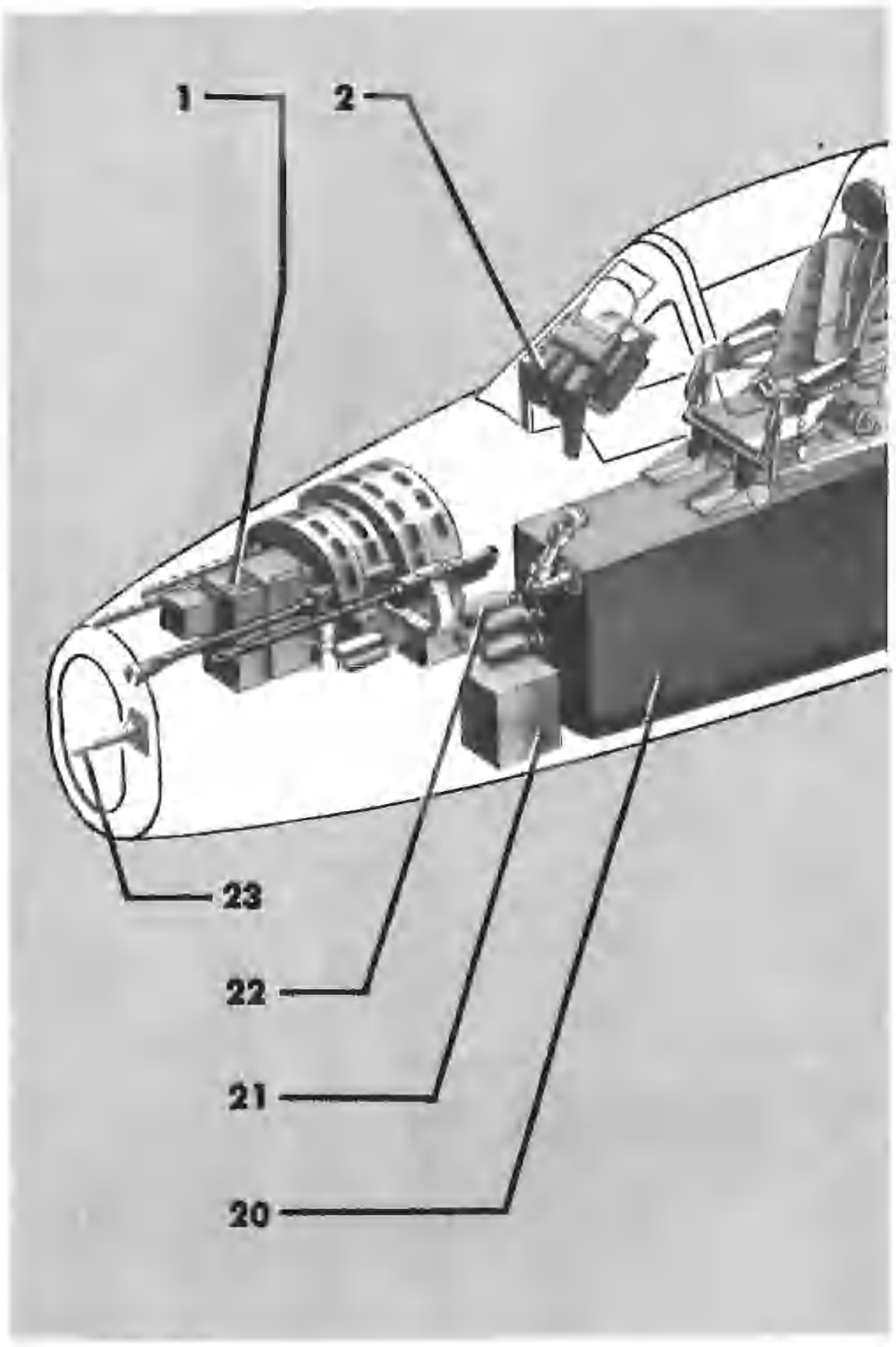
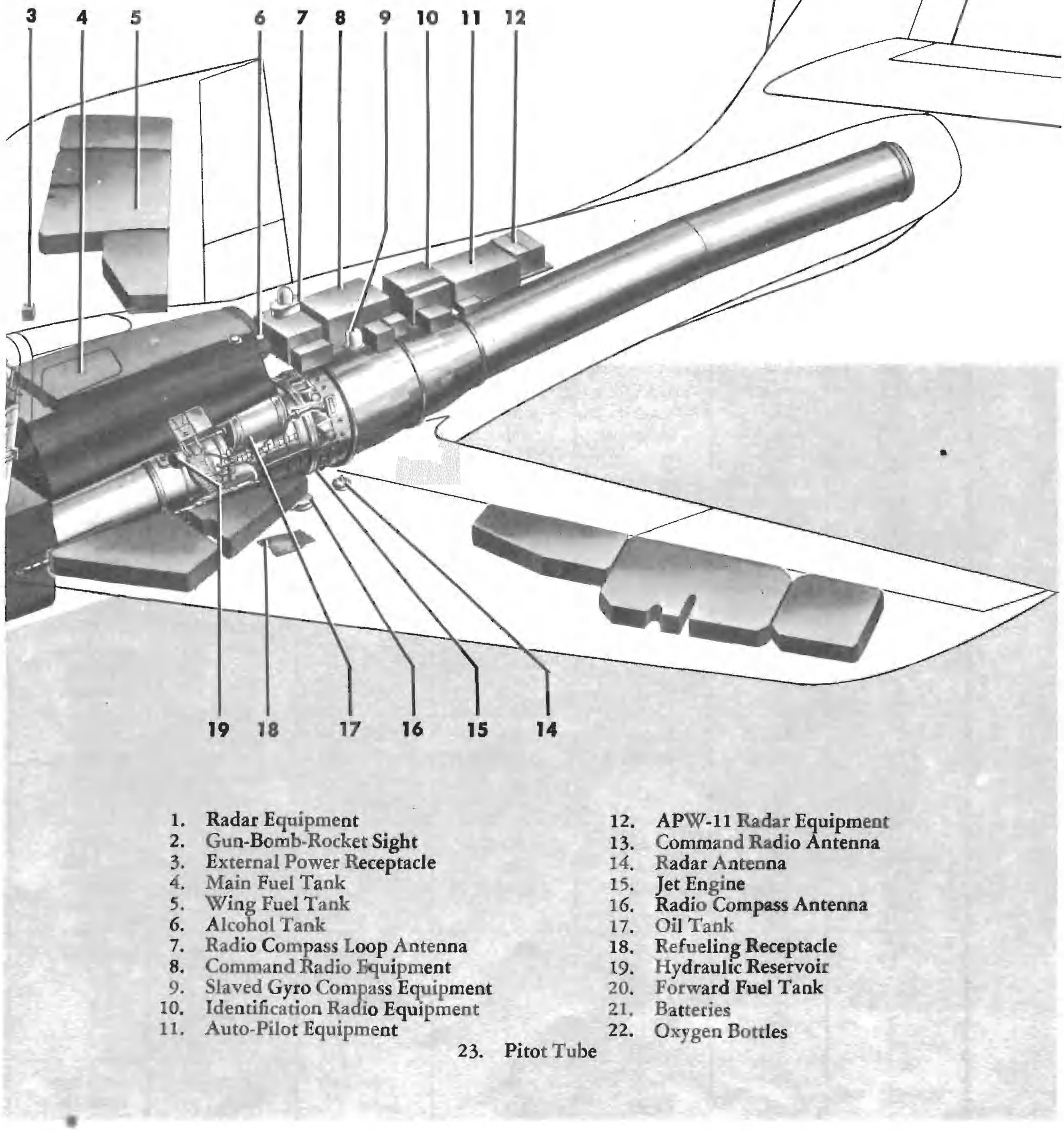


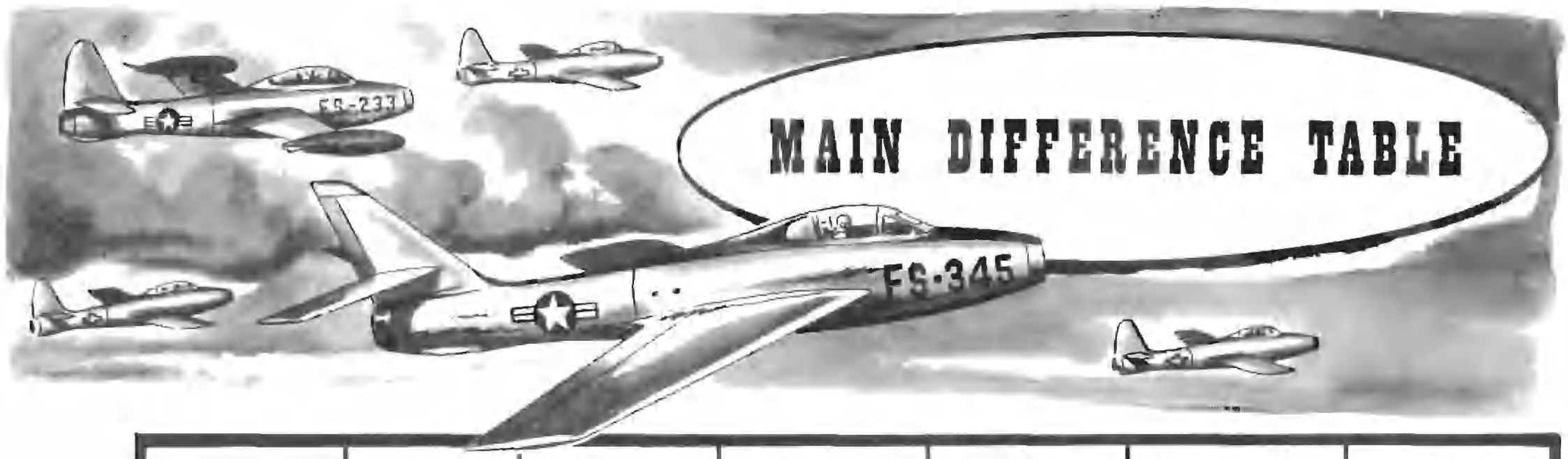
Figure 1–2. General Arrangement (Sheet 1 of 2)

GENERAL ARRANGEMENT



1. Radar Equipment
2. Gun-Bomb-Rocket Sight
3. External Power Receptacle
4. Main Fuel Tank
5. Wing Fuel Tank
6. Alcohol Tank
7. Radio Compass Loop Antenna
8. Command Radio Equipment
9. Slaved Gyro Compass Equipment
10. Identification Radio Equipment
11. Auto-Pilot Equipment
12. APW-11 Radar Equipment
13. Command Radio Antenna
14. Radar Antenna
15. Jet Engine
16. Radio Compass Antenna
17. Oil Tank
18. Refueling Receptacle
19. Hydraulic Reservoir
20. Forward Fuel Tank
21. Batteries
22. Oxygen Bottles
23. Pitot Tube

Figure 1–2. General Arrangement (Sheet 2 of 2)



MAIN DIFFERENCE TABLE

	F-84B	F-84C	F-84D	F-84E	F-84G	F-84F
Engine	J35-A-5 J35-A-15	J35-A-13	J35-A-17 Derated J35-A-29	J35-A-17	J35-A-29	YJ65-W-1 YJ65-W-1A
Fuel System	Toggle switches up to F-84B-21RE	Rotary switch F-84B-21RE up to F-84C-11RE.	Manual fuel tank selector. F-84C-11RE and up.	Manual fuel tank selector.	Manual fuel tank selector. Flight refueling single point ground refueling.	Manual fuel tank selector. Flight refueling single point ground refueling.
Landing Gear	Hydraulic shrink struts	Hydraulic shrink struts	Mechanical shrink struts	Mechanical shrink struts	Mechanical shrink struts	Mechanical shrink strut nose wheel only.
Flight Controls	Conventional with hydraulic Aileron boost	Conventional with hydraulic Aileron boost	Conventional with hydraulic Aileron boost	Conventional with hydraulic Aileron boost	Conventional with hydraulic Aileron boost	Conventional with hydraulic Aileron elevator and rudder actuators
Trim	Trim tabs	Trim tabs	Trim tabs	Left aileron and elevators tabs only.	Left aileron and elevators tabs only.	Adjustable spring capsules and adjustable horizontal stabilizer
Canopy	Sliding — Jettisonable	Sliding — Jettisonable	Sliding — Jettisonable	Sliding — Jettisonable with canopy remover.	Sliding — Jettisonable with canopy remover.	Clamshell Jettisonable
Wings and Empennage	Straight — Up Stabilizer	Straight — Fixed Stabilizer	Straight — Fixed Stabilizer	Straight Fixed stabilizer	Straight Fixed stabilizer	Sweptback adjustable Horizontal stabilizer
Gun Sight	K-14B	K-14B	A-1C	A-1C with APG-30 provisions	A-1C up to F-84G-5RE A-4 on F-84G-5RE and up. APG-30 on all.	A-4 with APG-30
Bomb Racks	Fixed Pylons	Fixed Pylons	Fixed Pylons	Jettisonable Pylons	Jettisonable Pylons	Jettisonable Pylons

TABLE 1—2. MAIN DIFFERENCES TABLE

ENGINE FUEL CONTROL SYSTEM

Schematic

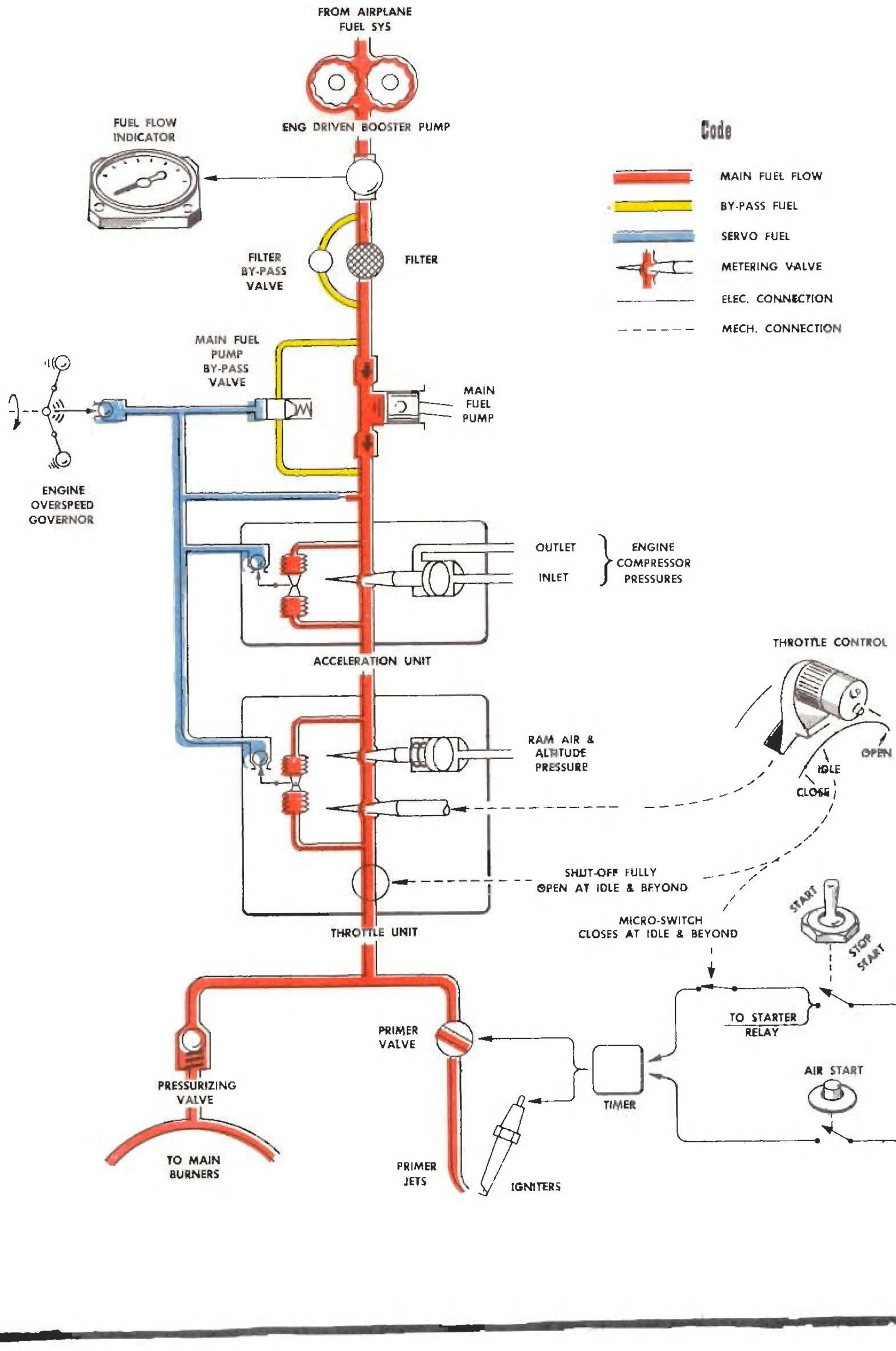


Figure 1–3. Engine Fuel Control System – Schematic

Schematic

AIRPLANE FUEL SYSTEM

F-84F-1RE up to -15RE and F-84F-1GK up to -25GK

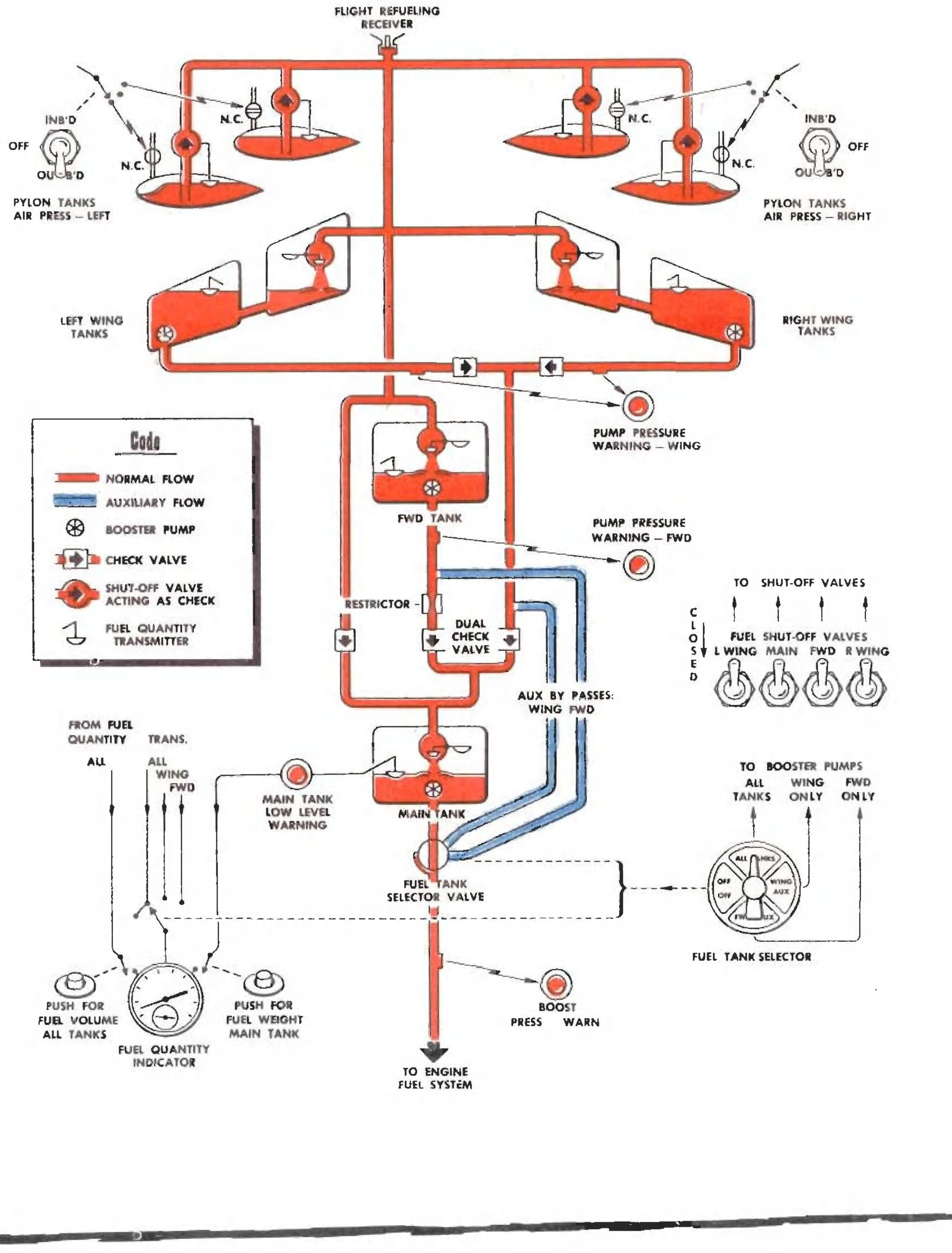


Figure 1—4. Airplane Fuel System Schematic — F-84F-1RE to -15RE and F-84F-1GK to -25GK

Schematic

AIRPLANE FUEL SYSTEM

F-84F-15RE

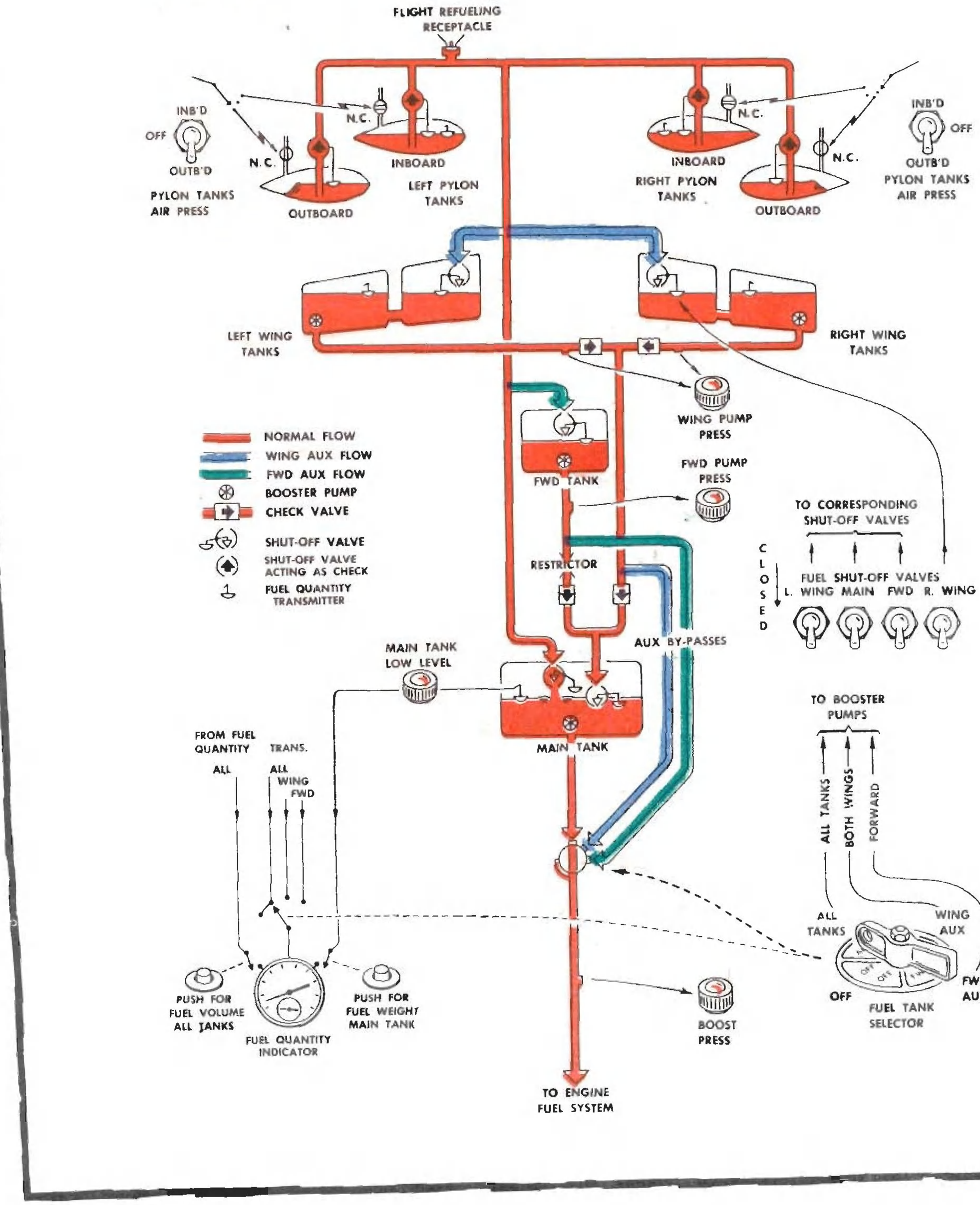


Figure 1—4A. Airplane Fuel System Schematic — F-84F-15RE Airplanes

Schematic

AIRPLANE FUEL SYSTEM

F-84F-20RE

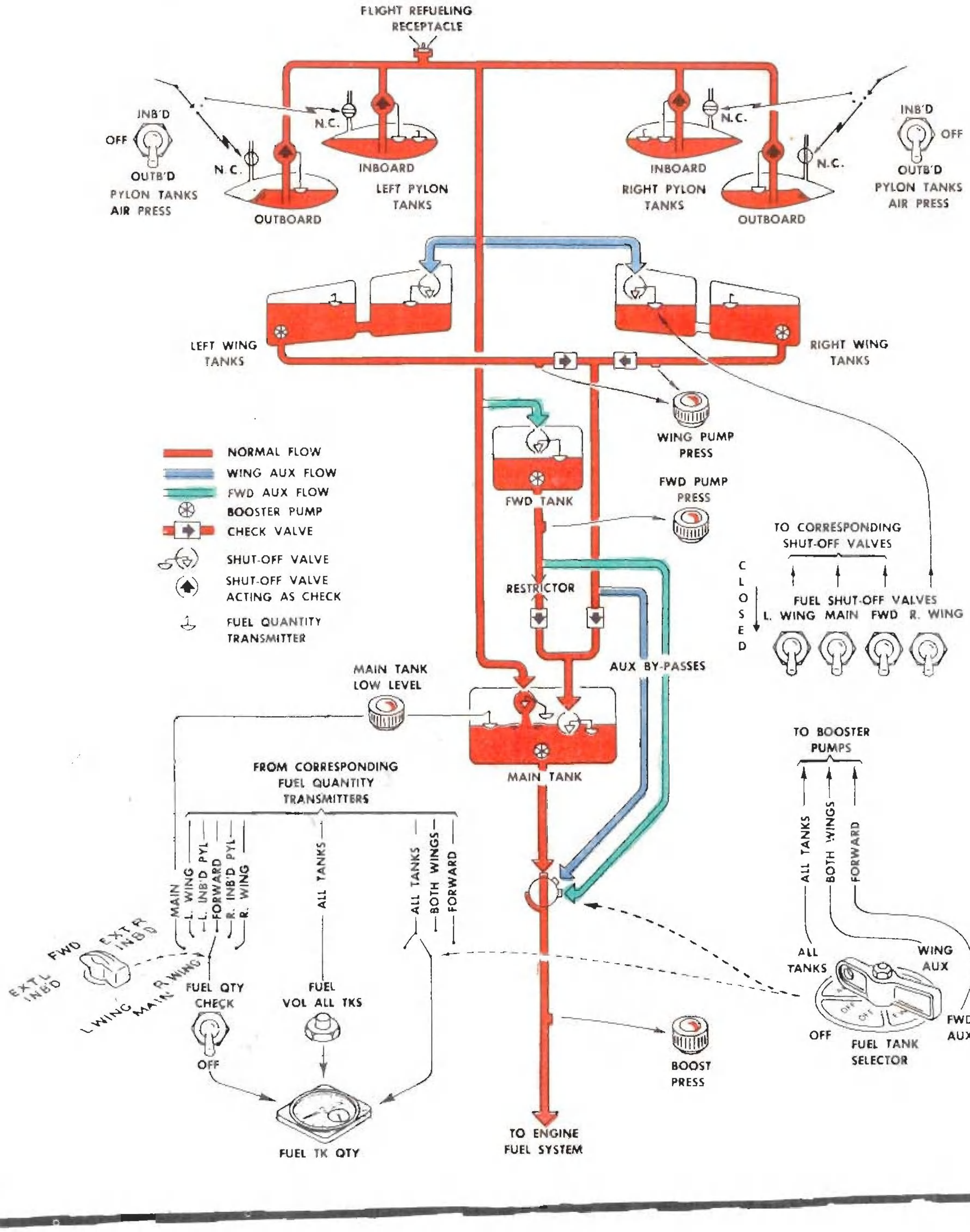


Figure 1–4B. Airplane Fuel System Schematic — F-84F-20RE Airplanes

can be interrupted so as to close the primer valve by actuating the starter switch to the STOP START position. Once the timer cycle has started, the 20 second limit must elapse before another 20 second cycle can be started unless the timer circuit is interrupted by placing the starter switch in the STOP START position.

IGNITION.

The fuel-air mixture in the engine is ignited by an automatic ignition system which incorporates two igniters. Once the engine is started the ignition system is no longer used as burning in the combustion chambers is continuous. Power for ignition is supplied by two high tension vibrators which derive their power from the primary bus. The system incorporates a timer device which supplies ignition continuously for 20 seconds; controls are also provided for interrupting the 20-second ignition cycle. The ignition system is operated by the start or air start switch which are discussed under starting system.

STARTING SYSTEM.

Engine starting torque is provided by a 28 volt d-c combination starter-generator unit mounted on the front of the engine and using a common drive. The unit is used as a starter motor during engine start and, after engine start, is used as a generator for the airplane's d-c electrical system. Power for the starter is supplied from the primary bus or from the external power receptacles. The starter operates automatically until the engine reaches approximately 18% rpm at which time power to the starter is automatically disconnected. The ignition and primer systems operate concurrently with the starter. These systems are designed to function for a period of 20 seconds only after the throttle is in the idle or above position and will not operate when the throttle is closed. However, the ignition and priming systems as well as the starter will automatically cease functioning when the engine reaches approximately 18% rpm; this same cessation may be accomplished manually. Controls are also provided for starting the engine during air starts and for ground maintenance.

STARTER SWITCH.

The starter switch (10 figure 1–13) is provided to actuate the engine starter and the automatic ignition and priming timer. It is a three position switch spring loaded to the center position. The two extreme positions are START and STOP START with the center position unmarked. Held for two seconds in the START position energizes the automatic starting system and arms the ignition and priming timer unit. The starter will operate until the engine rpm increases to approximately 18% at which time the starter relay will automatically disconnect the starter and timer. The timer will operate for 20 seconds only after the throttle is moved from the CLOSED to the idle or above position. If the starter switch is momentarily held in the STOP START position the starter and the timer unit will be deenergized immediately. For normal starts power is supplied by the two external power receptacles. However, if only one plug is available the service receptacle is used with the normal-emergency start switch in the EMERG START position. A start can also be accomplished with the airplane's batteries if the battery switch is in BATT ON, the normal-emergency start switch in the EMERG START position and the instrument power switch in the ALT position.

Engine rotation can be checked during ground maintenance by placing the starter switch in the START position with the throttle fully closed and the fuel tank selector in the OFF position.

CAUTION

If the throttle is opened to the IDLE position or above while turning the engine over for ground test, the ignition and priming circuits will be energized and the engine may start.

AIR START SWITCH.

The air start switch (21 figure 1–13) is provided to supply ignition and priming fuel during an air start when the engine is windmilling and starting torque is not required. A ground check of the ignition system can also be made using the air start switch. In this case the throttle must be in the CLOSED position so that fuel will not flow to the engine primers. The switch is a push button type marked AIR START. When depressed momentarily the automatic timing unit is energized from the primary bus to supply ignition to the engine and open the priming solenoid for a period of 20 seconds regardless of the throttle position. However, priming fuel will not flow to the primers unless the throttle is in the idle or above position. Ignition can be stopped and the primer valve closed if the timer circuit is interrupted by pacing the starter switch in the STOP START position.

NORMAL-EMERGENCY START SWITCH.

The normal-emergency start switch (11 figure 1–13) is provided to connect the primary bus to the starter circuit during an emergency start; i.e., when start is made without power cart connected to the starter external power receptacle. The two switch positions are NORM START and EMERG START with a red cover guarding the EMERG START position. The NORM START position is used when a ground start is made using both external power receptacles. The EMERG START position is used if the start is to be accomplished using the service receptacle or the airplane's batteries.

ENGINE SCREEN.

The engine screens are provided to protect the engine compressor from foreign objects during ground operation. However, the screens are retractable during flight so as to prevent loss of thrust and high exhaust gas temperatures which could result from icing. Engine thrust is increased by approximately 3% with the screens retracted. The screens are located in the air intake duct just forward of the engine and are operated with hydraulic pressure. The hydraulic pressure passes through a solenoid valve, powered from the primary bus. A light indicates operation and position of the screens.

ENGINE SCREEN SWITCH.

The engine screen switch (30 figure 1—14) is powered from the primary bus and positions a solenoid valve in the hydraulic system to operate the engine screens. The two switch positions are EXTEND and RETRACT. When the switch is placed in the EXTEND or the RETRACT position the engine screen will move to the respective position and the solenoid valve will automatically return to neutral. The switch is left in the selected position after the screen has cycled.

ENGINE SCREEN WARNING LIGHT.

The engine screen warning light (30 figure 1—14) will illuminate whenever the engine screen switch is repositioned and will remain illuminated until the screen has completed its cycle to either the fully extended or retracted position if power is available from the primary bus.

ASSIST TAKE-OFF SYSTEM.

Provision is made for the installation of four solid fuel ato units on an expendable adapter which is suspended from retractable hooks on the underside of the fuselage. The units are used to supply additional thrust for high gross weight or shorter run take-offs. Each unit is rated at 1000 lb. thrust and once ignited, burns continuously for 14 seconds. After ignition takes place the unit cannot be turned off or the adapter cannot be jettisoned while the units are producing thrust. Power to ignite the units is supplied from the primary bus. The adapter is jettisoned and the hooks on the fuselage are retracted by means of hydraulic pressure which is controlled by an electrically operated shut-off valve powered from the primary bus.

ATO READY SWITCH.

The ato ready switch (32 figure 1—4) is provided as a safety switch to prevent accidental firing of the ato units. It is a switch type circuit breaker with two positions marked OFF and ATO READY. The ATO READY positions arms the ato ignition system and illuminates the ato ready warning light if the primary bus is energized.

ATO IGNITION SWITCH.

The ato ignition switch (1 figure 1—13) is a push button type switch marked ATO IGNITION. When depressed to the ATO IGNITION position a circuit is completed to the ignition posts of the ato units if the primary bus is energized and the ato ready switch is in the ATO READY position.

ATO JETTISON SWITCH.

The ato unit adapter, suspended from retractable hooks under the fuselage, is hydraulically jettisoned after the ato units have burned out. The jettisoning system is controlled by the ato jettison switch (6 figure 1—13). The switch is a push button type switch marked ATO JETTISON. Depressing the ato jettison switch for a minimum of two seconds energizes the ato jettison solenoid shut-off valve from the primary bus to allow hydraulic pressure to release the adapter and retract the hooks into the fuselage.

OIL SYSTEM.

The oil system is entirely automatic and requires no attention from the pilot. Lubricating oil is contained in a 5.2 U.S. gallon capacity oil tank which is mounted on the upper left side of the engine compressor housing. Oil, under pressure, is delivered to the front bearings and accessory drives where it is scavenged and returned to the oil tank. Two metering pumps, in the oil pump, supply metered oil to the center and rear engine bearings where it is mixed with air and forms a mist. This oil is not scavenged but is vented overboard through a vent located on the underside of the fuselage. Air flow around the fuselage prevents the mist from collecting on the fuselage skin. Oil consumption is approximately 2.5 lbs. per hour maximum. The oil tank is designed to supply sufficient oil to the engine during inverted flight for a period of approximately one minute. Oil grade and specifications are noted in the servicing diagram figure 1—20.

FUEL SYSTEM.

The airplane fuel system, figure 1—4, is designed to provide automatic fuel transfer during normal operation without attention from the pilot. The airplane is basically equipped with four internal, self-sealing fuel tanks; a main tank installed behind the pilot, a forward tank under the cockpit floor and interconnected tanks in both wings. In addition, a jettisonable external tank can be carried on each of four pylons. Fuel from all tanks, internal and external is transferred to the main tank simultaneously on airplanes up to F-84F-15RE and -25GK. On F-84F-15RE and subsequent RE airplanes the external fuel is transferred to the main tank before internal fuel is transferred. Normally tanks empty in the following order; external tanks, wing tanks, forward tank and the main tank. A restrictor is incorporated in the forward tank outlet to adjust fuel flow so as to automatically maintain the required cg location; the wing tanks are emptied at the same time or before the forward tank. Transfer of fuel from the external to the internal tanks is accomplished by means of air pressure which is manually controlled. Each internal tank incorporates a float which controls a shut-off valve in the transfer line to the tank. Fuel will flow to the tank until it is full then the float will automatically close the shut-off valve in the transfer line to that tank. These shut-off valves may be closed at any time to prevent fuel flow to any of the internal tanks. Internal tank fuel is pumped into the main tank by booster pumps which operate automatically according to the position of the fuel tank selector. The main tank is kept full until all external and internal fuel is used. A booster pump in the main tank supplies the engine fuel system. The pilot may vary the normal sequence of fuel flow by setting the manual fuel tank selector to allow a direct flow of fuel to the engine from either the internal wing or forward tanks. If the wing or forward tank is selected, fuel will flow to the main tank until it is full then all fuel will flow from the selected tank to the engine. The system is provided with a flowmeter which indicates the rate of fuel flow to the engine, also a fuel quantity indicator which reads

Fuel Quantity Data (Gallons)

TANKS	NO.	USEABLE FUEL (EACH)
Main	1	193
FWD	1	171
L. Wing	1	97
R. Wing	1	116
Left Inboard Pylon	1	230
Right Inboard Pylon	1	230
Left Inboard Pylon (Alt)	1	450
Right Inboard Pylon (Alt)	1	450
Left Outboard Pylon	1	230
Right Outboard Pylon	1	230

Useable Fuel Totals

Maximum Internal (Main, FWD, Wing)	577
Internal Plus Inboard Pylons (Main, FWD, Wing & Inboard Pylons)	1037 1477 alt.
Maximum (Main, FWD, Wing, Inboard and Outboard Pylons)	1497

Figure 1–5. Fuel Tank Elevation and Capacities

the amount of fuel remaining in the airplane. Provisions for ground refueling of the airplane, from a point are made through an adapter installed in the flight refueling receptacle on the left wing. The single point refueling equipment is designed to operate similar to the flight refueling system. The refueling truck must be equipped with a single-point nozzle and must be capable of delivering fuel at 500 gpm at a pressure of 50 psi. The airplane is provided with a flight refueling system and a fuel filter deicing system which are covered in Section IV.

FUEL SPECIFICATION AND GRADE.

Recommended fuel specification and grade are noted on the servicing diagram, figure 1–20.

BOOSTER PUMPS.

A booster pump is provided in the main fuel tank to supply fuel to the engine fuel control system. Booster pumps in the wing and forward tanks normally transfer fuel from these tanks to the main tank but also may be used to supply the engine fuel control system directly by proper positioning of the fuel tank selector. All the booster pumps are electrically operated from the secondary bus and are controlled by a rotary switch mechanically connected to the fuel tank selector. At altitudes below 6,000 feet, full engine rpm may be maintained with a failed booster pump as the fuel can be recovered by direct suction of the engine driven booster pump. Engine operation up to a maximum range power setting, with an inoperative booster pump and a maximum fuel temperature of 80°F, will be satisfactory up to 20,000 feet when operating on JP-4 fuel or up to 10,000 feet when operating on JP-3 fuel or gasoline. Operation of

Figure 1–6. Assist Take-off Installation

the engine from a tank containing a failed booster pump may result in vapor lock and damage or complete failure to the engine driven fuel pump if operating above 6,000 feet on hot fuel or above 10,000 feet on cool JP-3 or 20,000 feet on cool JP-4 fuel. Caution must be observed when switching from a fuel tank without the booster pump operating to a fuel tank with the booster pump operating as the engine rpm may surge enough to cause an acceleration flame-out. Fuel from the wing or forward tanks cannot be transferred to the main fuel tank without the aid of the booster pumps in the respective tanks, however, fuel may be fed directly to the engine from the forward tank up to 6,000 or 20,000 feet, depending on the fuel, with an inoperative booster pump. It is possible to feed in this manner from the wing tanks but operation under these conditions is prohibited due to the lack of individual wing fuel tank level indicators. There are no direct indicators to show when a booster pump is not operating, however, booster pump failure may be suspected as noted under fuel system indicators.

FUEL SHUT-OFF VALVES.

Shut-off switches are provided to close the fuel shut-off valves in the internal tanks; so that fuel will not be transferred. Refer to Section IV for detailed description.

PYLON TANKS AIR PRESSURE SWITCHES.

Fuel from the external tanks is transferred to the internal tanks by means of air pressure. The pylon tank air pressure switches control the flow of air for pressurizing the external tanks. There are two switches; one marked LEFT and the other RIGHT. Each switch has three positions; INB'D PYLON TANKS AIR PRESS., OUTB'D PYLON TANKS AIR PRESS., and OFF. When in the INB'D PYLON TANKS AIR PRESS OR OUTB'D PYLON TANKS AIR PRESS position, air from the engine compressor is directed to pressurize the respective tanks. In the OFF position the air pressure and vent ports are closed. The vent port is automatically opened during the flight refueling cycle so as to permit fuel flow into the tanks. The air pressure port is spring loaded to the closed position. Power from the primary bus keeps the port open, therefore in the event of primary bus power failure the external fuel will not transfer.

PYLON TANK JETTISONING.

JETTISON EXTERNAL STORES SWITCH.

The jettison external stores switch (2 figure 1–13) is a push button type switch recessed in the panel to prevent accidental actuation. The switch is marked EXTERNAL STORES JETTISON, and when depressed will jettison the outboard and inboard pylon tanks together with the pylons if the battery bus is energized. Rockets will also jettison if the airplane is airborne and the primary bus is energized.

CAUTION

The pylons will jettison together with any stores if the jettison external stores switch is depressed with the airplane in the static position.

JETTISON OUTB'D AND INB'D PYLON SWITCHES.

The inboard and outboard pylons can be jettisoned separately by actuating the respective pylon jettison switch (12, 13 figure 1–14). Each of the two switches is guarded with a cover type guard. One guard is marked JETT INBD PYLON and an arrow while the other is marked JETT OUTBD PYLON with an arrow. When either switch is actuated in the direction of the arrow to the JETT position the respective pylons will be jetti-

FUEL TANK SELECTOR

The fuel tank selector is a rotary control having four positions. The selector mechanically positions the fuel tank selector valve and indexes a rotary switch which opens and closes circuits to the internal tank booster pumps and to the fuel quantity indicator so that readings on the indicator will reflect the tank(s) being used. The four positions are as follows:

ALL TANKS

The ALL TANKS (normal) position turns on all booster pumps; channels all internal fuel into the main tanks and completes a circuit to the fuel quantity indicator to read fuel in all tanks except outboard external tanks. The main tank booster supplies fuel to the engine driven booster pump. As the fuel in the main tank drops to a predetermined level, a float in the tank opens a shut-off valve in the transfer line and allows fuel from the external tanks to transfer to the main tank. When external tanks have emptied, fuel from the wing and forward tanks transfer to the main tank simultaneously. To maintain a favorable cg travel the flow is such that approximately 0 to 20 gallons will still be in the forward tank after the wing tanks have emptied. The remaining forward and main tank fuel is then used. The remaining forward and main tank fuel is then used. The fuel quantity indicator will indicate fuel remaining in all tanks, internal and external.

Figure 1–7. Fuel Tank Selector (Sheet 1 of 2)

soned simultaneously and also any stores carried on them if the battery bus is energized.

BOMB RELEASE SWITCH.

The outboard or inboard pylon tanks can be jettisoned in the same manner as for normally releasing the bombs by use of the bomb release switch. This switch is described in detail in Section IV.

WING PUMP PRESSURE WARNING LIGHT.

Wing booster pump pressure is indicated by a red light (21 figure 1–12) marked WING PUMP PRESSURE WARN. The light will illuminate if the pressure in the fuel line from either wing tank is between 4.5 and 6.5 psi and the primary bus is energized. The light-on condition indicates that one or both wing tanks are empty or the booster pump in one or both wing tanks has failed. In the event of a failed booster pump in one wing, fuel from that wing will not transfer to the main tank. The remaining fuel will affect trim only slightly.

CAUTION

In normal operation the flicker or light-on condition of the wing pump pressure warning light is disregarded since fuel is being fed to the engine from the main tank; however, in WING AUX operation, the engine is being fed directly from the wing tanks and at the first flicker or flash of the warning light the FWD AUX position on the fuel tank selector must be selected immediately (if fuel remains in the forward tank) to assure against a flame-out.

FORWARD PUMP PRESSURE WARNING LIGHT.

Forward tank booster pump pressure is indicated by a red light (20 figure 1–12) marked FWD PUMP PRESSURE WARN. The light will illuminate if the pressure in the fuel line from the forward tank is between 4.5 and 6.5 psi and the primary bus is energized. The light-on condition indicates that the forward tank is empty or the booster pump has failed. In the event of a booster pump failure the forward tank fuel cannot be transferred to the main tank by gravity since the main tank is higher than the forward tank.

MAIN TANK LOW LEVEL WARNING LIGHT.

The main tank low level warning light (29 figure 1–12) is a red light marked MAIN TANK LOW LEVEL WARNING and will illuminate when there is approximately 150 gallons (975 to 1000 lbs) of fuel or less remaining in the main tank and the primary bus is energized.

BOOSTER PRESSURE WARNING LIGHT.

The booster pressure warning light (19 figure 1–12) is a red light marked BOOST PRESS WARN and will illuminate if the primary bus is energized and the fuel pressure between the fuel selector valve and the engine driven booster pump is between 4.5 and 6.5 psi.

FUEL QUANTITY INDICATOR.

The fuel quantity indicator (27 figure 1–12) is an a-c powered electrical unit which operates from power of either the normal or alternate inverter. It reads the quantity of fuel remaining in the airplane in units of pounds with provisions for indicating when the airplane is fully serviced based on the fuel volume. Fuel weight is calibrated by the combination of a float unit in each tank and a unit installed in the main tank which compensates for the density and temperature of fuel in the tanks. This combination assures a true indication of the weight of fuel in the airplane within a tolerance of approximately 4%, however, the indicator will read differently each time the

WING AUX

The WING AUX position turns on the wing tank booster pumps; routes wing tank fuel directly to the engine driven booster pump and completes a circuit to the fuel quantity indicator so that the reading indicates fuel in the wing and inboard external tanks only. No other booster pump will operate with the fuel tank selector in this position. When operating in WING AUX position fuel will continue to transfer to the main tank until it is full; the float in the main tank will then close the shut-off valve in the tank and all fuel will then be available to the engine fuel system through the auxiliary lines.

FWD AUX

The FWD AUX position closes a circuit to turn on the forward tank booster pump; indexes the selector valve so that forward tank fuel is fed directly to the engine driven booster pump of the engine fuel system and completes a circuit to the fuel quantity indicator so that the reading will indicate fuel in the forward and inboard external tanks only. No other pump will operate with the fuel tank selector in this position. When operating in FWD AUX position fuel will continue to transfer to the main tank until it is full; the float in the main tank will then close the shut-off valve in the transfer line to the main tank and all fuel, will then be available to the engine fuel system through the auxiliary feed line.

OFF

The OFF position turns off the internal tank booster pumps and shuts off the fuel supply to the engine fuel system.

Figure 1–7. Fuel Tank Selector (Sheet 2 of 2)

airplane is serviced with fuel of a different density. Therefore, the volume reading is provided to indicate when the airplane is fully serviced either on the ground or during flight refueling, regardless of fuel density. Switches are provided to change the electrical circuits so that either volume or weight is read on the same dial.

NORMAL READING.
Normally the reading on the large scale multiplied by 1000 plus the reading on the small scale multiplied by 100 indicates the fuel remaining in pounds in the airplane for three configurations depending on the position of the fuel tank selector. With the fuel tank selector in the ALL TANKS position the fuel quantity indicator will read the total weight of internal and external fuel in the inboard pylon tanks remaining in the airplane. With the fuel tank selector in the WING AUX or FWD AUX position, the quantity indicator will read the weight of fuel remaining in the respective tank plus the fuel remaining in the inboard external tanks.

WARNING

The fuel quantity indicator reads 25 percent low when operating with the fuel tank selector in the WING AUX or FWD AUX position.

FUEL VOLUME SWITCH.
The fuel volume switch (28 figure 1–12) marked PUSH FOR VOLUME ALL TANKS is provided to change the fuel quantity indicator a-c circuit so that fuel volume instead of fuel weight is read on the indicator. This information is valuable when refueling on the ground or in the air as the fuel capacity of the airplane, in gallons, remains constant. Two markings on the indicator, one at approximately 422 indicates full internal fuel and one at approximately 760 indicates full internal fuel plus two 230 gal inboard external tanks. On F-84F-20RE airplanes a third marking at 1076 indicates full internal fuel plus two 450 gal inboard external tanks. When the fuel volume switch is depressed with the fuel tank selector in the ALL TANKS position the pointer will stop at either marking when the airplane is fully serviced. Validity of these readings would be affected if outboard external tanks are carried since these do not have fuel quantity transmitters.

MAIN TANK FUEL WEIGHT SWITCH. **A,C**
When the push type switch (25 figure 1–12) marked PUSH FOR WEIGHT MAIN TANK is depressed the number of pounds remaining in the main tank will be indexed on the fuel quantity indicator provided the fuel tank selector is in the ALL TANKS position. The quantity is read in the same manner as for normal readings.

FUEL TANK QUANTITY SELECTOR SWITCH **D**
The fuel tank quantity selector switch, located on the instrument panel, is provided so that the fuel quantity in individual tanks can be determined. It is a rotary switch with the following positions: MAIN, L. WING, EXT L INB'D, FWD, EXT R. INB'D and R. WING. When positioned to anyone of these positions, the quantity of fuel in the respective tank will register on the fuel quantity indicator when the fuel quantity check switch is placed in the FUEL QTY CHECK position regardless of the position of the fuel tank selector.

FUEL QUANTITY CHECK SWITCH. **D**
The fuel quantity check switch, located on the instrument panel, is used when it is desired to ascertain the quantity of fuel in the individual tanks. The switch has two positions; FUEL QTY CHECK and OFF. When placed in the FUEL QTY CHECK position the quantity of fuel remaining in the tank, indicated by the position of the fuel tank quantity selector switch, will register on the fuel quantity indicator. The OFF position will register fuel remaining in the tanks as indicated by the fuel tank selector.

FUEL FLOW INDICATOR.

The fuel flow indicator (26 figure 1–12) registers the flow of fuel to the engine in units of pounds per hour. The indicator is a-c powered from either the main or alternate inverter. It is operated by a fuel flow meter which is located in the fuel system between the main fuel filter and the engine driven fuel pump. All fuel flowing to the engine will be recorded whether from the normal or auxiliary systems.

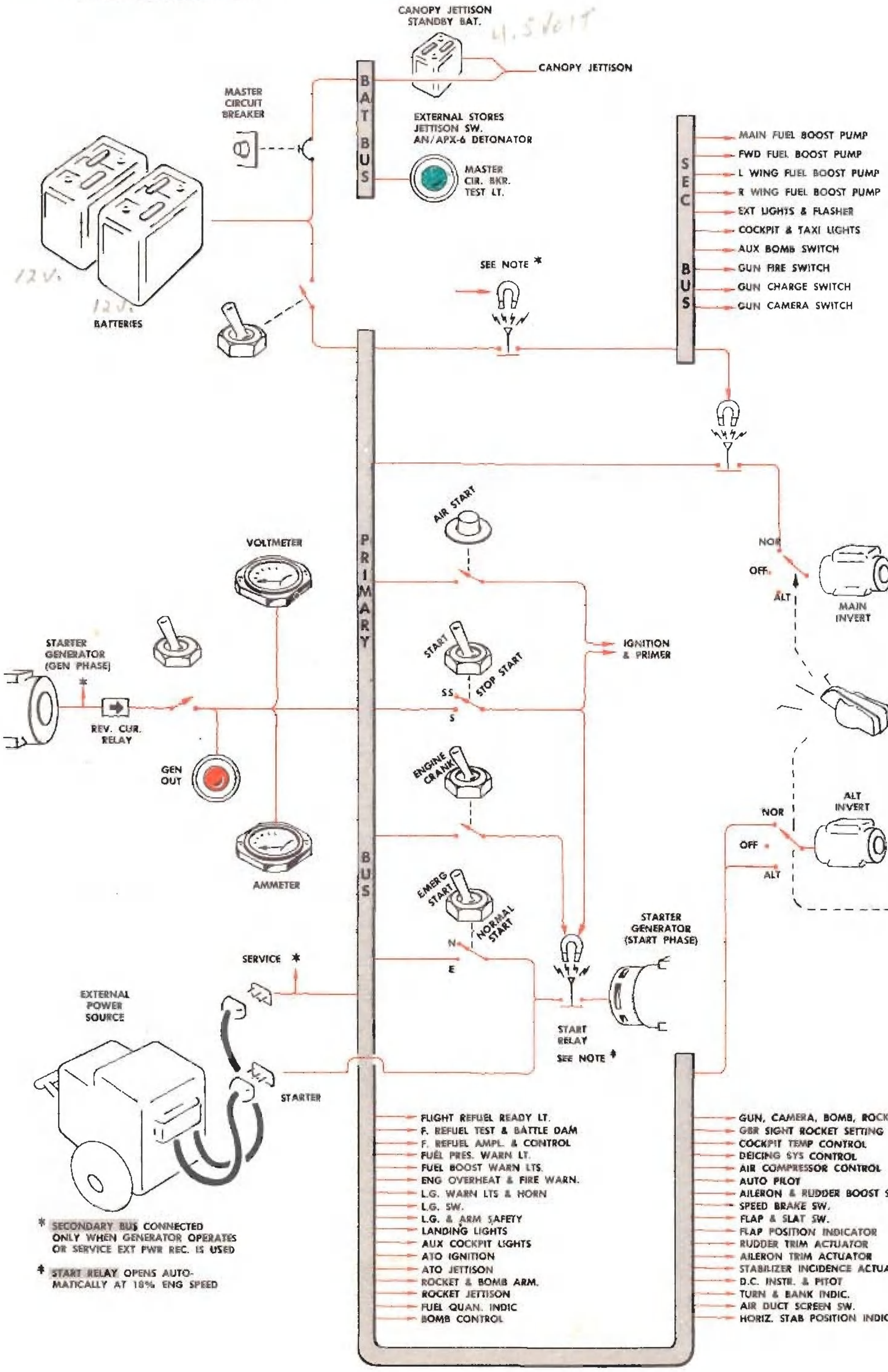
ELECTRICAL POWER SUPPLY SYSTEM.

The aircraft is equipped with both a-c and d-c electrical power systems. All circuits are protected with either a circuit breaker or a fuse both of which are accessible from the cockpit. A 4.5 volt dry cell battery is installed as an emergency source of power for canopy jettisoning if the main electrical system fails.

D-C SYSTEM.

The 28-volt d-c system is powered from a 400 ampere, engine-driven starter-generator with two 12-volt batteries connected in series as a stand-by source of d-c power. The system also incorporates two external power receptacles for the accommodation of an external power cart. Electrical power is distributed through a three bus system consisting of: a battery bus, a primary bus, and a secondary bus. The battery bus services emergency equipment and remains energized regardless of the battery switch position or generator operation. The primary bus services equipment essential to flight and is energized by the battery, the generator, or the service external power receptacle. The secondary bus services equipment not essential to flight and is energized only by the generator or the service external power receptacle. Therefore, in the event of generator failure in flight, all equipment not essential to flight will be automatically cut out since the secondary bus will cease to be energized, and battery power will be conserved for primary bus equipment, i.e., equipment essential to flight. A master circuit breaker is provided in the system to de-energize the battery bus when ground personnel are working on the aircraft. The two external power receptacles are marked SERVICE and STARTER. The starter receptacle supplies energy to the starter only. However, the starter receptacle cannot be used alone for a start

ELECTRICAL SYSTEM
Schematic



* SECONDARY BUS CONNECTED ONLY WHEN GENERATOR OPERATES OR SERVICE EXT PWR REC. IS USED

† START RELAY OPENS AUTOMATICALLY AT 18% ENG SPEED

Figure 1—8. Electrical System — Schematic

since the secondary which supplies the booster pumps is not energized. The service external power receptacle must be used for operational check of electrical equipment.

Note

The secondary bus cannot be energized by the aircraft batteries.

A-C SYSTEM.

The a-c system is powered from two single phase, 115-volt, 400 cycle inverters; one is a main inverter and the other is an alternate inverter. The main inverter requires power from the primary and secondary buses and will therefore not be available if the secondary bus (or generator) fails. The alternate inverter is powered from the primary bus and therefore in event of generator failure, only a-c energized instruments (which are necessary for flight) will operate provided the instrument power switch is in alternate position. A switch for the selection of the inverters and a light for indication of failure of either inverter are provided in the cabin. During normal operation both inverters are in operation as the output of the main inverter alone is not sufficient to accommodate all a-c equipment.

MASTER CIRCUIT BREAKER TEST LIGHT.

The master circuit breaker test light (26 figure 1—14) is marked PRESS TO TEST LIGHT ON INDICATES MASTER CB CLOSED. This is a press to test light which indicates that the master circuit breaker, located adjacent to the battery, is closed and that the battery bus is energized.

BATTERY SWITCH.

The battery switch (9, figure 1—13) is a two position on-off switch. The BATT ON position connects the airplane's battery to the primary bus. In the OFF position the primary bus is not energized, however, the battery bus is always energized unless the master circuit breaker located in the nose wheel well is opened.

GENERATOR SWITCH.

The generator switch (17 figure 1—13) positions are ON, OFF and RESET. The switch is guarded in the ON position. If the generator voltage is too high or too low, the generator is automatically disconnected from the electrical system. If the generator has cut-out due to over-voltages, the generator switch is positioned to RESET for a few seconds to reset the generator field control relay and then returned to ON. If the generator is not operating after positioning the generator switch to RESET and returning to the ON position, the OFF position is selected to disconnect the generator from the electrical system. The ON position connects the generator to the electrical system whenever the generator speed is high enough to close the reverse current relay.

INSTRUMENT POWER SWITCH (INVERTER SELECTION).

The instrument power switch (8 figure 1—13) has three positions; NOR, OFF and ALT. In the NOR position both the main and alternate inverters are supplying a-c power if the generator is operating or external power is connected to the service external power receptacle. The main inverter supplies power to the instruments, the auto-pilot, the windshield defroster and the gun-bomb-rocket sight, while the alternate inverter supplies power to the identification radar. The ALT position supplies power from the alternate inverter to the instruments if the battery switch is on, or if external power is connected to the service external power receptacle. The OFF position turns off both inverters.

CIRCUIT BREAKER PANELS.

Circuit breaker panels (19 figure 1—15) (2 figure 1—14) are provided to protect the various electrical circuits in the airplane. The circuit breakers are of the push button type and pushed in to reset.

AMMETER.

The ammeter (13 figure 1—13) is marked LOAD and indicates the load being drawn from the generator in percent from 0 to 100% with provisions for an additional 25% reading to indicate over-load and a minus 10% reading to indicate discharge.

VOLTMETER.

The voltmeter (16 figure 1—13) indicates the voltage output of the generator.

INVERTER FAILURE INDICATOR LIGHT.

Failure of the main or alternate inverter is indicated by illumination of the inverter failure indicator light (7 figure 1—13) which is marked INVERT FAILURE. If the instrument power switch is in the NOR position and the inverter failure indicator light illuminates, the main inverter is inoperative. (May be caused by inverter or generator failure.) Turning the instrument power switch to the ALT position will shift a-c power output to the alternate inverter and the light will go out in a few seconds. If the inverter failure indicator light goes on with the instrument power switch in the ALT position, it indicates that the alternate inverter is not operating.

GENERATOR OUT INDICATOR LIGHT.

The generator out indicator light (12 figure 1—13) is a red light marked GEN. OUT. Whenever the reverse current relay opens the generator out indicator will illuminate, which shows that the generator is disconnected from the electrical system.

HYDRAULIC POWER SUPPLY SYSTEM.

Hydraulic pressure is provided by a variable delivery type engine driven pump. This pump instantly and positively adjusts delivery to the demand of the hydraulic system. The pump is designed so that pressure is supplied only when a system demands power. If pressure is not demanded the suction port of each piston is closed off and therefore pressure is not supplied. When power is required the suction port is open. The hydraulic system is fully automatic and it is only necessary to move the selected control to the desired position to obtain control of the selected system. A balanced relief valve is incorporated in the hydraulic system so that in the event

PNEUMATIC POWER SUPPLY *System*

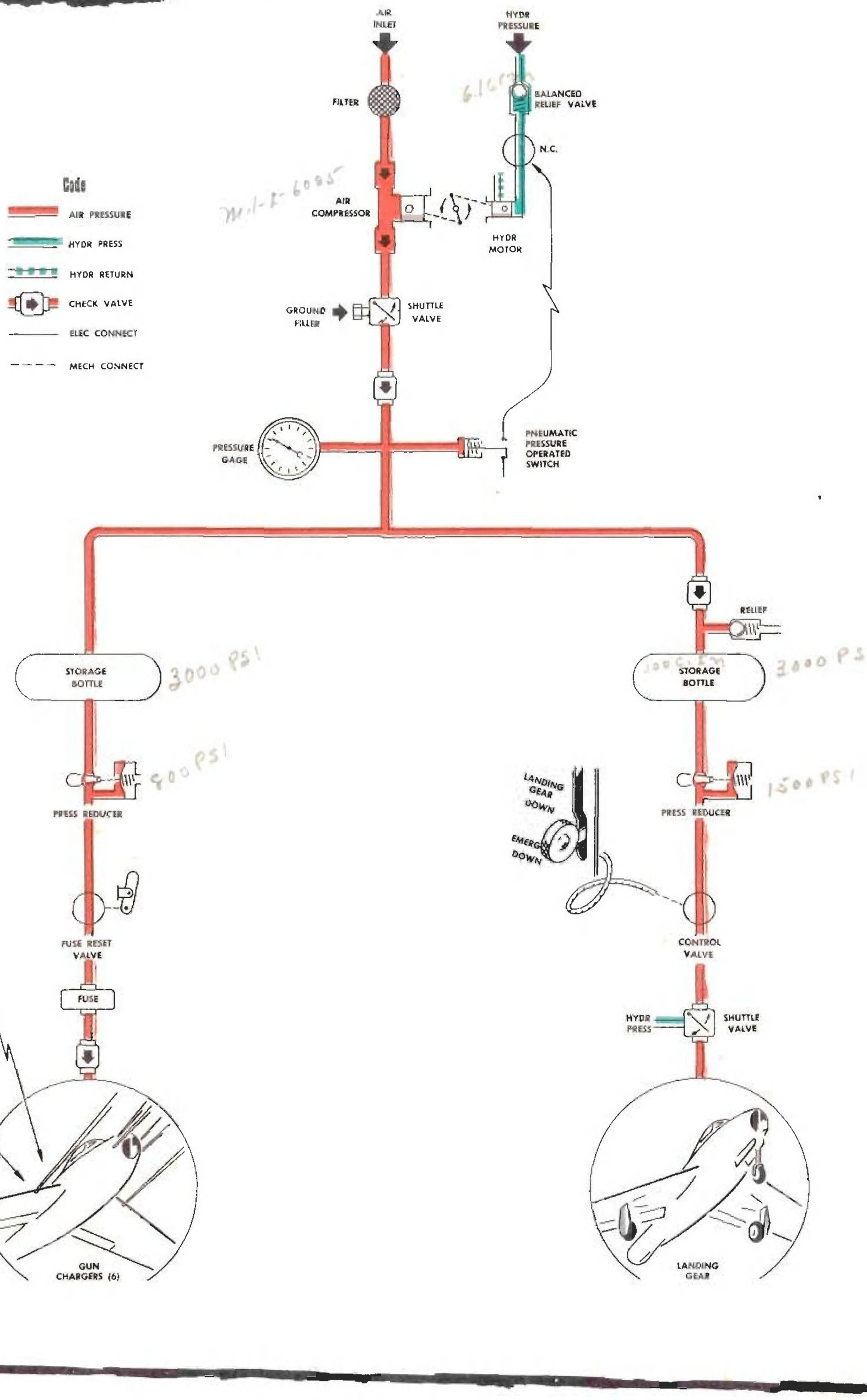


Figure 1–9. Pneumatic Power Supply System

HYDRAULIC SYSTEM
Schematic

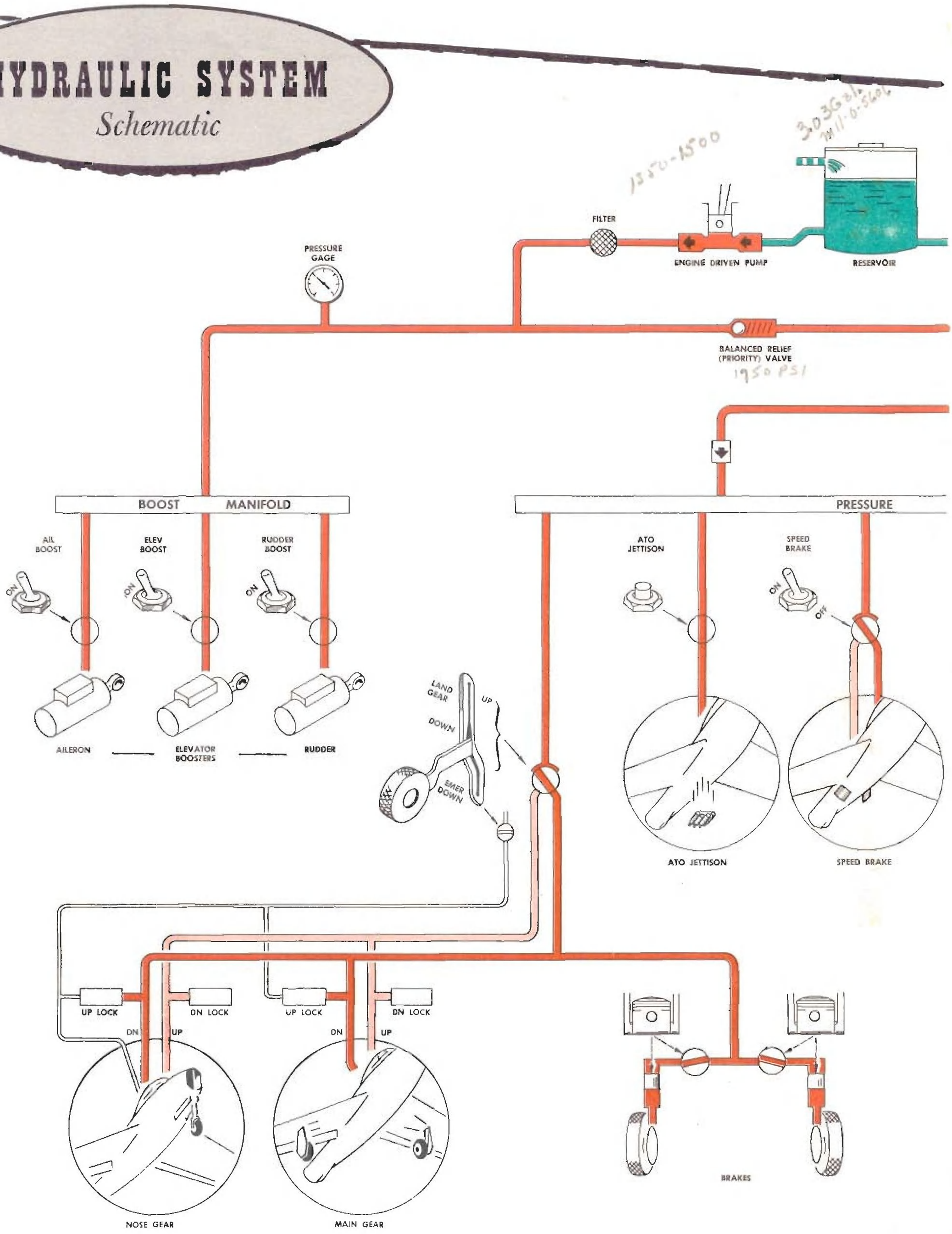


Figure 1–10. Hydraulic System — Schematic (Sheet 1 of 2)

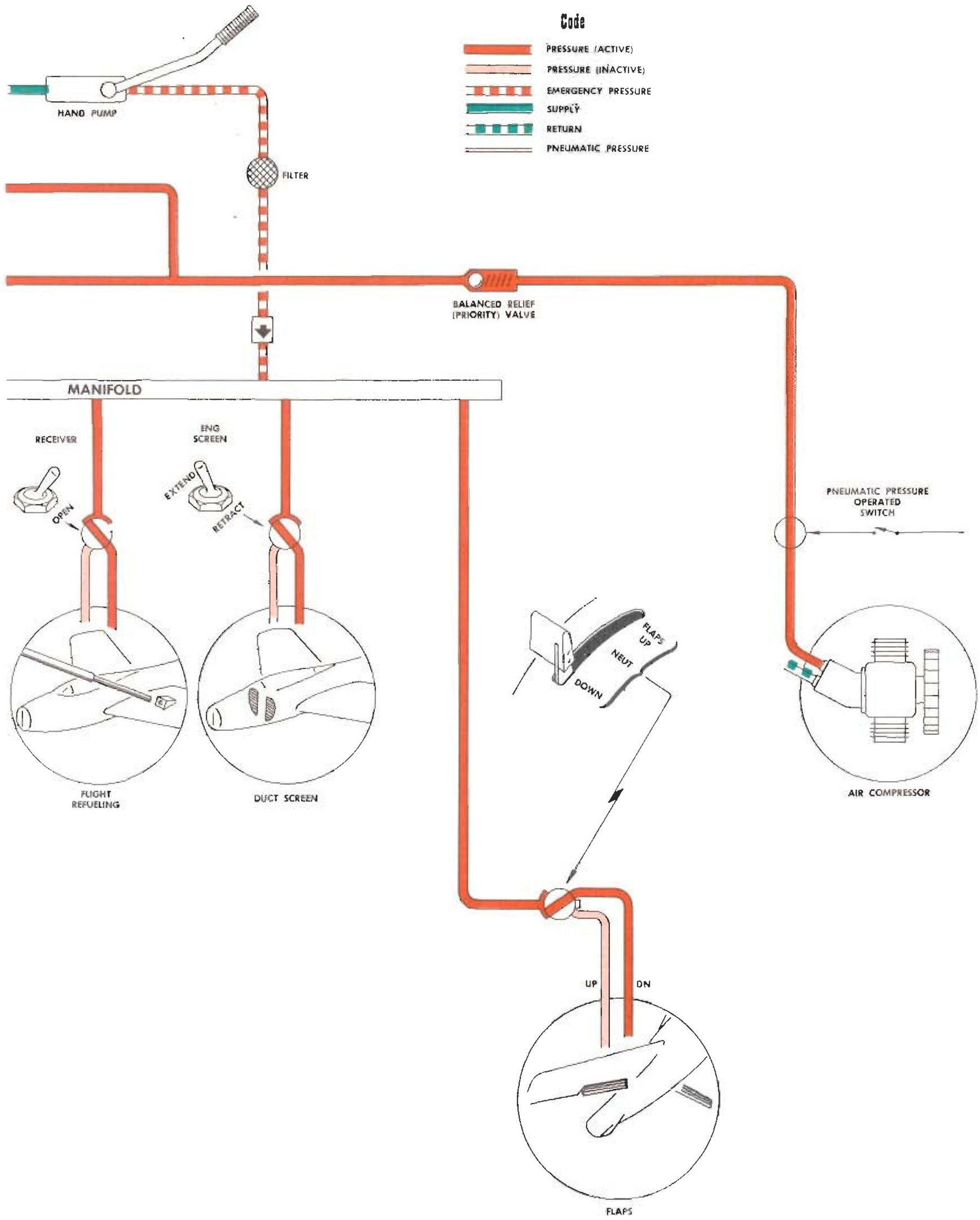


Figure 1–10. Hydraulic System – Schematic (Sheet 2 of 2)

of low hydraulic pressure or inadequate flow of fluid, the flight control actuators will be powered first. Any remaining flow will power the remainder of the hydraulic systems. A hydraulic hand pump is installed for ground operation of all the systems except the flight control actuators. A compressed air system is provided for emergency extension of the landing gear. Hydraulically operated systems are; flight actuators, landing gear, landing flaps, aerial refueling system, speed brake, wheel brake control boost, jato release and engine screen system. These systems are described under applicable headings.

HYDRAULIC HAND PUMP.

The hydraulic hand pump (23A, figure 1–14) can be used to supply hydraulic pressure for operating any hydraulic system except the flight control actuators. Pressure developed by the hydraulic hand pump will not be indicated on the hydraulic pressure gage. The hand pump has a telescoping handle that is pulled out, rotated 90 degrees and moved aft about one-quarter inch before using. This provides a longer handle and clearance between the handle and console for greater ease in operation. To operate a system, place the selected control in the desired position, then operate the hand pump.

Note

Use of the hand pump for emergency actuation of any unit is possible but impractical as the number of strokes required will be excessive except in the case of the aerial refueling receiver door provided the landing gear is retracted.

HYDRAULIC PRESSURE GAGE.

The hydraulic pressure gage (37 figure 1–12) indicates the pressure being supplied to the flight control actuators.

PNEUMATIC POWER SUPPLY SYSTEM.

A pneumatic power supply system (figure 1–9) is installed to supply air pressure that is used to charge the wing and fuselage guns and to extend the landing gear in the event of failure of the hydraulic or electrical systems. Air is bled from the engine compressor, then pressurized by a hydraulically operated compressor and stored in two storage bottles. The system is fully automatic but can be controlled by the pilot. Hydraulic pressure is automatically shut off through an electrical switch when the air pressure in the storage bottles reaches 3000 psi. Air from one storage bottle supplies the gun chargers and is sufficient for two complete charges without being replenished. Air from the second storage bottle is supplied to the main landing gear to release the uplocks and to the nose gear uplock and actuating cylinder through a manually operated control valve. In the event of failure of the primary bus the hydraulic shut-off valve to the compressor will close and the compressor will be inoperative. Hydraulic pressure to the compressor motor passes through a balanced relief valve. Therefore, if any other hydraulic system requires the available pressure, flow of hydraulic fluid to the compressor is automatically shut-off.

CAUTION

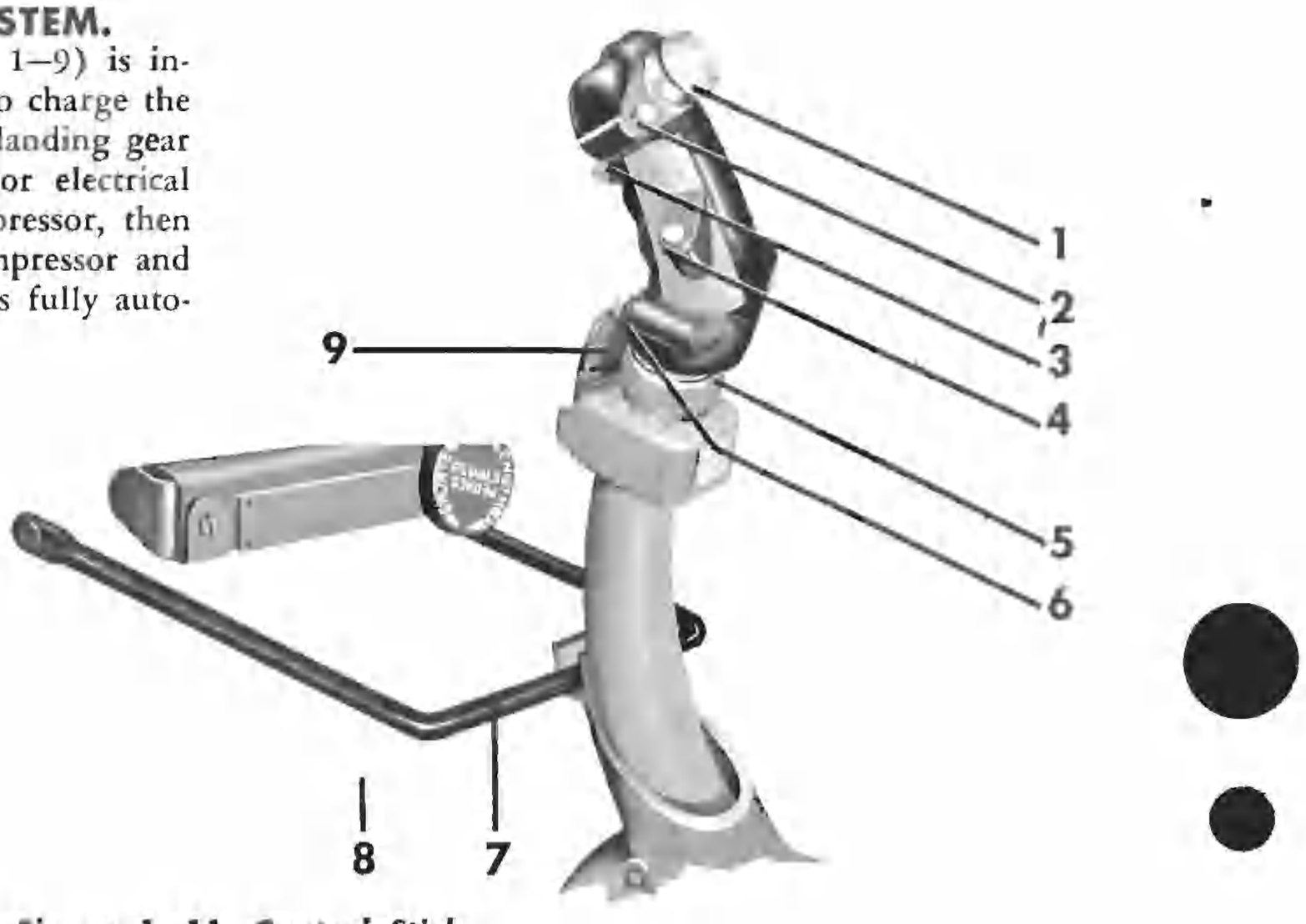
Once landing gear has been operated by pneumatic pressure it cannot be retracted unless released by ground personnel.

PNEUMATIC COMPRESSOR SWITCH.

A two position ON-OFF switch (32A, figure 1–14) marked PNEU COMP is incorporated on the left console so that the pneumatic compressor can be controlled manually in addition to the automatic control. The compressor should be turned off during take-off and landing so that all hydraulic pressure will be available for the flight control actuators and the landing gear system.

FLIGHT CONTROL SYSTEMS.

The flight control system of the airplane incorporates some novel and very desirable features heretofore lack-



1. Trim Switch
2. Bomb Release Switch
3. Stick Trigger
4. Radar Out Switch
5. Control Stick
6. "Roger" Button
7. Surface Control Lock – Locked Position
8. Surface Control Lock – Stowed Position
9. Auto-pilot Release Switch

Figure 1–11. Control Stick

ing in high speed aircraft. The most important of these features is the retention of the mechanical flight control system so that the pilot can—if necessary—move the surfaces directly with the stick and rudder pedals. As in all high speed aircraft the primary controls are normally power-operated. In the F-84F the power for moving the surfaces is derived from the hydraulic system by the position of electrically operated valves which will remain in the hydraulic power-on position in the event of electrical failure. Movement of the stick and rudder pedals is used to mechanically position hydraulic control valves which direct hydraulic pressure to actuators at the control surfaces. When hydraulic pressure is not available, the stick and rudder pedals will act on the surfaces directly and all hydraulic fluid is rerouted so as to eliminate resistance to movements of the controls. Since the hydraulic powered systems are irreversible (i.e., air loads on surfaces are not felt on the controls), control feel is simulated by artificial feel devices. These feel devices do not incorporate "Q" sensing; therefore "feel" will vary in proportion to stick or rudder pedals deflection only and will not be affected by airplane speed or altitude.

There are no movable trim tabs. Trimming of the ailerons and rudder is accomplished by use of switch-controlled electric actuators which reposition the artificial feel devices to the new neutral or "no load" position. Trim about the pitch axis is accomplished with an adjustable horizontal stabilizer. The horizontal stabilizer is pivoted at the aft edge so that the leading edge moves up or down by means of an electrical actuator. The movement of the stabilizer is approximately 4 degrees up and 9 degrees down. Provisions are made for the installation of an automatic pilot in the flight control system.

CONTROL STICK.

The control stick (figure 1—11) is conventional and incorporates a hand grip with the following controls; trim switch, bomb release switch, trigger, radar "out" switch; "roger" button for the radar beacon installation, and the auto-pilot release switch. These switches are discussed under the applicable systems.

RUDDER PEDAL ADJUSTMENT.

The rudder pedal adjusting knob adjusts both rudder pedals simultaneously to the desired fore and aft position.

SURFACE CONTROL LOCK.

The surface controls are held in the neutral position when the airplane is parked by engaging the surface control lock (30 figure 1—12). The lock is engaged by positioning the rudder pedals to neutral then hooking the surface control lock over a fitting on the control stick.

HYDRAULIC ACTUATORS.

The force to move the ailerons, elevators and rudder is supplied by a hydraulic actuator in each control system. The actuator is mechanically connected to the respective control surface and controlled by a mechanical linkage from the cabin controls. In the event of low hydraulic pressure the control actuators have first priority of the hydraulic pressure. Hydraulic pressure to each actuator is controlled by a normally open d-c electrically operated shut-off valve. In the event of failure of the primary bus the shut-off valves will be open and the actuators will operate as long as hydraulic pressure is available. The actuator unit is designed so that a by-pass valve permits free flow of hydraulic fluid from one end of the actuator cylinder to the other when the actuator system is turned off or is inoperative due to loss in hydraulic pressure. A hydraulic dampener eliminates air load vibrations. An accumulator is installed in the aileron hydraulic system in order to assure adequate flow of hydraulic fluid to the aileron actuator during all types of operation. The actuators will be effective with a windmilling engine provided maximum demand (such as full travel of the control surfaces) is not required. Therefore, in the event a landing is made with an inoperative engine it is recommended that the actuator be turned off so as to avoid erratic operation.

AILERON, ELEVATOR AND RUDDER ACTUATOR (BOOST) SWITCHES.

The surface control actuators are controlled by three ON-OFF switches (34, 35, 36 figure 1—14), which are protected in the ON position by cover type guards. The guards are marked AIL BOOST, ELEV BOOST and RUDDER BOOST. The ON position of the respective switch opens the primary electrical circuit to the shut-off valve allowing it to open and supply hydraulic pressure to the respective actuator unit. The OFF position closes the shut-off valve thereby turning the actuator off. In the event of primary bus failure the actuators cannot be turned off as the shut-off valves are spring loaded to open and are energized to close.

ARTIFICAL FEEL UNITS.

Since hydraulic actuators eliminate the natural control feel due to aerodynamic loads on the control surfaces an artificial feel unit is incorporated in each of the primary control systems. The artificial feel unit is a spring capsule designed to give the pilot a sense of control feel by increasing the control forces as the controls are moved. The unit in the aileron and rudder control system is also used when trimming the airplane about the roll and yaw axis. This is accomplished with an actuator powered from the primary bus which repositions the spring capsule so that when the controls are moved to trim the airplane, the spring capsule is moved to a no-load position and the airplane will be trimmed about the roll or yaw axes with no load on the cabin controls. The adjustable horizontal stabilizer is used to trim the airplane about the pitch axis. The artificial feel unit does not incorporate "Q" sensing.

TRIM SWITCH.

Airplane trim about the roll and pitch axis is controlled by a five position trim switch which is spring loaded to the center or off position. The lateral positions of the trim switch adjusts the artificial feel unit in the aileron control system so as to change the neutral position of the spring capsule thereby trimming the airplane about

the roll axis. The fore and aft positions of the trim switch adjusts the position of the horizontal stabilizer to trim the airplane about the pitch axis. Both trim circuits are energized from the primary bus and are inoperative unless the pitch trim switch is in the STICK TRIM PWR NORMAL position.

Note

The trim switch is inoperative with the autopilot turned on.

PITCH TRIM SWITCH.

The pitch trim switch (15, figure 1–14) is provided as a safety switch for operation of the horizontal stabilizer in the event of malfunction of the trim switch. The switch has four positions: Two positions are marked STICK TRIM PWR; OFF and NORMAL; the other two positions are NOSE UP and NOSE DOWN. When held in the NOSE UP or NOSE DOWN position primary bus power is supplied to the stabilizer actuator to adjust the stabilizer position to trim the airplane about the pitch axis. When released from either of these positions the switch returns to the OFF position. In the OFF position the trim switch on the control stick is inoperative in both the aileron and stabilizer trim positions. The NORMAL position supplies power to the trim switch for operation of both the aileron and stabilizer trim circuits.

Note

The pitch trim switch will be inoperative with the autopilot turned on.

RUDDER TRIM SWITCH.

Airplane trim about the yaw axis is accomplished by adjusting the neutral position of the spring capsule in the rudder control system. The neutral position is selected by a three position rudder trim switch (14 figure 1–14) which is energized from the primary bus and spring loaded to the off position. The other switch positions are NOSE LEFT and NOSE RIGHT. The switch is held in the desired position until the airplane is trimmed about the yaw axis and then released.

AILERON AND RUDDER TRIM INDICATORS.

The aileron and rudder trim indicators (20 figure 1–14) are amber lights that illuminate when the actuator, in the respective artificial feel unit, is in the neutral position. The light does not necessarily indicate the neutral position of the surface. It will so indicate only if there is no load on the cockpit controls. The lights are energized from the primary bus circuit.

HORIZONTAL STABILIZER POSITION INDICATOR.

The horizontal stabilizer position indicator (43 figure 1–12) shows the trim of the airplane about the pitch axis in degrees from a maximum of 10 degrees NOSE UP to 6 degrees NOSE DOWN. The indicator is controlled by the position of the adjustable horizontal stabilizer and powered from the primary bus.

Figure 1–12. Instrument Panel (Sheet 1 of 2)

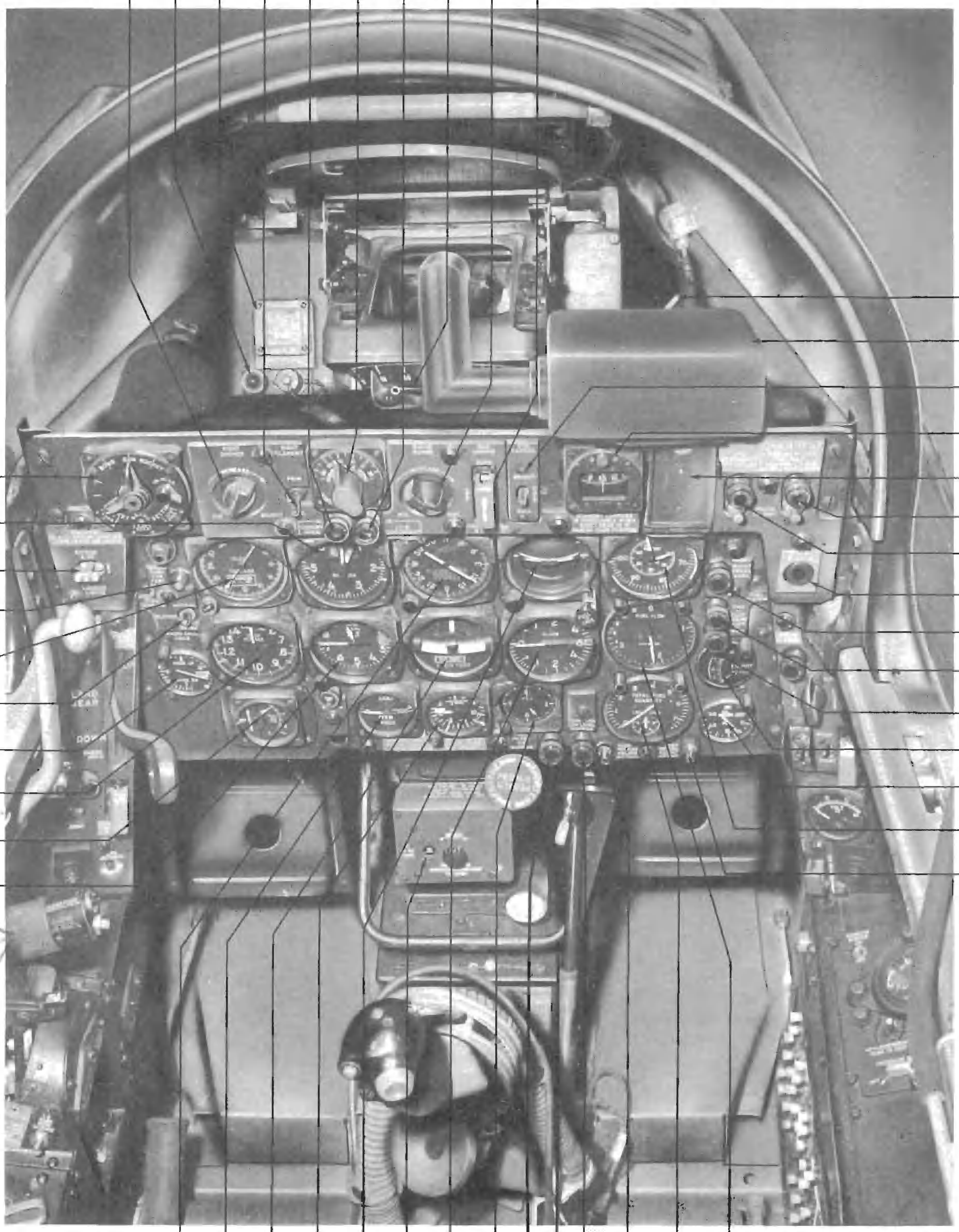
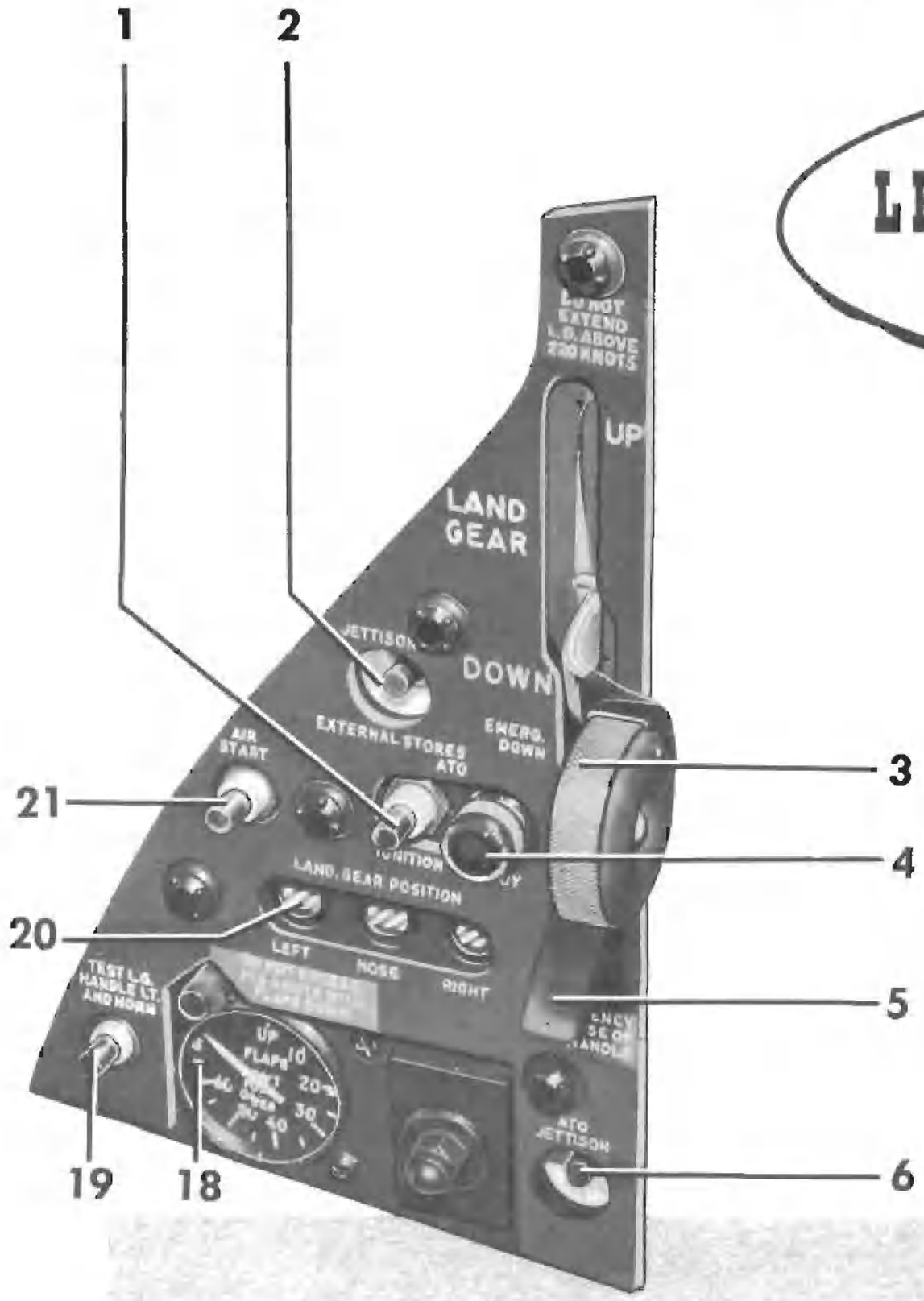
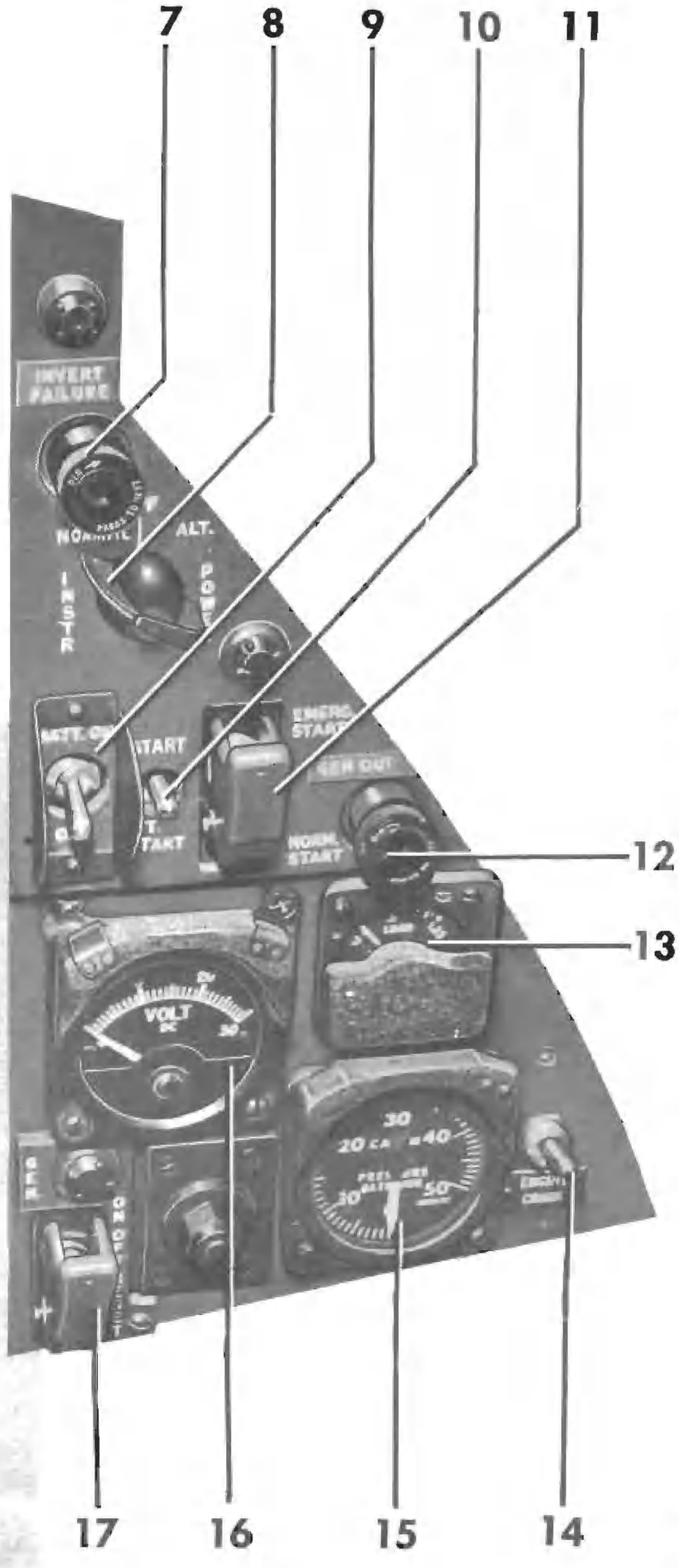


Figure 1–12. Instrument Panel (Sheet 2 of 2)

LEFT and RIGHT HAND SIDE PANELS





1. Ato Ignition Switch
2. Jettison External Stores Switch
3. Landing Gear Selector Handle
4. Ato Ready Warning Light
5. Emergency Landing Gear Release Switch
6. Ato Jettison Switch
7. Inverter Failure Indicator Light
8. Instrument Power Switch
9. Battery Switch
10. Engine Starter Switch
11. Normal-Emergency Start Switch
12. Generator Cut Indicator Light
13. Ammeter
14. Engine Crank Switch
15. Cabin Altimeter
16. Voltmeter
17. Generator Switch
18. Landing Flap Position Indicator
19. Landing Gear Warning Light and Horn Test Switch
20. Landing Gear Position Indicators
21. Engine Air Start Switch

Figure 1—13. Left and Right Hand Side Panels

LANDING FLAPS.

The landing flaps are partial span, plain, trailing edge type and extend from the aileron to the fuselage on each wing. The flaps are extended and retracted with hydraulic pressure and are controlled by an electrically operated shut-off valve. The flaps are locked in the up position by a mechanical lock in each of the actuating cylinders and are kept in the down position by hydraulic pressure. Intermediate positions of the flaps may be selected and the position will be shown on the flap position indicator. A restrictor is installed in the flap hydraulic system so that 7 to 10 seconds are required to retract or extend the flaps. The flaps will not extend, or if extended, will retract if the airspeed is excessive. The flaps are not mechanically connected but are hydraulically synchronized so that they will extend simultaneously when used during flight. However, during ground operation prior to take-off, the flaps are fully extended then returned to the take-off position to assure both flaps being in the proper position.

LANDING FLAP LEVER.

The landing flap lever (17 figure 1—14) is used for positioning the landing flaps. There are three positions, UP, NEUT, and DOWN. The UP position electrically positions the hydraulic selector valve to direct hydraulic pressure to the up side of the flap actuators. When the flaps are fully up and the mechanical locks in the actuating cylinders are locked, the flap selector valve automatically returns to the neutral position which relieves the pressure on the up side of the actuating cylinder. In the NEUT position, hydraulic pressure in the down side of the flap actuating cylinders is trapped while pressure in the up side is relieved. This position is used for partial flap extension. The flaps are lowered to the desired position then the landing flap lever is returned to NEUT. The trapped hydraulic fluid maintains the flaps in the desired position. The DOWN position electrically positions the hydraulic selector valve to direct hydraulic pressure to the down side of the flap actuating cylinders.

LANDING FLAP POSITION INDICATOR.

Markings on the landing flap position indicator (18 figure 1—13) show the position of the landing flap from UP to 40 degrees down. The indicator is powered from the primary bus.

SPEED BRAKES.

A hydraulically operated speed brake is installed on each side of the aft fuselage. The speed brakes are designed as drag increasing devices for use during "let downs" and maneuvers. The actuating cylinder on each speed brake incorporates an internal mechanical lock mechanism which locks the brakes in the closed position. Hydraulic pressure is maintained to keep the brakes open. Speed brake operation is controlled by an electrical shut-off valve. In the event of failure of the primary bus, the control valve will return to neutral position and speed brake will not open and if open, the air loads on the brake will close them.

SPEED BRAKE SWITCH.

The speed brake switch (19 figure 1—14) is an ON, OFF switch which controls the position of the speed brake selector valve. The ON position indexes the hydraulic selector valve to apply pressure to open and hold the speed brakes in the open position. The OFF position indexes the selector valve to close the speed brakes. When the brakes are fully closed, the selector valve is automatically closed and the hydraulic lines are open to return. The speed brakes cannot be positioned in any intermediate position.

CAUTION

The speed brakes should not be opened when the ato adapter is installed as the brakes will be damaged due to contact with the adapter.

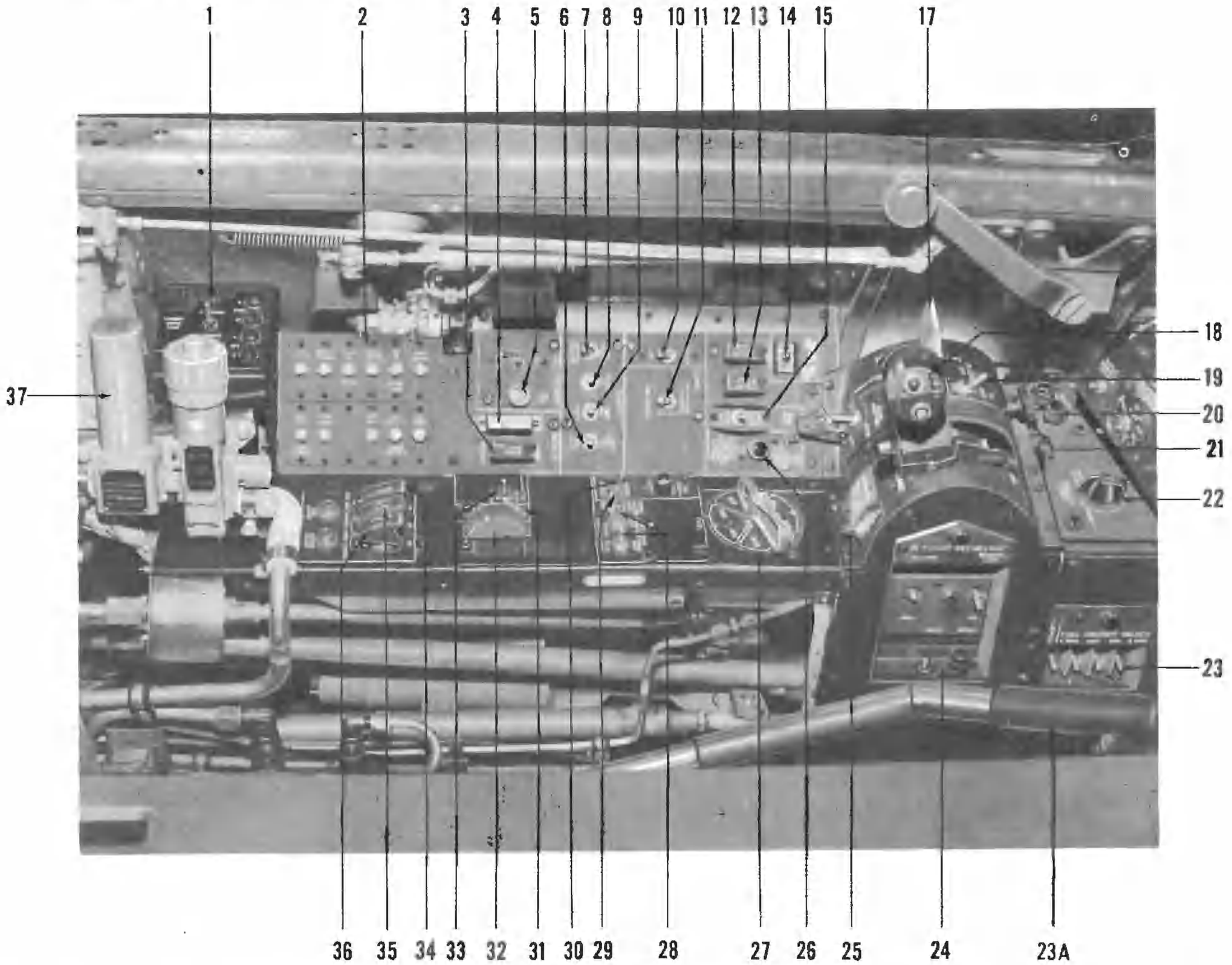
LANDING GEAR SYSTEM. C

The retractable tricycle landing gear is hydraulically actuated and electrically controlled from the primary bus. Each strut is enclosed by fairing doors that are flush with the contour of the wing and fuselage when the gear is retracted and remain open when the landing gear is extended. The nose wheel shock strut is mechanically shrunk as it is being retracted and automatically returns to its fully extended position when the gear is let down. Mechanical locks secure the three struts in the retracted or extended positions. Inadvertent retraction of the gear when the airplane is on the ground is prevented by a solenoid lock which automatically prevents moving the landing gear selector handle. A switch is provided to override this safety system in emergencies. The main landing gear down locks are spring loaded to the locked position and are unlocked by hydraulic pressure when the struts are retracted. In an emergency the main gear uplocks are released by pneumatic pressure and the gears drop to the locked down position by gravity. During normal operation the nose gear is retracted and extended with hydraulic pressure. In an emergency the nose gear is unlocked and extended with pneumatic pressure. Ground safety locks are provided for maintenance purposes only. Landing gear position indicators and a warning horn are provided to inform the pilot of the position of the landing gear struts.

LANDING GEAR SELECTOR HANDLE. C

The landing gear selector handle (3 figure 1—13) controls the extension and retraction of the landing gear struts. Both normal and emergency systems are operated by this handle. The selector has a plastic wheel shaped knob which incorporates a red warning light. There are three positions; UP, DOWN and EMERG DOWN. The DOWN position electrically positions the hydraulic control valve to apply pressure to extend the landing gear and to energize the brake boosters. Hydraulic power is supplied to the brakes only when the landing gear selector handle is in the DOWN position. Hydraulic pressure is maintained in the landing gear system except when the landing gear is up and locked.

LEFT HAND CONSOLE



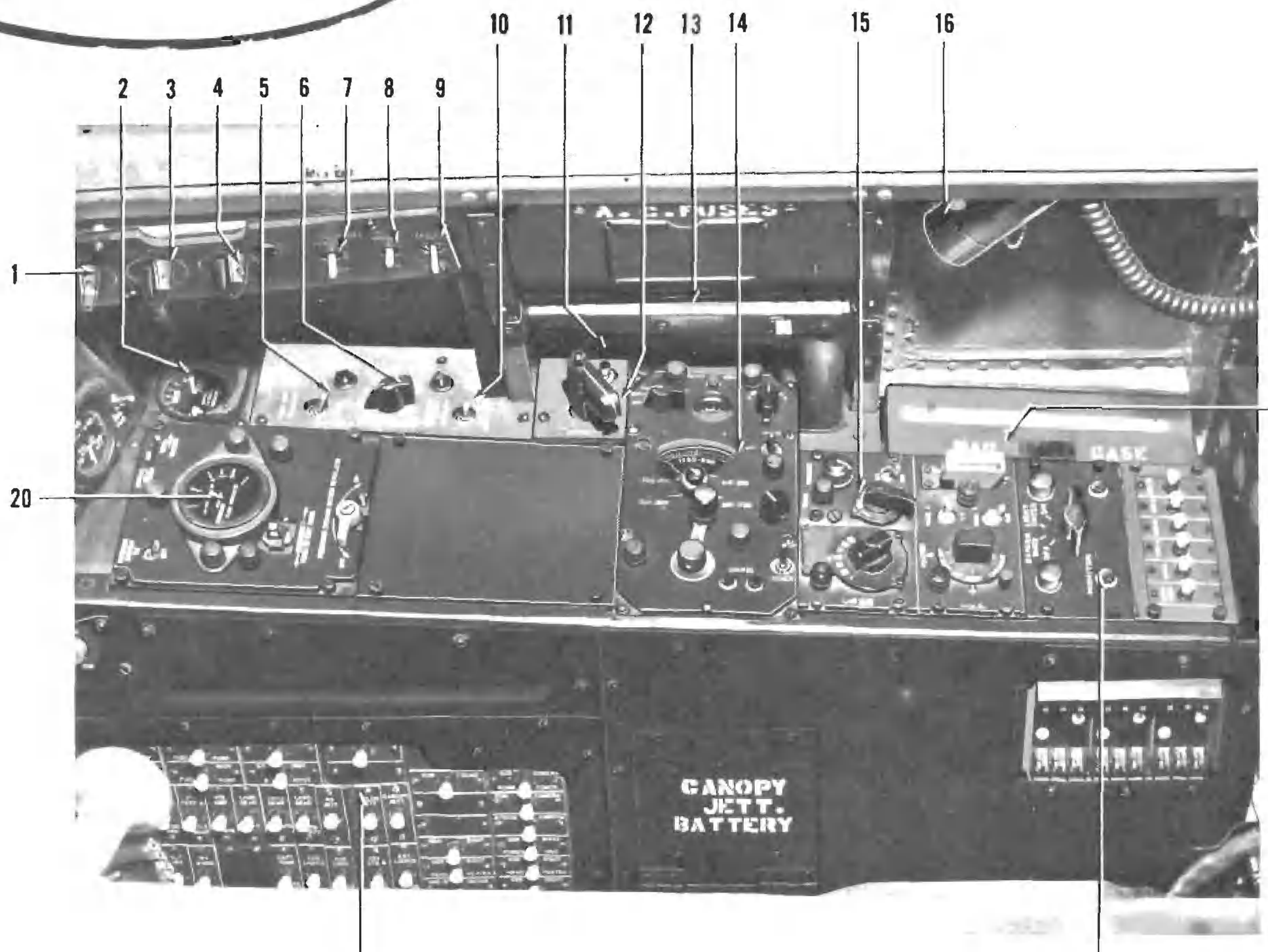
1. Canopy Squib Test Switch and Indicator Lights
2. Circuit Breaker Panel
3. Rocket Jettison Ready Switch
4. Rocket Selector Switch
5. Auxiliary Bomb Selector Switch and Indicator Light
6. Bomb Arming Switch
7. Bomb Release Selector Switch
8. Outboard Bomb Selector Switch
9. Inboard Bomb Selector Switch
10. Gun Heater Switch
11. Gun Charger Switch
12. Outboard Pylon Jettison Switch
13. Inboard Pylon Jettison Switch
14. Rudder Trim Switch
15. Pitch Trim Switch
16. Deleted
17. Landing Flap Lever (Slat Control)
18. Throttle Control
19. Speed Brake Switch
20. Aileron and Rudder Trim Indicators
21. Throttle Friction Lock
22. Console Lights Rheostat Switch
23. Fuel Shut-off Valves

23A. Hydraulic Hand Pump

24. Inflight Refueling Controls
25. Landing Gear Warning Horn Silence Switch
26. Master Circuit Breaker Test Light
27. Fuel Tank Selector
28. Pylon Tanks Air Pressure Switches
29. Fuel Filter De-Icing Switch
30. Engine Screen Switch and Warning Light
31. Pitot Heater Switch
32. Ato Ready Switch
33. Rocket Arming Switch
34. Aileron Boost Switch
35. Elevator Boost Switch
36. Rudder Boost Switch
37. Anti-g Valve

Figure 1—14. Left Hand Console

RIGHT HAND CONSOLE



1. Auxiliary Light Rheostat
2. High Pressure Oxygen Gage
3. Non-Flight Instrument Rheostat
4. Flight Instrument Rheostat
5. Cabin Vent Switch
6. Cabin Temperature Selector
7. Position Light Switch
8. Position Light Intensity Switch
9. Taxi Light Switch
10. Cabin Temperature Control
11. Canopy Dry Air Switch
12. Defroster Control
13. Side Air Outlet Shut-off
14. Radio Compass Control Panel
15. Command Set Control Panel
16. Cabin Light
17. IFF Set Control Panel
18. Radar Set Control Panel
19. Circuit Breaker Panel
20. Oxygen Regulator

Figure 1—15. Right Hand Console

An electrical solenoid prevents the landing gear selector from being moved from the DOWN position, with the shock struts compressed. This safety can be overriden if it is desirable to retract the gear before the weight is off the landing gear struts. The UP position electrically positions the hydraulic control valve so that hydraulic pressure releases the downlocks and retracts the landing gear. After the landing gear is fully retracted and the fairing doors closed, the hydraulic control valve automatically returns to the neutral position which relieves the hydraulic pressure in the landing gear system. If any fairing door opens or landing gear uplock unlocks when the gear is retracted, hydraulic pressure is automatically applied until the gear is fully up and locked, at which time the pressure is again relieved. The EMERG DOWN position is used in the event of hydraulic pressure or primary bus failure. Pneumatic pressure unlocks all three gears and extends the nose gear. The main gears drop and lock by gravity. The landing gear selector handle must be moved inboard then pushed down to position it from the DOWN to the EMERG DOWN position. Once the EMERG DOWN position has been selected the selector cannot be returned to the DOWN position until the handle lock has been released by the ground crew.

CAUTION

Once the landing gear is extended by the emergency procedure the emergency landing gear release switch will not retract the gear.

LANDING GEAR SYSTEM. B

The retractable tricycle landing gear is hydraulically actuated and electrically controlled from the primary bus. Each strut is enclosed by fairing doors that are flush with the contour of wing and fuselage when the gear is retracted and remain open when the landing gear is extended. The nose wheel shock strut is mechanically shrunk as it is being retracted and automatically returns to its fully extended position when the gear is let down. Mechanical locks secure the three struts in the retracted or extended positions. Inadvertent retraction of the gear when the airplane is on the ground is prevented by a solenoid lock which automatically prevents moving the landing gear selector handle. A switch is provided to override this safety system in emergencies. The main landing gear down locks are spring loaded to the locked position and are unlocked by hydraulic pressure when the struts are retracted. In an emergency the main gear uplocks are released by pneumatic pressure and the gears drop to the locked down position by gravity. During normal operation the nose gear is retracted and extended with hydraulic pressure. In an emergency the nose gear is unlocked and extended with pneumatic pressure. Ground safety locks are provided for maintenance purposes only. Landing gear position indicators and a warning horn are provided to inform the pilot of the position of the landing gear struts.

LANDING GEAR SELECTOR HANDLE B

The landing gear selector handle (3 figure 1–13) controls the extension and retraction of the landing gear struts. Both normal and emergency systems are operated by this handle. The selector has a plastic wheel shaped knob which incorporates a red warning light. There are four positions; UP, NEUT, DOWN and EMERG DOWN. The DOWN position electrically positions the hydraulic control valve to apply pressure to extend the landing gear and to energize the brake boosters. Hydraulic power is supplied to the brakes only when the landing gear selector handle is in the DOWN position. An electrical solenoid prevents the landing gear selector from being moved from the DOWN position, with the shock struts compressed. This safety can be overridden if it is desirable to retract the gear before the weight is off the landing gear struts. The UP position electrically positions the hydraulic control valve so that hydraulic pressure releases the downlocks and retracts the landing gear. Hydraulic pressure is maintained in the system as long as the selector handle is in the UP position. The NEUT position returns the hydraulic selector valve to the neutral position which relieves the hydraulic pressure in the landing gear system thus preventing loss of hydraulic oil in the event of leakage in the system outboard of the selector valve. The EMERG DOWN position is used in the event of hydraulic pressure or primary bus failure. Pneumatic pressure unlocks all three gears and extends the nose gear. The main gears drop and lock by gravity. The landing gear selector handle must be moved inboard then pushed down to position it from the DOWN to the EMERG DOWN position. Once the EMERG DOWN position has been selected the selector cannot be returned to the DOWN position until the handle lock has been released by the ground crew.

CAUTION

Once the landing gear is extended by the emergency procedure the emergency landing gear release switch will not retract the gear.

EMERGENCY LANDING GEAR RELEASE SWITCH.

The emergency landing gear release switch (5 figure 1–13) is provided so that the landing gear can be retracted before the landing gear struts are fully extended if the primary bus is energized. The switch is marked EMERGENCY RELEASE OF L.G. HANDLE and is protected by a cover type guard. If it becomes necessary to retract the landing gear and the airplane is not airborne the cover guard is lifted and the emergency landing gear release switch is actuated. This makes it possible to move the landing gear selector handle to the UP position.

CAUTION

If the landing gear shock struts are overinflated so as to be fully extended it will be possible to move the landing gear selector to the UP position with the airplane on the ground.

LANDING GEAR POSITION INDICATORS.

Three landing gear position indicators (20 figure 1–13) are marked LEFT, NOSE and RIGHT. When the respective gear is locked down the outline of a wheel appears on the indicator. If the gear is in any position between locked down or up, alternate red and white stripes appear and when the gear is retracted the word UP appears on the indicator.

LANDING GEAR WARNING HORN.

The landing gear warning horn, located on the aft wall of the cockpit, will sound if the throttle is retarded below minimum cruise setting and the landing gear is not down and locked.

LANDING GEAR WARNING HORN SILENCE SWITCH.

The landing gear warning horn silence switch (25 figure 1–14) is a push button type switch marked L G WARN HORN SILENCE. The warning horn can be silenced by depressing the landing gear warning horn silence switch momentarily. If the horn has been silenced and the throttle is opened above minimum cruise then closed again, the horn will start to sound again.

LANDING GEAR WARNING LIGHT AND HORN TEST SWITCH.

The landing gear warning light and horn test switch (19 figure 1–13) is a push button type switch marked TEST L.G. HANDLE LT. AND HORN. If the test switch is pushed and held, the red light in the landing gear selector handle will illuminate regardless of the position of the landing gear. This tests the electrical circuit and the lamp in the selector handle. The landing gear warning horn will also sound if the throttle is positioned below the minimum cruise rpm position.

BRAKES.

Fluid for the brake control is provided by the hydraulic system. The system is designed so that foot pressure on the master cylinder attached to each rudder pedal is added to the hydraulic pressure of the brake system. System hydraulic pressure is available to the brakes only when the landing gear selector handle is in the DOWN position and the primary bus is energized. If no pressure is available from the hydraulic system the brakes will function through conventional action of the master brake cylinder when toe pressure is applied to the pedal. Parking brakes are not provided.

INSTRUMENTS.

The turn and bank indicator, the radio compass indicator, the flap position indicator, the voltmeter, the ammeter and the pitot heater are operated from the d-c power supply. The engine tachometer and the exhaust temperature indicator are self generated electrical

LANDING GEAR SELECTOR HANDLE LIGHT.

A red light, located in the plastic knob of the landing gear selector handle illuminates when the landing gear is in an unsafe condition. The light indications are as follows:

RED LIGHT ON

a. With throttle below minimum cruise rpm.
b. With throttle above minimum cruise rpm.

a. Indicates landing gear not locked down.
b. Indicates landing gear in any unlocked position.

Figure 1—16. Landing Gear Position Indicator

instruments which do not require power from the airplane's electrical system. The slaved gyro compass indicator, attitude gyro indicator, the fuel level indicator, the fuel flow indicator and the oil pressure indicator are powered from the a-c power circuit and will operate from either the main or alternate inverters. The accelerometer and the mach meter, both installed in the instrument panel, do not require any electrical power. The static vent is located on the lower section of the forward fuselage while the pitot pressure head is located on the tunnel division of the nose section. The pitot heater is described in Section IV.

ATTITUDE INDICATOR.

The attitude indicator, Type J-8 (figure 1—17) shows the attitude of the aircraft in relation to the earth's horizontal plane during any aircraft maneuver, throughout 360 degrees. The position of the sphere which is visible to the pilot during level flight and in dives or climbs up to 27 degrees, is unmarked. Relative motion of the aircraft is indicated on the face of the instrument by movement of the horizontal bar with respect to the miniature airplane in the center of the dial. Angular displacement of the horizontal bar with respect to the miniature airplane indicates the degree of roll. The actual amount of roll is indicated by the position of the bank index relative to the 10, 20, 30, 60 and 90-degree roll markings on the bezel mask. When the aircraft exceeds 27 degrees of dive, the horizontal bar is held in its extreme (27 degree) position. At this point, the word DIVE on the upper portion of the sphere becomes visible toward the pole of the sphere which indicate the angle of dive as they coincide with the trim indicator on the dial. These graduations are placed at the 70, 75 and 80 degree intervals; the 85 degree dive indication is reached when the trim indicator coincides with the edge of the bulls eye. When the aircraft exceeds 27 degrees of climb, the horizontal bar is held in its extreme (27 degrees) downward position and any increase in climb is indicated on the sphere. The lower portion of the sphere is marked similarly to the upper with the word CLIMB substituted for DIVE. After a loop or during a turn, displacement of the horizontal bar in excess of five degrees in pitch and/or bank may result. The J-8 indicator will immediately begin to correct these errors once true gravitational forces are sensed. This characteristic error is commonly called "sluggishness" or "lag" by pilots. In successive loops, the above described error may become increasingly greater and may cause the horizon bar to reach the limit of its movement. This is normal in successive loops and is not indicative of a defective instrument. The J-8 attitude indicator may be caged manually by means of a gyro centering device operated by pulling the cage knob. To cage the gyro, the PULL TO CAGE knob is drawn smoothly away from the face of the instrument. A momentary stop will be felt when the bank caging mechanism is engaged; as the cage knob is pulled further out, the pitch caging mechanism is engaged. As soon as the caging knob reaches the limit of its travel, it should be released quickly.

CAUTION

A violent or hard pull on the caging knob when caging the attitude indicator may damage the instrument. Remember that the indicator cages to the attitude of the aircraft and not to the true vertical. Therefore, the instrument should never be caged to correct in-flight errors unless the aircraft is in straight and level flight by visual reference to a true horizon.

EMERGENCY EQUIPMENT.

The airplane has an engine overheat system and an engine fire warning system. The engine overheat system consists of a set of thermal switches installed in the aft fuselage section and an amber warning light (16 figure 1—12) which is marked OVERHEAT. The engine fire warning system consists of a set of thermal switches in the forward section of the fuselage and a red warning light (17 figure 1—12) which is marked FIRE. Both systems are automatic and have a test switch adjacent to the lights marked PRESS TO TEST. Illumination of the lights, when the test switch is depressed, indicates that the circuits are complete.

WINDSHIELD.

The windshield (figure 1—18) consists of three transparent panels, set in rubber and mounted in an aluminum frame. The center panel is laminated bullet resistant glass with an electrical element incorporated between the laminations for deicing and defogging. Each side panel is made up of two plexiglass panels with an air space between them for defogging. Heated and dried air is circulated between the two layers and is controlled by a manually operated switch. A defroster system, with a manual shut-off, directs hot air from the engine compressor to a perforated tube that directs the air over the inside of each side panel. For complete description of the defroster system, see Section IV.

CANOPY SQUIB TEST SWITCH AND INDICATOR LIGHTS.

The canopy is hinged to the fuselage with a hinge on each side and one in the aft center. Two independent squib circuits for jettisoning the canopy are provided in the fittings attaching the side hinges to the canopy and in the fittings on each side of the aft hinge. A test circuit is incorporated in the squib firing circuit, therefore, it is possible to check the firing circuit on the ground. The canopy squib test switch (1 figure 1—14) has three positions: A CIRCUIT, off and B CIRCUIT. If the switch is held in the A CIRCUIT position, a circuit is completed through one set of squibs in each fitting and the indicator lights (1 figure 1—14) marked FWD, R and L and AFT L and R will illuminate if all squibs circuits are closed. If any one of the four lights remain out it indicates an open circuit in that squib circuit. When held in the B CIRCUIT position, the four indicator lights will illuminate if circuit in the second set of squibs in each fitting is closed. Any light not illuminating will indicate which squib circuit is open.

Note

The canopy must be fully open when making this test as the circuits are completed through the full open limit switch.

CANOPY INDICATOR LIGHT.

The canopy indicator light (5 figure 1—12) is a red light marked CANOPY OPEN. The light will illuminate if the canopy is not fully closed and locked.

PILOT'S SEAT.

The pilot's seat (figure 1—19) is the ejection type designed to catapult the seat and the pilot clear of the airplane in an emergency. The seat is adjustable for height, includes a headrest, adjustable arm rests, and is designed to accommodate a life raft attached to the pilot's parachute harness. A lap type safety belt is attached to the sides of the seat and a shoulder harness is attached to the seat by means of an inertia reel and cable. A seat catapult, attached to the rear of the seat, supplies the propelling force to eject the seat during an emergency. The catapult is fired by an initiator which develops a high pneumatic pressure that is directed to activate the catapult firing mechanism. The initiator is safetied, for ground operation, by a pin to which is attached a red streamer that is marked REMOVE THIS PIN BEFORE FLIGHT, REPLACE IMMEDIATELY UPON LANDING.

SHOULDER HARNESS LOCK CONTROL.

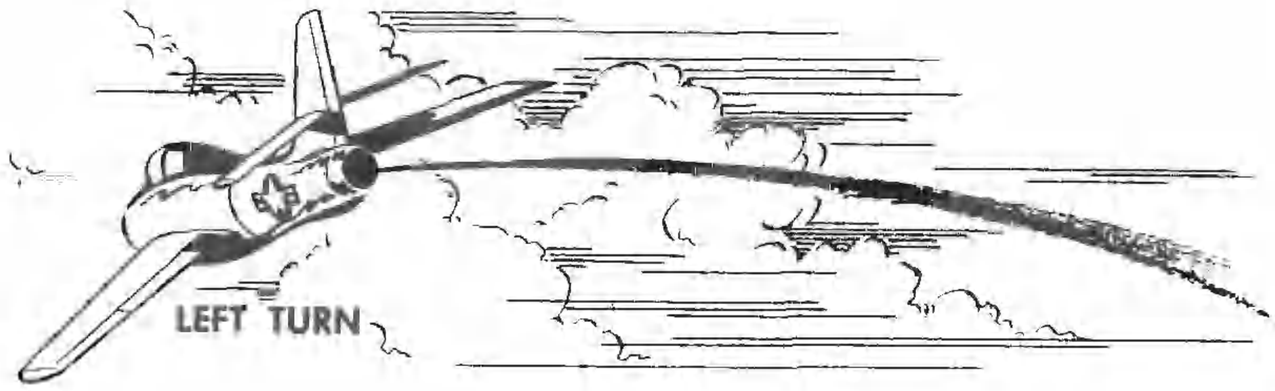
A two position (lock-unlocked) shoulder harness inertia reel lock control (6 figure 1—19) is located on the left side of the pilot's seat. A latch is provided for positively retaining the control handle in either position of the quadrant. By pressing down on the top of the control handle, the latch is released and the control handle may be moved freely from one position to another. When the control is in the unlocked position (full aft), the reel harness cable will extend to allow the pilot to lean forward in the cockpit; however, the reel harness cable will automatically lock when an impact force of 2 to 3 g's is encountered. When the reel is locked in this manner, it will remain locked until the control handle is moved to the locked and then returned to the unlocked position. If the control is in the locked position (full forward) while the pilot is leaning forward, as he straightens up, the harness will retract with him, moving into successive locked positions as he moves back against the seat. The locked position is used when a crash landing is anticipated. This position provides an added safety precaution over and above that of the automatic safety lock.

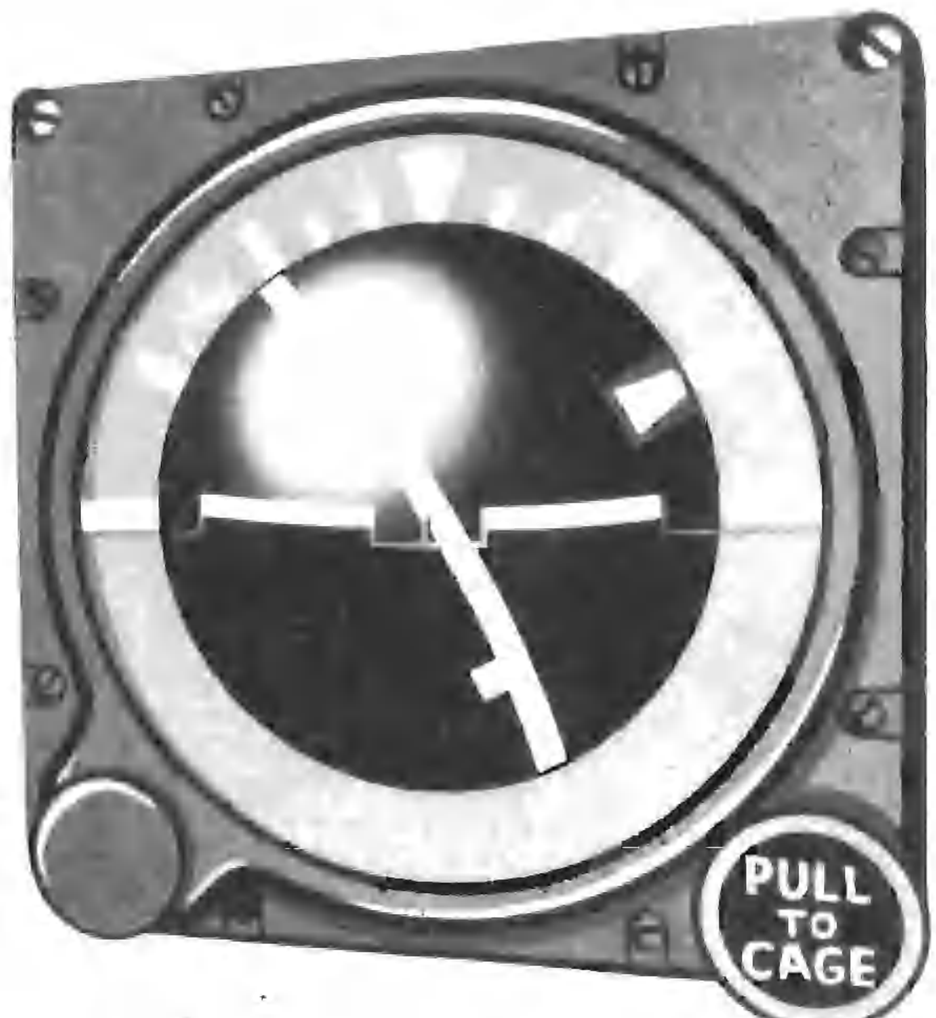
VERTICAL ADJUSTMENT CONTROL.

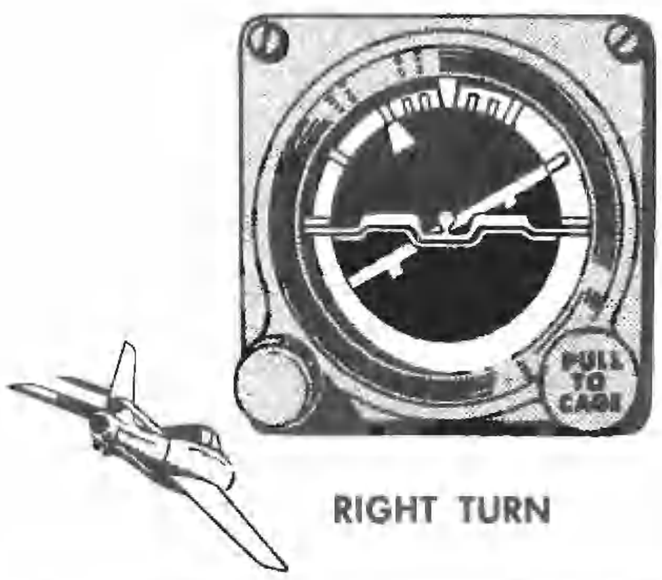
The vertical adjustment control (10 figure 1—19) with an attached locking pin indicator lever is located on the right side of the pilot's seat. Moving the vertical adjustment control up releases the seat so that it may be raised or lowered to the desired height and at the same time the foot rests are released from the seat so that they remain in contact with the cabin floor at all times. With the vertical adjustment control in this position there is no "finger" space between the adjustment

ATTITUDE INDICATOR

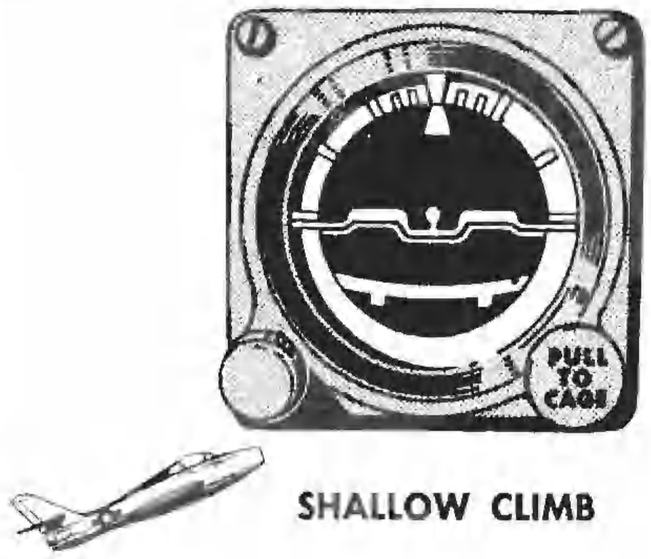
Positions



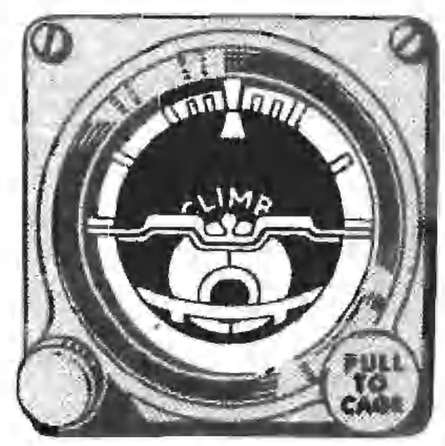




RIGHT TURN

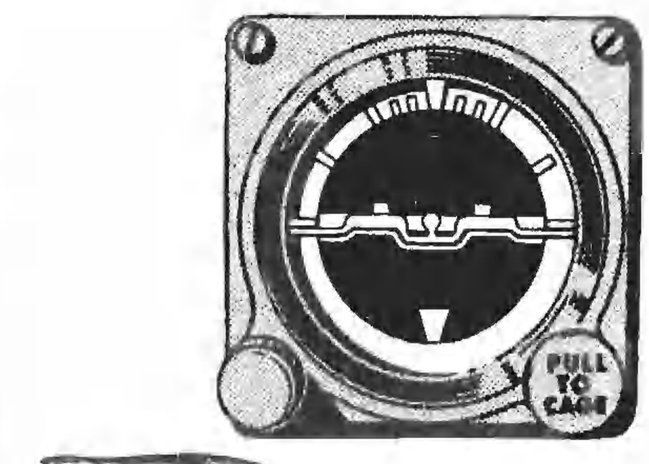


SHALLOW CLIMB



STEEP CLIMB

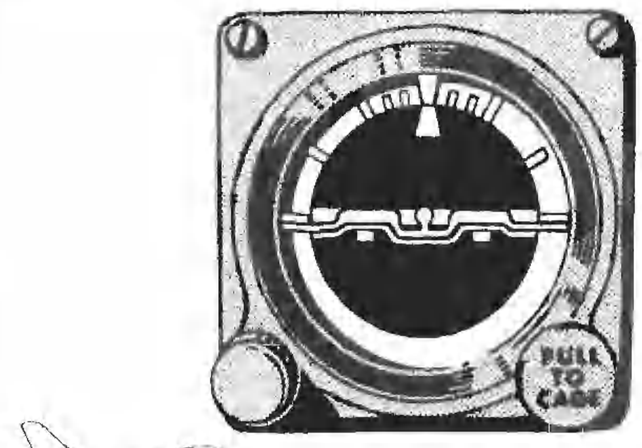
INVERTED CLIMB



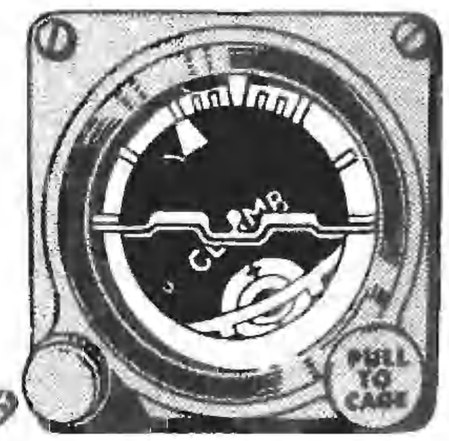
LEVEL INVERTED FLIGHT

INVERTED DIVE

UPRIGHT DIVE



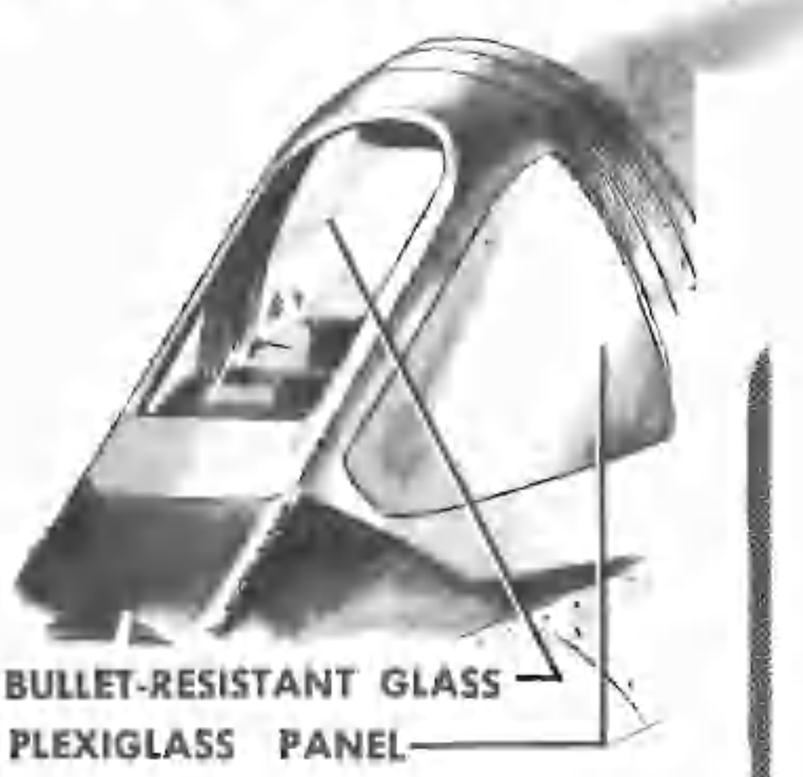
UPRIGHT LEVEL FLIGHT

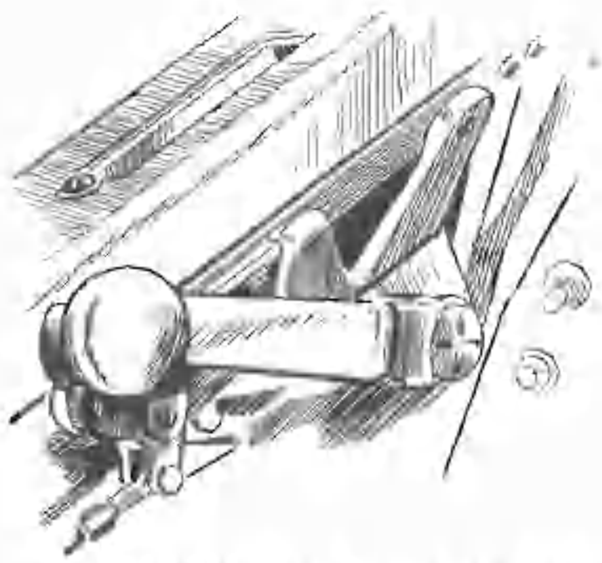


RIGHT CLIMBING TURN

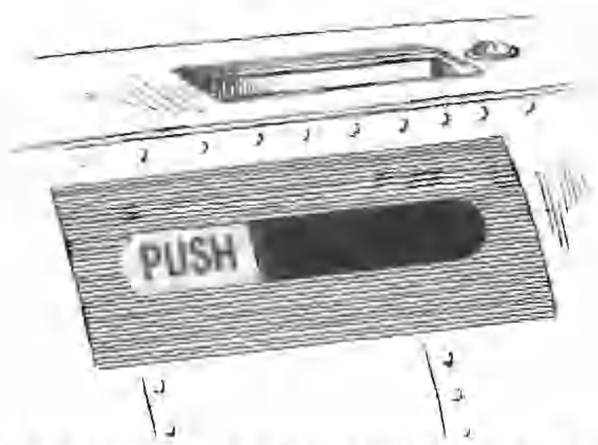
Figure 1–17. Attitude Indicator Positions

CANOPY CONTROLS





CANOPY CONTROL LEVER



EXTERNAL CANOPY CONTROL

CANOPY JETTISON CONTROL (RIGHT HANDGRIP)

PLEXIGLASS CANOPY

CANOPY

The canopy is a one piece bubble type made up of two layers of plexiglass with an air space between them. Heated and dried air controlled by a manually operated switch, is circulated between the two layers to defog the canopy. Power is not required to operate the canopy as it is manually operated and is hinged to the fuselage in such a way that when it is opened, it moves up and aft in an arc so as to clear the pilot at all times. It is counterbalanced so that opening and closing is accomplished with a minimum effort. The canopy is jettisoned by means of a manually fired initiator and electrically fired squib (explosive charger). Firing the initiator builds up a high pneumatic pressure which is directed to unlock the canopy and raise it about four inches into the airstream. The canopy hinge fittings are equipped with electrically fired squibs (explosive charges) that separate the canopy from the fuselage after it reaches the full open position. In the closed position, the canopy is sealed to the cabin structure by rubber tubes that are automatically inflated by air pressure from the engine compressor. A warning light is provided to indicate when the canopy is not fully closed and locked.

CANOPY CONTROL LEVER

The canopy control lever operates a manual lock and has only two positions: OPEN and CLOSE. The CLOSE position mechanically locks the canopy to the fuselage structure. The OPEN position releases the canopy locks and the canopy can then be lifted to the full open position. When fully open, a lock automatically engages on the side hinges to hold the canopy fully open. These locks are released by pulling the canopy control lever aft, past the OPEN position. This operation assures that the canopy control lever will be in the OPEN position before closing the canopy. When the canopy is jettisoned, the mechanical locks between the canopy and fuselage are automatically opened.

EXTERNAL CANOPY CONTROL

The external canopy control, located on the left side of the fuselage below the canopy is marked: TO OPEN CANOPY PUSH & LIFT. The control is used to open or close the canopy from outside the airplane. The forward end is marked PUSH and if pushed in the control, rotates from its flush position so that a handle is available and at the same time unlocks the canopy from the fuselage. The canopy is then lifted to the open position. The external canopy control will remain exposed until the canopy is closed and locked.

CANOPY JETTISON CONTROL (RIGHT HANDGRIP)

The right handgrip on the pilot's seat is a combination canopy and seat jettison control. The upper handle is marked CANOPY JETTISON and is guarded with a spring loaded clip and a safety pin to which is attached a red streamer. The pin is removed prior to flight and replaced immediately after landing. Pulling the canopy jettison control up, fires an initiator which in turn unlocks the canopy and lifts it up into the airstream about four inches. In this position the air loads will rotate the canopy to the full open position where the squibs fire and release the canopy from the fuselage. The initiator is safetied on the ground with a safety pin to which is attached a red streamer marked REMOVE THIS SAFETY PIN BEFORE FLIGHT, REPLACE IMMEDIATELY UPON LANDING. The pin and streamer are removed before flight. With the canopy jettison control in the jettison position the seat jettison control is exposed.

Figure 1–18. Cockpit Enclosure and Canopy Controls

control and the locking pin indicator. After the seat is at the desired height the vertical adjustment control is released and the seat and foot rest locking pins automatically engage. If the locking pins are fully engaged there will be "finger" space (approximately 5/8 inch) between the vertical adjustment control and the locking pin indicator lever. In the event that the locking pins are not fully engaged (indicated by no finger space), jiggle the seat to permit the pins to fully seat.

ARM RESTS.

The pilot's seat has two arm rests that may be moved fore and aft. The forward position must be used when ejecting the seat, therefore the arm rests will automatically move to the forward position when the respective seat hand grip is pulled up. The arm rest is released to the forward position by moving the arm rest release aft.

LEFT HANDGRIP.

The left handgrip (5 figure 1–19) is for emergency use. When the handgrip is pulled up it automatically released the left arm rest to the forward position and locks the shoulder harness.

RIGHT HANDGRIP (CANOPY AND SEAT JETTISON).

The right handgrip (1 figure 1–19) on the pilot's seat is made up of two controls which are normally folded down in front of the arm rest. The top lever is the canopy jettison control and the bottom lever is the pilot's seat jettison control. Both controls are safetied in the folded position by a spring loaded clip. The seat jettison control cannot be actuated until the canopy jettison control has reached its full up position and the canopy has been jettisoned. Each lever controls the firing of an initiator. The initiators develop a high pneumatic

PILOT'S SEAT

1. Canopy Jettison Control
2. Seat Jettison Control
3. Arm Rest
4. Arm Rest Release
5. Left Hand Grip
6. Shoulder Harness Lock Control
7. Foot Rests
8. Oxygen, radio and anti-g-suit hose disconnects
9. Seat spacer—Remove when using seat pack
10. Vertical Adjustment Control

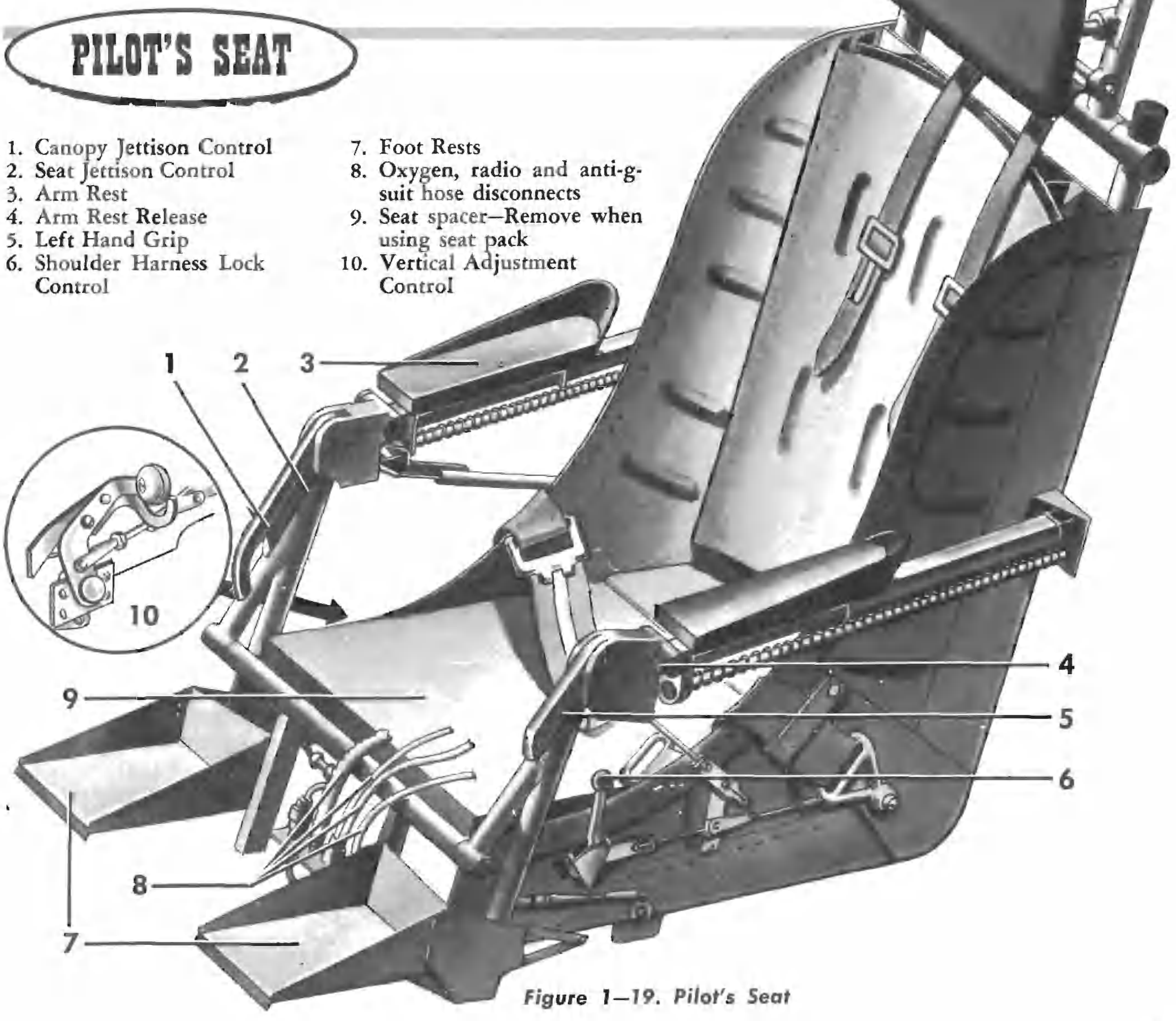


Figure 1–19. Pilot's Seat

SERVICING DIAGRAM

1. External Power Receptacle
2. Wing Tank
3. Main Tank
4. Alcohol Tank
5. Oil Tank
6. Refueling Receptacle
7. Wing Tank
8. Hydraulic Reservoir
9. Forward Tank
10. Oxygen Filler Valve

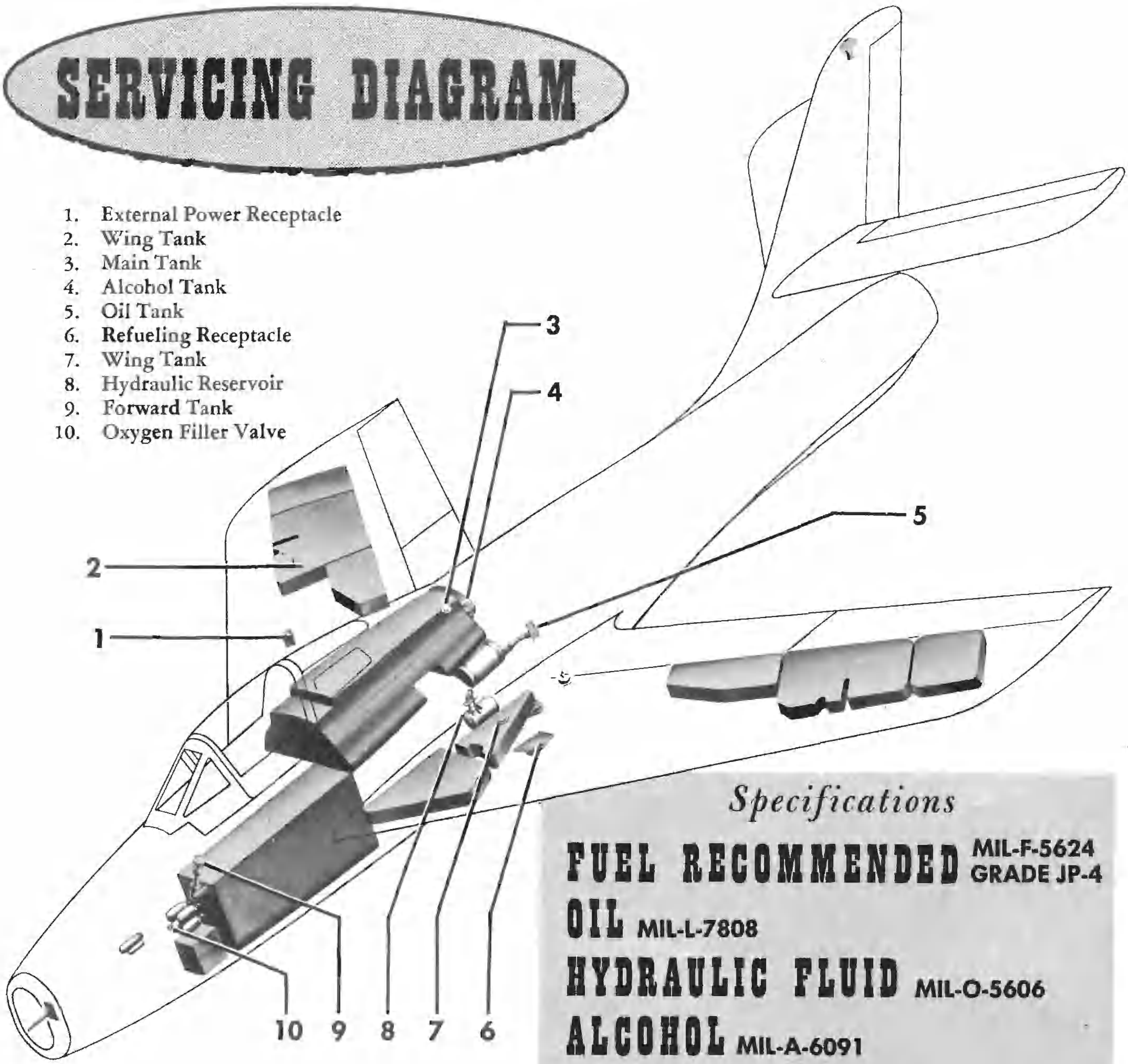


Figure 1—20. Servicing Diagram

Specifications

FUEL RECOMMENDED MIL-F-5624 GRADE JP-4
OIL MIL-L-7808
HYDRAULIC FLUID MIL-O-5606
ALCOHOL MIL-A-6091
OXYGEN AN-O-1

pressure which is directed to actuate the canopy jettison and seat ejection systems. When the canopy jettison control is pulled all the way up, it locks in position and jettisons the canopy. The seat jettison control is then exposed and when it is squeezed, using the canopy jettison control as a brace, the seat is ejected. The two initiators, one for the canopy jettison and one for the seat jettison, are protected against accidential firing on the ground by inserting a safety pin with a red streamer attached. The pins must be removed before flight.

WARNING

Do not attempt to squeeze the seat jettison control until canopy jettison control is fully up and locked so as to assure proper sequence of canopy jettison and seat ejection.

AUXILIARY EQUIPMENT.

Section IV of this handbook contains information on the following auxiliary equipment: oxygen, pressurization, heating, ventilating, communications, in-flight refueling, armament, anti-g, de-icing, d-fogging, lighting and autopilot.

Section II NORMAL PROCEDURES

FLIGHT RESTRICTIONS.

Refer to Section V of this handbook for flight restrictions on the aircraft.

FLIGHT PLANNING.

Determine cruise control data such as power settings, air speeds, etc., from data in the Appendix of this handbook.

WEIGHT AND BALANCE.

Check take-off and anticipated landing gross weight and balance. Consult Handbook of Weight and Balance Data, T.O. No. 1-1B-40 for loading procedure. Make sure weight and balance clearance (Form F) is satisfactory. Check that total weight of fuel, oil, armament, oxygen, and special equipment carried is suitable to the mission to be performed. Refer to Section V for weight limitations for various configurations.

ENTRANCE TO AIRPLANE.

1. Place a ladder against the left side of the aircraft at the cockpit. No external grips or steps are provided.
2. Open canopy using the external canopy control.

CAUTION

Do not use the canopy rail for a step or the gun sight as a hand hold.

BEFORE EXTERIOR INSPECTION.

1. Check Form 1 for status of the airplane.
2. Battery switch OFF.
3. Auxiliary bomb switch OFF.
4. Rocket selector switch OFF.
5. Rocket arming switch, OFF or FUSE DELAY.
6. Ato ready switch OFF.
7. Bomb switches OFF or SAFE.

WARNING

Since take-off requires a large amount of rearward stick travel there is a good possibility of the bomb release button being inadvertently energized by contacting the pilot's clothing or the parachute harness. In order to preclude this possibility the bomb and rocket selector switches must be placed in the OFF position and the bomb and rocket arming switches must be in the OFF or SAFE position prior to take-off.

8. Fuel tank selector OFF.
9. Gun arming switch SIGHT CAMERA & RADAR.
10. Check that canopy jettison control safety clip is in position.

EXTERIOR INSPECTION

EXTERIOR INSPECTION
(FIGURE 2–1.)

1. Make a complete pre-flight inspection of the airplane. (See figure 2–1.)

❶ NOSE SECTION.

a. Intake duct plug and pitot cover—Removed.

b. Air intake ducts for foreign objects.

c. Nose wheel shock strut—Visible damage and proper inflation. Strut extension depending on weight of airplane.

d. Nose gear safety pin—Removed.

e. Nose wheel tire—Proper inflation and evidence of slippage.

f. Nose gun blast tubes—Plugs installed.

g. Nose wheel static ground wire—Ground contact.

❷ FORWARD FUSELAGE AND RIGHT WING.

a. Static ports—Clear.

b. All access doors and gun deck cover—Installed.

c. Check battery lift—Retracted and Secured.

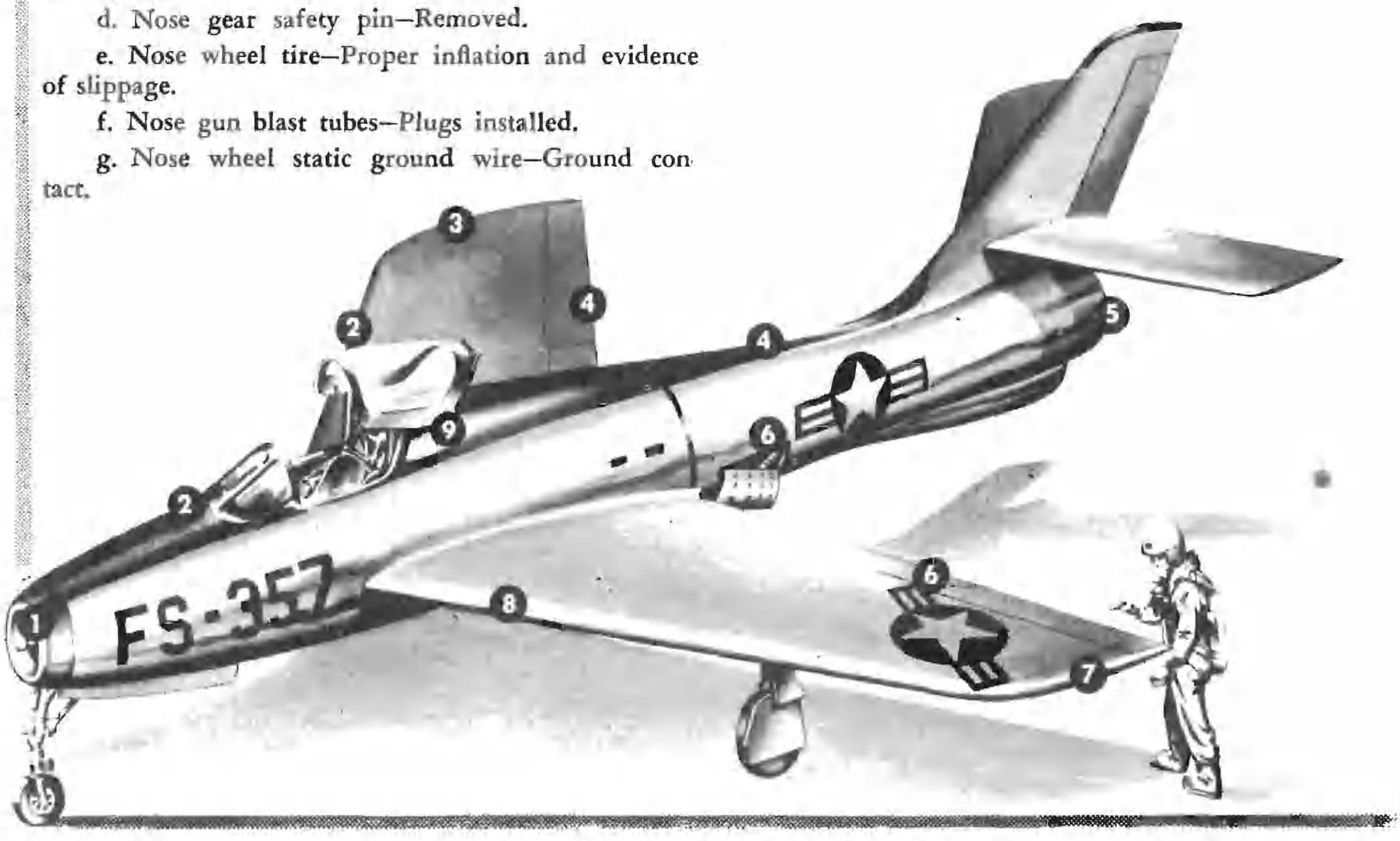
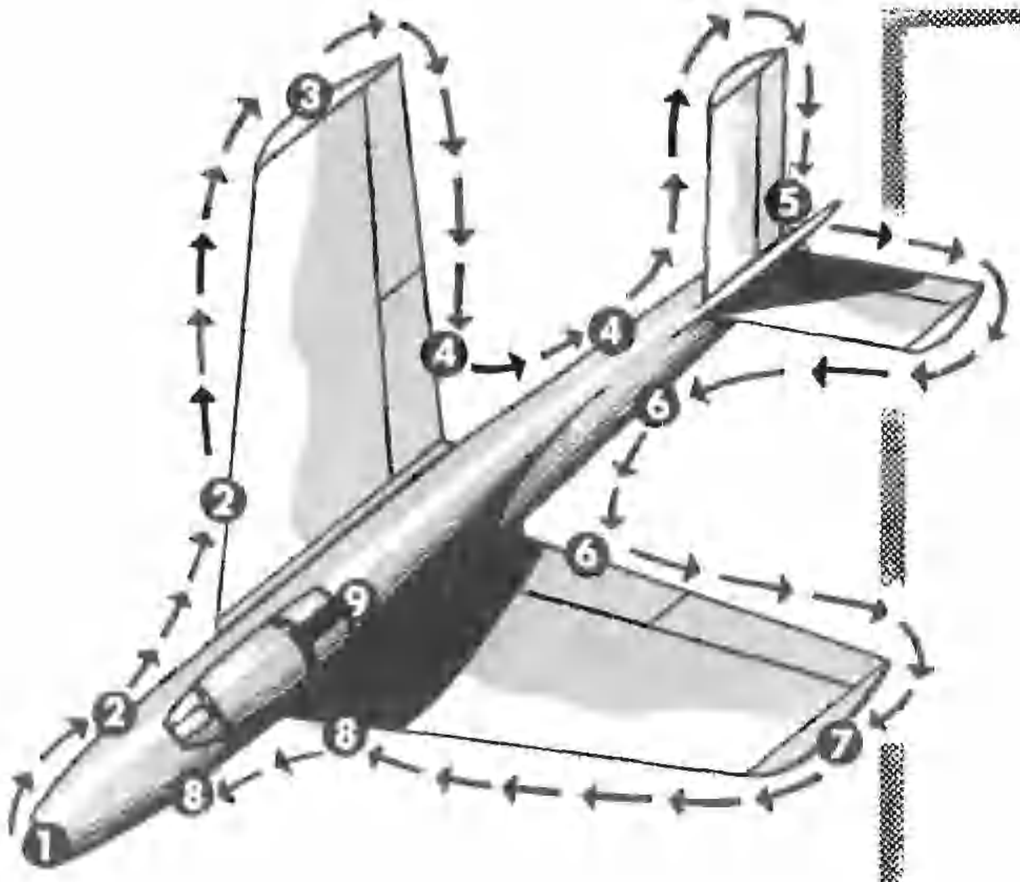


Figure 2–1. Exterior Inspection (Sheet 1 of 2)



e. Oxygen filler—Secured.

f. Pylon tank or bomb—proper installation on inboard pylon and pylon tank filler cover secured.

g. Armament safety override switch—Check.

h. External power source—Stand-by ready for connecting to the service and the starter receptacles or to the service receptacle.

j. Landing gear strut—visible damage and proper inflation. Strut extension approx. 5⅜ inches.

k. Landing gear tire—Blisters, grease or oil, proper inflation and evidence of slippage.

l. Wheel chock—In place.

m. Landing gear safety clip—Removed.

n. Air pressure in inboard pylon jettison system. 1600 psi.

o. Air pressure in inboard pylon tank jettison system 2000 psi.

3 RIGHT WING TIP.

a. Front rocket posts—Properly retracted.

b. Rear rocket doors—Flush fit with under side of wing skin and security of latches.

c. Pylon tank or bomb—Proper installation on outboard pylon and pylon tank filler cover secured.

d. Air pressure in outboard pylon jettison system 1600 psi.

e. Air pressure in outboard pylon tank jettison system 2500 psi.

f. Position lights—Condition.

4 RIGHT WING TRAILING EDGE AND AFT FUSELAGE.

a. Wing fuel filler cover—Installed.

b. Jato units—Installed and nozzles clear.

c. Engine access doors—Closed and secured.

d. Speed brake—Condition.

5 EMPENNAGE.

a. Tailpipe dust plug—Removed.

b. Tailpipe for accumulation of fuel or oil.

c. Empennage for general condition.

d. Tail position lights—Condition.

e. Fuel tank vents—Condition.

6 AFT FUSELAGE AND LEFT WING TRAILING EDGE.

a. Make same inspections as in step 4 in reverse order.

7 LEFT WING TIP.

a. Make same inspections as in step 3 in reverse order.

8 LEFT WING AND FORWARD FUSELAGE.

a. Make applicable inspections as in step 2.

b. Aerial refueling door—Evidence of damage.

9 AFT CANOPY.

a. Check oil supply and tank filler cover—Installed.

b. Check hydraulic oil supply and reservoir filler cover—Installed.

c. Main fuel tank filler cover—Installed.

d. Check alcohol supply and tank filler cover—Installed.

e. Canopy and canopy frame—Cleanliness and security.

f. Canopy for cracks, nicks, crazing and security.

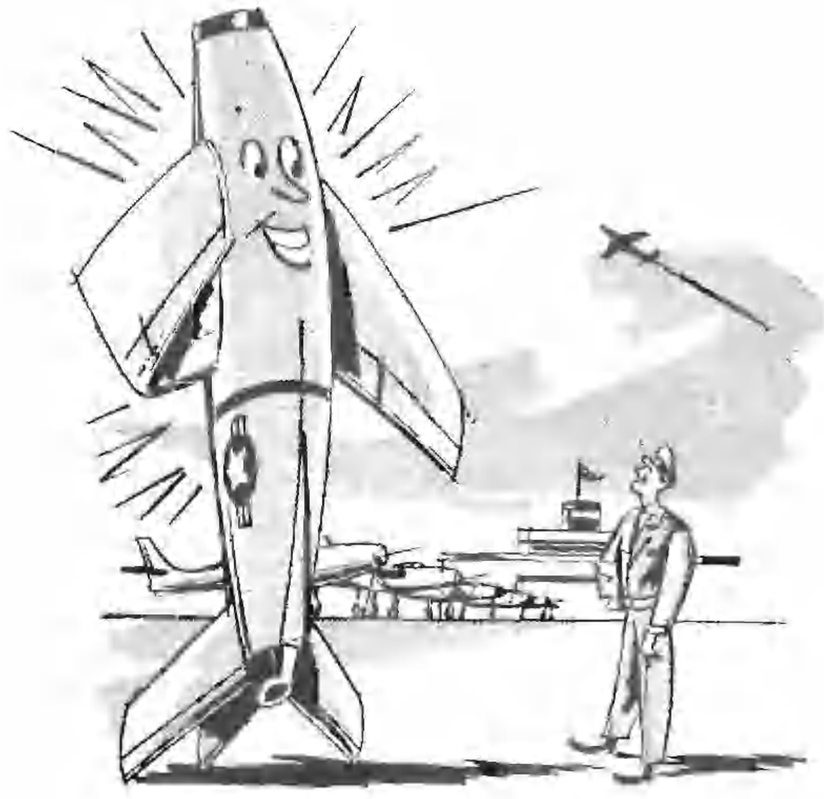
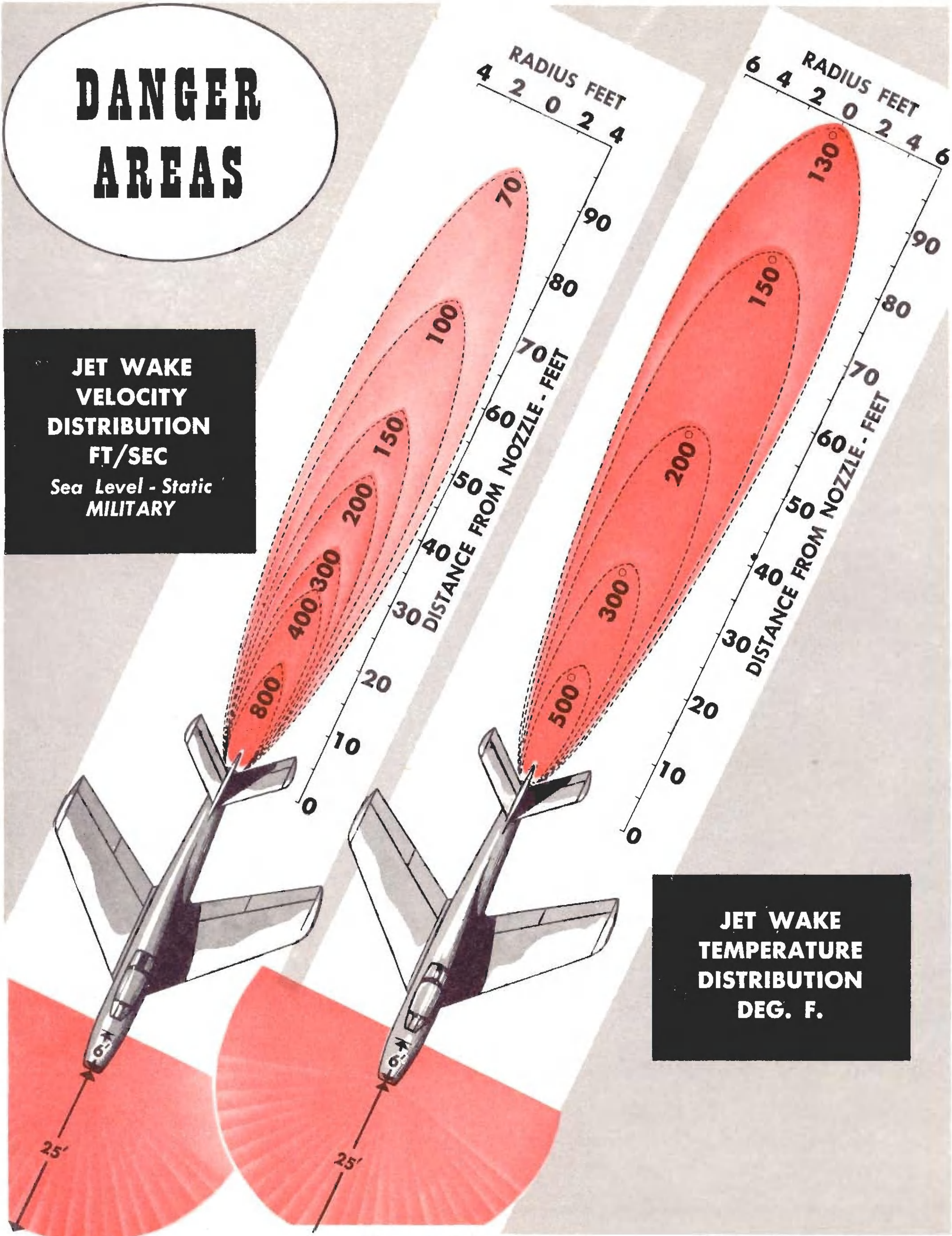


Figure 2—1. Exterior Inspection (Sheet 2 of 2)

DANGER AREAS

JET WAKE VELOCITY DISTRIBUTION FT/SEC

Sea Level - Static
MILITARY



JET WAKE TEMPERATURE DISTRIBUTION DEG. F.

Figure 2—2. Danger Areas

ON ENTERING THE PILOT'S COMPARTMENT.

Interior Check — All Flights.

1. Test master circuit breaker indicator light.
2. Check the trim switch for security of mounting on the control stick. Operate the trim switch in all four ON positions and note that it automatically returns to the OFF position when released. If the switch sticks in any of the ON positions, enter this fact with a red cross in the Form 1 and do not fly the airplane.

CAUTION

Do not twist the grip as such action may cause the grip to become less secure.

3. Check all circuit breakers on left console IN.
4. Aileron, elevator and rudder booster switches ON, red cover guard down.
5. Pitot heater switch OFF.
6. Engine screen switch EXTEND.
7. Fuel filter deicing switch OFF.
8. Pylon tanks air pressure switches OUTB'D PYLON or INB'D PYLON.
9. Gun heater switch OFF.
10. Outboard and inboard pylon jettison switches, cover guard down.
11. Fuel tank selector OFF.
12. Test operate hydraulic hand pump to insure pressure.
13. Throttle control CLOSED.
14. Landing flap lever UP.
15. Speed Brake switch ON.
16. Fuel tank battle damage switches, up position.
17. Aerial refueling receiver switch, up position.
18. Aerial refueling receiver light switch, up position.
19. Landing gear selector handle DOWN.
20. Gyro compass switch NORMAL.
21. Set altimeter to correct setting.
22. Set accelerometer.
23. Check clock for proper setting.
24. Gun-bomb-rocket sight mechanical caging lever CAGE.
25. Instrument power switch NOR.
26. Normal-emergency start switch NORM START.
27. Generator switch ON.
28. Oxygen pressure — Low 300 psi min, High 1800 psi.
29. Check all circuit breakers on right console IN.
30. Cabin vent switch PRESSURE.
31. Defrost control OFF.
32. Check all radio controls — OFF.
33. Request crew chief to connect external power to service and starter power receptacles.
34. Check and test all warning lights.
35. Check fuel quantity.
36. Internal and external lights OFF.
37. Test canopy squib A and B circuits (Canopy must be open).

WARNING

If the squib test circuits are not functioning properly on GK airplanes and the squibs in the rear hinge bolts fire, the bolts will take a horizontal path. Therefore be sure that no personnel are in line with these bolts when testing the canopy squib circuits on these airplanes.

38. Adjust arm rests to desired position and seat for proper height.
39. Examine safety belt and shoulder harness for security of adjustment and proper operation of lock movement and leave unlocked.
40. Release control lock and adjust rudder pedals to proper position. Check controls for free and correct movement.
41. Remove safety pins from canopy and seat jettison initiators.
42. Remove safety pin from canopy jettison control.
43. Connect pilot's oxygen, G suit and radio connections.
44. Head the aircraft into the wind if possible.

CAUTION

To prevent damage to the fuselage shroud, be sure that all inspection doors and covers in the aft fuselage are in place.

45. Make certain that all personnel are clear of the jet exhaust and intake areas.

INTERIOR CHECK — Night Flights.

1. Console lights CHECK.
2. Instrument panel lights CHECK.
3. Position lights CHECK with crew chief.
4. Landing lights CHECK.
5. Taxi light CHECK.
6. Flashlight CHECK.

Figure 2—3. Interior Check

STARTING ENGINE.

1. Throttle closed.

2. Battery switch OFF and check external power connected.

Note

If external power is not available turn battery switch to BATT ON, normal-emergency start switch to EMERG START and instrument power switch to ALT. (This is considered an emergency procedure.) After engine has started, return normal-emergency start switch to NORM START and instrument power switch to NOR.

3. Fuel tank selector ALL TANKS.

4. Hold starting switch in the START position momentarily to engage automatic starting system.

5. At 10 percent rpm, move throttle to a point just under the idle stop, which opens the shutoff valve, the priming valve, and energizes the ignition timer which provides ignition for approximately 20 seconds.

CAUTION

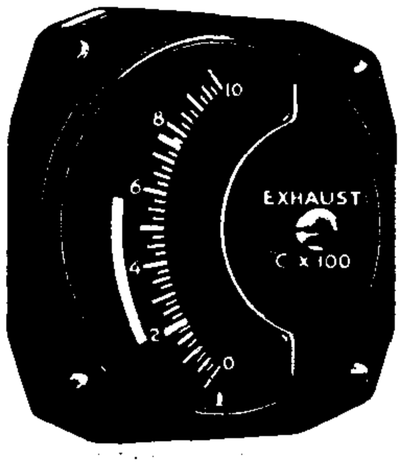
If the engine does not reach 10 percent rpm within 30 seconds, trip the starter switch to the STOP START position and allow the engine to stop. Check to see that the source of electrical power is adequate and that all connections are good. A thorough check should be made of the external power connector. (A minimum of 1000 amperes is necessary at the starter initially for successful starts. Use of the A-3 or C-22 APU-' are recommended.) If repeated attempts fail, investigate the condition of the starter-generator and the engine. If ignition, as indicated by rising exhaust temperature does not occur within 15 seconds after opening the throttle, move the throttle to the CLOSED position and trip the starter switch to STOP START. Allow combustion chambers to drain for 3 minutes, or longer if drainage continues, before attempting another start.

6. Immediately adjust the throttle to obtain 600-700 pounds per hour fuel flow. When initial high rate of temperature rise decreases and the exhaust gas temperature appears to be stabilizing, advance the throttle to the idle detent position. If the exhaust gas temperature reaches approximately 700°C and the rate of temperature rise does not appear to be decreasing, retard the throttle slightly attempting to control the temperature rise, or return the throttle to the OFF position and trip the starting switch to the STOP START position. The false start procedure should then be followed.

7. When engine speed reaches approximately 18 percent rpm, the starting circuit automatically deenergizes. To assure this procedure, place the starting switch in the STOP START position when engine speed reaches 18 percent rpm.

PROCEDURE IN EVENT OF FALSE START

1. If the exhaust gas temperature reaches maximum allowable for hot starts and accelerations during an attempted start, position the throttle to the CLOSED position, trip the starting switch to the STOP START position and allow the engine stop. Be sure all fuel has completely drained from combustion chamber by observing the drain valve then attempt another start.



WARNING

A hot start is defined as either five starts during which the exhaust temperature is between 800 and 900°C or one start during which the exhaust temperature reaches 900°C or higher. Record each start where the exhaust temperature is above 800°C in the Form 1. After five starts in which the temperature is between 800 and 900°C or after one start in which the exhaust temperature is 900°C or higher, accomplish the special inspections outlined in the applicable T.O. A hot section inspection must be performed in accordance with applicable T.O. if overspeeding of 105.5 to 108 percent rpm is encountered during flight or ground operation. The engine must be removed from service if overspeeding in excess of 108 percent rpm is encountered.

2. If the exhaust gas temperature does not rise within approximately 15 seconds after opening the throttle to IDLE, move the throttle to the CLOSED position and trip the starting switch to STOP START and allow the engine to stop. Be sure all fuel has completely drained from the combustion chamber by observing the drain valve then attempt another start.

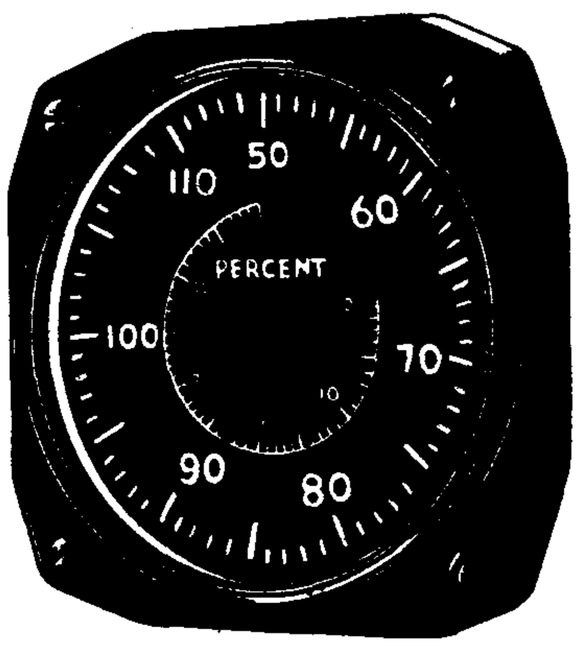
CAUTION

If the engine fails to start after two starting attempts, the starting motor and ignition coils must be allowed to cool for five minutes. If the engine fails to start on the next attempt after the five minute cooling period, the starting motor and ignition coils must be allowed to cool for twenty minutes before another start is attempted.

Figure 2–4. Procedure in Event of False Start

ENGINE GROUND OPERATION

No warm-up period is required. Take-off may be made immediately if the engine instruments show normal readings.



note

In the event of condensation in the form of mist or snow is blown into the cabin from the air-conditioning outlets and is found to be objectionable to the pilot, the cabin vent switch can be positioned to RAM, or a higher temperature selected on the cabin temperature selector.

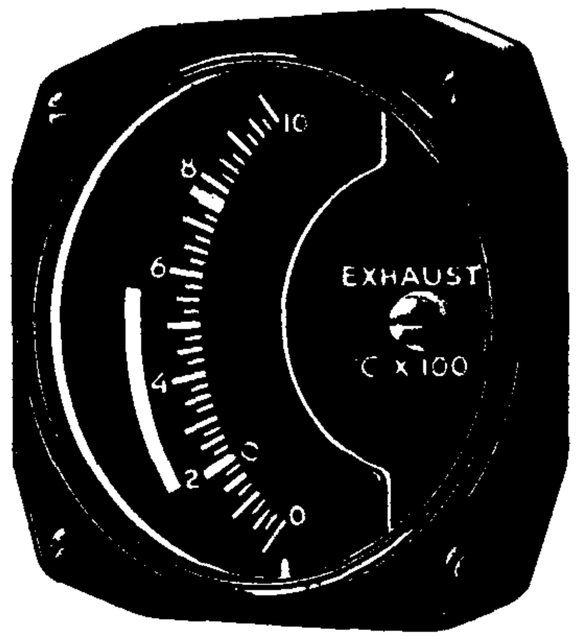
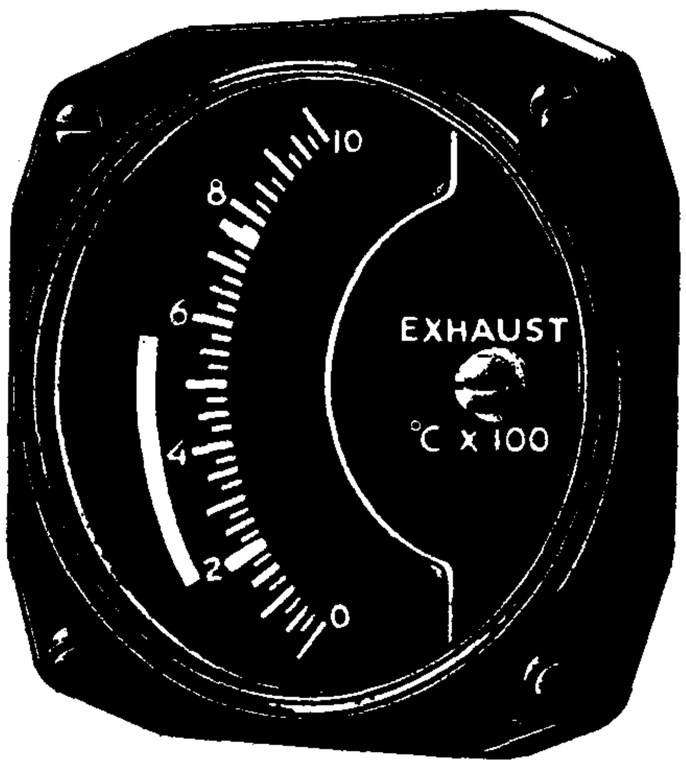


Figure 2–5. Engine Ground Operation

ACCELERATION

If the maximum exhaust temperature is exceeded during acceleration of the engine, close the throttle slightly until the temperature has dropped below the steady state limit. The engine may then be accelerated by advancing the throttle gradually so that the acceleration temperature limit is not exceeded.



caution

Avoid throttle busting which can cause compressor stalls.

Figure 2–6. Acceleration

GROUND TEST

1. Check hydraulic pressure.

2. Check for firm and positive brake action.

3. Test operate landing flaps, and speed brake through complete range.

CAUTION

Do not operate the speed brakes if the ato adapter is installed as the speed brakes will be damaged due to contact with the ato adapter.

4. Check flight controls for free and correct movement.

5. Check control surface trim devices.

6. Check fuel tank selector ALL TANKS.

7. Check external tank air pressure switches, OUTB'D PYLON or (INB'D PYLON).

8. Check charge on ammeter at 40% rpm and above.

9. Check voltage on voltmeter at 40% rpm and above.

10. Check communication equipment.

11. Check that no fuel is overflowing from main tank vent lines (observed by crew chief).

Figure 2–7. Ground Test

8. When engine speed has stabilized at idle (36.2 to 41.0 percent rpm) check that the oil pressure is within limits.

9. Check that all engine instruments are within range indicate normal operation. Advance throttle as desired.

10. Have external power supply disconnected and turn battery switch to BATT ON.

TAXIING INSTRUCTIONS.

Remove chocks, close and lock canopy, release brakes and increase power until airplane starts to move. Once the airplane is moving, taxi at the lowest practicable rpm to conserve fuel and avoid damage from tailpipe blast. Brakes are required for steering as the rudder is ineffective at low speeds and nose wheel steering is not provided. Slightly higher than normal force is required on the brakes for turning, however, the airplane is easy to taxi. When the airplane is fully loaded with external items, a much higher rpm is necessary to get the airplane rolling. When heavily loaded, the turning radius must be slightly increased to prevent excessive side loads on the struts and tires. Limit taxiing to a minimum as the airplane range is decreased by the high rate of fuel consumption during taxiing. Fuel consumed during taxiing is approximately, 15 to 25 pounds per minute.

Figure 2—8. Deleted

BEFORE TAKE-OFF.

After taxiing into take-off position, complete the following checks:

PRE-FLIGHT ENGINE CHECK.

1. With engine idling, check instrument readings to make sure engine is functioning properly.

2. Retract engine screens.

CAUTION

Do not retract the engine screens if conditions are such that foreign objects may be drawn into the air intake.

3. Advance throttle from idle to 100% rpm.

Note

The engine should accelerate from idle to 100% rpm in 6-7 seconds.

4. Check instruments for desired readings at take-off power, (See table 2—1 or 2—2).

5. Return engine screens as required.

MAXIMUM Exhaust Gas Temperature

TABLE 2—1.
(ENGINE SCREEN RETRACTED)

YJ65-W-1A *(Engine Stabilized at 100 percent rpm)*

AMBIENT TEMP °F	MAX EGT °C	MIN EGT °C
100	630	610
90	628	608
80	626	606
70	624	604
60	622	602
50	621	601
40	619	599
30	617	597
20	615	595
10	613	593
0	611	591
—10	609	589
—20	607	587
—30	606	586
—40	604	584
—50	602	582
—60	600	580
—65	599	579

TABLE 2—2.

MAXIMUM Exhaust Gas Temperature

(ENGINE SCREEN RETRACTED)

YJ65-W-1 *(Engine Stabilized at 100 percent rpm)*

AMBIENT TEMP °F	MAX EGT °C	MIN EGT °C
100	650	630
90	646	626
80	643	623
70	640	620
60	636	616
50	633	613
40	629	609
30	626	606
20	622	602
10	619	599
0	616	596
—10	612	592
—20	609	589
—30	605	585
—40	602	582
—50	599	579
—60	595	575
—65	594	574

PREFLIGHT AIRCRAFT CHECK

1. Landing flaps, full down then return to 20°
2. Speed brake switch OFF.
3. Trim indicator lights, Illuminated.
4. Fuel tank selector ALL TANKS.
5. Pylon tank air pressure switches OUTB'D PYLON or (INB'D PYLON).
6. Stabilizer position indicator, 2 degrees nose up.
7. Safety belt and shoulder harness tightened and check inertia reel unlocked.
8. Prior to ATO take-off, place ATO ready switch in ATO READY. ATO ready warning light should go on.
9. Oxygen mask adjusted properly and oxygen system operating. Arrange oxygen hose so as not to interfere with full stick travel.
10. Oxygen warning system switch ON.

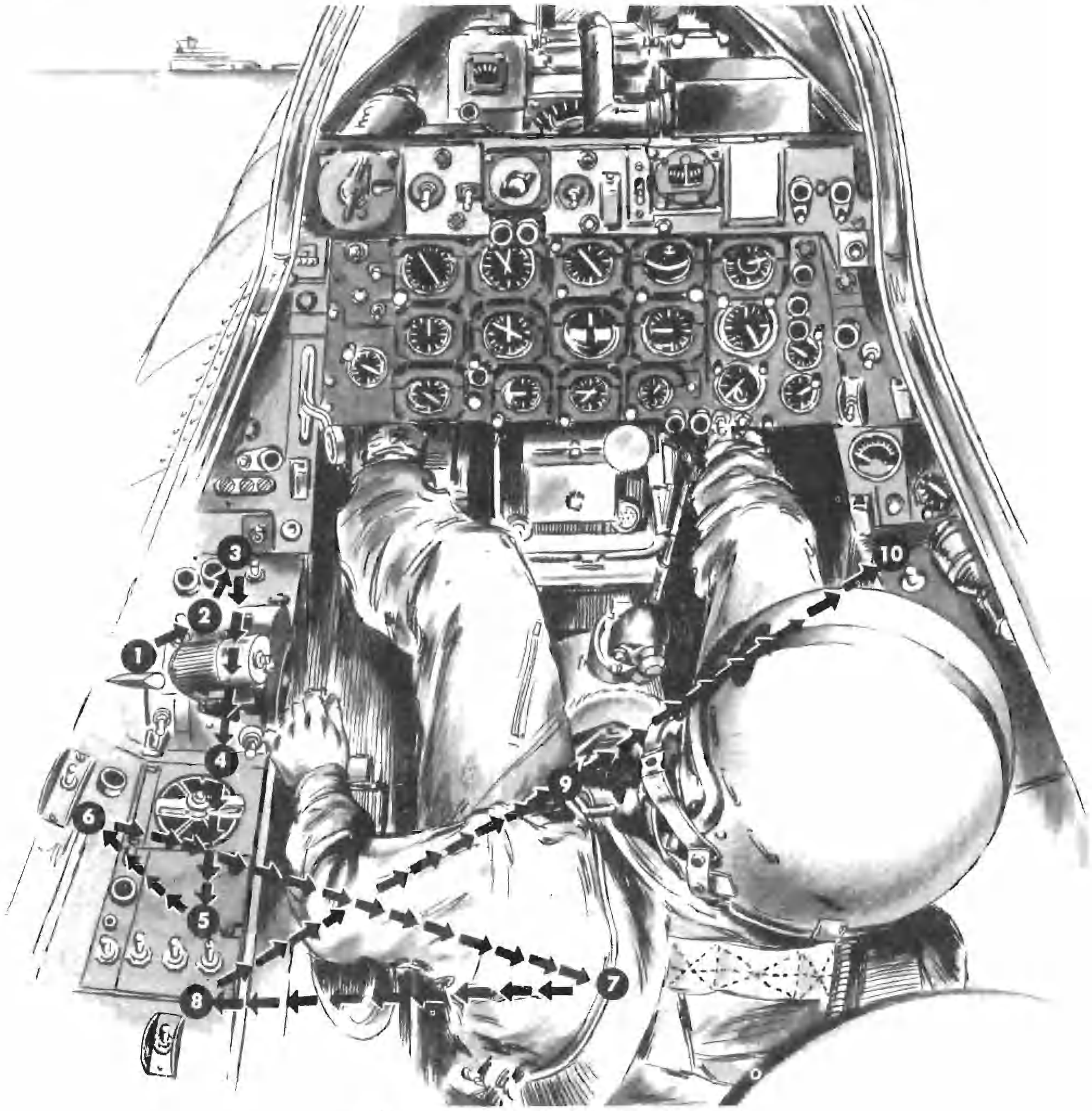
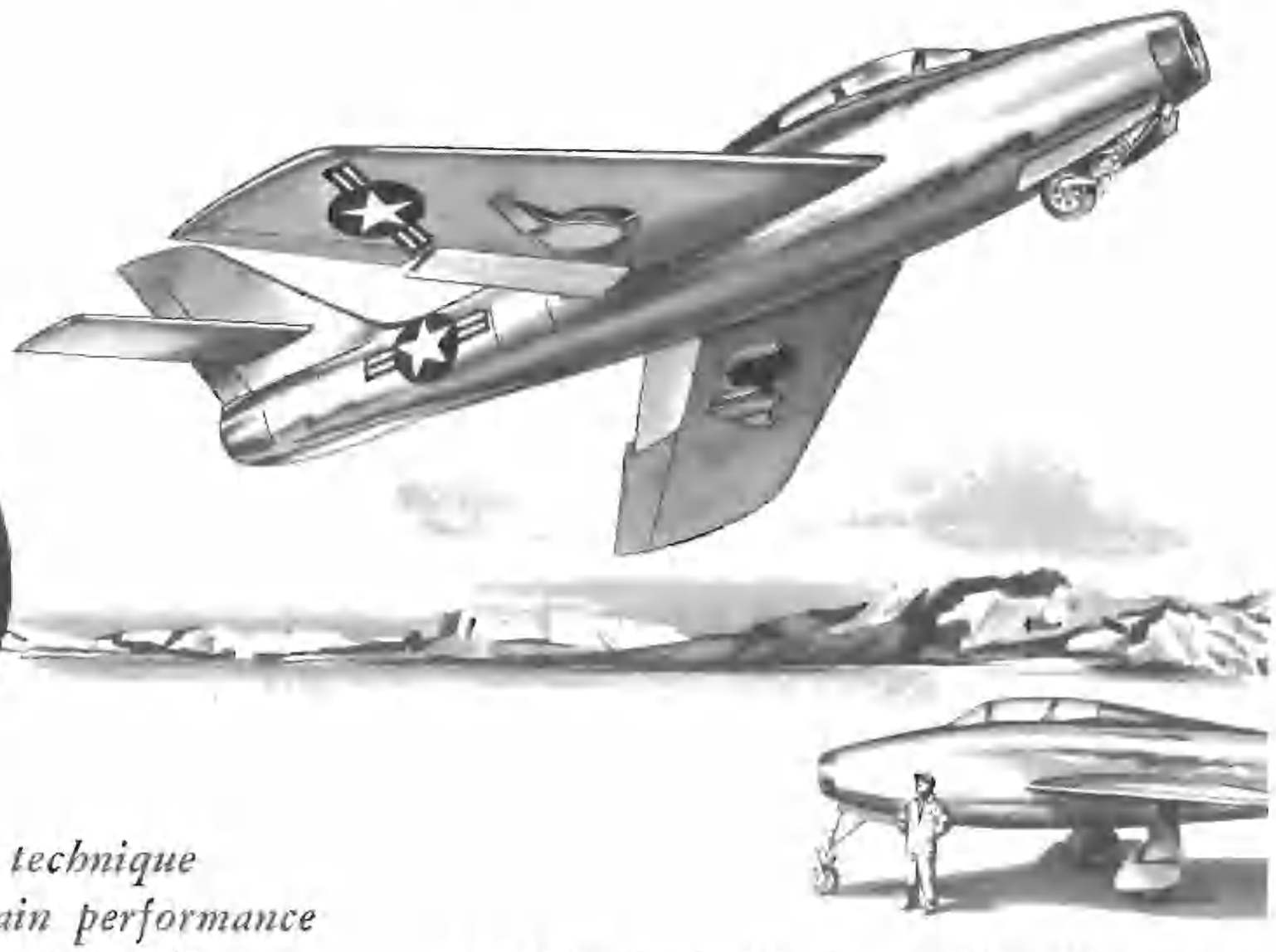


Figure 2–9. Preflight Aircraft Check



TAKE-OFF

The following technique must be used to obtain performance illustrated in the Appendix.

1. Refer to Appendix for minimum take-off distances required by various combinations of gross weight, pressure altitude and air temperature, also for best climbing speed, rate of and time to climb, and fuel consumption.
2. Advance the throttle to take-off rpm. Check instruments, release brakes to begin take-off run.
3. Maintain directional control by minimum use of brakes until rudder becomes effective at approximately 60 knots.
4. If using ATO, push ATO ignition switch as airspeed approaches the desired values as noted in the Appendix.
5. Leave control stick in neutral until take-off speed is reached. This reduces drag to a minimum.

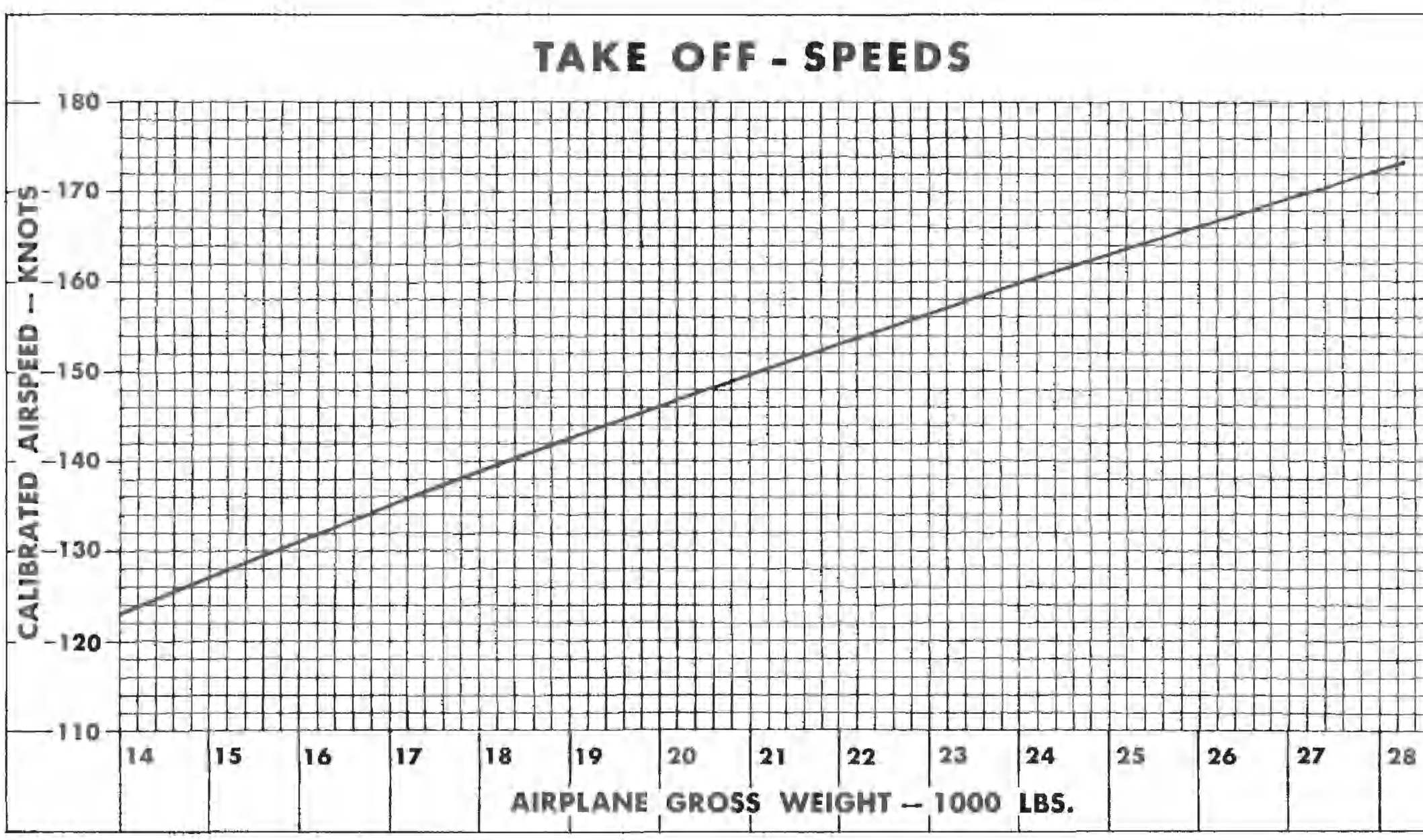


Figure 2–10. Take-off

ASSISTED TAKE-OFF

The effect of ATO on airplane trim is slight as the units are installed near the fuselage centerline. No special technique is required. Take-off performance will depend on the speed at which the ATO units are fired during the take-off run. Refer to the Appendix for the ATO cut-in speed for a four ATO unit take-off.

Figure 2–11. Assisted Take-off

CLIMB.

The climb characteristics of the airplane permit a high initial rate of climb and sustained climbing speed to the service ceiling. See Appendix for recommended climb speeds, rate of climb, engine rpm and fuel consumption during climb.

CAUTION

During a climb at or near the maximum rpm, the throttle should be retarded when ever the rpm starts to exceed the steady stated limit, to prevent overspeed due to altitude creep in the governor.

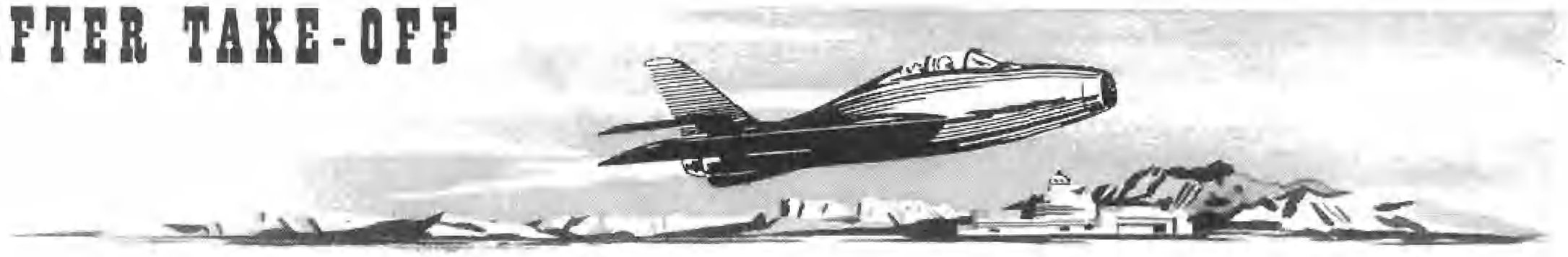
FLIGHT CHARACTERISTICS.

Refer to Section VI for detailed information on the aircraft flight characteristics.

SYSTEMS OPERATION.

Refer to Section VII for detailed information regarding operation of the various aircraft systems.

AFTER TAKE-OFF



1. Landing gear selector handle: UP when definitely air borne. Check the landing gear position indicators.

note

Landing gear will retract in approximately ten seconds at normal temperatures.

2. Landing flap lever : UP at approximately 190 knots IAS.

3. Hold 200 knots IAS until obstacles are cleared.

4. After take-off, drop ato units when at a safe altitude, by depressing ato jettison switch.

CAUTION

To prevent damage to the fuselage drop ato units between 200 and 250 knots.

5. Ato ready switch: OFF.

6. Climb to safe altitude and adjust speed for best climb.

7. Cabin vent switch to PRESSURE if take-off was made in RAM.

8. Engine screen switch: RETRACT. Check engine screen warning light ON then OFF.

9. Pneumatic compressor switch ON.

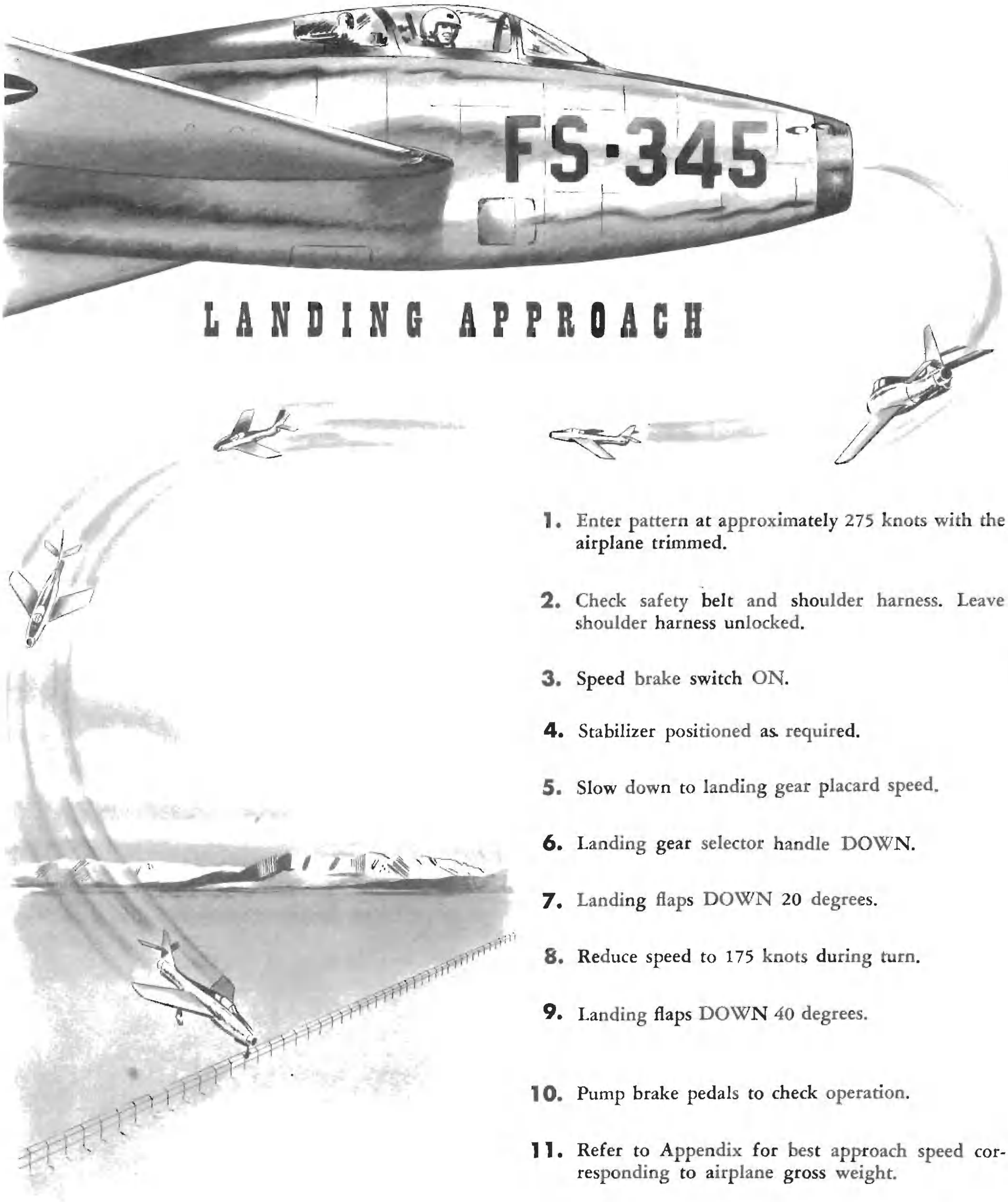
Figure 2–12. After Take-off

PRE-TRAFFIC PATTERN CHECK LIST

1	Auxiliary bomb selector switch	**OFF**
2	Rocket selector switch	**OFF**
3	Rocket Arming switch	**OFF** or **FUSE DELAY**
4	Bomb selector switch	**OFF**
5	Bomb arming switch	**SAFE**
6	Engine screen switch **EXTEND** Check engine screen warning light	**ON** then **OFF**
7	Fuel tank selector **ALL TANKS** unless operation has been necessary in	**AUX**
8	Gun arming switch	**OFF**
9	Gun-bomb-rocket sight mechanical caging lever	**CAGE**
10	Pneumatic compressor switch	**OFF**

CAUTION If the mechanical caging lever is left in the UNCAGE position during landing or taxiing, the sight mirror or mirror suspension may become damaged due to vibration.

Figure 2–13. Pre-Traffic Pattern Check List



LANDING APPROACH

1. Enter pattern at approximately 275 knots with the airplane trimmed.
2. Check safety belt and shoulder harness. Leave shoulder harness unlocked.
3. Speed brake switch ON.
4. Stabilizer positioned as required.
5. Slow down to landing gear placard speed.
6. Landing gear selector handle DOWN.
7. Landing flaps DOWN 20 degrees.
8. Reduce speed to 175 knots during turn.
9. Landing flaps DOWN 40 degrees.
10. Pump brake pedals to check operation.
11. Refer to Appendix for best approach speed corresponding to airplane gross weight.
12. Come in over the fence at no less than 150 knots IAS with full flaps and slats and make contact at 135 knots IAS.

Figure 2—14. Landing Approach

LANDING

Normal Landing

Refer to Appendix for landing data. A ten minute interval between landings is necessary to permit the brakes to cool.

1. Landing is made with the tail low, touching down on the main gear then letting the nose wheel contact. It is not necessary to hold the nose wheel off as long as possible as the increased drag is negligible.

note

Directional control is good throughout the entire landing roll.

2. After touch-down apply brakes normally and hold until airplane speed reduces to taxiing speed to obtain data shown in Appendix.

note

The tail can be dragged by touching down at too low an airspeed.

3. Landing flaps lever UP and speed brake switch OFF before taxiing.

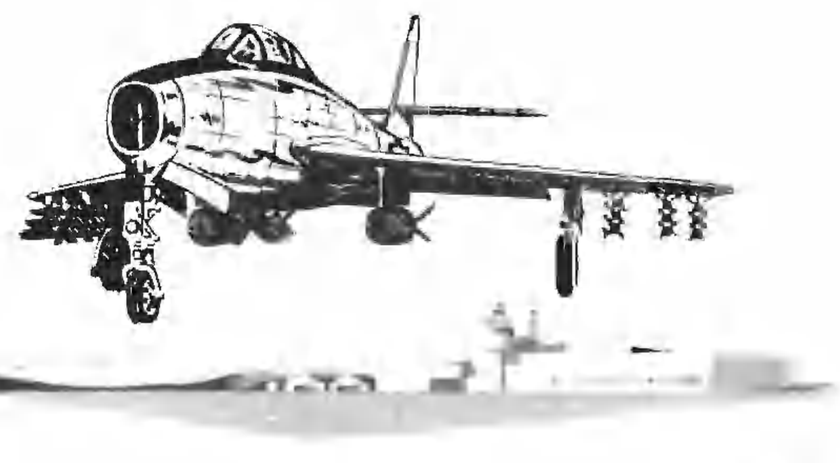
Figure 2—15. Normal Landing

EMERGENCY LANDING.

Refer to Section III for procedure in event of an emergency landing.

LANDING

with External Load



Landing with external loads such as bombs, pylon tanks and rockets should be avoided because the loads applied to the wing structure during such landings may cause wrinkles in the wing unless good smooth landings are made. Landing is made in the normal manner except that the speed will be higher because of the higher stalling speed due to the increased weight.

Figure 2—16. Landing with External Load

CROSS WIND LANDING

CROSS WIND LANDING.

The procedure for cross wind landing is the same as for normal landing. However, if the drift appears excessive, the upwind wing may be lowered until just before contact. During landing roll the airplane can be held in a straight path with the rudder until speed reduces to approximately 70 knots. At the lower speeds, direction is controlled by the use of the brakes.

Figure 2—17. Cross Wind Landing

GO AROUND OR WAVE-OFF.

WARNING

The decision to go-around should be made as soon as possible due to the slow acceleration of the jet engine.

1. Open the throttle smoothly to full rpm.
2. Speed brake switch OFF.
3. Retract the landing gear if airborne.
4. Retract the landing flaps to 20 degrees immediately and to full up position as conditions dictate.

STOPPING THE ENGINE.

1. Move throttle to IDLE STOP.
2. Flight controls locked.
3. Throttle CLOSED.

Note

If engine is being shut down from normal thrust or above, pause for at least one minute at the IDLE STOP to allow the temperature conditions within the engine to stabilize, then move the throttle from idle to CLOSED. If the engine is being shut down from below normal thrust, the throttle may be moved to the CLOSED position immediately.

4. After engine stops rotating turn fuel tank selector to OFF.

Note

If the fuel tank selector is turned to the OFF position, immediately after closing the throttle, the fuel tank selector becomes tightly bound on some airplanes and cannot be moved to any other position without extreme difficulty. Therefore, when stopping the engine, wait until the engine stops rotating before turning the fuel tank selector to the OFF position to avoid fuel pressure build up between the selector and the engine driven pump.

5. All switches OFF except the generator switch.

AFTER STOPPING THE ENGINE.

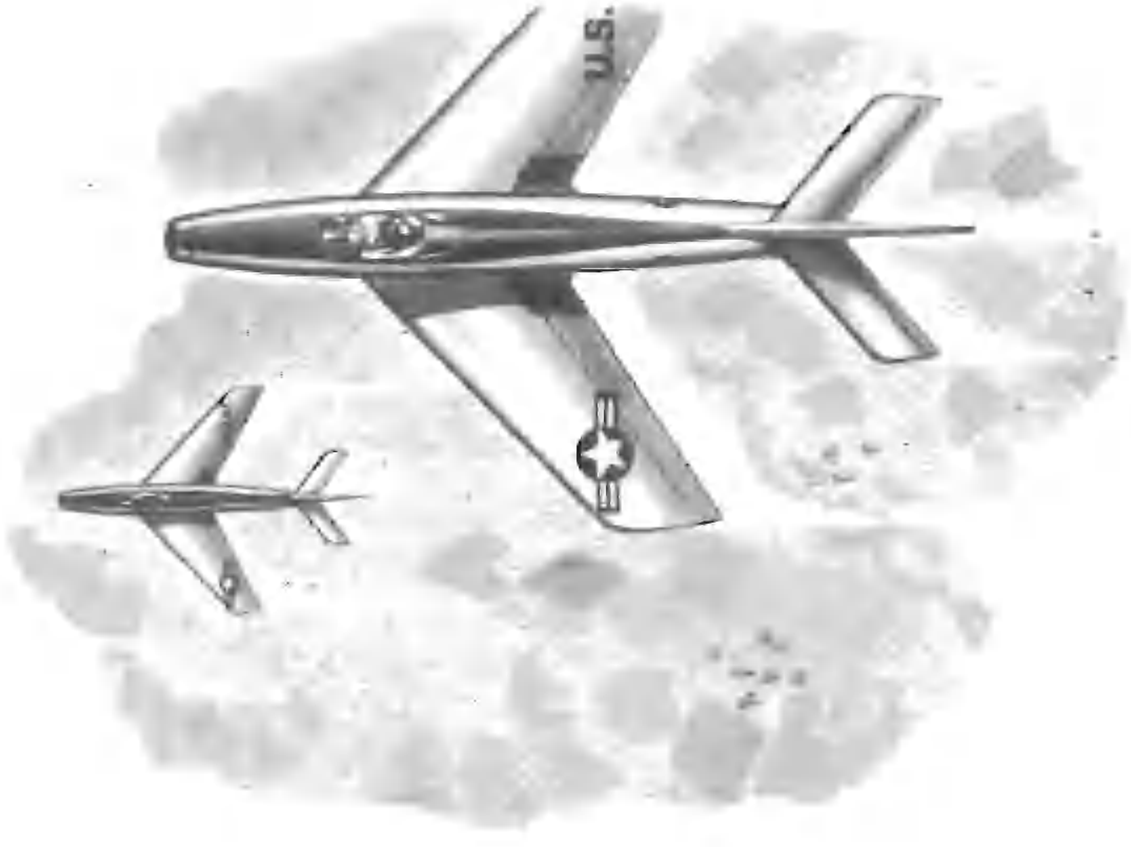
Smoke may be noted issuing from the tail pipe or nose duct within approximately 5 minutes after stopping the engine. To avert possible explosions, position the starter switch to START position until approximately 6 to 7% rpm is reached then momentarily place the starter switch to the STOP START position.

WARNING

Before actuating the starter switch to the START position, be sure the throttle is fully closed. This prevents priming fuel and ignition from being supplied to the engine.

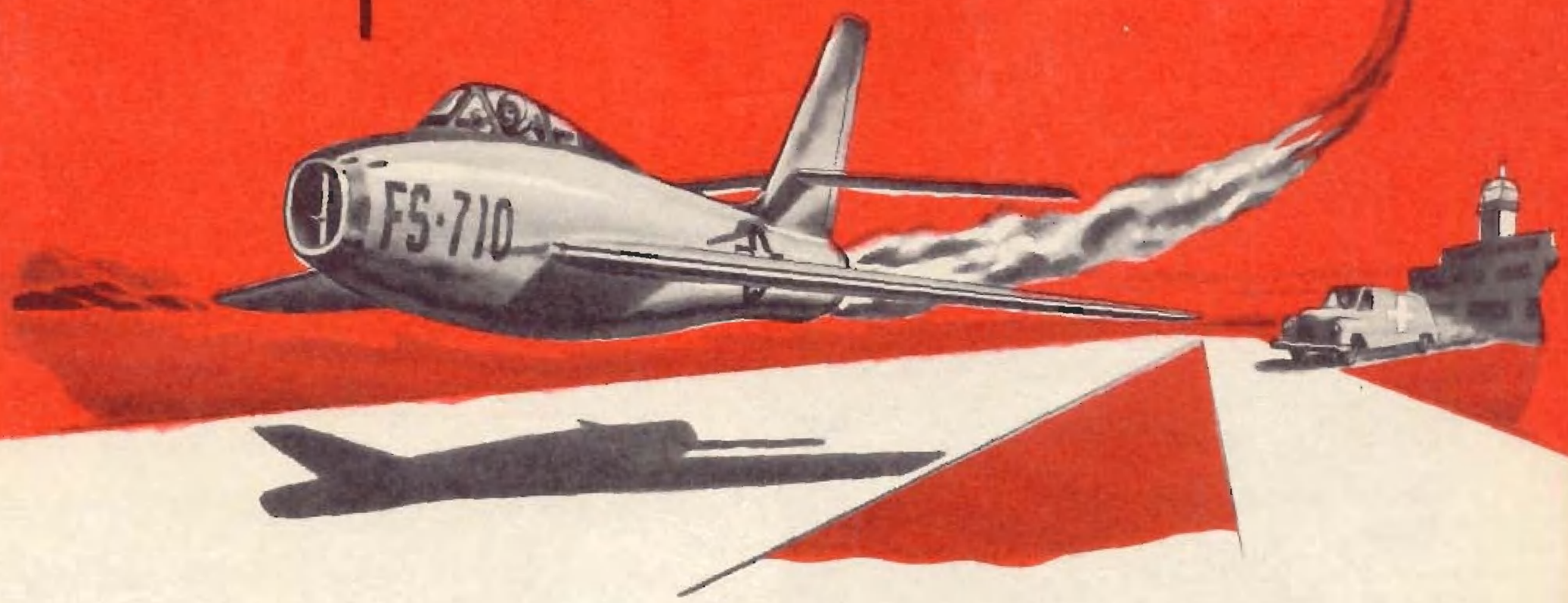
BEFORE LEAVING AIRPLANE.

1. Chocks in place.
2. Install safety pins in seat and canopy jettison initiators.
3. Fill out Form 1.
4. Close canopy.



Section III

EMERGENCY PROCEDURES



ENGINE FAILURE.

PROCEDURE ON ENCOUNTERING ENGINE FAILURE.

Successful engine operation is primarily dependent upon satisfactory function of the two fuel systems; the engine fuel system, which provides fuel to the engine at the required pressure and the airplane fuel system which maintains the supply of fuel to the engine system. If the main fuel tank (the normal source of supply to the engine fuel system) should fail, fuel from the wing and forward tanks can be recovered in WING AUX and FWD AUX operation. Failure of each of the two systems is covered in detail in this section. If power does fail, the fuel boost pressure warning light will isolate the source of trouble. If the fuel boost pressure warning light is on, the main tank booster pump has failed or the tank is empty, so that switching to auxiliary operation is necessary to recover fuel. If the fuel boost pressure warning light is off, the main tank is delivering fuel to the engine fuel system and therefore failure must have occurred in the engine fuel system. In this case, power cannot be regained as there is no alternate or emergency fuel system incorporated in the engine. In the event of a complete engine power failure, the following procedure is recommended:

1. Close throttle to prevent flooding the engine.
2. Select proper fuel system as indicated by fuel boost pressure warning light.
3. Attempt to restart the engine.

Note

Flight Characteristics of the aircraft with a dead engine are normal and rapid trim changes are not necessary.

ENGINE AIR STARTING

CAUTION

Attempt an air start only if it is suspected that the power failure was caused by a fuel system failure or a flame out. If engine failure was accompanied by an explosion or similar noise that would indicate damage to the engine, an attempted air start may only result in a fire.

1. Throttle CLOSED.
2. Raise nose to drain out unburned fuel through tailpipe.
3. Descend to 20,000 feet or lower. Air start at lower altitudes are more positive.
4. If engine failure occurred with fuel boost pressure warning light ON, indicating a failed booster pump in the main tank, turn fuel tank selector to WING AUX. If fuel boost pressure warning light remains ON, indicating a failed booster pump or empty wing tanks, turn fuel tank selector to FWD AUX. If boost pressure warning light is OFF make a forced landing or bail out as conditions dictate.
5. Maintain an airspeed of 150 to 220 knots.
6. Momentarily depress the AIR START switch which opens the primer valve and energizes the ignition timer for a period of 20 seconds.
7. Immediately move the throttle to IDLE which opens the fuel shut-off valve. A delay will waste part of the 20 seconds ignition cycle.

Note

The ignition timer will not recycle, even though the AIR START switch is pushed again, until its 20 second period has run out unless the circuit to the timer is first interrupted. The start switch must be momentarily tripped to its STOP START position to interrupt this circuit if a second air start attempt is required during the 20 second period.

8. If engine windmilling speed is too low, place the normal emergency start switch in the EMERG START position then move the start switch to START.
9. If start switch was used for starting, move start switch to STOP START when rpm reaches 18%.

Figure 3–1. Engine Air Starting

COMPLETE ENGINE FAILURE DURING TAKE-OFF.

BEFORE FLYING SPEED IS REACHED.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Landing flaps DOWN, speed brake ON.
4. Brake to a stop on the runway if possible.
5. Depress external stores jettison switch if necessary.
6. If impossible to stop on runway: Jettison canopy, operate landing gear ground retract switch, landing gear selector UP then turn battery switch OFF.

AFTER LEAVING THE GROUND.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Depress external stores jettison switch if necessary.
4. Landing flaps DOWN 20°.
5. Use full flaps and speed brakes to regulate glide.
6. Landing gear UP.
7. Jettison canopy.
8. Battery and generator switches OFF.
9. Shoulder harness LOCKED.
10. Land straight ahead, changing course only enough to miss obstacles.

PARTIAL ENGINE FAILURE DURING TAKE-OFF.

1. If not airborne, abort take-off.
2. If airborne and fuel boost pressure warning light is ON, indicating a failed booster pump or a restricted fuel supply from the main tank, turn fuel tank selector to WING AUX or FWD AUX. Go around and land.
3. If airborne and fuel boost pressure warning light is OFF indicating a failed engine fuel system, go around and land if airspeed permits or prepare for a forced landing.

ENGINE FAILURE DURING FLIGHT.

If engine failure occurs during flight the following procedure is recommended:

1. Throttle CLOSED.
2. Landing flaps UP and speed brake OFF for maximum glide.
3. Trim airplane for 215 knots IAS.
4. Attempt an air start.
5. If an air start is impossible, make a forced landing or abandon the airplane as conditions dictate.

MAXIMUM GLIDE WITH DEAD ENGINE.

If it is desired to obtain the maximum glide of the aircraft in order to reach a suitable landing area with a dead engine, proceed as follows:

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Landing flaps UP.
4. Landing gear UP.
5. Speed brake OFF.
6. Jettison external stores. Do not drop stores over inhabited areas.
7. Trim aircraft to maintain recommended glide speed. (See figure 3–2.)

MAXIMUM GLIDE CHART

MAXIMUM GLIDE DISTANCE

Clean Airplane

WINDMILLING ENGINE

GROSS WEIGHT – 18,500 LBS.

V_c IN GLIDE – 205 KNOTS

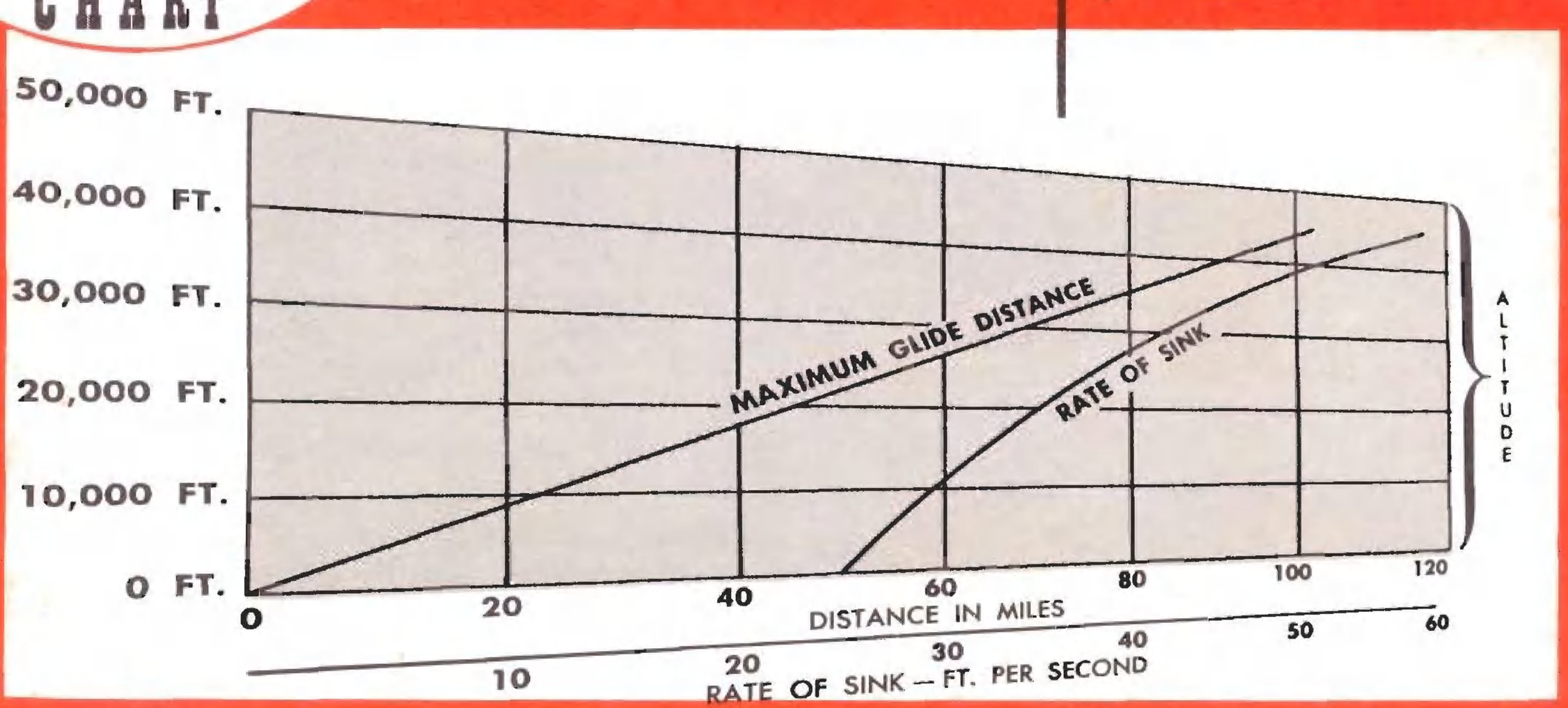


Figure 3–2. Maximum Glide Chart

LANDING WITH DEAD ENGINE.

Landing on an unprepared surface with the landing gear down should not be attempted due to the possibility of the wheels sinking in from the high aircraft weight. If it is possible to land on a prepared runway of adequate length, the landing can be made with the landing gear extended. In case a runway of sufficient length is not available, land with wheels retracted. Refer to figure 3—2 for maximum gliding distance from various altitudes.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Jettison external stores over uninhabited areas.
4. Safety belt and shoulder harness tightened and inertia reel lock control locked.

CAUTION

The pilot is prevented from bending forward when the inertia reel lock control is in the locked position; therefore all switches not readily accessible should be "cut" before moving the control to the locked position.

5. Aileron, elevator and rudder booster OFF to prevent sudden surges and accompanying trim changes.
6. Speed brake OFF, landing gear UP and landing flaps UP to increase glide distance.
7. Make landing approach at a higher altitude than normal as the glide path with a dead engine is steeper than with an idling engine.
8. If gear down landing is to be made, extend landing gear by emergency procedure.
9. After landing is assured, landing flaps full DOWN. Use emergency procedure.
10. Come in over the fence at normal speed but at a higher altitude and make contact in the normal manner.

FAILURE OF ASSIST TAKE-OFF UNITS.

In the event of failure of one or more of the jato units during take-off, a rapid change of trim will not be necessary as the jato units are close to the center line of the aircraft. Take-off distance will be increased as noted in the Appendix.

FIRE.

ENGINE FIRE DURING FLIGHT.

ENGINE OVERHEAT LIGHT ON.

1. Reduce power. If light remains on, follow emergency procedure in following paragraphs.

ENGINE FIRE WARNING LIGHT ON.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Battery and generator switches OFF.
4. Make emergency landing or abandon airplane as conditions dictate.

FIRE WHILE STARTING THE ENGINE.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Battery switch OFF or disconnect external power supply.
4. Leave cabin immediately.

ENGINE FIRE DURING TAKE-OFF — IF NOT AIRBORNE.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Landing flaps DOWN, speed brake ON.
4. Brake to a stop on runway if possible.
5. Depress external stores jettison switch as necessary.
6. If impossible to stop on runway: Jettison canopy, operate landing gear ground retract switch, landing gear selector UP then turn battery switch OFF.
7. Leave cabin as soon as possible.

ENGINE FIRE DURING TAKE-OFF — IF AIRBORNE.

1. Throttle CLOSED.
2. Fuel tank selector OFF.
3. Depress external stores jettison switch.
4. Landing flaps DOWN, 20°.
5. Land straight ahead on runway and brake to a stop if possible.
6. If impossible to stop on runway: Jettison canopy, actuate landing gear ground retract switch if wheels are on the ground, landing gear selector UP then turn battery switch OFF.
7. Leave cabin as soon as possible.

SMOKE ELIMINATION.

If smoke or fumes enter the cabin, the cause may be a fire, a fuel leak in the engine compartment or a failed refrigeration turbine.

1. Connect oxygen mask.
2. Set oxygen regulator diluter lever to 100% OXYGEN.

3. Position cabin temperature control to highest point. If smoke is eliminated the cause is in the refrigeration turbine.

4. If smoke is not eliminated, position cabin vent switch to RAM and defroster switch to OFF.

Note

The intake distribution valve will close and the ram air and dump valves will open. The intake of air through the ram air valve will scavenge the air in the cockpit through the open dump valve and rapidly dissipate the fumes and smoke.

LANDING EMERGENCIES.

LANDING WITH WHEELS RETRACTED.

1. Jettison external stores over uninhabited area.

WARNING

Be sure that the bomb arming switch is SAFE and the rocket arming switch is OFF or DELAY.

2. Jettison canopy.

3. Safety belt and shoulder harness tightened and inertia reel lock control locked.

CAUTION

The pilot is prevented from bending forward when the reel lock control is in the locked position; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

4. Extend landing flaps as desired.

5. Make normal approach.

6. Before contact with the ground, close throttle, turn fuel tank selector OFF and turn battery switch OFF.

7. Leave cabin as soon as possible.

WARNING

Leave airplane on left side to prevent possible actuation of seat jettison handle.

LANDING WITH MAIN GEAR DOWN — NOSE GEAR UP or UNLOCKED.

If the nose gear will not extend or lock down as indicated by the landing gear indicators, proceed as follows:

1. Jettison external stores and canopy over uninhabited areas.

2. Landing gear DOWN.

3. Plan approach to touch down as near the end of runway as possible.

4. Make normal approach, landing flaps DOWN, and speed brakes ON.

5. Safety belt and shoulder harness tightened and inertia reel lock control locked.

CAUTION

The pilot is prevented from bending forward when the reel lock control is in the locked position: therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

6. Before contact with the ground, close throttle, turn fuel tank selector OFF and turn battery switch OFF.

7. Hold the nose wheel off the ground as long as possible.

8. Do not use brakes unless it becomes absolutely necessary as this will tend to slam the nose to the ground.

9. Leave cabin as soon as possible.

BRAKE FAILURE.

1. If left brake is out, make landing on left side of runway.

2. If right brake is out, make landing on right side of runway.

3. If both brakes are out, land as short as possible at lowest safe speed. Landing flaps DOWN, and speed brakes ON.

4. If you are not sure that you can stop after landing and there is a chance of going off the end of the runway, close the throttle to "cut" the engine. If the engine rotation is stopped or slowed down below normal idling speed, a definite braking action is experienced.

5. Dragging the tail during landing will shorten the roll.

LANDING WITH FLAT TIRE.

1. If nose wheel tire is flat; make normal landing holding nose wheel off as long as possible.

2. If one main wheel tire is flat; make normal landing on side of runway nearest inflated tire.

3. If both main wheel tires are flat; make normal landing in center of runway and use brakes sparingly and with caution.

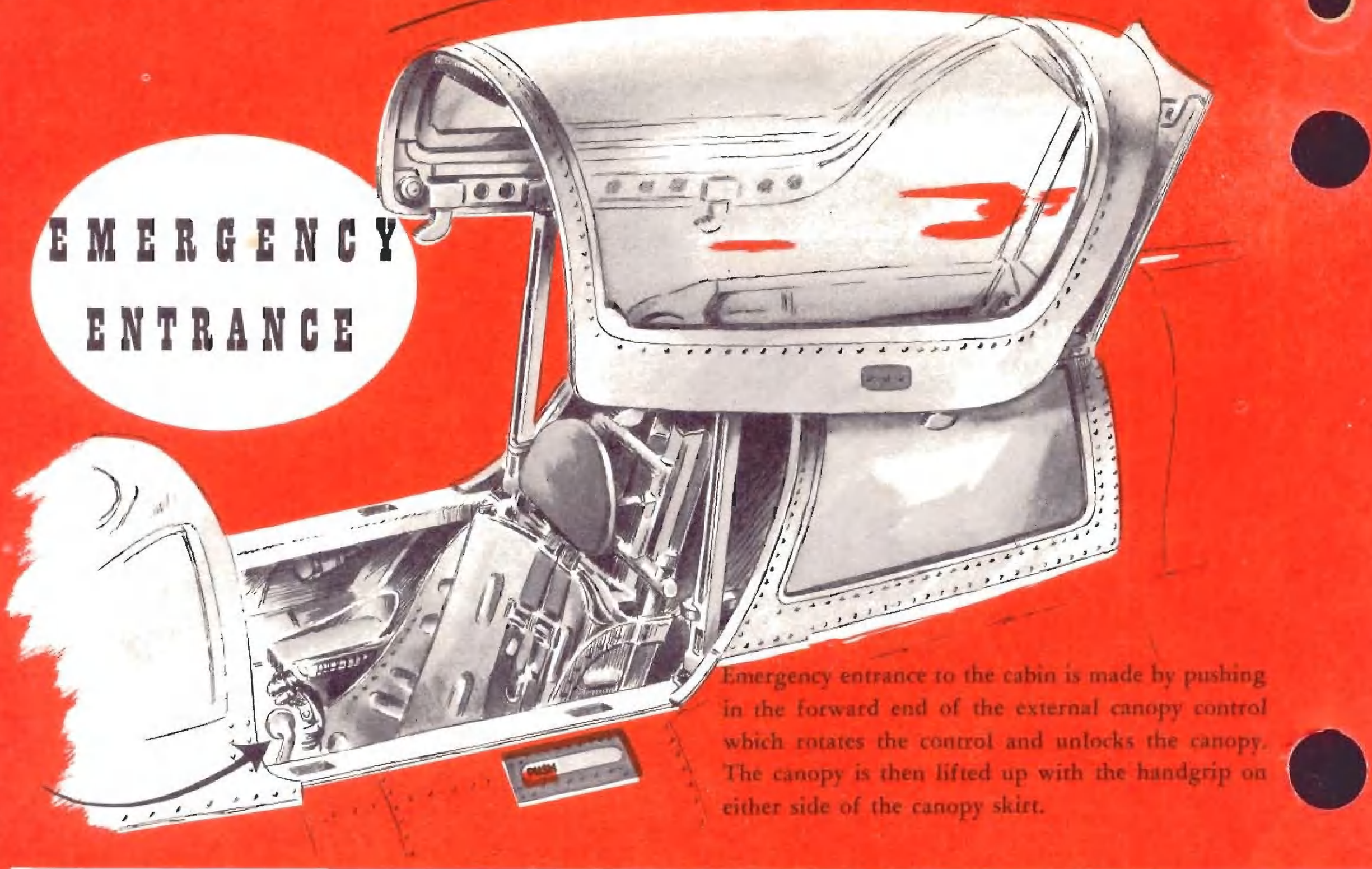


Figure 3–3. Emergency Entrance

DITCHING.

Bail out is preferred to ditching but in the event of low altitude or any other reason where bail out is impracticable, ditch the airplane as follows:

1. Turn IFF to emergency.
2. Jettison all external stores.
3. Throttle CLOSED.
4. Shoulder harness and safety belt secured and inertia reel lock control locked. Unbuckle parachute and disconnect oxygen, anti-g suit and electrical connections.

CAUTION

The pilot is prevented from bending forward when the inertia reel lock control is in the locked position; therefore, all switches not readily accessible should be "cut" before moving the control to the locked position.

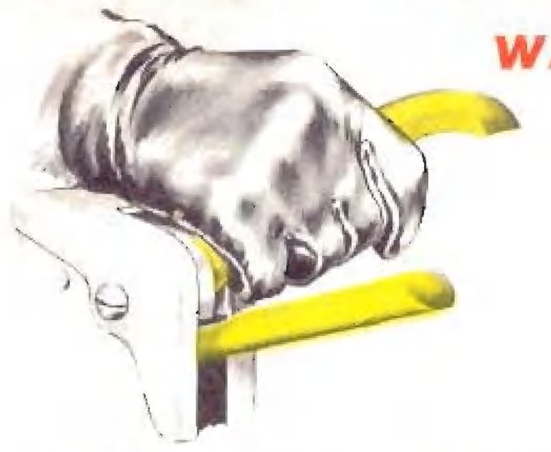
5. Check landing gear and speed brake UP and OFF respectively.
6. Set landing flaps 20 to 30 degrees DOWN.
7. Jettison canopy by pulling the CANOPY JETTISON lever all the way up to the locked position.

WARNING

Be careful not to squeeze the seat jettison lever accidently.

8. Touchdown in a slightly nose high attitude.
9. If a regular wave or swell pattern exists, aim the touchdown parallel to the waves and attempt to land on the crest or on the falling side of the wave.
10. More often, the sea surface will be irregular with two or more wave or swell patterns intermingled. In this case, the best compromise is to head into whatever wind may be blowing. Examine sea to find areas where the intermingling waves cancel out. Aim touchdown for one of these calmer areas.
11. Make actual touchdown in the same attitude as for normal landing. Make the "softest" possible landing. Do not stall the airplane at time of contact.
12. After the airplane has slowed down in the water, leave the cabin at once, since fighter aircraft sink very rapidly.

BAIL-OUT PROCEDURE



WARNING: *Do not accidently squeeze the seat jettison lever until ready to jettison the seat.*

1 Jettison canopy by pulling canopy jettison lever all the way up until it locks. Pull up left handgrip (this locks shoulder harness and releases left arm rest).

2 Place feet firmly on foot rests and brace arms on arm rests. Sit erect with head hard against head rest and chin tucked in.

3 Squeeze the seat jettison lever to eject seat.

IF TIME AND CONDITIONS PERMIT

Observe the following precautions

1. Unclamp the oxygen hose from the shoulder harness and clip to parachute harness prior to ejection, to avoid being strapped in the seat with the oxygen hose.
2. Before ejection stow all loose equipment.
3. At altitude, pull ball handle on bailout bottle.
4. Unfasten safety belt before ejection at low altitude to aid in separating from seat.
5. If the canopy does not jettison, an attempt should be made to release the canopy by placing the canopy control lever in the OPEN position and raising the canopy into the air stream. As a last resort, the seat may be ejected without jettisoning the canopy. This procedure should be used only after all attempts to release the canopy have been made. When using the last resort procedure, it is recommended that the seat be adjusted to the bottom position to allow the greatest possible clearance between the top of head and the top of headrest.

Note

(This note applies to both procedures) After ejection, release safety harness and kick away from the seat as soon as possible. Delay opening parachute as long as altitude will permit to allow seat to fall clear and reduce parachute opening shock.

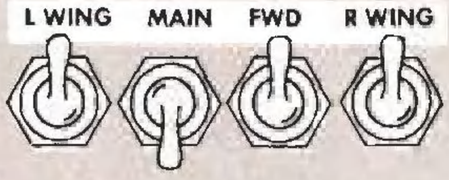
Figure 3–4. Bail-out Procedure

FUEL SYSTEM FAILURE *schematic*

MAIN BOOSTER FAILURE

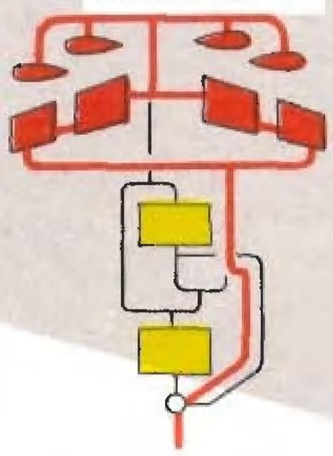
HALT FUEL FLOW TO MAIN TANK BY MEANS OF APPROPRIATE SHUT-OFF VALVE

CLOSED



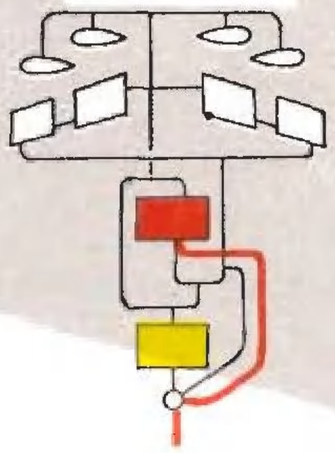
1 SWITCH TO WING AUX FUEL FLOW

AT WARNING LT. INDICATION —

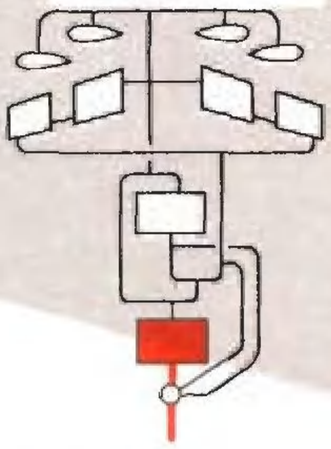


2 SWITCH TO FWD AUX FUEL FLOW

AT WARNING LT. INDICATION —



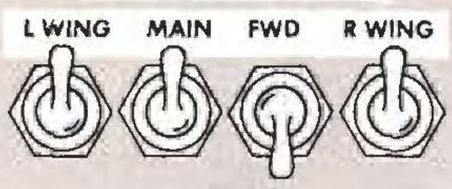
3 SWITCH TO ALL TANKS TO RECOVER REMAINING FUEL UNDER LIMITED OPERATION



FWD BOOSTER FAILURE

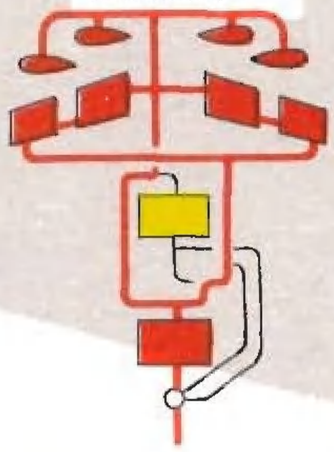
HALT FUEL FLOW TO FWD TANK BY MEANS OF APPROPRIATE SHUT-OFF VALVE

CLOSED

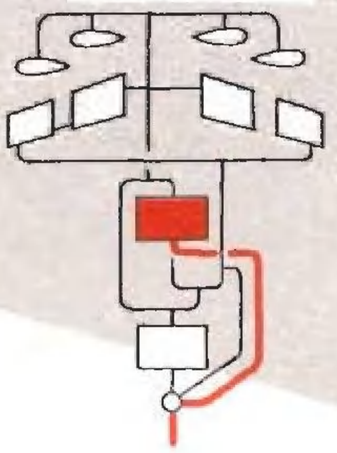


1 REMAIN IN ALL TANKS POSITION

WHEN ALMOST EXHAUSTED —



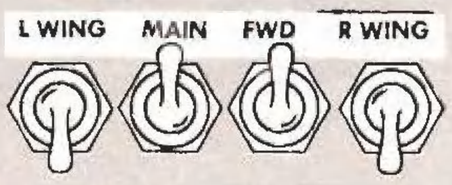
2 SWITCH TO FWD AUX TO RECOVER REMAINING FUEL UNDER LIMITED OPERATION



WING BOOSTER FAILURE

HALT FUEL FLOW TO WING TANKS BY MEANS OF APPROPRIATE SHUT-OFF VALVES

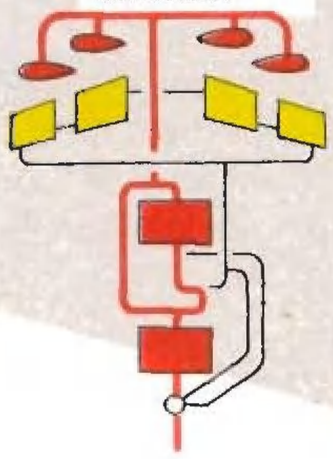
CLOSED



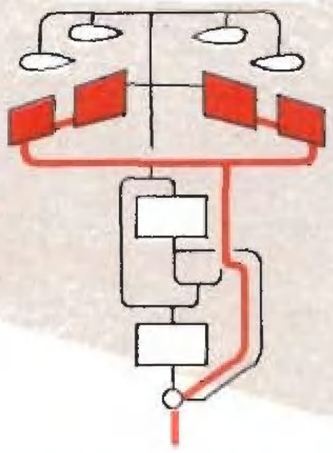
PULL WING BOOSTER PUMP CIRCUIT BREAKERS

1 REMAIN IN ALL TANKS POSITION

WHEN ALMOST EXHAUSTED —



2 SWITCH TO WING AUX TO RECOVER REMAINING FUEL UNDER LIMITED OPERATION



NOTE: —

IF FAILURE IS SUCH THAT FUEL IN EFFECTED TANK IS NOT RECOVERABLE (SUCH AS BATTLE DAMAGE) PROCEED AS ABOVE, ELIMINATING THE FINAL STEP IN EACH CASE

Figure 3–5. Fuel System Failure (Sheet 1 of 3)

FUEL SYSTEM FAILURE

Airplane fuel system failure is indicated by premature illumination of the wing or forward pump pressure warning lights or the booster pressure warning light. The only indication of an engine fuel system component failure will be a loss of rpm or flame-out.

MAIN TANK BOOSTER PUMP FAILURE

Main tank booster pump failure is indicated by illumination of the booster pressure warning light when operating with the fuel tank selector in the ALL TANKS position. If a main tank booster pump failure is suspected, proceed as follows to recover all fuel.

Note

In order to prevent fuel transfer from the remaining tanks to the main tank, position the MAIN fuel shut-off valve to CLOSED.

1. Turn fuel tank selector to WING AUX until the first flicker or flash of the wing pump pressure warning light, then turn to FWD AUX immediately to avoid a possible flame-out.

Note

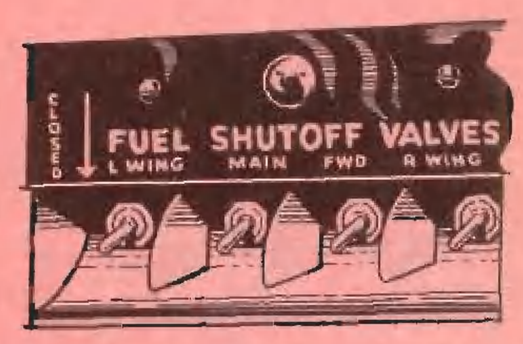
Main tank booster pump failure will not cause an rpm drop under ordinary conditions below 6,000 feet altitude, as the fuel in the main tank can be recovered by direct suction of the engine driven booster pump. Engine operation up to maximum range power setting, with an inoperative main booster pump and a maximum fuel temperature of 80°F, will be satisfactory up to 20,000 feet when operating on JP-4 fuel or up to 10,000 feet when operating on JP-3 fuel or gasoline.

2. Continue to operate at optimum altitude with fuel tank selector in FWD AUX until the forward pump pressure warning light illuminates.

3. Descend to an altitude below 20,000 with JP-4 fuel or 10,000 feet with JP-3 fuel or gasoline and turn fuel tank selector to ALL TANKS for remainder of fuel.

CAUTION

When turning fuel tank selector from FWD AUX to ALL TANKS, do not hesitate when in the WING AUX position as the wing tanks will be empty and a flame-out will result.



ENGINE-DRIVEN FUEL PUMP FAILURE

In the event of failure of the engine driven fuel pump, the engine will be inoperative as there is no emergency fuel system. Make a forced landing or abandon the airplane as conditions dictate.

Figure 3–5. Fuel System Failure (Sheet 2 of 3)

WING TANK BOOSTER PUMP FAILURE

Wing tank booster pump failure in one or both tanks is indicated by a premature light-on condition of the wing pump pressure warning light. Fuel in the wing tank with an inoperative booster pump will not be transferred to the main tank. The engine can be operated at the maximum range power setting with the fuel tank selector in WING AUX and without wing tank booster pump pressure up to an altitude of approximately 20,000 feet with JP-4 fuel or 10,000 feet with gasoline. Fuel remaining in one wing tank cannot be recovered if the other wing tank is empty, as the engine driven booster pump will suck air from the empty tank. If a wing booster pump failure is suspected, proceed as follows to recover the most fuel.

CAUTION

If the LEFT WING FUEL PUMP circuit breaker is pulled out while operating with the fuel tank selector in the ALL TANKS position on F-84F-1RE up to -15RE and F-84F-1GK and subsequent GK airplanes both wing pumps will stop but if the RIGHT WING FUEL PUMP circuit breaker is pulled out only the right wing pump will stop. The reverse is true when operating on WING AUX: If the RIGHT WING FUEL PUMP circuit breaker is pulled out both wing pumps will stop and if the LEFT WING FUEL PUMP circuit breaker is pulled out only the left wing pump will stop. On F-84F-15RE and subsequent RE airplanes both pumps will stop if the circuit breaker marked WING PUMP FUEL CONTR is pulled out.

1. Pull circuit breakers for both wing tank booster pumps as soon as the wing pump pressure warning light illuminates. This will stop both pumps and prevent the wing tank, with the operating pump, from emptying.
2. Plan remainder of flight so as to land as soon as possible.

Note

To prevent external fuel from transferring to the wing tanks actuate the L. WING and R. WING fuel shut-off valves to the CLOSED position.

3. Continue to operate with fuel tank selector in the ALL TANKS position at optimum altitude until the main tank low level warning light illuminates, or if range is critical, until the fuel quantity indicator shows the main tank to be almost empty.
4. Descend to an altitude below 20,000 feet with JP-4 fuel or 10,000 feet with gasoline and turn fuel tank selector to WING AUX.

FORWARD TANK BOOSTER PUMP FAILURE

Forward tank booster pump failure is indicated by a premature light-on condition of the forward pump pressure warning light.

Fuel in the forward tank can be recovered up to an altitude of approximately 20,000 feet with JP-4 fuel or up to 10,000 feet with gasoline by operating with the fuel tank selector in the FWD AUX position. In event of a forward tank booster pump failure, proceed as follows to recover all fuel.

1. Continue to operate with fuel tank selector in ALL TANKS at optimum altitude until the main tank low level warning light illuminates, or if range is critical, until the fuel quantity indicator shows the main tank to be almost empty.

Note

To prevent external fuel from transferring to the forward tank, actuate the FWD fuel shut-off valve to the CLOSED position.

2. Plan remainder of flight so as to land as soon as possible.
3. Descend to an altitude below 20,000 feet with JP-4 fuel or 10,000 feet with gasoline and turn fuel tank selector to FWD AUX.

CAUTION

When turning fuel tank selector from ALL TANKS to FWD AUX do not hesitate when in the WING AUX position as the wing tanks will be empty and a flame-out will result.

Figure 3–5. Fuel System Failure (Sheet 3 of 3)

ELECTRICAL FAILURE

COMPLETE FAILURE.

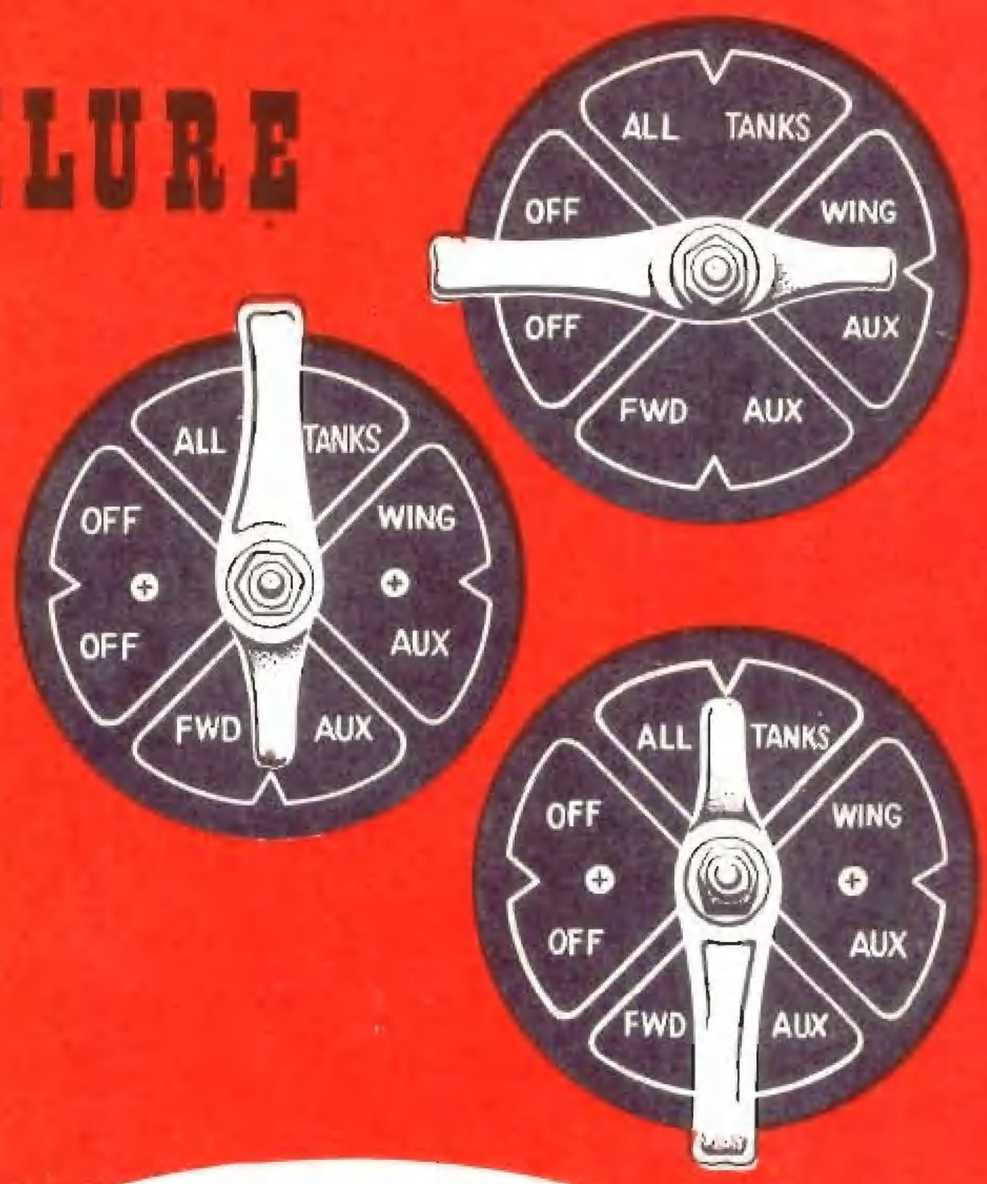
If the electrical failure is complete, the booster pumps and fuel system indicators will be inoperative. At altitudes below 20,000 feet with JP-4 fuel or 10,000 feet with JP-3 fuel or gasoline satisfactory engine operation up to maximum range power settings can be maintained with fuel temperatures up to 80°F.

Operate fuel system as follows:

1. Operate with fuel tank selector on WING AUX until wing tank fuel is used.
2. Turn fuel tank selector to FWD AUX. Continue to operate in FWD AUX until forward tank fuel is used.
3. Turn fuel tank selector to ALL TANKS for remainder of fuel in main tank.

CAUTION

With complete electrical failure, fuel warning lights are inoperative and fuel consumption from the fuel tanks will have to be estimated. Fuel in the pylon tanks cannot be recovered because the solenoid operated air shut-off valves will be closed. Land as soon as possible.



GENERATOR FAILURE

In the event of generator failure only, the fuel warning lights will operate normally but the fuel tank booster pumps will be inoperative. Operate the fuel system in the same manner as for complete electrical failure.

Note

Fuel in the pylon tanks can be recovered as the air pressure solenoid shut-off valves are energized by the primary bus.

Figure 3–6. Electrical Failure

PYLON TANK JETTISON.

Refer to Section V for recommended speeds for jettisoning empty external tanks.

NORMAL JETTISON.

The pylon tanks are jettisoned in the same manner as releasing bombs manually.

1. Inboard bomb selector switch ALL.
2. Outboard bomb selector switch ALL.
3. Bomb release selector switch MANUAL RELEASE.
4. Bomb release switch, depress.

EMERGENCY JETTISON.

The inboard or outboard pylon tanks can be jettisoned individually or simultaneously as conditions dictate. To jettison individually, actuate the inboard pylon jettison or the outboard pylon jettison switch to the JETT position. This also jettisons the respective pylons. To jettison the pylon tanks simultaneously, depress the external stores jettison switch. The inboard and outbord pylons will be jettisoned also rockets will jettison if the airplane is airborne.

ELECTRICAL POWER SUPPLY SYSTEM FAILURE.

INVERTER FAILURE.

Inverter failure is noted if the inverter failure indicator light illuminates. Turn the instrument power switch to ALT position. If the light does not go out in a few seconds, both inverters have failed.

CAUTION

In the event of failure of the main inverter the slaved gyro compass indicator and the oil pressure gage will tend to remain at their last reading. The above instruments will return to normal operation when the instrument power switch is placed in the ALT position.

GENERATOR FAILURE.

If generator cuts out of the electrical system, as indicated by the generator out indicator, check following:

1. Place generator switch in the RESET position for a few seconds then return to ON. Light should go out and voltmeter read normal voltage.
2. If light remains on, position generator switch to OFF.
3. Turn off all electrical equipment possible to conserve battery for necessary electrical operations.

Note

See figure 1—10 for equipment that will be inoperative with generator failure.

4. Turn instrument power switch to ALT.
5. Land as soon as possible.

HYDRAULIC POWER SUPPLY SYSTEM FAILURE.

In the event of hydraulic power supply system failure, the flight control booster systems will be inoperative. The landing gear is extended for landing by an air pressure system. The speed brake, ato jettison, aerial refueling receiver door and the engine screen system are inoperative.

Note

The hydraulic hand pump is provided for ground operation of the systems and too many strokes would be required for emergency operation, also hydraulic fluid would be pumped overboard in event of a damaged line.

FLIGHT CONTROL SYSTEM FAILURE.

HYDRAULIC FAILURE.

If the aileron, elevator or rudder booster systems should fail, each individual system can be turned off by placing the aileron, elevator or rudder booster switch in the OFF position. The individual surfaces are connected mechanically to the cabin controls but control stick and rudder pedal forces will be much higher.

WARNING

Lateral control is inadequate under "BOOST OFF" high speed, low altitude conditions, and under turbulent landing conditions.

ELECTRICAL FAILURE.

In the event of generator failure, the control system boosters and indicators will operate normally as long as energy from the battery is available. If the primary electrical bus should fail the boosters cannot be turned off as the shut-off valves are normally open and the trim indicators will be inoperative.

LANDING FLAPS SYSTEM FAILURE.

HYDRAULIC FAILURE.

In the event of hydraulic pressure failure and before emergency extension of the landing gear the landing flaps can be extended by placing the landing flap lever in the DOWN position and actuating the hydraulic hand pump. If the landing gear has been extended by the emergency system, excessive strokes of the hydraulic hand pump would be required before the flaps will move as pressure would have to be built up in the down side of the landing gear since the main landing gear extends by gravity.

ELECTRICAL FAILURE.

In the event of failure of the primary bus, the flap position indicator will be inoperative and it will not be possible to operate the flap system with hydraulic pressure.

SPEED BRAKE FAILURE.

In the event of hydraulic failure or primary bus power failure the speed brake cannot be opened. However, if the speed brake is open when the failure occurs the air loads on the brakes will close them.

LANDING GEAR SYSTEM FAILURE.

LANDING GEAR RETRACTION WHILE ON THE GROUND.

If it becomes necessary to retract the landing gear while the weight of the airplane is on the main struts proceed as follows:

1. Actuate the emergency ground retract switch.
2. Move the landing gear control to UP.

Note

The landing gear will retract only if hydraulic pressure is available.

LANDING GEAR EXTENSION WHILE IN THE AIR.

If the landing gear will not extend, indicated by the landing gear position indicators, warning horn or low hydraulic pressure, proceed as follows:

1. Reduce speed to 220 knots IAS or below.
2. Move landing gear control to EMERG DOWN.

Note

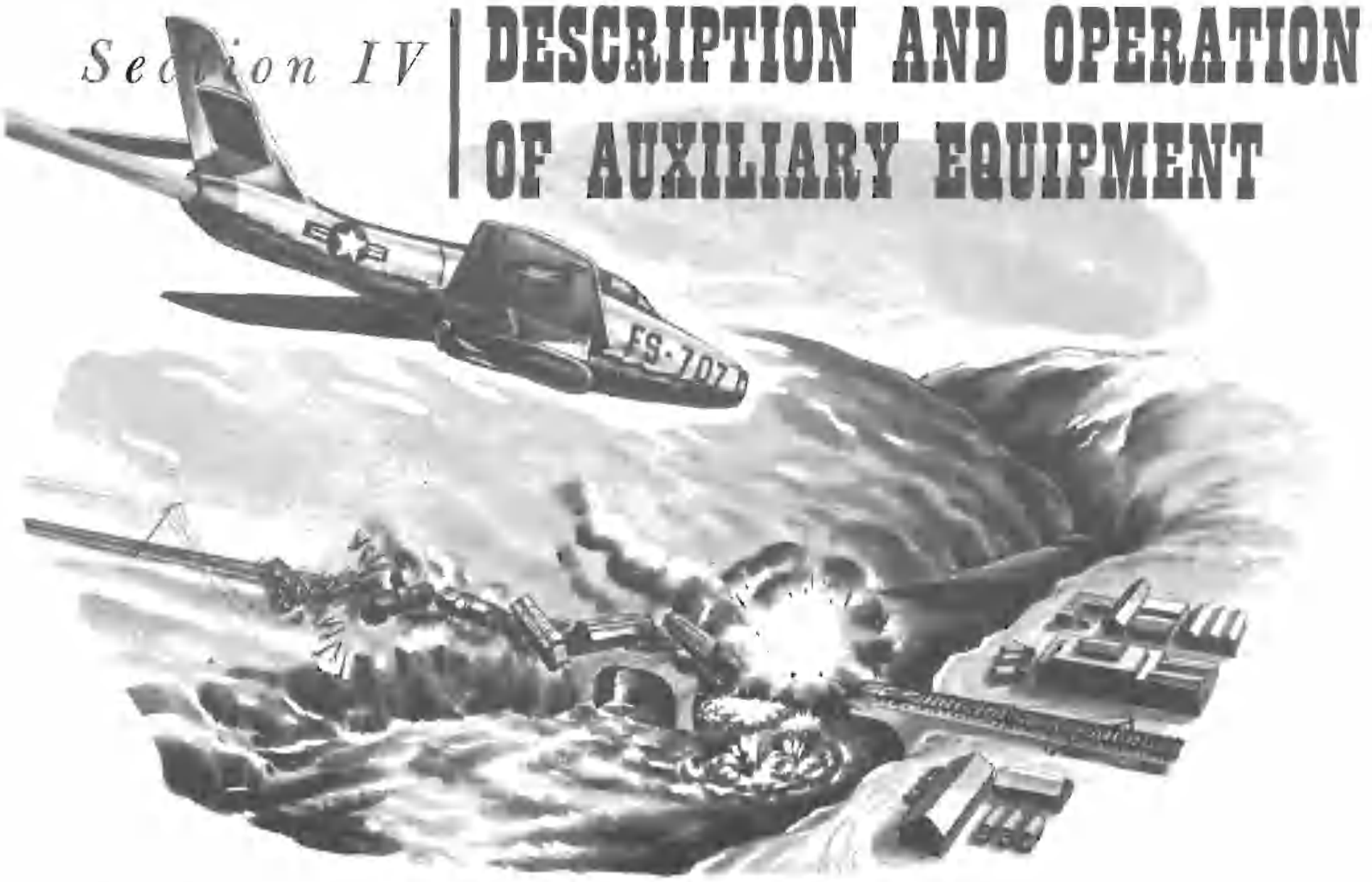
The landing gear control can not be moved from the EMERG DOWN position until released by ground personnel.

3. If necessary, yaw the airplane to lock the main gear.

Note

Observe the landing gear position indicators when yawing the airplane to determine when the spring loaded down locks on the main gear are engaged. The nose gear is extended by air pressure and the spring loaded nose gear down lock is locked when the strut is fully extended as indicated by the nose gear position indicator.

Section IV | DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT



HEATING, PRESSURIZING AND VENTILATING SYSTEM.

Pressurization, heating and ventilating are combined into an air condition system (figure 4–4) which is controlled electrically with power from the primary bus. When the canopy is closed the cabin is sealed by an automatically inflated rubber seal. Air for pressurization, heating, ventilating and canopy seal inflation is obtained from the engine compressor. Cabin temperature is controlled by diverting a portion of hot air from the engine compressor through a turbo-refrigerator, for cooling, before it enters the cabin. Air enters the cabin through two foot registers, a register behind the pilot's seat and an outlet on the right side directly opposite the pilot's chest. Pressurization is maintained automatically by the pressure regulator which releases air from the cabin through a variable opening designed to maintain the proper pressure differential and rate of change of cabin air. From sea level to 12,500 feet altitude the cabin is unpressurized; from 12,500 to 31,000 feet altitude cabin pressure remains equivalent to atmospheric pressure at 12,500 feet; above 31,000 feet a constant pressure differential of 5.0 psi is maintained between cabin and outside atmosphere. The cabin altimeter (40 figure 1–12) indicates the equivalent cabin altitude. The dump valve operates automatically to relieve excessive cabin pressure and can also be opened to dump cabin pressure if necessary. Outside ventilating air is available to the cabin only if pressurization is shut off.

CABIN VENT SWITCH.

Cabin pressurization is selected by the cabin vent switch (figure 4–1) which is a two position electrical switch marked PRESSURE and RAM. The RAM position opens the ram air valve and dump valves allowing a flow of ram air through the cabin and closes the engine air shut-off valve stopping the flow of engine air to the cabin. Cabin temperature can not be selected when operating in the RAM position. The PRESSURE position closes the ram inlet and dump valves and the air flow by-pass valve is adjusted automatically or manually to maintain the desired temperature. The cabin vent switch is powered from the primary bus is normally left in the PRESSURE position.

CABIN TEMPERATURE SELECTOR. C

Cabin temperature is selected with the cabin temperature selector (figure 4–2) which is a rotary switch marked COOL and HEAT. The range of the temperature selector is from 20°F to 100°F. Any cabin temperature is selected by positioning the pointer between these limits if power from the primary bus is available.

Note

The cabin temperature selector will function only when the cabin temperature control is in the AUTOMATIC position and the cabin vent switch is in the PRESSURE position.

CABIN TEMPERATURE CONTROL. C

The cabin temperature is automatically or manually selected with the cabin temperature control (figure 4–3) which has four positions, AUTOMATIC, COOL, HEAT

Figure 4–1. Cabin Vent Switch

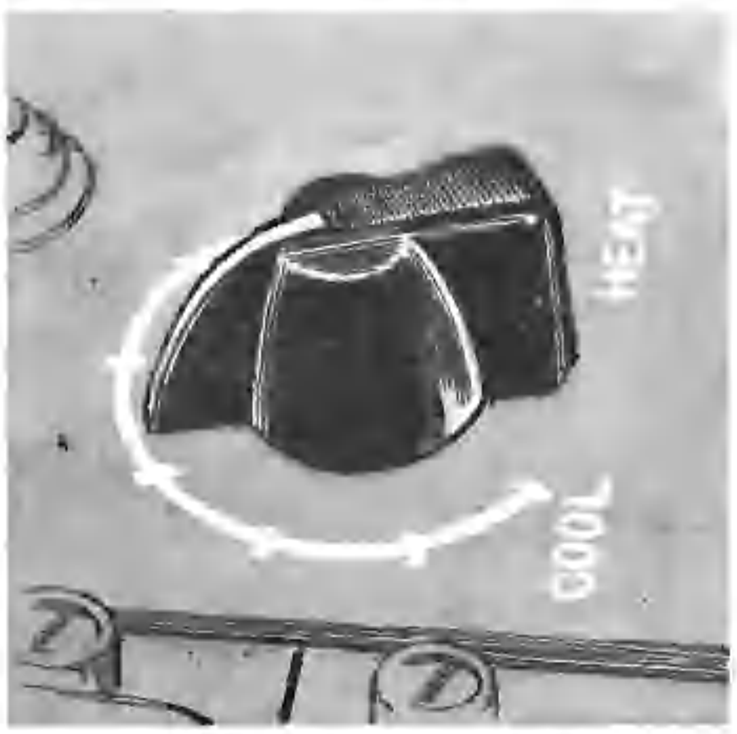


Figure 4–2. Cabin Temperature Selector

Figure 4–3. Cabin Temperature Control

and OFF. With the cabin temperature control in the AUTOMATIC position and the cabin vent switch in the PRESSURE position the cabin heating system will automatically provide temperature controlled air to maintain the selected temperature, between 20°F to 100°F, in the cabin. If the automatic temperature control fails, the momentary HEAT and COOL positions, provided for manual control are used to obtain desired cabin temperature. By holding the cabin temperature control in the HEAT or COOL position the by-pass valve is motorized to open or close respectively. To stop the rotation the control is released and automatically returns to off. By trial and error, the position of the by-pass valve is obtained to satisfy cabin temperature demands if primary bus power is available.

CABIN TEMPERATURE CONTROL. B

The cabin temperature is manually selected with the cabin temperature control (figure 4–3) which has three positions, COOL, off and HEAT spring loaded to the off position. By holding the cabin temperature control in the HEAT or COOL position the by-pass valve is motorized to open or close respectively. To stop the rotation the control is released and automatically returns to off. By trial and error, the position of the by-pass valve is obtained to satisfy cabin temperature demands if primary bus power is available.

SIDE AIR OUTLET SHUT-OFF.

The side air outlet shut-off (figure 4–5) is located on the right side of the cabin. The quantity of hot or cold air going into the cabin through this outlet may be varied by manually sliding the shut-off over the air outlets.

ANTI-ICING AND DE-ICING SYSTEMS.

DEFROSTING SYSTEM.

The center windshield panel is designed and built so that an electrical current, passing through an electrical conductive coating between laminations, keeps the windshield panel at a temperature of 110°F and therefore ice free. Both a-c and d-c power are required for operation; the a-c being supplied only by the main inverter and the d-c by the primary bus. The system automatically energizes when the primary and secondary buses are energized as there is no manual control provided. The side panels on the windshield and the side panels on the aft canopy are defrosted with hot air supplied from the engine compressor to the perforated defroster tubing assembly. The hot air defroster is available whenever the engine is running regardless of the position of the cabin vent switch.

DEFROSTER CONTROL.

The defroster control (figure 4–6) is a manually operated shut-off valve that controls the flow of hot air from the engine compressor to the defroster tubes. The control has two positions: ON and OFF. The ON position supplies hot air to the windshield side panels and the aft canopy side panels and will operate regardless of the position of the cabin vent switch.

ANTI-FOGGING SYSTEM.

The canopy and the windshield side panels are defogged by air, taken from the cabin, passed through a chemical drier and passed through the space between the inner and outer surfaces of the panels. The drier must be checked periodically to make sure that the chemical is still active. Circulation is controlled electrically through a normally closed shut-off valve.

CANOPY DRY AIR SWITCH. (ANTI-FOGGING)

The canopy dry air switch (figure 4–7) controls the flow of dry air in the anti-fogging system. It is a push button switch marked CANOPY DRY AIR and must be held down to open the normally closed solenoid shut-off valve which allows dry air to pass through the canopy and windshield side panels. When the switch is released, the solenoid closes and shuts off the flow of air to the anti-fogging system. The valve also closes when energy from the primary bus is not available.

PITOT HEATER.

The pitot tube, installed in the duct divider in the nose of the airplane, is electrically heated from the primary bus to keep it ice free.

PITOT HEATER SWITCH.

The pitot heater switch (31 figure 1–14) has two positions OFF and PITOT HEAT. The PITOT HEAT position turns on the heater element which heats the pitot tube and keeps it free of ice.

AIR CONDITIONING SYSTEM
Schematic

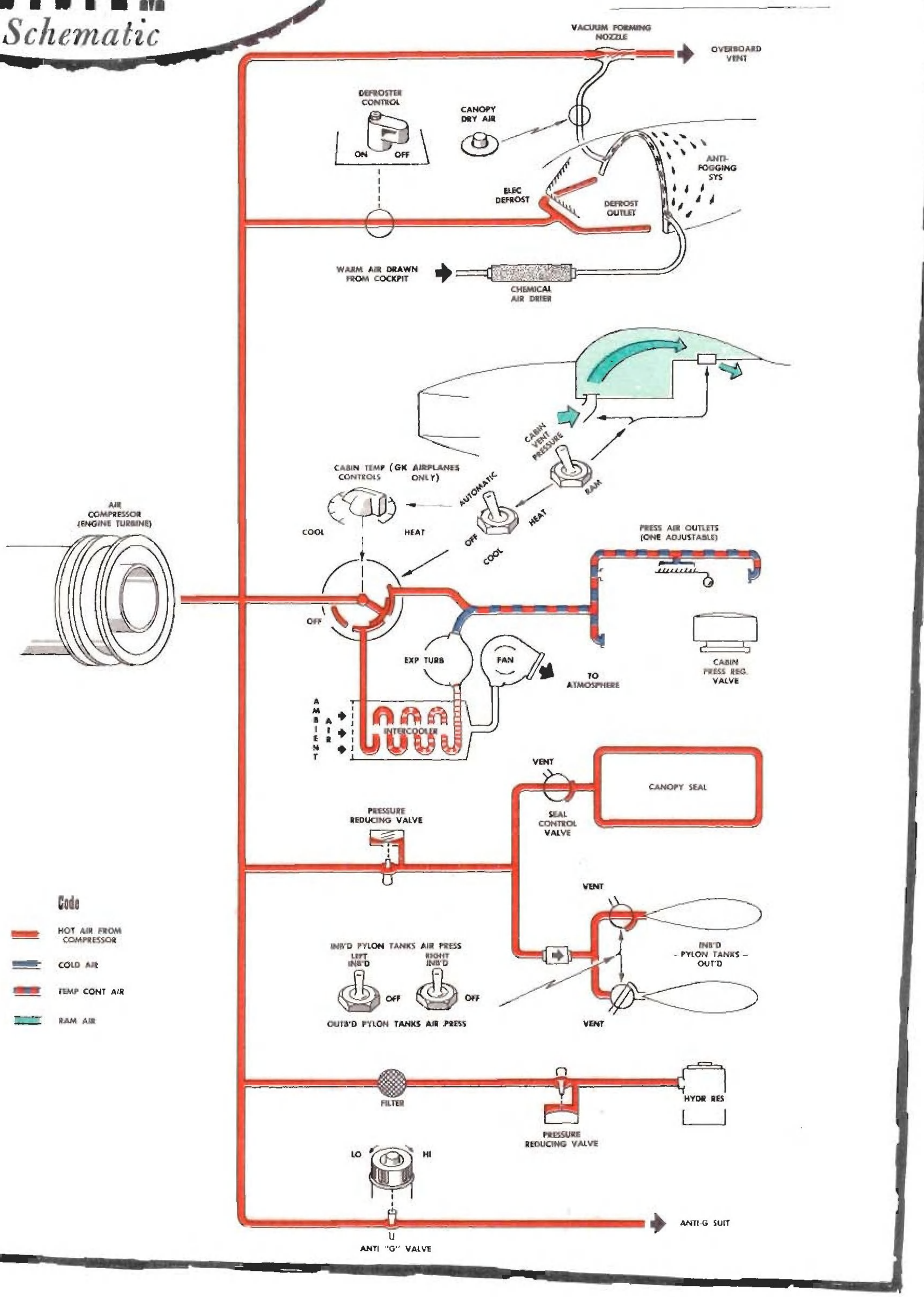


Figure 4–4. Air Conditioning System — Schematic

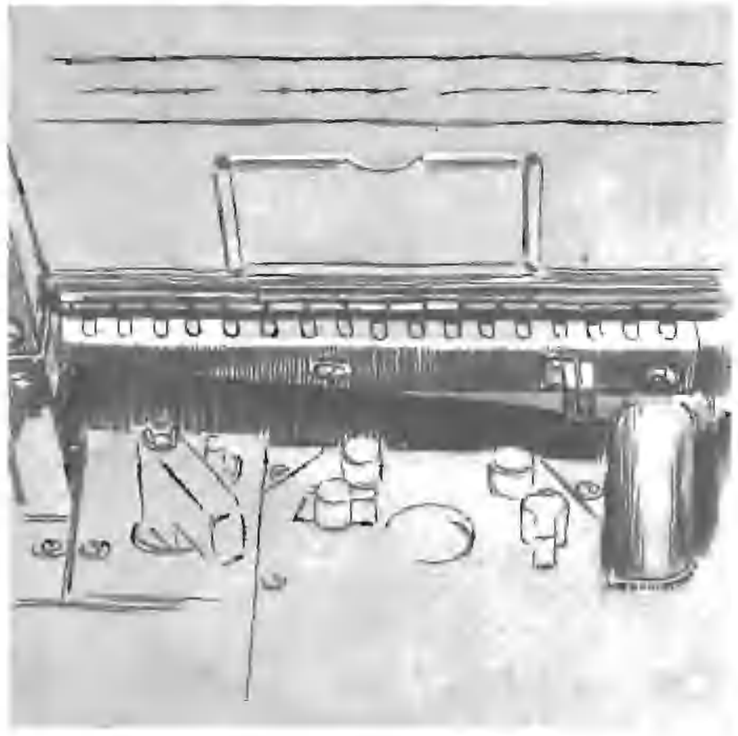


Figure 4–5. Side Air Outlet Shut-off

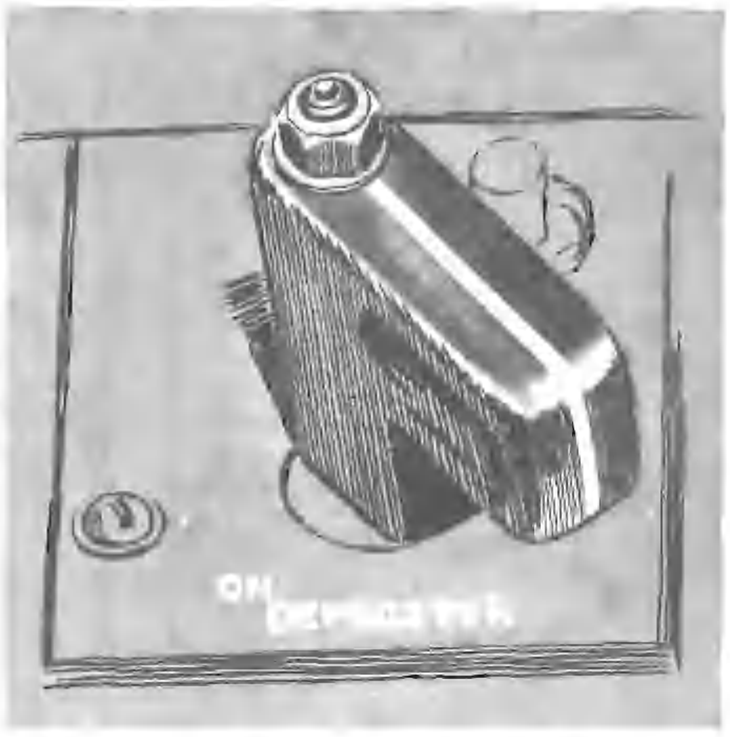


Figure 4–6. Defroster Control

Figure 4–7. Canopy Dry Air Switch

CAUTION

The pitot heater should not be used on the ground as serious overheating will occur without sufficient air flow.

FUEL FILTER DE-ICING SYSTEM.

A fuel filter de-icing system is installed to remove ice that may collect in the low pressure fuel filter. Alcohol is injected into the fuel line upstream of the fuel filter by means of an electric pump which is inoperative if the alcohol tank is empty or in the event of primary bus failure. Automatic or manual operation may be selected. The alcohol supply is sufficient for approximately two minutes of continuous injection. An icing condition is indicated by a warning light. Specifications of the de-icing fluid used is noted in the servicing diagram.

FUEL FILTER DE-ICING SWITCH.

The fuel filter de-icing switch (29 figure 1–14) is a toggle switch having three positions; AUTO, OFF and MAN. In the AUTO position the injection of alcohol starts automatically at the predetermined pressure drop across the low pressure fuel filter and ceases as soon as the pressure drop across the fuel filter returns to normal. In the MAN position a continuous flow of alcohol is injected into the fuel filter. The MAN position is used in the event of failure of the automatic system.

Note

If the fuel filter de-icing switch is positioned to MAN with the throttle closed and the fuel tank selector in the OFF position, the alcohol will build up enough pressure in the fuel line to prevent turning the fuel tank selector to any other position.

FUEL FILTER ICE WARNING LIGHT.

The fuel filter ice warning light (2, figure 1–12) is a red light marked FILTER ICE WARNING. The light will illuminate automatically when the fuel pressure drop across the low pressure fuel filter is indicative of icing and go out when the pressure returns to normal.

DEICING SYSTEM *Schematic*

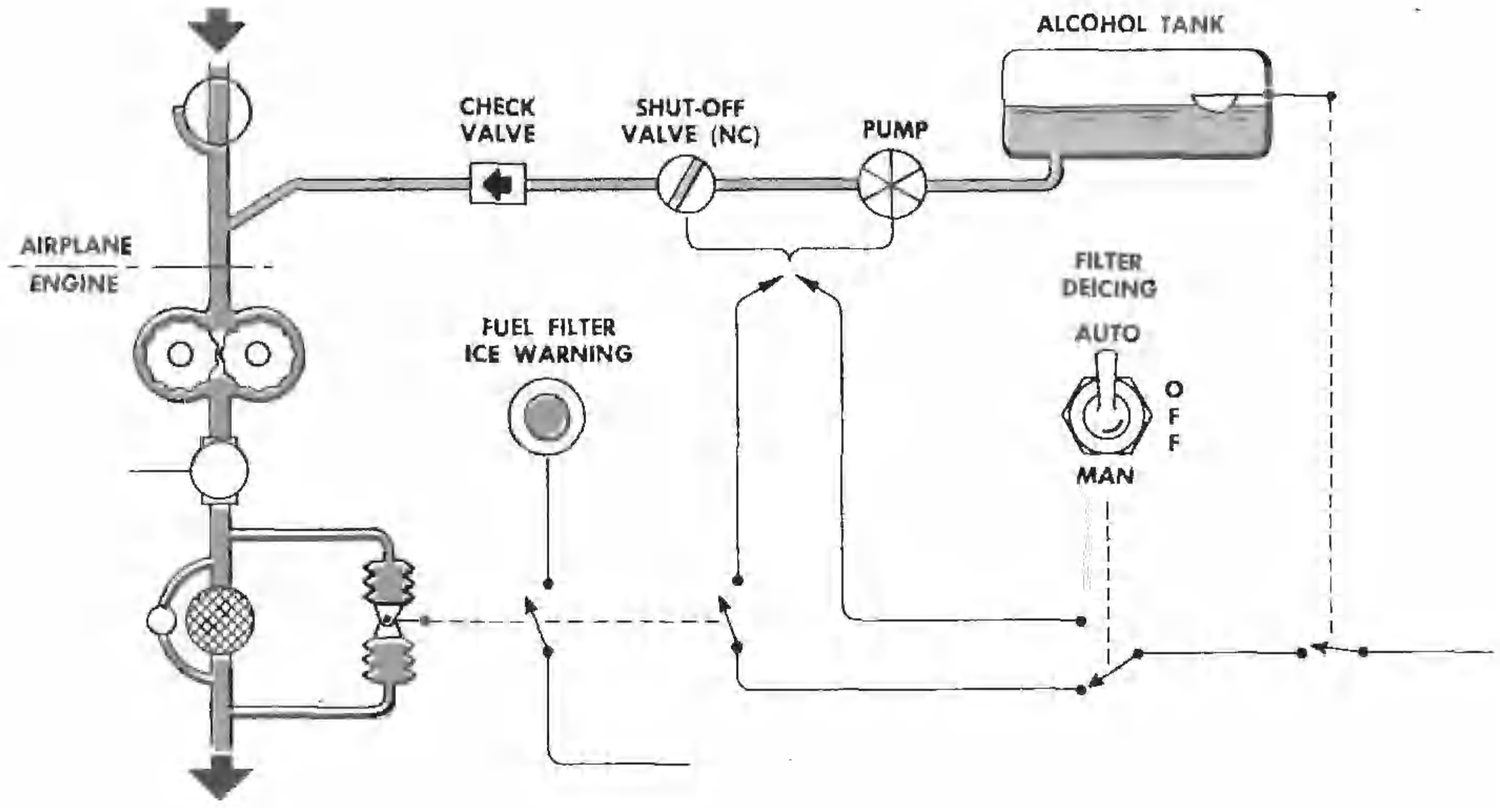


Figure 4–8. De-icing System Schematic

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

Communication equipment installed includes a command set, an IFF identification set, a radio compass and a radar set. All radios are remotely controlled from the right console.

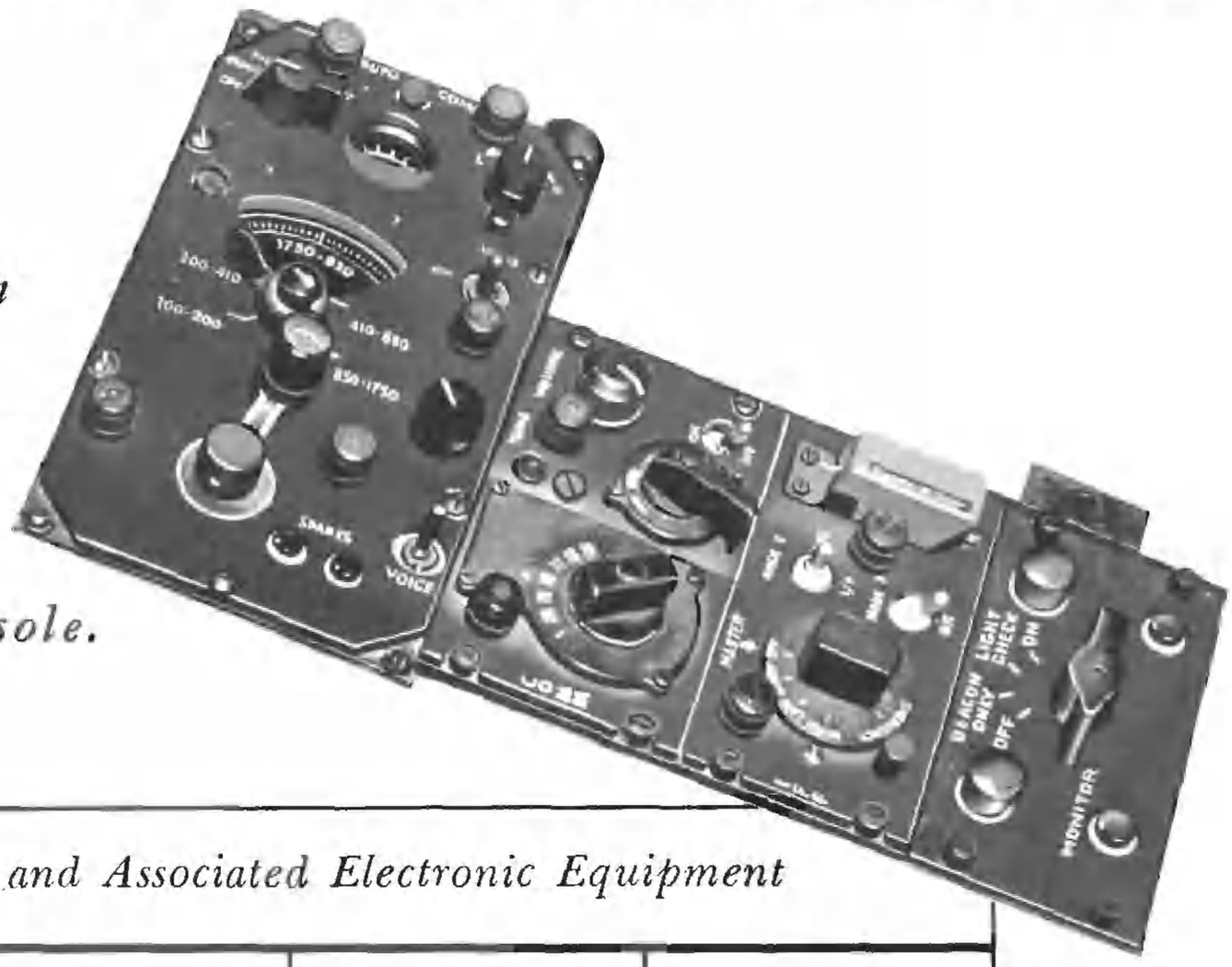


Table of Communications and Associated Electronic Equipment

Type	COMMAND SET	IFF SET	RADIO COMPASS	RADAR SET
Designation	AN/ARC-33	AN/APX-6	ARN-6	APW-11
Function	Two-way voice communication	Automatic Identification	Radio Navigation	Ground Support
Range	30 miles at 1000 feet altitude to 135 miles at 10,000 feet altitude	100 miles up to 50,000 feet altitude	250 miles	—
Locations of Controls	R. H. Console (figure 1-15)	R. H. Console (figure 1-15)	R. H. Console (figure 1-15)	R. H. Console

OPERATION OF COMMUNICATION EQUIPMENT.

Insert microphone plug and headset plug into two extensions on the front of the pilot's seat. The primary bus must be energized for radio operation. Each set is described individually in the following paragraphs:

note

The AN/ARC-33 Command Set and the AN/ARN-6 radio compass will operate from the airplane's batteries as power is supplied to these sets from the primary bus. The AN/APX-6 IFF Radio Set is energized by the alternate inverter when the instrument power switch is in the NOR position and is inoperative with the instrument power switch in the ALT position.

Figure 4–9. Communication and Associated Electronic Equipment

COMMAND SET – AN/ARC-33.

Radio set AN/ARC-33 is a remotely controlled receiver-transmitter designed to operate in the 225 to 399.9 mc band. A total of 1750 crystal controlled receive and transmit channels are provided within tuning range of the set. Any 20 of these channels may be present at the radio set control unit so as to be quickly available when desired. Because of the nature of the operating frequencies employed, communication is essentially over line-of-sight distances with a practical maximum of approximately 75 miles. The radio set is designed to operate at altitudes as high as 50,000 feet. A guard channel receiver is incorporated which may be placed in operation along with the main channel receiver, thus making it possible to continually monitor an emergency or command channel while still carrying on communication on another channel. During the warm-up period of approximately 30 seconds and for approximately three to six seconds when changing channels a tone is heard in the head set to indicate to the operator that the set is not ready for operation.

STARTING.

1. Place the ON-OFF switch on the control panel in the ON position. Allow approximately 30 seconds for warm-up.

2. Rotate the channel selector control knob until the respective number for the desired channel appears in the window above the knob.

Note

The tuning drive motor is protected by a thermal time delay cut-out which opens the motor circuit after approximately one minute of continuous tuning. Therefore, if the tuning motor is unable to come to rest because of some fault in the equipment or because of constant rotation of the channel selector control the tuning motor circuit is automatically broken after approximately 30 seconds. The motor circuit may be reset by selecting a new channel then returning to the original channel.

3. Listen for the tone in the headset. Make no attempt to receive or transmit while the tone is heard.

4. Place the function switch in the MAIN, BOTH or G position depending on the operation desired.

5. Adjust the volume control for comfortable level in the headset.

STOPPING.

1. Place the ON-OFF switch in the control panel in the OFF position.

IFF SET – AN/APX-6.

The purpose of this set is to enable the aircraft in which it is installed to identify itself, automatically, as friendly, whenever it is properly challenged by suitably equipped friendly surface and airborne radars.

CAUTION

Before take-off make sure that AN/APX-6 IFF frequency counters have been set to the proper frequency channels, and the three destructors have been inserted in the face of the IFF transponder.

STARTING.

1. Rotate the master control to NORM position unless instructed otherwise.

Note

The AN/APX-6 set is inoperative with the instrument power switch in the ALT position.

2. Set mode 2 and mode 3 control as instructed.

STOPPING.

1. Rotate the master control to the OFF position.

Note

If the destruct control was operated during the flight, report this fact immediately upon landing so that a new receiver-transmitter may be installed.

RADIO COMPASS – AN/ARN-6.

The radio compass AN/ARN-6 is an airborne navigational instrument. There are four bands covering a frequency range of 100 to 1750. The radio compass is capable of providing the following:

1. Automatic visual bearing indication of the direction of arrival of radio signals and simultaneous aural reception of corresponding sound.

2. Aural reception of radio signals, using a non-directional antenna.

3. Aural-null directional indicators of the arrival of radio signals using a loop antenna.

STARTING.

1. Turn the function switch to COMP, ANT or LOOP position.

Note

The function switch position marked CONT on the control panel is not used on this installation.

STOPPING.

1. Rotate function switch to OFF.

RADAR SET – APW-11.

This radar set has a higher classification than this handbook, therefore, refer to applicable T.O. for detailed information.

LIGHTING EQUIPMENT.

INSTRUMENT LIGHTS.

Instrument lighting is provided with individual red ring lights on each instrument. Auxiliary instrument light is provided by a spot light mounted on each side of the canopy frame.

INSTRUMENT PANEL LIGHT SWITCHES.

The instrument panel lights are controlled by three

rheostat switches. The flight instrument rheostat (4, figure 1–15) is marked FLIGHT and controls the individual lights on all the flight instruments. The non-flight instrument rheostat (3, figure 1–15) is marked NON-FLIGHT and controls the individual lights on all non-flight instruments. The auxiliary light rheostat (1 figure 1–15) is marked AUXILIARY and controls the two spot lights mounted on the canopy frame. All rheostats have two positions OFF and BRIGHT. The FLIGHT and NON-FLIGHT instrument lights are energized by the secondary bus while the AUXILIARY lights are powered from the primary bus.

CONSOLE AND INSTRUMENT PANEL LIGHTS.

The left console is lighted by three incandescent lights covered with red filters and mounted above the console. The placards on the instrument panel and on the right console are lighted with incandescent lights used in conjunction with plastic panels. These lights are energized by the secondary bus and are controlled by a rheostat switch (22, figure 1–14) marked CONSOLE LIGHTS with three positions, OFF, DIM and BRIGHT.

CABIN LIGHT.

A type C4A cabin light (16, figure 1–15) is mounted on the right side of the cabin. The light is provided with an extension cord and it may be removed from its mounting bracket to be used as a portable light. The light is powered by the primary bus and controlled by a rheostat switch located on the light. The rheostat switch controls the intensity of the light for continuous illumination. A push button type switch on the light may be used for intermittent light use. The light is equipped with a red filter which may be removed and the light used as a white spot light.

LANDING LIGHTS.

A landing light, mounted on an electrically retracted door is installed on each wing tip. The door and light are both actuated with power from the primary bus and controlled by a landing light switch.

LANDING LIGHTS SWITCH.

The landing light switch (47, figure 1–12) has three positions EXTEND and ON, OFF and RETRACT. The EXTEND and ON position opens the doors and turns the landing lights on. The OFF position will turn the lights off if the doors are open but the doors will not retract. The RETRACT position retracts the landing lights to the fully closed position.

TAXI LIGHTS.

The taxi light is mounted on the nose wheel strut and is powered by the secondary bus and controlled by an ON-OFF switch (9, figure 1–15) located above the right console. A switch in the nose wheel well will automatically put the light out when the nose wheel is retracted.

POSITION LIGHTS.

Position lights consist of a red light on the left wing tip, a green light on the right wing tip, a yellow and a a white light on the tail and a white light on the top and the bottom of the fuselage. All lights are powered from the secondary bus and controlled by a position light switch (7, figure 1–15) having three positions STEADY, OFF and FLASH. In the STEADY position the wing, tail, and fuselage lights will provide continuous illumination. In the FLASH position the wing and white tail lights will flash alternately with the yellow tail light and the fuselage lights will be steady. The intensity of the position lights is controlled by a DIM-BRIGHT switch (8, figure 1–15) adjacent to the position light switch.

OXYGEN SYSTEM.

The oxygen system is a high pressure system with pressure being supplied from four high pressure oxygen cylinders installed in the forward fuselage above the battery well. The cylinders are properly check valved

CREW MEMBER OXYGEN DURATION — HOURS

CABIN ALTITUDE-FEET	GAGE PRESSURE — P.S.I. 1800	1600	1400	1200	1000	800	600	400	BELOW 400
40,000	15.2 15.2	13.3 13.3	11.4 11.4	9.5 9.5	7.6 7.6	5.7 5.7	3.8 3.8	1.9 1.9	Emergency Descent to Altitude Not Requiring Oxygen
35,000	11.2 11.2	10.1 10.1	8.6 8.6	7.2 7.2	5.7 5.7	4.3 4.3	2.8 2.8	1.4 1.4	
30,000	8.1 8.3	7.1 7.3	6.1 6.2	5.1 5.2	4.1 4.1	3.0 3.1	2.0 2.0	1.0 1.0	
25,000	6.3 7.8	5.5 6.8	4.7 5.8	3.9 4.8	3.1 3.9	2.4 2.9	1.6 1.9	0.8 0.9	
20,000	4.7 8.9	4.1 7.8	3.5 6.7	2.9 5.6	2.3 4.5	1.7 3.3	1.1 2.2	0.6 1.1	
15,000	3.8 10.8	3.3 9.5	2.8 8.1	2.3 6.8	1.9 5.4	1.4 4.0	0.9 2.7	0.4 1.4	
10,000	3.0 14.3	2.6 12.5	2.3 10.7	1.9 8.9	1.5 7.2	1.1 5.4	0.7 3.6	0.3 1.8	

OXYGEN DURATION CHART

Black figures indicate Diluter Lever Normal.
Red figures indicate Diluter Lever "100%".

1 Crew Member — 4 Type AN6025-AX205 Cylinders

Figure 4–10. Oxygen Duration Chart

Figure 4–11. Oxygen Regulator

Figure 4–12. Regulator Diluter Lever

Figure 4–13. Oxygen Supply Shut-off Lever

Figure 4–14. Oxygen Emergency Toggle Lever

for combat safety and are refilled through a single filler valve which is accessible from the nose wheel well. The oxygen supply passes through a reducing valve then flows to the oxygen regulator panel on the right console. Oxygen supply from the regulator to the pilot's pressure breathing demand oxygen mask passes through a quick disconnect on the front of the pilot's seat. A warning light is incorporated in the oxygen system as a visual indication of the proper functioning of the system.

REGULATOR.

An automatic pressure breathing diluter-demand oxygen regulator (figure 4–11) is installed on the right console and includes a low pressure gage and a flow indicator. The regulator automatically supplies the proper mixture of oxygen and air at all altitudes with provisions for positive pressure breathing at high altitudes and also indicates the proper functioning of the oxygen system by means of a warning light.

REGULATOR DILUTER LEVER.

The regulator diluter lever (figure 4–12) has two positions NORMAL OXYGEN and 100% OXYGEN. When the lever is in the NORMAL OXYGEN position, the regulator unit will function to provide automatic mixing of air and oxygen in sea level concentration at all altitudes. In the event that the regulator malfunctions, a pressure relief valve in the regulator unit will relieve to protect the pilot from excessive pressure. When the lever is in the 100% OXYGEN position, the automatic air-oxygen mixing feature is by-passed and 100% oxygen is supplied regardless of altitude.

OXYGEN SUPPLY SHUT-OFF LEVER.

An ON-OFF oxygen supply shut-off lever (figure 4–13) is located on the aft end of the regulator. When the lever is in the ON position, system oxygen is supplied to the regulator unit. When the lever is in the OFF position the oxygen supply to the regulator is shut-off to prevent any flow of oxygen from that unit when not in use.

OXYGEN EMERGENCY TOGGLE LEVER.

The oxygen emergency toggle lever (figure 4–14) is provided for emergency operation or to supply maximum pressure for leakage test of the oxygen mask. When the lever is in the EMERGENCY position (either to the right or left from the normal off position), oxygen is supplied to the mask at a fixed pressure increase over that being supplied automatically. This will provide an increased flow of oxygen in an emergency. When the lever is pushed straight in to the test mask position, maximum pressure is delivered at the outlet regardless of altitude, for leakage test of the oxygen mask. The lever will return to the off position when released. In the off position, oxygen flow is controlled automatically by the regulator unit.

OXYGEN WARNING SYSTEM SWITCH.

An ON-OFF switch (figure 4–15) is provided on the regulator to control the oxygen warning system. When the switch is in the ON position, power is supplied from the primary bus to the warning light circuit. In the OFF position the warning light circuit is deenergized.

HIGH PRESSURE GAGE.

The high pressure gage (figure 4–16) indicates the pressure in the oxygen system before it is reduced. Maximum operation pressure of high pressure system is 1800 psi and the gage scale indicates pressures from 0 to 2000 psi.

LOW PRESSURE GAGE.

The low pressure gage (figure 4–17) incorporated in the oxygen regulator unit records the oxygen pressure being supplied to the regulator. The gage scale reads from 0 to 500 psi and the maximum operating pressure is 450 psi.

OXYGEN FLOW INDICATOR.

A blinker type oxygen flow indicator (figure 4–18) is incorporated in the pressure demand regulator unit. Black and luminescent segments alternately appear through four slots in the indicator face with each breath taken through the oxygen mask.

OXYGEN WARNING LIGHT.

An oxygen warning light (18 figure 1–12) is provided to indicate the functioning of the oxygen system. A dim continuous glow from the light indicates the pilot is breathing normally through the mask. A bright continuous illumination of the light indicates either a zero flow or a continuous flow of oxygen through the regulator. This would result when the oxygen supply lever

Figure 4–15. Oxygen Warning System Switch

Figure 4–16. High Pressure Gage

Figure 4–17. Low Pressure Gage

Figure 4–18. Oxygen Flow Indicator

is in the ON position and the regulator is unused at high altitude or when the regulator emergency toggle is pushed to EMERGENCY position or the regulator diluter lever is at 100% OXYGEN and the regulator unused at any altitude. Breaking of the disconnect between the mask to regulator tubing and the mask tubing or any large leak between the regulator and the pilot will cause the light to come on brightly.

Note

At altitudes below 10,000 feet with the oxygen regulator operating and the mask being used, the light may blink brightly or glow continuously dim. Since this condition may occur only at low altitudes, it should not cause undue concern as either condition indicates satisfactory operation at low altitudes.

NORMAL OPERATION.

BEFORE TAKE-OFF.

1. Place oxygen supply lever in ON position. Check regulator pressure on low pressure gage, (400 to 450 psi). Check high pressure gage (1800 psi).

2. Place the oxygen warning system switch in ON position; the warning light will illuminate brightly.

3. Place the regulator diluter lever in 100% OXYGEN position and depress the emergency pressure lever to flush the regulator hose; the oxygen flow blinker will indicate continuous flow and the warning light should go dim momentarily.

4. With the emergency lever depressed, block the regulator hose tightly with the hand; the blinker should indicate no flow and, after a few seconds, the warning light should come on bright. A hissing of the regulator or a flow indication will indicate a ruptured regulator diaphragm or other pressure leaks. Check the hose and hose fittings.

5. Plug in and adjust the mask on the face and check blinker operation during normal breathing; the warning light should go dim and remain dim.

6. Depress the emergency toggle lever to the TEST MASK position and hold breath; the blinker should indicate no flow. After approximately 10 seconds or less, the warning light will illuminate brightly. A pressure leak will be indicated by a flow indication or a hissing sound from the regulator.

7. Release the emergency pressure lever (allowing return to neutral) and set the diluter lever in NORMAL OXYGEN position. The system is now ready for use.

IN-FLIGHT OPERATION.

The pressure regulator diluter lever should always be in the NORMAL OXYGEN position except when operating under emergency conditions. When going on oxygen, proceed as follows:

1. Place oxygen supply shut-off lever in the ON position.

2. Check regulator diluter lever in the NORMAL OXYGEN position.

3. Place oxygen warning system switch in the ON position. The warning light should blink brightly for a few seconds and then glow with continuous brightness.

4. As breathing through the mask is started, the warning light should blink brightly a few seconds and then change to a dim continuous glow, and the oxygen flow indicator should start functioning. The proper flow of oxygen will be automatically maintained by the regulator unit.

EMERGENCY OPERATION.

1. With symptoms of anoxia or if smoke or fumes should enter the cabin, immediately place the regulator diluter lever in the 100% OXYGEN position and place the emergency lever in the EMERGENCY position.

2. In the event of accidental loss of cabin pressure no action is required if oxygen is being used as the regulator unit will automatically compensate for the increased cabin altitude.

3. If the oxygen regulator should become inoperative, pull the cord of the H-2 emergency oxygen cylinder and descend to a cabin altitude not requiring oxygen.

FLIGHT REFUELING SYSTEM.

The airplane is equipped with a flight refueling system (figure 4–19) which enables the airplane to be refueled in the air from a tanker using a flying boom. The receiver is located on the left wing upper surface and is concealed by a flush type door which is hydraulically operated. During the refueling operation, the engine is operated with the fuel tank selector in the ALL TANKS position so that the engine is fed from the main tank. The forward, wing, main and pylon tanks are filled during the flight refueling cycle. Once the receiver door in the wing is opened and the tanker's boom is inserted in the nozzle, refueling sequence is accomplished electrically through an amplifier which is powered from the primary bus. When the tanks are full, the fuel flow in the refueling lines is reduced to an amount equal to the engine consumption and the fuel pressure, in the lines, increases. These changes are noted in the tanker airplane and a disconnect is effected. An automatic disconnect will be accomplished if the fuel pressure is excessive in the refueling lines, if rough air causes excessive tension on the nozzle or by any uncontrolled or intentional change in flight attitude of the receiver airplane wherein a conical angle of 15° from the normal is exceeded. Provision is made so that the forward, main or wing tanks can be isolated, if damaged, from the refueling system. In the event the main tank is damaged and is shut-off during refueling, operation can be accomplished with the fuel tank selector in the WING AUX or FWD AUX position.

RECEIVER SWITCH.

The receiver switch (24 figure 1–14) is a two position toggle switch marked OPEN and an unmarked position. The OPEN position unlocks and opens the receiver door hydraulically and also supplies d-c power from the primary bus to the refueling amplifier which is an electronic device that sends and receives signals from the tanker to the receiver aircraft through the refueling boom. The ready indicator light will illuminate when the receiver door is open. The unmarked position closes and locks the receiver door hydraulically, and disconnects the power supply to the receiver amplifier.

Note

The receiver door will close in the event of a primary bus power failure.

NOZZLE DISCONNECT SWITCH.

The gun-bomb-rocket sight caging switch, on the throttle control, is used as the nozzle disconnect switch (figure 4–23) when refueling in the air. The caging switch is in the flight refueling circuit only when the receiver switch is in the OPEN position. The switch is depressed to IFR DISCONN if it is desired to end the refueling cycle before the fuel tanks are full. Depressing the nozzle disconnect switch illuminates the disconnect indicator light, causes the tanker pumps to shut down, closes the fuel valves, signals the tanker operator that a disconnect has been made and releases the refueling boom from the receiver nozzle.

RESET SWITCH.

The reset switch (24 figure 1–14) is a push button switch spring loaded to the off position. If at any time during a refueling cycle the airplane becomes disconnected and the disconnect indicator light illuminates the airplane is made ready for refueling again by depressing the reset switch. The refueling system can also be made ready for refueling by closing then reopening the receiver door.

RECEIVER LIGHT SWITCH.

The receiver light switch (24 figure 1–14) is a toggle switch with an ON and an unmarked position. The ON position supplies power from the primary bus to illuminate a flood light on the side of the aircraft which lights up the receiver nozzle to aid the boom operator in the tanker during night refueling operations.

FUEL SHUT-OFF VALVES.

The same fuel lines are used for transfer of fuel from the external to the internal tanks as is used to supply all tanks during flight refueling. The fuel shut-off valves (23 figure 1–14) provide a means of controlling fuel flow to the individual internal tanks by closing a valve at the fuel line entrance to the tank. Each of the four fuel shut-off valves are controlled by a two position toggle switch. The switches are marked L. WING, MAIN, FWD and R. WING with an arrow indicating the CLOSED position. During normal operation the switches are left in the up position, which allows fuel to transfer from the external to the internal tanks and also allows all tanks to be refueled from the refueling receptacle. By placing the fuel shut-off valve in the CLOSED position the respective fuel tank will not receive fuel by transfer or flight refueling. This system is provided to isolate each of the internal tanks, in the event of battle damage to the tank, or failure of the booster pump in the tank. The fuel shut-off valves are actuated by the primary bus.

READY INDICATOR.

The ready indicator light powered by the primary bus (24 figure 1–14) is a green light marked READY and when illuminated indicates that the receiver nozzle is open, power is supplied to the refueling amplifier and the amplifier is ready for the refueling cycle. The ready indicator light will go out when contact is made.

DISCONNECT INDICATOR.

The disconnect indicator powered by the primary bus (7 figure 1–12) is an amber light marked IFR DISCONNECT. Illumination indicates the tanker's fuel pumps are shut down, the tanker's fuel valves are closed and that the boom nozzle has been disconnected from the receiver. If the disconnect indicator is illuminated the reset switch must be depressed or the receiver door closed and reopened before the refueling system will be ready to make another refueling cycle.

FLIGHT REFUELING

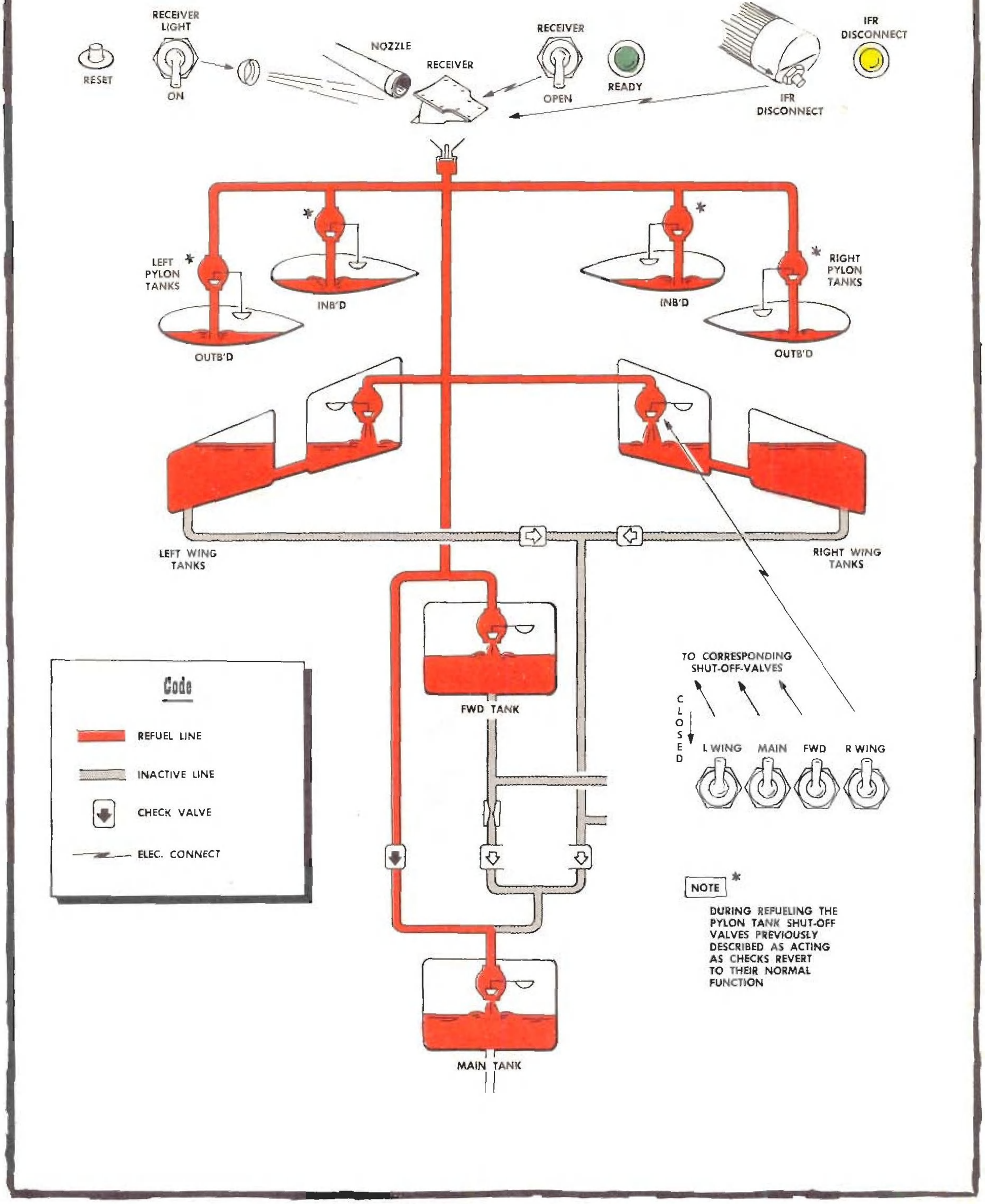


Figure 4—19. Flight Refueling Schematic

FLIGHT REFUELING SYSTEM OPERATION

1. Approach tanker at selected altitude and speed.
2. Fuel tank selector ALL TANKS unless operation is necessary in auxiliary.
3. Receiver switch OPEN. Ready indicator light on.
4. Receiver light switch ON if refueling operation is at night.
5. Ready indicator light will go out after contact is made.
6. After refueling check disconnect indicator light on.
7. If the disconnect indicator light illuminates before refueling is completed, depress the reset switch.

Note

A disconnect may be accomplished at any time by depressing the disconnect switch.

8. Receiver switch, up position after refueling is completed.

Note

Fuel system operation is normal after the receiver door is closed.

Figure 4—20. Flight Refueling System Operation

BATTLE DAMAGE.

If the main forward or wing tanks have been damaged and it is desired to refuel, these tanks may be isolated from the refueling system by placing the desired fuel shut-off valve' in the CLOSED position. Refuel as in normal operation.

EMERGENCY OPERATION.

At any time when in contact made position, the word BREAKAWAY is heard, the receiver pilot will actuate his disconnect switch immediately. The tanker pilot in such a situation, will pull up abruptly, 50 to 100 feet, and apply power. The receiver pilot shall not dive out of the refueling envelope until separation has been made.

AUTOMATIC PILOT.

The automatic pilot will be installed in the airplane at a later date.

NAVIGATION EQUIPMENT.

SLAVED GYRO MAGNETIC COMPASS.

A type J-2 slaved gyro magnetic compass is installed in the airplane which provides visual indication of the magnetic heading of the airplane. The indication is read on an indicator (38 figure 1—12) whose operation is governed by a gyro whose spin axis is stabilized in a horizontal plane by means of a leveling device and whose orientation in azimuth is slaved to the earth's magnetic meridian by a direction-sensing component, located in the left stabilizer. The compass requires both a-c and d-c power. The d-c power is supplied from the primary bus and the a-c power is supplied by the main or alternate inverter.

The gyro is free to operate within 85 degrees from level flight in dive and climb, and in right and left bank. At the limits, it strikes mechanical stops which render the indications on the directional gyro control and the settable dial indicator inaccurate. After return to level flight errors up to 5 degrees in heading may be introduced; but the gyro will recover its erect and slaved positions automatically in a period of 5 minutes or less and thereafter will again resume correct indications until the limits are again exceeded. The flux valve unit of the remote compass transmitter remains pendulous through 30 degrees on both sides of the vertical in pitch and roll. When these limits are exceeded or a coordinated turn is being executed the vertical components of the earth's field are picked up which results in flash signals. Restoration of the airplane to an attitude within these limits renders the flux valve unit pendulous again, and it automatically resumes correct sensing. A thermal switch in the amplifier provides fast slaving and leveling of the directional gyro during the initial operation of the compass.

GYRO COMPASS SLAVING SWITCH.

The gyro compass switch (44 figure 1-12) has two positions: NORMAL and CUTOUT. The NORMAL position supplies power to the heating, leveling and slaving systems. The CUTOUT position cuts off the power supply to the control field of the slaving torque motor and is used when the horizontal lines of magnetic force dip at 84 degrees or more.

GYRO COMPASS FAST SLAVING SWITCH.

The gyro fast slaving switch (46 figure 1-12) marked PUSH FOR FAST SLAVE is pushed in momentarily to shorten the time required to restore the gyro to its erect and slaved position, after level flight is resumed, following maneuvers in which the gyro has hit the mechanical stops. Approximately two minutes of fast slaving is obtained by depressing the fast slaving switch.

STARTING.

The compass will operate if the engine is operating and the instrument power switch is in NOR or ALT, if the engine is inoperative and the battery switch is positioned to BATT ON and the instrument power switch is in ALT or if the primary and secondary busses are energized through the external power receptacles and the instrument power switch is in NOR. Allow 3 minutes to elapse so that the gyro in the directional gyro control comes up to operating speed, levels and aligns the indication on the settable dial indicator with that sensed by the remote compass transmitter.

Note

It is necessary, for proper operation of the J-2 compass, that the a-c and d-c power supplies to the system be turned on simultaneously. To assure this, depress the fast slaving switch momentarily after the engine is running. This action turns the d-c power (to the compass) off and on again with the inverter running.

OPERATION.

SETTING INDICATOR. By means of the SET COURSE knob on the indicator, set the dial index for the heading it is desired to fly. It is preferable to set the dial index against the zero bezel index of the indicator although any index may be chosen.

USING THE COMPASS – STRAIGHT FLIGHT. After the airplane becomes airborne, the indicator is referred to in the same manner as a magnetic compass.

USING THE COMPASS – IN TURNS. Perfect 45, 90 and 180 degree turns can be executed by setting the dial index, with the overlapping pointer against the zero bezel index, then flying the aircraft to align the pointer with the 45 and 90 degree bezel indices on both sides of the zero index or with the index at 180 degrees. Then final heading may be set against the zero bezel index by means of the SET COURSE knob. Another method is to set the dial index for the new heading against any bezel index, then flying the aircraft to align the pointer with that bezel index.

ARMAMENT EQUIPMENT.

This aircraft is equipped to carry guns, bombs, rockets and chemical tanks. The guns are installed internally and the bombs, rockets and chemical tanks are carried as external stores. The gun-bomb-rocket sight is provided and is used when firing the guns and rockets and releasing the bombs at the proper time to be effective on a target. Manual operation is also provided. The pilot is protected from enemy fire by two pieces of armor plate installed behind the seat. A gun camera mounted above the instrument panel records results of fixed gun and rocket firing.

GUN ARMING SWITCH.

The gun arming switch has three position; GUNS, OFF and SIGHT-CAMERA & RADAR. AC power is supplied to the sight gyros and heaters as soon as the secondary bus is energized if the instrument power switch is in the NOR position. The SIGHT-CAMERA & RADAR or GUNS position supplies d-c power to the sight tube heaters, relays and control units in addition to the gyros and heaters and also energizes the gun camera circuit. In addition the GUNS position energizes a relay so that the guns will fire when the stick trigger is actuated if the aircraft is airborne. The sight is ready for use with the gun arming switch in either the SIGHT-CAMERA & RADAR or GUNS position.

GUN-BOMB-ROCKET SIGHT.

The A-4 gun-bomb-rocket sight (3 figure 1—12) automatically computes the fire control problems for gun fire from fixed guns, for bombing and for rocket fire. The computed range takes into account the speed of the target. The sight reticle image, consisting of a circle and a central dot, is reflected on an inclined transparent window. The automatic features of the sight enables the pilot to direct his full attention to the selected target provided he flies the aircraft so that the reticle circle is continuously super-imposed on the target. Range data is supplied to the sight, for gunnery operations, by a manual range control or automatically by an AN/APG-30 radar range unit. The radar system also provides automatic search within its range. It automatically locks onto and tracks a target in range and indicates to the pilot when the equipment is tracking a target. On overland targets below 6,000 feet, radar range distance may be reduced by use of the radar range sweep control to prevent the radar from locking on the ground when target is at low altitudes. Bombs can be released automatically at the proper release point by a mechanism within the sight. Electrical power (28 volt d-c) is supplied to the sight and sight heaters from the secondary bus. AC electrical power is supplied from the main inverter and a sight inverter which are both powered from the secondary bus. Manual sight ranging may be used if the a-c power supply fails or when the radar system is inoperative. The sight can be operated as a fixed reticle sight as long as d-c power is available.

SIGHT DIMMER CONTROL.

The sight dimmer control (figure 4—21) controls the illumination intensity of the reticle image from DIM to BRIGHT.

SIGHT FILAMENT SWITCH.

The sight filament switch (figure 4—22) has two positions PRIM and SEC and is used to select one of the dual filaments of the lamp for the sight reticle circle and dot. If either filament goes out the spare filament may be cut-in by changing the switch to the other position.

ELECTRIC CAGING BUTTON.

The push-button type caging switch, (figure 4—23) on the throttle control is used to stabilize the reticle image on the target. Depressing the switch, electrically cages the gyros in the computer and brings the sight line to the "no deflection" position, which gives the pilot a fixed sight for placing the reticle image on the target initially. The caging button is also used as the nozzle disconnect switch when refueling in the air. The receiver door must be open for the caging switch to operate in this manner.

MECHANICAL CAGING LEVER.

The mechanical caging lever (figure 4—24) is moved to the left to CAGE and right to UNCAGE the sight mirror. For firing at ground targets, or in the event of sight failure, the caging lever may be placed at CAGE and the reticle used as a fixed sight. The mechanical caging lever should always be positioned to CAGE during violent air maneuvers to protect the sight mirror suspension.

SPAN ADJUSTMENT LEVER.

The span adjustment lever (figure 4—25) is set to the wingspan of the target, in feet, when the gun-bomb-rocket sight is operated with manual range.

MANUAL RANGE CONTROL.

The manual range control, (figure 4—26) incorporated in the throttle control provides for manual ranging during gunnery operation when radar ranging is impossible (below 6,000 feet on overland targets). The range control covers a span of 1,500 feet, from approximately 1,200 feet to approximately 2,700 feet. Clockwise rotation of the twist grip reduces the range (increases the reticle size). The manual ranging control is spring-loaded to the full counterclockwise (detent) position which is used for operation of the radar ranging system.

RADAR "OUT" SWITCH.

When the radar detects a target, it locks on it and measures its range. The radar may be shifted to another target by means of the radar "out" switch (figure 4—27) located on the left side of the control stick grip. Depressing the "out" switch for several seconds causes the radar to reject the target and drift in or out in range. If the rocket dive angle control is in either BOMB or ROCKET position in preparation for a bomb or rocket run and gun firing is required, the rocket drive angle control will automatically return to the GUNS position when the radar "out" switch is depressed.

RADAR RANGE SWEEP CONTROL.

The radar range sweep control (figure 4—28) is a rheostat marked INCREASE with an arrow showing the direction. Turning the control in the MIN direction lowers the radar ranging distance to prevent radar from locking on the earth when the aircraft is at low altitudes. Turning the control toward MAX increases the range. During normal operations control should be at MAX.

BOMB-TARGET-WIND CONTROL.

The bomb-target-wind control (figure 4—29) has a ROCKET GUN position and a BOMB scale indicating downwind and upwind adjustment. Setting the B-T-W control adjusts the sight to compensate for the components of wind velocity and target motion parallel to the direction of the attacking airplane. The ROCKET GUN position is selected when using the sight for gun or rocket firing.

ROCKET DIVE ANGLE CONTROL.

The rocket dive angle control (figure 4—30) is three separate controls on one dial. One pointer has three positions on the top of the dial; BOMB, GUN AND ROCKET. The appropriate position is selected for bombing, gunnery or rocket firing. If the pointer is in either the BOMB or ROCKET position and the stick

Figure 4–21. Sight Dimmer Control

Figure 4–22. Sight Filament Switch

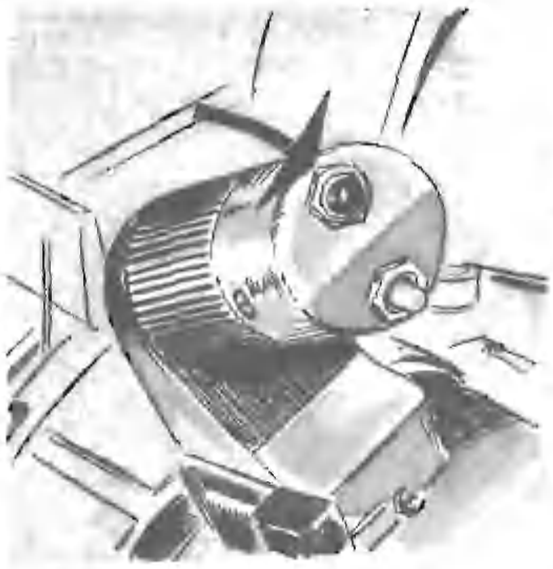


Figure 4–23. Electric Caging Button

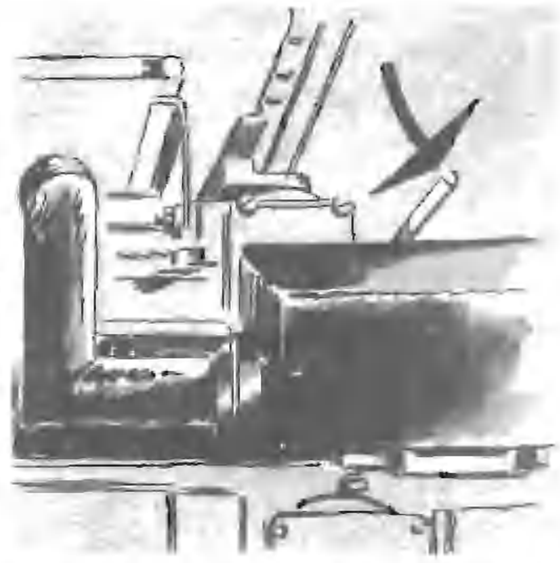


Figure 4–24. Mechanical Caging Lever

trigger on the control stick is depressed the pointer will automatically return to the GUN position. The second pointer is the rocket setting pointer and has three positions; 5″ HVAR, 2.25SCAR and 2.75FFAR. Each position has an N and an S position. When firing rockets the rocket dive angle control is turned to N for dives up to 40 degrees or to S for dives greater than 40 degrees under the type of rocket being fired. The third pointer has three positions; TR, HI and LO and is used for gunnery only. The TR position is used in a low speed attacking airplane for the purpose of controlling gun fire or rocket fire against a low speed target. The HI position is used when the sight is in a high speed attacking airplane flying against a high speed target. The LO position is used when the sight is in a high speed attacking airplane directing fire against a low speed target.

TARGET INDICATOR LIGHT.

The target indicator light (figure 4–31) is located on the left side of the gun sight. Illumination of the light indicates that the radar set is "locked-on" a target.

OPERATION.

STARTING THE SIGHT. The sight gyros and heaters start to operate as soon as the secondary bus is energized. A period of approximately 20 minutes is necessary for the sight to come up to operating temperatures and stabilize.

1. Position the gun arming switch to either the GUNS or SIGHT CAMERA & RADAR position which supplies power to the amplifier. Allow approximately one minute for the amplifier tubes to warm up.

2. Check to see that the reticle image appears on the reflector glass.

3. Check the reticle image by moving the mechanical caging lever from one position to the other. The dot should flicker as the lever is moved and the circle should change to four circular arcs in the CAGE position.

STOPPING. Position the gun arming switch to the OFF position. This turns off the tube heaters, relays and controls but leaves the sight operating and ready for use within one minute after repositioning the gun selector switch. The gyros and heaters will operate as long as the secondary bus is energized. Position the mechanical caging lever to CAGE.

GUNNERY EQUIPMENT.

Four .50 caliber machine guns are installed in the gun bay of the fuselage and one .50 caliber machine gun is installed in the leading edge of each wing. Electric heaters are provided for the guns. The normal load of ammunition for each gun is 300 rounds. All guns are charged with a pneumatic gun charger. A gun camera, installed above the instrument panel operates automatically when the guns are fired or it may be operated separately. A safety circuit, controlled by the extension of the landing gear shock struts prevent the guns from being fired, or the rockets jettisoned if the airplane is in the static position. If for any reason the guns must be fired or the rockets jettisoned while the airplane is on the ground the safety circuit can be by-passed by remov-

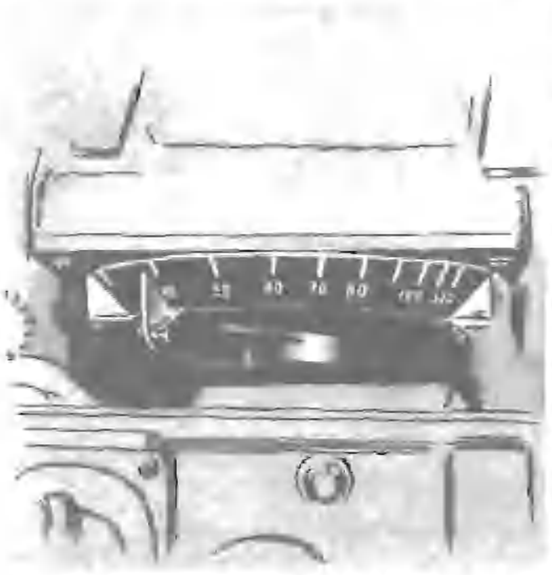


Figure 4–25. Span Adjustment Lever

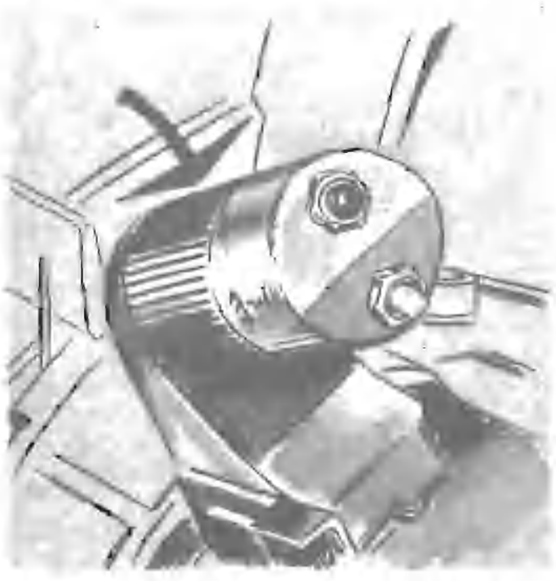


Figure 4–26. Manual Range Control

Figure 4–27. Radar "Out" Switch

Figure 4–28. Radar Range Sweep Control

Figure 4–29. Bomb-Target Wind Control

Figure 4–30. Rocket Dive Angle Control

Figure 4–31. Target Indicator Light

Figure 4–32. Gun Charger Switch

ing the cover of the armament safety override switch located in the right wheel well. The secondary bus must be energized in order to fire the guns or to charge the guns.

GUN CHARGER.

The gun charger, mounted on each gun, is operated by pneumatic system and controlled electrically. The charger can be used for charging the guns from the cockpit, holding the guns in the retracted position for purposes of safety and to permit cooling of the guns, automatically charging the guns during gunfire when a failure to fire occurs and for firing the guns by the use of an electro-pneumatic sear actuator contained in each gun charger. The guns are automatically charged if the gun arming switch is in the GUNS position and the gun trigger, on the control stick, is depressed when the airplane is airborne and the secondary bus is energized.

GUN CHARGER SWITCH. The gun charger switch (figure 4–32) is a three position switch spring loaded to the OFF position. The other two positions are CHARGE and RELEASE. The switch is used to energize the gun charger circuits if the secondary bus is energized and the airplane is on the ground. The guns are charged by placing the switch in the CHARGE position. This actuates a solenoid which in turn allows air pressure to draw the gun bolt to the rear and locks it in that position. The RELEASE position will return the gun bolt to the forward position. The guns will fire, if the gun arming switch is in the GUNS position and the aircraft is airborne, when the stick trigger is depressed regardless of the position of the gun bolt.

STICK TRIGGER.

The gun camera and gun firing circuits are energized by depressing the stick trigger (figure 4–33) located on the control stick grip. There are two definite switch positions. The first position starts the gun camera operating if the gun arming switch is in the SIGHT-CAMERA & RADAR or the GUNS position and the secondary bus is energized. The second, or fully depressed position, charges and fires the guns if the gun arming switch is in the GUNS position, the airplane is airborne and secondary power is available.

GUN HEATER SWITCH.

The gun heater switch (figure 4–34) located on the left console is a circuit breaker type switch having two positions: OFF and HEATER. The HEATER position supplies power to the gun heaters from the secondary bus.

GUN CAMERA SWITCH.

The gun camera switch is provided on airplanes up to F-84F-10RE to adjust the camera aperture for existing light conditions so as to improve pictures taken during gunnery. The gun camera switch (figure 4–35) operates from the secondary bus and has three positions: BRIGHT, HAZY and DULL which refer to light conditions. On subsequent airplanes the camera aperature is adjusted manually.

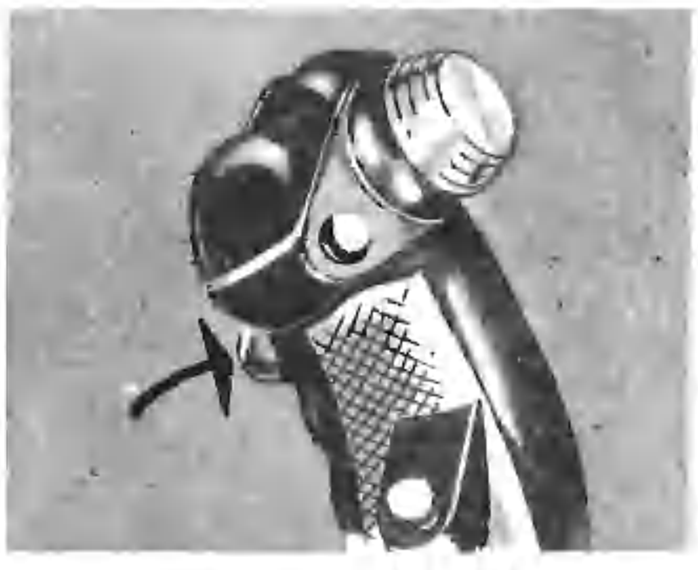


Figure 4–33. Stick Trigger

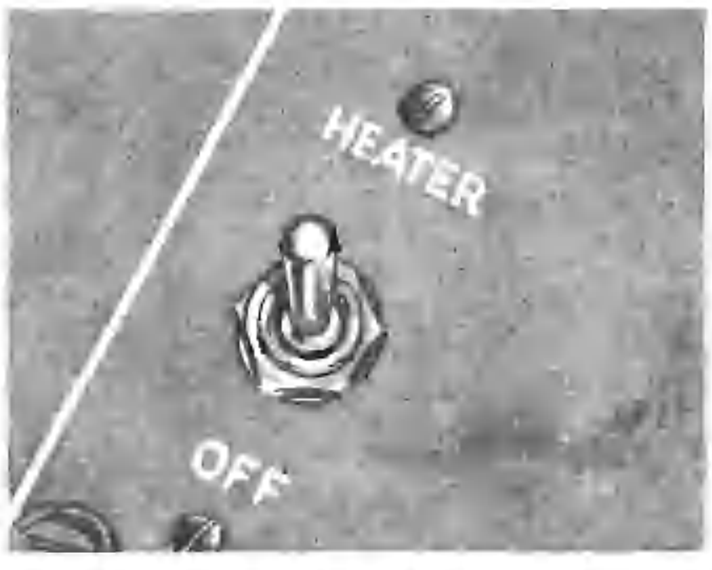


Figure 4–34. Gun Heater Switch

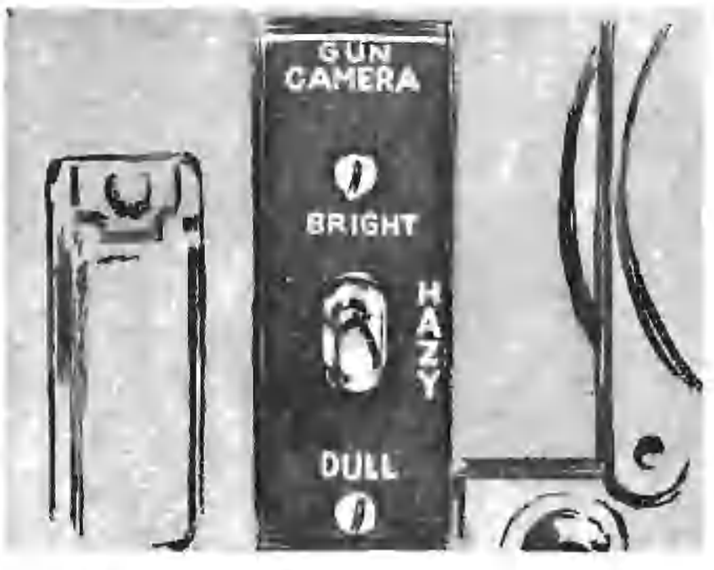
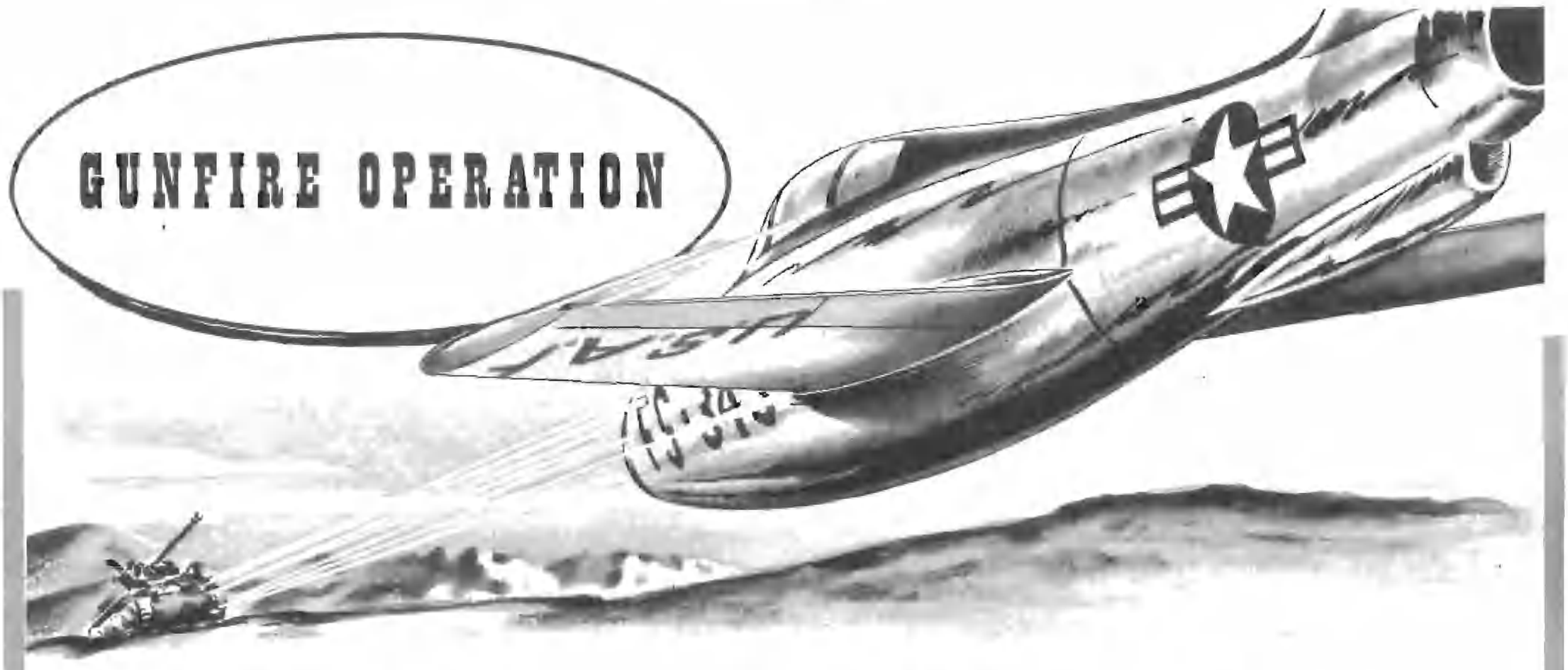


Figure 4–35. Gun Camera Switch

GUNFIRE OPERATION



(with Radar Range)

1. Gun heater switch HEATER.

2. Gun arming switch GUNS. Allow one minute for amplifier to warm up and stabilize.

3. Set rocket dive angle control to GUN.

4. Set the TR, HI, LO pointer on the rocket dive angle control to suit gunnery target speed.

5. Set B-T-W control to ROCKET-GUN.

6. Check instrument power switch — NOR.

7. Manual range control on throttle in detent.

8. Set mechanical caging lever on sight head to UNCAGE.

9. Set reticle dimmer control for desired brilliance.

10. When searching for targets, press caging button on throttle control to stabilize the reticle image.

11. When target is located and tracking is started, release caging button. Fly the airplane so that the reticle image is continuously and accurately centered on the target. After the target has been tracked smoothly without slipping or skidding for approximately one second, fire the guns.

(with Manual Range)

1. Gun heater switch HEATER.

2. Gun arming switch GUNS. Allow one minute for amplifier to warm up and stabilize.

3. Set rocket dive angle control to GUN.

4. Set B-T-W control to ROCKET GUN.

5. Check instrument power switch NOR.

6. Set mechanical caging lever on sight head to UNCAGE.

7. Set reticle dimmer control for desired brilliance.

8. Identify target and set wing span with span adjustment lever corresponding to the target wing span.

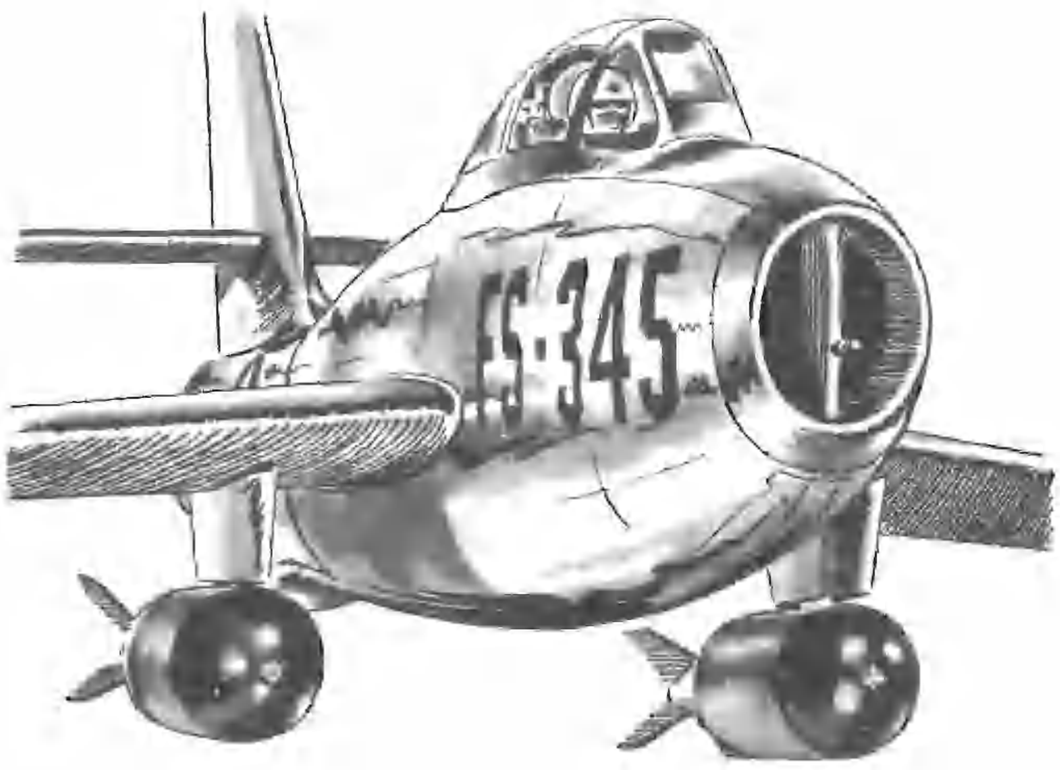
9. When searching for targets, press caging button on throttle control to stabilize the reticle image.

10. After the target is close enough for a sphere containing the wing tips to coincide with the framing circle at minimum diameter, release the caging button.

11. Track smoothly, turning manual range control on throttle so that the circle continuously and accurately frames or encloses the target. After the target has been framed and tracked smoothly for approximately one second without slipping or skidding, fire the guns.

Figure 4—36. Gunfire Operation

BOMBING EQUIPMENT



Two jettisonable bomb pylons can be installed under each wing. The pylons are jettisoned by explosive charges in the attaching bolts and are blown away from the airplane by compressed air cylinders. These cylinders must be charged manually. Each inboard pylon will carry all bombs up to and including 2000 pounds, one fragmentation bomb rack assembly, a chemical tank or an external fuel tank. Each outboard pylon will carry all bombs up to and including 1000 pounds or an external fuel tank. The gun-bomb-rocket sight is used for bomb sighting and automatic bomb release. Controls are provided for normal or emergency release of any external stores carried on the pylons. Normal release may be accomplished automatically or manually, with bombs released singly or simultaneously. The arming condition of the bomb nose and tail fuses is manually selected.

INBOARD BOMB SELECTOR SWITCH.

Release of the bombs installed on the inboard pylons is controlled by the inboard bomb selector switch (9 figure 1—14) which is energized from the primary bus. The switch has three positions INBD ALL, OFF and SINGLE. When the switch is in the SINGLE position the left bomb will release when the bomb release switch is depressed. The right bomb will release when the release switch is depressed again. With the switch placed in the INBD ALL position both bombs will release simultaneously when the bomb release switch is depressed. When in the OFF position the bombs on the inboard pylons will not release when the bomb release switch is depressed.

OUTBOARD BOMB SELECTOR SWITCH.

Release of the bombs installed on the outboard pylons is controlled by the outboard bomb selector switch (8 figure 1—14) which is energized from the primary bus. The bombs can not be released singly as the pylons are too near the wing tip and trim of the airplane with only one bomb on the outboard pylon would be excessive. The outboard bomb selector switch has two positions; OUTBD ALL and OFF. When in the OUTBD ALL position both bombs will be released simultaneously when the bomb release switch is depressed. In the OFF position the outboard bombs will not release when the bomb release switch is depressed.

BOMB ARMING SWITCH.

The bombs arming switch has three positions; ARM NOSE & TAIL, SAFE and TAIL ONLY and is energized by the primary bus. When the switch is placed in the ARM NOSE & TAIL position the electric circuit is indexed to arm the bombs for time explosion. When the switch is placed in the TAIL ONLY position the electric circuit is indexed to arm the bombs for impact explosion. In the SAFE position the bombs are unarmed when dropped.

BOMB RELEASE SELECTOR SWITCH.

The bomb release selector switch is energized from the primary bus and has two positions which are AUTO RELEASE and MANUAL RELEASE. In the AUTO RELEASE position the bombs will be released automatically by the gun-bomb-rocket sight. In the MANUAL RELEASE position the bombs are released manually by depressing the bomb release switch on the control stick regardless of whether or not the sight is utilized or in operation.

AUXILIARY BOMB SELECTOR SWITCH.

The auxiliary bomb selector switch is energized from the secondary bus and is used when fragmentation bomb racks or chemical tanks are attached to the pylons. The auxiliary bomb selector switch has three positions: ALL, OFF and SINGLE. In the SINGLE position the left rack will release its bombs then transfer the circuit to the right rack. In the ALL position both fragmentation racks will operate simultaneously to drop their bombs or the chemical tanks will fire when the bomb release switch is actuated. The auxiliary bomb release indicator light (5, figure 1—14) illuminates when the fragmentation racks are loaded and remains on until the fragmentation bombs are dropped. The ALL position is used when firing chemical tanks. The OFF position is used when bombs are installed on the pylons.

BOMB RELEASE SWITCH.

The bomb release switch is a spring-loaded, button type switch installed on the top of the control stick and energized by the primary bus. When the switch is depressed the bomb rack electric circuit is energized to release the bombs or pylon tanks in accordance with the setting of the bomb release selector switch. The bomb release switch will also fire the rockets, salvo the rockets, or release bombs, depending on the position of the rocket selector switch or the inboard or outboard bomb selector switch respectively.

Figure 4—37. Bombing Equipment (Sheet 1 of 2)

EXTERNAL STORES JETTISON SWITCH.

The external stores jettison switch (2 , figure 1–13) is a push button type switch and when depressed all external stores including the pylons are jettisoned if the battery bus is energized.

Note

The rockets will jettison only if the airplane is airborne.

INBOARD PYLON JETTISON SWITCH.

The inboard pylon jetison switch (13, figure 1–14) is guarded with a cover type guard which is marked JETT INBD PYLON and an arrow. When actuated in the direction of the arrow the inboard pylons are jettisoned simultaneously together with any stores carried on them if the battery bus is energized.

OUTBOARD PYLON JETTISON SWITCH.

The outboard pylon jettison switch (12, figure 1–14) is guarded with a cover type guard which is marked JETT OUTBD PYLON and an arrow. When actuated in the direction of the arrow the outboard pylons are jettisoned simultaneously together with any stores carried on them if the battery bus is energized.

BOMBING OPERATION – MANUAL.

1. Set inboard or outboard bomb selector switch as desired.
2. Set bombs arming switch as desired.
3. Set bomb release selector in MANUAL RELEASE.
4. Press bomb release switch on control stick.

CAUTION

Before depressing the bomb release switch, check to determine that all selector switches are in proper position. This is necessary to determine that only the desired circuits will be energized. It is possible, for example, if both the rocket jettison ready switch and the rocket selector switch are both on, to fire some rockets and drop the others when the bomb release switch is depressed.

BOMBING OPERATION USING GUN-BOMB-ROCKET SIGHT.

1. Set rocket dive angle control to BOMB position.

Note

If the stick trigger is depressed with the dive angle control in the BOMB position the control will automatically return to the GUN position.

2. Set B-T-W control to the known or estimated up or down wind plus or minus the estimated target velocity. The reticle will immediately move down to a position just over the nose.
3. Set the mechanical caging lever on the sight head to UNCAGE.
4. Set reticle dimmer control for desired brilliance.
5. Set the bomb release selector switch in the AUTO RELEASE position.
6. Position inboard or outboard bomb selector switch as desired.
7. Fly an approach which will give the desired dive angle during the bombing run. The electrical caging button must be depressed during this maneuver.
8. After a smooth dive has been established with the reticle on the target, release the electrical caging button.
9. Depress the bomb release switch at approximately the bomb drop point.
10. Track very smoothly until the reticle image becomes extinguished. This indicates an automatic bomb release.
11. If manual release is desired, place the bomb release selector switch in the MANUAL RELEASE position, get on the target and track as above. After the reticle image circle becomes extinguished, press the bomb release button. The manual release is not as accurate as the automatic release because of the time lag due to the pilot's reaction time.
12. Computation accomplished during the above prescribed procedure will be good for only one release, i.e., a single bomb, bombs in train with interval control not exceeding ½ second from the first to the last bomb, a pair of bombs released simultaneously or a salvo.

EMERGENCY OPERATION

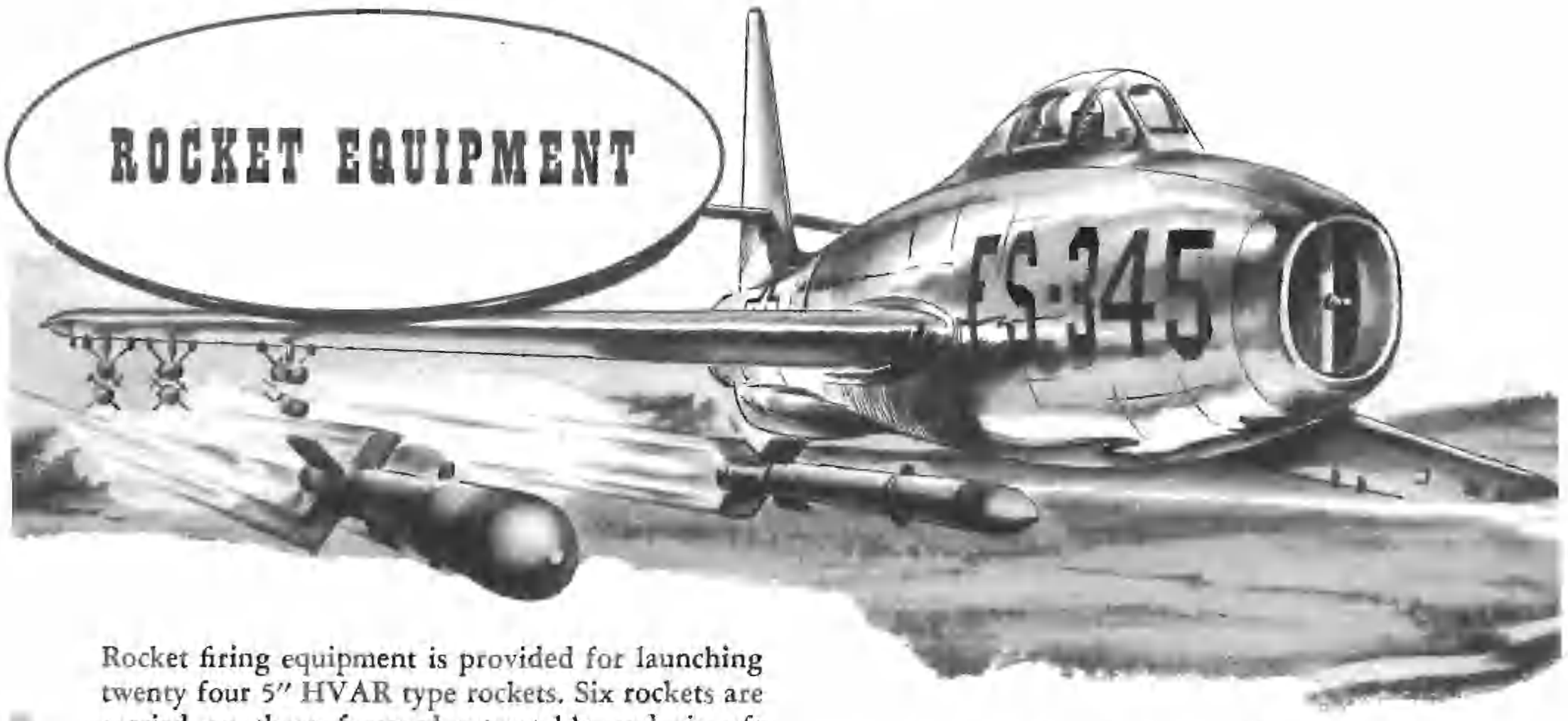
The bombs can be dropped simultaneously unarmed by depressing the external stores jettison switch.

CAUTION

The bombs, pylon tanks or chemical tanks will be dropped if the external stores jettison switch is actuated with the airplane in the static position.

Figure 4–37. Bombing Equipment (Sheet 2 of 2)

ROCKET EQUIPMENT



Rocket firing equipment is provided for launching twenty four 5" HVAR type rockets. Six rockets are carried on three forward retractable and six aft retractable support posts under each wing and six rockets are carried on an adapter on each inboard pylon. Arming solenoids mounted in the leading edge of each wing and on each pylon retain the rocket nose fuse arming wires when the rockets are fired in the armed condition. Rocket firing sequence is controlled by a rocket release control. Each forward post is equipped with a jettison mechanism for jettisoning the rockets in an emergency. The fore and aft supports retract automatically after the rockets have been fired or jettisoned. When carrying twelve rockets on the rocket posts, rockets are fired singly or in train, however, in the 24 rocket configuration the rockets are fired in pairs, i.e., one from the outboard rocket post and one from the opposite pylon adapter. The gun-bomb-rocket sight is used for aiming rockets and the rockets are fired by depressing the bomb release switch.

ROCKET JETTISON READY SWITCH.

The rocket jettison ready switch is energized by the primary bus and has two positions: NORMAL and JETTISON READY. The NORMAL position is guarded with a red cover guard and is in the rocket firing circuit. The JETTISON READY position indexes the rocket jettison circuit so that the pylon adapter and the rockets on the rocket ports will be jettisoned simultaneously when the bomb release switch on the control stick is pressed. However, if bombs or tanks are installed on the pylons they will not jettison with the rockets on the wings.

Note

Rockets can be jettisoned only if the airplane is airborne.

ROCKET RELEASE CONTROL.

The rocket release control is an electrically operated timing device incorporating an intervalometer, a reset knob and an indicator. The intervalometer automatically selects the next rocket firing circuit in sequence whether firing the rockets singly or in train. The indicator, marked RX TO BE FIRED, informs the pilot by rocket number, the position and location of the next rocket to be fired and enables him to keep check of the number of rockets fired and those remaining on the launchers. The reset knob, turned counter clockwise, permits the intervalometer to be re-indexed so that any rocket number can be selected for firing. Number 1 on the indicator is a safety position, therefore, rocket firing starts with Number 2 position.

ROCKET SELECTOR SWITCH.

The rocket selector switch is energized by the primary bus and has three positions: OFF, SINGLE and AUTO. When the switch is placed in the SINGLE position, the electrical circuit to the rocket shown by number on the indicator will be energized when the bomb release switch is pressed. When the switch is placed in the AUTO position, the firing circuits to each of the rockets is completed in automatic sequence by the intervalometer when the bomb release switch is pressed and held.

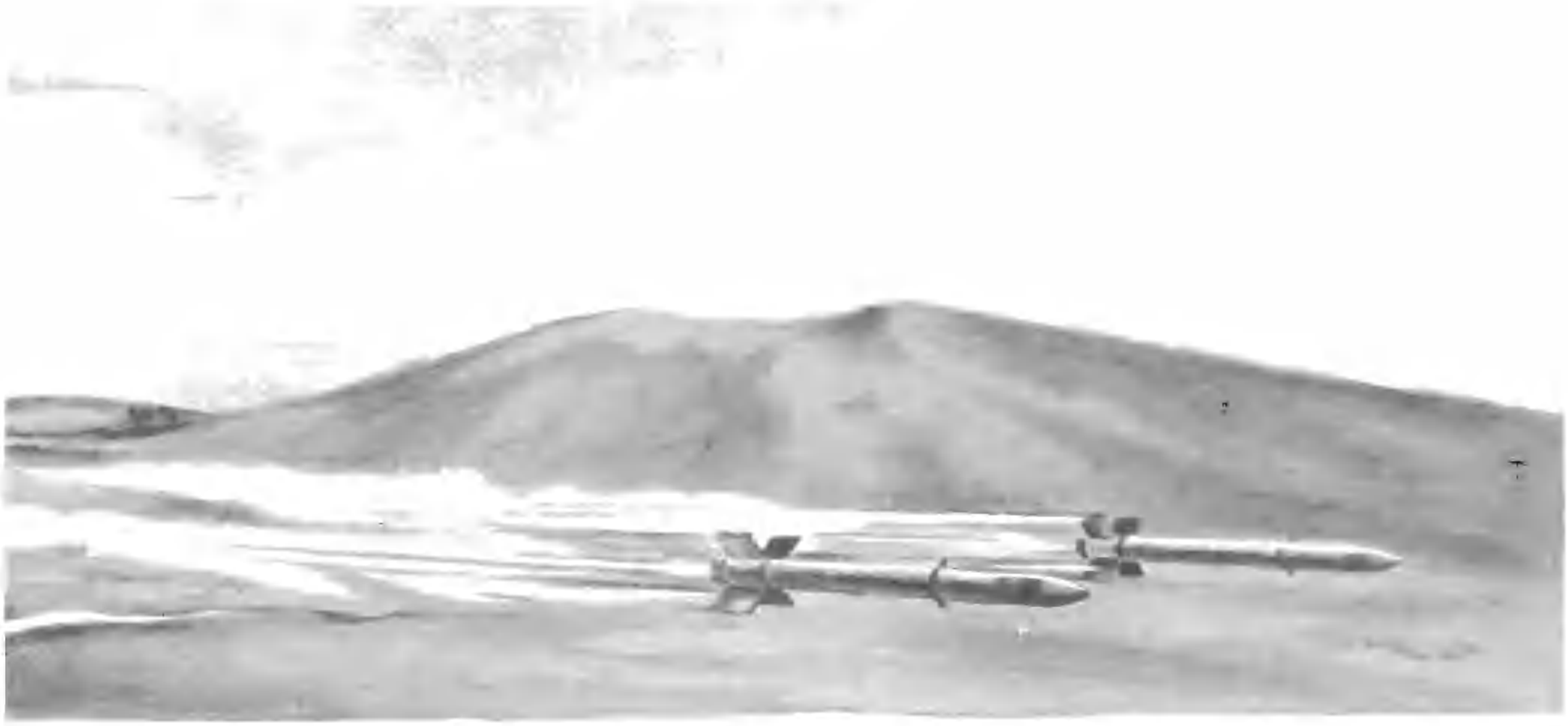
ROCKET ARMING SWITCH.

The rocket arming switch is energized by the primary bus and has three positions: FUSE DELAY, OFF and INSTANT. When the switch is in the INSTANT position the arming wire is retained by the armng solenoid when the rocket is fired.

EXTERNAL STORES JETTISON SWITCH.

The external stores jettison switch (2, figure 1–13) is a push button type switch and when depressed jettisons all external stores including pylons if the battery bus is energized. The rockets will jettison only if the airplane is airborne.

Figure 4–38. Rocket Equipment (Sheet 1 of 2)



ROCKET FIRING (MANUAL).

1. Set rocket selector switch as desired.
2. Set rocket arming switch as desired.
3. Set rocket indicator as desired.
4. Press bomb release switch on control stick.

CAUTION

The lower rocket must always be fired first. When a misfire occurs in the air during "single" round firing the pilot shall check his intervalometer to ascertain which round has misfired, remembering that the number shown on the intervalometer is the rocket number to to be fired. Reference to rocket firing sequence will identify the rocket as an upper or lower rocket. If the rocket is a lower rocket, the rocket firing sequence will reveal from which rocket it is suspended. The upper rocket should not be fired. The intervalometer should be positioned upon the next position when the number of the upper rocket of the misfired pair appears on the intervalometer, thereby bypassing a double rocket release. (During automatic firing, the pilot has little control over the rockets as they fire at 0.1 second intervals while firing button is held down. If a misfire should occur during automatic firing, experience indicates that if the upper rocket is fired with the lower rocket still attached thereto, and provided the fins are secured per instruction, only slight damage will occur to the aircraft consisting of two superficial scratches on the under surface of the wing and scorched paint. The trajectory of the rocket under double release is immediate nose-over).

ROCKET FIRE OPERATION.

1. Set B-T-W control to ROCKET-GUN.
2. Set rocket dive angle control to type rocket being fired and the expected dive condition; set pointer to S for steep dives of more than 40° or N for dives less than 40°.

Note

If the stick trigger is depressed with the dive angle control in the ROCKET position the sight will automatically return to the GUN position.

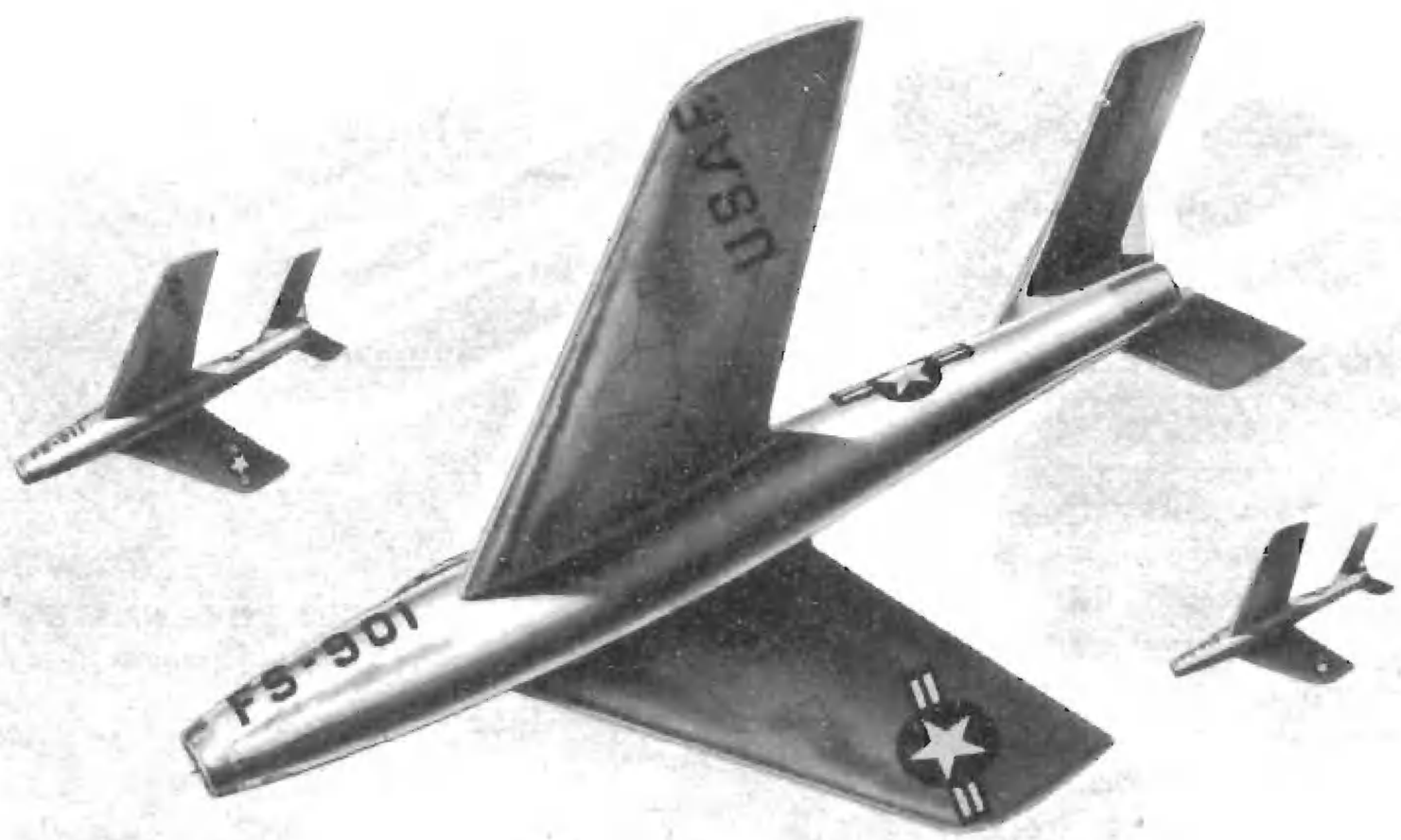
3. Set mechanical cage lever on sight head to UNCAGE.
4. Set reticle dimmer control for desired brilliance.
5. Depress the electrical caging button.
6. Fly on the desired approach to the target, until the reticle image lies on the target, then track smoothly.

Figure 4–38. Rocket Equipment (Sheet 2 of 2)

MISCELLANEOUS EQUIPMENT.

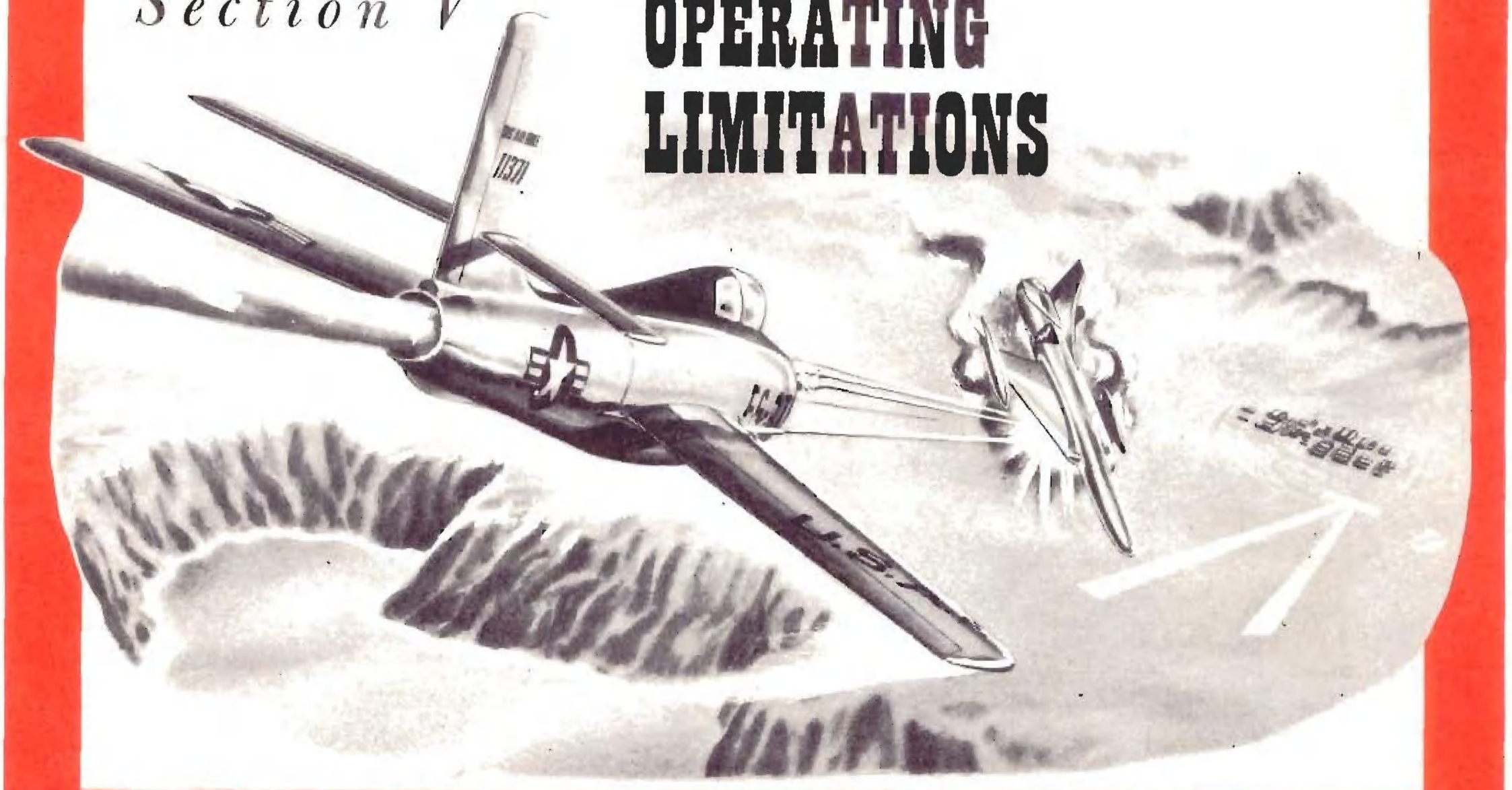
ANTI-G SUIT PROVISIONS.

An air pressure outlet connection on the front of the pilot's seat (8, figure 1–19) provides for the attachment of the air pressure intake tube of the pilot's anti-G suit. Air pressure for inflation of the anti-G suit bladder is conducted from the engine compressor through a pressure regulating valve located on the left console (37, figure 1–14) which starts functioning when a force of 1.75 g's is applied to the aircraft. A control marked HI and LO allows for adjustment of the rate of inflation of the anti-G suit. In the LO range the valve opens at 1.75 g and then allows 1 psi of air pressure to pass to the suit for every increase of 1 g force thereafter. In the HI range the valve still opens at 1.75 g but delivers 1.5 psi per g force thereafter. The suit will inflate in 0.2 to 2.0 seconds depending on the input pressure.



Section V

OPERATING LIMITATIONS



INTRODUCTION.

This section includes the engine and aircraft limitations that must be observed for safe and efficient operation. Instrument markings form a part of these limitations; however, these limitations are not repeated in the text and must be referred to on the instrument marking page. For complete restrictions carefully read the instrument marking page and the explanatory text.

OVER SPEED LIMITS.

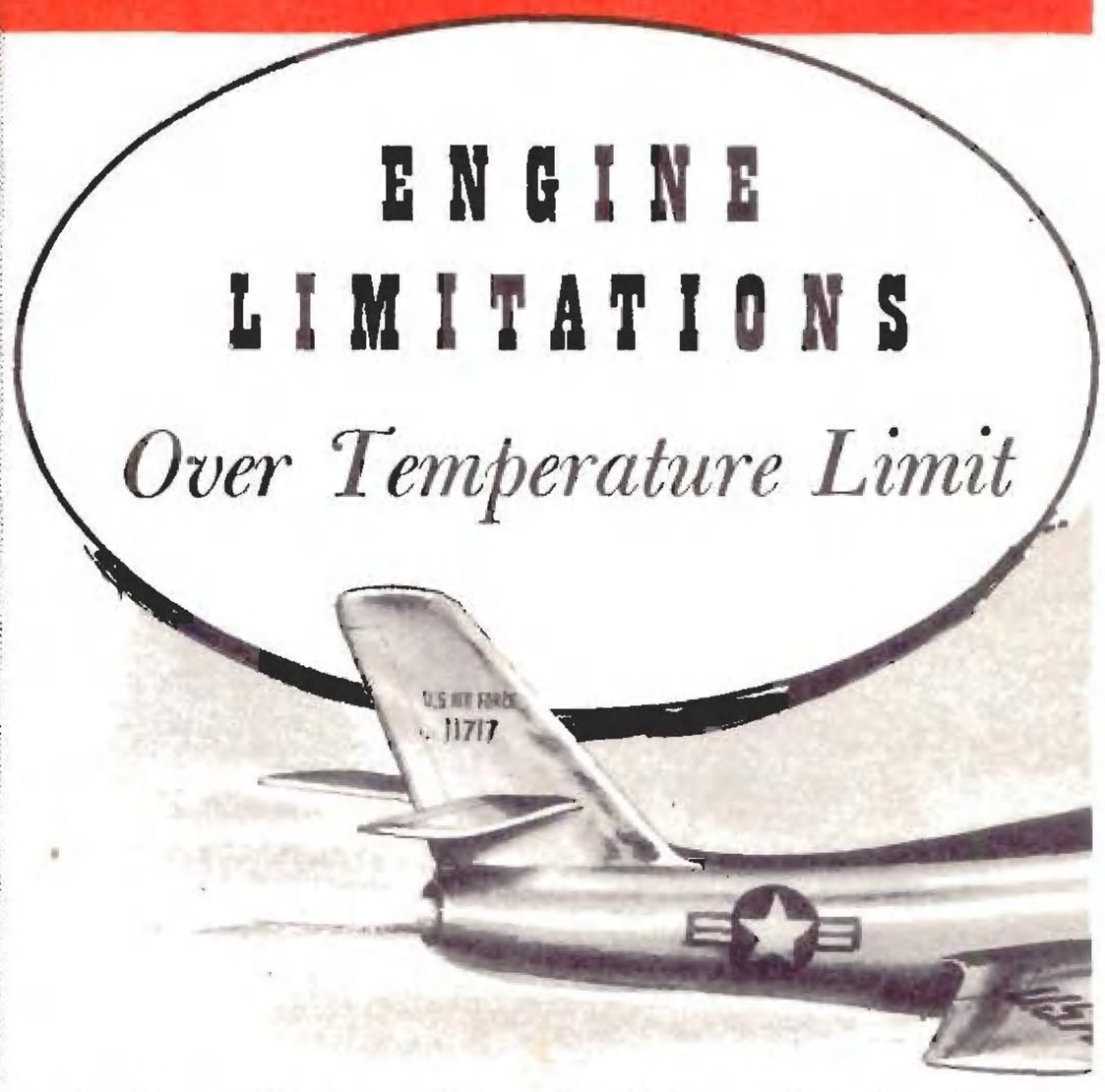
A hot section inspection in accordance with applicable T.O. must be performed if overspeeding of 105.5 to 108 percent rpm is encountered during flight or ground operation. The engine must be removed from service if overspeeding in excess of 108 percent rpm is encountered.

ENGINE ACCELERATION.

Avoid burst accelerations which can cause engine compressor stalls.

ENGINE LIMITATIONS

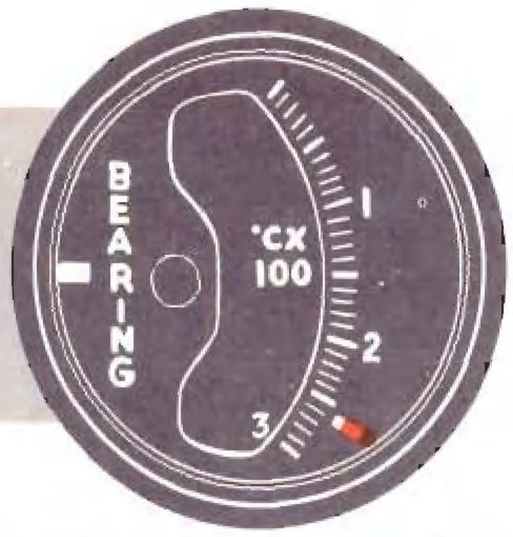
Over Temperature Limit



An inspection must be made of the combustion chamber and turbine after five starts during which the exhaust gas temperature is between 800 and 900°C or after one start during which the exhaust gas temperature reaches 900°C or higher.

Figure 5—1. Engine Limitations

INSTRUMENT MARKINGS



BEARING TEMPERATURE

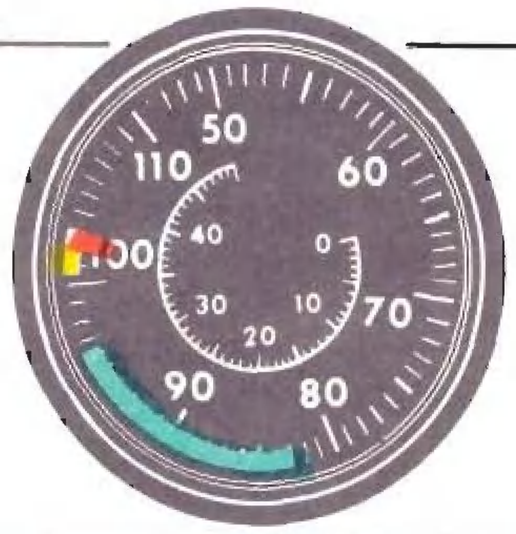
■ 260°C Maximum

AIRSPEED INDICATOR

■ 220 knots — Landing gear down. (Landing flaps down 225 knots)

MACH METER

■ 1.175 Maximum airspeed.



TACHOMETER

■ 83 to 96.5% Best cruise rpm
■ 102.5% rpm Maximum (30 min)
■ 100.7 to 102.5% rpm Maximum for ground setting only.

NOTE: Maximum rpm for ground operation is 100.7% rpm.

HYDRAULIC PRESSURE

■ 1350 — 1500 psi Normal
■ 1750 psi Maximum

EXHAUST TEMPERATURE

■ 200°C Minimum for flight
■ 200—595°C Continuous operation (YJ65-W-1A engine)
■ 200—600°C Continuous operation (YJ65-W-1 engine)
■ 630°C Maximum for flight (YJ65-W-1A engine)
■ 650°C Maximum for flight (YJ65-W-1 engine)
■ 775°C Maximum during starting and acceleration

ACCELEROMETER

■ +7.5G Maximum clean airplane under Mach No. .90
■ +5.9G Maximum clean airplane over Mach No. .90 or airplane with external stores at any Mach No.
■ —2.0G Maximum until flight test

HORIZONTAL STABILIZER

1 to 4° Landing and take-nose up off range.

OIL PRESSURE

■ 15 psi Minimum during idle
■ 20 — 35 psi Continuous operation
■ 40 psi Maximum

Figure 5—2. Instrument Markings

AIRSPEED LIMITATIONS

1. Do not lower the landing flaps at speeds above 225 knots IAS.
2. Do not lower landing gear above 220 knots IAS.
3. Do not extend landing lights above 225 knots.
4. Jettison ato units between 200 and 250 knots IAS to prevent damage to the rear hooks and fuselage.
5. PYLON TANK JETTISONING
   The following speeds are recommended for jettisoning EMPTY external fuel tanks:

Inb'd Pylon	450 gal C1 II	182-313 Kn IAS
	225 gal C1 II	217-400 Kn IAS
Outb'd Pylon	225 gal C1 II	217-304 Kn IAS

The above speeds were established as safe ranges in which empty external fuel tanks can be dropped without danger of the tanks striking the underside of the wing. If the tanks are dropped at lower speed the tanks assume a nose up attitude and strike the underside of the wing. If the tanks are jettisoned at a higher speed they assume a nose down attitude and strike the trailing edge of the wing. However, if fuel remains in the tanks the safe range extends in proportion to the amount of fuel remaining in the tanks. Therefore in the event it becomes necessary to jettison the external tanks immediately after take-off and the tanks are almost full the recommended safe speed can be disregarded and the tanks dropped safely.

WARNING: The speed brakes must be in the closed position when the inboard pylon tanks are jettisoned as the tanks will strike the speed brakes if they are extended.

Prohibited Maneuvers

1. Inverted flying or any other maneuver resulting in negative acceleration for longer than one minute may result in engine flame-out as the fuel and oil supply is sufficient for one minute of operation in this attitude.

2. Do not attempt spins until flight tests have been completed.

3. Avoid landing the airplane with fuel in the external tanks or with bombs installed. Landing with fuel in the external tanks or with bombs installed requires that a good landing technique be employed to prevent wrinkling or buckling the wings during such landings.

4. Do not fly in a zero g flight configuration for any extended period of time as hydraulic pressure may be lost due to hydraulic pump cavitation. If loss of pressure occurs, considerable time may elapse before hydraulic pressure is regained.

Acceleration Limitations

The airplane is placarded for the following acceleration limitations until static tests have been completed.

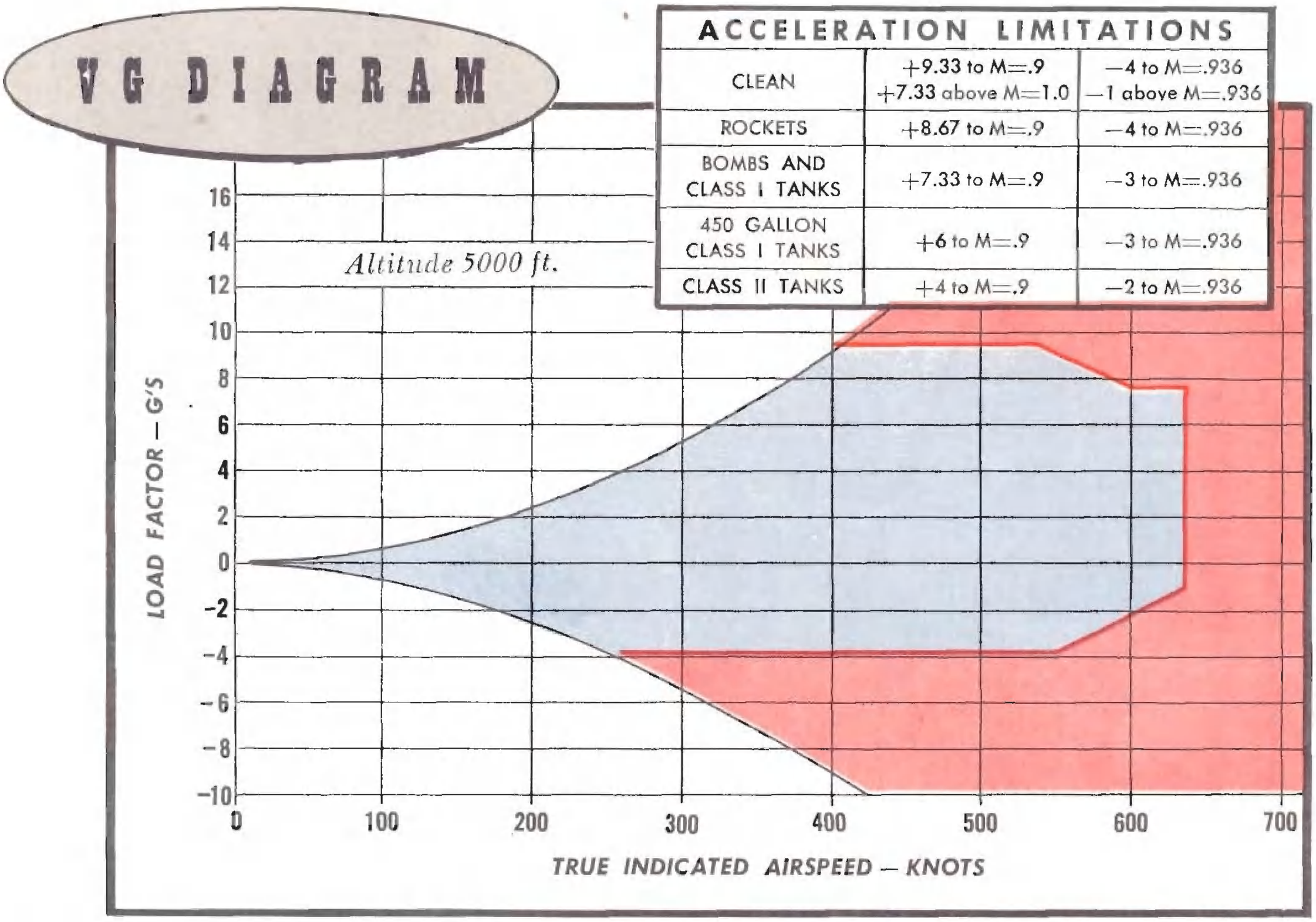
CLEAN AIRPLANE – MACH NO. UNDER .90 + 7.5g –3.2g
CLEAN AIRPLANE – MACH NO. OVER .90 + 5.9g –2.4g
AIRPLANE WITH COMBAT EXTERNAL STORES + 5.9g –2.4g

The airplane is designed for the following load factors; however, these load factors should not be used until flight tests have been completed.

Load Factors

		pos G	*neg G*
1	Limit Maneuver Load Factor (clean – 18,500 lbs)	**9.33**	**-4.0**
2	Full internal fuel and ammunition plus external stores except 1000 and 2000 lb bombs and external fuel tanks.	**8.67**	**-4.0**
3	Full internal fuel and ammunition and external stores, 450 gal. pylon tanks with not more than 200 gals per tank or Class 1, 230 gal. pylon tanks.	**7.33**	**-3.0**
4	Full internal fuel and ammunition and external stores, full 450 gal. pylon tanks.	**6.00**	**-3.0**
5	Full internal fuel and ammunition and external stores, full 450 gal. pylon tanks and Class II, 230 gal. pylon tanks.	**4.00**	**-2.0**

Figure 5–3. Airspeed Limitations



This is a velociy and g load diagram for the F-84F airplane. It shows what speeds and g's are possible and allowable for the airplane. The upper and lower curved lines represent the maximum load that the airplane can sustain before the wing stalls. At 130 knots IAS the upper curved line shows that the load can be lg. This corresponds to the stalling speed of the airplane with flaps and gear up. At this speed the load cannot be greater than lg because the wing cannot lift any more than the weight of the airplane at this airspeed. At 300 knots IAS it is possible for the airplane to develop a load of 5.2g. When the load on the airplane at 300 knots has been increased to 5.2g the airplane has reached the point where the wings cannot lift any more, and the airplane will stall if the pilot tries to increase the load. Further study of this diagram will show that the pilot cannot exceed the load of 9.33g unless the airplane is indicating speed which is greater than 400 knots. Above this indicated airspeed of 400 knots, it is up to the pilot to be careful to make sure that a load greater than 9.33g is not obtained up to speeds of 537 knots or 7.33g above 600 knots. It is the high indicated airspeeds which pack the terrific wallop and the high indicated airspeeds are only possible at low altitudes. The blue area represents the area of g loads and airspeeds which may be used by the pilot without damage to the airplane. It should be possible for the airplane to perform all the maneuvers and tactics which are required, within the blue area.

Figure 5–4. Operating Flight Strength Diagram

WEIGHT LIMITATIONS.

MAXIMUM GROSS WEIGHT.

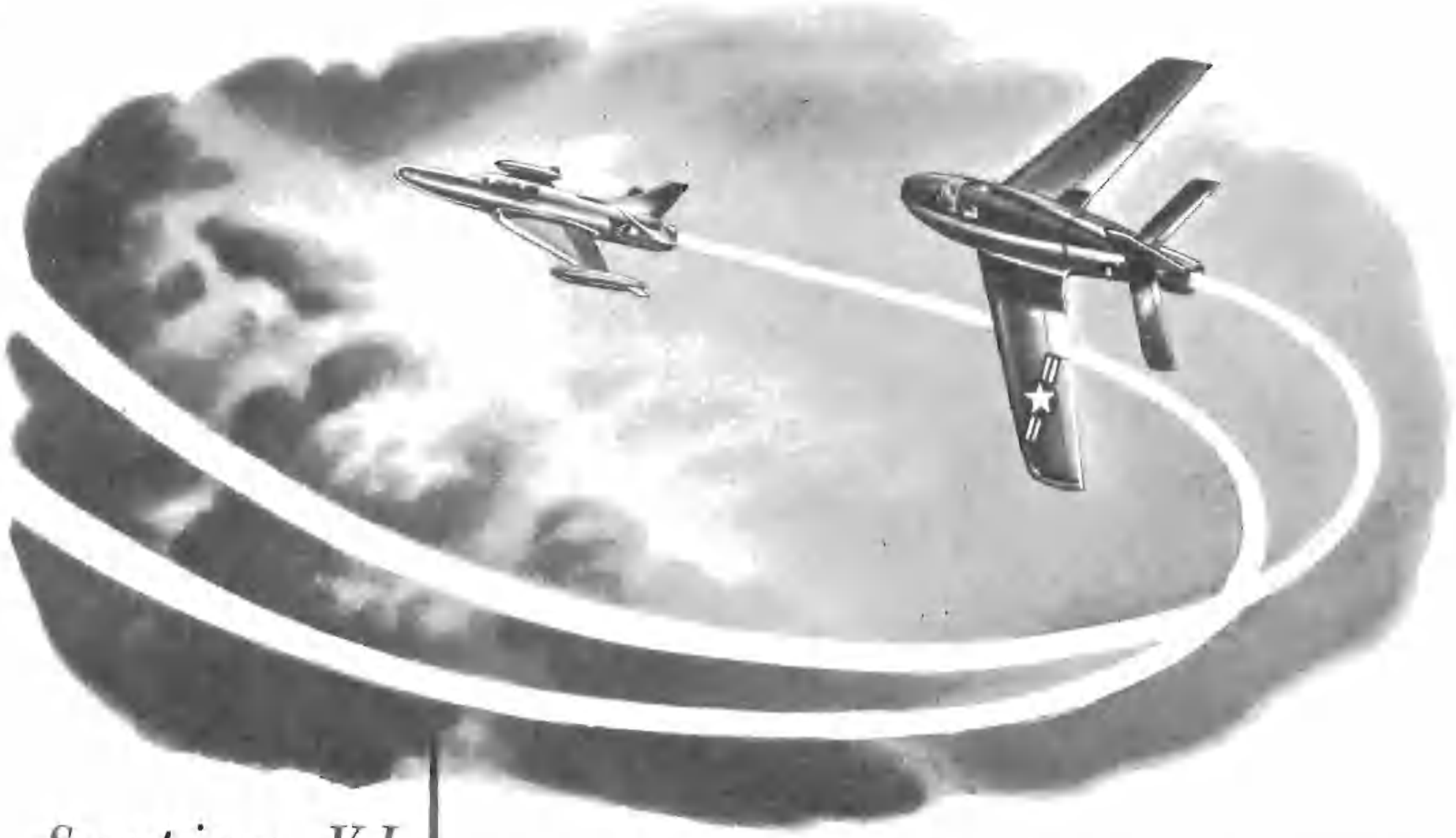
The maximum gross weight permissible is 27,000 pounds. Refer to Handbook of Weight and Balance AN01-1B-40 for loading procedures.

BALLAST.

It is not necessary to carry ballast in the fuselage ammunition cans if ammunition is not carried for the nose guns.

NOSE WHEEL STRUT EXTENSION.

The nose wheel strut should have the correct extension as noted in (2 figure 2–1). A bottomed or low strut will increase the nose wheel "unsticking speed" to above the take-off speed. Consequently this will increase the take-off speed and ground roll.



Section VI

FLIGHT CHARACTERISTICS

GENERAL FLIGHT CHARACTERISTICS.
The airplane is designed for high speed at all altitudes. Flight characteristics are excellent throughout the speed range. The swept wing and tail surfaces reduce the effects of compressibility, therefore the high speed is limited only by the available thrust and the total drag of the airplane. All flight controls are hydraulically operated to provide comfortable control forces and ease of maneuvering. Minor longitudinal trim changes occurring in level flight at high Mach numbers, are easily trimmed out with the adjustable stabilizer which is controlled by the trim button on the stick. This, in combination with trimming of the aileron and rudder artificial "feel" systems permits complete trim throughout the speed range.

STALLS – UNACCELERATED.
The airplane stalls straight ahead in either the clean or landing configuration. Lateral control is adequate during the stall and recovery, and any roll off tendency is easily controllable. Light buffeting occurs well in advance of the stall and an unmistakeable transition to heavier buffeting occurs just prior to the stall giving adequate stall warning. A control softening or slight nosing up tendency occurs at speeds slightly above stall speed. This is easily controlled with the elevator. Since the airplane does not "fall through" at the stall, but maintains a nose high attitude, practice stalls may be misleading. The airplane appears to be flying at speeds well below those shown in figure 6–1 but under these conditions the sinking speeds are quite high, making these lower speeds unusable for landing. It is very difficult to establish a clear cut stall speed with a swept wing airplane of this type and with increased experience it will be come apparent to the pilot that the practical stall speeds are governed by the sinking speed of the airplane.

LOW SPEED – ACCELERATED STALLS.
As the stall is approached in accelerated turns the control force softens just about coincident with the onset of mild buffeting. A t somewhat higher "g", buffeting becomes severe, indicating that stall is imminent and a final moderate pitchup occurs at the stall.

HIGH SPEED – ACCELERATED STALLS.
At Mach Numbers above 0.85 the characteristics are similar except that pulling up through this heavy buffet region (stall warning) may result in a severe pitchup which will increase "g" and at altitudes below 25,000 ft. this could cause structural failure. To avoid experiencing this pitchup, observe the accelerated stall warnings consisting of a slight nose up tendency followed by an increase in buffet severity. If the pitchup is experienced, be prepared to supplement full forward stick with nose down trim. This phenomenon, associated with swept wing characteristics is described in more detail in the section on maneuvering characteristics.

F-84F STALLING SPEEDS *at sea level — knots*

TAKE-OFF	FLAP DEFLECTION DEGREES	GROSS WEIGHT — LBS.		
		MAXIMUM 27,000 Lbs	DESIGN 18,500 Lbs	MINIMUM 15,136 Lbs
	20°	154	128	116
Clean	0°	162	135	122
Landing 0° Bank	40°	148	123	111
30° Bank	40°	159*	132	119
45° Bank	40°	176*	146	132
60° Bank	40°	209*	174*	157

*Insufficient power for level flight. *All red figures have not been flight checked.*

Figure 6—1. F-84F Stalling Speeds

SPINS.

Intentional spins are prohibited until flight tests have been conducted. Based on the results of spin tunnel tests the airplane exhibits satisfactory spin characteristics. Configurations tested included the complete range of C.G's both with and without external tanks. In all cases of both upright and inverted spins for the clean, take-off, and landing conditions recovery was accomplished in less than three turns with normal corrective action. Deflecting the speed brakes does not prevent recovery from a spin.

SPIN RECOVERY.

To recover from a spin use standard spin recovery procedure as follows:

a. Apply full opposite rudder with elevator and ailerons approximately neutral.

b. If recovery is not readily attained deflect ailerons with the spin.

FLIGHT CONTROLS.

The elevator ailerons and rudder are equipped with irreversible hydraulic actuators. In the event of a hydraulic failure, forces on all systems will be heavy due to friction forces in addition to the air loads. At moderate speeds, however, the airplane is controllable with hydraulic power off and landings can be made safely. The rudder is a useful control for picking up a wing if the hydraulic power off aileron forces are excessive. In the event of an engine failure, the control system actuators should be turned off. In this condition the hydraulic system does not maintain sufficient flow to maintain boost at all times and the boost may kick in or out unexpectedly. Various cams are being tried in the artificial feel units, therefore the stick forces diagram will be supplied when available.

Trimming with the horizontal stabilizer differs from normal trimming (trim tab) in that additional "g's" can be obtained, even at full elevator deflection, through use of the trim button. Since the "g" obtainable with the elevator alone is limited by the elevator travel at high Mach numbers and high indicated speeds, the maneuverability of the airplane can be increased in an emergency by sensible use of the trim button. However, if this use of the trim button is required, the pilot should be careful to maintain a substantial pull force on the stick so that the airplane will tend to recover if the stick is released. The pilot should *never* attempt to trim out all of the stick force in a maneuver because this would result in a forward stick position, leaving little or no down elevator for rapid recovery or to fly the airplane in the event of a stabilizer failure.

WARNING

Lateral control is inadequate under "Boost OFF" high speed, low altitude conditions, and under turbulent landing conditions.

SPEED BRAKES.

Retractable speed brakes are provided on each side of the aft fuselage. These are effective and provide good deceleration from any speed with only minor trim changes. Buffeting due to the extension of these brakes is slight and not limiting to the utility of the airplane. Preliminary tests have indicated that extension of the brakes at supersonic speeds causes a nose down (tuck

under) tendency. Since this aggravates dive recovery, caution should be exercised in their use during supersonic dives.

MANEUVERING FLIGHT.

With the increased usable speed range of this airplane, you will be operating during a major part of the flight time in the high speed region where the wing is capable of developing load factors which can cause structural damage.

The "g's" which the wing is capable of developing at various obtainable speeds are shown for altitudes up to 40,000 ft. in Figure 6–2. The maximum speeds shown are those to which the airplane is designed for 9.33g. Note that the obtainable g increases with indicated airspeed. Therefore since the higher indicated airspeeds are obtained at the lower altitudes, it is there that structural overloading is most likely. It is apparent from Figure 6–2 that the limit load factor can be exceeded at altitudes below 30,000 ft.

Due to the large range of speeds and altitudes within which the structure can be overloaded if the airplane is misused, considerable emphasis will be placed on those characteristics which might cause accidental overloading.

CONTROL EFFECTIVENESS.

Control effectiveness decreases noticably on high speed airplanes beyond approximately 0.9 Mach Number. This decrease in effectiveness is primarily a Mach Number effect, but it is aggravated by the effects of structural deflection due to the airloads at high indicated airspeeds. High Mach Numbers at sea level therefore are generally the worst conditions for low control effectiveness. This decrease in control effectiveness occurs on all of the movable control surfaces, elevator, ailerons and rudder. Most important, and most noticeable to you will be the elevator effectiveness. You will notice a signifi cant increase in the stick movement required to pull "g" as the reduction in effectiveness comes in at high Mach Numbers. At high Mach Numbers therefore the obtainable "g" is limited by full elevator travel as shown in Figure 6–3. Remember that this effect is aggravated at the high indicated airspeeds obtainable at low altitudes so high speed dives requiring moderate to high "g" for recovery must be avoided at low altitudes.

In an emergency, more "g" can be obtained by sensible use of the stabilizer trim. However, considerable caution should be used to prevent overloading the airplane in the event of a change in trim or sudden return of control effectiveness as the speed decreases in the maneuver. When use of the stabilizer is necessary, near full elevator travel should be used before adding stabilizer to ensure full surface travel for recovery in the event that excessive "g's" is obtained.

HIGH MACH NUMBER STALL PITCHUP.

The section on high speed accelerated stalls explained that a severe pitchup could be encountered if the stall warning was neglected at high Mach Number. This

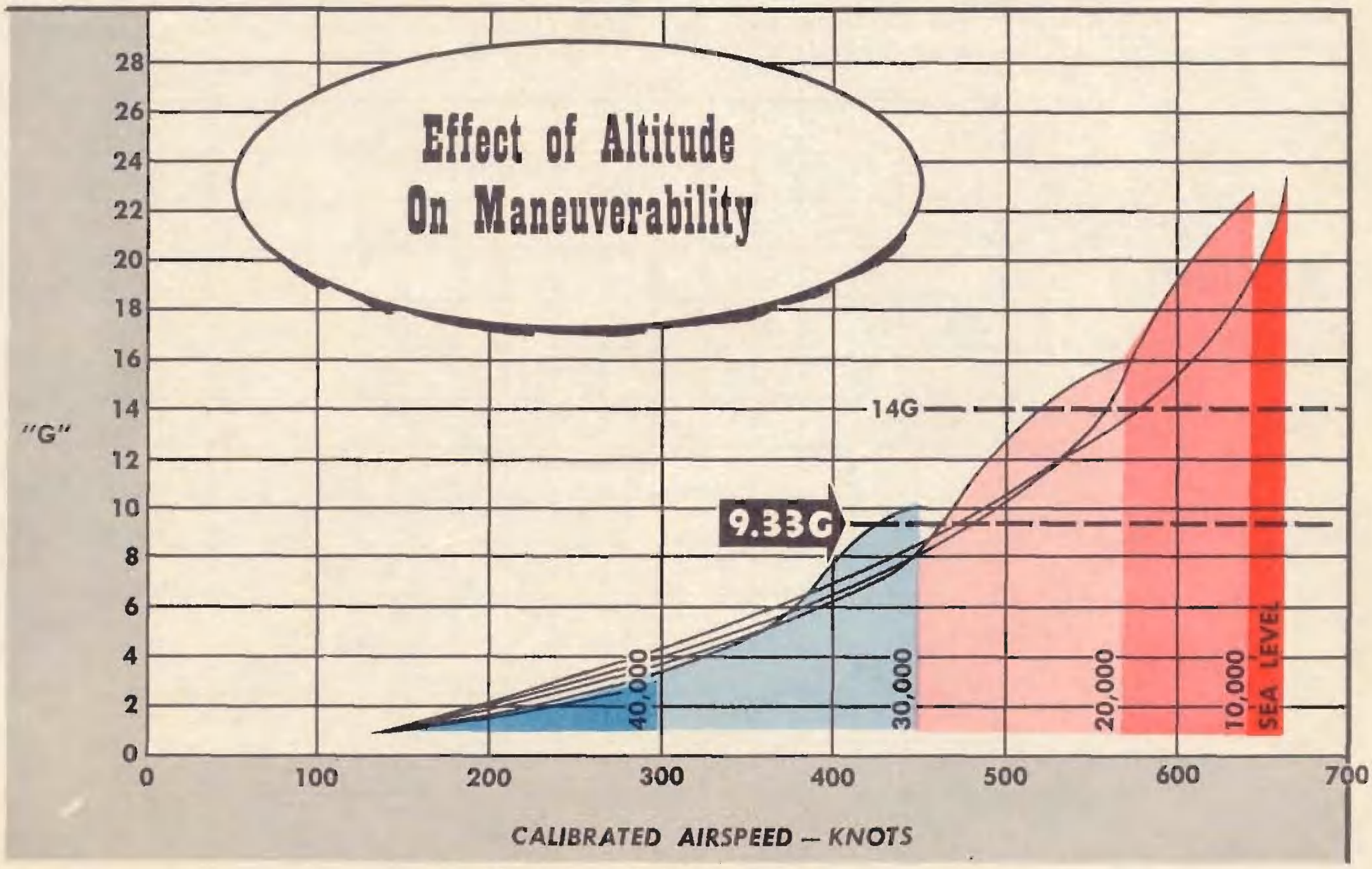


Figure 6–2. Effect of Altitude on Maneuverability

pitchup, which is associated with an inboard shift in the lift distribution at near maximum lift on sweptwing airplanes, can be encountered just prior to a complete stall at Mach Numbers beyond .85. It will increase the "g" loads on the airplane and at altitudes below about 25,000 ft. could result in structural failure. The abrupt pitchup is preceded by severe stall warning buffet, which combined with a moderate control force softening provides adequate warning. Since this phenomenon occurs near the maximum lift capabilities of the wing, it is apparent that the "g" at which it is experienced increases with indicated airspeed. For example at low altitude where the indicated speed corresponding to, for example, .93 Mach Number is very high, the "g" required to develop this high (near stall) lift, is very high and far beyond the limit "g" which you are permitted to pull. The possibility therefore of encountering this pitchup at low altitude is practically non existent. At high altitude on the other hand, the indicated speed corresponding to this Mach Number is low. Just as an accelerated stall occurs at low "g" when the airspeed is low, this pitchup, (which occurs at high lift just prior to the stall) is experienced at fairly low "g" at high altitude. You would be most likely to experience it therefore when making very tight turns at high Mach Number at high altitude. Under these conditions, the airplane will stall before excessive "g's" are experienced, but the rapid nose up movement could result in loss of control. The severity is aggravated by reduced elevator effectiveness at high Mach Number.

At medium altitudes, 20,000 to 25,000 ft. the maximum hazard due to this pitchup exists because there you may encounter it at just about the limit load factor of the wing and the uncontrollable "g" in the pitchup may result in structural damage. To avoid experiencing this phenomenon, observe the accelerated stall warnings consisting of a light nose up tendency followed by an increase in buffet severity. If the pitchup is experienced be prepared to supplement full forward stick with nose down trim.

BUFFET BOUNDARY.

Due to the large amount of wing sweepback and the thin air-foil section used, the buffet boundary, is postponed to relatively high "g's" particularly at the higher Mach Numbers as shown in Figure 6–3. A very mild buffet is experienced when the g is increased to the initial onset of buffet and this remains mild with further increase in g until an abrupt increase in the buffet intensity occurs at a higher "g". This abrupt increase in buffet intensity occurs at a higher "g". This abrupt increase in buffet intensity is unmistakable and constitutes the practical buffet limit in maneuvers. It is the latter increase in intensity which constitutes the accelerated stall warning, and this should normally be considered a stopping point to prevent the high Mach Number stall pitchup previously described. The mild buffeting at somewhat lower "g's" is not considered limiting to maneuvers.

LEVEL FLIGHT.

LOW SPEED.

The stalling characteristics and handling qualities are good. In common with swept wing airplanes of this type, angles of attack at minimum flying speeds are somewhat higher than with a straight wing. The stabilizing tendency for the leading wing to rise, when the

Maneuvering Characteristics

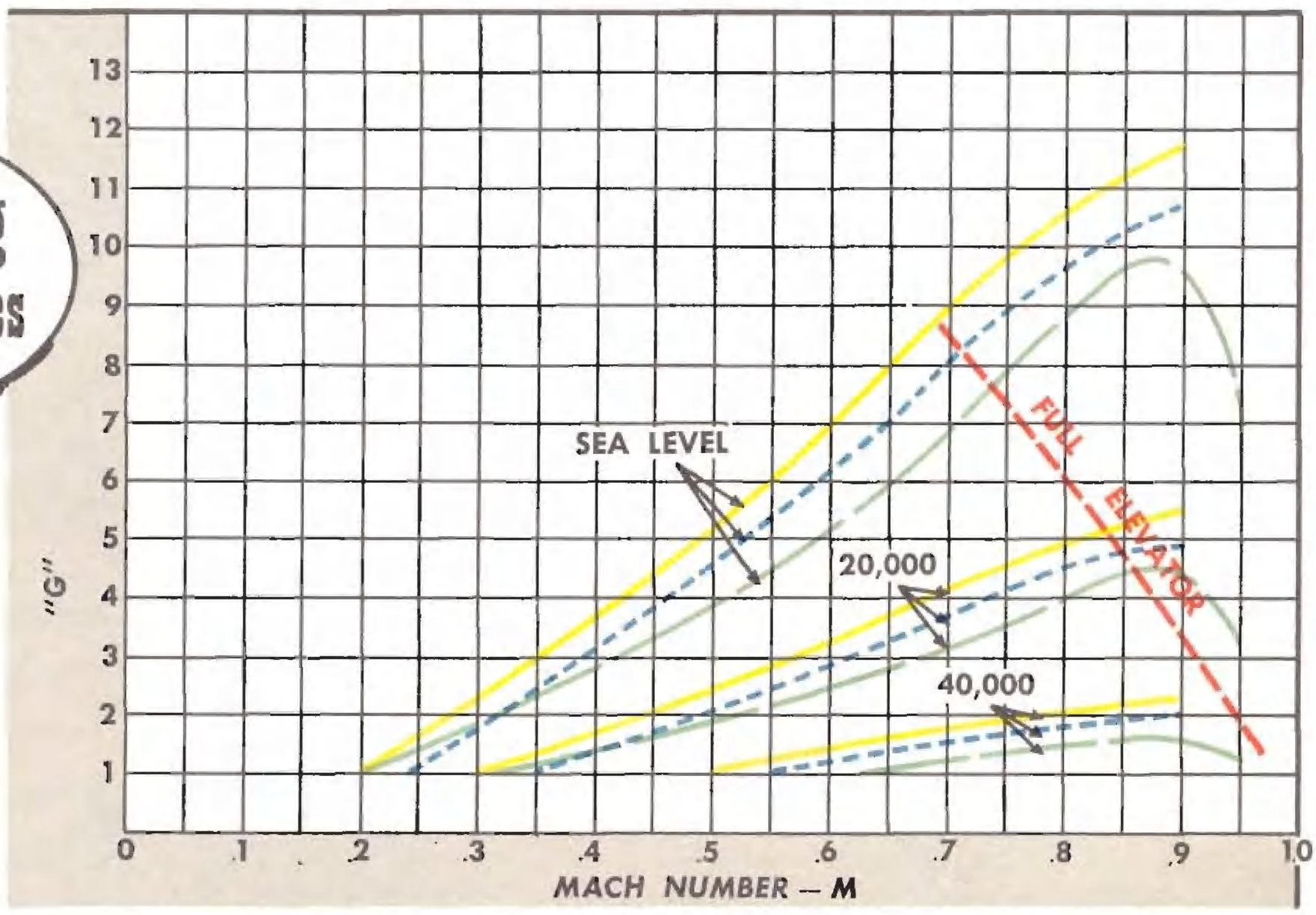


Figure 6–3. Maneuvering Characteristics

airplane is yawed with the rudder, is more noticeable with swept wings than with a straight wing. This is known as "dihedral effect" and the wings are drooped (negative dihedral) to reduce this effect. This dihedral effect produces considerable rolling tendency when the airplane is yawed, particularly at low speed, and can be used vary effectively to assist lateral control. However, this effect can also oppose the ailerons and may require abnormal aileron deflections at approach speed if the airplane is yawed excessively.

Good control effectiveness about all control axes is provided down through the stall. Due to the relatively high wing loading, rates of descent are proportionately high near the stall and approach speeds must be governed accordingly.

Extension or retraction of the landing flaps and gear causes only a slight trim change.

CRUISE AND HIGH SPEED.

The airplane trims well throughout the entire speed range. Acceleration is excellent and very high level flight speeds are obtainable. Stability is good about all axes. At Mach Number between approximately .85 and 0.95 a slight nose down tendency is present. This trim change is scarcely noticeable to the pilot due to its mild nature and due to the elevator boost which minimizes the pilot effort.

In unaccelerated flight the airplane does not encounter any buffet throughout the speed range.

FLIGHT CHARACTERISTICS WITH EXTERNAL STORES.

A great many combinations of external tanks, bombs, rockets, etc. have been flown in preliminary evaluations on prototypes of this airplane. The results of these tests which were extended to very high Mach Numbers have indicated excellent flight characteristics. A more detailed description of these characteristics will be added in this section when flight tests of finalized configurations have been completed.

DIVES.

Due to the low aerodynamic drag of this airplane the acceleration in a dive is very rapid, permitting high dive speeds. The design limit dive speeds are shown in figure 6–4. Within these limits the airplane is structurally capable of withstanding maneuvers which develop design load factors. However, due to the rapid acceleration, dives at high Mach Numbers close to the ground, must be avoided because of the large altitude loss during recovery as shown in figure 6–5. This is seriously aggravated by the previously mentioned reduction in elevator effectiveness at high Mach Numbers which limits the obtainable "g." As noted before, the adjustable stabilizer can be used to obtain additional "g's" in an emergency.

The high Mach Number dive characteristics are excellent. No buffet is experienced and the airplane picks up speed rapidly. The transition from subsonic to supersonic velocity is sometimes accompanied by a very slight, momentary, wing dropping tendency, and a momentary directional displacement. Both are easily controlled by the pilot. Supersonic characteristics are excellent but low control effectiveness, common to high Mach Number airplanes should be anticipated.

WARNING

The maximum available load factor for full back stick at low altitudes and high Mach Nos is as follows:

at Mach No. .80 5.0g
at Mach No. .90 3.4g
at Mach No. 1.00 2.0g

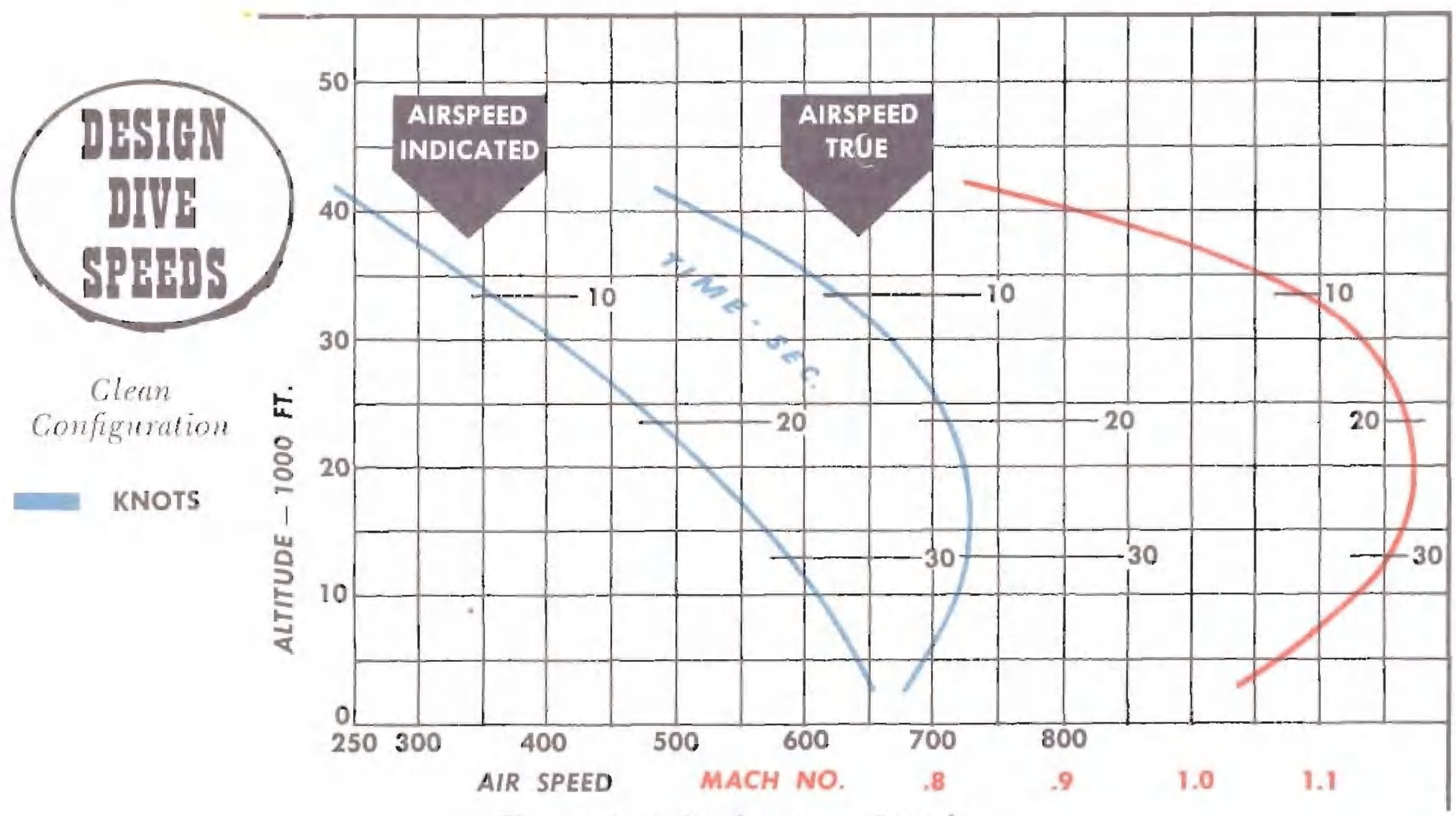
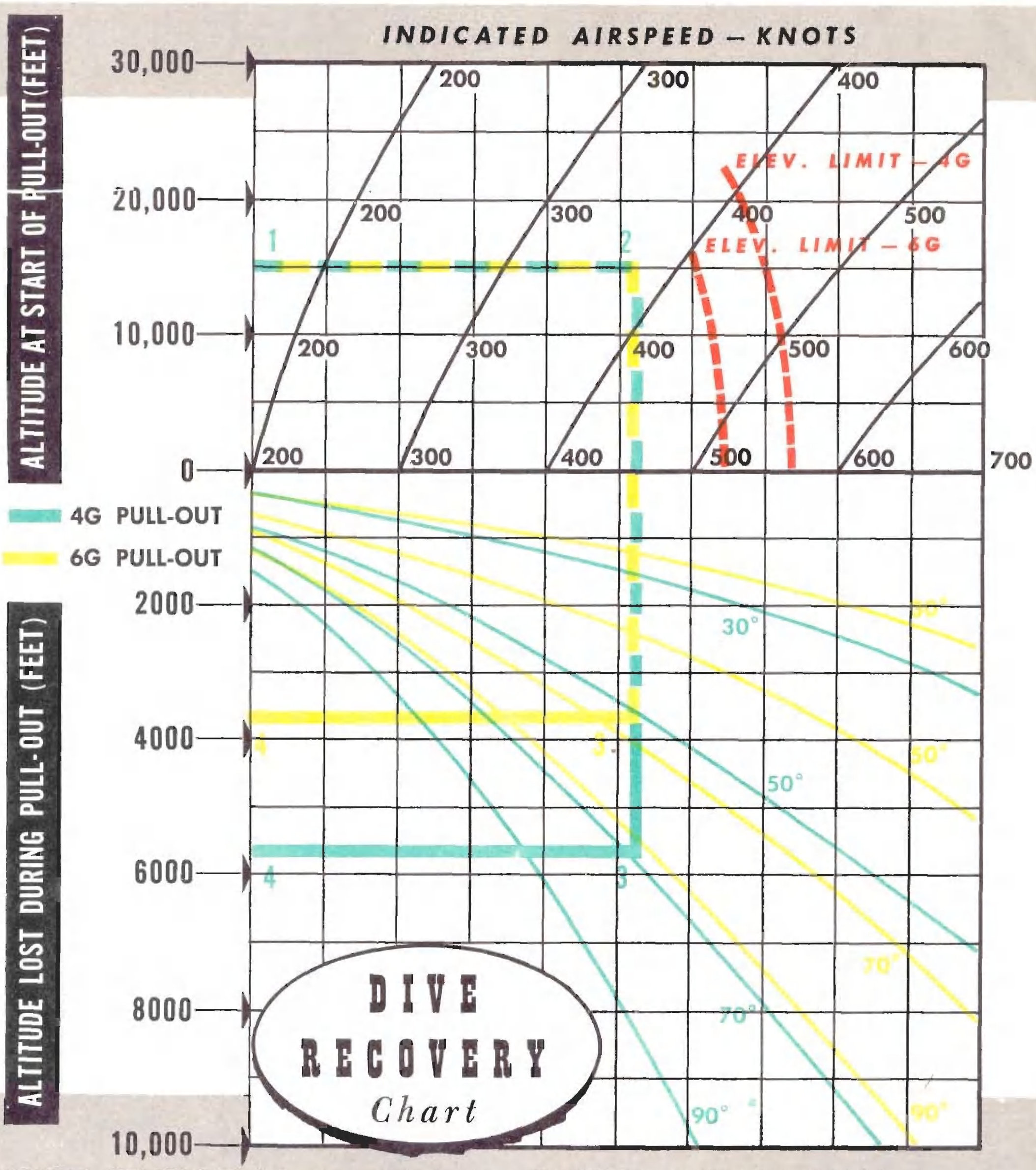


Figure 6–4. Design Dive Speeds



HOW TO USE CHARTS: Select appropriate chart, depending upon acceleration (4g or 6g) to be held in pull-out; then –

1. Enter chart at altitude line nearest actual altitude at start of pull-out. (For example 20,000 ft.)
2. On scale along altitude line, select point nearest the IAS at which pull-out is started (350 knots IAS.)
3. Sight vertically down to point on curve of dive angle (70°) directly below airspeed.
4. Sight back horizontally to scale at left to read altitude lost during pull-out (constant 4g pull-out 5700 ft.; constant 6g pull-out 3800 ft.).

WARNING

Boundaries of load factors attainable with maximum elevator deflection are shown to indicate the maximum speeds at which 4g & 6g pull-up can be executed. Pull-outs at speeds beyond the boundary lines result in altitude losses greater than shown for a given condition of speed, angle of dive and load factor. Caution should be exercised to make sure sufficient altitude is available to clear local terrain for any maneuver.

Figure 6–5. Dive Recovery Chart

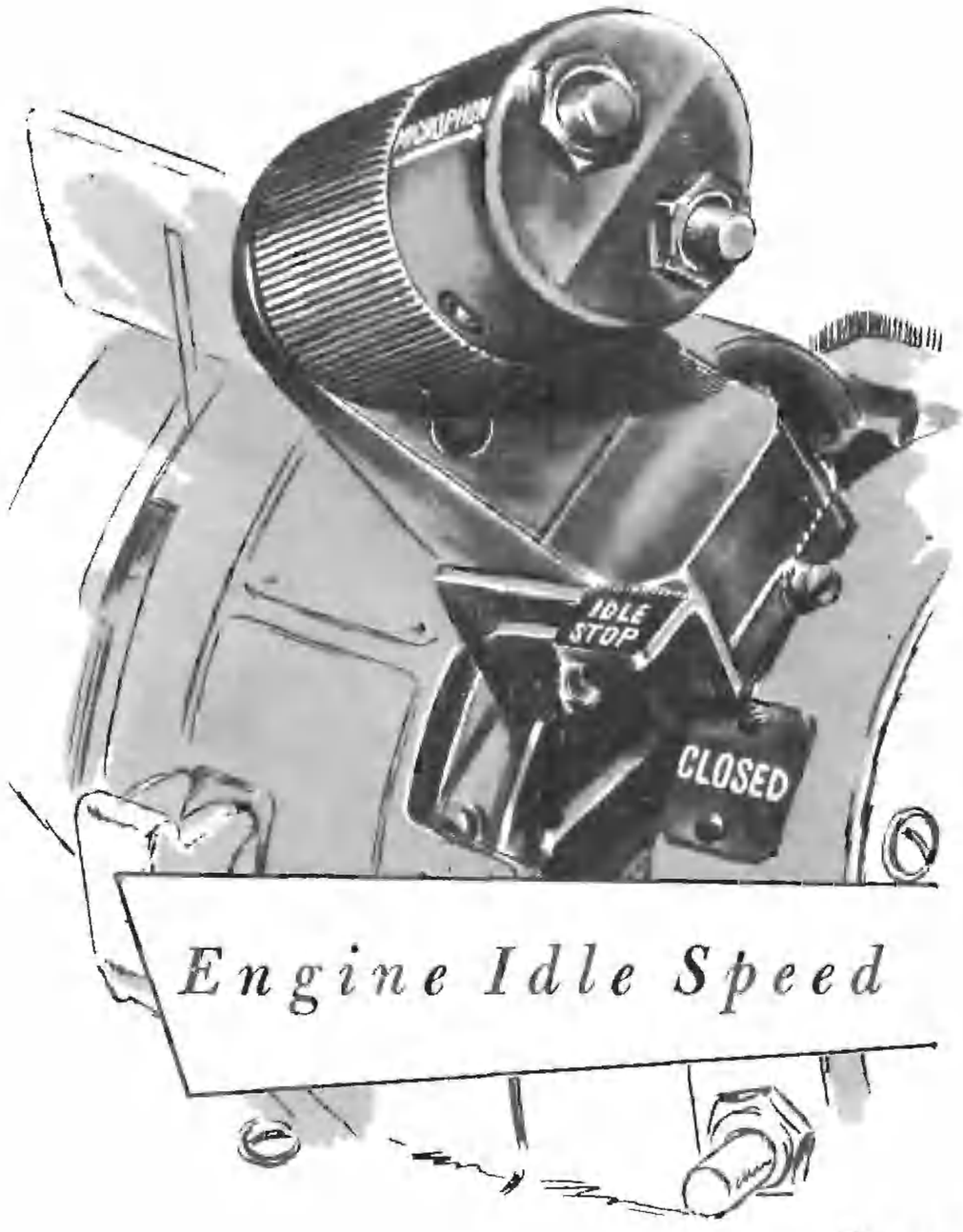
Section VII

SYSTEMS OPERATION

ENGINE

Engine Acceleration and Maximum Speed

The top speed of the engine is controlled by the top speed governor incorporated in the fuel pump. This unit limits the fuel flow through the throttling control when 100% rpm is reached. It is important that an appreciable amount of overtravel exists between the position for 100% rpm and the full throttle position. The presence of overtravel indicates that maximum rpm is controlled by the governor and the amount of overtravel will vary with ambient temperature and barometric pressure. Low temperatures result in decreased overtravel while an increase in altitude will increase the overtravel. This condition is normal for the engine and is caused by the fact that ambient temperature compensation is not provided for in the throttling control unit. The unit is factory adjusted to provide the maximum fuel flow which will be required during operation at a very low temperature. The engine has a decreased fuel flow requirement for operation at 100% rpm at any ambient temperature above that used for factory adjustment of the throttling control unit.



Engine Idle Speed

With the throttle control set at IDLE, the rpm of the engine will increase from 36.2 – 41% at sea level to approximately 70% at 15,000 feet. From 15,000 feet to 55,000 feet the rpm at idle will gradually increase from 70% to approximately 78.4%.

Figure 7–1. Engine

STARTING SYSTEM

The starting system is automatic, therefore, an engine start is accomplished without holding the starter switch once it has been actuated. A holding coil will keep the starter operating until the combination of the battery current drop, together with the decreased current requirements of the starter reach a predetermined value at which time the starter circuit is deenergized if operating from the airplane's batteries. The current requirements of the starter are such that if operated from an external power source, delivering a constant current, the holding coil may not drop out at the required time. Therefore, when the engine is started the starter switch is actuated to stop the starting cycle when a selected rpm or time limit is reached to make sure that the starting system is deenergized.

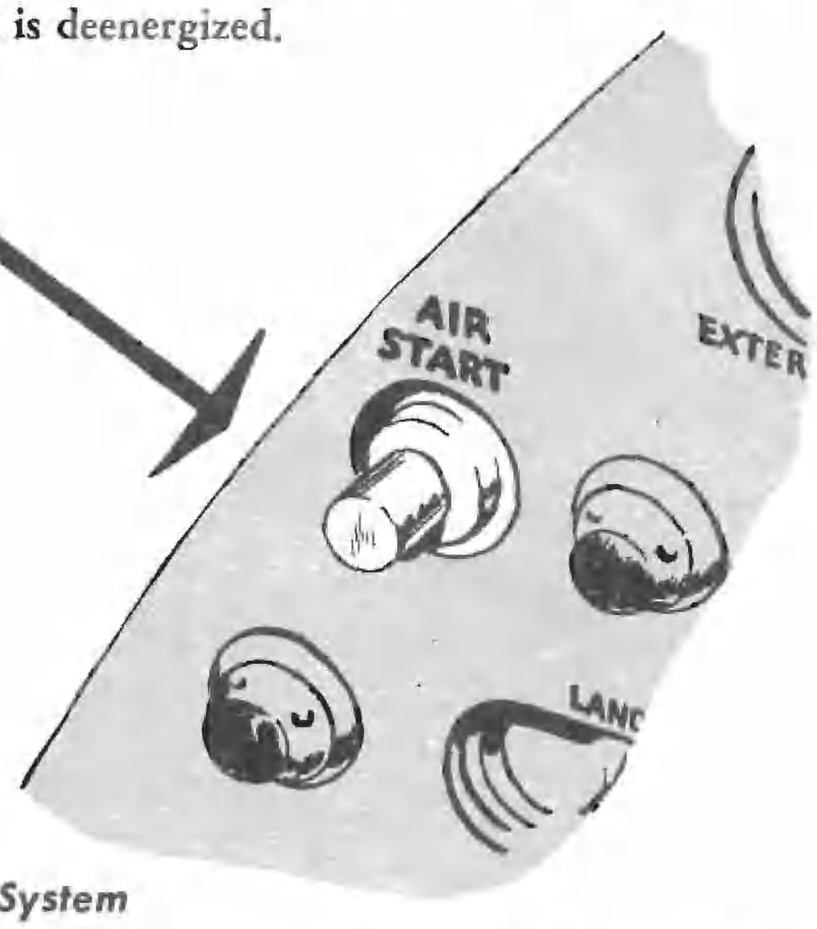


Figure 7—2. Starting System

FUEL SYSTEM MANAGEMENT

During normal operation fuel is transferred first from the outboard pylon then the inboard pylons to all internal tanks so that the pylon tanks may be dropped to reduce drag. Fuel is then transferred simultaneously from the wing and forward tanks to the main tank at varying flows so that the wing tanks will empty while there still remains 0 to approximately 40 gals in the forward tank. The fuel in the main tank is then consumed. Inasmuch as the normal fuel system is fully automatic, with the fuel tank selector in the ALL TANKS position, the pilot does not have to select the various fuel flow patterns except for manual selections of the external tanks air pressure. If it is necessary to operate on either the wing or forward auxiliary fuel flow patterns, the fuel tank selector should not be turned through the OFF position as a flame out may occur due to a lack of fuel supply.

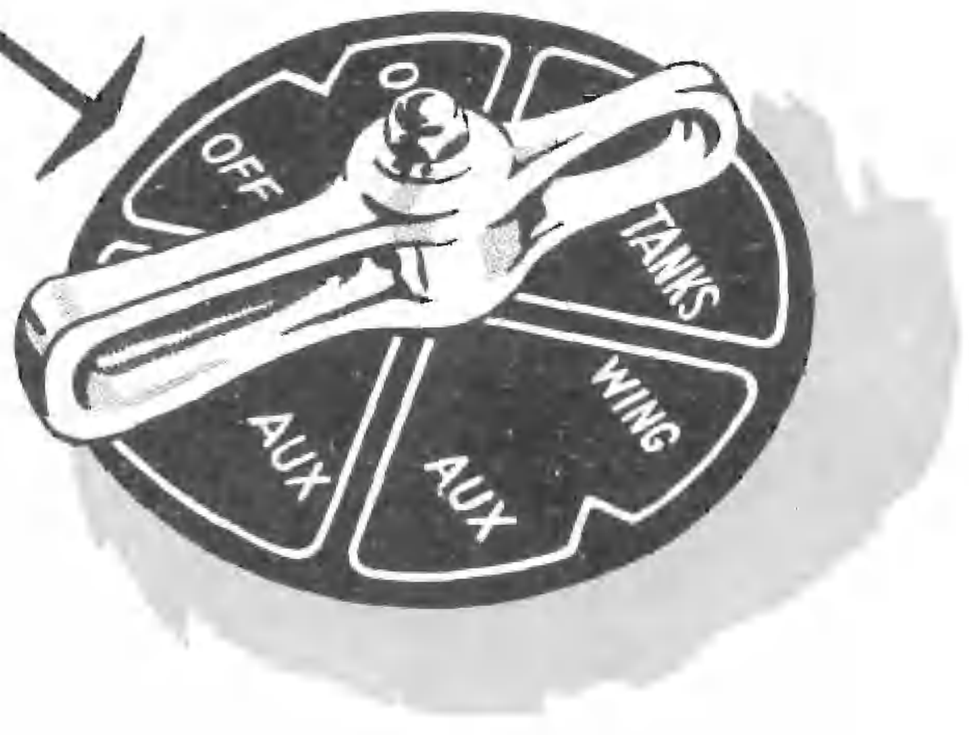


Figure 7—3. Fuel System Management

FUEL SYSTEM MANAGEMENT
Schematic

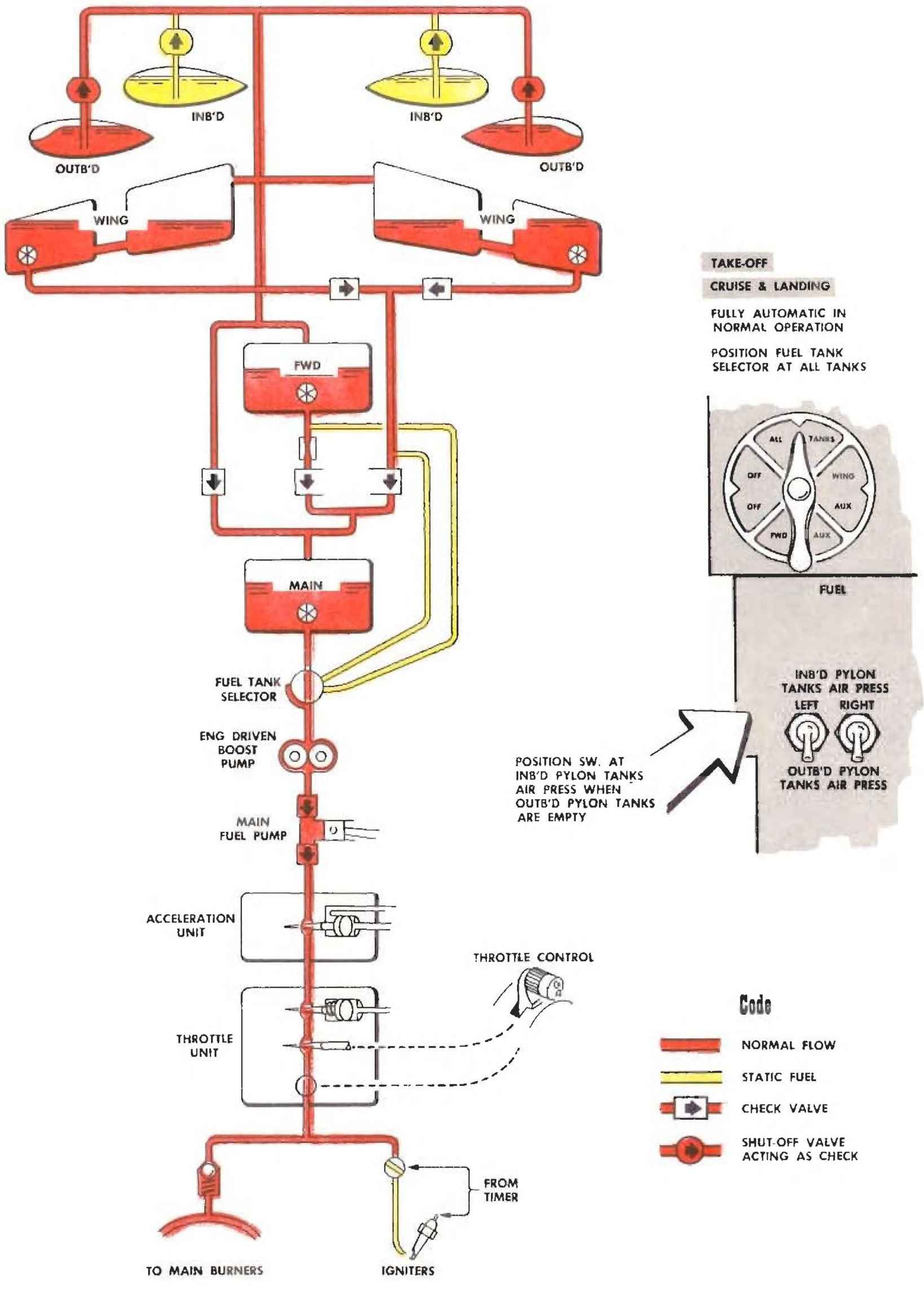


Figure 7–4. Fuel System Management — Schematic

ENGINE COMPRESSOR SURGE.

The following indications may be used to determine whether or not engine compressor surge is encountered during throttle burst accelerations. Any one or combination of these indications may constitute a compressor surge.

1. High exhaust gas temperature; i.e. temperatures above acceleration temperature limits established for the particular engine.

2. Engine rpm "hang-up." The engine acceleration should be continuous and the acceleration time limit should not be exceeded.

3. Loss of compressor discharge pressure (CDP). On engines instrumented to measure CDP a drop-off in the CDP during acceleration will be noted if surge is encountered.

4. Excessive engine vibration, "shuddering" or "banging." A slight instantaneous shudder is acceptable providing none of the above items are exhibited.

5. Loss of thrust.

6. Flame shooting out of the tailpipe.

OPERATION WITH VARIOUS FUELS.

At the present time fuel in accordance with Spec. MIL-F-56264A (grade JP-4) is the only recommended fuel for use in the engine. If it becomes necessary to use gasoline (MIL-F-5572) as an alternate fuel this is considered an emergency procedure and a hot section inspection of the engine must be performed after each time gasoline is used.

ENGINE SCREEN.

The engine screen is retracted when the airplane is in flight so as to prevent the formation of ice on the screen. Air intake icing can occur when no visual evidence of ice can be detected on the aircraft. The effect of engine screen icing, at a fixed throttle setting, causes a reduction of air flow to the combustion chambers with a corresponding loss in thrust. This condition is not accompanied by any discernable change in fuel flow but results in a rapid increase in exhaust gas temperature. The engine screen is extended during ground operation to prevent foreign objects being drawn into the compressor section with resultant damage. The maximum exhaust gas temperature table indicates the maximum and minimum allowable exhaust gas temperature with the engine screens retracted, therefore, the engine screens must be retracted while the airplane is on the ground to make this check. However, be sure the area is clean so the foreign objects will not be drawn into the intake when making this check.

HYDRAULIC POWER SUPPLY SYSTEM.

The hydraulic hand pump is provided for operation checks of the hydraulic systems while the airplane is on the ground with the engine inoperative. In the event of hydraulic failure, operation of the systems that are necessary for emergency flight is accomplished with air pressure.

If the landing gear is extended by the emergency system and then the hydraulic hand pump is operated to extend the speed brakes, hydraulic pressure would have to be built up in the down side of the landing gear actuating cylinders before enough pressure would be available to actuate the speed brakes. The volume of the landing gear actuating cylinders and the capacity of the hydraulic hand pump are such that the time to extend the speed brakes would be excessive.

LANDING GEAR SYSTEM.

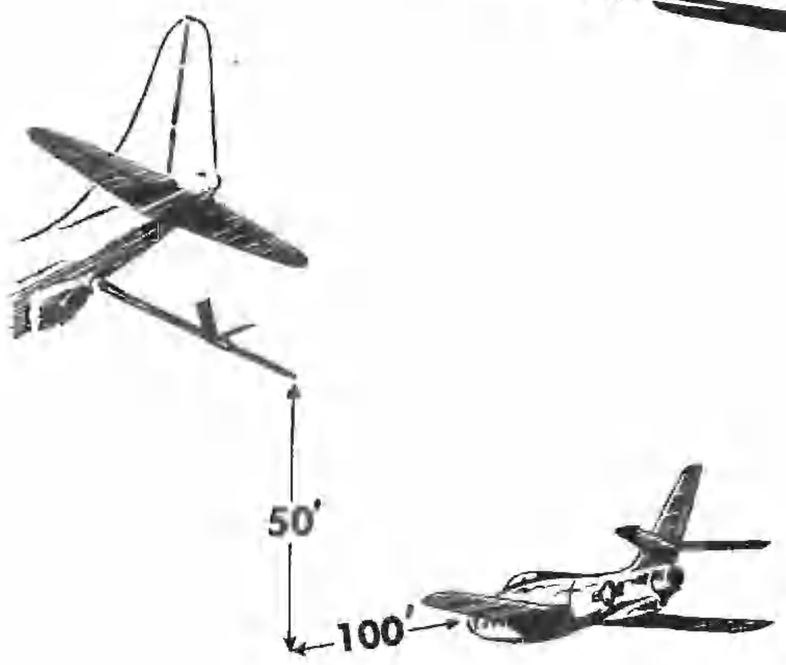
A vibration, felt after take-off when the landing gear is retracted, may be mistaken for engine roughness but could be caused by an unbalanced nose wheel. This vibration would be more noticeable after take-off in the heavier configurations as the take-off speed is higher. Vibration, caused by the nose wheel, will diminish as the wheel coasts to a stop.

FLIGHT REFUELING SYSTEM.

The word "BREAKAWAY" is restricted to use as a code word to denote emergency separation. At any time when in contact made position, any crew member of the tanker or receiver can call the radio signal "BREAKAWAY" when he feels that circumstances are either hazardous to the safety of the aircraft or malfunction of the equipment warrants disconnect. On hearing the word "BREAKAWAY" the receiver pilot will actuate his disconnect switch immediately. The tanker pilot will pull up abruptly 50 or 100 feet and apply power. The receiver pilot will not dive out of the refueling envelope until separation has been made.

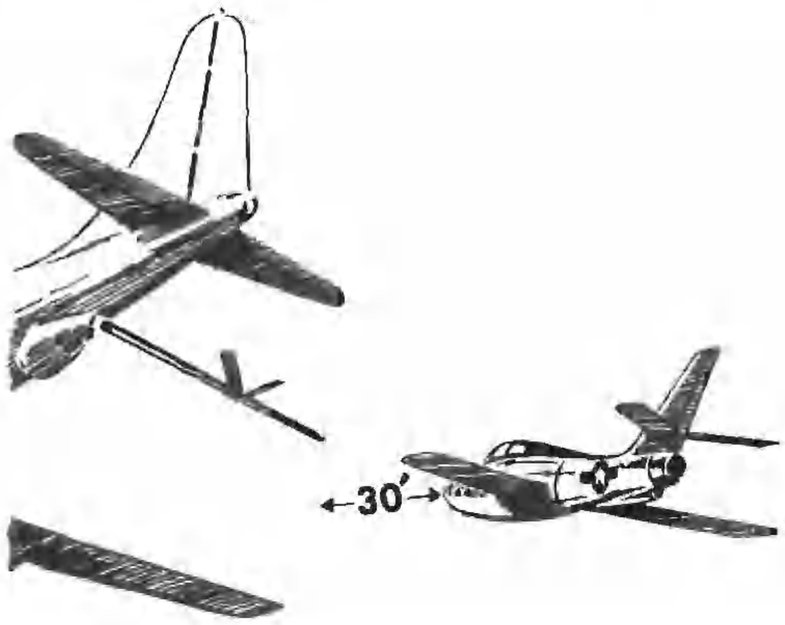
Pilot Technique

FLIGHT REFUELING

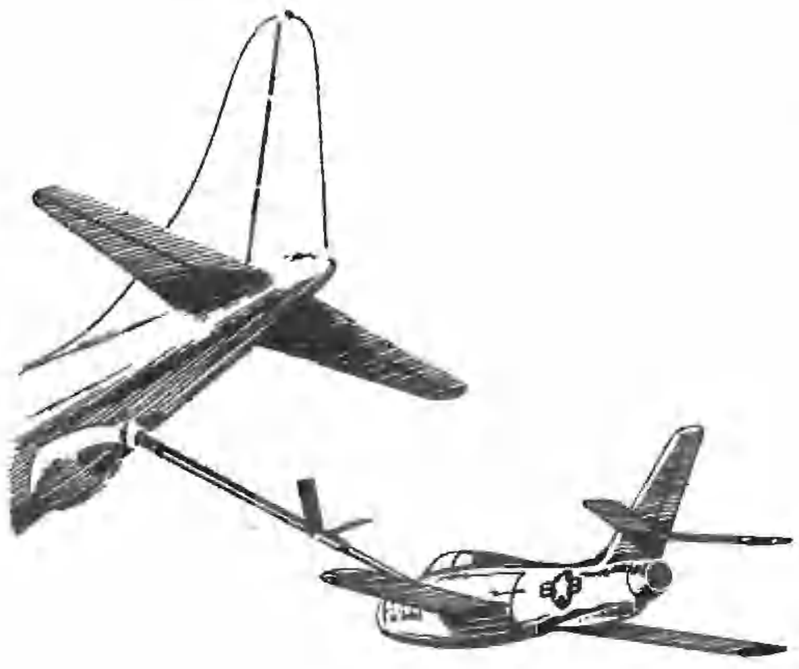


OBSERVATION POSITION

A position 100 feet directly behind and 50 feet below the tanker airplane is known as the observation position. Upon reaching the observation position, the receiver pilot should trim the airplane, stabilize the throttle setting so as to stay in that position and check the throttle friction lock setting. Trim about the pitch axis is not critical as it may require slight retrim as the receiver flies into the tanker downwash.



When going from the observation position to the contact position, the recommended procedure is to move forward and upward simultaneously to a position at the proper elevation but approximately 30 feet aft of the contact position and then move straight forward from that position. It is possible, though somewhat more difficult, to move directly from the observation position to the contact position.



CONTACT POSITION

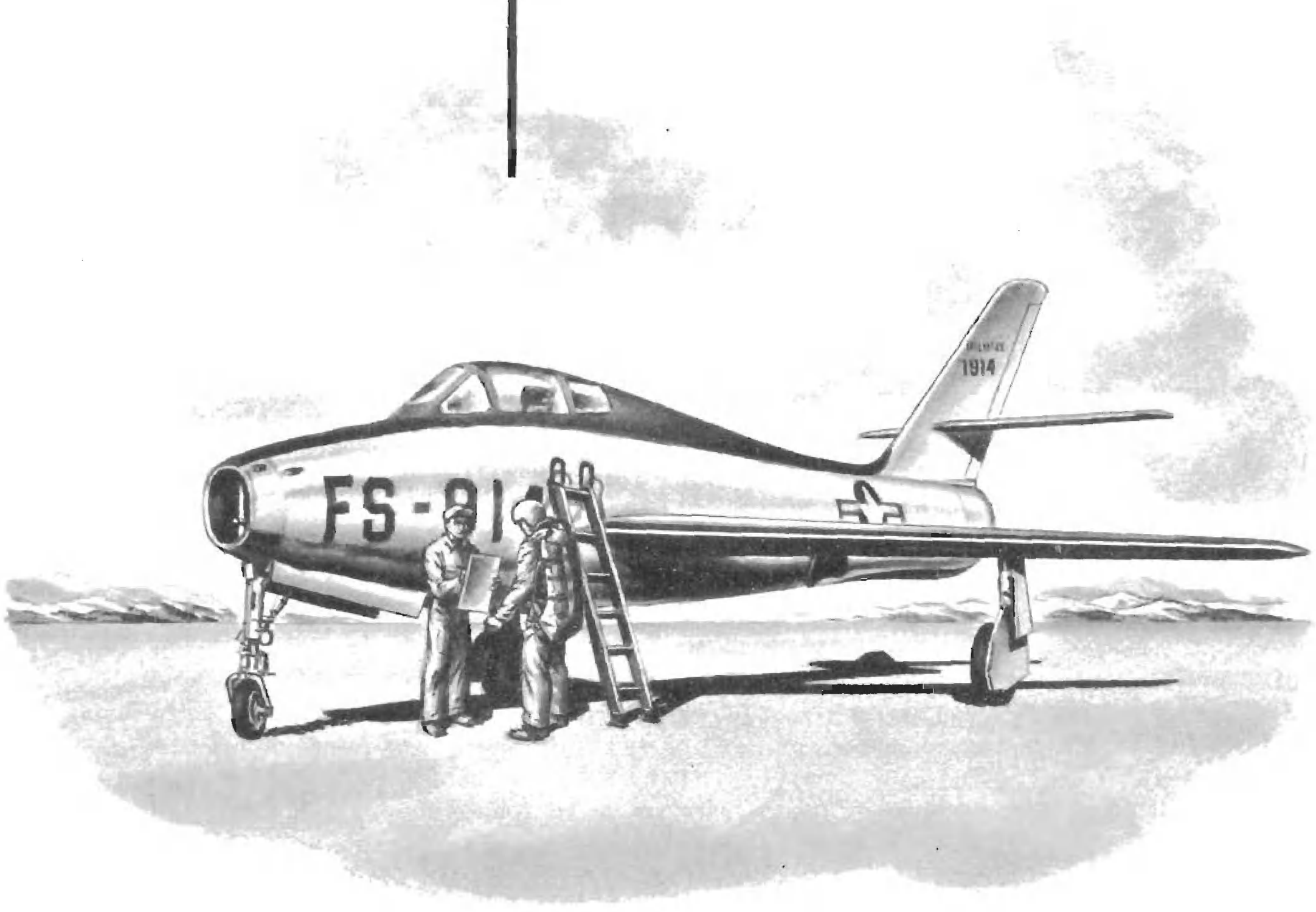
While moving into the contact position the receiver pilot will rely primarily upon his visual observations and verbal instructions from the boom operator. The pilot director lights, located on the bottom of the tanker, are actuated by movements of the boom and therefore provide assistance only when in contact. When contact has been established, the receiver pilot's visual observations are confirmed by the pilot director lights and the boom operator's instructions.

Figure 7–5. Pilot Technique – Flight Refueling

Section VIII

CREW DUTIES

Section VIII "Crew Duties" is not applicable to this airplane.



Section IX ALL WEATHER OPERATION

INTRODUCTION.

This section contains only those procedures that differ or are in addition to the normal operating instructions covered in Section II except where repetition may be necessary for emphasis, clarity or continuity of thought.

NIGHT FLYING.

Cabin vision is good in all directions and lighting equipment is adequate for night flying. The individual instrument lighting and the edge lighting on placards and right console reduces reflections, however, lighting intensity should be kept at a minimum to reduce uncontrolled reflections.

OPERATION UNDER INSTRUMENT FLIGHT CONDITIONS.

The handling characteristics of the airplane when flying on instruments is excellent and stability about all axises is satisfactory. Instrumentation is adequate for blind flying and instrument approaches are accomplished with the aid of radio equipment and GCA (Ground Control Approach). Some phases of instrument flight, such as slow rate of descent, locating radio range stations and unsuccessful approaches when landing will reduce the range of the airplane. Consideration of these factors should be taken into account when planning an instrument flight.

INSTRUMENT TAKE-OFF.

1. Visually line up airplane on runway.
2. Set slaved gyro magnetic compass pointer to the indices at the top of the dial regardless of the indicated heading.
3. Set attitude gyro; adjust reference plane for level flight.
4. Pitot heater and defroster ON if precipitation or icing conditions are anticipated.
5. Horizontal stabilizer: 2 degrees nose up trim.
6. Hold brakes and advance throttle to take-off rpm.
7. Check engine instruments, then release brakes.
8. Use brakes for directional control until rudder becomes effective. Use slaved gyro as the primary instrument for heading until the airplane is airborne.
9. Take-off at normal speeds (Refer to Appendix I).
10. Maintain a constant nose high, wing level, attitude after leaving the ground.
11. Landing gear selector UP when definitely airborne and the rate of climb and altimeter show definite ascent.
12. Landing flap control UP at approximately 190 knots IAS.
13. Climb to a safe altitude and trim for best climbing speed.

INSTRUMENT CLIMB.

Climbing airspeed and attitude are easily maintained and the aircraft handles satisfactorily up to the maximum rate of climb. Climbing turns should be limited to a double needle width or standard rate turn up to 20,000 ft. Above 20,000 feet a simple needle width turn is best, however, the angle of bank should never exceed 30 degrees.

DURING INSTRUMENT CRUISING FLIGHT.

The airplane handles well throughout the speed range. Maneuvers can be accomplished with the aid of the attitude indicator and the slaved gyro magnetic compass. The attitude indicator may show an erroneous attitude of the airplane after completing a maneuver due to lag or sluggishness of the instrument, however, this condi-

tion is normal and the indicator will correct itself once true gravitational forces are sensed. Cross check the slaved gyro and the turn needle for bank control until the attitude indicator precesses back to straight and level. It should be remembered that the attitude indicator cages to the attitude of the airplane and not to the true vertical. Therefore, the instrument should never be caged to correct in-flight errors unless the aircraft is in straight and level flight by visual reference to a true horizon. Although the attitude indicator and the slaved gyro offers the quickest and easiest reference, all of the instruments incorporated in the airplane are important and should be utilized to obtain a more accurate interpretation of what is going on. Instrument installation is such that the more pertinent flight instruments are located centrally, thus reducing the eye-strain over long periods.

SPEED RANGE.

The airplane handles satisfactorily throughout the speed range. The most desirable speed range for individual flights will be governed by the nature of the flight and on local conditions. For the most desirable speed under specific conditions refer to the Flight Operating Charts in the Appendix.

RADIO AND NAVIGATION EQUIPMENT.

The reliability of the radio compass as a navigational aid is considerably reduced at high altitudes by static caused by thunderstorms, thin overcasts, haze, dust etc. The flight should be thoroughly planned and positions checked against radio range signals to eliminate unnecessary concern in event of faulty operation of the radio compass. The reception normally improves at the lower altitudes when the airplane is nearing the station. If reception on the ANT position is too noisy due to crash or atmospheric static, better results may be obtained by operating in LOOP position. The automatic feature or COMP position is very unreliable when thunderstorms are in the area or when flying over coastal areas where shore line effect causes the indicator to give erroneous readings. When receiving on a low frequency the importance of station identification cannot be over emphasized as it is very easy to be tuned into an unwanted station. The desirable station to use for navigation in the order of their reliability are Adcock Range Stations, Loop Range Stations, Homing Station, Clear Channel Commercial Stations and Commercial Stations. The ANT and LOOP positions are more accurate in performing radio navigation.

HOLDING.

When holding, in preparation for a let-down, reduce airspeed and maintain the airplane in a clean configuration to reduce the needed throttle setting and thus conserve fuel.

INSTRUMENT APPROACHES

RADIO RANGE LETDOWN.

In all letdowns, particularly on a radio range, the outstanding factor is the time required for landing after reaching low altitude. Before the descent is started the pilot should make his decision to letdown or to proceed to his alternate field depending on the latest weather and traffic on arrival at his destination. Either a high or slow speed letdown can be used depending on local conditions. The high speed letdown is made with the airplane in the clean configuration, i.e.; landing gear and flaps retracted and speed brakes closed. Start the descent over the radio fix being used for the letdown and continue on a straight course until one half the altitude is lost; turn 180 degrees and continue the descent until the radio fix is again reached. If the letdown is started from a high altitude the airplane will cover considerable distance from the field before the turn is made. This may not be desirable if the terrain is mountainous or thunderstorms are nearby in which case a slow speed descent should be made. The slow speed descent is made with the landing gear, flaps, and speed brakes extended. In this case the rate of descent is slower and the airplane can stay in close to the radio fix being utilized for the letdown. Both of the above techniques should be practiced visually before attempting actual instrument approach conditions.

GROUND CONTROL APPROACH.

In moderate to heavy rain, control of the airplane by GCA is extremely difficult. The aircraft is frequently lost on the operator's scope under these conditions. GCA is a landing approach system which brings the airplane down to an altitude of 200 feet on the final approach. However, the system can be utilized for touch down under emergency conditions. The aircraft heading and altitude are of primary importance during the final approach and must be watched carefully. Once the GCA operator has picked you up follow his instructions.

ICE SNOW AND RAIN

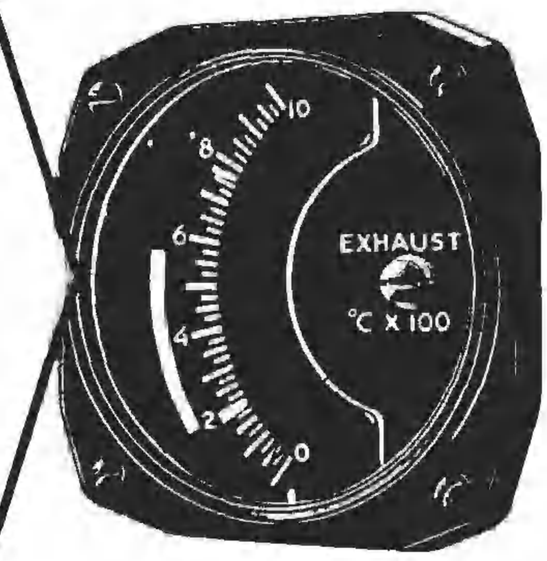
Only forward visibility in heavy precipitation is through curved panels of the windshield. Adequate fuel reserve should be allowed for missed GCA approach due to radar controller's difficulty in maintaining contact with the airplane when precipitation echoes clutter GCA scopes. Icing has marked effect on wings of this aircraft, notably in reduced airspeed and rate of climb. Flight should be planned at ice-free altitudes due to absence of wing and tail de-icing. A fuel filter de-icing system is provided.

ENGINE ICING.

Engine air intake icing may occur if the engine screen is extended even though no other visual evidence of ice can be detected on the aircraft. The effect of icing on jet engines at a fixed throttle setting causes a reduction in airflow to the combustion chambers with a corresponding loss in thrust. This condition is *not* accompanied by any discernable change in fuel flow but results in a rapid increase in exhaust gas temperatures. To prevent icing, the engine screen should be retracted after take-off and flying into known icing conditions should be avoided whenever possible. If icing should occur, immediately retard the throttle to maintain a normal temperature and attempt to leave the icing area.

WARNING

If the throttle is not immediately retarded to maintain normal tail-pipe temperatures, engine failure may result due to overheating of the turbine and exhaust system. This may occur very rapidly. Do not advance the throttle in an effort to maintain thrust as this will aggravate the overheating condition and accelerate engine failure.



This illustration will be supplied when available

Figure 9–1. Turbulent Air Penetration Speeds

FLIGHT *in Turbulence and Thunderstorms*

BEFORE TAKE-OFF

FLIGHT IN TURBULENCE AND THUNDERSTORMS.

Power setting and pitch attitude are the keys to proper flight technique in turbulent air. The power setting and pitch attitude required for desired penetration airspeed should be established before entering the storm. This power setting and pitch attitude if maintained throughout the storm, must result in a constant airspeed, regardless of any false reading of the airspeed indicator.

BEFORE TAKE-OFF.

1. Check Turbulent Air Penetration Speed Chart (Figure 9–1) for best penetration speed.

2. Make a thorough analysis of the general weather situation to determine thunderstorm areas and prepare a flight plan which will require least exposure of the airplane to regions of possible thunderstorms.

3. Be sure to check proper operation of all flight instruments, navigation equipment, pitot heaters, instrument panel lights, and anti-icing equipment before undertaking any instrument flight and also before attempting flight into thunderstorm areas.

CAUTION

Thunderstorm flying demands considerable instrument experience and should be intentionally undertaken only by pilots able to qualify for AF Form 8A (Green) instrument card. However, many routine flight operations require a certain amount of thunderstorm flying, since it is often impossible to detect individual storms and find the in-between clear areas. A pilot, using modern equipment and possessing a combination of proper experience, common sense and instrument flying proficiency, can safely fly thunderstorms.

CAUTION

Figure 9–2. Flight in Turbulence and Thunderstorms (Sheet 1 of 2)

APPROACHING THE STORM

It is imperative that you prepare the airplane prior to entering a zone of turbulent air. If the storm cannot be seen, its proximity can be detected by radio crash static. Prepare the airplane as follows:

1. Adjust throttle control as necessary to obtain safe penetration speed.

2. Trim airplane before entering storm. Speed brake may be opened to reduce speed then return to OFF.

Note

The most comfortable penetration speed is between knots IAS. At higher speeds the turbulence of the storm will cause constant jarring of the airplane.

3. Pitot heater switch ON.

4. Check gyro instruments for proper settings.

5. Lower seat to prevent contact with the canopy in rough air.

6. Safety belt fastened.

7. Turn off any radio equipment rendered useless by static.

8. At night, turn cockpit lights full bright or use dark glasses to minimize effects of lightning.

CAUTION

Do not lower gear and flaps, as they merely decrease the aerodynamic efficiency of the airplane.

IN THE STORM

1. Maintain power setting and pitch attitude (established before entering the storm) throughout the storm. Hold these constant and your airspeed will be constant regardless of the airspeed indicator.

2. Devote all attention to flying the airplane.

3. Expect turbulence, precipitation and lightning. Don't allow these conditions to cause undue concern.

4. Maintain attitude. Concentrate principally on holding a level attitude by reference to the attitude indicator.

5. Maintain original heading. Do not make any turns unless absolutely necessary.

6. Don't chase the airspeed indicator, since doing so will result in extreme airplane attitudes. If a sudden gust should be encountered while airplane is in a nose-high attitude, a stall might easily result. A heavy rain, by partial blocking of the pitot tube pressure head, may decrease the indicated airspeed reading considerably.

7. Use as little elevator control as possible to maintain your attitude in order to minimize the stresses imposed on the airplane.

8. The altimeter may be unreliable in thunderstorms because of differential barometric pressure within the storm. A gain or loss of several thousand feet may be expected. Make allowance for this error in determining minimum safe altitude.

Note

Altitudes between 10,000 and 20,000 feet are usually the most turbulent areas in a thunderstorm. The least turbulent areas will be below 6,000 feet and above 30,000 feet. Therefore, if flying at an altitude near 30,000 feet or if over rugged terrain, altitudes in excess of 30,000 feet are recommended for thunderstorm penetration. However, if flight is at altitudes close to 6,000 feet and over flat terrain, it would be more desirable to let down to 6,000 feet instead of climbing to 30,000 feet.

Figure 9–2. Flight in Turbulence and Thunderstorms (Sheet 2 of 2)

COLD WEATHER PROCEDURES

PRE-FLIGHT.

1. When the ambient temperature is 0°C (32°F) or lower, use a portable heater to blow hot air into the airplane air inlet duct for a period of 10-15 minutes. This procedure is necessary to prevent the starter-generator unit from being damaged due to ice seizure of the compressor rotor.

Note

To heat the cockpit, loosen the canopy cover and open the canopy enough so that the heater hose can be inserted into the cockpit.

2. Inspect fuel tank vents, pitot tubes, fuselage and wing drainage and ventilation holes, and remove ice if present.

3. Clean dirt and ice from shock struts and all exposed actuating cylinder pistons. Check shock struts and tires for proper inflation. Wipe exposed parts of shock struts and pistons with a rag soaked in the same type hydraulic fluid as used in the system.

4. Use external power for operating and ground checking all electrical and radio equipment.

5. Remove wing, empennage and canopy covers, and the dust plugs in the air intake ducts and tail-pipe.

6. Remove snow and ice from surfaces, control hinges, fuel tank caps and vents, and inside and outside of wings and fuselage.

7. Check surface controls.

PRESTARTING.

1. Start engine in normal manner.

2. If there is no oil pressure after 30 seconds running, or if pressure drops after a few minutes ground operation, shut down and check for blown lines or for congealed oil.

3. Care should be exercised when using full, or near full engine power when airplane is being run-up on chocks as slippage of chocks occurs frequently.

4. Inspect all instruments for proper operation.

5. Operate wing flaps through several cycles.

TAKE-OFF.

1. Do not taxi through loose snow as it may get into brakes and freeze. Pack or remove loose snow from runway prior to take-off.

2. Never turn on electrical equipment except that absolutely needed, until generator shows CHARGE.

3. Pitot heater ON if icing conditions are anticipated.

4. Heating (pressurizing system), and defroster system ON.

5. Full power check will probably be impossible until airplane is in position for take-off due to slippage on ice or hard packed snow, therefore, it will be necessary to make full power check in conjunction with take-off. Power should be applied as rapidly as possible in order to enable use of maximum amount of runway if take-off is discontinued due to engine malfunctioning or failure.

WARNING

Never take-off with snow, ice or frost on wings. (Even loose snow may not blow off.) Loss of lift and treacherous stalling characteristics will ensue.

AFTER TAKE-OFF.

1. Turn gun heat switch ON immediately after take-off.

2. After take-off from a snow or slush covered field, operate landing gear and flaps through several complete cycles to preclude their freezing in the UP position.

Note

Landing gear retracting time is from 9 seconds at —20°F to 12 seconds at —65°F.

LANDING.

1. Pump brake pedals several times during the approach.

2. Disconnect electrical units not absolutely needed.

WARNING

Landing gear extension time is from 8 seconds at—20°F to 8.5 seconds at —65°F.

3. Use brakes sparingly and not until absolutely necessary after setting the airplane down.

4. Taxi with sufficient rpm to cut-in generator if conditions permit because low temperature decreases battery output.

POST FLIGHT.

1. Clean dirt and ice from shock struts and all exposed actuating cylinder pistons and wipe with a rag soaked in hydraulic fluid of the same type as used in the system.

2. Leave brakes in OFF position.

3. Leave canopy slightly open to prevent cracking of transparent areas due to differential contraction. Also air circulation retards frost formation in cockpit.

4. Install wing, empennage and canopy covers and install dust plugs in air intake duct and tail-pipe.

5. Check specific gravity of battery at least weekly. If less than 1.250 remove battery and service.

6. Moor airplane firmly.

7. If lay-over of several days is expected, remove the battery. Further, at temperatures below —29°C (—20°F) remove the battery if lay-over exceeds four hours.

SUMP DRAINAGE.

Drain fuel tank sump of condensate frequently. Under prolonged freezing conditions a small amount of ice or snow gets into the fuel tanks each time the airplane is serviced. When there is sufficient rise in temperature due to placing the airplane in a hangar or to warmer weather, these crystals melt, resulting in water in the system. Regular and frequent drainage especially under thawing conditicns, is the best method of preventing ice in the fuel lines when the airplane is again subjected to freezing weather. Keeping the tanks as full as possible when the airplane is parked will also help to reduce moisture condensation.

HOT WEATHER AND DESERT PROCEDURES

BEFORE ENTERING THE AIRPLANE.

1. All metal surfaces exposed to the sun are burning hot to touch. Wear gloves to prevent burns.

2. Make all possible ground checks before starting the engine.

3. If operating in sandy country, ascertain that air filters, instrument filters, and oil filters have been cleaned for each flight.

4. Check seals and tires to ascertain that they are not blistered or show other evidence of deterioration.

5. Run the engine on the ground only as long as is necessary. Don't run-up engines to windward of other planes, personnel or ground installation.

TAKE-OFF.

1. If ground is sandy or dusty, avoid taking off in the wake of another airplane.

2. Cabin vent switch; PRESSURE position unless high humidity causes cockpit to fill up with fog. If so take-off with cabin vent switch in RAM.

Note

Take-off distances will be longer because the air is less dense during warm weather.

AFTER TAKE-OFF.

Do not climb the airplane at less than flying speed specified in the climb chart.

LANDING.

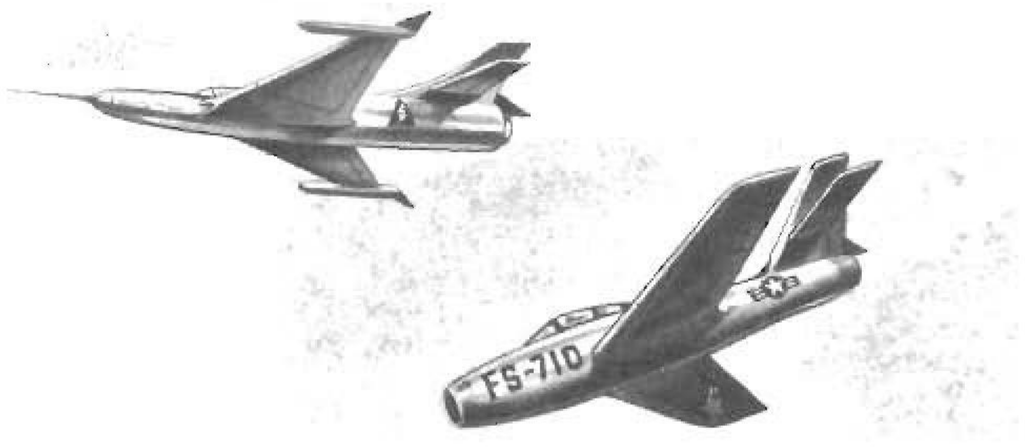
Because hot air is less dense than cold air, true stalling speed will be greater and additional distance will be required for landing.

PARKING.

1. If in sandy country, close and cover all openings to keep sand out. Cover windshield and canopy to prevent sand scratches.

2. Keep canvas covers on the windshield and canopy whenever the airplane is parked in the sun. If this is not done, the sun's heat will soften and distort the transparent plastic. Malfunctioning of instruments and communications equipment will also result.

3. If blowing sand is not a hazard, keep canopy and selected access doors open to permit air circulation.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Appendix I

OPERATING DATA

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TABLE A-1 AIRSPEED INSTALLATION CORRECTION TABLE

AIRSPEED INSTALLATION CORRECTION TABLE

Model: F-84F Engine(s) YJ65-W-1 or -1A

GEAR AND FLAPS UP ADD CORRECTION TO CORRECTED INSTRUMENT READING TO OBTAIN CAS		*GEAR AND FLAPS DOWN ADD CORRECTION TO CORRECTED INSTRUMENT READINGS TO OBTAIN CAS*	
IAS (KNOTS)	*CORRECTION (KNOTS)*	*IAS (KNOTS)*	*CORRECTION (KNOTS)*
150	—4		
200	—6		
250	—8	110	+10
300	—10	120	+9
350	—12	130	+8
400	—13	140	+7
450	—14	150	+6
500	—14	160	+5

Remarks: Red figures are estimated data based on F-84G pitot static system.

Data As Off: 14 January 1953

Data Basis: BLACK FIGURES – FLIGHT TEST, RED FIGURES – ESTIMATES

INTRODUCTION.

To facilitate preflight and inflight mission planning, two standard types of operating data charts are presented. The first type provides airspeed corrections. The second type shows performance during normal operation, with various weight configurations, and the instructions necessary to attain this performance. All data pertain to NACA standard ambient temperatures unless otherwise indicated. Most of the charts are applicable in nonstandard atmosphere if the recommended calibrated airspeed (CAS) values are maintained unless a deviation in calibrated airspeed is necessary to avoid violating engine limits. This rule is necessary because performance is greatly dependent on Mach No, which at each pressure altitude is dependent on CAS alone. Fuel quantities are given in pounds so that the charts can be used when the engine is operated with either the recommended or alternate fuel.

AIRSPEED INSTALLATION CORRECTION TABLES.

In order to obtain correct airplane speeds, several corrections must be applied to the airspeed indicator reading. The first correction is made for the error in the individual instrument. This value is noted on the instrument calibration card and when applied to the instrument reading provides indicated airspeed (IAS). The second correction is for airspeed installation error. This correction is taken from table A—1, and when applied to the indicated airspeed (IAS) provides a calibrated airspeed (CAS). The third correction is for compressibility error. This correction is taken from A—2, and when applied to calibrated airspeed provides true indicated airspeed (TIAS). Dividing the true indicated airspeed by the square root of relative density (ratio of ambient to standard sea level density) provides true airspeed (TAS). Vectorially adding wind velocity to true airspeed provides ground speed.

SAMPLE PROBLEM.

For purposes of explaining the use of the Airspeed Installation Correction Table and the Compressibility Correction Table, consider the airplane flying at 25,000 feet and an airspeed indicator reading of 350 knots per hour. Since the airplane is not equipped with an outside air temperature indicator, determine the ambient temperature at 25,000 ft from the Density Altitude chart which will be —35°C.

TABLE A-2 COMPRESSIBILITY CORRECTION TABLE

Pressure Altitude	*CALIBRATED AIRSPEED – KNOTS*									
	150	*200*	*250*	*300*	*350*	*400*	*450*	*500*	*550*	*600*
5,000	0	0	1	2	2	3	5	6	8	10
10,000	0	1	2	3	5	7	10	13	17	21
15,000	1	2	3	6	8	12	16	21	27	
20,000	1	3	5	8	12	17	23	31		
25,000	2	4	7	11	17	24	32			
30,000	2	5	9	15	23	32				
35,000	3	7	12	20	29					
40,000	4	9	16	25						

Remarks:

SUBTRACT CORRECTION FROM CALIBRATED AIRSPEED TO OBTAIN TRUE INDICATED AIRSPEED.

Airspeed Indicator Reading	350 knots
Correction for Instrument Error (from instruemnt calibration card)	—2
Indicated Airspeed (IAS)	348 knots
Correction for Installation Error (from Airspeed Installation Correction Table)	—12
Calibrated Airspeed (CAS)	336 knots
Correction for Compressibility Error (from Compressibility Correction Table)	—15
True Indicated Airspeed (TIAS)	321 knots
Correction for Air Density (from Density Altitude Chart)	×1.49
True Airspeed (TAS)	478 knots

TAKE-OFF CHART.

Ground run distance and total distance to clear a 50-foot obstacle are tabulated for both normal and assisted take-off with four 14 second 1000 pound ato units. Ato cut-in speeds are tabulated on separate charts which are to be used in conjunction with the corresponding take-off chart. Data is presented for the maximum fuel weight for several configurations including external stores and at several pressure altitudes and ambient temperatures. Ambient temperature is included among the variables because take-off distance is critically dependent on this quantity. Values on the charts may be interpolated for intermediate altitudes and temperatures. Set airplane altimeter to 29.92 and read pressure altitude. With air temperature in degrees centigrade as obtained from the field weather station and pressure altitude, enter chart and determine take-off distance. In the event of an assisted take-off determine the air speed at which the ato units should be ignited from the ato cut-in speed chart. In order to obtain the distance shown the take-off technique explained in Section II must be employed.

CLIMB CHART.

From the climb chart can be determined the best climb speed, fuel consumed, time to climb, distance covered and rate of climb for maximum or normal power. A fuel allowance for start, taxi, take-off and acceleration to climb speed is listed at sea level. Fuel requirements at other altitudes include this allowance plus the fuel needed to climb from sea level. Fuel required for an in-flight climb from one altitude to another is the difference of the tabulated fuel required to climb to each altitude from sea level. Time and distance covered during an in-flight climb may be obtained in the same manner. The recommended climb speeds should be maintained in order to obtain tabulated rates of climb. Higher or lower climb speeds will result in lower rates of climb. Climb data is presented for the highest and lowest fuel weights for several configurations at the altitudes shown. Data for intermediate weights may be interpolated.

DESCENT CHART.

The descent chart presents rates of descent, distance covered, time required, fuel consumed and airspeed (CAS) for maximum range descents with minimum rpm at which engine operation can be maintained. Data is based on retracted speed brake to provide best economy in the descent. To minimize fuel consumption, the lowest allowable fuel pressure is used. Data is presented for a constant Mach No. descent for several landing configurations at altitudes from normal service ceiling to sea level. Neither the fuel or time tabulated includes any

TABLE A-3. STANDARD ATMOSPHERIC TABLE

Standard Altitude Table

Standard Sea Level Air:
T = 15° C. W = .07651 lb/cu. ft. ρ_o = .002378 slugs/cu. ft.
P = 29.921 in. of Hg. 1" of Hg. = 70.732 lb/sq. ft. = 0.4912 lb/sq. in.
This table is based on NACA Technical Report No. 218 a_o - 1116 ft./sec.

Altitude feet	Density Ratio ρ/ρ_o	$\frac{1}{\sqrt{\sigma}}$	Temperature Deg. C	Temperature Deg. F	Speed of Sound Ratio a/a_o	Pressure In. of Hg.	Pressure Ratio P/Po
0	1.0000	1.0000	15.000	59.000	1.0000	29.92	1.0000
1000	.9710	1.0148	13.019	55.434	.997	28.86	.9644
2000	.9428	1.0299	11.038	51.868	.993	27.82	.9298
3000	.9151	1.0454	9.056	48.301	.990	26.81	.8962
4000	.8881	1.0611	7.075	44.735	.986	25.84	.8636
5000	.8616	1.0773	5.094	41.169	.983	24.89	.8320
6000	.8358	1.0938	3.113	37.603	.979	23.98	.8013
7000	.8106	1.1107	1.132	34.037	.976	23.09	.7716
8000	.7859	1.1280	-0.850	30.471	.972	22.22	.7427
9000	.7619	1.1456	-2.831	26.904	.968	21.38	.7147
10000	.7384	1.1637	-4.812	23.338	.965	20.58	.6876
11000	.7154	1.1822	-6.793	19.772	.962	19.79	.6614
12000	.6931	1.2012	-8.774	16.206	.958	19.03	.6359
13000	.6712	1.2206	-10.756	12.640	.954	18.29	.6112
14000	.6499	1.2404	-12.737	9.074	.950	17.57	.5873
15000	.6291	1.2608	-14.716	5.507	.947	16.88	.5642
16000	.6088	1.2816	-16.699	1.941	.943	16.21	.5418
17000	.5891	1.3029	-18.680	-1.625	.940	15.56	.5202
18000	.5698	1.3247	-20.662	-5.191	.936	14.94	.4992
19000	.5509	1.3473	-22.643	-8.757	.932	14.33	.4790
20000	.5327	1.3701	-24.624	-12.323	.929	13.75	.4594
21000	.5148	1.3937	-26.605	-15.890	.925	13.18	.4405
22000	.4974	1.4179	-28.586	-19.456	.922	12.63	.4222
23000	.4805	1.4426	-30.568	-23.022	.917	12.10	.4045
24000	.4640	1.4681	-32.549	-26.588	.914	11.59	.3874
25000	.4480	1.4940	-34.530	-30.154	.910	11.10	.3709
26000	.4323	1.5209	-36.511	-33.720	.906	10.62	.3550
27000	.4171	1.5484	-38.493	-37.287	.903	10.16	.3397
28000	.4023	1.5768	-40.474	-40.853	.899	9.720	.3248
29000	.3879	1.6056	-42.455	-44.419	.895	9.293	.3106
30000	.3740	1.6352	-44.436	-47.985	.891	8.880	.2968
31000	.3603	1.6659	-46.417	-51.551	.887	8.483	.2834
32000	.3472	1.6971	-48.399	-55.117	.883	8.101	.2707
33000	.3343	1.7295	-50.379	-58.684	.879	7.732	.2583
34000	.3218	1.7628	-52.361	-62.250	.875	7.377	.2465
35000	.3098	1.7966	-54.342	-65.816	.871	7.036	.2352
36000	.2962	1.8374	-55.000	-67.000	.870	6.708	.2242
37000	.2824	1.8818	-55.000	-67.000	.870	6.395	.2137
38000	.2692	1.9273	-55.000	-67.000	.870	6.096	.2037
39000	.2566	1.9738	-55.000	-67.000	.870	5.812	.1943
40000	.2447	2.0215	-55.000	-67.000	.870	5.541	.1852
41000	.2332	2.0707	-55.000	-67.000	.870	5.283	.1765
42000	.2224	2.1207	-55.000	-67.000	.870	5.036	.1683
43000	.2120	2.1719	-55.000	-67.000	.870	4.802	.1605
44000	.2021	2.2244	-55.000	-67.000	.870	4.578	.1530
45000	.1926	2.2785	-55.000	-67.000	.870	4.364	.1458
46000	.1837	2.3332	-55.000	-67.000	.870	4.160	.1391
47000	.1751	2.3893	-55.000	-67.000	.870	3.966	.1325
48000	.1669	2.4478	-55.000	-67.000	.870	3.781	.1264
49000	.1591	2.5071	-55.000	-67.000	.870	3.604	.1205
50000	.1517	2.5675	-55.000	-67.000	.870	3.436	.1149

allowance for loitering while awaiting landing clearance, for taxiing after landing, or for any navigational error. Additional allowances for these considerations must be made. The fuel, time, and air-distance values for inflight descents from one altitude to another are merely the differences in values tabulated for the initial and final altitudes concerned.

LANDING CHART.

Landing distance for several pressure altitudes and gross weights sufficiently bracketing those anticipated for normal service is tabulated in the Landing Distance Chart. Only standard ambient temperatures are represented, since landing distance is not greatly affected by this quantity.

MAXIMUM ENDURANCE CHART.

The Maximum Endurance Chart presents the airspeeds, fuel flow and percent of maximum rpm for maximum endurance flight. Data is presented at altitudes from sea level to the service ceiling for each configuration and for several weights in each configuration.

COMBAT ALLOWANCE CHART.

The Combat Allowance Chart presents a fuel flow at normal thrust and at maximum thrust from altitudes from sea level to combat ceiling.

MAXIMUM CONTINUOUS POWER SUMMARY CHART.

The Maximum Continuous Power Summary Chart presents the percent of maximum rpm, calibrated airspeed, true airspeed and fuel flow for maximum continuous power operation at altitudes from sea level to the highest probable flight altitude. Data is presented for several configurations and for various weights in each configuration.

FLIGHT OPERATION INSTRUCTION CHARTS.

The Flight Operation Instruction Charts are provided to facilitate flight planning. They show the range of the airplane at maximum range airspeeds and the procedure required to obtain this range. The charts contain columns for each 5000 foot increase in altitude up to the maximum altitude at which the rate of climb is 300 fpm with maximum continuous rpm. On line opposite available fuel in the upper half of the chart, ranges are shown for each initial altitude. In general, two range values are quoted for each altitude and fuel quantity. One is for continued flight at the initial altitude and one for the maximum range obtainable by climbing to a higher altitude. The charted ranges do not include fuel consumed and distance covered during warm-up, take-off, and initial climb at the start of a flight. However, fuel used and distance covered during letdown or during in-flight climb to an optimum altitude are taken into account. The lower half of each chart presents operating procedure to obtain the ranges quoted in the upper half. When altitude is changed, operating instructions in the column according to the new altitude must be used if the ranges listed are to be obtained.

Under different wind conditions, ranges (in ground miles) are varied by the effect of wind on ground speed. Let-down distances are affected for the same reason. Recommended CAS also may change in order to maintain the most favorable ground miles per gallon. To facilitate range computation under wind conditions, the operating procedure in the lower half of each chart contains instructions for various winds at each altitude listed. Ground miles in a wind are obtained by multiplying chart air miles by the range factor found opposite the effective wind at the cruising altitude. Thus, range factors may be used to determine the best altitude for cruising when there is a known wind difference at different altitudes.

Although a wind may be from any direction with respect to the airplane course, it may be expressed as an effective wind. An effective wind has the same effect on the airplane ground speed as if it were a straight head wind or tail wind. In other words, the wind component in the direction of the airplane heading is the effective wind. For example, a 100 knot wind at 45 degrees to the course is an effective head wind of approximately 75 knots. If the airplane true airspeed is 400 knots the true ground speed is approximately 325 knots.

The approximate rpm values quoted on any one chart are based on the gross weight equal to the high limit of the chart weight band. If the recommended CAS values are maintained, the rpm values will decrease slightly as the gross weight decreases. No allowances are made for navigational errors, combat, formation flight, landing, or other contingencies. Such allowances must be made as required.

PRE-FLIGHT RANGE PLANNING.

Select the applicable Flight Operation Instruction Chart. Determine the amount of fuel available for flight planning. Available fuel is equal to the total amount in the airplane before starting the engine minus the amount needed for warm-up, taxi, take-off, initial climb, and necessary reserves. Select a figure in the fuel column equal to, or less than, the amount available for flight planning. Interpolate if desired.

To determine maximum range at a given altitude—move horizontally right or left to the desired altitude column. Multiply the range value thus obtained by the correct range factor and add the distance covered in initial climb to obtain total range with a given wind at altitude. Fly according to the instructions in the lower half of the chart, changing charts if external tanks are dropped.

To fly a given distance, determine range factors for the effective winds at altitudes to be considered. From the desired distance subtract the miles covered in climb. Divide the resultant figure by the range factor to obtain miles to be covered in the cruise and descent. Enter the chart as described under preflight range planning. Move horizontally right or left to a range figure which exceeds the calculated air distance to be covered in cruise and descent. Fly according to the instructions for the altitude so obtained, changing charts if external tanks are dropped.

If altitude, wind or external load does not remain reasonably constant, break the flight up into several sections and plan each section separately.

IN-FLIGHT RANGE PLANNING.

To use the charts in flight, determine altitude, available fuel, and effective wind. Available fuel is equal to the fuel on board minus necessary reserves. Enter the appropriate Flight Operation Instruction Chart at a fuel quantity equal to or less than the available fuel. Move horizontally right or left to the applicable altitude column. From the ranges and wind factors listed, determine the altitude at which the flight will be continued. For continued cruising at the present altitude, refer to the instructions directly below. When changing charts if external tanks are dropped, refer to cruising instructions on the new chart at the altitude of flight. To obtain the range shown at optimum altitude when flying at a given altitude, climb immediately according to the recommended climb procedure. For cruising instructions at the new altitude refer to the lower half of the chart in the column under the new altitude. When changing charts if external tanks are dropped, refer to cruising instructions on the new chart at the new altitude of flight.

SAMPLE PROBLEMS BASED ON JP-3 FUEL.

PROBLEM 1.

To illustrate use of the charts for planning a flight, suppose an airplane must be ferried 1200 nautical miles. For unexpected difficulties, a general reserve of 900 pounds (140 gallons JP-4 fuel) is considered necessary. From the Flight Operation Instruction Charts, it is apparent that drop tanks must be carried; however, it is desired to keep the tanks. Use of 450-gallon drop tanks will give a maximum fuel capacity of 1475 gallons x 6.5 (pounds per gallon JP-4 fuel) or 9588 pounds. The initial, known conditions are as follows:

Required range .....1200 nautical miles

Effective winds .....40 knot head wind at 25,000 feet and below
80 knot head wind at 30,000 feet and above

From the Climb Chart (figure A—3) and the Flight Operation Instruction Chart for 450-gallon Drop Tanks (figure A—16), the following data are obtained:

1. Cruising altitude	20,000	25,000	30,000
2. Fuel capacity, pounds	9,588	9,588	9,588
3. Reserve fuel, pounds	900	900	900
4. Fuel used to altitude, pounds (climb at 100% rpm)	1,080	1,275	1,485
	20,000	25,000	30,000
5. Available cruise fuel, pounds (2-3-4)	7,608	7,413	7,203
6. Nautical miles in climb	43	63	89
7. Cruise and descent distance (Interpolate as necessary)	1,310	1,415	1,505
8. Range, zero wind (6 + 7)	1,353	1,478	1,594
9. Range factor	.90	.90	.80
10. Ground miles (8 x 9)	1,220	1,330	1,275

Therefore, the flight can be made at 20,000 feet or higher. The cruise airspeed at 25,000 feet for a 40 knot head wind would be 305 knots. CAS and the letdown would begin at 15 nautical miles from destination.

PROBLEM 2.

Suppose that during the descent at the end of this theoretical flight, the pilot has reached 5000 feet when he learns that the field is closed and he must use an alternate airport some 120 nautical miles farther on. Fuel remaining is only the 900 pounds originally planned for general reserve. Reference to the Flight Operation Instruction Chart for 450-gallon Drop Tanks (figure A—16) shows that with the existing head wind and the empty tanks still on, available range with 1000 pounds of fuel is approximately 117 (130 x .9) nautical miles at 5000 feet or 144 (180 x .80) nautical miles at optimum altitude (40,000 feet) with no reserve for landing. It is evident that the empty drop tanks should be jettisoned immediately. Reference to the Flight Operation Instruction Chart for No External Load (figure A—18) shows that even without the drop tanks only 135 (150 x .9) nautical miles can be covered at 5000 feet with 1000 pounds of fuel and a 40 knot head wind. However, by climbing immediately to 45,000 feet (optimum altitude) at 100% rpm, a range of 200 (250 x .8) nautical miles can be attained. At 45,000 feet the cruise condition will be 235 knots CAS, 1450 pounds per hour fuel flow, 425 knots ground speed, and letdown begun 65 nautical miles from destination. Since the required range is only 120 nautical miles, the difference between 200 and 120 nautical miles is the reserve which, expressed in time, is 11 minutes (80 nautical + 425 knots G.S. =M .188 hours or 11 minutes). The corresponding fuel reserve is 270 pounds (.188 hours x 1450 pounds per hour). However, this was figured for 1000 pounds of fuel at 5000 feet and only 900 pounds were available, so the landing reserve will be 100 pounds less, or 170 pounds. In other words, judging from this sample problem when you have to get all you can out of the fuel available, climb immediately to optimum altitude and, if necessary, jettison empty drop tanks.

MAXIMUM RANGE SUMMARY CHART.

The Maximum Range Summary Charts summarize the operating conditions for no wind flight entered on the Flight Operation Instruction Charts. These charts present calibrated airspeed, Mach No., miles per pound of fuel and approximate percent rpm for each weight and altitude shown in the Flight Operation Instruction Charts.

TAKE-OFF DISTANCES — FEET

20° FLAPS, HARD SURFACE RUNWAY

WITHOUT JATO

MODEL (S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION AND GROSS WEIGHT	PRESSURE ALTITUDE	-5 DEG. CENT. 23°F				+15 DEG. CENT. 59°F				+35 DEG. CENT. 95°F				+55 DEG. CENT. 131°F			
		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND	
		GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'
Clean + four 230 gal. external tanks G.W. = 25380 Lbs	SL	5250	6740	3360	4560	6600	8820	4220	5020	8160	11200	5220	7710	10600	16000	6780	11280
	1,000	5700	7480	3650	5090	7200	9670	4610	6630	8920	12330	5710	8510	11720	18620	7500	13260
	2,000	6200	8230	3970	5610	7840	10650	5020	7320	9720	13820	6220	9610				
	3,000	6740	8970	4310	6140	8530	11720	5460	8080	10560	15400	6760	10800				
	4,000	7300	9850	4670	6760	9280	12910	5940	8950	11520	17000	7370	11950				
	5,000	7990	10870	5110	7480	10180	14270	6520	9930								
Clean + two 230 gal. external tanks + two 1000 Lb. bombs + eight 5" HVAR G.W. = 25192 Lbs	SL	5340	6980	3420	4750	6630	9110	4240	6250	8300	11870	5310	8230	10900	17420	6980	12380
	1,000	5780	7650	3700	3220	7290	10080	4670	6950	9150	13280	5860	9250	11920	21500	7630	15610
	2,000	6300	8370	4030	5710	7970	11150	5100	7710	9980	14720	6390	10320				
	3,000	6900	9220	4420	6320	8660	12400	5540	8620	10850	16500	6940	11250				
	4,000	7460	10180	4770	7000	9480	13920	6070	9570	11900	18580	7620	13200				
	5,000	8220	11390	5260	7870	10700	15450	6850	10810								
Clean + two 450 gal. external tanks G.W. = 25065 Lbs	SL	5150	6580	3300	4450	6350	8450	4060	5770	7800	10650	4990	7320	10220	15000	6550	10580
	1,000	5580	7230	3570	4910	6930	9320	4440	6390	8500	11920	5470	8240	11680	17800	7480	12160
	2,000	6050	7920	3870	5390	7550	10180	4830	6990	9320	13110	5970	9100				
	3,000	6530	8670	4180	5930	8200	11130	5250	7660	10510	14350	6500	10000				
	4,000	7080	9440	4530	6460	8940	12250	5720	8490	11070	16150	7080	11320				
	5,000	7740	10530	4950	7240	9800	13600	6270	9440	12500	19150	8000	13580				
Clean G.W. = 18500 Lbs	SL	2600	3260	1660	2170	3170	4020	2030	2690	3890	4980	2490	3340	4970	6500	3180	4400
	1,000	2820	3530	1810	2360	3450	4370	2210	2930	4230	5440	2710	3670	5400	7150	3460	4860
	2,000	3060	3820	1960	2550	3740	4760	2390	3200	4590	5920	2940	4000	5870	7820	3760	5320
	3,000	3300	4150	2110	2730	4050	5180	2590	3490	4970	6440	3180	4360	6380	8580	4080	5860
	4,000	3570	4500	2290	3030	4400	5640	2820	3810	5440	7030	3480	4760	6930	9440	4440	6470
	5,000	3860	4900	2470	3300	4810	6200	3080	4190	5920	7760	3790	5280	7530	10500	4820	7230

REMARKS: (1) TAKE-OFF WITHOUT ASSISTANCE

(2) GROSS WEIGHTS BASED ON JP-3 or JP-4 FUEL @ 6.5 Lbs/Gal.

DATA AS OF: 4 September 1952

DATA BASIS: Estimates

FUEL GRADE: JP-3 or JP-4

FUEL DENSITY: 6.5 Lbs/Gal

Figure A—1. Take-off Distances

ATO TAKE-OFF DISTANCES — FEET

20° FLAPS, HARD SURFACE RUNWAY

MODEL (S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION AND GROSS WEIGHT	PRESSURE ALTITUDE	-5 DEG. CENT. 23°F				+15 DEG. CENT. 59°F				+35 DEG. CENT. 95°F				+55 DEG. CENT. 131°F			
		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND	
		GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'	GROUND RUN	CLEAR 50'
Clean + four 230 gal. External tanks G.W. = 26220 Lbs.	SL	3970	4790	2540	3160	5100	6080	3260	4060	6420	7600	4110	5080	8380	9960	5360	6620
	1,000	4350	5260	2780	3530	5570	6630	3570	4440	7050	8270	4510	5520	9850	11500	6300	7670
	2,000	4720	5740	3020	3860	6060	7230	3880	4840	7690	9000	4920	6010	10700	12700	6850	8520
	3,000	5210	6250	3330	4190	6660	7900	4260	5290	8400	9840	5380	6580	12250	14000	7840	9310
	4,000	5660	6820	3620	4580	7320	8630	4680	5770	9310	10860	5960	7250				
	5,000	6240	7400	3990	4950	8200	9620	5250	6430	10470	12150	6700	8110				
Clean + two 230 gal. External tanks + two 1000 lb. bombs + eight 5" HVAR G.W. = 26030 Lbs.	SL	3980	4820	2550	3230	5070	6100	3250	4090	6460	7690	4130	5140	9080	10830	5810	7260
	1,000	4350	5200	2780	3470	5570	6680	3570	4480	7150	8500	4500	5700	10020	11780	6410	7880
	2,000	4750	5640	3040	3770	6140	7340	3930	4916	7900	9290	5060	6210	11020	12850	7050	8570
	3,000	5200	6150	3330	4110	6780	8040	4340	5380	8750	10280	5600	6810				
	4,000	5700	6750	3650	4450	7500	8870	4800	5935	9700	11360	6210	7590				
	5,000	6270	7530	4010	5050	8370	9890	5360	6620	10900	12700	6970	8420				
Clean + two 450 gal. External tanks G.W. = 25905 Lbs.	SL	3780	4580	2420	3070	4820	5760	3090	3850	6070	7180	3890	4800	8160	9650	5220	6450
	1,000	4190	4990	2680	3330	5300	6300	3390	4210	6680	7880	4280	5270	9250	10830	5920	7230
	2,000	4580	5470	2930	3660	5830	6920	3730	4630	7360	8650	4710	5780	10530	12150	6740	8090
	3,000	5020	5970	3210	3990	6390	7570	4090	5060	8060	9470	5160	6330	11550	13000	7400	8600
	4,000	5480	6550	3510	4300	7060	8320	4520	5560	8910	10400	5700	6940				
	5,000	6000	7190	3840	4830	7870	9210	5040	6250	9980	11700	6390	7830				
Clean G.W. = 19340 Lbs.	SL	1760	2130	1130	1420	2070	2530	1330	1680	2500	3050	1600	2040	3160	3810	2020	2540
	1,000	1900	2280	1220	1520	2250	2730	1440	1820	2720	3300	1740	2210	3470	4170	2220	2790
	2,000	2030	2450	1300	1630	2430	2940	1560	1960	2960	3570	1890	2380	3780	4550	2420	3040
	3,000	2190	2650	1400	1770	2630	3200	1680	2130	3220	3870	2060	2580	4150	4900	2660	3270
	4,000	2350	2840	1500	1890	2870	3450	1840	2310	3520	4210	2250	2810	4500	5350	2880	3570
	5,000	2520	3080	1610	2060	3130	3780	2000	2520	3880	4610	2480	3070	4950	5830	3170	3890

REMARKS: (1) TAKE-OFF WITH four 1000 Lb. 14 SEC. JATO UNITS

(2) GROSS WEIGHTS SHOWN INCLUDE WEIGHT OF JATO UNITS

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3 or JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

ATO CUT-IN SPEED — KNOTS

20° FLAPS, HARD SURFACE RUNWAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION AND GROSS WEIGHT	PRESSURE ALTITUDE	− 5 DEG. CENT.		+ 15 DEG. CENT.		+ 35 DEG. CENT.		+ 55 DEG. CENT.	
		ZERO WIND	30 KNOT WIND	ZERO WIND	30 KNOT WIND	ZERO WIND	30 KNOT WIND	ZERO WIND	30 KNOT WIND
		ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED	ATO CUT-IN SPEED
Clean + four 230 Gal. External tanks G.W. = 26220 Lbs.	SL	93	63	107	77	120	90	134	104
	1,000	99	69	112	82	126	96	140	110
	2,000	105	75	118	88	132	102	145	115
	3,000	110	80	124	94	138	108	151	121
	4,000	117	87	130	100	144	114	157	127
	5,000	123	93	136	106	150	120	163	133
Clean + two 230 Gal. External tanks + Two 1000 Lb. bomb + eight 5" HVAR G.W. = 26030 Lbs.	SL	92	62	107	77	122	92	137	107
	1,000	99	69	113	83	128	98	143	113
	2,000	105	75	119	89	134	104	149	119
	3,000	110	80	125	95	139	109	153	123
	4,000	117	87	132	102	146	116	161	131
	5,000	122	92	138	108	153	123	168	138
Clean + two 450 Gal. External tanks G.W. = 25905 Lbs.	SL	87	57	103	73	118	88	130	100
	1,000	94	64	109	79	124	94	135	105
	2,000	99	69	116	86	130	100	141	111
	3,000	106	76	120	90	134	104	147	117
	4,000	113	83	127	97	140	110	154	124
	5,000	120	90	133	103	146	116	160	130
Clean G.W. = 19340 Lbs.	SL	22	0	38	8	54	24	69	39
	1,000	28	0	44	14	60	30	75	45
	2,000	35	5	50	20	65	35	79	49
	3,000	41	11	56	26	70	40	85	55
	4,000	48	18	62	32	76	46	90	60
	5,000	54	24	68	38	83	53	97	67

REMARKS: (1) TAKE-OFF WITH four 1000 Lb. 14 SEC. JATO UNITS

(2) GROSS WEIGHTS SHOWN INCLUDE WEIGHT OF JATO UNITS

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3 or JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—2. Ato Take-off Distances (Sheet 2 of 2)

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal tanks + two
WEIGHT: 25190 Lbs. 1000 Lb. bombs + eight 5" HVAR

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
3270	0	0	465(1)	260	SEA LEVEL	260	465(1)	0	0	3620
2630	8	1.9	670	250	5000	250	645	1.6	7	2980
2010	18	4.0	870	245	10000	245	825	3.6	16	2360
1460	32	6.8	1110	235	15000	235	1060	6.1	28	1780
910	52	11.3	1420	225	20000	225	1295	9.4	45	1200

CONFIGURATION: Clean + two 230 gal tanks + two
WEIGHT: 23508 Lbs. 1000 Lb. bombs + eight 5" HVAR

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4020	0	0	465(1)	260	SEA LEVEL	260	465(1)	0	0	4450
3330	6	1.5	625	250	5000	250	605	1.3	5	3740
2710	14	3.2	785	245	10000	245	750	2.9	12	3050
2100	25	5.4	975	235	15000	235	915	4.7	22	2420
1470	39	7.8	1195	225	20000	225	1100	7.1	34	1730
840	66	12.2	1495	220	25000	220	1325	10.6	54	1110

CONFIGURATION: Clean + two 230 gal tanks + two
WEIGHT: 21826 Lbs. 1000 Lb. bombs + eight 5" HVAR

CONFIGURATION: Clean + two 230 gal tanks + two
WEIGHT: 20144 Lbs. 1000 Lb. bombs + eight 5" HVAR

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED
(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–3. Climb Chart – Maximum Power (Sheet 1 of 6)

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 25380 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4450	0	0	465(1)	335	SEA LEVEL	335	465(1)	0	0	4900
3800	7	1.4	615	330	5000	330	615	1.2	7	4150
3150	17	3.1	780	325	10000	325	755	2.8	16	3500
2550	29	4.9	945	315	15000	315	905	4.5	27	2850
1950	44	7.2	1130	305	20000	305	1070	6.5	41	2250
1350	64	10.4	1345	290	25000	290	1255	9.3	59	1650
800	97	14.9	1605	275	30000	275	1480	13.3	86	1050

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 22140 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 20520 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5300	0	0	465(1)	335	SEA LEVEL	335	465(1)	0	0	5800
4550	6	1.0	595	330	5000	330	585	.9	6	5050
3900	15	2.5	755	325	10000	325	705	2.2	13	4300
3200	24	4.0	860	315	15000	315	825	3.6	21	3600
2600	37	5.9	1010	305	20000	305	955	5.3	33	2950
1900	53	8.2	1175	290	25000	290	1095	7.1	47	2250
1350	76	11.7	1360	275	30000	275	1255	10.2	67	1650
					35000	255	1465	14.2	96	1000

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED
(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A-3. Climb Chart – Maximum Power (Sheet 2 of 6)

AN 01-65BJD-1

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 18900 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
6400	0	0	465(1)	335	SEA LEVEL	335	465(1)	0	0	7100
5550	5	.8	575	330	5000	330	560	.7	5	6200
4800	12	1.9	680	325	10000	325	655	1.6	10	5350
4050	19	3.2	790	315	15000	315	755	2.8	15	4550
3300	30	4.6	900	305	20000	305	855	4.1	24	3750
2600	42	6.4	1020	290	25000	290	960	5.7	34	3000
2000	58	8.7	1155	275	30000	275	1075	7.5	47	2350
1250	81	11.8	1315	255	35000	255	1200	10.1	63	1600
					40000	230	1345	13.6	87	750

CONFIGURATION: Clean + two 230 gal tanks
WEIGHT: 21990 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5750	0	0	465(1)	355	SEA LEVEL	355	465(1)	0	0	6350
4990	6	1.0	585	340	5000	340	575	.9	5	5490
4230	13	2.2	705	330	10000	330	685	2.0	12	4700
3560	23	3.6	835	320	15000	320	785	3.1	21	3980
2970	34	5.3	975	315	20000	315	925	4.8	31	3380
2320	50	7.5	1120	305	25000	305	1050	6.6	44	2700
1700	69	10.1	1285	285	30000	285	1190	8.9	60	2050
1000	98	14.0	1485	270	35000	270	1350	12.0	84	1370

CONFIGURATION: Clean + two 230 gal tanks
WEIGHT: 20308 Lbs.

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED

(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–3. Climb Chart – Maximum Power (Sheet 3 of 6)

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal tanks
WEIGHT: 18626 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
7000	0	0	465 (1)	355	SEA LEVEL	355	465 (1)	0	0	7800
6150	5	.9	560	340	5000	340	555	.8	4	6820
5300	11	1.8	660	330	10000	330	640	1.6	10	5920
4490	18	2.8	765	320	15000	320	730	2.5	16	5070
3800	27	4.3	870	315	20000	315	830	3.8	24	4330
3090	39	5.8	985	305	25000	305	930	5.1	35	3570
2400	53	7.8	1105	285	30000	285	1030	6.9	47	2850
1700	72	10.4	1245	270	35000	270	1145	9.0	63	2100
850	101	14.2	1400	240	40000	240	1265	11.9	85	1250

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 25065 Lbs.

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 23467 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4860	0	0	465 (1)	360	SEA LEVEL	360	465 (1)	0	0	5270
4180	8	1.4	610	350	5000	350	595	1.2	8	4600
3500	16	2.7	760	345	10000	345	730	2.4	15	3870
2880	28	4.3	920	330	15000	330	875	4.0	26	3220
2330	43	6.3	1080	315	20000	315	1025	5.8	39	2620
1750	63	9.2	1275	305	25000	305	1195	8.2	56	2000
1180	89	12.9	1485	285	30000	285	1385	11.4	78	1410

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED

(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal

Figure A–3. Climb Chart – Maximum Power (Sheet 4 of 6)

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 21869 Lbs.

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KN		KN	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5730	0	0	465(1)	360	SEA LEVEL	360	465(1)	0	0	6230
5000	7	1.0	585	350	5000	350	570	.9	6	5480
4240	14	2.2	705	345	10000	345	685	2.0	12	4660
3570	24	3.6	835	330	15000	330	805	3.3	22	3950
2930	35	5.3	970	315	20000	315	925	4.8	31	3280
2300	50	7.3	1125	305	25000	305	1065	6.5	45	2610
1700	70	10.1	1290	285	30000	285	1200	9.0	61	1990
1050	101	14.0	1505	270	35000	270	1370	12.3	86	1340

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 18673 Lbs.

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KN		KN	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
6840	0	0	465(1)	360	SEA LEVEL	360	465(1)	0	0	7700
6000	6	.8	560	350	5000	350	555	.7	5	6760
5200	12	1.8	665	345	10000	345	650	1.6	10	5970
4410	20	3.0	773	330	15000	330	745	2.7	18	5090
3700	28	4.3	880	315	20000	315	850	3.9	25	4300
3000	40	5.9	1005	305	25000	305	945	5.3	36	3540
2350	55	8.0	1110	285	30000	285	1045	7.1	49	2790
1670	75	10.7	1260	270	35000	270	1160	9.4	65	2100
					40000	270	1300	12.4	90	1130

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 20271 Lbs.

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 17075 Lbs.

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—3. Climb Chart — Maximum Power (Sheet 5 of 6)

CLIMB CHART FOR MAXIMUM POWER

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean
WEIGHT: 18500 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET
RATE OF CLIMB	FROM SEA LEVEL DIST.	FROM SEA LEVEL TIME	FROM SEA LEVEL FUEL		
8100	0	0	465(1)	426	SEA LEVEL
7200	5	.7	555	415	5000
6370	12	1.6	655	405	10000
5620	20	2.5	745	390	15000
4820	29	3.7	840	380	20000
4140	38	4.9	935	350	25000
3400	49	6.1	1040	325	30000
2320	63	7.7	1135	295	35000
1550	82	10.2	1230	265	40000
520	122	15.0	1395	225	45000

CONFIGURATION: Clean
WEIGHT: 16631 Lbs.

CAS KN	APPROXIMATE FROM SEA LEVEL FUEL	FROM SEA LEVEL TIME	FROM SEA LEVEL DIST.	RATE OF CLIMB
426	465(1)	0	0	9060
415	545	.7	5	8050
405	635	1.5	11	7150
390	710	2.3	17	6400
380	795	3.3	25	5670
350	870	4.2	33	4860
325	945	5.4	43	3990
295	1025	6.8	55	3150
265	1110	8.8	70	2000
225	1212	12.0	98	1000

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET
RATE OF CLIMB	FROM SEA LEVEL DIST.	FROM SEA LEVEL TIME	FROM SEA LEVEL FUEL		

CONFIGURATION:
WEIGHT:

CAS	APPROXIMATE FROM SEA LEVEL FUEL	FROM SEA LEVEL TIME	FROM SEA LEVEL DIST.	RATE OF CLIMB

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED
(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–3. Climb Chart – Maximum Power (Sheet 6 of 6)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal tanks + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 25190 Lbs.

CONFIGURATION: Clean + two 230 gal tank + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 20144 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
2275	0	0	465(1)	240	SEA LEVEL	240	465(1)	0	0	3170
1820	12	2.7	710	238	5000	238	635	1.8	8	2640
1350	25	5.9	985	237	10000	237	820	4.1	17	2130
900	44	10.2	1295	230	15000	230	1025	6.9	32	1600
450	82	17.8	1785	223	20000	223	1275	10.8	50	1040
					25000	213	1635	17.5	83	550

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 25380 Lbs.

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 17281 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
3150	0	0	465(1)	305	SEA LEVEL	305	465(1)	0	0	4900
2700	10	1.8	635	295	5000	295	575	1.2	6	4300
2200	21	4.0	830	288	10000	288	690	2.5	13	3680
1760	38	6.7	1035	279	15000	279	810	4.0	22	3100
1300	57	10.3	1265	269	20000	269	940	6.0	34	2510
850	84	14.8	1530	260	25000	260	1085	8.4	48	1950
400	141	23.5	1975	252	30000	252	1240	11.6	69	1500
					35000	246	1445	16.3	101	1000
					40000	230	1745	26.0	158	500

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED

(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–4. Climb Chart – Normal Power (Sheet 1 of 2)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 25065 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
3400	0	0	465(1)	317	SEA LEVEL	317	465(1)	0	0	5680
2950	10	1.7	630	313	5000	313	565	1.0	6	5050
2500	21	3.8	795	308	10000	308	675	2.3	13	4425
2025	37	6.3	1010	300	15000	300	780	3.8	20	3800
1580	56	9.5	1225	291	20000	291	895	5.3	31	3200
1125	82	13.4	1495	283	25000	283	1015	7.3	44	2640
675	129	20.2	1825	272	30000	272	1140	9.7	61	2100
					35000	257	1285	13.0	85	1300

CONFIGURATION: Clean
WEIGHT: 18500 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5940	0	0	465(1)	363	SEA LEVEL	363	465(1)	0	0	6780
5770	6	1.0	570	360	5000	360	555	0.8	6	6030
4620	14	2.2	670	356	10000	356	645	1.9	12	5325
4030	22	3.7	785	350	15000	350	745	3.2	20	4650
3475	35	5.1	885	342	20000	342	840	4.5	31	4070
2850	50	7.0	995	333	25000	333	935	6.2	44	3500
2270	65	8.9	1115	324	30000	324	1035	7.8	57	3000
1830	86	11.4	1235	298	35000	298	1135	9.8	74	2290
950	116	15.0	1375	267	40000	267	1245	12.6	97	1400
100	195	25.0	1675	238	45000	238	1410	18.0	142	530

CONFIGURATION: Clean + two 450 gal tanks
WEIGHT: 17075 Lbs.

CONFIGURATION: Clean
WEIGHT: 16631 Lbs.

REMARKS: (1) ALLOWANCE FOR START, TAXI, TAKE-OFF AND ACCELERATION TO CLIMB SPEED

(2) CLIMB AT RECOMMENDED CAS

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–4. Climb Chart – Normal Power (Sheet 2 of 2)

AN 01-65BJD-1

DESCENT CHART
STANDARD DAY

MODEL F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal. tanks + two
WEIGHT: 19470 Lbs. 1000 Lb. bombs + eight 5" HVAR

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 17120 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL						TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL				FUEL	TIME	DISTANCE	
					40000					
					35000	240	105	6.70	54	2900
					30000	270	89	5.20	42	3300
					25000	305	72	3.90	32	3800
8630	13	1.55	32	340	20000	340	55	2.80	24	4000
10830	9	1.08	23	375	15000	375	39	1.95	16	5800
13550	6	0.70	15	410	10000	410	25	1.25	11	7450
17800	4	0.40	8	450	5000	450	14	0.70	6	9800
23200	2	0.18	4	490	SEA LEVEL	490	6	0.30	3	13000
29240	0	0	0	530		530	0	0	0	18350

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL						TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL				FUEL	TIME	DISTANCE	

REMARKS: (1) GROSS WEIGHTS BASED ON FUEL DENSITY OF 6.5 Lbs/Gal.
(2) DESCEND AT CONSTANT MACH NUMBER = 0.8
(3) DESCEND AT IDLE RPM

Rate of Descent: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal

Figure A–5. Descent Chart (Sheet 1 of 2)

DESCENT CHART
STANDARD DAY

MODEL F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 16915 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET
RATE OF DESCENT	TO SEA LEVEL DISTANCE	TO SEA LEVEL TIME	TO SEA LEVEL FUEL		
					45000
4230	38	4.2	73	250	40000
5050	29	3.2	60	310	35000
6200	22	2.3	48	345	30000
7700	16	1.7	37	385	25000
9760	11	1.2	25	425	20000
12350	7	0.7	16	465	15000
15900	4	0.4	9	505	10000
21000	2	0.2	3	550	5000
28730	0	0	0	595	SEA LEVEL

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 16282 Lbs.

CAS KN	APPROXIMATE TO SEA LEVEL FUEL	TO SEA LEVEL TIME	TO SEA LEVEL DISTANCE	RATE OF DESCENT
280	77	4.5	41	3950
310	62	3.3	30	52[illegible]
345	49	2.4	23	5650
385	37	1.7	16	7185
425	26	1.2	11	9200
465	17	.8	7	11850
505	9	.4	4	15450
550	4	.2	2	20700
595	0	0	0	27900

CONFIGURATION: Clean
WEIGHT: 15323 Lbs.

APPROXIMATE				CAS KN	PRESSURE ALTITUDE FEET
RATE OF DESCENT	TO SEA LEVEL DISTANCE	TO SEA LEVEL TIME	TO SEA LEVEL FUEL		
2700	76	8.6	132	245	45000
2755	61	6.7	114	250	40000
3000	46	5.0	92	310	35000
3650	33	3.6	71	345	30000
4750	24	2.5	53	385	25000
6250	16	1.7	37	425	20000
8300	10	1.1	23	465	15000
11000	6	0.6	12	505	10000
14900	3	0.3	5	550	5000
21450	0	0	0	595	SEA LEVEL

CONFIGURATION:
WEIGHT:

CAS	APPROXIMATE TO SEA LEVEL FUEL	TO SEA LEVEL TIME	TO SEA LEVEL DISTANCE	RATE OF DESCENT

REMARKS: (1) GROSS WEIGHTS BASED ON FUEL DENSITY OF 6.5 Lbs/Gal
(2) DESCEND AT CONSTANT MACH NUMBER = 0.9
(3) DESCEND AT IDLE RPM

Rate of Descent: FEET PER MINUTE
DISTANCE: MILES (NAUTICAL)
TIME: MINUTES
FUEL: LBS.
CAS: CALIBRATED AIRSPEED
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal

Figure A—5. Descent Chart (Sheet 2 of 2)

LANDING DISTANCE — FEET

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-1,-1A

GROSS WEIGHT LB	BEST CAS FOR APPROACH		40 DEGREE FLAPS - HARD SURFACE - NO WIND							
	POWER OFF	POWER ON	AT SEA LEVEL		AT 2000 FT		AT 4000 FT		AT 6000 FT	
	KN	KN	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'
18500	167	167	3660	5370	3850	5670	4120	6000	4420	6390
16500	158	158	3280	4780	3470	5100	3710	5420	3960	5730
14500	147	147	2880	4220	3110	4480	3310	4810	3480	5100

REMARKS: (1) NO CONSERVATISM

(2) DISTANCES BASED ON LANDING TECHNIQUE SHOWN IN SECTION II

LEGEND

KN-KNOTS
CAS-CALIBRATED AIRSPEED

DATA AS OF: 28 September 1953
DATA BASIS: ESTIMATES

Figure A—6. Landing Distances

MAXIMUM ENDURANCE

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 Lb bombs + eight 5" HVAR
WEIGHT: 25190 Lb

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 Lb bombs + eight 5" HVAR
WEIGHT: 23508 Lb

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
3125	84	205	SEA LEVEL	195	83	2970
3100	86	200	5000	190	85	2840
3015	88	200	10000	190	87	2785
3050	90	205	15000	190	89	2780
			20000	195	91	2775
			25000			
			30000			
			35000			
			40000			
			45000			
			50000			
			55000			

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 Lb bombs + eight 5" HVAR
WEIGHT: 21826 Lb

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 Lb bombs + eight 5" HVAR
WEIGHT: 20144 Lb

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2820	81	185	SEA LEVEL	180	81	2685
2655	83	180	5000	175	82	2495
2575	85	180	10000	170	84	2380
2540	87	180	15000	170	86	2320
2520	89	180	20000	170	88	2300
2565	93	180	25000	175	91	2310
			30000			
			35000			
			40000			
			45000			
			50000			
			55000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN
LB/HR. - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–7. Maximum Endurance Chart (Sheet 1 of 6)

MAXIMUM ENDURANCE

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 25380 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 23760 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2750	81	215	SEA LEVEL	210	80	2625
2660	83	220	5000	210	82	2495
2580	85	225	10000	210	84	2400
2530	87	225	15000	215	85	2340
2495	89	230	20000	220	87	2300
2470	91	235	25000	225	90	2275
2470	94	235	30000	225	92	2280
			35000			
			40000			
			45000			
			50000			
			55000			

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 22140 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 20520 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2510	79	205	SEA LEVEL	200	78	2390
2335	81	205	5000	200	80	2185
2225	82	205	10000	195	81	2060
2155	84	205	15000	195	83	1975
2110	86	210	20000	200	84	1925
2085	88	215	25000	210	86	1900
2095	90	215	30000	210	89	1910
			35000	210	93	1945
			40000			
			45000			
			50000			
			55000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN
LB/HR. - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–7. Maximum Endurance Chart (Sheet 2 of 6)

MAXIMUM ENDURANCE

STANDARD DAY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 18900 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2280	77	195	SEA LEVEL	190	76	2170
2050	78	195	5000	190	77	1940
1910	80	195	10000	185	78	1790
1810	81	190	15000	185	80	1670
1750	83	195	20000	190	81	1600
1725	85	200	25000	190	83	1560
1725	87	200	30000	190	85	1540
1755	91	200	35000	190	88	1565
			40000	200	94	1665
			45000			
			50000			
			55000			

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 25065 Lbs.

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 23467 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LB/HR.	%RPM				%RPM	LBS/HR.
2620	80	235	SEA LEVEL	225	80	2530
2575	82	225	5000	220	81	2380
2440	84	220	10000	220	83	2270
2370	85	220	15000	210	84	2190
2330	87	225	20000	220	86	2150
2310	90	235	25000	225	88	2150
2360	93	240	30000	235	90	2150
			35000			
			40000			
			45000			
			50000			
			55000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–7. Maximum Endurance Chart (Sheet 3 of 6)

MAXIMUM ENDURANCE

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 21869 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2440	79	215	SEA LEVEL	205	77	2330
2265	80	210	5000	200	79	2145
2130	81	205	10000	200	80	2005
2040	83	210	15000	200	82	1900
1995	84	210	20000	205	83	1840
1995	86	215	25000	210	85	1840
1975	89	220	30000	215	88	1810
2020	93	230	35000	220	91	1835
			40000			
			45000			
			50000			
			55000			

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 18673 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2205	76	200	SEA LEVEL	190	75	2080
2040	77	190	5000	185	76	1825
1890	79	190	10000	185	77	1780
1780	80	190	15000	185	79	1670
1700	81	195	20000	185	80	1580
1670	83	200	25000	190	82	1510
1655	86	205	30000	190	84	1510
1655	89	210	35000	200	87	1480
			40000	200	92	1545
			45000			
			50000			
			55000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–7. Maximum Endurance Chart (Sheet 4 of 6)

MAXIMUM ENDURANCE

STANDARD DAY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 21990 Lbs.

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 20308 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2410	78	220	SEA LEVEL	205	77	2300
2190	80	215	5000	205	78	2050
2080	81	215	10000	200	80	1930
2020	83	215	15000	200	81	1860
1970	84	215	20000	210	83	1805
1950	86	220	25000	210	85	1790
1970	89	220	30000	210	87	1800
1980	92	225	35000	210	91	1805
			40000			
			45000			
			50000			
			55000			

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 18626 Lbs.

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 16944 Lbs.

APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LBS/HR.	%RPM				%RPM	LBS/HR.
2175	76	200	SEA LEVEL	190	75	2060
1910	77	195	5000	190	76	1785
1780	78	195	10000	190	77	1650
1705	80	190	15000	185	79	1560
1660	81	195	20000	185	80	1540
1625	83	200	25000	190	82	1455
1620	85	205	30000	195	84	1445
1615	89	205	35000	195	87	1435
1700	94	210	40000	195	92	1510
			45000			
			50000			
			55000			

REMARKS:

CAS - CALIBRATED AIRSPEED, KN
LB/HR. - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—7. Maximum Endurance Chart (Sheet 5 of 6)

AN 01-65BJD-1

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean WEIGHT: 18500 Lbs.				CONFIGURATION: Clean WEIGHT: 16631 Lbs.		
APPROXIMATE		CAS KN	PRESSURE ALTITUDE FEET	CAS KN	APPROXIMATE	
LB /HR.	%RPM				%RPM	LB /HR.
2050	75	204	SEA LEVEL	195	73	1925
1860	76	208	5000	195	74	1730
1715	77	208	10000	195	76	1595
1610	78	208	15000	195	77	1495
1535	80	208	20000	195	78	1405
1475	82	208	25000	200	80	1335
1445	84	208	30000	200	82	1300
1460	86	217	35000	204	84	1290
1500	90	226	40000	208	88	1310
1575	96	226	45000	217	93	1380
			50000			
			55000			

CONFIGURATION: WEIGHT:				CONFIGURATION: WEIGHT:		
APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
/HR.	%RPM				%RPM	/HR.

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/gal.

Figure A--7. Maximum Endurance Chart (Sheet 6 of 6)

COMBAT ALLOWANCE CHART

STANDARD DAY

MODEL(S): F-84F ENGINE(S) YJ65-W-1

AT ALTITUDE FEET	FUEL REQUIRED POUNDS PER MINUTE	
	96 % RPM (NORMAL POWER) MAX CONTINUOUS	100 % RPM (MILITARY POWER) 30 MINUTE LIMIT
SEA LEVEL	121	149
5000	107	131
10000	92	114
15000	81	100
20000	70	86
25000	61	75
30000	53	62
35000	44	52
40000	35	40

REMARKS:

(1) Clean + two 230 Gal. Tanks configuration

DATA AS OF: 4 September 1952 FUEL GRADE: JP-3, JP-4

DATA BASIS: Estimates FUEL DENSITY: 6.5 Lbs/Gal

Figure A–8. Combat Allowance Chart (Sheet 1 of 2)

COMBAT ALLOWANCE CHART

STANDARD DAY

MODEL(S): F-84F ENGINE(S) YJ65-W-1

AT ALTITUDE FEET	FUEL REQUIRED POUNDS PER MINUTE	
	96 % RPM (NORMAL POWER) MAX. CONTINUOUS	100 % RPM (MILITARY POWER) 30 MINUTE LIMIT
SEA LEVEL	131	156
5000	114	137
10000	100	119
15000	87	103
20000	76	90
25000	66	77
30000	56	65
35000	46	53
40000	37	42
45000	28	33

REMARKS:

(1) CLEAN CONFIGURATION

DATA AS OF: 4 September 1952 FUEL GRADE: JP-3, JP-4

DATA BASIS: Estimates FUEL DENSITY: 6.5 lbs/Gal

Figure A—8. Combat Allowance Chart (Sheet 2 of 2)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal. tanks + two
WEIGHT: 25190 Lbs. 1000 Lb. bombs + eight 5" HVARS

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/ HR	TAS	CAS KN				CAS KN	TAS	LB/HR
6550	390	390	96	SEA LEVEL	96	390	390	6560
5400	390	364	96	5000	96	365	390	5500
4840	385	338	96	10000	96	340	390	4860
4280	385	310	96	15000	96	315	390	4290
3720	375	280	96	20000	96	285	380	3750
				25000				
				30000				
				35000				
				40000				
				45000				
				50000				
				55000				

CONFIGURATION: Clean + two 230 gal. tanks + two
WEIGHT: 23508 Lbs. 1000 Lb. bomb + eight 5" HVARS

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVAR
WEIGHT: 21826 Lbs.

CONFIGURATION: Clean + two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVAR
WEIGHT: 20144 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS	CAS KN				CAS KN	TAS	LB/HR
6575	395	395	96	SEA LEVEL	96	395	395	6585
5600	395	370	96	5000	96	370	395	5640
4900	395	345	96	10000	96	350	400	4930
4310	395	320	96	15000	96	325	400	4325
3780	390	290	96	20000	96	295	400	3810
3230	380	260	96	25000	96	270	390	3265
				30000				
				35000				
				40000				
				45000				
				50000				
				55000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB/HR - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–9. Maximum Continuous Power Summary Chart (Sheet 1 of 7)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 25380 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 23760 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/	TAS	CAS KN				CAS KN	TAS	/HR
7130	500	500	96	SEA LEVEL	96	505	505	7125
6350	505	470	96	5000	96	475	510	6360
5600	510	445	96	10000	96	450	515	5620
4900	515	420	96	15000	96	420	515	4930
4265	515	395	96	20000	96	395	515	4275
3720	510	355	96	25000	96	360	515	3700
3105	490	320	96	30000	96	325	500	3140
				35000				
				40000				
				45000				
				50000				
				55000				

CONFIGURATION: Clean + four 230 gal. tanks.
WEIGHT: 22140 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks.
WEIGHT: 20520 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/ HR	TAS	CAS KN				CAS KN	TAS	LB/HR
7120	505	505	96	SEA LEVEL	96	505	505	7125
6350	510	480	96	5000	96	480	510	6350
5630	515	450	96	10000	96	450	515	5625
4950	520	425	96	15000	96	425	520	4925
4280	520	395	96	20000	96	395	520	4290
3680	520	365	96	25000	96	365	520	3700
3130	510	330	96	30000	96	335	515	3190
				35000	96	295	490	2630
				40000				
				45000				
				50000				
				55000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB/HR - FUEL CONSUMPTION
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–9. Maximum Continuous Power Summary Chart (Sheet 2 of 7)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 18900 Lbs.

CONFIGURATION: Clean + four 230 gal. tanks
WEIGHT: 17281 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/ HR	TAS	CAS KN				CAS KN	TAS	LB /HR
7125	505	505	96	SEA LEVEL	96	505	505	7130
6350	515	485	96	5000	96	485	515	6370
5625	520	455	96	10000	96	455	520	5625
4925	520	425	96	15000	96	425	520	4925
4295	525	400	96	20000	96	400	525	4305
3740	525	370	96	25000	96	370	525	3750
3210	520	340	96	30000	96	340	525	3225
2645	500	295	96	35000	96	305	510	2675
				40000	96	255	480	2070
				45000				
				50000				
				55000				

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/	TAS	CAS				CAS	TAS	/HR

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB /HR - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal

Figure A–9. Maximum Continuous Power Summary Chart (Sheet 3 of 7)

AN 01-65BJD-1

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 25065 Lbs.

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 23467Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS	CAS KN				CAS KN	TAS	LB/HR
7220	525	525	96	SEA LEVEL	96	530	530	7225
6190	530	510	96	5000	96	510	530	6210
5480	530	465	96	10000	96	465	530	5500
4870	530	435	96	15000	96	435	530	4890
4320	530	405	96	20000	96	405	530	4320
3760	525	375	96	25000	96	375	530	3770
3210	515	335	96	30000	96	340	520	3220
				35000				
				40000				
				45000				
				50000				
				55000				

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/	TAS	CAS				CAS	TAS	/HR

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB/HR - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—9. Maximum Continuous Power Summary Chart (Sheet 4 of 7)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 21869 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET
LB/HR	TAS	CAS KN		
7225	530	530	96	SEA LEVEL
6220	530	510	96	5000
5510	530	465	96	10000
4900	530	435	96	15000
4330	530	405	96	20000
3780	530	375	96	25000
3230	525	345	96	30000
2660	510	305	96	35000
				40000
				45000
				50000
				55000

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 20271 Lbs.

%RPM	APPROXIMATE		
	CAS KN	TAS	LB/HR
96	530	530	7225
96	510	530	6230
96	470	535	5530
96	440	535	4910
96	410	535	4340
96	375	530	3790
96	345	525	3240
96	305	515	2680

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 18673 Lbs.

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET
LB/HR	TAS	CAS KN		
7230	530	530	96	SEA LEVEL
6235	535	505	96	5000
5535	535	470	96	10000
4920	535	440	96	15000
4350	535	410	96	20000
3800	535	380	96	25000
3250	530	350	96	30000
2690	520	310	96	35000
				40000
				45000
				50000
				55000

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 17075 Lbs.

%RPM	APPROXIMATE		
	CAS KN	TAS	LB/HR
96	530	530	7235
96	505	535	6240
96	470	535	5540
96	445	540	4940
96	415	540	4360
96	380	535	3810
96	350	530	3260
96	315	525	2700
96	260	510	2130

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB /HR - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–9. Maximum Continuous Power Summary Chart (Sheet 5 of 7)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 21990 Lbs.

APPROXIMATE LB/HR	APPROXIMATE TAS	APPROXIMATE CAS KN	%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE CAS KN	APPROXIMATE TAS	APPROXIMATE LB/HR
7280	530	530	96	SEA LEVEL	96	535	535	7270
6370	535	505	96	5000	96	505	535	6375
5600	540	475	96	10000	96	475	540	5600
4930	545	450	96	15000	96	450	545	4935
4400	545	415	96	20000	96	415	545	4400
3815	540	385	96	25000	96	385	540	3825
3250	530	345	96	30000	96	345	535	3260
2695	510	305	96	35000	96	310	515	2707
				40000				
				45000				
				50000				
				55000				

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 20308 Lbs.

CONFIGURATION: Clean + two 230 gal. tanks
WEIGHT: 18626 Lbs.

APPROXIMATE LB/HR	APPROXIMATE TAS	APPROXIMATE CAS KN	%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE CAS KN	APPROXIMATE TAS	APPROXIMATE LB/HR
7265	535	535	96	SEA LEVEL	96	535	535	7260
6375	540	510	96	5000	96	510	540	6380
5600	545	480	96	10000	96	480	545	5600
4945	545	455	96	15000	96	455	550	4955
4402	550	420	96	20000	96	420	550	4410
3835	545	385	96	25000	96	390	545	3845
3263	535	350	96	30000	96	350	540	3275
2720	520	310	96	35000	96	315	525	2735
2130	505	270	96	40000	96	275	515	2150
				45000				
				50000				
				55000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB/HR - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—9. Maximum Continuous Power Summary Chart (Sheet 6 of 7)

MAXIMUM CONTINUOUS POWER SUMMARY

MODEL(S): F-84F ENGINE(S): YJ65-W-1

CONFIGURATION: Clean WEIGHT: 18500 Lbs.					CONFIGURATION: Clean WEIGHT: 16631 Lbs.				
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE			
LB/ HR	TAS	CAS KN				CAS KN	TAS	LB/HR	
7840	595	595	96	SEA LEVEL					
6790	590	555	96	5000	96	595	595	7755	
5980	590	515	96	10000	96	560	595	6775	
5240	585	480	96	15000	96	520	590	5950	
4555	575	445	96	20000	96	480	585	5220	
3950	565	405	96	25000	96	445	575	4555	
3350	555	365	96	30000	96	395	570	3950	
2790	545	330	96	35000	96	365	560	3355	
2210	535	285	96	40000	96	330	550	2790	
1645	505	245	96	45000	96	295	540	2225	
				50000	96	250	525	1650	
				55000					

CONFIGURATION: WEIGHT:					CONFIGURATION: WEIGHT:				
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE			
LB/	TAS	CAS				CAS	TAS	/HR	

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
TAS - TRUE AIRSPEED KN.
LB/HR - FUEL CONSUMPTION
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY 6.5 Lbs/Gal.

Figure A—9. Maximum Continuous Power Summary Chart (Sheet 7 of 7)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 25190 TO 23508 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks + two 1000 Lb. bombs + eight 5" HVARS carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1)																
(510)	20	(710)	6728	(570)	20	(720)	(620)	20	(730)	(675)	20	(740)	6728	(725)	20	
(485)	20	(675)	6400	(540)	20	(690)	(590)	20	(700)	(645)	20	(710)	6400	(690)	20	
470	20	655	6200	(525)	20	(670)	(575)	20	(680)	(625)	20	(690)	6200	(670)	20	
455	20	635	6000	510	20	650	(555)	20	(660)	(605)	20	(670)	6000	(650)	20	
440	20	615	5800	495	20	630	540	20	640	(590)	20	(650)	5800	(630)	20	
425	20	595	5600	475	20	610	520	20	620	570	20	630	5600	(610)	20	
415	20	580	5400	460	20	590	505	20	600	550	20	610	5400	(590)	20	
400	20	560	5200	445	20	570	490	20	580	535	20	590	5200	570	20	
390	20	540	5046	435	20	555	475	20	565	520	20	575	5046	555	20	

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW							305	94	4155	270	.75	5	305	96	4125	295	.75	5	80 HW						
300	89	4195	260	.85	0	40 HW	300	91	4080	280	.85	0	295	93	3985	300	.85	5	290	95	3895	320	.90	5	40 HW	280	96	3660	330	.90	10
285	88	3925	285	1.0	0	0	285	90	3835	305	1.0	0	280	92	3780	325	1.00	5	280	94	3700	345	1.00	5	0	280	96	3660	370	1.00	10
280	87	3830	320	1.15	0	40 TW	280	89	3745	340	1.15	0	275	91	3620	355	1.15	5	275	93	3620	380	1.10	5	40 TW	280	96	3660	410	1.10	10
						80 TW							265	90	3460	385	1.30	5	270	92	3490	410	1.25	5	80 TW	280	96	3660	450	1.20	10
						120 TW																			120 TW	280	96	3660	490	1.35	10

Figure A—10. Flight Operation Instruction Chart (Sheet 1 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25190 TO 23508 LBS.

EXT. LOAD Two 230 gal. tanks + two 1000 Lb. bombs + eight 5" HVARS carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
				(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)												

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW																			80 HW						
						40 HW																			40 HW						
						0																			0						
						40 TW																			40 TW						
						80 TW																			80 TW						
						120 TW																			120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 6200 Lbs. of available fuel, you can fly 525 NAUTICAL airmiles by holding 285 KNOT CAS. However, you can fly 670 NAUTICAL airmiles by immediately climbing to 20000 ft. using 100% RPM. At 20000 ft. cruise at 280 KNOT CAS and start let down 10 NAUT miles from home. With an 40 KNOT headwind the range at 20000 ft. would be 670x.9 or 605 NAUTICAL miles. Cruise at 280 KNOT CAS with this wind and start let down 10 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—10. Flight Operation Instruction Chart (Sheet 2 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23508 TO 21826 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVARS carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximums. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
390	20	540	5046	435	20	555	475	20	565	520	20	575	5046	555	20	-
370	20	520	4800	415	20	530	455	20	540	495	20	550	4800	530	20	-
355	20	500	4600	395	20	510	435	20	520	475	20	530	4600	510	20	-
340	20	475	4400	380	20	490	420	20	500	455	20	510	4400	490	20	-
325	20	455	4200	365	20	470	400	20	480	435	20	490	4200	470	20	
310	20	435	4000	350	20	445	380	20	455	415	20	465	4000	450	20	
295	20	410	3800	330	20	425	365	20	435	400	20	445	3800	430	20	
280	20	390	3600	315	20	400	345	20	415	380	20	425	3600	405	20	
265	20	365	3364	295	20	375	325	20	390	355	20	400	3364	380	20	

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW							305	93	4050	270	.75	5	300	95	3920	290	.75	5	80 HW						
300	89	4095	260	.85	0	40 HW	295	90	3885	275	.85	0	290	92	3790	295	.85	5	285	93	3705	315	.85	5	40 HW	275	96	3570	330	.90	10
285	88	3820	285	1.00	0	0	275	89	3580	295	1.00	0	275	90	3510	315	1.00	5	275	92	3480	340	1.00	5	0	275	96	3570	370	1.00	10
275	87	3650	315	1.15	0	40 TW	270	88	3510	330	1.15	0	265	89	3365	345	1.15	5	270	91	3365	370	1.10	5	40 TW	275	96	3570	410	1.10	10
						80 TW							265	89	3365	385	1.25	5	270	91	3365	410	1.25	5	80 TW	270	95	3470	445	1.20	10
						120 TW																			120 TW	270	95	3470	485	1.35	10

Figure A—10. Flight Operation Instruction Chart (Sheet 3 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23508 TO 21826 LBS.

EXT. LOAD Two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVARS carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL LBS.	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL LBS.	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
				(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)												

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW																			80 HW						
						40 HW																			40 HW						
						0																			0						
						40 TW																			40 TW						
						80 TW																			80 TW						
						120 TW																			120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 4800 Lbs. of available fuel, you can fly 415 NAUTICAL airmiles by holding 275 KNOT CAS. However, you can fly 530 NAUTICAL airmiles by immediately climbing to 20000 ft. using 100% RPM. At 20000 ft. cruise at 275 KNOTS CAS and start let down 10 NAUTICAL miles from home. With an 40 KNOT headwind the range at 20000 ft. would be 530x.9 or 475 NAUTICAL miles. Cruise at 275 KNOT CAS with this wind and start let down 10 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—10. Flight Operation Instruction Chart (Sheet 4 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 21826 TO 20144 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVAR carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1))																
265	25	365	3364	295	25	375	325	25	390	355	25	400	3364	380	25	410
235	25	320	3000	265	25	335	290	25	345	315	25	360	3000	340	25	370
220	25	300	2800	245	25	315	270	25	325	295	25	335	2800	320	25	345
205	25	275	2600	230	25	290	255	25	300	275	25	310	2600	295	25	320
190	25	250	2400	210	25	265	235	25	275	255	25	290	2400	275	25	295
170	25	225	2200	195	25	240	215	25	250	235	25	265	2200	255	25	275
155	25	205	2000	175	25	215	195	25	225	215	25	240	2000	235	25	250
140	25	180	1800	160	25	195	180	25	205	195	25	215	1800	210	25	225
130	25	165	1682	150	25	180	165	25	190	185	25	200	1682	200	25	210

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW							300	91	3830	265	.75	5	290	93	3685	280	.75	5	80 HW	285	95	3610	300	.75	10
295	88	3955	255	.85	0	40 HW	290	89	3700	270	.85	0	280	90	3530	285	.85	5	275	92	3410	300	.85	5	40 HW	265	94	3335	320	.85	10
280	87	3650	280	1.00	0	0	275	87	3460	295	1.00	0	270	88	3315	310	1.00	5	265	91	3185	325	1.00	5	0	265	94	3335	360	1.00	10
270	86	3525	310	1.15	0	40 TW	260	86	3290	320	1.15	0	250	87	3075	330	1.15	5	245	89	2980	345	1.15	5	40 TW	260	93	3155	385	1.10	10
						80 TW							250	87	3075	370	1.30	5	245	89	2980	385	1.25	5	80 TW	245	92	2995	410	1.25	10
						120 TW																			120 TW	245	92	2995	450	1.35	10

Figure A—10. Flight Operation Instruction Chart (Sheet 5 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 21826 TO 20144 LBS.

EXT. LOAD Two 230 gal. tanks + two 1000 Lb. bombs + eight 5" HVARS carried entire distance
NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'				IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'				IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	FUEL LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	FUEL LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
420	25	-	3364										3364			
375	25	-	3000										3000			
355	25	-	2800										2800			
330	25	-	2600										2600			
305	25	-	2400										2400			
280	25	-	2200										2200			
260	25	-	2000										2000			
235	25	-	1800										1800			
220	25	-	1682										1682			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW																			80 HW						
						40 HW																			40 HW						
260	96	3165	375	1.00	15	0																			0						
245	95	3010	400	1.10	15	40 TW																			40 TW						
245	95	3010	440	1.20	15	80 TW																			80 TW						
245	95	3010	480	1.35	15	120 TW																			120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 2800 Lbs. of available fuel, you can fly 295 NAUTICAL airmiles by holding 265 KNOT CAS. However, you can fly 335 NAUTICAL airmiles by immediately climbing to 25000 ft. using 100% RPM. At 25000 ft. cruise at 260 KNOT CAS and start let down 15 NAUT. miles from home. With an 40 KNOT headwind the range at 25000 ft. would be 335x1.1 or 370 NAUT miles. Cruise at 245 KNOT CAS with this wind and start let down 15 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—10. Flight Operation Instruction Chart (Sheet 6 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20144 TO 18462 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks + two 1000 lb. bombs + eight 5" HVAR carried entire distance.
NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
130	25	165	1682	150	25	180	165	25	190	185	25	200	1682	200	25	210
110	25	130	1400	125	25	140	140	25	155	155	25	165	1400	165	25	175
80	SL	-	1000	90	5	-	100	25	105	110	25	115	1000	120	25	125
45	SL	-	600	55	5	-	65	10	-	70	15	-	600	75	20	-
15	SL	-	200	20	5	-	25	10	-	25	15	-	200	30	20	-

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
						80 HW							295	91	3770	260	.70	5	285	92	3525	275	.73	5	80 HW	280	94	3430	295	.75	10
290	87	3790	250	.85	0	40 HW	285	88	3605	265	.85	0	280	90	3415	280	.85	5	275	91	3280	300	.85	5	40 HW	265	93	3165	315	.85	10
275	86	3490	275	1.00	0	0	275	87	3230	285	1.00	0	260	88	3085	300	1.00	5	255	90	2950	315	1.00	5	0	250	91	2940	335	1.00	10
265	85	3315	305	1.15	0	40 TW	260	86	3120	315	1.15	0	250	87	2930	325	1.15	5	235	88	2740	335	1.15	5	40 TW	230	90	2685	350	1.15	10
						80 TW							240	86	2815	355	1.30	5	235	88	2749	375	1.30	5	80 TW	230	90	2685	390	1.25	10
						120 TW																			120 TW	230	90	2685	430	1.40	10

Figure A—10. Flight Operation Instruction Chart (Sheet 7 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20144 TO 18462 LBS.

EXT. LOAD Two 230 gal. tanks + two 1000 Lb. bombs + eight 5" HVARS carried entire distance
NO. OF ENGINES OPERATING: 1

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
220	25	-	1682										1682			
185	25	-	1400										1400			
135	25	-	1000										1000			
85	25		600										600			
35	25		200										200			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW						
270	96	3245	310	.75	10	80 HW																			80 HW						
260	95	3045	335	.90	10	40 HW																			40 HW						
245	94	2875	360	1.00	15	0																			0						
235	93	2730	385	1.10	15	40 TW																			40 TW						
235	93	2730	425	1.25	15	80 TW																			80 TW						
235	93	2730	465	1.35	15	120 TW																			120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 1400 Lbs. of available fuel, you can fly 125 NAUTICAL airmiles by holding 275 KNOT CAS. However, you can fly 140 NAUTICAL airmiles by immediately climbing to 2500 ft. using 100% RPM. At 25000 ft. cruise at 245 KNOT CAS and start let down 15 NAUTICAL miles from home. With an 40 KNOT headwind the range at 25000 ft. would be 140 x .9 or 125 NAUT miles. Cruise at 260 KNOT CAS with this wind and start let down 10 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—10. Flight Operation Instruction Chart (Sheet 8 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 25380 TO 23760 POUNDS

EXTERNAL LOAD ITEMS
Four 230 gal tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
(970)	30	(1830)	9718	(1120)	30	(1850)	(1265)	30	(1865)	(1405)	30	(1880)	9718	(1525)	30	(1895)
(960)	30	(1810)	9600	(1110)	30	(1830)	(1250)	30	(1845)	(1390)	30	(1860)	9600	(1510)	30	(1875)
(940)	30	(1780)	9400	(1090)	30	(1800)	(1230)	30	(1815)	(1365)	30	(1830)	9400	(1480)	30	(1840)
920	30	1750	9200	(1065)	30	(1770)	(1210)	30	(1785)	(1340)	30	(1800)	9200	(1455)	30	(1810)
900	30	1720	9000	1045	30	1735	(1185)	30	(1750)	(1310)	30	(1770)	9000	(1430)	30	(1780)
885	30	1695	8800	1025	30	1705	1160	30	1720	(1285)	30	(1735)	8800	(1400)	30	(1745)
865	30	1650	8600	1000	30	1670	1140	30	1690	1260	30	1700	8600	(1375)	30	(1715)
845	30	1620	8400	980	30	1640	1115	30	1655	1235	30	1670	8400	1345	30	1680
820	30	1570	8098	945	30	1585	1075	30	1600	1195	30	1615	8098	1300	30	1630

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	92	3275	325	.70	10
						80 HW							340	89	3290	305	.80	5	330	90	3160	325	.80	10	80 HW	335	92	3275	365	.80	15
345	87	3710	305	.85	0	40 HW	340	88	3465	325	.85	5	340	89	3290	345	.90	5	330	90	3160	365	.90	10	40 HW	315	91	3015	380	.90	15
330	86	3505	330	1.00	0	0	325	87	3305	350	1.00	5	330	88	3135	370	1.00	5	330	90	3165	405	1.00	10	0	315	91	3015	420	1.00	15
320	85	3370	360	1.15	0	40 TW	320	86	3235	385	1.15	5	330	88	3135	410	1.10	5	315	89	3020	430	1.10	10	40 TW	315	91	3015	460	1.10	20
						80 TW							310	87	3000	435	1.20	5	310	88	2940	460	1.20	15	80 TW	300	90	2850	480	1.20	20
						120 TW																			120 TW	300	90	2850	520	1.30	20

Figure A—11. Flight Operation Instruction Chart (Sheet 1 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25380 TO 23760 LBS.

EXT. LOAD Four 230 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL LBS.	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL LBS.	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1680)	30	(1910)	9718	(1825)	30	-							9718			
(1660)	30	(1890)	9600	(1805)	30	-							9600			
(1635)	30	(1855)	9400	(1775)	30	-							9400			
(1605)	30	(1820)	9200	(1740)	30	-							9200			
(1575)	30	(1790)	9000	(1710)	30	-							9000			
(1540)	30	(1755)	8800	(1680)	30	-							8800			
(1510)	30	(1725)	8600	(1645)	30	-							8600			
(1480)	30	(1690)	8400	(1610)	30	-							8400			
1435	30	1645	8098	1560	30	-							8098			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
325	94	3170	395	.70	20	120 HW	300	96	3015	360	.75	25													120 HW						
325	94	3170	385	.80	20	80 HW	300	96	3015	400	.80	30													80 HW						
310	93	2960	405	.90	20	40 HW	300	96	3015	440	.90	30													40 HW						
310	93	2960	445	1.00	25	0	290	95	2790	455	1.00	30													0						
300	92	2840	470	1.10	25	40 TW	290	95	2790	495	1.10	35													40 TW						
300	92	2840	510	1.20	30	80 TW	290	95	2790	535	1.20	40													80 TW						
300	92	2840	550	1.30	30	120 TW	290	95	2790	575	1.30	40													120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 9000 Lbs. of available fuel, you can fly 1045 NAUTICAL airmiles by holding 325 KNOT CAS. However, you can fly 1735 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 290 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 80 KNOT headwind the range at 30000 ft. would be 1735x.80 or 1390 NAUTICAL miles. Cruise at 300 KNOT CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–11. Flight Operation Instruction Chart (Sheet 2 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23760 TO 22140 POUNDS

EXTERNAL LOAD ITEMS

Four 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
820	30	1570	8098	945	30	1585	1075	30	1600	1195	30	1615	8098	1300	30	1630
790	30	1520	7800	915	30	1540	1040	30	1555	1155	30	1565	7800	1260	30	1580
770	30	1485	7600	895	30	1505	1015	30	1520	1130	30	1530	7600	1230	30	1550
750	30	1450	7400	870	30	1470	990	30	1485	1100	30	1500	7400	1200	30	1515
735	30	1420	7200	850	30	1435	965	30	1450	1070	30	1465	7200	1170	30	1480
715	30	1385	7000	830	30	1400	940	30	1420	1050	30	1430	7000	1140	30	1445
695	30	1350	6800	805	30	1365	920	30	1380	1020	30	1395	6800	1110	30	1410
675	30	1315	6600	785	30	1330	895	30	1345	995	30	1360	6600	1080	30	1375
660	30	1295	6478	770	30	1310	880	30	1325	975	30	1340	6478	1065	30	1355

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	330	91	3085	315	.70	10
						80 HW							340	89	3260	310	.80	5	320	89	3045	325	.80	10	80 HW	330	91	3085	355	.80	15
340	86	3590	300	.85	0	40 HW	335	87	3320	320	.85	5	330	88	3070	335	.90	5	320	89	3045	365	.90	10	40 HW	315	90	2845	380	.90	15
330	85	3425	330	1.00	0	0	320	86	3160	345	1.00	5	315	87	2985	365	1.00	5	310	88	2865	385	1.00	10	0	305	89	2780	405	1.00	15
315	84	3255	355	1.15	0	40 TW	310	85	3060	375	1.15	5	310	86	2910	395	1.10	5	310	88	2865	425	1.10	10	40 TW	305	89	2780	445	1.10	20
						80 TW							300	85	2815	425	1.20	5	295	87	2715	445	1.20	15	80 TW	285	88	2625	465	1.20	20
						120 TW																			120 TW	285	88	2625	505	1.35	20

Figure A—11. Flight Operation Instruction Chart (Sheet 3 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23760 TO 22140 LBS.

EXT. LOAD Four 230 gal. tanks carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'				IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'				IF YOU ARE AT 45000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1435	30	1645	8098	1560	30	-							8098			
1390	30	1595	7800	1510	30	-							7800			
1360	30	1560	7600	1480	30	-							7600			
1325	30	1530	7400	1440	30	-							7400			
1295	30	1490	7200	1410	30	-							7200			
1260	30	1460	7000	1370	30	-							7000			
1230	30	1420	6800	1340	30	-							6800			
1195	30	1390	6600	1305	30	-							6600			
1175	30	1365	6478	1285	30	-							6478			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
320	93	3035	340	.70	20	120 HW	305	95	2853	355	.75	25													120 HW						
310	92	2860	365	.80	20	80 HW	295	94	2720	380	.80	25													80 HW						
310	92	2860	405	.90	25	40 HW	295	94	2720	420	.90	30													40 HW						
300	91	2710	430	1.00	25	0	285	93	2590	445	1.00	30													0						
300	91	2710	470	1.10	25	40 TW	285	93	2590	485	1.10	35													40 TW						
285	90	2585	490	1.20	25	80 TW	285	93	2590	525	1.20	40													80 TW						
285	90	2585	530	1.35	30	120 TW	280	92	2530	555	1.30	40													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 7000 Lbs. of available fuel, you can fly 940 NAUTICAL airmiles by holding 315 KNOT CAS. However, you can fly 1420 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 285 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 120 KNOT headwind the range at 30000 ft. would be 1420x.75 or 1065 NAUTICAL miles. Cruise at 305 KNOT CAS with this wind and start let down 25 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption- POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—11. Flight Operation Instruction Chart (Sheet 4 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 22140 TO 20520 POUNDS

EXTERNAL LOAD ITEMS
Four 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
660	30	1295	6478	770	30	1310	880	30	1325	975	30	1340	6478	1065	30	1355
635	30	1245	6200	740	30	1260	845	30	1275	940	30	1290	6200	1025	30	1305
615	30	1210	6000	720	30	1230	820	30	1240	910	30	1255	6000	995	30	1270
595	30	1175	5800	695	30	1190	795	30	1205	880	30	1220	5800	965	30	1230
575	30	1135	5600	670	30	1155	770	30	1170	855	30	1185	5600	930	30	1200
555	30	1100	5400	650	30	1120	740	30	1130	830	30	1145	5400	900	30	1160
540	30	1060	5200	625	30	1080	715	30	1095	800	30	1110	5200	870	30	1125
520	30	1020	5000	600	30	1040	690	30	1055	770	30	1070	5000	840	30	1090
500	30	990	4858	585	30	1010	670	30	1025	750	30	1040	4858	820	30	1055

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	90	2895	305	.70	10
						80 HW							335	88	3180	305	.80	5	315	89	2980	320	.80	10	80 HW	320	90	2895	345	.80	15
340	86	3495	300	.85	0	40 HW	330	87	3180	315	.85	5	315	87	2855	320	.90	5	310	88	2800	345	.90	10	40 HW	300	89	2650	360	.90	15
325	85	3295	325	1.00	0	0	320	86	3010	340	1.00	5	315	87	2855	360	1.00	5	305	87	2660	375	1.00	10	0	300	89	2650	400	1.00	15
310	84	3120	350	1.15	0	40 TW	305	85	2860	365	1.15	5	300	86	2700	385	1.10	5	290	86	2560	400	1.10	10	40 TW	285	88	2480	420	1.10	15
						80 TW							290	85	2620	415	1.20	5	290	86	2560	440	1.20	15	80 TW	285	88	2480	460	1.20	20
						120 TW																			120 TW	285	88	2480	500	1.35	20

Figure A—11. Flight Operation Instruction Chart (Sheet 5 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 22140 TO 20520 LBS.

EXT. LOAD Four 230 gal. tanks carried the entire distance.

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1175	30	1365	6478	1285	30	-							6478			
1130	30	1320	6200	1235	30	-							6200			
1100	30	1280	6000	1200	30	-							6000			
1065	30	1245	5800	1160	30	-							5800			
1030	30	1210	5600	1125	30	-							5600			
995	30	1175	5400	1090	30	-							5400			
960	30	1145	5200	1055	30	-							5200			
930	30	1100	5000	1020	30	-							5000			
905	30	1070	4858	990	30	-							4858			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
305	91	2725	320	.70	20	120 HW	295	93	2605	340	.70	25													120 HW						
305	91	2725	360	.80	20	80 HW	295	93	2605	380	.80	30													80 HW						
305	91	2725	400	.90	25	40 HW	280	92	2440	400	.90	30													40 HW						
285	90	2490	415	1.00	25	0	280	92	2440	440	1.00	30													0						
285	90	2490	455	1.10	25	40 TW	280	92	2440	480	1.10	35													40 TW						
275	89	2400	480	1.20	30	80 TW	270	91	2340	505	1.20	35													80 TW						
275	89	2400	520	1.35	30	120 TW	270	91	2340	545	1.35	40													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 5800 Lbs. of available fuel, you can fly 695 NAUTICAL airmiles by holding 320 KNOT CAS. However, you can fly 1190 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 280 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be 1190x.9 or 1070 NAUT. miles. Cruise at 280 KNOT CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs./Gal.

Figure A—11. Flight Operation Instruction Chart (Sheet 6 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20520 TO 18900 POUNDS

EXTERNAL LOAD ITEMS

Four 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
500	35	990	4858	585	35	1010	670	35	1025	750	35	1040	4858	820	35	1055
480	35	940	4600	560	35	960	640	35	975	715	35	990	4600	780	35	1010
460	35	900	4400	535	35	900	610	35	935	680	35	950	4400	750	35	970
440	35	860	4200	510	35	880	585	35	900	650	35	910	4200	720	35	930
420	35	820	4000	490	35	840	560	35	860	625	35	870	4000	685	35	890
400	35	780	3800	465	35	800	530	35	815	595	35	830	3800	655	35	845
380	35	740	3600	440	35	760	505	35	775	565	35	790	3600	620	35	805
355	35	695	3400	420	35	715	480	35	730	535	35	745	3400	590	35	760
340	35	660	3238	400	35	680	455	35	695	510	35	710	3238	560	35	725

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	310	89	2730	295	.70	10
						80 HW							315	86	2850	280	.80	5	310	87	2695	300	.80	10	80 HW	300	88	2560	320	.80	15
335	85	3385	295	.85	0	40 HW	320	85	3025	305	.85	5	315	86	2850	320	.90	5	310	87	2695	340	.90	10	40 HW	300	88	2560	360	.90	15
320	84	3175	320	1.00	0	0	310	84	2825	330	1.00	5	300	85	2605	345	1.00	5	290	86	2460	360	1.00	10	0	285	87	2370	380	1.00	15
305	83	3005	345	1.15	0	40 TW	295	83	2715	355	1.15	5	285	84	2515	370	1.10	5	290	86	2460	400	1.10	10	40 TW	285	87	2370	420	1.10	20
						80 TW							275	83	2385	395	1.25	5	270	85	2290	415	1.25	15	80 TW	275	86	2230	440	1.25	20
						120 TW																			120 TW	275	86	2230	480	1.35	20

Figure A—11. Flight Operation Instruction Chart (Sheet 7 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20520 TO 18900 LBS.

EXT. LOAD Four 230 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'				IF YOUR ARE AT 30000'				IF YOU ARE AT 35000'				IF YOU ARE AT 40000'				IF YOU ARE AT 45000'			
RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			FUEL LBS.
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																			
905	35	1070	4858	990	35	1085	4858	1090	35	-	4858				4858				
860	35	1020	4600	945	35	1035	4600	1040	35	-	4600				4600				
825	35	980	4400	910	35	995	4400	1000	35	-	4400				4400				
790	35	940	4200	870	35	950	4200	960	35	-	4200				4200				
755	35	900	4000	830	35	910	4000	915	35	-	4000				4000				
720	35	860	3800	790	35	870	3800	875	35	-	3800				3800				
690	35	820	3600	755	35	830	3600	830	35	-	3600				3600				
650	35	775	3400	720	35	790	3400	790	35	-	3400				3400				
620	35	740	3238	685	35	755	3238	755	35	-	3238				3238				

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						EFFEC-TIVE WIND	CRUISING AT 35000'						EFFEC-TIVE WIND	CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'						EFFEC-TIVE WIND
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	
305	90	2625	320	.70	20	120 HW	280	91	2455	335	.70	25	120 HW	270	94	2265	340	.70	30	120 HW							120 HW						120 HW
305	90	2625	360	.80	20	80 HW	280	91	2455	375	.80	25	80 HW	270	94	2265	380	.80	35	80 HW							80 HW						80 HW
285	89	2350	370	.90	20	40 HW	280	91	2455	400	.90	30	40 HW	260	93	2160	405	.90	40	40 HW							40 HW						40 HW
285	89	2350	410	1.00	25	0	280	91	2455	440	1.00	30	0	260	93	2160	445	1.00	40	0							0						0
275	88	2245	435	1.10	25	40 TW	280	91	2455	480	1.10	35	40 TW	260	93	2160	485	1.10	45	40 TW							40 TW						40 TW
275	88	2245	475	1.25	30	80 TW	265	90	2190	500	1.20	35	80 TW	260	93	2160	525	1.20	50	80 TW							80 TW						80 TW
275	88	2245	515	1.35	30	120 TW	265	90	2190	540	1.30	40	120 TW	260	93	2160	565	1.30	55	120 TW							120 TW						120 TW

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 4000 Lbs. of available fuel, you can fly 560 NAUTICAL airmiles by holding 300 KNOT CAS. However, you can fly 860 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 260 KNOT CAS and start let down 40 NAUTICAL miles from home. With an 80 KNOT headwind the range at 35000 ft. would be .8x860 or 690 NAUT. miles. Cruise at 270 KNOT CAS with this wind and start let down 35 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

AN 01-65BJD-1

Figure A—11. Flight Operation Instruction Chart (Sheet 8 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 18900 TO 17281 POUNDS

EXTERNAL LOAD ITEMS: Four 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1))																
340	35	660	3238	400	35	680	455	35	695	510	35	710	3238	560	35	725
315	35	610	3000	370	35	630	425	35	645	475	35	660	3000	525	35	675
295	35	570	2800	350	35	590	400	35	600	445	35	620	2800	490	35	630
275	35	525	2600	320	35	545	370	35	560	415	35	575	2600	460	35	590
250	35	485	2400	300	35	500	340	35	520	385	35	530	2400	420	35	545
230	35	440	2200	275	35	460	315	35	475	350	35	490	2200	390	35	500
210	35	395	2000	250	35	415	290	35	430	320	35	445	2000	360	35	460
190	35	345	1800	225	35	365	260	35	380	290	35	400	1800	325	35	410
170	35	300	1619	205	35	320	235	35	340	265	35	355	1619	295	35	370

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	305	88	2555	285	.65	15
						80 HW							315	86	2830	280	.75	5	295	86	2470	285	.75	10	80 HW	290	87	2405	310	.75	15
330	84	3255	290	.85	0	40 HW	310	85	2835	295	.85	5	300	85	2565	305	.90	5	295	86	2470	325	.90	10	40 HW	275	86	2195	325	.90	15
315	83	3040	315	1.00	0	0	305	84	2695	325	1.00	5	290	84	2435	335	1.00	5	280	85	2255	345	1.00	10	0	275	86	2195	365	1.00	15
300	82	2655	340	1.25	0	40 TW	290	83	2425	350	1.25	5	275	83	2210	355	1.15	5	265	84	2125	370	1.15	10	40 TW	260	85	2075	380	1.15	15
						80 TW							275	83	2210	395	1.25	5	265	84	2125	410	1.25	15	80 TW	260	85	2075	430	1.25	20
						120 TW																			120 TW	250	84	1980	455	1.40	20

Figure A—11. Flight Operation Instruction Chart (Sheet 9 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 18900 TO 17281 LBS.

EXT. LOAD Four 230 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
620	35	740	3238	685	35	755	755	35	-						3238	
580	35	690	3000	640	35	705	705	35	-						3000	
540	35	650	2800	600	35	660	660	35	-						2800	
505	35	605	2600	560	35	620	615	35	-						2600	
470	35	560	2400	515	35	570	570	35	-						2400	
430	35	515	2200	475	35	530	530	35	-						2200	
395	35	470	2000	435	35	480	485	35	-						2000	
360	35	430	1800	395	35	440	440	35	-						1800	
325	35	385	1619	360	35	395	400	35	-						1619	

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
290	88	2365	300	.65	20	120 HW	285	91	2315	330	.70	25	265	92	2070	330	.70	30							120 HW						
290	88	2365	340	.75	20	80 HW	280	90	2190	355	.80	25	265	92	2070	370	.80	35							80 HW						
275	87	2160	355	.90	20	40 HW	280	90	2190	395	.90	30	265	92	2070	410	.90	40							40 HW						
275	87	2160	395	1.00	25	0	270	89	2110	425	1.00	30	255	91	1965	435	1.00	40							0						
260	86	2060	420	1.15	25	40 TW	270	89	2110	465	1.10	35	255	91	1965	475	1.10	45							40 TW						
260	86	2060	460	1.25	30	80 TW	260	88	2020	490	1.20	35	255	91	1965	515	1.20	50							80 TW						
255	85	2025	495	1.40	30	120 TW	260	88	2020	530	1.30	40	255	91	1965	555	1.30	55							120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 2400 Lbs. of available fuel, you can fly 300 NAUTICAL airmiles by holding 305 KNOT CAS. However, you can fly 500 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 255 KNOT CAS and start let down 40 NAUTICAL miles from home. With an 80 KNOT headwind the range at 35000 ft. would be 500x.80 or 400 NAUTICAL miles. Cruise at 265 KNOT CAS with this wind and start let down 35 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—11. Flight Operation Instruction Chart (Sheet 10 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 17281 TO 15662 POUNDS

EXTERNAL LOAD ITEMS
Four 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
170	40	300	1619	205	40	320	235	40	340	265	40	355	1619	295	40	370
150	40	250	1400	175	40	270	205	40	285	230	40	300	1400	255	40	315
105	40	155	1000	125	40	175	145	40	190	165	40	205	1000	185	40	220
65	25	70	600	75	35	85	90	35	95	100	35	110	600	115	40	125
20	SL	-	200	25	5	-	30	10	-	40	15	-	200	45	20	-

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	290	87	2340	270	.65	10
						80 HW							305	85	2595	270	.75	5	290	85	2355	280	.75	10	80 HW	280	86	2200	295	.75	15
320	84	3075	280	.85	0	40 HW	310	84	2705	290	.85	5	290	84	2390	295	.90	5	280	84	2195	305	.90	10	40 HW	270	85	2075	320	.90	15
310	83	2930	310	1.00	0	0	300	83	2535	315	1.00	5	280	83	2250	320	1.00	5	265	83	2070	330	1.00	10	0	260	84	1980	350	1.00	15
300	82	2815	340	1.15	0	40 TW	295	82	2445	345	1.15	5	280	83	2250	360	1.15	5	265	83	2070	370	1.15	10	40 TW	260	84	1980	390	1.15	20
						80 TW							250	82	2055	375	1.25	5	250	82	1935	390	1.25	15	80 TW	240	83	1825	405	1.25	20
						120 TW																			120 TW	240	83	1825	445	1.40	20

Figure A—11. Flight Operation Instruction Chart (Sheet 11 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 17281 TO 15662 LBS.

EXT. LOAD Four 230 gal. tanks carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
325	40	385	1619	360	40	395	400	40	410	420	40	-	1619			
280	40	330	1400	315	40	345	350	40	360	365	40	-	1400			
205	40	235	1000	230	40	245	255	40	260	270	40	-	1000			
130	40	140	600	145	40	150	160	40	165	175	40	-	600			
50	25	-	200	60	30	-	65	35	-	75	40	-	200			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB /HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB /HR	G.S.	R.F.	LET DOWN DIST.
285	87	2205	290	.65	20	120 HW	280	89	2140	320	.70	25	265	91	1955	330	.70	30	235	94	1855	330	.75	40	120 HW						
285	87	2205	330	.75	20	80 HW	280	89	2140	360	.80	30	265	91	1955	370	.80	35	235	94	1855	370	.80	45	80 HW						
265	86	2010	345	.90	20	40 HW	260	88	1940	370	.90	30	265	91	1955	410	.90	40	235	94	1855	410	.90	50	40 HW						
265	86	2010	385	1.00	25	0	260	88	1940	410	1.00	30	250	90	1820	430	1.00	40	235	94	1855	450	1.00	55	0						
250	85	1875	405	1.15	25	40 TW	245	87	1820	430	1.10	35	250	90	1820	470	1.10	45	235	94	1855	490	1.10	60	40 TW						
250	85	1875	445	1.25	30	80 TW	245	87	1820	470	1.20	35	250	90	1820	510	1.20	50	235	94	1855	530	1.20	65	80 TW						
240	84	1800	470	1.40	30	120 TW	245	87	1820	510	1.35	40	250	90	1820	550	1.30	55	235	94	1855	570	1.30	70	120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 1400 Lbs. of available fuel, you can fly 230 NAUTICAL airmiles by holding 265 KNOT CAS. However, you can fly 300 NAUTICAL airmiles by immediately climbing to 40000 ft. using 100% RPM. At 40000 ft. cruise at 235 KNOT CAS and start let down 55 NAUTICAL miles from home. With an 40 KNOT headwind the range at 40000 ft. would be 300x.9 or 270 NAUTICAL miles. Cruise at 235 KNOT CAS with this wind and start let down 50 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—11. Flight Operation Instruction Chart (Sheet 12 of 12)

AIRCRAFT MODEL (S) F-84F	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY	EXTERNAL LOAD ITEMS
ENGINE(S) YJ65-W-1	CHART WT. LIMITS 25380 TO 23760 POUNDS	Four 230 gal tanks dropped when empty NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
(1060)	30	(2290)	9718	(1225)	30	(2310)	(1400)	30	(2325)	(1570)	30	(2340)	9718	(1740)	30	(2355)
(1050)	30	(2270)	9600	(1215)	30	(2290)	(1380)	30	(2305)	(1555)	30	(2320)	9600	(1725)	30	(2335)
(1030)	30	(2240)	9400	(1195)	30	(2260)	(1365)	30	(2275)	(1530)	30	(2290)	9400	(1695)	30	(2300)
1010	30	2210	9200	(1170)	30	(2230)	(1345)	30	(2245)	(1505)	30	(2260)	9200	(1670)	30	(2270)
990	30	2180	9000	1150	30	2195	(1320)	30	(2210)	(1475)	30	(2230)	9000	(1645)	30	(2240)
975	30	2155	8800	1130	30	2165	1295	30	2180	(1450)	30	(2195)	8800	(1615)	30	(2205)
955	30	2110	8600	1105	30	2130	1275	30	2150	1425	30	2160	8600	(1590)	30	(2175)
935	30	2080	8400	1085	30	2100	1250	30	2115	1400	30	2130	8400	1560	30	2140
910	30	2030	8098	1050	30	2045	1210	30	2060	1360	30	2075	8098	1515	30	2090

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	92	3275	325	.7	10
						80 HW							340	89	3290	305	.8	5	330	90	3160	325	.8	10	80 HW	335	92	3275	365	.8	15
345	87	3710	305	.85	0	40 HW	340	88	3465	325	.85	5	340	89	3290	345	.9	5	330	90	3160	365	.9	10	40 HW	315	91	3015	380	.9	15
330	86	3505	330	1.0	0	0	325	87	3305	350	1.0	5	330	88	3135	370	1.0	5	330	90	3160	405	1.0	10	0	315	91	3015	420	1.0	15
320	85	3370	360	1.15	0	40 TW	320	86	3235	385	1.15	5	330	88	3135	410	1.1	5	315	89	3020	430	1.1	10	40 TW	315	91	3015	460	1.1	15
						80 TW							310	87	3000	435	1.2	5	310	88	2940	460	1.2	10	80 TW	300	90	2850	480	1.2	15
						120 TW																			120 TW	300	90	2850	520	1.3	20

Figure A—12. Flight Operation Instruction Chart (Sheet 1 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25380 TO 23760

EXT. LOAD
Four 230 gal tanks dropped when empty.
NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000' RANGE IN AIRMILES			FUEL	IF YOUR ARE AT 30000' RANGE IN AIRMILES			IF YOU ARE AT 35000' RANGE IN AIRMILES			IF YOU ARE AT 40000' RANGE IN AIRMILES			FUEL	IF YOU ARE AT 45000' RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1915)	30	(2370)	9718	(2110)	30	-							9718			
(1895)	30	(2350)	9600	(2090)	30	-							9600			
(1870)	30	(2315)	9400	(2060)	30	-							9400			
(1840)	30	(2280)	9200	(2025)	30	-							9200			
(1810)	30	(2250)	9000	(1995)	30	-							9000			
(1775)	30	(2215)	8800	(1965)	30	-							8800			
(1745)	30	(2185)	8600	(1930)	30	-							8600			
(1715)	30	(2150)	8400	(1895)	30	-							8400			
1670	30	2105	8098	1845	30	-							8098			

CRUISING AT 25000' C.A.S.	APPROX. % RPM	APPROX. LB/HR	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30000' C.A.S.	APPROX. % RPM	APPROX. LB/HR	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 35000' C.A.S.	APPROX. % RPM	APPROX. LB/HR	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	CRUISING AT 40000' C.A.S.	APPROX. % RPM	APPROX. LB/HR	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45000' C.A.S.	APPROX. % RPM	APPROX. LB/HR	APPROX. G.S.	APPROX. R.F.	APPROX. LET DOWN DIST.
325	94	3070	345	.7	20	120 HW	300	96	3015	360	.75	30													120 HW						
325	94	3170	385	.8	20	80 HW	300	96	3015	400	.8	30													80 HW						
310	93	2960	405	.9	25	40 HW	300	96	3015	440	.9	30													40 HW						
310	93	2960	445	1.0	25	0	290	95	2790	455	1.0	35													0						
300	92	2840	470	1.1	25	40 TW	290	95	2790	495	1.1	35													40 TW						
300	92	2840	510	1.2	30	80 TW	290	95	2790	535	1.2	40													80 TW						
300	92	2840	550	1.3	30	120 TW	290	95	2790	575	1.3	45													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 9000 LBs. of available fuel, you can fly 1150 NAUTICAL airmiles by holding 325 KNOT CAS. However, you can fly 2195 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 290 KNOT CAS and start let down 35 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be .9 x 2195 or 1975 NAUTICAL miles. Cruise at 300 KNOTS CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.- Range factor- Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )- RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A-12. Flight Operation Instruction Chart (Sheet 2 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23760 TO 22390 POUNDS

EXTERNAL LOAD ITEMS
Four 230 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
910	30	2030	8098	1050	30	2045	1210	30	2060	1360	30	2075	8098	1515	30	2090
880	30	1980	7800	1020	30	2000	1175	30	2015	1320	30	2025	7800	1475	30	2040
840	25	1915	7400	975	25	1925	1125	30	1950	1265	30	1960	7400	1415	30	1975
805	10	1830	7000	935	15	1850	1075	20	1875	1215	25	1890	7000	1355	25	1895
780	SL	1775	6728	905	5	1795	1045	10	1815	1175	15	1830	6728	1315	20	1850

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	330	91	3085	315	.7	10
						80 HW							340	89	3260	310	.8	5	320	89	3045	325	.8	10	80 HW	330	91	3085	355	.8	15
340	86	3590	300	.85	0	40 HW	335	87	3320	320	.85	5	330	88	3070	335	.9	5	320	89	3045	365	.9	10	40 HW	315	90	2845	380	.9	15
330	85	3425	330	1.00	0	0	320	86	3160	345	1.00	5	315	87	2985	365	1.0	5	310	88	2865	385	1.0	10	0	305	89	2780	405	1.0	15
315	84	3255	355	1.15	0	40 TW	310	85	3060	375	1.15	5	310	86	2910	395	1.1	5	310	88	2865	425	1.1	10	40 TW	305	89	2780	445	1.1	15
						80 TW							300	85	2815	425	1.2	5	295	87	2715	445	1.2	10	80 TW	285	88	2625	465	1.2	15
						120 TW																			120 TW	285	88	2625	505	1.35	20

Figure A—12. Flight Operation Instruction Chart (Sheet 3 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23760 TO 22390

EXT. LOAD

Four 230 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL LBS.	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL LBS.	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1670	30	2105	8098	1845	30	-							8098			
1625	30	2055	7800	1795	30	-							7800			
1560	30	1990	7400	1750	30	-							7400			
1490	30	1920	7000	1655	30	-							7000			
1455	25	1865	6728	1610	30	-							6728			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
320	93	3035	340	.7	20	120 HW	305	95	2853	355	.75	30													120 HW						
310	92	2860	365	.8	20	80 HW	295	94	2720	380	.80	30													80 HW						
310	92	2860	405	.9	25	40 HW	295	94	2720	420	.90	30													40 HW						
300	91	2710	430	1.0	25	0	285	93	2590	445	1.00	35													0						
300	91	2710	470	1.1	25	40 TW	285	93	2590	485	1.10	35													40 TW						
285	90	2585	490	1.2	30	80 TW	285	93	2590	525	1.20	40													80 TW						
285	90	2585	530	1.35	30	120 TW	280	92	2530	555	1.30	45													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 8098 Lbs. of available fuel, you can fly 1050 NAUTICAL airmiles by holding 320 KNOT CAS. However, you can fly 2045 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 285 KNOT CAS and start let down 35 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be .9 x 2045 or 1840 NAUT miles. Cruise at 295 KNOT CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—12. Flight Operation Instruction Chart (Sheet 4 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 25380 TO 23760 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal tanks carried the entire distance + two 230 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1))																
1005	30	2025	9718	1160	30	2045	1310	30	2060	1470	30	2075	9718	1625	30	2090
995	30	2005	9600	1150	30	2025	1295	30	2040	1455	30	2055	9600	1610	30	2070
975	30	1975	9400	1130	30	1995	1275	30	2010	1430	30	2025	9400	1580	30	2035
955	30	1945	9200	1105	30	1965	1255	30	1980	1405	30	1995	9200	1555	30	2005
935	30	1915	9000	1085	30	1930	1230	30	1945	1375	30	1965	9000	1530	30	1975
920	30	1890	8800	1065	30	1900	1205	30	1915	1350	30	1930	8800	1500	30	1940
900	30	1845	8600	1040	30	1865	1185	30	1885	1325	30	1895	8600	1475	30	1910
880	30	1815	8400	1020	30	1835	1160	30	1850	1300	30	1865	8400	1445	30	1875
855	30	1765	8098	985	30	1780	1120	30	1795	1260	30	1810	8098	1400	30	1825

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	92	3275	325	.70	10
						80 HW							340	89	3290	305	.80	5	330	90	3160	325	.80	5	80 HW	335	92	3275	365	.80	10
345	87	3710	305	.85	0	40 HW	340	88	3465	325	.85	5	340	89	3290	345	.90	5	330	90	3160	365	.90	5	40 HW	315	91	3015	380	.90	10
330	86	3505	330	1.00	0	0	325	87	3305	350	1.00	5	330	88	3135	370	1.00	5	330	90	3160	405	1.00	10	0	315	91	3015	420	1.00	10
320	85	3370	360	1.15	0	40 TW	320	86	3235	385	1.15	5	330	88	3135	410	1.10	5	315	89	3020	430	1.10	10	40 TW	315	91	3015	460	1.10	15
						80 TW							310	87	3000	435	1.20	5	310	88	2940	460	1.20	10	80 TW	300	90	2850	480	1.20	15
						120 TW																			120 TW	300	90	2850	520	1.30	15

Figure A—13. Flight Operation Instruction Chart (Sheet 1 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25380 TO 23760

EXT. LOAD Two 230 gal tanks carried the entire distance + two 230 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1790	30	2105	9718	1960	30	-							9718			
1770	30	2085	9600	1940	30	-							9600			
1745	30	2050	9400	1910	30	-							9400			
1715	30	2015	9200	1875	30	-							9200			
1685	30	1985	9000	1845	30	-							9000			
1650	30	1950	8800	1815	30	-							8800			
1620	30	1920	8600	1780	30	-							8600			
1590	30	1885	8400	1745	30	-							8400			
1545	30	1840	8098	1695	30	-							8098			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
325	94	3170	345	.7	15	120 HW	300	96	3015	360	.75	20													120 HW						
325	94	3170	385	.8	15	80 HW	300	96	3015	400	.80	20													80 HW						
310	93	2960	405	.9	15	40 HW	300	96	3015	440	.90	20													40 HW						
310	93	2960	445	1.0	15	0	290	95	2790	455	1.00	25													0						
300	92	2840	470	1.1	15	40 TW	290	95	2790	495	1.10	25													40 TW						
300	92	2840	510	1.2	20	80 TW	290	95	2790	535	1.20	25													80 TW						
300	92	2840	550	1.3	20	120 TW	290	95	2790	575	1.30	30													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 9000 Lbs. of available fuel, you can fly 1085 NAUTICAL airmiles by holding 325 KNOT CAS. However, you can fly 1930 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 290 KNOT CAS and start let down 25 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be .9x1930 or 1740 NAUTICAL miles. Cruise at 300 KNOT CAS with this wind and start let down 20 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—13. Flight Operation Instruction Chart (Sheet 2 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23760 TO 22390 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal tanks carried the entire distance + two 230 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1)																
855	30	1765	8098	985	30	1780	1120	30	1795	1260	30	1810	8098	1400	30	1825
825	30	1715	7800	955	30	1735	1085	30	1750	1220	30	1760	7800	1360	30	1775
785	25	1650	7400	910	25	1660	1035	30	1685	1165	30	1695	7400	1300	30	1710
750	10	1565	7000	870	15	1585	985	20	1610	1115	25	1625	7000	1240	25	1630
725	SL	1510	6728	840	5	1530	955	10	1550	1075	15	1565	6728	1200	20	1585

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	330	91	3085	315	.70	10
						80 HW							340	89	3260	310	.80	5	320	89	3045	325	.80	5	80 HW	330	91	3085	355	.80	10
340	86	3590	300	.85	0	40 HW	335	87	3320	320	.85	5	330	88	3070	335	.90	5	320	89	3045	365	.90	5	40 HW	315	90	2845	380	.90	10
330	85	3425	330	1.00	0	0	320	86	3160	345	1.00	5	315	87	2985	365	1.00	5	310	88	2865	385	1.00	10	0	305	89	2780	405	1.00	10
315	84	3255	355	1.15	0	40 TW	310	85	3060	375	1.15	5	310	86	2910	395	1.10	5	310	88	2865	425	1.10	10	40 TW	305	89	2780	445	1.10	15
						80 TW							300	85	2815	425	1.20	5	295	87	2715	445	1.20	10	80 TW	285	88	2625	465	1.20	15
						120 TW																			120 TW	285	88	2625	505	1.35	15

Figure A—13. Flight Operation Instruction Chart (Sheet 3 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23760 TO 22390 LBS.

EXT. LOAD Two 230 gal tanks carried the entire distance + two 230 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1545	30	1840	8098	1695	30								8098			
1500	30	1790	7800	1645	30								7800			
1435	30	1725	7400	1575	30								7400			
1370	30	1655	7000	1505	30								7000			
1330	25	1600	6728	1460	30								6728			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
320	93	3035	340	.70	15	120 HW	305	95	2853	355	.75	20													120 HW						
310	92	2860	365	.80	15	80 HW	295	94	2720	380	.80	20													80 HW						
310	92	2860	405	.90	15	40 HW	295	94	2720	420	.90	20													40 HW						
300	91	2710	430	1.00	15	0	285	93	2590	445	1.00	25													0						
300	91	2710	470	1.10	15	40 TW	285	93	2590	485	1.10	25													40 TW						
285	90	2585	490	1.20	20	80 TW	285	93	2590	525	1.20	25													80 TW						
285	90	2585	530	1.35	20	120 TW	280	92	2530	555	1.30	30													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 9000 Lbs. of available fuel, you can fly 985 NAUTICAL airmiles by holding 320 KNOT CAS. However, you can fly 1780 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 285 KNOTS CAS and start let down 25 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be .9x1780 or 1600 NAUT miles. Cruise at 295 KNOT CAS with this wind and start let down 20 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )- RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—13. Flight Operation Instruction Chart (Sheet 4 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 21990 TO 20308 POUNDS

EXTERNAL LOAD ITEMS

Two 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHARTS: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	Lbs	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	Lbs	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
725	35	1510	6728	840	35	1530	955	35	1550	1075	35	1565	6728	1200	35	1585
715	35	1485	6600	825	35	1505	940	35	1520	1055	35	1540	6600	1175	35	1560
695	35	1440	6400	805	35	1460	915	35	1480	1030	35	1500	6400	1145	35	1520
670	35	1400	6200	780	35	1420	890	35	1440	1000	35	1455	6200	1110	35	1475
650	35	1360	6000	755	35	1380	860	35	1400	970	35	1415	6000	1080	35	1430
630	35	1320	5800	735	35	1340	835	35	1355	940	35	1370	5800	1050	35	1390
610	35	1275	5600	710	35	1295	810	35	1315	910	35	1330	5600	1015	35	1345
590	35	1230	5400	685	35	1250	780	35	1270	880	35	1290	5400	980	35	1300
570	35	1190	5200	660	35	1210	755	35	1230	850	35	1240	5200	950	35	1260
550	35	1155	5046	640	35	1175	735	35	1195	825	35	1210	5046	925	35	1230

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	lb/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	lb/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	90	2790	330	.7	10
						80 HW							340	87	3030	310	.8	5	330	88	2820	330	.8	5	80 HW	330	89	2680	355	.8	10
355	85	3440	315	.9	0	40 HW	340	86	3065	320	.9	0	330	86	2825	335	.9	5	320	87	2680	355	.9	5	40 HW	315	88	2560	380	.9	10
335	84	3210	335	1.0	0	0	320	85	2900	345	1.0	0	315	85	2705	360	1.0	5	310	86	2545	380	1.0	10	0	305	87	2435	400	1.0	10
320	83	3020	360	1.15	0	40 TW	310	84	2755	370	1.15	0	295	84	2495	380	1.15	5	295	85	2400	400	1.1	10	40 TW	305	87	2435	440	1.1	15
						80 TW							295	84	2495	420	1.3	5	295	85	2400	440	1.25	10	80 TW	290	86	2295	465	1.25	15
						120 TW																			120 TW	290	86	2295	505	1.35	15

Figure A—14. Flight Operation Instruction Chart (Sheet 1 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 21990 TO 20308 lb.

EXT. LOAD Two 230 Gal. Tanks carried entire distance.

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	lbs	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	lbs	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1330	35	1600	6728	1460	35	1615	1590	35					6728			
1310	35	1570	6600	1435	35	1590	1560	35					6600			
1275	35	1530	6400	1395	35	1545	1520	35					6400			
1240	35	1490	6200	1355	35	1505	1475	35					6200			
1200	35	1450	6000	1315	35	1460	1435	35					6000			
1165	35	1405	5800	1280	35	1420	1395	35					5800			
1130	35	1365	5600	1240	35	1380	1350	35					5600			
1090	35	1320	5400	1200	35	1335	1310	35					5400			
1055	35	1280	5200	1160	35	1290	1265	35					5200			
1025	35	1245	5046	1130	35	1260	1235	35					5046			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	APPROXIMATE lb/HR	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	APPROXIMATE lb/HR	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	APPROXIMATE lb/HR	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	APPROXIMATE lb/HR	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	APPROXIMATE lb/HR	APPROXIMATE G.S.	APPROXIMATE R.F.	APPROXIMATE LET DOWN DIST.
330	91	2675	350	.7	15	120 HW	315	92	2525	365	.75	20	290	94	2345	370	.75	25							120 HW						
320	90	2570	380	.8	15	80 HW	315	92	2525	405	.8	20	290	94	2345	410	.85	25							80 HW						
305	89	2440	400	.9	15	40 HW	295	91	2375	425	.9	20	290	94	2345	450	.9	30							40 HW						
305	89	2440	440	1.0	15	0	295	91	2375	465	1.0	25	285	93	2255	480	1.0	30							0						
295	88	2295	460	1.1	15	40 TW	285	90	2260	485	1.1	25	285	93	2255	520	1.1	35							40 TW						
295	88	2295	500	1.2	20	80 TW	285	90	2260	525	1.2	25	285	93	2255	560	1.2	35							80 TW						
295	88	2295	540	1.3	20	120 TW	285	90	2260	565	1.3	30	285	93	2255	600	1.3	40							120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 5400 lbs of available fuel, you can fly 780 NAUTICAL airmiles by holding 315 KNOT CAS. However, you can fly 1270 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 285 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be 1270x.9 or 1145 NAUT. miles. Cruise at 290 KNOTS CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB /HR-Fuel consumption- LBS per hour
RANGE- NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 lbs/gal.

Figure A—14. Flight Operation Instruction Chart (Sheet 2 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20308 TO 18626 POUNDS

EXTERNAL LOAD ITEMS
Two 230 Gal. Tanks carried entire distance.

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952

BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	lbs	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	lbs	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
550	35	1155	5046	640	35	1175	735	35	1195	825	35	1210	5046	925	35	1230
525	35	1100	4800	610	35	1120	700	35	1140	785	35	1160	4800	880	35	1170
505	35	1060	4600	690	35	1075	675	35	1090	755	35	1110	4600	850	35	1130
485	35	1010	4400	565	35	1030	645	35	1050	725	35	1070	4400	810	35	1085
465	35	970	4200	540	35	985	620	35	1000	695	35	1020	4200	780	35	1040
440	35	920	4000	515	35	940	590	35	960	660	35	975	4000	740	35	995
420	35	880	3800	490	35	895	560	35	910	630	35	930	3800	710	35	950
400	35	830	3600	465	35	845	535	35	865	600	35	880	3600	675	35	900
375	35	770	3364	435	35	790	500	35	805	565	35	825	3364	635	35	845

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	Lb/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	Lb/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	Lb/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	88	2565	305	.70	10
						80 HW							335	86	2895	305	.75	5	325	87	2640	320	.80	5	80 HW	310	87	2445	335	.80	10
350	85	3335	310	.85	0	40 HW	320	85	2945	315	.85	0	320	85	2670	325	.90	5	310	86	2495	340	.90	5	40 HW	290	86	2300	355	.90	10
330	84	3090	330	1.0	0	0	310	84	2735	335	1.0	0	305	84	2505	350	1.00	5	295	85	2350	365	1.00	10	0	290	86	2300	395	1.00	10
315	83	2925	355	1.15	0	40 TW	300	83	2600	360	1.15	0	285	83	2315	375	1.10	5	280	84	2200	385	1.10	10	40 TW	275	85	2115	410	1.10	10
						80 TW							285	83	2315	405	1.25	5	280	84	2200	425	1.25	10	80 TW	275	85	2115	450	1.25	15
						120 TW																			120 TW	275	85	2115	490	1.35	15

Figure A—14. Flight Operation Instruction Chart (Sheet 3 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20308 TO 18626 LBS.

EXT. LOAD Two 230 gal. tanks carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1025	35	1245	5046	1130	35	1260	1235	35					5046			
980	35	1190	4800	1075	35	1200	1180	35					4800			
930	35	1145	4600	1035	35	1160	1130	35					4600			
905	35	1100	4400	995	35	1110	1090	35					4400			
865	35	1055	4200	950	35	1070	1040	35					4200			
830	35	1010	4000	910	35	1020	995	35					4000			
790	35	960	3800	870	35	980	950	35					3800			
750	35	915	3600	830	35	930	905	35					3600			
705	35	860	3364	780	35	875	855	35					3364			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
310	89	2415	325	.70	15	120 HW	295	90	2275	345	.75	20	290	93	2210	370	.75	25							120 HW						
300	88	2295	350	.80	15	80 HW	295	90	2275	385	.80	20	280	92	2135	395	.80	25							80 HW						
300	88	2295	390	.90	15	40 HW	285	89	2140	405	.90	20	280	92	2135	435	.90	30							40 HW						
290	87	2170	415	1.00	15	0	285	89	2140	445	1.00	25	275	91	2055	470	1.00	30							0						
290	87	2170	455	1.10	20	40 TW	285	89	2140	485	1.10	25	275	91	2055	510	1.10	35							40 TW						
285	86	2080	480	1.20	20	80 TW	280	88	2060	515	1.20	25	275	91	2055	550	1.20	35							80 TW						
285	86	2080	520	1.30	20	120 TW	280	88	2060	555	1.30	30	275	91	2055	590	1.30	40							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 4400 Lbs. of available fuel, you can fly 725 NAUTICAL airmiles by holding 295 KNOT CAS. However, you can fly 1070 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 275 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be 1070x.9 or 965 NAUT. miles. Cruise at 280 KNOT CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—14. Flight Operation Instruction Chart (Sheet 4 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 18626 TO 16944 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
375	40	770	3364	435	40	790	500	40	805	565	40	825	3364	635	40	845
355	40	730	3200	425	40	750	480	40	765	535	40	790	3200	600	40	805
330	40	685	3000	390	40	700	450	40	720	505	40	735	3000	565	40	755
310	40	635	2800	365	40	650	420	40	670	470	40	685	2800	530	40	705
290	40	585	2600	340	40	600	390	40	620	440	40	640	2600	495	40	655
270	40	530	2400	315	40	550	360	40	570	410	40	585	2400	460	40	605
245	40	480	2200	290	40	500	330	40	520	375	40	535	2200	420	40	550
220	40	430	2000	260	40	450	300	40	470	340	40	485	2000	385	40	500
200	40	375	1800	235	40	400	270	40	415	305	40	430	1800	345	40	450
190	40	345	1682	220	40	365	255	40	385	290	40	400	1682	330	40	420

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	315	87	2420	300	.70	10
						80 HW							325	85	2650	290	.75	5	315	86	2430	305	.75	5	80 HW	305	86	2270	325	.80	10
330	83	3075	290	.85	0	40 HW	320	84	2715	300	.85	0	305	84	2450	310	.90	5	295	85	2275	325	.90	5	40 HW	285	85	2115	340	.90	10
320	82	2945	320	1.00	0	0	305	83	2560	325	1.00	0	295	83	2310	335	1.00	5	285	84	2165	350	1.00	10	0	285	85	2115	380	1.00	10
305	81	2790	345	1.15	0	40 TW	295	82	2455	355	1.15	0	280	82	2160	360	1.15	5	270	83	2030	375	1.15	10	40 TW	270	84	1965	400	1.10	10
						80 TW							280	82	2160	400	1.30	5	270	83	2030	415	1.25	10	80 TW	270	84	1965	440	1.25	15
						120 TW																			120 TW	260	83	1895	470	1.35	15

Figure A—14. Flight Operation Instruction Chart (Sheet 5 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 18626 TO 16944 LBS.

EXT. LOAD Two 230 gal. tanks carried entire distance.

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
705	40	860	3364	780	40	875	855	40	890	905	40		3364			
670	40	820	3200	740	40	835	810	40	850	865	40		3200			
635	40	770	3000	700	40	785	765	40	800	815	40		3000			
590	40	720	2800	655	40	735	720	40	750	764	40		2800			
550	40	675	2600	610	40	690	670	40	700	715	40		2600			
510	40	625	2400	565	40	640	620	40	655	665	40		2400			
470	40	575	2200	520	40	590	575	40	600	610	40		2200			
430	40	520	2000	475	40	540	525	40	550	560	40		2000			
385	40	470	1800	430	40	485	475	40	500	510	40		1800			
365	40	440	1682	405	40	455	450	40	470	480	40		1682			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
305	88	2270	320	.70	15	120 HW	295	89	2140	340	.70	20	280	91	2040	355	.75	25	260	95	1965	370	.75	30	120 HW						
295	87	2155	345	.80	15	80 HW	285	88	2015	360	.80	20	270	90	1945	385	.80	25	260	95	1965	410	.85	35	80 HW						
280	86	2030	365	.90	15	40 HW	285	88	2015	400	.90	20	270	90	1945	420	.90	30	260	95	1965	450	.90	40	40 HW						
280	86	2030	405	1.00	15	0	275	87	1895	425	1.00	25	270	90	1945	465	1.00	30	255	94	1890	480	1.00	40	0						
270	85	1900	425	1.10	15	40 TW	275	87	1895	465	1.10	25	260	89	1840	490	1.10	30	255	94	1890	520	1.10	45	40 TW						
270	85	1900	465	1.20	20	80 TW	275	87	1895	505	1.20	25	260	89	1840	530	1.20	35	255	94	1890	560	1.20	45	80 TW						
270	85	1900	505	1.35	20	120 TW	265	86	1815	525	1.30	30	260	89	1840	570	1.30	35	255	94	1890	600	1.25	50	120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 2600 Lbs. of available fuel, you can fly 340 NAUTICAL airmiles by holding 305 KNOT CAS. However, you can fly 600 NAUTICAL airmiles by immediately climbing to 40000 ft. using 100% RPM. At 40000 ft. cruise at 255 KNOTS CAS and start let down 40 NAUTICAL miles from home. With an 80 KNOT headwind the range at 40000 ft. would be 600x.85 or 510 NAUT. miles. Cruise at 260 KNOT CAS with this wind and start let down 35 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—14. Flight Operation Instruction Chart (Sheet 6 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 16944 TO 15262 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
190	40	345	1682	220	40	365	255	40	385	290	40	400	1682	330	40	420
155	40	270	1400	185	40	290	215	40	310	245	40	325	1400	275	40	345
110	40	165	1000	135	40	185	155	40	205	175	40	220	1000	195	40	240
65	30	75	600	80	30	90	95	35	95	105	40	115	600	120	40	135
20	SL	-	200	30	5	-	35	10	-	40	15	-	200	45	20	-

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	290	85	2160	275	.65	10
						80 HW							315	84	2510	280	.75	5	295	84	2175	280	.75	5	80 HW	290	85	2160	315	.75	10
335	83	3035	295	.85	0	40 HW	320	83	2650	300	.85	0	305	83	2330	305	.85	5	295	84	2175	320	.90	5	40 HW	280	84	1985	335	.90	10
315	82	2820	315	1.00	0	0	300	82	2440	320	1.00	0	290	82	2175	330	1.00	5	275	83	1990	340	1.00	10	0	270	83	1880	360	1.00	10
295	80	2625	335	1.15	0	40 TW	280	81	2265	340	1.15	0	265	82	1870	360	1.15	5	260	82	1870	360	1.15	10	40 TW	255	82	1765	380	1.10	10
						80 TW							265	81	1965	385	1.30	5	250	81	1795	390	1.25	10	80 TW	255	82	1765	420	1.25	15
						120 TW																			120 TW	240	81	1715	445	1.35	15

Figure A—14. Flight Operation Instruction Chart (Sheet 7 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 16944 TO 15262

EXT. LOAD Two 230 gal. tanks carried entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
365	40	440	1682	405	40	455	450	40	470	480	40	-	1682			
305	40	365	1400	340	40	375	375	40	395	405	40	-	1400			
220	40	255	1000	245	40	270	270	40	285	295	40	-	1000			
135	40	145	600	150	40	160	170	40	175	185	40	-	600			
50	25	-	200	60	30	-	65	35	-	75	40	-	200			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
295	86	2060	300	.70	15	120 HW	285	87	1915	325	.70	20	270	89	1830	340	.70	25	255	93	1785	365	.75	30	120 HW						
295	86	2060	340	.80	15	80 HW	285	87	1915	360	.80	20	270	89	1830	380	.80	25	255	93	1785	405	.80	35	80 HW						
285	85	1905	360	.90	15	40 HW	260	86	1790	385	.90	20	260	88	1725	405	.90	30	255	93	1785	445	.90	40	40 HW						
270	84	1775	385	1.00	15	0	260	86	1790	420	1.00	25	260	88	1725	445	1.00	30	250	92	1700	470	1.00	40	0						
270	84	1775	425	1.10	20	40 TW	250	85	1680	440	1.10	25	260	88	1725	485	1.10	35	250	92	1700	510	1.10	45	40 TW						
255	83	1680	445	1.20	20	80 TW	250	85	1680	480	1.20	25	250	87	1665	515	1.20	35	250	92	1700	550	1.20	50	80 TW						
255	83	1680	485	1.35	20	120 TW	250	85	1680	520	1.30	30	250	87	1665	555	1.30	40	250	92	1700	590	1.30	50	120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 1400 Lbs. of available fuel, you can fly 215 NAUTICAL airmiles by holding 290 KNOT CAS. However, you can fly 310 NAUTICAL airmiles by immediately climbing to 40000 ft. using 100% RPM. At 40000 ft. cruise at 250 KNOT CAS and start let down 40 NAUT. miles from home. With an 40 KNOT headwind the range at 40000 ft. would be 310 x.9 or 280 NAUTICAL miles. Cruise at 255 KNOT CAS with this wind and start let down 40 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—14. Flight Operation Instruction Chart (Sheet 8 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 21990 TO 20308 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
780	35	1775	6728	905	35	1795	1045	35	1815	1175	35	1830	6728	1315	35	1850
770	35	1750	6600	890	35	1770	1030	35	1785	1155	35	1805	6600	1290	35	1815
750	35	1705	6400	870	35	1725	1005	35	1745	1130	35	1765	6400	1260	35	1785
725	35	1665	6200	845	35	1685	980	35	1705	1100	35	1720	6200	1225	35	1740
705	35	1625	6000	820	35	1645	950	35	1665	1070	35	1680	6000	1195	35	1695
685	35	1585	5800	800	35	1605	925	35	1620	1040	35	1635	5800	1165	35	1655
665	35	1540	5600	775	35	1560	900	35	1580	1010	35	1595	5600	1130	35	1610
645	35	1495	5400	750	35	1515	870	35	1535	980	35	1555	5400	1095	35	1565
625	35	1455	5200	725	35	1475	845	35	1495	950	35	1505	5200	1065	35	1525
605	35	1420	5046	705	35	1440	825	35	1460	925	35	1475	5046	1040	35	1495

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	335	90	2790	330	.7	10
						80 HW							340	87	3030	310	.8	5	330	88	2820	330	.8	10	80 HW	330	89	2680	355	.8	15
355	85	3440	315	.9	0	40 HW	340	86	3065	320	.9	5	330	86	2825	335	.9	5	320	87	2680	355	.9	10	40 HW	315	88	2560	380	.9	15
335	84	3210	335	1.0	0	0	320	85	2900	345	1.0	5	315	85	2705	360	1.0	5	310	86	2545	380	1.0	10	0	305	87	2435	400	1.0	15
320	83	3020	360	1.15	0	40 TW	310	84	2755	370	1.15	5	295	84	2495	380	1.15	5	295	85	2400	400	1.1	10	40 TW	305	87	2435	440	1.1	15
						80 TW							295	84	2495	420	1.3	5	295	85	2400	440	1.25	10	80 TW	290	86	2295	465	1.25	15
						120 TW																			120 TW	290	86	2295	505	1.35	20

Figure A—15. Flight Operation Instruction Chart (Sheet 1 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 21990 TO 20308 LBS.

EXT. LOAD Two 230 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
1455	35	1865	6728	1610	35	1880	1775	35					6728			
1435	35	1835	6600	1585	35	1855	1745	35					6600			
1400	35	1795	6400	1545	35	1810	1705	35					6400			
1365	35	1755	6200	1505	35	1770	1660	35					6200			
1325	35	1715	6000	1465	35	1725	1620	35					6000			
1290	35	1670	5800	1430	35	1685	1580	35					5800			
1255	35	1630	5600	1390	35	1645	1535	35					5600			
1215	35	1585	5400	1350	35	1600	1495	35					5400			
1188	35	1545	5200	1310	35	1555	1450	35					5200			
1150	35	1510	5046	1280	35	1525	1420	35					5046			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
330	91	2675	350	.7	20	120 HW	315	92	2525	365	.75	30	290	94	2345	370	.75	35							120 HW						
320	90	2570	380	.8	20	80 HW	315	92	2525	405	.8	30	290	94	2345	410	.85	40							80 HW						
305	89	2440	400	.9	25	40 HW	295	91	2375	425	.9	30	290	94	2345	450	.9	40							40 HW						
305	89	2440	440	1.0	25	0	295	91	2375	465	1.0	35	285	93	2255	480	1.0	45							0						
295	88	2295	460	1.1	25	40 TW	285	90	2260	485	1.1	35	285	93	2255	520	1.1	50							40 TW						
295	88	2295	500	1.2	30	80 TW	285	90	2260	525	1.2	40	285	93	2255	560	1.2	50							80 TW						
295	88	2295	540	1.3	30	120 TW	285	90	2260	565	1.3	45	285	93	2255	600	1.3	55							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 25000 ft. with 6000 Lbs of available fuel, you can fly 1325 NAUTICAL airmiles by holding 305 KNOT CAS. However, you can fly 1715 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 285 KNOT CAS and start let down 45 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be .9x1715 or 1545 NAUT miles. Cruise at 290 KNOTS CAS with this wind and start let down 40 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—15. Flight Operation Instruction Chart (Sheet 2 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20308 TO 19000 POUNDS

EXTERNAL LOAD ITEMS
Two 230 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.).Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952

BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1)																
605	35	1420	5046	705	35	1440	825	35	1460	925	35	1475	5046	1040	35	1495
580	35	1365	4800	675	35	1385	790	35	1405	885	35	1425	4800	995	35	1435
540	30	1275	4400	630	35	1300	735	35	1315	825	35	1335	4400	925	35	1350
495	10	1155	4000	580	15	1180	680	20	1200	760	25	1225	4000	855	35	1260
470	SL	1095	3738	550	5	1120	640	10	1140	720	15	1160	3738	815	20	1180

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	88	2565	305	.7	10
						80 HW							335	86	2895	305	.75	5	325	87	2640	320	.8	10	80 HW	310	87	2445	335	.8	15
350	85	3335	310	.85	0	40 HW	320	85	2945	315	.85	5	320	85	2670	325	.9	5	310	86	2495	340	.9	10	40 HW	290	86	2300	355	.9	15
330	84	3090	330	1.0	0	0	310	84	2735	335	1.0	5	305	84	2505	350	1.0	5	295	85	2350	365	1.0	10	0	290	86	2300	395	1.0	15
315	83	2925	355	1.15	0	40 TW	300	83	2600	360	1.15	5	285	83	2315	375	1.1	5	280	84	2200	385	1.1	10	40 TW	275	85	2115	410	1.1	15
						80 TW							285	83	2315	405	1.25	5	280	84	2200	425	1.25	10	80 TW	275	85	2115	450	1.25	15
						120 TW																			120 TW	275	85	2115	490	1.35	20

Figure A—15. Flight Operation Instruction Chart (Sheet 3 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20308 TO 19000 LBS.

EXT. LOAD Two 230 gal tanks dropped when empty.

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1150	35	1510	5046	1280	35	1525	1420	35					5046			
1105	35	1455	4800	1225	35	1465	1365	35					4800			
1030	35	1365	4400	1145	35	1375	1275	35					4400			
955	35	1275	4000	1060	35	1285	1180	35					4000			
905	25	1200	3738	1010	30	1220	1125	35					3738			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
310	89	2415	325	.7	20	120 HW	295	90	2275	345	.75	30	290	93	2210	370	.75	35							120 HW						
300	88	2295	350	.8	20	80 HW	295	90	2275	385	.8	30	280	92	2135	395	.8	40							80 HW						
300	88	2295	390	.9	25	40 HW	285	89	2140	405	.9	30	280	92	2135	435	.9	40							40 HW						
290	87	2170	415	1.0	25	0	285	89	2140	445	1.0	35	275	91	2055	470	1.0	45							0						
290	87	2170	455	1.1	25	40 TW	285	89	2140	485	1.1	35	275	91	2055	510	1.1	50							40 TW						
285	86	2080	480	1.2	30	80 TW	280	88	2060	515	1.2	40	275	91	2055	550	1.2	50							80 TW						
285	86	2080	520	1.3	30	120 TW	280	88	2060	555	1.3	45	275	91	2055	590	1.3	55							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 25000 ft. with 4800 Lbs. of available fuel, you can fly 1105 NAUTICAL airmiles by holding 290 KNOT CAS. However, you can fly 1455 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 275 KNOT CAS and start let down 45 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be .9x1455 or 1310 NAUT miles. Cruise at 280 KNOTS CAS with this wind and start let down 40 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—15. Flight Operation Instruction Chart (Sheet 4 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 25065 TO 23467 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
(1005)	30	(1950)	9588	(1155)	30	(1970)	(1305)	30	(1985)	(1445)	30	(2000)	9588	(1610)	30	(2015)
(990)	30	(1920)	9400	(1135)	30	(1935)	(1280)	30	(1950)	(1420)	30	(1970)	9400	(1580)	30	(1985)
(965)	30	(1885)	9200	(1110)	30	(1900)	(1255)	30	(1920)	(1395)	30	(1935)	9200	(1550)	30	(1950)
945	30	1850	9000	(1090)	30	(1865)	(1230)	30	(1880)	(1370)	30	(1900)	9000	(1520	30	(1915)
925	30	1815	8800	1065	30	1830	1210	30	1845	(1340)	30	(1865)	8800	(1490)	30	(1880)
905	30	1780	8600	1045	30	1795	1180	30	1810	1315	30	1830	8600	(1460)	30	(1845)
885	30	1745	8400	1020	30	1760	1160	30	1780	1290	30	1795	8400	1430	30	1810
870	30	1710	8200	1000	30	1725	1130	30	1740	1260	30	1760	8200	1400	30	1775
845	30	1670	7990	980	30	1685	1110	30	1705	1235	30	1720	7990	1370	30	1735

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	345	91	3175	340	.7	10
						80 HW							360	88	3365	330	.8	5	345	89	3170	350	.8	5	80 HW	335	90	3010	360	.8	10
345	86	3535	305	.9	0	40 HW	355	87	3490	340	.9	5	360	88	3365	370	.9	5	345	89	3170	390	.9	5	40 HW	335	90	3010	400	.9	10
345	86	3535	345	1.0	0	0	340	86	3235	360	1.0	5	340	87	3090	385	1.0	5	330	88	3040	405	1.0	5	0	315	89	2795	420	1.0	10
330	85	3315	370	1.1	0	40 TW	340	86	3235	400	1.1	5	340	87	3090	425	1.1	5	315	87	2880	430	1.1	5	40 TW	315	89	2795	460	1.1	10
						80 TW							320	86	2940	445	1.2	5	315	87	2880	470	1.2	5	80 TW	315	89	2795	500	1.2	10
						120 TW																			120 TW	315	89	2795	540	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 1 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25065 TO 23467 LBS.

EXT. LOAD Two 450 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1775)	30	(2030)	9588	(1930)	30								9588			
(1740)	30	(1995)	9400	(1900)	30								9400			
(1710)	30	(1960)	9200	(1860)	30								9200			
(1675)	30	(1925)	9000	(1825)	30								9000			
(1640)	30	(1895)	8800	(1790)	30								8800			
(1610)	30	(1860)	8600	(1755)	30								8600			
(1580)	30	(1820)	8400	(1720)	30								8400			
1545	30	1785	8200	(1690)	30								8200			
1510	30	1750	7990	1650	30								7990			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
330	92	2930	350	.7	10	120 HW	310	94	2785	365	.7	15													120 HW						
330	92	2930	390	.8	10	80 HW	310	94	2785	405	.8	15													80 HW						
310	91	2745	410	.9	15	40 HW	305	93	2655	430	.9	20													40 HW						
310	91	2745	450	1.0	15	0	305	93	2655	470	1.0	20													0						
310	91	2745	490	1.1	15	40 TW	305	93	2655	510	1.1	20													40 TW						
310	91	2745	530	1.2	15	80 TW	305	93	2655	550	1.2	25													80 TW						
305	90	2645	555	1.3	20	120 TW	305	93	2655	590	1.3	25													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 8800 Lbs. of available fuel, you can fly 1065 NAUTICAL airmiles by holding 340 KNOT CAS. However, you can fly 1830 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 305 KNOT CAS and start let down 20 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be 1830x.9 or 1645 NAUT. miles. Cruise at 305 KNOT CAS with this wind and start let down 20 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption- POUNDS per hour
RANGE- NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—16. Flight Operation Instruction Chart (Sheet 2 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23467 TO 21869 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1))																
845	30	1670	7990	980	30	1685	1110	30	1705	1235	30	1720	7990	1370	30	1735
830	30	1635	7800	955	30	1650	1085	30	1670	1210	30	1685	7800	1340	30	1700
805	30	1600	7600	930	30	1615	1060	30	1630	1185	30	1650	7600	1310	30	1665
785	30	1565	7400	910	30	1580	1035	30	1595	1155	30	1615	7400	1280	30	1630
765	30	1525	7200	885	30	1540	1010	30	1560	1130	30	1580	7200	1245	30	1590
745	30	1490	7000	860	30	1505	980	30	1520	1100	30	1540	7000	1215	30	1555
725	30	1450	6800	840	30	1465	955	30	1475	1070	30	1500	6800	1185	30	1515
705	30	1410	6600	815	30	1430	930	30	1445	1040	30	1465	6600	1155	30	1480
680	30	1370	6392	790	30	1385										

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	340	90	3050	330	.7	10
						80 HW							350	88	3320	320	.8	5	340	88	2990	335	.8	5	80 HW	320	89	2850	350	.8	10
350	86	3465	310	.9	0	40 HW	345	86	3250	325	.9	5	340	87	3055	345	.9	5	340	88	2990	375	.9	5	40 HW	320	89	2850	390	.9	10
335	85	3300	335	1.0	0	0	330	85	3040	350	1.0	5	325	86	2870	370	1.0	5	315	87	2740	390	1.0	5	0	305	88	2600	405	1.0	10
325	84	3160	365	1.1	0	40 TW	330	85	3040	390	1.1	5	325	86	2870	410	1.1	5	315	87	2740	430	1.1	5	40 TW	305	88	2600	445	1.1	10
						80 TW							305	85	2700	425	1.2	5	300	86	2600	445	1.2	5	80 TW	305	88	2600	485	1.2	10
						120 TW																			120 TW	285	87	2470	505	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 3 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23467 TO 21869 LBS.

EXT. LOAD Two 450 gal tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1510	30	1750	7990	1650	30								7990			
1480	30	1715	7800	1620	30								7800			
1450	30	1680	7600	1580	30								7600			
1415	30	1645	7400	1540	30								7400			
1380	30	1605	7200	1505	30								7200			
1345	30	1570	7000	1465	30								7000			
1310	30	1530	6800	1425	30								6800			
1275	30	1495	6600	1390	30								6600			
1240	30	1450	6392	1350	30								6392			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
320	91	2790	340	.7	10	120 HW	310	93	2650	365	.7	15													120 HW						
320	91	2790	380	.8	10	80 HW	310	93	2650	405	.8	15													80 HW						
305	90	2580	395	.9	15	40 HW	300	92	2525	425	.9	20													40 HW						
305	90	2580	435	1.0	15	0	300	92	2525	465	1.0	20													0						
305	90	2580	475	1.1	15	40 TW	300	92	2525	505	1.1	20													40 TW						
285	89	2445	495	1.2	15	80 TW	290	91	2460	535	1.2	25													80 TW						
285	89	2445	535	1.3	20	120 TW	290	91	2460	575	1.3	25													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 7400 Lbs. of available fuel, you can fly 1035 NAUTICAL airmiles by holding 325 KNOT CAS. However, you can fly 1595 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 300 KNOT CAS and start let down 20 NAUT. miles from home. With an 80 KNOT headwind the range at 30000 ft. would be 1595x.8 or 1275 NAUT. miles. Cruise at 310 KNOTS CAS with this wind and start let down 15 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB /HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—16. Flight Operation Instruction Chart (Sheet 4 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 21869 TO 20271 POUNDS

EXTERNAL LOAD ITEMS

Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.),move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; then, when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL(1)																
680	35	1370	6392	790	35	1385	900	35	1405	1010	35	1420	6392	1120	35	1435
665	35	1330	6200	770	35	1350	875	35	1365	980	35	1385	6200	1090	35	1400
645	35	1290	6000	745	35	1310	850	35	1325	950	35	1345	6000	1060	35	1360
625	35	1250	5800	725	35	1270	825	35	1290	920	35	1305	5800	1025	35	1320
600	35	1210	5600	700	35	1230	800	35	1245	895	35	1265	5600	995	35	1280
580	35	1170	5400	680	35	1190	770	35	1205	865	35	1225	5400	960	35	1240
560	35	1130	5200	655	35	1145	745	35	1165	835	35	1180	5200	930	35	1200
540	35	1090	5000	630	35	1105	720	35	1120	805	35	1140	5000	895	35	1155
520	35	1045	4794	605	35	1060	690	35	1080	775	35	1095	4794	865	35	1110

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	315	88	2680	300	.7	10
						80 HW							325	86	2840	290	.8	5	315	87	2665	315	.8	5	80 HW	315	88	2680	340	.8	10
335	85	3260	295	.9	0	40 HW	320	85	2905	300	.9	5	325	86	2840	330	.9	5	315	87	2665	350	.9	5	40 HW	295	87	2410	355	.9	10
330	84	3175	330	1.0	0	0	320	85	2905	340	1.0	5	305	85	2600	350	1.0	5	305	86	2480	370	1.0	5	0	295	87	2410	395	1.0	10
320	83	3055	360	1.1	0	40 TW	310	84	2745	370	1.1	5	305	85	2600	390	1.1	5	305	86	2480	410	1.1	5	40 TW	295	87	2410	435	1.1	10
						80 TW							300	84	2460	420	1.2	5	305	85	2355	435	1.2	5	80 TW	295	87	2410	475	1.2	10
						120 TW																			120 TW	275	86	2260	490	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 5 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 21869 TO 20271 LBS.

EXT. LOAD Two 450 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25000' — RANGE IN AIRMILES			FUEL LBS.	IF YOUR ARE AT 30000' — RANGE IN AIRMILES			IF YOU ARE AT 35000' — RANGE IN AIRMILES			IF YOU ARE AT 40000' — RANGE IN AIRMILES			FUEL LBS.	IF YOU ARE AT 45000' — RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
1240	35	1450	6392	1350	35	1465	1450	35					6392			
1205	35	1415	6200	1310	35	1430	1410	35					6200			
1170	35	1375	6000	1275	35	1390	1370	35					6000			
1135	35	1335	5800	1240	35	1350	1330	35					5800			
1100	35	1295	5600	1200	35	1310	1290	35					5600			
1060	35	1255	5400	1160	35	1270	1245	35					5400			
1025	35	1215	5200	1125	35	1225	1205	35					5200			
990	35	1170	5000	1085	35	1185	1165	35					5000			
955	35	1130	4794	1040	35	1140	1125	35					4794			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
310	92	2570	360	.7	10	120 HW	310	92	2540	360	.7	15	295	95	2430	375	.75	25							120 HW						
295	91	2570	380	.8	10	80 HW	295	91	2395	380	.8	15	290	94	2360	410	.85	25							80 HW						
295	91	2405	420	.9	15	40 HW	295	91	2395	420	.9	20	290	94	2360	450	.9	30							40 HW						
295	91	2405	460	1.0	15	0	295	91	2395	460	1.0	20	290	94	2360	490	1.0	30							0						
295	91	2290	500	1.1	15	40 TW	295	91	2395	500	1.1	20	290	94	2360	530	1.1	30							40 TW						
285	90	2290	525	1.2	15	80 TW	285	90	2305	525	1.2	25	290	94	2360	570	1.2	35							80 TW						
285	90	2290	565	1.3	20	120 TW	285	90	2305	565	1.3	25	290	94	2360	610	1.3	35							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 6000 Lbs. of available fuel, you can fly 950 NAUTICAL airmiles by holding 305 KNOT CAS. However, you can fly 1345 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 290 KNOTS CAS and start let down 30 NAUT. miles from home. With an 40 KNOT headwind the range at 35000 ft. would be 1345x.9 or 1210 NAUT miles. Cruise at 290 KNOT CAS with this wind and start let down 28 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—16. Flight Operation Instruction Chart (Sheet 6 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20271 TO 18673 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
520	35	1045	4794	605	35	1060	690	35	1080	775	35	1095	4794	865	35	1110
500	35	1005	4600	580	35	1020	665	35	1035	745	35	1055	4600	830	35	1070
475	35	960	4400	560	35	980	635	35	995	715	35	1010	4400	800	35	1030
455	35	920	4200	535	35	935	610	35	950	685	35	970	4200	765	35	985
435	35	875	4000	510	35	890	580	35	910	650	35	930	4000	730	35	940
415	35	830	3800	485	35	850	555	35	870	620	35	885	3800	700	35	900
395	35	790	3600	460	35	805	525	35	825	590	35	840	3600	660	35	855
370	35	745	3400	440	35	760	500	35	780	560	35	795	3400	630	35	810
350	35	700	3196	410	35	715	470	35	735	530	35	750	3196	590	35	765

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	88	2660	310	.7	10
						80 HW							330	86	2880	295	.8	5	320	87	2680	315	.8	5	80 HW	305	87	2415	325	.8	10
330	84	3135	290	.9	0	40 HW	315	84	2800	295	.9	5	305	85	2620	315	.9	5	305	86	2475	335	.9	5	40 HW	305	87	2415	365	.9	10
320	83	3005	320	1.0	0	0	315	84	2800	335	1.0	5	305	85	2620	355	1.0	5	305	86	2475	375	1.0	5	0	305	87	2415	405	1.0	10
310	82	2895	350	1.1	0	40 TW	305	83	2645	365	1.1	5	300	84	2425	380	1.1	5	290	85	2315	400	1.1	5	40 TW	285	86	2210	420	1.1	10
						80 TW							300	84	2425	420	1.2	5	290	85	2315	440	1.2	5	80 TW	285	86	2210	460	1.2	10
						120 TW																			120 TW	285	86	2210	500	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 7 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20271 TO 18673 LBS.

EXT. LOAD Two 450 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL LBS.	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL LBS.	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
955	35	1130	4794	1040	35	1140	1125	35					4794			
920	35	1085	4600	1005	35	1100	1080	35					4600			
880	35	1045	4400	960	35	1060	1035	35					4400			
845	35	1000	4200	920	35	1015	995	35					4200			
805	35	960	4000	880	35	970	950	35					4000			
770	35	915	3800	840	35	930	910	35					3800			
730	35	875	3600	795	35	885	865	35					3600			
690	35	830	3400	760	35	840	820	35					3400			
655	35	780	3196	715	35	795	775	35					3196			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
305	91	2465	355	.7	10	120 HW	305	91	2335	355	.72	15	290	93	2275	370	.75	25							120 HW						
300	90	2465	385	.8	10	80 HW	300	90	2285	385	.81	15	285	92	2195	400	.8	25							80 HW						
300	90	2275	425	.9	15	40 HW	300	90	2285	425	.91	20	285	92	2195	440	.9	30							40 HW						
285	89	2275	440	1.0	15	0	285	89	2165	440	1.0	20	275	91	2100	465	1.0	30							0						
285	89	2160	480	1.1	15	40 TW	285	89	2165	480	1.1	20	275	91	2100	505	1.1	35							40 TW						
285	89	2160	520	1.2	15	80 TW	285	89	2165	520	1.2	25	275	91	2100	545	1.2	35							80 TW						
285	89	2160	560	1.3	20	120 TW	285	89	2165	560	1.3	25	275	91	2100	585	1.3	40							120 TW						

SPECIAL NOTES

1 Climb at 100 % RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 4000 Lbs. of available fuel, you can fly 580 NAUTICAL airmiles by holding 305 KNOT CAS. However, you can fly 910 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 275 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 80 KNOT headwind the range at 35000 ft. would be 910x.8 or 730 NAUT miles. Cruise at 285 KNOT CAS with this wind and start let down 25 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—16. Flight Operation Instruction Chart (Sheet 8 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 18673 TO 17075 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
350	35	700	3196	410	35	715	470	35	735	530	35	750	3196	590	35	765
330	35	655	3000	385	35	670	445	35	690	500	35	705	3000	560	35	720
310	35	610	2800	360	35	630	415	35	645	465	35	660	2800	520	35	675
285	35	565	2600	335	35	580	385	35	600	435	35	615	2600	485	35	630
265	35	520	2400	310	35	535	360	35	550	405	35	570	2400	450	35	585
240	35	470	2200	285	35	485	330	35	505	370	35	525	2200	410	35	540
220	35	420	2000	260	35	440	300	35	455	335	35	475	2000	375	35	490
200	35	370	1800	230	35	390	270	35	405	305	35	420	1800	340	35	440
175	35	315	1598	210	35	335	245	35	355	270	35	370	1598	305	35	390

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	310	87	2390	290	.7	10
						80 HW							325	86	2700	290	.8	5	310	86	2465	305	.8	5	80 HW	310	87	2390	330	.8	10
330	84	3065	290	.9	0	40 HW	320	84	2745	300	.9	5	310	85	2490	315	.9	5	300	85	2250	325	.9	5	40 HW	285	86	2150	345	.9	10
315	83	2895	315	1.0	0	0	310	83	2570	330	1.0	5	305	84	2365	345	1.0	5	300	85	2250	365	1.0	5	0	285	86	2150	385	1.0	10
310	82	2820	350	1.1	0	40 TW	310	83	2570	370	1.1	5	305	84	2365	390	1.1	5	300	85	2250	405	1.1	5	40 TW	285	86	2150	425	1.1	10
						80 TW							280	83	2180	405	1.2	5	275	84	2080	425	1.2	5	80 TW	275	85	2035	445	1.2	10
						120 TW																			120 TW	275	85	2035	485	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 9 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 18673 TO 17075 LBS.

EXT. LOAD Two 450 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
655	35	780	3196	715	35	795	775	35	-				3196			
615	35	735	3000	675	35	750	730	35	-				3000			
575	35	690	2800	630	35	705	680	35	-				2800			
535	35	645	2600	590	35	660	635	35	-				2600			
495	35	600	2400	545	35	615	590	35	-				2400			
455	35	555	2200	500	35	565	545	35	-				2200			
415	35	505	2000	460	35	520	500	35	-				2000			
375	35	455	1800	415	35	470	455	35	-				1800			
335	35	405	1598	370	35	420	405	35	-				1598			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
310	88	2285	320	.7	10	120 HW	300	89	2210	345	.7	15	275	92	2125	355	.7	25							120 HW						
310	88	2285	360	.8	10	80 HW	300	89	2210	385	.8	15	275	91	2055	390	.8	25							80 HW						
285	87	2115	370	.9	15	40 HW	275	88	2010	395	.9	20	275	91	2055	430	.9	30							40 HW						
285	87	2115	410	1.0	15	0	275	88	2010	435	1.0	20	270	90	1950	455	1.0	30							0						
300	86	2000	440	1.1	15	40 TW	275	88	2010	475	1.1	20	270	90	1950	495	1.1	30							40 TW						
300	86	2000	480	1.2	15	80 TW	275	88	2010	515	1.2	25	270	90	1950	535	1.2	35							80 TW						
300	86	2000	520	1.3	20	120 TW	265	87	1920	535	1.3	25	260	89	1900	560	1.3	35							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 2800 Lbs. of available fuel, you can fly 465 NAUTICAL airmiles by holding 300 KNOT CAS. However, you can fly 660 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 270 KNOT CAS and start let down 30 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be 660 x .9 or 595 NAUTICAL miles. Cruise at 275 KNOT CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—16. Flight Operation Instruction Chart (Sheet 10 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 17075 TO 15477 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal. tanks carried entire distance

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
175	40	315	1598	210	40	335	245	40	355	270	40	370	1598	305	40	390
155	40	265	1400	180	40	280	215	40	300	240	40	320	1400	270	40	340
130	40	210	1200	160	40	230	185	40	250	205	40	270	1200	230	40	290
110	40	160	1000	130	40	180	155	40	200	170	40	220	1000	195	40	235
65	25	75	600	80	25	85	90	35	95	105	40	110	600	120	40	130
20	SL	-	200	30	5	-	35	10	-	40	15	-	200	45	20	-

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	305	86	2210	280	.7	10
						80 HW							310	85	2500	280	.8	5	305	85	2240	295	.8	5	80 HW	305	86	2210	320	.8	10
335	84	3100	295	.9	0	40 HW	335	84	2810	315	.9	5	310	85	2500	320	.9	5	305	85	2240	335	.9	5	40 HW	280	85	1990	335	.9	10
315	82	2820	315	1.0	0	0	305	83	2500	325	1.0	5	300	84	2280	340	1.0	5	285	84	2055	350	1.0	5	0	280	85	1990	375	1.0	10
300	81	2690	340	1.1	0	40 TW	295	82	2400	355	1.1	5	285	83	2145	370	1.1	5	285	84	2055	390	1.1	5	40 TW	280	85	1990	415	1.1	10
						80 TW							285	83	2145	410	1.2	5	285	84	2055	430	1.2	5	80 TW	280	85	1990	455	1.2	10
						120 TW																			120 TW	265	84	1880	475	1.3	15

Figure A—16. Flight Operation Instruction Chart (Sheet 11 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 17075 TO 15497 LBS.

EXT. LOAD Two 450 gal. tanks carried the entire distance

NO. OF ENGINES OPERATING: 1

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
335	40	405	1598	370	40	420	405	40	435	445	40	-	1598			
295	40	355	1400	325	40	370	360	40	385	395	40	-	1400			
255	40	300	1200	280	40	315	310	40	330	340	40	-	1200			
215	40	250	1000	240	40	265	260	40	280	285	40	-	1000			
135	40	140	600	145	40	155	160	40	170	180	40	-	600			
50	25	-	200	55	30	-	65	35	-	75	40	-	200			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
310	87	2160	310	.7	10	120 HW	290	88	2025	330	.7	15	275	90	1930	345	.7	25	250	92	1795	355	.7	30	120 HW						
275	86	1995	320	.8	10	80 HW	290	88	2025	370	.8	15	265	89	1855	370	.8	25	250	92	1795	395	.8	35	80 HW						
275	86	1995	360	.9	15	40 HW	270	87	1865	385	.9	20	265	89	1855	410	.9	30	245	91	1725	425	.9	35	40 HW						
275	86	1995	400	1.0	15	0	270	87	1865	425	1.0	20	265	89	1855	450	1.0	30	245	91	1725	465	1.0	40	0						
270	85	1850	425	1.1	15	40 TW	270	87	1865	465	1.1	20	255	88	1750	475	1.1	30	245	91	1725	505	1.1	45	40 TW						
270	85	1850	465	1.2	15	80 TW	260	86	1775	490	1.2	25	255	88	1750	515	1.2	35	245	91	1725	545	1.2	45	80 TW						
270	85	1850	505	1.3	20	120 TW	260	86	1775	530	1.3	25	255	88	1750	555	1.3	35	245	91	1725	585	1.3	50	120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 15000 ft. with 1200 Lbs. of available fuel, you can fly 205 NAUTICAL airmiles by holding 285 KNOT CAS. However, you can fly 270 NAUTICAL airmiles by immediately climbing to 40000 ft. using 100% RPM. At 40000 ft. cruise at 245 KNOT CAS and start let down 40 NAUTICAL miles from home. With an 80 KNOT headwind the range at 40000 ft. would be 270x.8 or 215 NAUT miles. Cruise at 250 KNOT CAS with this wind and start let down 35 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–16. Flight Operation Instruction Chart (Sheet 12 of 12)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 25065 TO 23467 POUNDS

EXTERNAL LOAD ITEMS

Two 450 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
(1065)	30	(2265)	9588	(1225)	30	(2285)	(1400)	30	(2300)	(1555)	30	(2315)	9588	(1735)	30	(2330)
(1050)	30	(2235)	9400	(1205)	30	(2250)	(1375)	30	(2265)	(1530)	30	(2285)	9400	(1705)	30	(2300)
(1025)	30	(2200)	9200	(1180)	30	(2215)	(1350)	30	(2235)	(1505)	30	(2250)	9200	(1675)	30	(2265)
1005	30	2165	9000	(1160)	30	(2180)	(1325)	30	(2195)	(1480)	30	(2215)	9000	(1645)	30	(2230)
985	30	2130	8800	1135	30	2145	1305	30	2160	(1450)	30	(2180)	8800	(1615)	30	(2195)
965	30	2095	8600	1115	30	2110	1275	30	2125	1425	30	2145	8600	(1585)	30	(2160)
945	30	2060	8400	1090	30	2075	1255	30	2095	1400	30	2110	8400	1555	30	2125
930	30	2025	8200	1070	30	2040	1225	30	2055	1370	30	2075	8200	1525	30	2090
905	30	1985	7990	1050	30	2000	1205	30	2020	1345	30	2035	7990	1495	30	2050

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	345	91	3175	340	.7	10
						80 HW							360	88	3365	330	.8	5	345	89	3170	350	.8	10	80 HW	335	90	3010	360	.8	15
345	86	3535	305	9	0	40 HW	355	87	3490	340	.9	5	360	88	3365	370	.9	5	345	89	3170	390	.9	10	40 HW	335	90	3010	400	.9	15
345	86	3535	345	1.0	0	0	340	86	3235	360	1.0	5	340	87	3090	385	1.0	5	330	88	3040	405	1.0	10	0	315	89	2795	420	1.0	15
330	85	3315	370	1.1	0	40 TW	340	86	3235	400	1.1	5	340	87	3090	425	1.1	5	315	87	2880	430	1.1	10	40 TW	315	89	2795	460	1.1	15
						80 TW							320	86	2940	445	1.2	5	315	87	2880	470	1.2	10	80 TW	315	89	2795	500	1.2	15
						120 TW																			120 TW	315	89	2795	540	1.3	20

Figure A—17. Flight Operation Instruction Chart (Sheet 1 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 25065 TO 23467

EXT. LOAD Two 450 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
(1925)	30	(2345)	9588	(2110)	30								9588			
(1890)	30	(2310)	9400	(2080)	30								9400			
(1860)	30	(2275)	9200	(2040)	30								9200			
(1825)	30	(2240)	9000	(2005)	30								9000			
(1790)	30	(2210)	8800	(1970)	30								8800			
(1760)	30	(2175)	8600	(1935)	30								8600			
(1730)	30	(2135)	8400	(1900)	30								8400			
1695	30	2100	8200	(1870)	30								8200			
1660	30	2065	7990	1830	30								7990			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
330	92	2930	350	.7	20	120 HW	310	94	2785	365	.7	30													120 HW						
330	92	2930	390	.8	20	80 HW	310	94	2785	405	.8	30													80 HW						
310	91	2745	410	.9	25	40 HW	305	93	2655	430	.9	30													40 HW						
310	91	2745	450	1.0	25	0	305	93	2655	470	1.0	35													0						
310	91	2745	490	1.1	25	40 TW	305	93	2655	510	1.1	35													40 TW						
310	91	2745	530	1.2	30	80 TW	305	93	2655	550	1.2	40													80 TW						
305	90	2645	555	1.3	30	120 TW	305	93	2655	590	1.3	45													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 8800 Lbs of available fuel, you can fly 1135 NAUTICAL airmiles by holding 340 KNOT CAS. However, you can fly 2145 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 305 KNOTS CAS and start let down 35 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be 9 x 2145 or 1930 NAUT miles. Cruise at 305 KNOTS CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUTICAL miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—17. Flight Operation Instruction Chart (Sheet 2 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 23467 TO 21869 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
905	30	1985	7990	1050	30	2000	1205	30	2020	1345	30	2035	7990	1495	30	2050
890	30	1950	7800	1025	30	1965	1180	30	1985	1320	30	2000	7800	1465	30	2015
865	30	1915	7600	1000	30	1930	1155	30	1945	1295	30	1965	7600	1435	30	1980
845	30	1880	7400	980	30	1895	1130	30	2010	1265	30	1930	7400	1405	30	1945
825	30	1840	7200	955	30	1855	1105	30	1875	1240	30	1895	7200	1370	30	1905
805	30	1805	7000	930	30	1820	1075	30	1835	1210	30	1855	7000	1340	30	1870
785	30	1765	6800	910	30	1780	1050	30	1750	1180	30	1815	6800	1310	30	1830
765	30	1725	6600	885	30	1745	1025	30	1760	1150	30	1780	6600	1280	30	1795
740	30	1685	6392	860	30	1700	995	30	1720	1120	30	1735	6392	1245	30	1750

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	340	90	3050	330	.7	10
						80 HW							350	88	3320	320	.8	5	340	88	2990	335	.8	10	80 HW	320	89	2850	350	.8	15
350	86	3465	310	.9	0	40 HW	345	86	3250	325	.9	5	340	87	3055	345	.9	5	340	88	2990	375	.9	10	40 HW	320	89	2850	390	.9	15
335	85	3300	335	1.0	0	0	330	85	3040	350	1.0	5	325	86	2870	370	1.0	5	315	87	2740	390	1.0	10	0	305	88	2600	405	1.0	15
325	84	3160	365	1.1	0	40 TW	330	85	3040	390	1.1	5	325	86	2870	410	1.1	5	315	87	2740	430	1.1	10	40 TW	305	88	2600	445	1.1	15
						80 TW							305	85	2700	425	1.2	5	300	86	2600	445	1.2	10	80 TW	305	88	2600	485	1.2	15
						120 TW																			120 TW	285	87	2470	505	1.3	20

Figure A—17. Flight Operation Instruction Chart (Sheet 3 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 23467 TO 21869

EXT. LOAD
Two 450 gal tanks dropped when empty
NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1660	30	2065	7990	1830	30								7990			
1630	30	2030	7800	1800	30	-							7800			
1600	30	1995	7600	1760	30	-							7600			
1565	30	1960	7400	1720	30	-							7400			
1530	30	1920	7200	1685	30	-							7200			
1495	30	1885	7000	1645	30	-							7000			
1460	30	1845	6800	1605	30	-							6800			
1425	30	1810	6600	1570	30	-							6600			
1530	30	1765	6392	1680	30	1							6392			

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
320	91	2790	340	.7	20	120 HW	310	93	2650	365	.7	30													120 HW						
320	91	2790	380	.8	20	80 HW	310	93	2650	405	.8	30													80 HW						
305	90	2580	395	.9	25	40 HW	300	92	2525	425	.9	30													40 HW						
305	90	2580	435	1.0	25	0	300	92	2525	465	1.0	35													0						
305	90	2580	475	1.1	25	40 TW	300	92	2525	505	1.1	35													40 TW						
285	89	2445	495	1.2	30	80 TW	290	91	2460	535	1.2	40													80 TW						
285	89	2445	535	1.3	30	120 TW	290	91	2460	575	1.3	45													120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 7000 Lbs. of available fuel, you can fly 9.30 NAUTICAL airmiles by holding 30000 CAS. However, you can fly 1820 NAUTICAL airmiles by immediately climbing to 30000 ft. using 100% RPM. At 30000 ft. cruise at 300KNOTS CAS and start let down 35 NAUTICAL miles from home. With an 40 KNOT headwind the range at 30000 ft. would be 9 x 1820 or 1640 NAUT. miles. Cruise at 300KNOTS CAS with this wind and start let down 30 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—17. Flight Operation Instruction Chart (Sheet 4 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 21869 TO 20271 POUNDS

EXTERNAL LOAD ITEMS
Two 450 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximums. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
740	35	1685	6392	860	35	1700	995	35	1720	1120	35	1735	6392	1245	35	1750
725	35	1645	6200	840	35	1665	970	35	1680	1090	35	1700	6200	1215	35	1715
705	35	1605	6000	815	35	1625	945	35	1640	1060	35	1660	6000	1185	35	1675
685	35	1565	5800	795	35	1585	920	35	1605	1030	35	1620	5800	1150	35	1635
660	35	1525	5600	770	35	1545	895	35	1560	1005	35	1580	5600	1120	35	1595
640	35	1485	5400	750	35	1505	865	35	1520	975	35	1540	5400	1085	35	1555
620	35	1445	5200	725	35	1460	840	35	1480	945	35	1495	5200	1055	35	1515
600	35	1405	5000	700	35	1420	815	35	1435	915	35	1455	5000	1020	35	1470
580	35	1360	4794	675	35	1375	785	35	1395	885	35	1410	4794	990	35	1425

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	315	88	2680	300	.7	10
						80 HW							325	86	2840	290	.8	5	315	87	2665	315	.8	10	80 HW	315	88	2680	340	.8	15
335	85	3260	295	.9	0	40 HW	320	85	2905	300	.9	5	325	86	2840	330	.9	5	315	87	2665	350	.9	10	40 HW	295	87	2410	355	.9	15
330	84	3175	330	1.0	0	0	320	85	2905	340	1.0	5	305	85	2600	350	1.0	5	305	86	2480	370	1.0	10	0	295	87	2410	395	1.0	15
320	83	3055	360	1.1	0	40 TW	310	84	2745	370	1.1	5	305	85	2600	390	1.1	5	305	86	2480	410	1.1	10	40 TW	295	87	2410	435	1.1	15
						80 TW							300	84	2460	420	1.2	5	305	85	2355	435	1.2	10	80 TW	295	87	2410	475	1.2	15
						120 TW																			120 TW	275	86	2260	490	1.3	20

Figure A—17. Flight Operation Instruction Chart (Sheet 5 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 21869 TO 20271

EXT. LOAD
Two 450 gal tanks dropped when empty

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1390	35	1765	6392	1530	35	1780	1680	35	-				6392			
1355	35	1730	6200	1490	35	1745	1640	35	-				6200			
1320	35	1690	6000	1455	35	1705	1600	35	-				6000			
1285	35	1650	5800	1420	35	1665	1560	35	-				5800			
1250	35	1610	5600	1380	35	1625	1520	35	-				5600			
1210	35	1570	5400	1340	35	1585	1475	35	-				5400			
1175	35	1530	5200	1305	35	1540	1435	35	-				5200			
1140	35	1485	5000	1265	35	1500	1395	35	-				5000			
1105	35	1445	4794	1220	35	1455	1355	35	-				4794			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.							
310	92	2570	360	.7	20	120 HW	310	92	2540	360	.7	30	295	95	2430	375	.7	35							120 HW						
295	91	2570	380	.8	20	80 HW	295	91	2395	380	.8	30	290	94	2360	410	.8	40							80 HW						
295	91	2405	420	.9	25	40 HW	295	91	2395	420	.9	30	290	94	2360	450	.9	40							40 HW						
295	91	2405	460	1.0	25	0	295	91	2395	460	1.0	35	290	94	2360	490	1.0	45							0						
295	91	2290	500	1.1	25	40 TW	295	91	2395	500	1.1	35	290	94	2360	530	1.1	50							40 TW						
285	90	2290	525	1.2	30	80 TW	285	90	2305	525	1.2	40	290	94	2360	570	1.2	50							80 TW						
285	90	2290	565	1.3	30	120 TW	285	90	2305	565	1.3	45	290	94	2360	610	1.3	55							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 6000 Lbs. of available fuel, you can fly 815 NAUTICAL airmiles by holding 320 KNOT CAS. However, you can fly 1625 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 290 KNOT CAS and start let down 45 NAUT. miles from home. With an 40 KNOT headwind the range at 35000 ft. would be 9 x 1625 or 1460 NAUT. miles. Cruise at 290 KNOT CAS with this wind and start let down 40 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT. miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—17. Flight Operation Instruction Chart (Sheet 6 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 20271 TO 19215 POUNDS

EXTERNAL LOAD ITEMS: Two 450 gal tanks dropped when empty

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1)																
580	35	1360	4794	675	35	1375	785	35	1395	885	35	1410	4794	990	35	1425
560	35	1320	4600	650	35	1335	760	35	1350	855	35	1370	4600	955	35	1385
535	30	1275	4400	630	30	1285	730	35	1310	825	35	1325	4400	925	35	1345
495	10	1155	4000	580	15	1180	675	20	1200	760	25	1225	4000	855	30	1250
470	SL	1095	3738	550	5	1120	640	10	1140	720	15	1160	3738	815	20	1180

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	320	88	2660	310	.7	10
						80 HW							330	86	2880	295	.8	5	320	87	2680	315	.8	10	80 HW	305	87	2415	325	.8	15
330	84	3135	290	.9	0	40 HW	315	84	2800	295	.9	5	305	85	2620	315	.9	5	305	86	2475	335	.9	10	40 HW	305	87	2415	365	.9	15
320	83	3005	320	1.0	0	0	315	84	2800	335	1.0	5	305	85	2620	355	1.0	5	305	86	2475	375	1.0	10	0	305	87	2415	405	1.0	15
310	82	2895	350	1.1	0	40 TW	305	83	2645	365	1.1	5	300	84	2425	380	1.1	5	290	85	2315	400	1.1	10	40 TW	285	86	2210	420	1.1	15
						80 TW							300	84	2425	420	1.2	5	290	85	2315	440	1.2	10	80 TW	285	86	2210	460	1.2	15
						120 TW																			120 TW	285	86	2210	500	1.3	20

Figure A—17. Flight Operation Instruction Chart (Sheet 7 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 20271 TO 19215

EXT. LOAD
Two 450 gal tanks dropped when empty
NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL LBS.	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL LBS.	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
1105	35	1445	4794	1220	35	1455	1355	35	-				4794			
1070	35	1400	4600	1185	35	1413	1310	35	-				4600			
1030	35	1360	4400	1140	35	1375	1265	35	-				4400			
955	35	1275	4000	1060	35	1285	1180	35	-				4000			
905	25	1200	3738	1010	30	1220	1125	35	-				3738			

CRUISING AT 25000'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
305	91	2465	355	.7	20	120 HW	305	91	2335	355	.72	30	290	93	2275	370	.75	35							120 HW						
300	90	2465	385	.8	20	80 HW	300	90	2285	385	.81	30	285	92	2195	400	.8	40							80 HW						
300	90	2275	425	.9	25	40 HW	300	90	2285	425	.91	30	285	92	2195	440	.9	40							40 HW						
285	89	2275	440	1.0	25	0	285	89	2165	440	1.0	35	275	91	2100	465	1.0	45							0						
285	89	2160	480	1.1	25	40 TW	285	89	2165	480	1.1	35	275	91	2100	505	1.1	50							40 TW						
285	89	2160	520	1.2	30	80 TW	285	89	2165	520	1.2	40	275	91	2100	545	1.2	50							80 TW						
285	89	2160	560	1.3	30	120 TW	285	89	2165	560	1.3	45	275	91	2100	585	1.3	55							120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 25000 ft. with 4600 Lbs. of available fuel, you can fly 1070 NAUTICAL airmiles by holding 285 KNOT CAS. However, you can fly 1400 NAUTICAL airmiles by immediately climbing to 35000 ft. using 100% RPM. At 35000 ft. cruise at 275 KNOTS CAS and start let down 45 NAUTICAL miles from home. With an 40 KNOT headwind the range at 35000 ft. would be .9 x 1400 or 1260 NAUT miles. Cruise at 285 KNOTS CAS with this wind and start let down 40 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOTS
R.F.- Range factor- Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—17. Flight Operation Instruction Chart (Sheet 8 of 8)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 18500 TO 16631 POUNDS

EXTERNAL LOAD ITEMS

NONE

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))																
470	40	1095	3738	550	40	1120	640	40	1140	720	40	1160	3738	815	40	1180
425	40	995	3400	500	40	1020	580	40	1040	660	40	1060	3400	740	40	1080
400	40	935	3200	470	40	960	550	40	980	620	40	1000	3200	700	40	1020
375	40	875	3000	440	40	900	515	40	920	580	40	945	3000	655	40	960
350	40	815	2800	415	40	840	480	40	860	545	40	880	2800	615	40	900
330	40	755	2600	385	40	780	450	40	800	510	40	820	2600	570	40	840
300	40	690	2400	355	40	720	415	40	740	470	40	760	2400	530	40	780
280	40	635	2200	330	40	650	380	40	675	430	40	695	2200	490	40	715
250	40	560	2000	300	40	585	345	40	610	395	40	630	2000	450	40	650
245	40	515	1869	280	40	540	325	40	565	370	40	585	1869	420	40	605

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	345	85	2250	335	.70	10
						80 HW							355	84	2545	325	.80	5	345	84	2240	345	.80	10	80 HW	320	84	2070	350	.80	15
355	83	2930	315	.90	0	40 HW	350	83	2635	335	.90	5	330	83	2330	340	.90	5	345	84	2240	385	.90	10	40 HW	320	84	2070	390	.90	15
345	82	2775	345	1.00	0	0	340	82	2460	365	1.00	5	330	83	2330	380	1.00	5	320	83	2065	395	1.00	10	0	300	83	1890	400	1.00	15
330	81	2670	370	1.10	0	40 TW	340	82	2460	405	1.10	5	320	82	2160	405	1.10	5	320	83	2065	435	1.10	10	40 TW	300	83	1890	440	1.10	15
						80 TW							320	82	2160	445	1.20	5	305	82	1965	455	1.20	10	80 TW	300	83	1890	480	1.20	20
						120 TW																			120 TW	285	82	1780	500	1.30	20

Figure A—18. Flight Operation Instruction Chart (Sheet 1 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 18500 TO 16631 LBS.

EXT. LOAD NONE

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'				IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'				IF YOU ARE AT 45000'			
RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL LBS.	RANGE IN AIRMILES			
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.		BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																	
905	40	1200	3738	1010	40	1220	1125	40	1240	1230	40		3738				
825	40	1100	3400	920	40	1120	1030	40	1135	1130	40		3400				
780	40	1040	3200	870	40	1055	975	40	1070	1065	40		3200				
730	40	980	3000	820	40	995	915	40	1010	1000	40		3000				
685	40	920	2800	770	40	935	860	40	950	940	40		2800				
640	40	855	2600	720	40	870	805	40	890	880	40		2600				
590	40	795	2400	665	40	810	745	40	825	820	40		2400				
545	40	730	2200	615	40	750	690	40	760	760	40		2200				
500	40	670	2000	560	40	690	630	40	700	695	40		2000				
470	40	625	1869	530	40	645	595	40	660	655	40		1869				

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
325	85	2065	350	.70	20	120 HW	310	85	1870	355	.70	30	290	87	1780	375	.75	35	270	91	1650	385	.75	45	120 HW						
310	84	1915	365	.80	20	80 HW	310	85	1870	395	.80	30	285	86	1700	400	.85	40	265	90	1610	420	.85	50	80 HW						
310	84	1915	405	.90	25	40 HW	285	84	1720	405	.90	30	285	86	1700	440	.90	40	265	90	1610	460	.90	55	40 HW						
285	83	1760	415	1.00	25	0	285	84	1720	445	1.00	35	285	86	1700	480	1.00	45	265	90	1610	500	1.00	60	0						
285	83	1760	455	1.10	25	40 TW	285	84	1720	485	1.10	40	280	85	1640	510	1.1	50	265	90	1610	540	1.1	65	40 TW						
285	83	1760	495	1.20	30	80 TW	280	83	1655	515	1.20	40	280	85	1640	550	1.15	50	265	90	1610	580	1.15	70	80 TW						
285	83	1760	535	1.30	30	120 TW	280	83	1655	555	1.30	45	280	85	1640	590	1.25	55	265	90	1610	620	1.25	75	120 TW						

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 5000 ft. with 2800 Lbs. of available fuel, you can fly 415 NAUTICAL airmiles by holding 340 KNOT CAS. However, you can fly 840 NAUTICAL airmiles by immediately climbing to 40000 ft. using 100% RPM. At 40000 ft. cruise at 265 KNOT CAS and start let down 60 NAUTICAL miles from home. With an 40 KNOT headwind the range at 40000 ft. would be 840x.9 or 755 NAUTICAL miles. Cruise at 265 KNOTS CAS with this wind and start let down 55 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind-KNOTS
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE-NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—18. Flight Operation Instruction Chart (Sheet 2 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE(S) YJ65-W-1

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 16631 TO 14762 POUNDS

EXTERNAL LOAD ITEMS

NONE

NUMBER OF ENGINES OPERATING: 1

INSTRUCTIONS FOR USING CHART: (A) IN FLIGHT - Select figure in fuel column equal to or less than fuel available for cruise (fuel on board minus allowance for reserve, combat, navigational error, formation flight, etc.). Move horizontally right or left to section according to present altitude and read total range available (no wind) by cruising at that altitude or by climbing to another altitude of maximum range. For a flight at initial altitude, operating instructions are given directly below. For a flight at higher altitude, climb immediately to desired altitude and read cruising instructions in appropriate cruising altitude section. (B) FLIGHT PLANNING - From initial fuel on board subtract fuel for take-off and climb to desired cruising altitude and all other necessary allowances. Then use chart as for IN FLIGHT above, adding initial climb distances to range values.

NOTES: Ranges shown at optimum altitudes are maximum. In order to obtain maximum range on flights requiring more than one chart (due to external configuration or gross weight changes), it is necessary to observe the optimum cruising altitude on each chart; i.e., when changing charts a climb may be required to obtain a maximum range. All range values include allowances for descent distance and fuel. Climb distance and fuel are included where climbs are indicated.

DATA BELOW CONTAIN NO FUEL RESERVE FOR LANDING

DATA AS OF: 4 September 1952 BASED ON: Estimates

LOW ALTITUDE

IF YOU ARE AT S.L.			(1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			(1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			FUEL	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	LBS.	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL[1])																
245	45	515	1869	280	45	540	325	45	565	370	45	585	1869	420	45	605
205	45	430	1600	240	45	450	280	45	475	315	45	495	1600	360	45	515
175	45	360	1400	210	45	385	245	45	410	275	45	425	1400	315	45	450
150	45	295	1200	180	45	315	210	45	340	240	45	355	1200	270	45	380
100	40	160	800	120	45	185	140	45	205	160	45	220	800	185	45	245
50	SL	-	400	60	20	65	70	25	75	85	35	90	400	95	40	105
25	SL	-	200	35	5	-	40	10	-	45	15	-	200	50	20	-

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFECTIVE WIND	CRUISING AT 20000'					
C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE					C.A.S.	APPROXIMATE						C.A.S.	APPROXIMATE				
	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.			% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW																			120 HW	345	85	2195	335	.7	10
						80 HW							385	83	2445	320	.8	5	375	84	2210	335	.8	10	80 HW	330	84	2025	355	.8	15
350	82	2820	310	.9	0	40 HW	340	82	2565	325	.9	5	320	82	2165	330	.9	5	315	83	2020	350	.9	10	40 HW	305	84	1845	365	.9	15
330	81	2635	330	1.0	0	0	330	81	2315	350	1.0	5	320	82	2165	370	1.0	5	315	83	2020	390	1.0	10	0	305	83	1845	405	1.0	15
320	80	2535	360	1.1	0	40 TW	330	81	2315	370	1.1	5	320	82	2165	410	1.1	5	300	82	1860	410	1.1	10	40 TW	305	83	1845	405	1.1	15
						80 TW							260	81	1980	420	1.2	5	300	82	1860	450	1.2	10	80 TW	280	83	1675	455	1.2	15
						120 TW																			120 TW	280	82	1675	495	1.3	20

Figure A—18. Flight Operation Instruction Chart (Sheet 3 of 4)

AIRCRAFT MODEL (S) F-84F

ENGINE (S): YJ65-W-1

HIGH ALTITUDE

CHART WT. LIMITS 16631 TO 14762 LBS.

EXT. LOAD NONE

NO. OF ENGINES OPERATING: 1

IF YOU ARE AT 25000'			FUEL	IF YOUR ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL	IF YOU ARE AT 45000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	LBS.	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)																
470	45	625	1869	530	45	645	595	45	660	655	45	675	1869	680	45	
405	45	535	1600	455	45	555	510	45	565	565	45	580	1600	585	45	
350	45	470	1400	400	45	485	450	45	500	495	45	510	1400	515	45	
305	45	400	1200	345	45	415	385	45	430	425	45	440	1200	445	45	
205	45	260	800	235	45	280	265	45	290	295	45	305	800	305	45	
110	40	120	400	125	30	-	140	35	-	160	40	-	400	170	45	
60	25	-	200	70	30	-	80	35	-	90	40	-	200	100	45	

CRUISING AT 25000'						EFFEC-TIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFEC-TIVE WIND	CRUISING AT 45000'				
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE						APPROXIMATE				
C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
330	85	1980	350	.7	20	120 HW	315	85	1770	360	.7	30	290	86	1620	370	.7	35	270	88	1495	380	.75	45	120 HW	235	93	1450	385	.75	55
315	84	1820	365	.8	20	80 HW	315	85	1770	400	.8	30	290	86	1620	410	.8	40	270	88	1495	420	.8	50	80 HW	235	93	1450	425	.8	65
315	84	1820	405	.9	25	40 HW	285	84	1630	405	.9	30	280	85	1530	430	.9	40	270	88	1495	460	.9	55	40 HW	235	93	1450	465	.9	70
285	83	1665	415	1.0	25	0	285	84	1630	445	1.0	35	280	85	1530	470	1.0	45	260	87	1455	495	1.0	60	0	235	93	1450	505	1.0	75
285	83	1665	455	1.1	25	40 TW	275	83	1540	470	1.1	35	280	85	1530	510	1.1	50	260	87	1455	535	1.1	65	40 TW	235	93	1450	545	1.1	80
285	83	1665	495	1.2	30	80 TW	275	83	1540	510	1.2	40	265	84	1465	530	1.2	50	260	87	1455	575	1.2	70	80 TW	235	93	1450	585	1.2	85
280	82	1570	510	1.3	30	120 TW	275	83	1540	550	1.3	45	265	84	1465	570	1.3	55	260	87	1455	615	1.3	75	120 TW	235	93	1450	625	1.3	95

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple NAUTICAL units by 1.15 to obtain STATUTE units.
3 Read lower half of chart opposite effective wind only.
4 Make additional allowances for landing, navigational errors, combat, formation flight etc. as required.

EXAMPLE

If you are at 10000 ft. with 1400 Lbs. of available fuel, you can fly 245 NAUTICAL airmiles by holding 320 KNOT CAS. However, you can fly 410 NAUTICAL airmiles by immediately climbing to 45000 ft. using 100% RPM. At 45000 ft. cruise at 235 KNOT CAS and start let down 75 NAUTICAL miles from home. With an 40 KNOT headwind the range at 45000 ft. would be 410 x .9 or 370 NAUTICAL miles. Cruise at 235 KNOT CAS with this wind and start let down 70 NAUTICAL miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- KNOT
R.F.-Range factor-Ratio of ground distance to airmiles for corresponding winds
G.S.-Ground speed in KNOTS
CAS-Calibrated airspeed in KNOTS
LB/HR-Fuel consumption-POUNDS per hour
RANGE- NAUT miles
( )-RANGE IN PARENTHESIS AVAILABLE ONLY WITH FUEL FROM EXTERNAL SOURCE.

DATA AS OF: 4 September 1952 BASED ON: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—18. Flight Operation Instruction Chart (Sheet 4 of 4)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F ENGINE(S): YJ65-W-1

CONFIGURATION. CLEAN + two 230 gal tanks + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 25190 Lbs.

CONFIGURATION: Clean + two 230 gal tanks + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 23508 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
88	.0726	.431	285	SEA LEVEL	285	.428	.0746	88
90	.0795	.470	285	5000	275	.458	.0824	89
92	.0860	.510	280	10000	275	.495	.0898	90
94	.0933	.551	280	15000	275	.543	.0977	92
				20000	275	.603	.1038	96
				25000				
				30000				
				35000				
				40000				
				45000				
				50000				

CONFIGURATION. Clean + two 230 gal tanks + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 21826 Lbs.

CONFIGURATION: Clean + two 230 gal tanks + two 1000 Lb. bombs + eight 5" HVAR
WEIGHT: 20144 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/ LB						MI/ LB	%RPM
87	.0767	.421	280	SEA LEVEL	275	.418	.0788	86
87	.0853	.453	275	5000	275	.442	.0882	87
88	.0935	.487	270	10000	260	.471	.0973	88
91	.1020	.520	265	15000	255	.503	.1067	90
94	.1088	.588	265	20000	250	.546	.1139	91
96	.1185	.623	260	25000	245	.600	.1252	94
				30000				
				35000				
				40000				
				45000				
				50000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUTICAL MILES PER POUND
KN-NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—19. Maximum Range Summary Chart (Sheet 1 of 6)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F ENGINE(S): YJ65-W-1

CONFIGURATION. Clean + four 230 gal tanks
WEIGHT: 25380 Lbs.

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 23760 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
86	.0942	.499	330	SEA LEVEL	330	.499	.0963	85
87	.1059	.539	325	5000	320	.532	.1092	86
88	.1175	.588	330	10000	315	.573	.1222	87
90	.1290	.647	330	15000	310	.615	.1348	88
91	.1394	.685	315	20000	305	.660	.1452	89
93	.1510	.740	310	25000	300	.715	.1590	91
95	.1621	.790	290	30000	285	.756	.1713	93
				35000				
				40000				
				45000				
				50000				

CONFIGURATION. Clean + four 230 gal tanks
WEIGHT: 22140 Lbs.

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 20520 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
85	.0986	.492	325	SEA LEVEL	320	.484	.1008	84
86	.1130	.523	320	5000	310	.508	.1168	84
87	.1272	.565	315	10000	300	.541	.1325	85
87	.1410	.599	305	15000	290	.575	.1460	86
89	.1517	.652	300	20000	285	.620	.1594	87
90	.1670	.690	285	25000	285	.682	.1755	89
92	.1802	.747	280	30000	290	.747	.1901	91
				35000	260	.773	.2059	93
				40000				
				45000				
				50000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUTICAL MILES PER POUND
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—19. Maximum Range Summary Chart (Sheet 2 of 6)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION. Clean + four 230 gal tanks
WEIGHT: 18900 Lbs.

APPROXIMATE %RPM	APPROXIMATE MI/LB	MACH NO.	CAS KN	PRESSURE ALTITUDE FEET
83	.1036	.477	315	SEA LEVEL
84	.1205	.500	305	5000
84	.1375	.526	290	10000
85	.1530	.551	280	15000
86	.1663	.595	275	20000
87	.1835	.657	275	25000
89	.2009	.722	270	30000
91	.2203	.756	255	35000
				40000
				45000
				50000

CONFIGURATION: Clean + four 230 gal tanks
WEIGHT: 17281 Lbs.

CAS KN	MACH NO.	APPROXIMATE MI/ LB	APPROXIMATE %RPM
310	.469	.1058	83
300	.485	.1242	83
280	.502	.1421	83
265	.528	.1590	83
260	.570	.1755	84
265	.640	.1920	86
260	.696	.2119	88
250	.756	.2346	90
235	.784	.2426	94

CONFIGURATION. Clean + two 450 gal. tanks
WEIGHT: 25065 Lbs.

APPROXIMATE %RPM	APPROXIMATE MI/LB	MACH NO.	CAS KN	PRESSURE ALTITUDE FEET
86	.0990	.52	345	SEA LEVEL
86	.1107	.56	340	5000
87	.1224	.60	340	10000
88	.1337	.65	330	15000
89	.1480	.69	315	20000
91	.1623	.75	310	25000
93	.1762	.80	305.	30000
				35000
				40000
				45000
				50000

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 23467 Lbs.

CAS KN	MACH NO.	APPROXIMATE MI/ LB	APPROXIMATE %RPM
340	.51	.1017	85
330	.54	.1145	85
325	.58	.1280	86
315	.62	.1404	87
305	.66	.1544	88
305	.72	.1710	90
300	.79	.1843	92

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUT. MILES PER POUND

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—19. Maximum Range Summary Chart (Sheet 3 of 6)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F ENGINE(S): YJ65-W-1

CONFIGURATION. Clean + Two 450 gal. tanks
WEIGHT: 21869 Lbs.

APPROXIMATE %RPM	APPROXIMATE MI/LB	MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE MI/LB	APPROXIMATE %RPM
84	.1038	.50	330	SEA LEVEL	320	.49	.1064	83
85	.1185	.52	320	5000	315	.52	.1223	84
85	.1330	.55	305	10000	305	.56	.1382	85
86	.1473	.59	305	15000	305	.60	.1540	86
87	.1636	.65	295	20000	305	.66	.1695	87
89	.1797	.72	300	25000	290	.70	.1883	88
91	.1928	.78	295	30000	285	.75	.2032	89
				35000				
				40000				
				45000				
				50000				

CONFIGURATION. Clean+Two - 450 gal tanks
WEIGHT: 18673 Lbs.

CONFIGURATION: Clean + two 450 gal. tanks
WEIGHT: 17075 Lbs.

APPROXIMATE %RPM	APPROXIMATE MI/LB	MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE MI/LB	APPROXIMATE %RPM
83	.1089	.48	315	SEA LEVEL	315	.47	.1109	82
83	.1260	.51	310	5000	305	.50	.1300	83
84	.1435	.54	305	10000	300	.53	.1485	84
85	.1605	.58	300	15000	285	.56	.1675	84
86	.1783	.63	285	20000	280	.61	.1871	85
87	.1970	.68	285	25000	275	.67	.2058	86
88	.2140	.74	275	30000	270	.72	.2270	87
90	.2690	.79	270	35000	265	.78	.2453	89
94	.2450	.82	250	40000	245	.81	.2665	91
				45000				
				50000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUTICAL MILES PER POUND
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A–19. Maximum Range Summary Chart (Sheet 4 of 6)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F ENGINE(S): YJ65-W-1

CONFIGURATION. Clean + two 230 gal tanks
WEIGHT: 21990 Lbs.

CONFIGURATION: Clean + two 230 gal tanks
WEIGHT: 20308 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
84	.1045	.510	335	SEA LEVEL	330	.500	.1070	84
85	.1190	.530	320	5000	310	.520	.1230	84
85	.1330	.565	315	10000	305	.555	.1390	84
86	.1495	.605	310	15000	295	.585	.1553	85
87	.1635	.660	305	20000	290	.635	.1720	86
89	.1815	.720	300	25000	290	.695	.1910	87
91	.1970	.785	295	30000	285	.755	.2075	89
93	.2110	.840	285	35000	280	.815	.2260	91
				40000				
				45000				
				50000				

CONFIGURATION. Clean + 230 gal tanks
WEIGHT: 18626 Lbs.

CONFIGURATION: Clean + 230 gal tanks
WEIGHT: 16944 Lbs.

APPROXIMATE		MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
82	.1095	.485	320	SEA LEVEL	315	.475	.1120	82
83	.1270	.500	305	5000	300	.495	.1310	82
83	.1450	.525	295	10000	290	.515	.1505	82
84	.1625	.560	285	15000	275	.540	.1700	83
85	.1820	.615	280	20000	270	.585	.1915	83
86	.2020	.670	280	25000	270	.645	.2130	84
87	.2210	.730	275	30000	260	.705	.2350	86
90	.2405	.795	270	35000	260	.770	.2580	88
94	.2520	.840	255	40000	250	.825	.2735	92
				45000				
				50000				

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUTICAL MILES PER POUND
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—19. Maximum Range Summary Chart (Sheet 5 of 6)

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) F-84F

ENGINE(S): YJ65-W-1

CONFIGURATION. Clean
WEIGHT: 18500 Lbs.

CONFIGURATION: Clean
WEIGHT: 16631 Lbs.

APPROXIMATE %RPM	APPROXIMATE MI/ LB	MACH NO.	CAS KN	PRESSURE ALTITUDE FEET	CAS KN	MACH NO.	APPROXIMATE MI/LB	APPROXIMATE %RPM
82	.1237	.52	345	SEA LEVEL	330	.50	.1260	81
82	.1450	.56	340	5000	330	.54	.1480	81
83	.1670	.60	330	10000	320	.58	.1715	82
83	.1880	.63	320	15000	315	.62	.1950	83
83	.2105	.65	300	20000	305	.66	.2200	83
83	.2320	.69	285	25000	285	.69	.2455	83
84	.2570	.76	285	30000	285	.75	.2760	84
86	.2850	.83	285	35000	280	.82	.3090	85
90	.3095	.87	265	40000	260	.86	.3380	87
				45000	235	.88	.3475	93
				50000				

CONFIGURATION.
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE %RPM	APPROXIMATE MI/	MACH NO.	CAS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE MI/	APPROXIMATE %RPM

REMARKS:

CAS - CALIBRATED AIRSPEED KN
MI/LB - NAUTICAL MILES PER POUND
KN - NAUTICAL MILES PER HOUR

DATA AS OF: 4 September 1952
DATA BASIS: Estimates

FUEL GRADE: JP-3, JP-4
FUEL DENSITY: 6.5 Lbs/Gal.

Figure A—19. Maximum Range Summary Chart (Sheet 6 of 6)

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