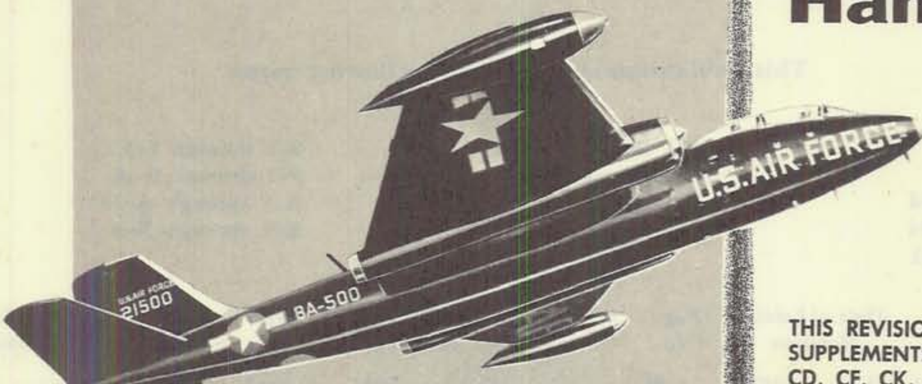
Flight Handbook



THIS REVISION REPLACES SUPPLEMENTS E, H, K, M, P, V, W, CD, CF, CK, AND CL. SEE BASIC INDEX, T.O. 0–1–1 AND WEEKLY INDEX, T.O. 0–1–1A FOR CURRENT STATUS OF SAFETY OF FLIGHT SUPPLEMENTS.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

B-57C

USAF SERIES AIRCRAFT

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS TECHNICAL PUBLICATION TO THE ATTENTION OF ALL AIR FORCE PERSONNEL CLEARED FOR OPERATION OF THIS AIRCRAFT.

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Insert revised pages into basic publication. Destroy superseded pages.

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INSERT LATEST REVISED PAGES. DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

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				X–4	1 February 1957

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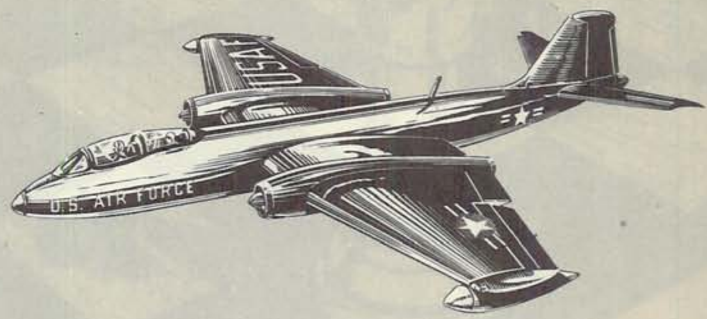

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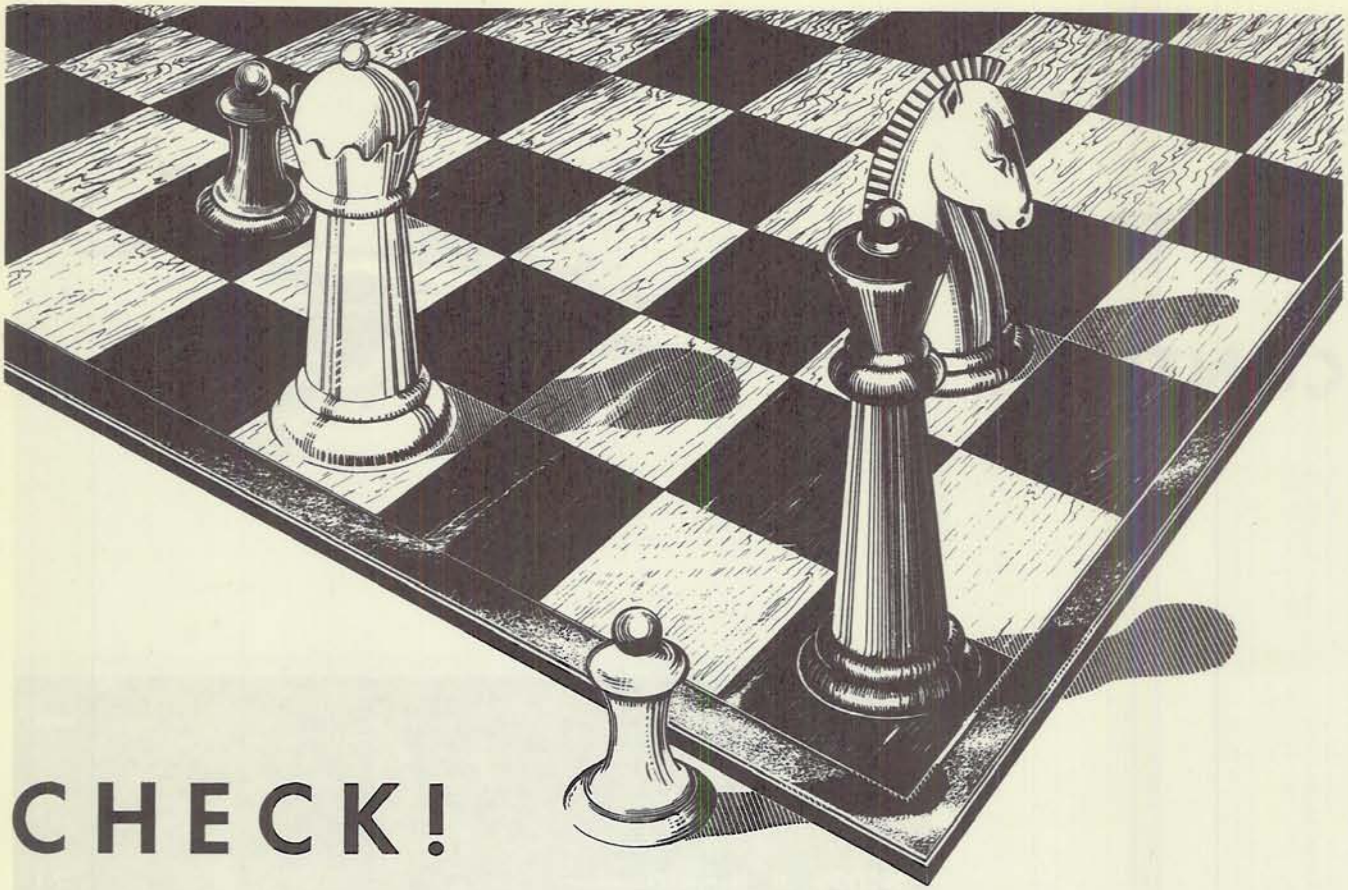

CHECK!

and double-check these pages

SCOPE

This handbook contains all the information necessary for safe and efficient operation of the B-57C airplane. These instructions do not teach basic flight principles, but are designed to give 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.

SOUND JUDGMENT

The instructions in this handbook have been prepared to answer the needs of a crew with no experience in the operation of this airplane. Although this book provides the best possible operating instructions under most circumstances, it is a poor substitute for sound judgment. Multiple emergencies, adverse weather, and terrain may require modification of the procedures contained herein.

PERMISSIBLE OPERATIONS

The Flight Handbook is positive in approach and normally tells you only what you are permitted to do. Any unusual operation is prohibited unless specifically covered. Obtain clearance from ARDC before attempting any questionable operation not specifically covered in the Flight Handbook.

STANDARDIZATION

Once you have learned to use one Flight Handbook, you will know how to use them all. The scope and arrangement of all Flight Handbooks are the same.

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ARRANGEMENT

To make the Flight Handbook easy to read and use as a reference, the information has been divided into ten sections, each having a table of contents. The first three sections present the minimum information needed to get the airplane off the ground and back down again safely. These sections must be read thoroughly and understood fully before a new airplane is to be flown. Section IV covers all equipment not essential to flight but which permits the airplane to perform special functions. The content of the remaining sections is obvious, except for Section VII, which contains detailed information on techniques and theory of operation. The experienced pilot need not study this section, but he should acquaint himself with any possible new information.

RESPONSIBILITY

These Flight Handbooks are kept up to date through an extremely active revision program. Frequent conferences with operating personnel and constant review of UR's, accident reports, and flight test reports assure inclusion of the latest data. In this regard, it is essential that you do your part! If you find anything you don't like about this book, let us know right away. We cannot correct an error we don't know about.

PERSONAL COPIES

All flight crew members, except those attached to an administrative base, are entitled to a personal copy of the Flight Handbook. Air Force Regulation 5-13 specifically makes that provision. Flexible loose-leaf tabs and binders are available to hold your personal copy of the Flight Handbook and to make it much easier for you to revise your handbook and keep it in good condition. These tabs and binders are secured through your local contracting officer.

HOW TO GET COPIES

To be sure of getting your handbook on time, order them before you need them. Early ordering will assure that enough copies are printed to cover you requirements. Technical Order 0-5-2 explain how to order Flight Handbooks so that you will automatically get all revisions, reissues, and Safety of Flight Supplements. Basically, all you have to do is order the required quantities in the Publication Requirements Table (T.O. 0-3-1). Talk to your base supply officer — it is his job to fulfill your Technical Order requests. Make sure to establish some system that will rapidly get the books to the flight crews once they are received on the base.

STATUS OF SAFETY OF FLIGHT SUPPLEMENTS

You can determine the status of Safety of Flight Supplements by referring to the Index of Technical Publications (T.O. 0-1-1) and the Weekly Supplemental Index. (T.O. 0-1-1A). Also check the title page of the Flight Handbook and the title block of each new Safety of Flight Supplement to determine how these publications affect existing Safety of Flight Supplements.

WARNINGS, CAUTIONS AND NOTES

The warnings, cautions, and notes found throughout the handbook have these meanings:

WARNING

Injury to personnel

CAUTION

Damage to equipment

Note:

Information requiring emphasis

COMMENTS AND QUESTIONS

Comments and questions regarding any phase of the Flight Handbook program are invited and should be addressed to the Directorate of Systems Management, Headquarters Air Research and Development Command, Wright-Patterson Air Force Base, Ohio, Attention: RDZSTH.

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N O T E

Paragraphs covering major system and equipment differences in the B-57C series airplanes are identified by code letters appearing at the top right corner of the paragraph. Code letters and/or text will be removed or changed in subsequent revisions if field service changes are made. Code letters are assigned as follows:

Group A	Airplanes 53-3825 through 53-3831	M3 50 Caliber guns
Group B	Airplanes 53-3832 and up	M39 20 multi-meter guns
Group C	Before modification (all airplanes)	Elevator system and stabilizer system
Group D	After modification (all airplanes)	Elevator system and stabilizer system
Group E	Before modification (all airplanes)	Fuel controls
Group F	After modification (all airplanes)	Fuel controls

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This handbook is divided into nine sections and one appendix, as follows:

Section I Description	This section describes the airplane and all systems and controls that contribute to the physical act of flying the airplane. Included in this section is a description of all emergency equipment that is not a part of an auxiliary system.
Section II Normal Procedures	This section contains the procedure to be followed from the time the flight is planned until the airplane is left parked on the ramp after one complete non-tactical mission under normal conditions has been made.
Section III Emergency Procedures	This section describes clearly and concisely the procedures to follow for any emergency (except those in connection with the auxiliary equipment) that could reasonably be expected to be encountered.
Section IV Description and Operation of Auxiliary Equipment	This section includes the description, normal operation, and emergency operation of all equipment not directly contributing to flight but which enables the airplane to perform certain specialized functions.
Section V Operating Limitations	This section sets out the various ground and flight limitations which must be observed if the airplane is to be operated with safety and efficiency.
Section VI Flight Characteristics	This section familiarizes the pilot with the sort of control response and general maneuverability that he may reasonably expect in flying this airplane. It emphasizes the characteristics that are different from other airplanes.
Section VII Systems Operation	This section gives additional information (to that covered in the other sections) about the operation of the various airplane systems.
Section VIII Crew Duties	This section contains an explanation of the responsibilities of each crew member toward the safe and efficient operation of the airplane. It lists the duties and responsibilities of these crew members.
Section IX All-Weather Operation	This section outlines the proper techniques and procedures to be used in unusual or unique weather conditions. The instructions in this section supplement the procedures outlined in Section II, III, and VII.
Appendix I Performance Data	The appendix contains all performance data necessary for preflight and in-flight missions planning with explanatory text on the use of the data.
Alphabetical Index	This index facilitates locating subject material and illustrations contained in the handbook.

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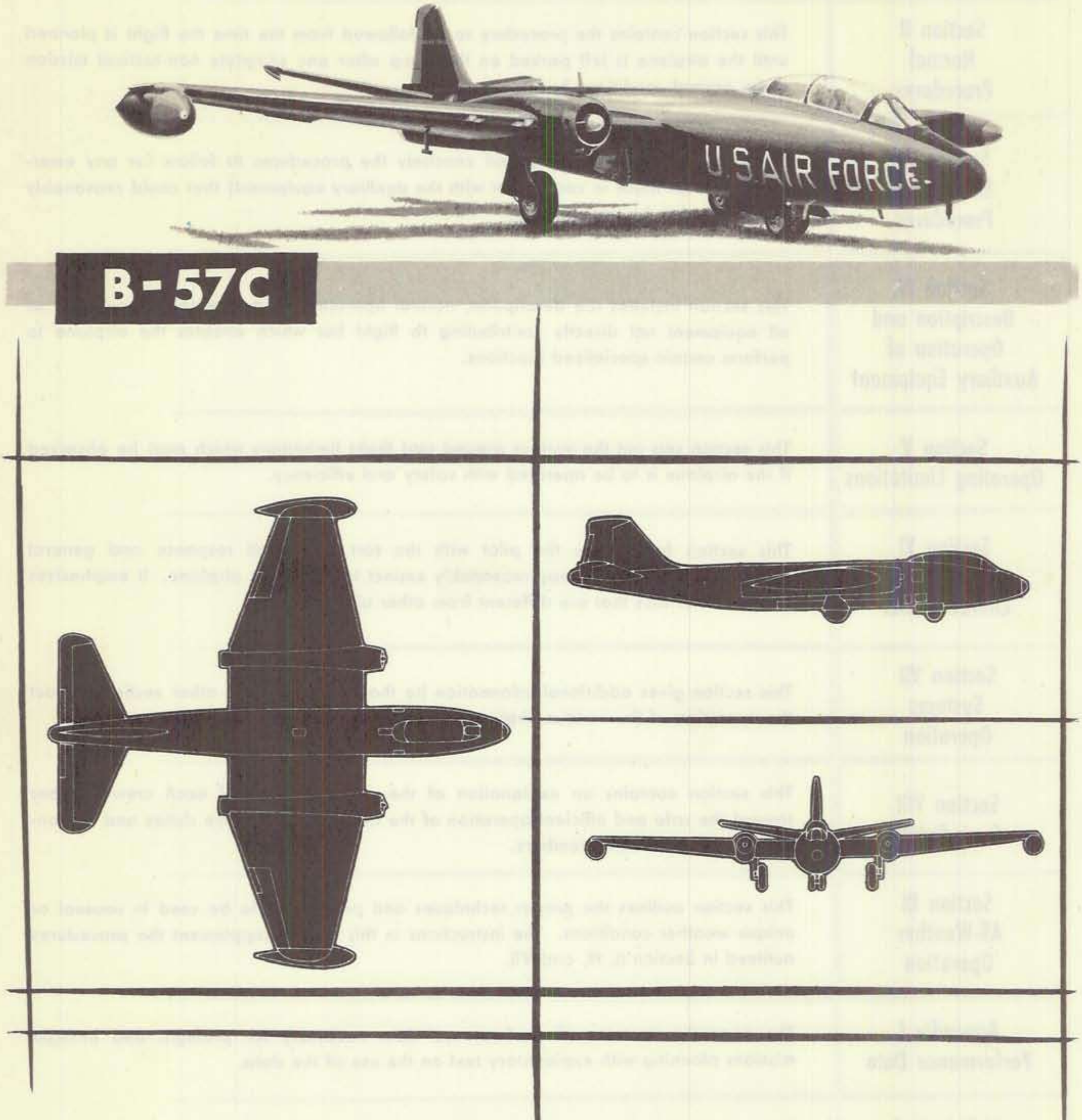

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Description

Section I

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THE AIRPLANE.

The B-57C, manufactured by the Martin Company, is a trainer version of the B-57B light bombardment airplane with a primary purpose of jet transition training and can be reconverted to the model B-57B. The B-57C is an all-metal, mid-wing, twin-engine, turbojet-propelled monoplane with retractable landing gear. Design features include a variable-incidence stabilizer, wing and fuselage dive brakes, and a rotary bomb door. The fuselage is of semimonocoque construction with a pressurized cabin for operation at altitudes above 10,000 feet. The oustanding recognition characteristic of the B-57 series of airplanes is the large chord of the wing between the root and the engine nacelle.

The nose section contains the pressurized cabin for the crew. The crew consists of a pilot and instructor-pilot and the tandem seating arrangement places

GENERAL ARRANGEMENT DIAGRAM

1. ACCESS HATCH APG-31
2. WINDSHIELD WIPER
3. GUNSIGHT
4. PILOT'S MAP CASE
4. ASH TRAY
6. PILOT'S EJECTION SEAT
7. INSTRUCTOR-PILOT'S PLOTTING BOARD
8. CURTAIN
9. INSTRUCTOR-PILOT'S ASH TRAY
10. INSTRUCTOR-PILOT'S EJECTION SEAT
11. LOOP ANTENNA
12. EQIUPMENT ACCESS HATCH
13. LEFT ELECTRICAL ACCESS HATCH
14. INSTRUCTOR-PILOT'S DATA CASE
15. RIGHT ELECTRICAL ACCESS HATCH, EXTERNAL POWER RECEPTACLE, AND SPARE LAMPS STOWAGE
16. UHF ANTENNA AN/ARC-27
17. INSTRUCTOR-PILOT'S RELIEF TUBE
18. PILOT'S DATA CASE
19. SHORAN RECEIVING ANTENNA
20. PILOT'S RELIEF TUBE
21. LAMPS STOWAGE
22. PITOT TUBE
23. ANTENNA APG-31
24. GUN PORTS
25. EXTERIOR LIGHTS
26. WING DIVE BRAKES
27. LIGHT LENS STOWAGE
28. STARTER CARTRIDGE STOWAGE
29. MOORING AND TIE DOWN LUGS AND LANDING GEAR EXTENDER VALVE STOWAGE
30. SENSE ANTENNA
31. CANOPY SAFETY COLLAR STOWAGE
32. AFT FUSELAGE DATA CASE
33. TAIL WARNING ANTENNA AN/APS-54
34. MARKER BEACON AN/ARN-12
35. SHORAN ANTENNA
36. FUSELAGE SPEED BRAKES
37. AFT FUSELAGE ACCESS HATCH
38. ANTENNA AN/APW-11A
39. BOMB CARRIER DOOR
40. BOMB HOIST ACCESS DOORS
41. BATTERY AND BATTERY ACCESS HATCH
42. IFF ANTENNA AN/APX-6

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Figure 1-1 (Sheet 1 of 2)

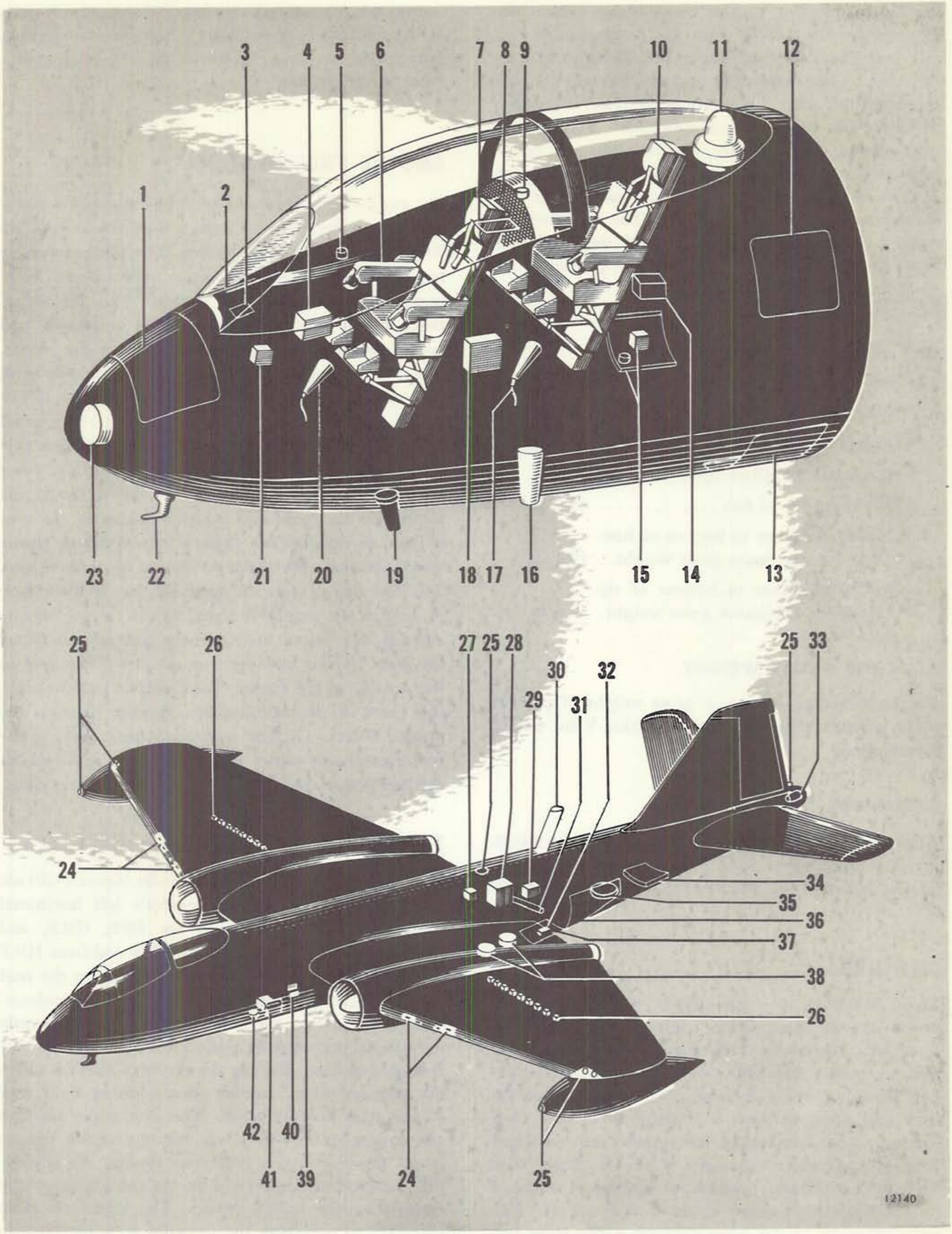

Figure 1-1 (Sheet 2 of 2)

the instructor-pilot to the rear of the pilot. The airplane has dual flight controls. A jettisonable canopy and ejection seats permit immediate escape for the crew. The center section of the fuselage contains the main fuel tanks, the rotary bomb door, the battery compartment, and electrical equipment. The aft fuselage section contains dive brakes, electronic equipment, and miscellaneous ground handling equipment. A skid on the underside of the tail section prevents damage to the tail during landings. The full-cantilever wing has dive brakes, inboard and outboard split flaps, fuel tanks, fixed wing guns, and provisions for tip tanks and external stores.

AIRPLANE DIMENSIONS.

The overall dimensions of the airplane are:

Wing Span	64.0 ft.
Length	65.5 ft.
Horizontal Stabilizer Span	27.8 ft.
Height (to top of fin)	15.5 ft.
Ground clearance to bottom of fuselage for maximum gross weight	19.2 in.
Ground clearance to bottom of tip tanks for maximum gross weight	5.4 ft.

AIRPLANE GROSS WEIGHT.

The approximate maximum gross weight of the airplane is 55,000 pounds. Refer to Section V for weight information.

ARMAMENT.

Airplane armament consists of fixed guns in the wings, a rotary bomb door; wing pylons for chemical tanks, bombs, and rockets; and special weapons equipment.

ENGINES.

Two J65–W–5 or J65–BW–5 turbo-jet engines power the airplane. Each engine has a rated sea-level static thrust of 7200 pounds for take-off and military power and 6350 pounds for normal continuous power. During operation, air enters the intake duct and flows through a 13-stage axial flow compressor. The compressed air passes into a single annular combustion chamber where it mixes with fuel for combustion. Continuous ignition is sustained by the high combustion chamber temperature. Partial expansion of the gases through a two-stage turbine produces the mechanical power that drives the compressor. Continued expansion of the exhaust gases in the exhaust duct produces a high-velocity jet that propels the airplane. There is no anti-icing equipment on the engines.

ENGINE FUEL SYSTEM.

The engine fuel system (figure 1–9) consists of a pump assembly, a fuel control unit, a flow transmitter, six flow dividers, and two primers. The pump assembly has three engine-driven pumps: a centrifugal boost pump and two gear-type pumps. The centrifugal boost pump receives fuel from the airplane's fuel system and delivers it to the main, gear-type pumps. The main pumps supply the fuel control unit with fuel under pressure ranging from 175 psi (at IDLE) to 600 psi (at FULL). The main pumps are in parallel and each pump has a discharge check valve that permits continued operation of one pump if the other fails. Either pump supplies enough fuel to the engine for maximum speed and power. Failure of the centrifugal pump does not cause a loss of engine power unless the fuel tank boost pumps are inoperative also. The fuel control unit automatically regulates the flow of fuel to the engine for any throttle setting at any altitude. Regulated fuel from the control unit enters the flow dividers and the flow dividers direct fuel to the nozzles in the combustion chamber. For starting, fuel flows to the combustion chamber through the primer circuits. A flow measuring mechanism at the fuel control unit outlet has a transmitter that operates the fuel flow indicator on the pilot's instrument panel.

THROTTLES.

Mechanically connected dual throttles (figure 1–10) are on the pilot's and instructor-pilot's left horizontal consoles. Throttle markings are OFF, IDLE, and FULL. Throttle movement out of OFF and from IDLE to OFF requires a vertical pull to disengage the stud on the throttle handle from detents in the quadrant. The detents are in the pilot's throttles only. Throttle movement mechanically positions the governor in the fuel control unit. Placing the throttles in IDLE closes the warning horn, landing gear warning light, and engine start microswitches. The dive brake switches and microphone press-to-talk buttons are on the inboard throttle lever at each crew station. An adjustable throttle friction knob is on the console below the throttles at the pilot's station. The maximum force necessary to overcome the throttles with the friction lock engaged does not exceed 17 pounds.

MAIN DIFFERENCES TABLE

	CREW STATIONS	CANOPY	JETTISONABLE HATCH	ENTRANCE	PHOTOGRAPHIC EQUIPMENT	DIVE BRAKES	PROPULSION CONTROLS	ARMAMENT AND BOMB DOOR	TOW-TARGET EQUIPPED	GENERATORS
RB-57A	Three	Pilot	Observer	Access Hatch	Day or Night Operation	Wing	Pilot Fixed	Bomb Door Only	No	3
B-57B	Two	Pilot and Observer	None	Canopy	None	Wing and Fuselage	Pilot	Yes	No	4
B-57C	Two	Pilot and Instructor Pilot	None	Canopy	None	Wing and Fuselage	Pilot and Instructor Pilot	Yes	53-3844 and 53-3845 Only	4
B-57D	CLASSIFIED INFORMATION									
B-57E	Two	Pilot and Tow-Target Operator	None	Canopy	None	Wing and Fuselage	Pilot and Tow-Target Operator	Provisions For	Yes Tow-Target Canisters On Aft Fuselage	4

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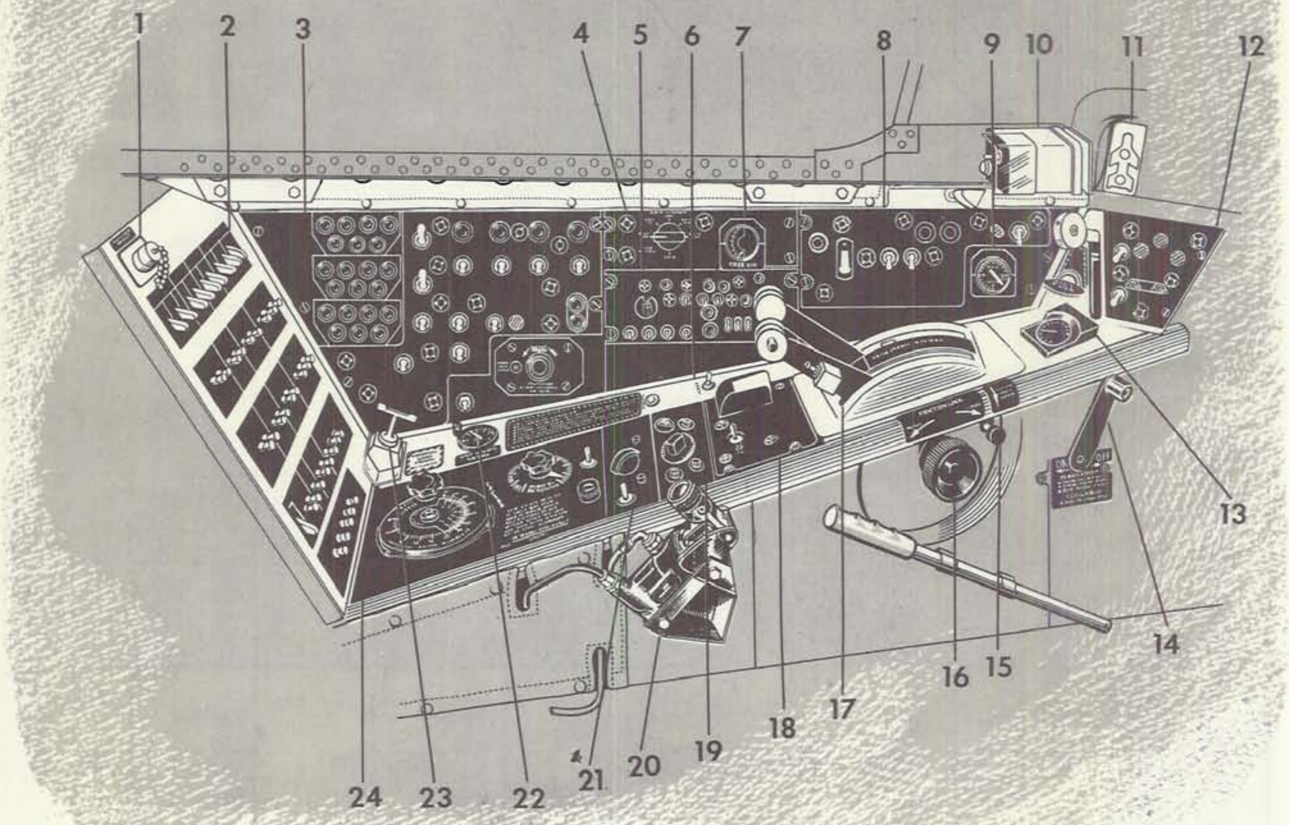
Figure 1–2

PILOT'S LEFT CONSOLE



1. T-23 POWER RECEPTACLE
2. CIRCUIT BREAKER PANEL
3. ARMAMENT CONTROL PANEL
4. SELECT ARMAMENT CONTROL PANEL
5. T-145 CONTROL PANEL
6. J-2 COMPASS CONTROLS
7. FREE-AIR TEMPERATURE GAGE
8. PILOT'S LEFT MAIN CONTROL PANEL
9. STABILIZER POSITION INDICATOR
10. CANOPY ACTUATING SWITCH
11. RADAR WARNING INDICATOR AN/APS-54
12. LANDING GEAR CONTROL PANEL
13. BRAKE PRESSURE GAGE
14. PARKING BRAKE
15. WARNING HORN RELEASE
16. THROTTLE FRICTION KNOB
17. THROTTLES
18. FLAP AND TRIM CONTROL PANEL
19. UHF RADIO CONTROLS
20. HYDRAULIC HAND PUMP
21. LABS CONTROL PANEL
22. HYDRAULIC SYSTEM PRESSURE GAGE
23. EMERGENCY CANOPY RELEASE
24. BOMB RELEASE INTERVAL CONTROL

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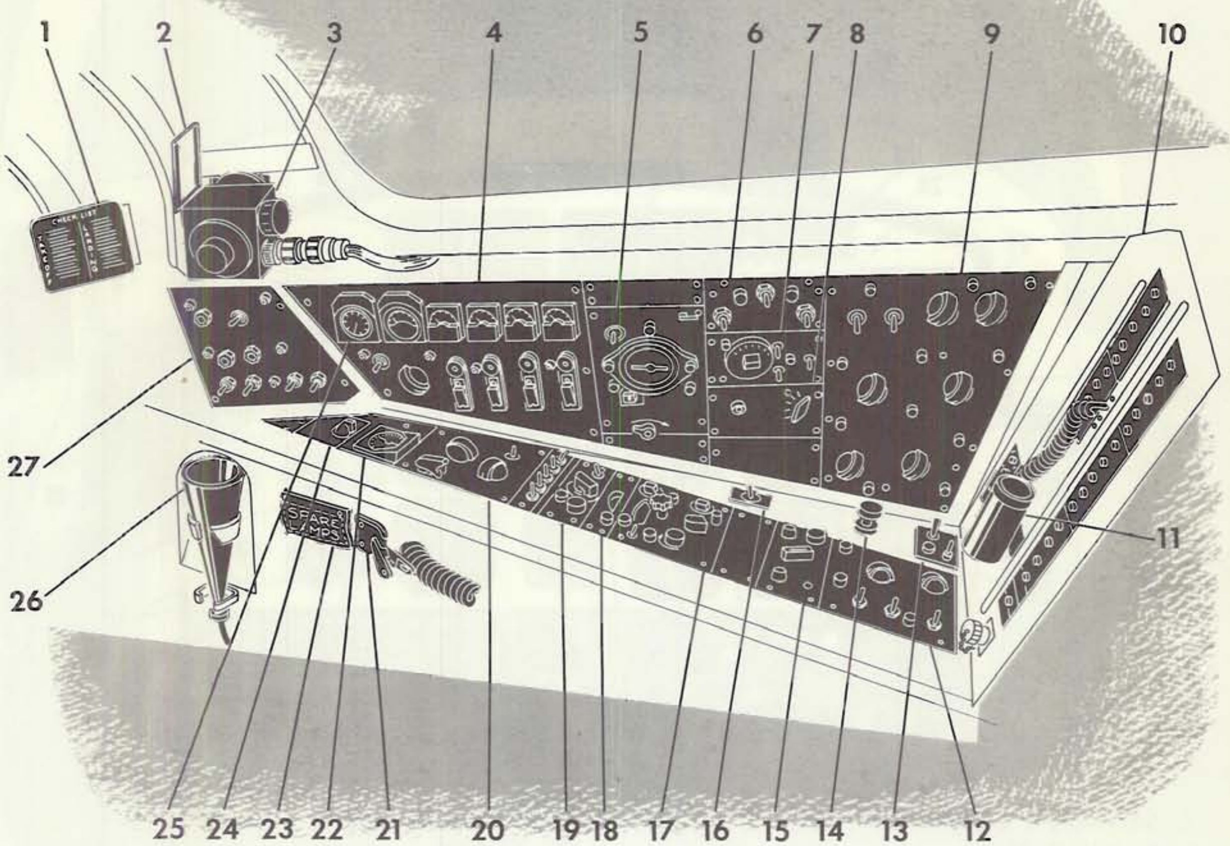
Figure 1-3

PILOT'S RIGHT CONSOLE



1. CHECK LIST
2. COMPASS DEVIATION CARD
3. POSITION SETTING UNIT
4. GENERATOR CONTROL PANEL
5. OXYGEN REGULATOR
6. AUXILIARY LIGHTING CONTROL PANEL
7. AN/APX-6A IFF RADAR CONTROL PANEL
8. AN/AIC-10 FILTER CONTROL PANEL
9. PILOT'S LIGHTING CONTROL PANEL
10. CIRCUIT BREAKER PANEL
11. C-4A LAMP
12. WINDSHIELD CONTROL PANEL
13. FERRY TANK CONTROL PANEL
14. DEFOG AIR KNOB
15. AN/APW-11 RADAR CONTROL PANEL
16. MARKER BEACON-RADAR WARNING SWITCH
17. AN/ARN-6 RADIO COMPASS CONTROL PANEL
18. ADF TUNER
19. AN/AIC-10 INTERPHONE CONTROL PANEL
20. AIR CONDITIONING CONTROL PANEL
21. OXYGEN HOSE
22. OXYGEN QUANTITY GAGE
23. SPARE LAMP
24. FUEL QUANTITY SELECTOR SWITCH
25. CABIN PRESSURE GAGE
26. RELIEF TUBE
27. INVERTER CONTROL PANEL

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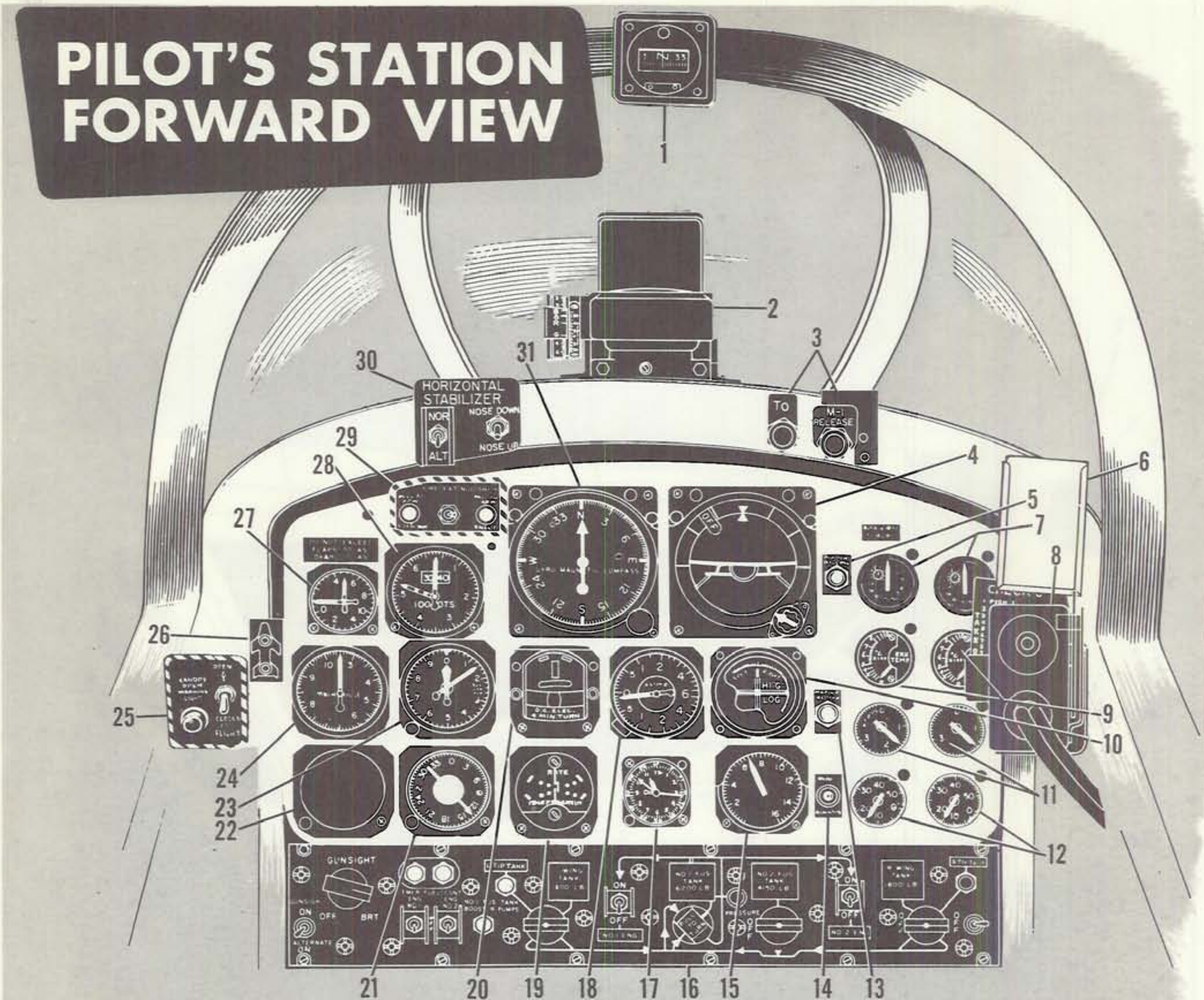
Figure 1-4



1. STANDBY COMPASS
2. GUNSIGHT
3. BOMB RELEASE INDICATOR LIGHTS
4. ATTITUDE INDICATOR
5. BOMB RELEASE INDICATOR LIGHT
6. COMPASS DEVIATION CARD
7. ENGINE TACHOMETERS
8. POSITION SETTING UNIT
9. ENGINE EXHAUST TEMPERATURE INDICATORS
10. LOW ALTITUDE BOMBING SYSTEM INDICATOR
11. FUEL FLOW INDICATORS
12. ENGINE OIL PRESSURE INDICATORS
13. MARKER BEACON LIGHT
14. FUEL QUANTITY TEST SWITCH
15. FUEL QUANTITY INDICATORS
16. FUEL CONTROL PANEL
17. CLOCK
18. VERTICAL VELOCITY INDICATOR
19. POSITION DEVIATION INDICATOR
20. TURN AND SLIP INDICATOR
21. RADIO COMPASS
22. FLIGHT COMMAND INDICATOR
23. ALTIMETER
24. MACHMETER
25. CANOPY ACTUATING SWITCH
26. APS-54 WARNING INDICATOR
27. ACCELEROMETER
28. AIRSPEED INDICATOR
29. FIRE EXTINGUISHER PANEL
30. HORIZONTAL STABILIZER OVERRIDE SWITCHES
31. GYRO MAGNETIC COMPASS

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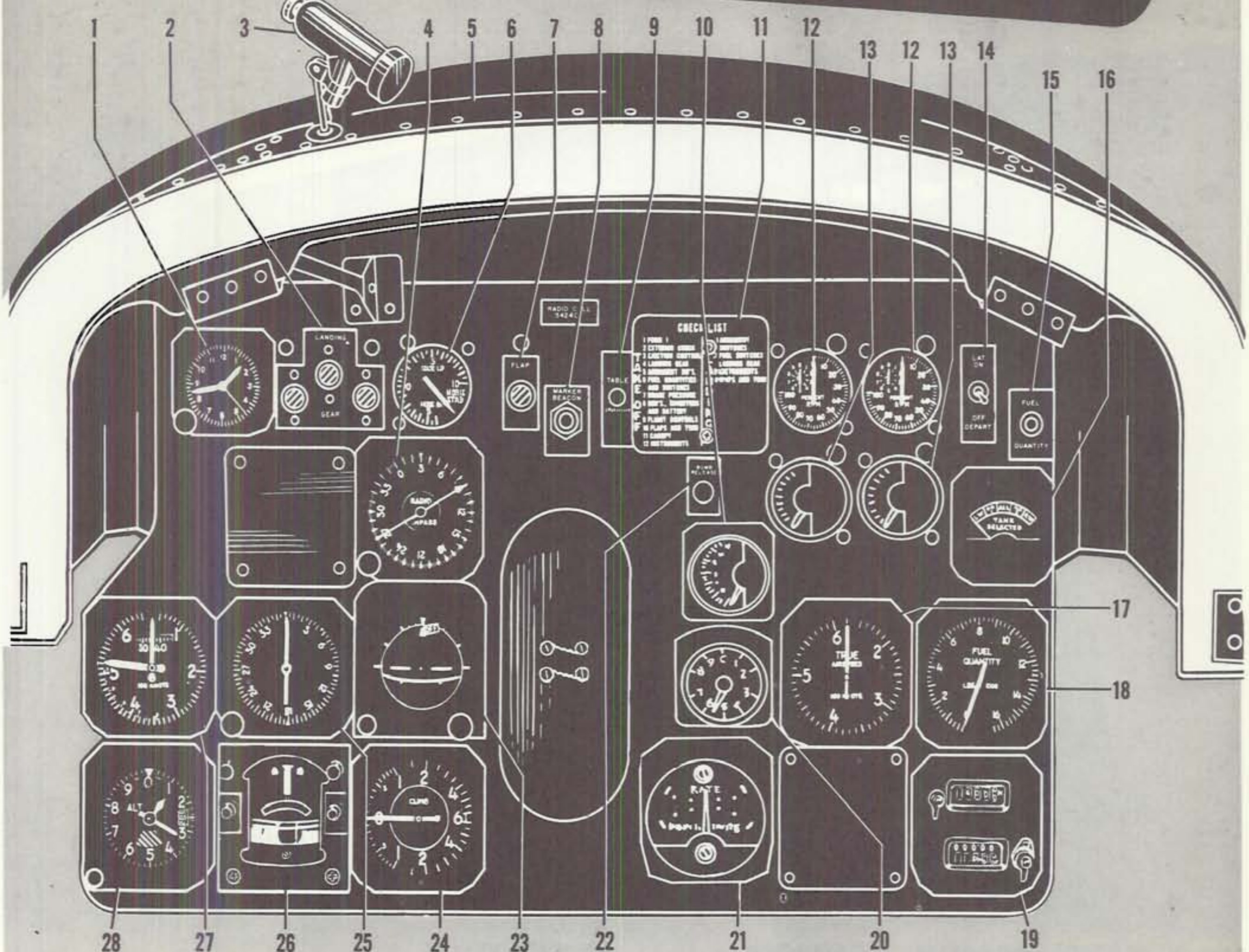
Figure 1-5

INSTRUCTOR-PILOT'S INSTRUMENT PANEL



1. CLOCK
2. LANDING GEAR POSITION INDICATOR
3. INSTRUCTOR-PILOT'S SPOTLIGHT
4. RADIO COMPASS INDICATOR
5. GLARE SHIELD
6. STABILIZER POSITION INDICATOR
7. WING FLAPS POSITION INDICATOR
8. MARKER BEACON INDICATOR
9. SPOTLIGHT SWITCH
10. OUTSIDE AIR TEMPERATURE INDICATOR
11. CHECK LIST
12. TACHOMETERS
13. ENGINE EXHAUST TEMPERATURE INDICATORS
14. AN/ASN-6 DEPARTURE SWITCH
15. FUEL QUANTITY TEST SWITCH
16. TANK SELECTOR POSITION INDICATOR
17. TRUE AIRSPEED INDICATOR
18. FUEL QUANTITY INDICATOR
19. GROUND POSITION INDICATOR
20. MILES TO RELEASE INDICATOR
21. POSITION DEVIATION INDICATOR
22. BOMB RELEASE INDICATOR LIGHT
23. ATTITUDE INDICATOR
24. RATE OF CLIMB INDICATOR
25. GYRO MAGNETIC COMPASS
26. TURN AND SLIP INDICATOR
27. AIRSPEED INDICATOR
28. ALTIMETER

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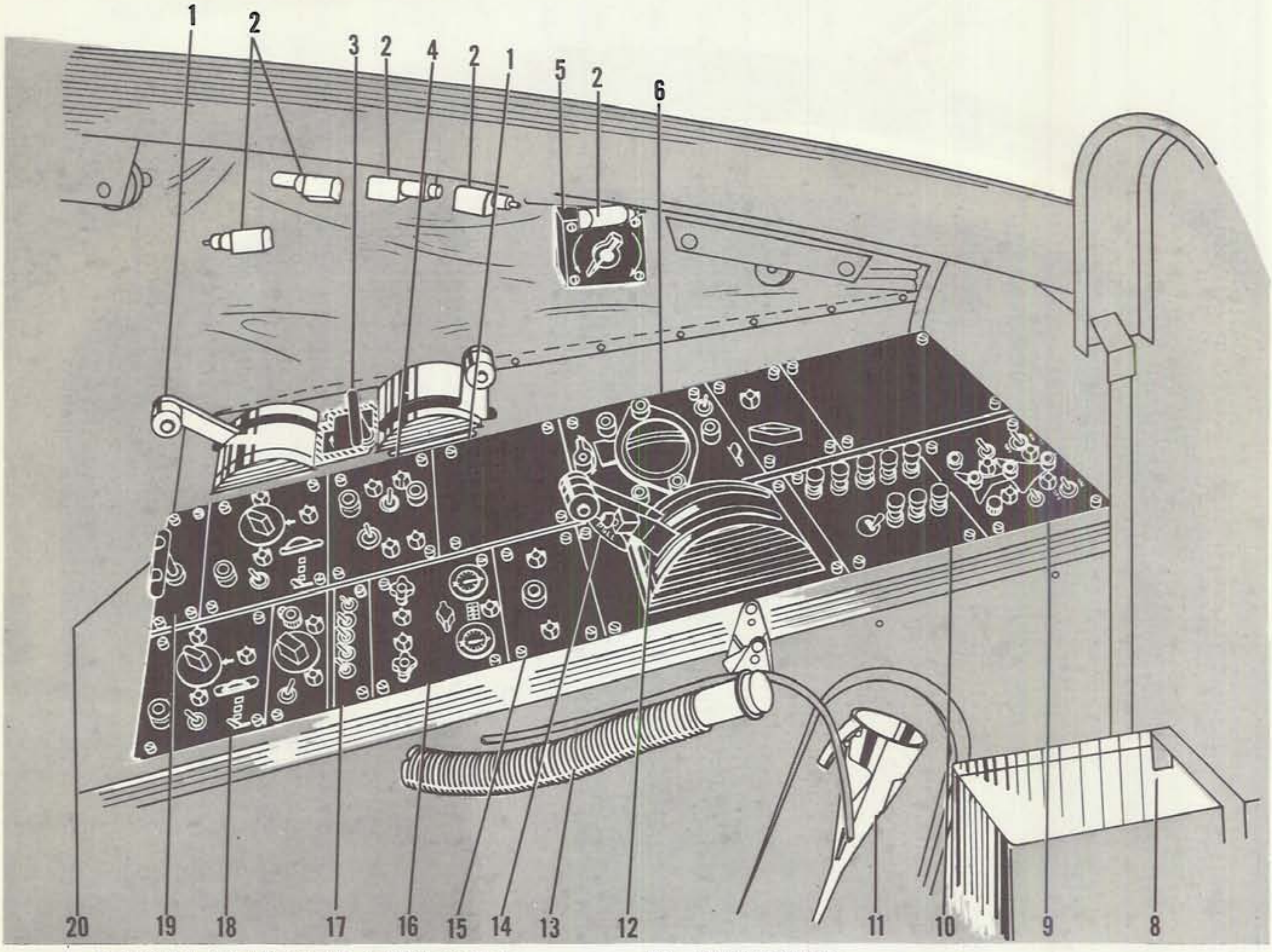
Figure 1-6

INSTRUCTOR PILOT'S LEFT CONSOLE



1. SPECIAL WEAPONS CONTROLS
2. CONSOLE LIGHTS
3. BOMB DOOR EMERGENCY OPEN HANDLE
4. SPECIAL WEAPONS CONTROL PANEL
5. HELMET DEFOG
6. OXYGEN REGULATOR
7. RADIO COMPASS FILTER CONTROL PANEL
8. MAP CASE
9. AN/APS-54 CONTROL PANEL
10. SPECIAL WEAPONS CIRCUIT BREAKER PANEL
11. RELIEF TUBE
12. THROTTLES
13. OXYGEN HOSE
14. EMERGENCY GEAR DOWN HANDLE
15. RUDDER TRIM CONTROL PANEL
16. AN/ASN-6 LATITUDE AND LONGITUDE CONTROL PANEL
17. INTERPHONE CONTROL PANEL
18. RIGHT WING CHAFF DISPENSER CONTROL PANEL
19. LEFT WING CHAFF DISPENSER CONTROL PANEL
20. EMERGENCY CANOPY RELEASE HANDLE

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Figure 1-7

INSTRUCTOR PILOT'S RIGHT CONSOLE

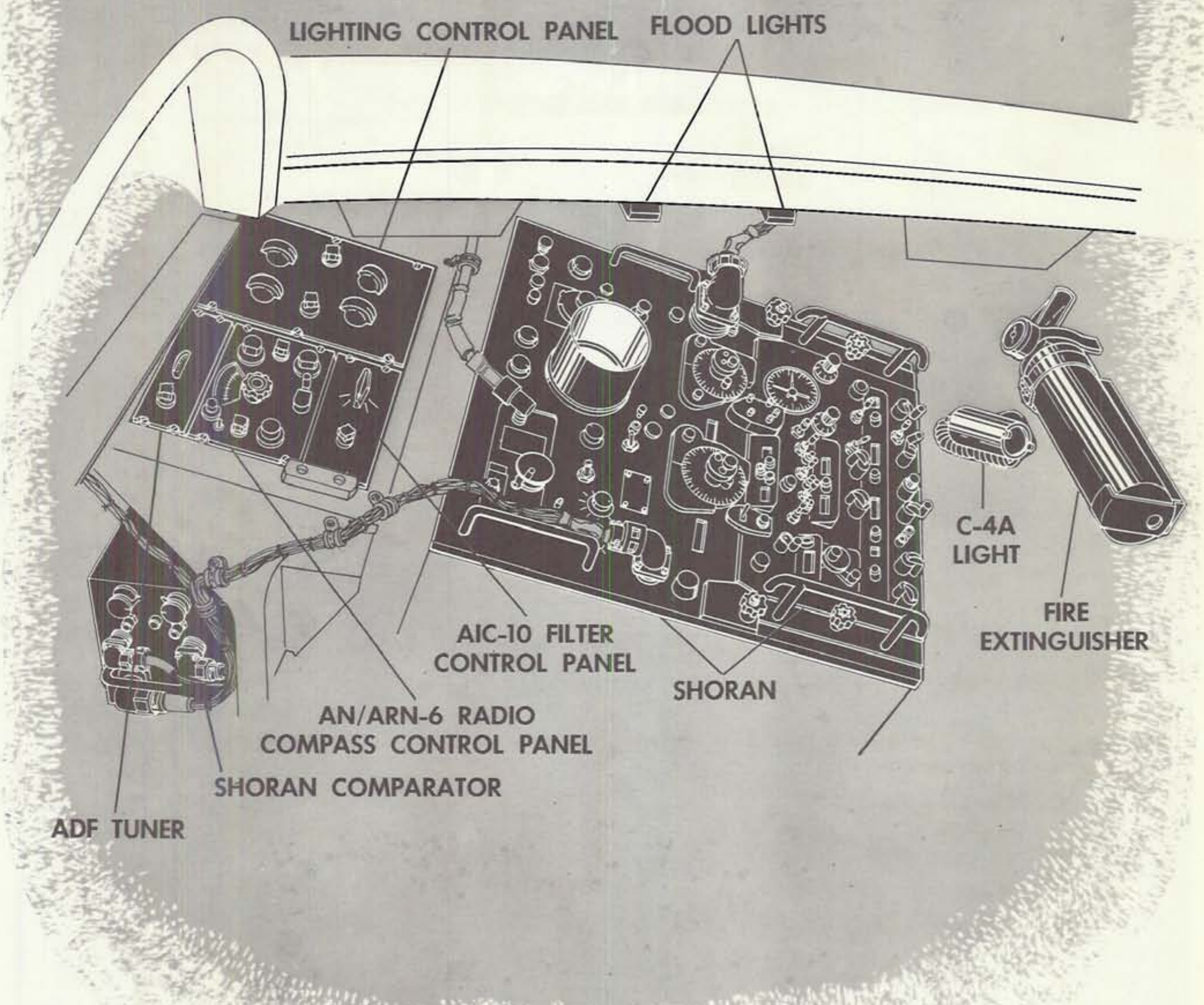

Figure 1-8

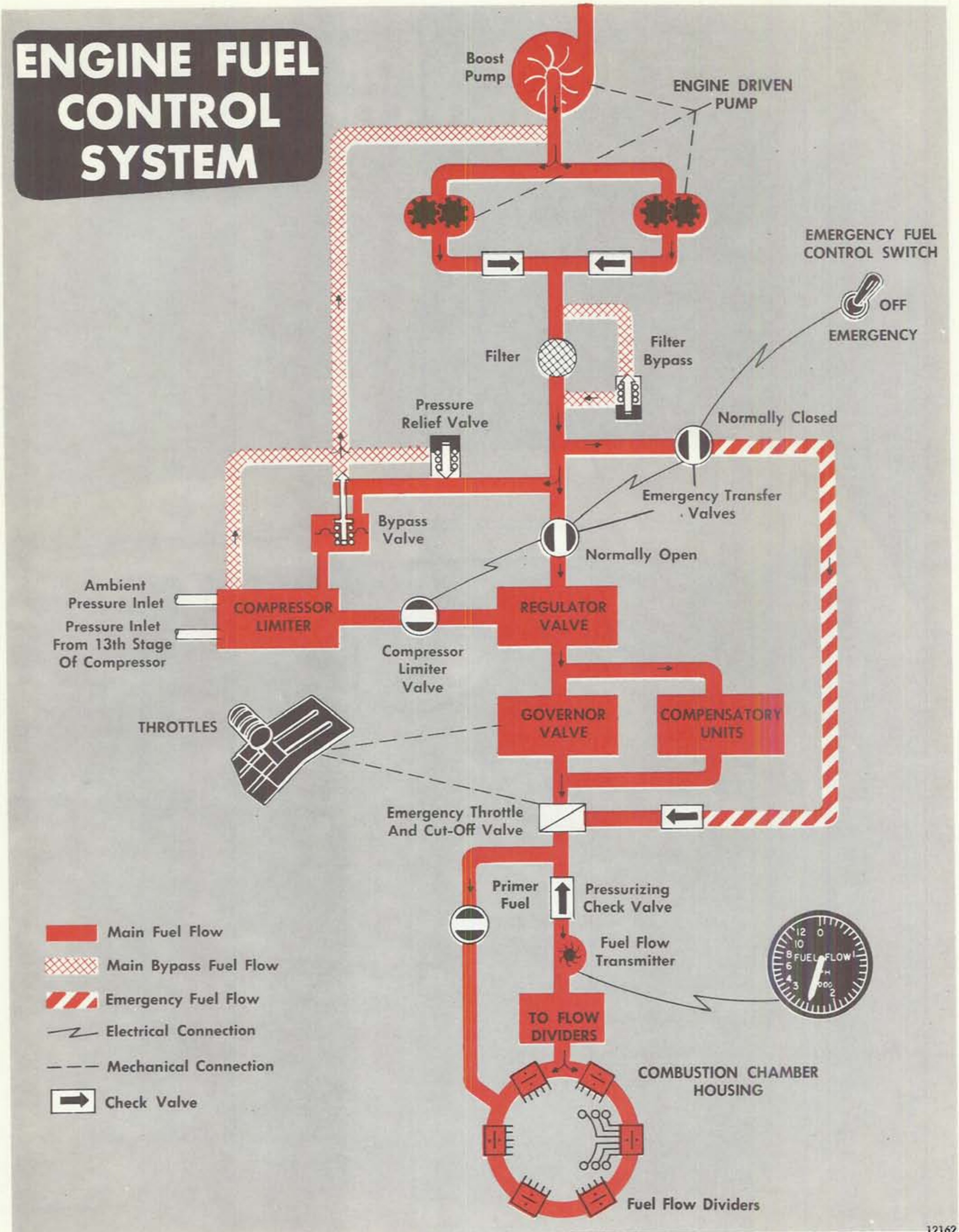
ENGINE FUEL CONTROL SYSTEM
Boost Pump
ENGINE DRIVEN PUMP
EMERGENCY FUEL CONTROL SWITCH
OFF
EMERGENCY
Filter
Filter Bypass
Pressure Relief Valve
Normally Closed
Emergency Transfer Valves
Bypass Valve
Normally Open
Ambient Pressure Inlet
Pressure Inlet From 13th Stage Of Compressor
COMPRESSOR LIMITER
REGULATOR VALVE
Compressor Limiter Valve
THROTTLES
GOVERNOR VALVE
COMPENSATORY UNITS
Emergency Throttle And Cut-Off Valve
Primer Fuel
Pressurizing Check Valve
Fuel Flow Transmitter
FUEL FLOW
TO FLOW DIVIDERS
COMBUSTION CHAMBER HOUSING
Fuel Flow Dividers
Main Fuel Flow
Main Bypass Fuel Flow
Emergency Fuel Flow
Electrical Connection
Mechanical Connection
Check Valve
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Figure 1-9

THROTTLES

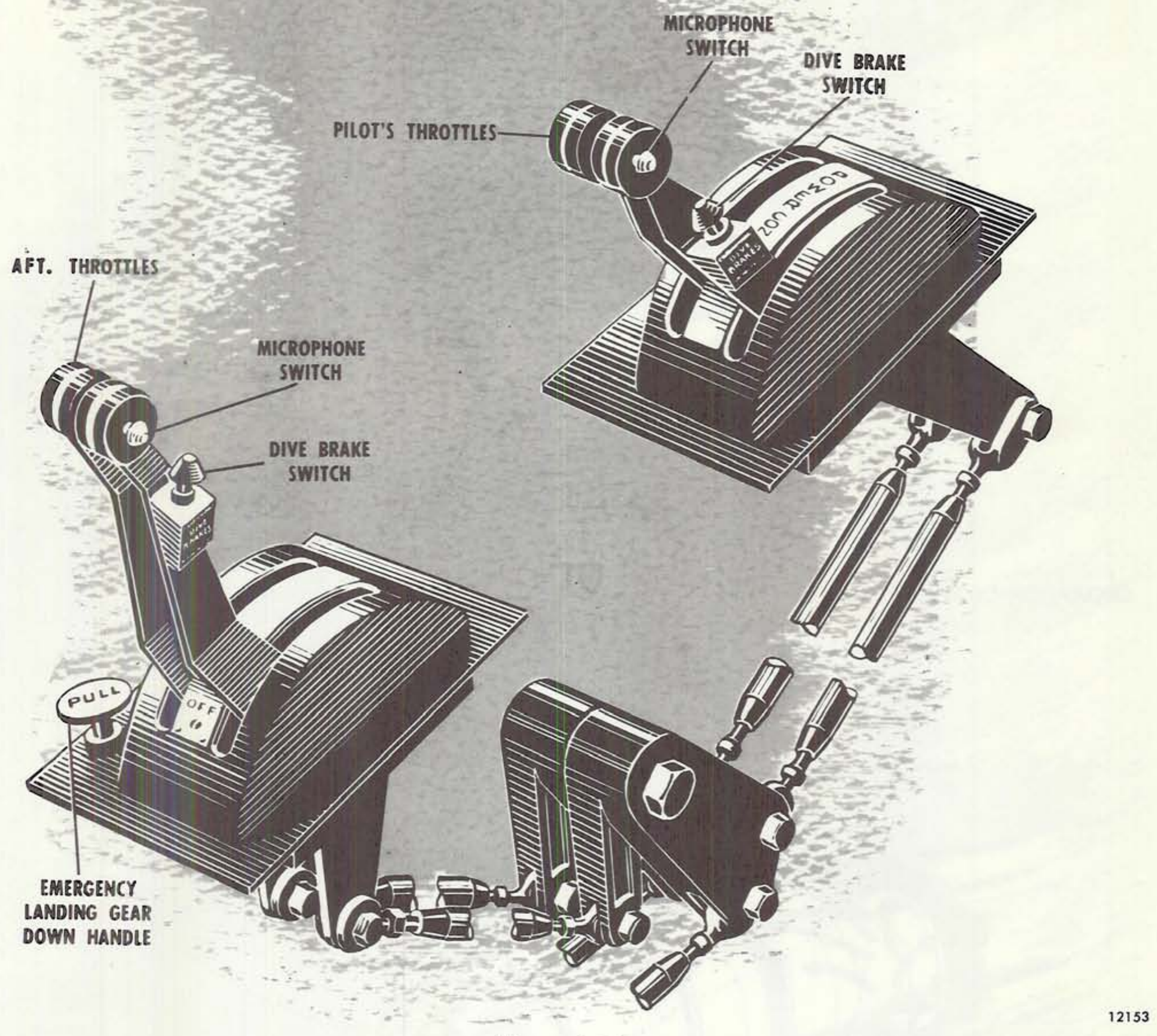


Figure 1-10

ENGINE FUEL CONTROL UNIT.

By regulating the amount of fuel, the fuel control unit governs the speed of the engine for a given throttle setting. The unit is a composite of several independently operated valves and each valve contributes to the regulation of the fuel. A filter at the control unit inlet protects the unit from any dirt in the fuel. If the filter becomes clogged, the filter relief valve opens and bypasses the fuel. A pressure relief valve relieves excessive pressure within the control unit. The regulator valve. operated by an engine-driven flyweight governor, works in conjunction with the bypass valve to regulate the fuel pressure within the control unit. The compensating devices give a fine adjustment to the pressure within the control unit. These devices compensate for altitude and engine air inlet temperature. Fuel leaves the control unit through the governor vaive, which is the main metering unit. An engine-driven flyweight governor and the throttle position the governor valve. Metered fuel from the governor valve passes through a cut-off valve and a pressurizing check valve to the fuel distribution sys-

ENGINE COOLING SYSTEM

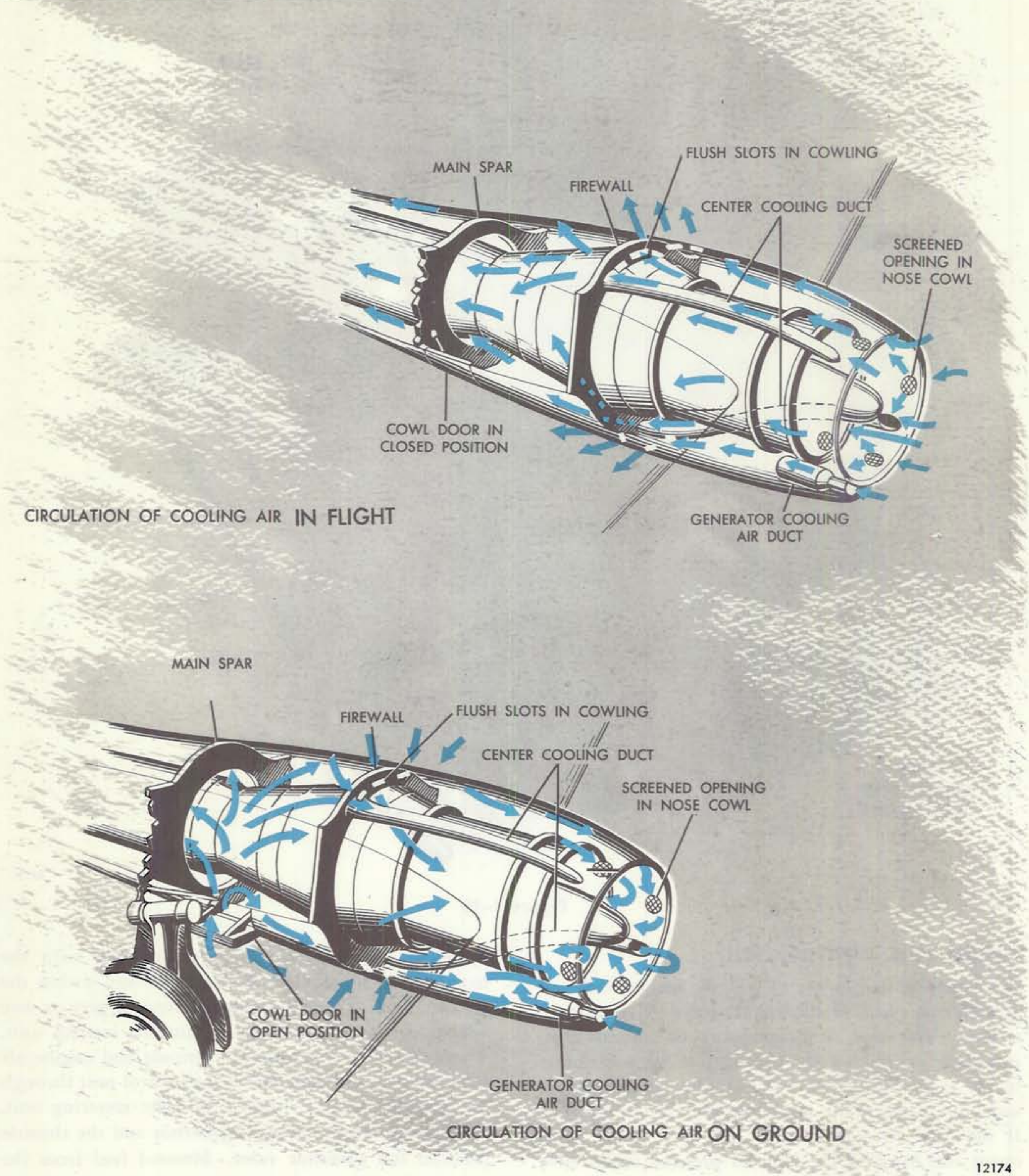


Figure 1-11

tem of the engine. When the throttles is closed (OFF), the cut-off valve prevents any fuel from leaving the control unit. An engine speed of approximately 18 percent is necessary to supply the pressure necessary (100 psi) to open the pressurizing check valve. Since the pressurizing check valve restricts the flow of fuel during starting, fuel flowing through the primer circuit is the only fuel supply. The compressor pressure rise limiter causes the bypass valve to open when the compressor discharge pressure exceeds a certain value. The opening of the bypass valve causes a reduction of fuel flow from the control unit and a corresponding reduction in rpm to maintain the compressor discharge pressure below the limit. An electrically controlled bypass within the unit directs fuel from the main pumps directly to the engine. Since this "emergency line" bypasses all of the regulating and governing devices within the control unit, an emergency throttle valve is the only control of the bypassed fuel.

ENGINE EMERGENCY FUEL CONTROL SWITCHES.

The switches that control the emergency bypass line in the fuel control unit are on the fuel control panel. (See figure 1–16.) The switch markings are OFF and EMERGENCY. When the switch is in OFF, the emergency fuel control is inoperative. Placing the switch in EMERGENCY actuates three solenoid operated valves that close the normal fuel passage in the fuel control unit, open the emergency passage, and isolate the compressor limiter. Placing an emergency fuel control switch in EMERGENCY causes the indicator light above the switch to illuminate. There is no automatic changeover to the emergency system; the switch must be manually placed in the EMERGENCY position to activate the system. The electrical power for the emergency system comes from the 28-volt pilot's circuit breaker bus.

Note

It is permissible to transfer to the emergency fuel system with the throttle in FULL up to an altitude of 6000 feet, provided the engine speed has not dropped below 85% at the time of the transfer. Under all other conditions, the throttle lever must be in IDLE prior to the transfer. Failure to do so will result in excessive exhaust gas temperatures and rich flame-out or compressor stall.

ENGINE EMERGENCY FUEL CONTROL INDICATOR LIGHTS.

There are two amber press-to-test indicator lights on the fuel control panel above the emergency fuel control switches. (See figure 1–16.) When the emergency fuel control switch is placed in EMERGENCY, its respective indicator light illuminates. Power to operate the lights comes from the pilot's 28-volt d-c circuit breaker bus.

ENGINE COOLING SYSTEM.

During flight, ram air enters four screened circular openings and two flush airscoops on the inside surface of the engine air intake duct. (See figure 1–11.) Air entering the screened openings cools the forward engine area and exhausts through flush slots forward of the firewall. Air entering the two airscoops cools the aft engine area. Aft engine cooling air exhausts through the area between the tail pipe and the nacelle. Ground engine operation creates low-pressure areas between the engine and cowling and between the tail pipe and nacelle, thus causing reverse air flow for ground engine cooling. Air entering the flush slots in the cowling flows forward around the engine and passes through the four screened openings in the nose cowl and exhausts through the engine. Extension of the landing gear opens the cowl doors allowing air to enter and cool the aft engine area. Part of this air flows forward through the ducts forward of the firewall and exhausts through the engine. The remaining air exhausts aft around the tailpipe.

Note

If either engine ground-cooling door remains open in flight, premature airframe buffet will generally occur, considerably below the normal buffet limit, and a moderate yaw will be noticeable at about 350 knots or above.

STARTING AND IGNITION SYSTEM.

Each engine has its own starting and ignition system. The systems consist of two high-tension igniters, a timer-box assembly, two fuel-primer solenoids, and an explosive-cartridge starter. Placing the throttle in IDLE closes the throttle-actuated engine start microswitch. Placing the STARTING AND IGNITION switch in START completes the circuit to the timer, igniters, fuel primer solenoid, and the explosive cartridge in the starter breech (figure 1–12) starts the engine. After 15 ± 3 seconds, the timer automatically de-energizes the fuel primers and igniters. At the end of the timing cycle, engine temperature and acceleration are sufficiently high for continued operation; therefore, the engine no longer requires ignition and fuel priming.

Note

Distinct clicks heard over the interphone system or from outside the airplane indicate proper functioning of the ignition system.

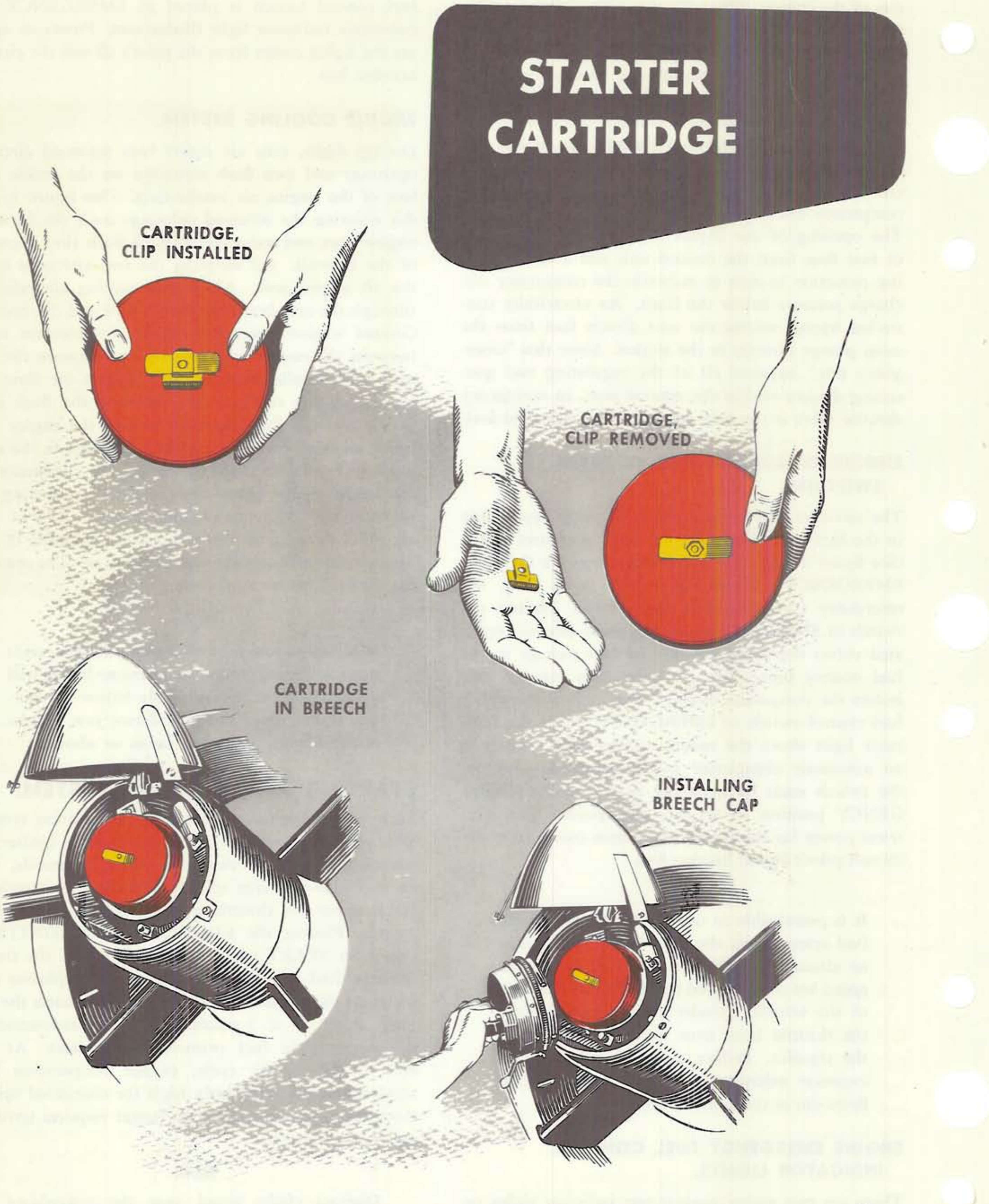

STARTER
CARTRIDGE
CARTRIDGE,
CLIP INSTALLED
CARTRIDGE,
CLIP REMOVED
CARTRIDGE
IN BREECH
INSTALLING
BREECH CAP
12163

Figure 1-12

For ground testing, the engine may be motored without combustion by using the CRANK ONLY position of the start and ignition switches. When the CRANK ONLY position is used to motor an engine, the throttle must be in the OFF position, otherwise the engine will start.

The 28-volt d-c circuit breaker bus supplies the power to operate the system through a 15-ampere circuit breaker.

STARTING AND IGNITION SWITCHES.

Two starting and ignition switches and a microswitch (figure 1–20) for each throttle control the starting and ignition systems. The starting and ignition switches are on the inverter control panel on the pilot's right vertical console. The switch positions are START (up), OFF (center), and CRANK ONLY (down). The switch is spring-loaded in the OFF position. Placing the throttle in IDLE and the starting switch in START completes the starting and ignition circuit. Placing the switch in the CRANK ONLY position bypasses the throttle microswitch to complete the starting and ignition circuit. Leaving the throttle in OFF prevents fuel flow to the engine. The CRANK ONLY position is for engine restarts in flight. By using CRANK ONLY, the ignition circuit operates prior to the introduction of fuel into the combustion chamber. Refer to ENGINE RESTART IN FLIGHT in Section III.

STARTER OVER-PRESSURE PROTECTION.

Although the starter is designed to withstand some excess pressure, a safety device guards against dangerously high pressures. The pressure-relief device is an integral part of the breech consisting of a blowout disc which ruptures at approximately 1½ times normal operating pressure. When the disc shears, the gas bypasses the starter turbine wheel and flows into the turbine ducting, and the indicator pin is released, detonating the sheared disc. The excessive pressure is then vented out the exhaust port. During a blowout disc rupture, little or no rpm indication appears on the tachometer. As a result of a blowout disc rupture an engine cannot be started.

OIL SYSTEM.

Each engine has an automatic integral oil system consisting of an oil tank, an oil pump assembly, and self-contained plumbing. An oil tank is on the upper left side of each engine compressor section. Oil from the tank is delivered to the pump assembly which consists of one pressure pump, a scavenger pump, and two oil metering pumps. A circulating oil system is used for the front bearing and accessory drives and a total-loss system for the center and rear bearing. The

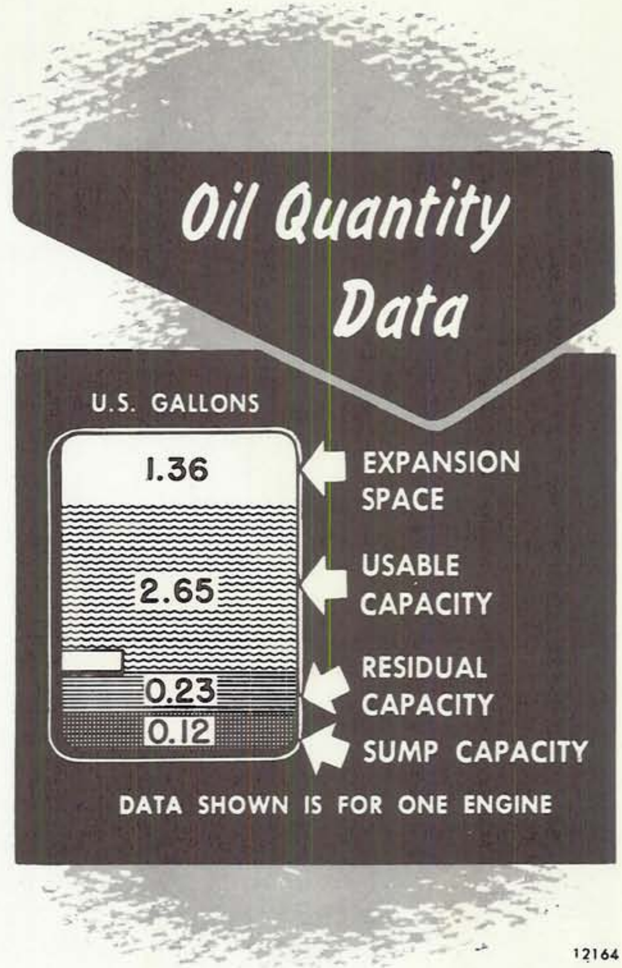


Figure 1–13

oil tanks do not have dip sticks. The oil tanks should be checked immediately following engine shut-down and serviced at that time. The servicing diagram (figure 1–37) lists the oil grades and specifications. For oil capacities see figure 1–13. For operating oil pressure refer to figure 5–1. Oil consumption will normally run about one quart per hour. Although the oil system supplies oil during inverted flight, sudden negative G maneuvers may cause the oil pressure drop to very low values and several seconds may be required to recover normal pressures. For oil pressure failure procedure, refer to Section III.

AIRPLANE FUEL SYSTEM.

The airplane has four internal fuel tanks (figure 1–14), two in the fuselage and one in each wing. In addition wing-tip tanks supplement the normal fuel supply. The tip tanks are held on the wing by explosive bolts that explode to jettison the tanks in an emergency. If required, a ferry tank may be installed on the bomb door to carry additional fuel. The fuel system consists of fuel booster pumps, shut-off valves, a transfer valve, and a fuel-level shut-off valve. The

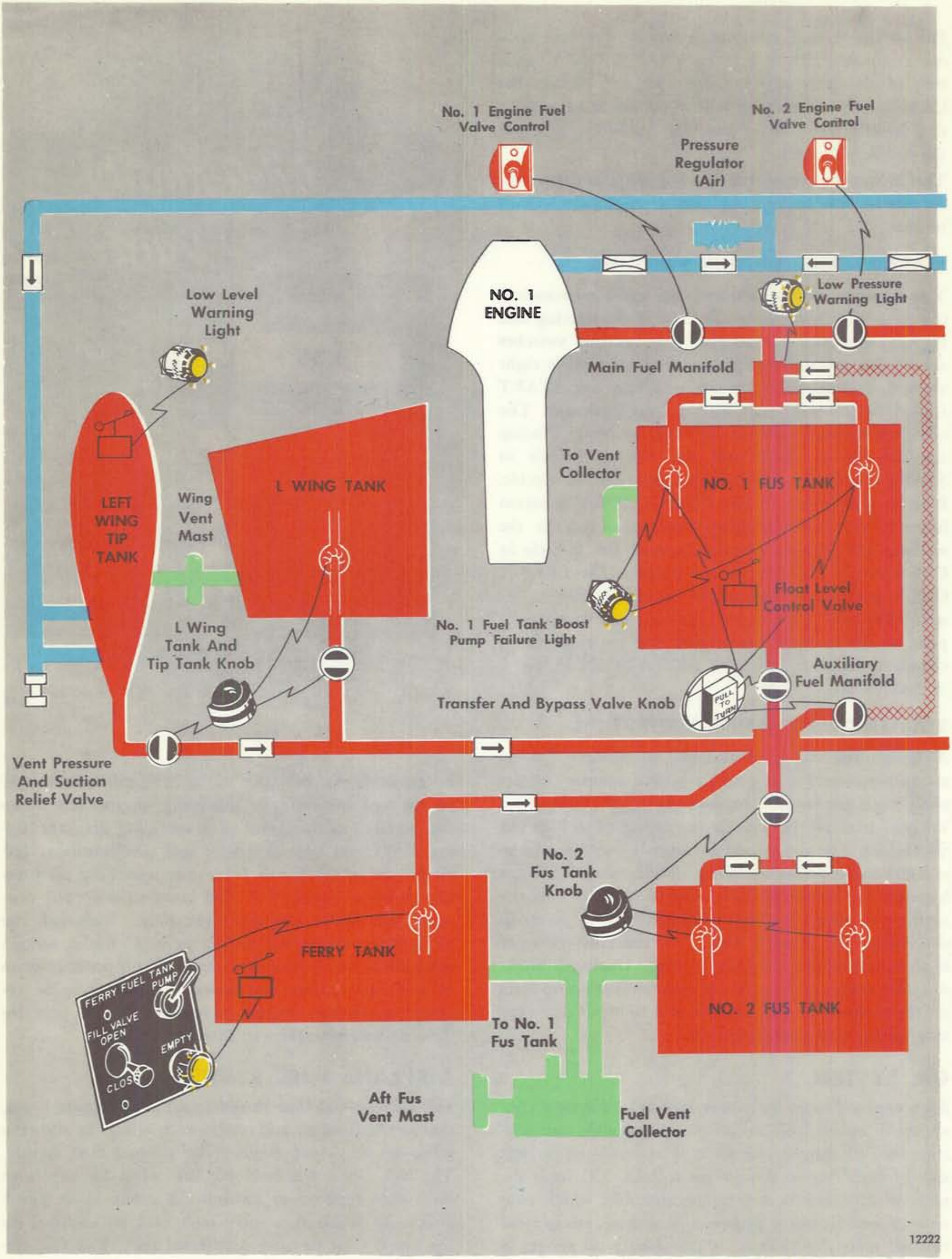


Figure 1–14 (Sheet 1 of 2)

AIRPLANE FUEL SYSTEM

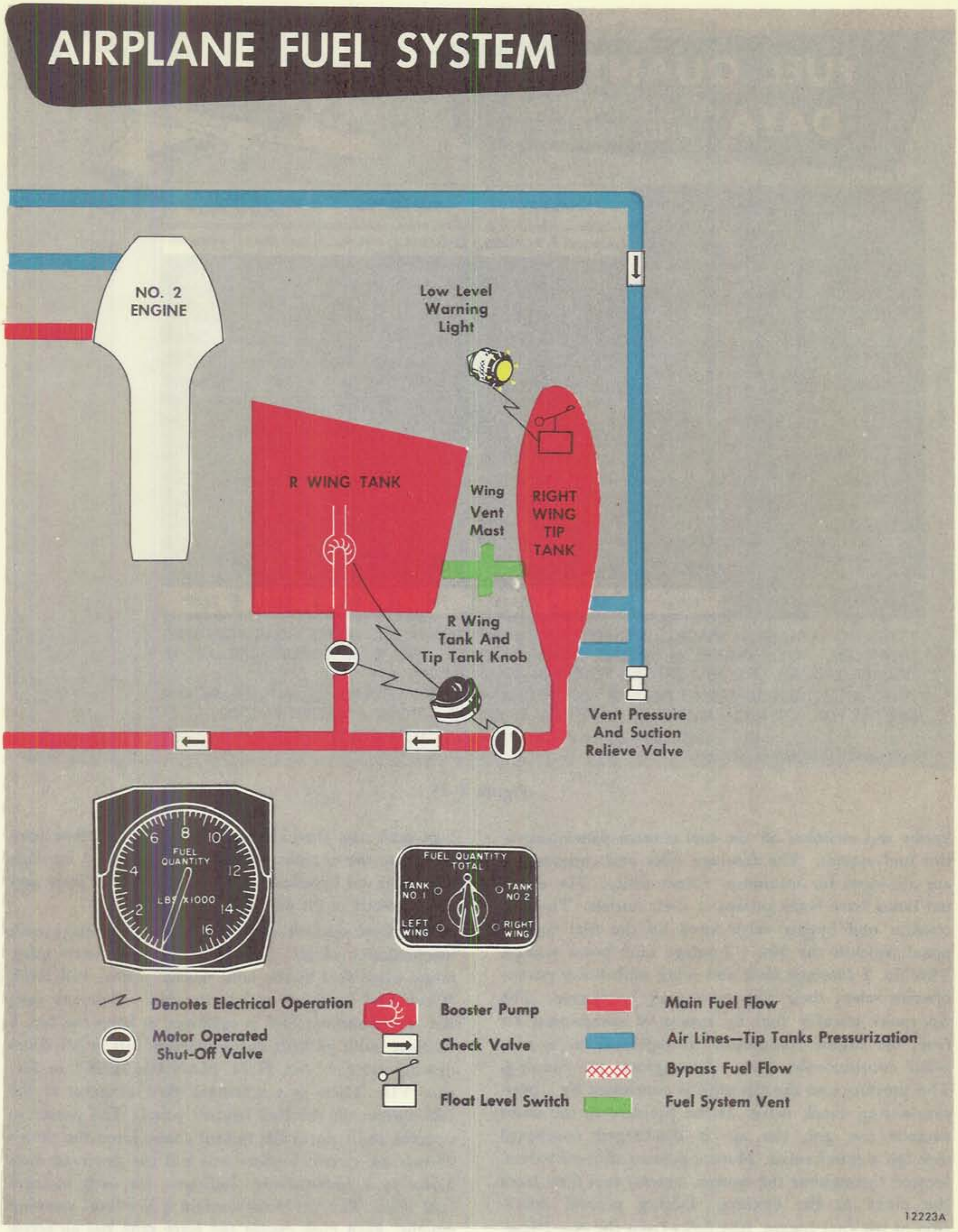
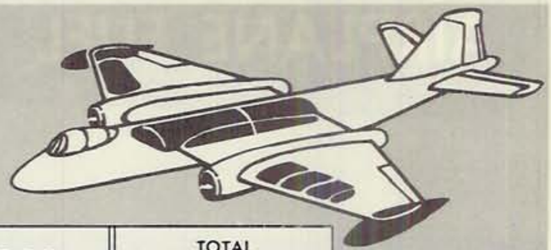


Figure 1-14 (Sheet 2 of 2)

FUEL QUANTITY DATA IN U.S. GALLONS AND POUNDS



TANKS	CONSTRUCTION	TOTAL FUEL		TRAPPED FUEL		TOTAL USABLE FUEL*	
		GALLONS	POUNDS	GALLONS	POUNDS	GALLONS	POUNDS
NO. 1 FUS TANK	SPLINTER PROOF SELF-SEALING	1040	6760	30	195	1010	6565
NO. 2 FUS TANK	FLEXIBLE NON-SELF-SEALING	662	4303	8	52	654	4251
R WING TANK	FLEXIBLE NON-SELF-SEALING	319	2073.5	29	188.5	290	1885
L WING TANK	FLEXIBLE NON-SELF-SEALING	319	2073.5	29	188.5	290	1885
R TIP TANK	METAL (ALU)	320	2080	NONE		320	2080
L TIP TANK	METAL (ALU)	320	2080	NONE		320	2080
BOMB DOOR FERRY	METAL	564	3666	14	91	550	3575
	TOTAL	3,544	23,036	110	715	3,434	22,321

NOTE: NO EXPANSION SPACE IS PROVIDED AS EXPANSION SPACE IS ABOVE THE VENT OUTLET, THEREFORE, ANY EXPANSION WOULD DRAIN THROUGH THE VENT OUTLET. THE ABOVE FIGURES ARE FOR GROUND (STATIC) POSITION 0.9° NOSE UP.

*THESE QUANTITIES REPRESENT THE FUEL WHICH CAN ACTUALLY BE USED. QUANTITIES SHOWN ON THE FUEL CONTROL PANEL ARE SLIGHTLY LOWER TO AFFORD A SAFETY FACTOR.

ONE GALLON OF JP-4 FUEL IS EQUAL TO 6.5 LBS.

*DATA BASIS FLIGHT TEST AS OF 9-30-55

12165 A

Figure 1–15

knobs and switches on the fuel control panel control the fuel system. The fuselage lines and components are arranged for minimum vulnerability. The external tanks have boost pumps at their outlets. The fuel transfer and bypass valve knob on the fuel control panel controls the No. 1 fuselage tank boost pumps. The No. 2 fuselage tank and wing tank boost pumps operate when their respective tank is selected. The tip tanks transfer fuel by means of compressed air from the engine compressor. Compressed air is supplied continuously when the engines are running. The pressure and the tip tank is controlled by a pressure-setting check valve. If the pressure in the tanks exceeds five psi, the air is discharged overboard through a relief valve. Motor-operated shut-off valves, located throughout the system, control fuel flow from the tanks to the engines. During normal operation of the fuel system, fuel flows from the No. 2 fuselage tank, the wing tanks, and the tip tanks through the auxiliary manifold (collector) to the No. 1 fuselage tank and then through the main manifold (collector) to the engines. If necessary, the No. 1 fuselage tank may be bypassed and fuel transferred from any tank directly to the engines.

A fuel-level shut-off valve in the No. 1 fuselage tank mechanically closes the tank inlet line from other tanks when fuel in the tank reaches a near full level. When fuel is transferred to the No. 1 fuselage tank the replenishment rate is sufficient to keep the No. 1 fuselage tank at least three-quarters full at all times during transfer. See FUEL MANAGEMENT in Section VII. There is a schematic flow diagram of the fuel system on the fuel control panel. The power to operate and control the system comes from the pilot's 28-volt d-c circuit breaker bus and the generator bus. There is a fuel-quantity indicator for each internal fuel tank. The tip tanks contain a low-level warning system. Each tank except the ferry tank has an access for ground refueling. Tank quantities are shown in figure 1–15.

AIRPLANE FUEL SYSTEM. (GROUPS E and F AIRPLANES)

The removal of the No. 1 fuselage tank boost pump indicator light from Group E airplanes and the installation of the No. 1 fuselage tank low-level warning light on Group F airplanes comprises the only difference between Groups E and F airplanes. See figure 1-16 for panel layout.

FUEL SPECIFICATION.

Fuel specifications and grades, and fuel tank filler points are shown on the servicing diagram (figure 1-36).

FUEL CONTROLS. (See figure 1-16.)

NO. 1 FUSELAGE TANK BOOST PUMP INDICATOR LIGHT. (GROUP E AIRPLANES)

The red indicator light for the No. 1 fuselage tank booster pumps goes on when both No. 1 fuselage tank boost pumps fail. The indicator light goes on when the transfer and bypass valve knob is in the bypass position, when the No. 1 fuselage tank boost pump circuit breakers are in OFF, or when electrical malfunction causes both remote circuit breakers (power control for boost pumps and light relays) to trip off. The 28-volt d-c distribution bus supplies power to operate the indicator light and test circuits.

NO. 1 FUSELAGE TANK LOW-LEVEL WARNING LIGHT. (GROUP F AIRPLANES)

A red low-level warning light on the fuel control panel goes on when fuel quantity in the No. 1 fuselage tank decreases below 940 gallons (6100 pounds). The 28-volt distribution bus supplies the power to operate the warning and press-to-test circuits.

ENGINE VALVE SWITCHES.

An engine valve switch controls the fuel flow to each engine. Switch markings are ON (up) and OFF (down). Placing the switches in ON opens the engine fuel shut-off valves. Placing the switches in OFF closes the engine fuel shut-off valves. The 28-volt d-c pilot's circuit breaker bus supplies power through a 5-ampere circuit breaker to operate the shut-off valves.

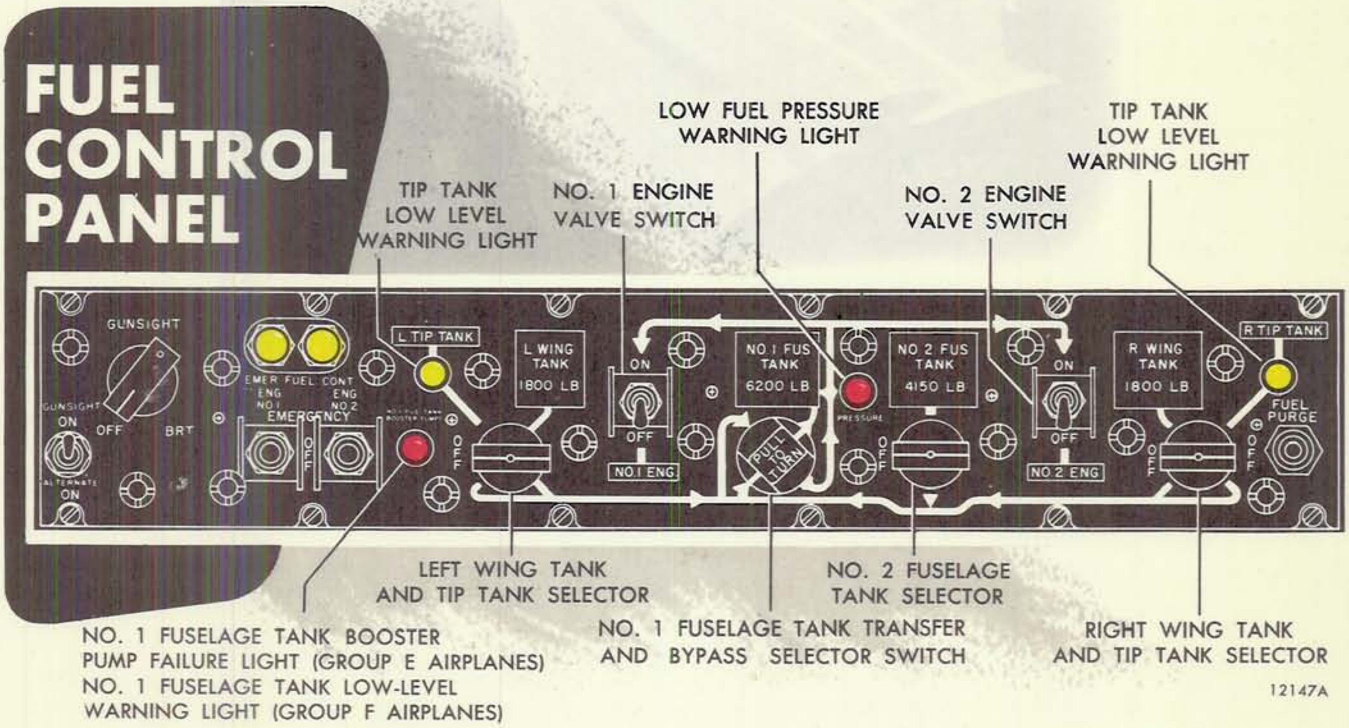


Figure 1-16

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FUEL TRANSFER AND BYPASS VALVE KNOB.

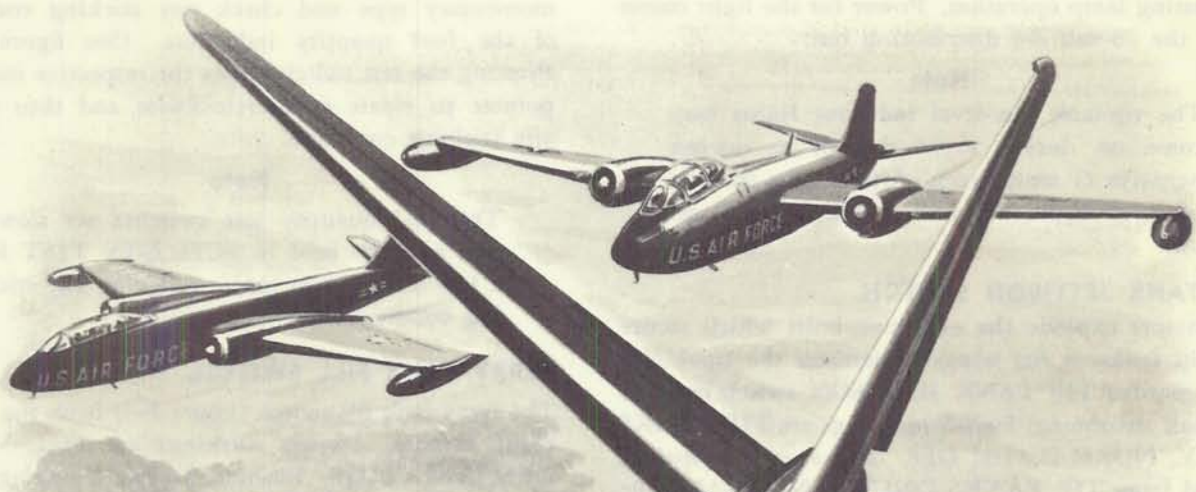
The fuel transfer and bypass valve directs fuel flow to the No. 1 fuselage tank or through the bypass line to the engines. Aligning the knob for flow to No. 1 tank directs all fuel to the No. 1 fuselage tank and turns on the No. 1 fuselage tank boost pumps. Aligning the knob to the bypass positions turns off the No. 1 fuselage tank boost pumps, closes the valves to the No. 1 fuselage tank, and directs all fuel through the bypass line to the engines. Before the knob can be turned to a desired position, a pull is necessary to disengage the knob from detents.

FUEL PRESSURE WARNING LIGHT.

The red fuel pressure warning light indicates a reduction of fuel pressure in the main fuel manifold. When the pressure drops to 8.5 (+1.5 −0) psi, a pressure-sensing device causes the warning light to go on. A PRESS-TO-TEST circuit tests lamp operation. Power to operate the light is supplied by the 28-volt d-c distribution bus.

NO. 2 FUSELAGE TANK KNOB.

The No. 2 fuselage tank knob controls the operation of the fuel shut-off valve and the two boost pumps for the No. 2 fuselage tank. With the knob in the flow position, the shut-off valve opens and the boost pumps operate to supply fuel to the auxiliary manifold. With the knob in OFF, the boost pumps are de-energized and the shut-off valve is closed.



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WING-TANK—TIP-TANK KNOBS.

Placing the left-wing-tank—left-tip-tank knob in line with the left-tip-tank flow lines opens a valve that permits fuel to flow to the auxiliary manifold. When the knob is in this position, the wing-tank shut-off valve is closed and its boost pump is inoperative. Placing the knob in line with the left-wing-tank flow lines opens the left-wing-tank shut-off valve, energizes the tank boost pump and pumps fuel into the auxiliary manifold. With the knob in this position the left-tip-tank shut-off valve is closed. With the switch in OFF, both shut-off valves are closed and the boost pump is inoperative. The right-wing-tank—right-tip-tank knob selects fuel from the right-tank and wing-tip tanks in the same manner as the left-wing—left-tip-tank knob.

TIP TANK LOW-LEVEL INDICATOR LIGHTS.

Two amber tip-tank low-level indicator lights, one for each tip tank, are on the fuel control panel. (See figure 1–16.) The fuel quantity gage does not indicate tip tank fuel quantity. The only indication of tip tank fuel quantity is the low-level indicator light that goes on when the fuel quantity is below 195 pounds (30 gallons). The lights have a press-to-test circuit for testing lamp operation. Power for the light comes from the 28-volt d-c distribution bus.

Note

The tip-tank low-level indicator lights may come on during rapid descent or during negative G maneuvers. After a few seconds of level flight, the indicator lights will go out.

TIP TANK JETTISON SWITCH.

Detonators explode the explosive bolts which secure the tip tanks to the wings to jettison the tip tanks. The guarded TIP TANK JETTISON switch controls tip tank jettisoning. Switch markings are TIP TANKS ONLY, NORMAL, and OFF. The switch is spring-loaded from TIP TANKS ONLY to NORMAL. The switch is on the pilot's left main control panel (figure 1–28). Placing the switch in the momentary TIP TANKS ONLY position fires the explosive bolts and releases both tip tanks simultaneously. Depressing the master jettison switch, when the tip tank jettison switch is at NORMAL, causes the tip tanks to jettison. See MASTER JETTISON SWITCH in Section IV. Electrical power for firing the detonators comes from the 28-volt d-c distribution bus. A resistor is installed in series with each detonator to prevent a short in any one detonator from affecting the other detonators.

FUEL QUANTITY INDICATORS.

The fuel quantity indicators (figures 1–5 and 1–6), on each crew member's main instrument panel, is a capacitance-type fuel gage which indicates the fuel quantity in each internal fuel tank individually or the total of all the internal tanks. The gages do not indicate the quantity of fuel in the tip tank. The indicators reflect the fuel quantity in pounds compensated for temperature, density, and airplane attitude so that the indication is a true indication of fuel quantity. The fuel quantity indicators show the quantity of fuel in the tank selected by the fuel quantity selector switch at the pilot's station. The indicator can be checked for sticking with the fuel quantity test switches. Power for the indicator comes from the No. 1 inverter.

FUEL QUANTITY SELECTOR SWITCH.

The fuel quantity selector switch (figure 1–4), on the pilot's right horizontal console selects the tank or tanks whose fuel quantity is to appear on the fuel quantity indicators. By positioning the switch, the quantity of fuel in any internal tank or the total fuel in all the internal tanks is shown on the indicators. Power for the switch comes from the No. 1 inverter.

FUEL QUANTITY TEST SWITCHES.

The fuel quantity test switch, on the pilot's and instructor-pilot's main instrument panels, are of the momentary type and check any sticking condition of the fuel quantity indicators. (See figure 1–5.) Pressing the test switch causes the respective indicator pointer to rotate counterclockwise and thus relieve any sticking condition.

Note

The fuel quantity test switches act slowly and must be held in FUEL QTY TEST for a few moments to insure relieving any sticking condition.

FERRY TANK FILL SWITCH.

The ferry tank fill switch (figure 1–4) is on the pilot's right console. Switch markings are FILL VALVE OPEN and CLOSE. Placing the No. 2 fuselage tank selector knob to flow and the fill valve switch to OPEN turns on the No. 2 fuselage tank boost pumps and opens the fill valve, allowing fuel to be pumped from the No. 2 fuselage tank into the ferry tank. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the fill valve.

FERRY TANK BOOST PUMP SWITCH.

The ferry tank boost pump switch (figure 1–4) is on the pilot's right console. Switch markings are PUMP and OFF. Placing the switch in PUMP turns on the ferry tank boost pump; thereby, pumping fuel from the ferry tank into the auxiliary fuel manifold. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the boost pump.

FERRY TANK FUEL LOW LEVEL INDICATOR LIGHT.

An amber PRESS-TO-TEST indicator light (figure 1-4) on the pilot's right console illuminates when the remaining fuel in the ferry tank reaches 65 pounds. Placing the ferry tank boost pump switch in OFF turns the low-level indicator light off. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the indicator light.

FUEL TANK VENT SYSTEM.

The fuel tank vent system maintains a regulated pressure within the fuel tanks to discharge combustible fuel vapors overboard and relieve excessive pressure within the tanks. When the difference between fuel tank pressure and ambient pressure reaches 0.5 psi, the corresponding vent-regulating valve opens and exhausts the vent pressure overboard through the vent masts. When the fuel tank pressure drops below 0.4 psi, the vent-regulating valve closes. The vent system services the fuselage tanks, the wing tanks, and the bomb door ferry tank when installed. The fuel tank vent system is electrically operated and automatically controlled whenever the fuel vent circuit breakers, on the pilot's circuit breaker panel, are pushed in. Power for the system comes from the 28-volt d-c pilot's circuit breaker bus.

Note

Venting of the fuel from the wing vent mast when the wing tanks are full is quite common during the early stages of flight.

FUEL PURGE SYSTEM.

The fuel purge system adds nitrogen to the fuel tanks to keep the vapor concentration below a combustible level. The system is normally used for combat missions as a safety measure to forestall explosions or fire hazards in the fuel tanks in the event they should be damaged. The operation of the system is automatic and requires no further action by the pilot after the initial actuation. The system services all the tanks except the tip tanks and the ferry tank. Power to operate the system comes from the 28-volt d-c distribution bus.

FUEL PURGE SWITCH.

The fuel purge system is controlled by the fuel purge switch on the fuel control panel (figure 1-16). Placing the switch in FUEL PURGE prior to take-off allows nitrogen to flow into the fuel tanks as fuel is consumed. Power to control the system comes from the 28-volt d-c distribution bus.

FUEL PURGE DISCHARGE INDICATOR.

Three overboard discharge indicators containing red discs are mounted in the fuselage skin just forward of the bomb bay on the right side. When the pressure in the nitrogen cylinders becomes excessive, the nitrogen discharges overboard. The absence of the red discs in the discharge indicators shows that the nitrogen has discharged.

ENGINE INSTRUMENTS.

OIL PRESSURE INDICATORS.

The oil pressure indicators (figures 1-5 and 1-6) on the pilot's and instructor-pilot's main instrument panels indicate the oil pressure delivered from the oil pumps. Pressure transmitters electrically transmit pressure information to the indicator. The 28-volt a-c bus supplies power through a 1-ampere fuse to energize the circuit.

FUEL FLOW INDICATOR.

The fuel-flow indicators (figure 1-5), one for each engine, indicate fuel consumption in pounds per hour. A flow-measuring device in the fuel line between the fuel control unit and the flow dividers has a transmitter that operates the fuel-flow indicator on the pilot's main instrument panel. Errors in density due to changes in altitude and temperature are negligible. The power to operate the circuit comes from the 28-volt a-c bus through a 1-ampere fuse.

TACHOMETER.

Engine-driven tachometer generators electrically transmit the percentage of engine rpm to their respective tachometer. (See figures 1-5 and 1-6.) The indicators are on both crew members main instrument panels. The tachometer circuits operates independently of the airplane's electrical system.

EXHAUST TEMPERATURE INDICATOR.

Two exhaust gas temperature indicators (one for each engine) are on each crew members main instrument panels. (See figures 1-5 and 1-6.) Four thermocouples connected in parallel around the tail pipe transmit an average exhaust gas temperature to the indicators. Temperature readings are in degrees centrigrade. The temperature indicator circuits operate independently of the airplane's electrical system.

ELECTRICAL SYSTEM.

A 24-volt 36-ampere-hour battery and four engine-driven 300-ampere 28-volt generators supply the electrical power to operate the airplane's electrical equipment. (See figure 1-17.) Each engine drives two generators. For starting or ground service, an external

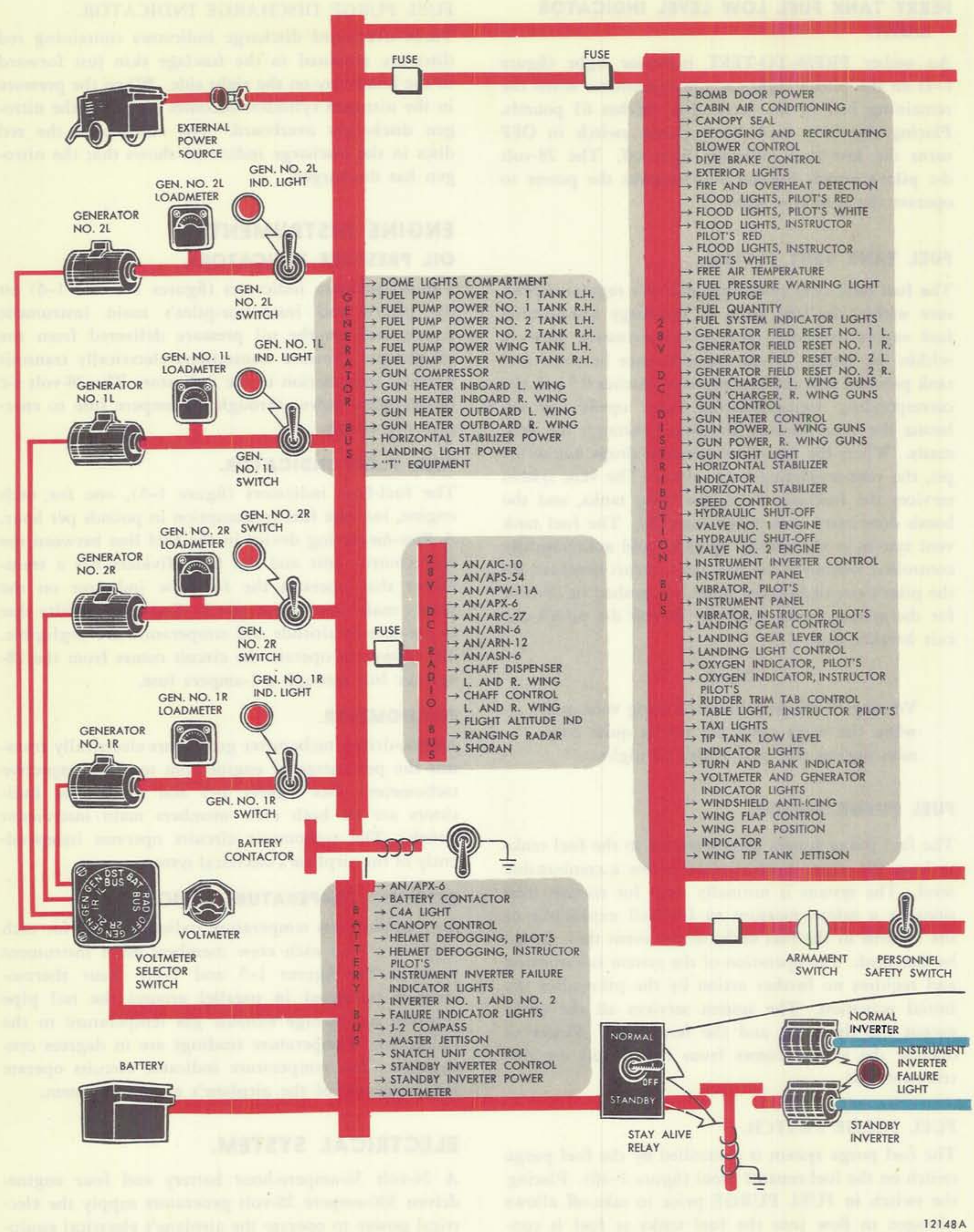
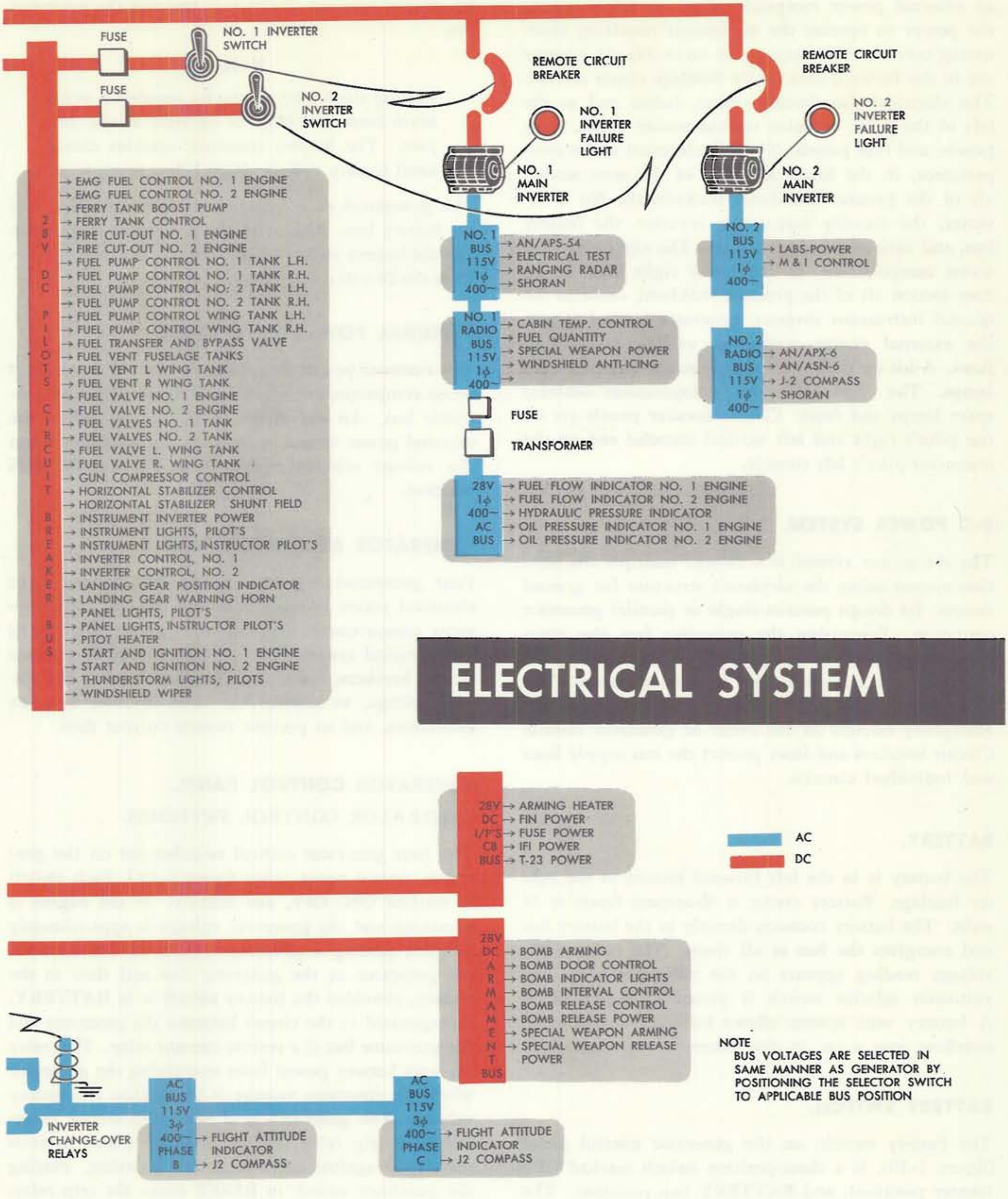


Figure 1–17 (Sheet 1 of 2)



ELECTRICAL SYSTEM

Figure 1-17 (Sheet 2 of 2)

power source can be connected to the system through an external power receptacle. Four inverters supply the power to operate the equipment requiring alternating current. The battery and main (No. 1) inverter are in the forward area of the fuselage center section. The electrical distribution center, below and to the left of the pilot, contains various power busses, relay panels, and fuse panels. The left electrical access compartment, in the lower left area of the nose section aft of the pressure bulkhead, contains the No. 2 inverter, the standby instrument inverter, the battery bus, and various relays and fuses. The right electrical access compartment, in the lower right area of the nose section aft of the pressure bulkhead, contains the normal instrument inverter, generator control panels, the external power receptacle, various relays, and fuses. A kit on the pilot's right console contains spare lamps. The right equipment compartment contains spare lamps and fuses. Circuit breaker panels are on the pilot's right and left vertical consoles and on the instructor-pilot's left console.

D-C POWER SYSTEM.

The d-c power system is a 28-volt multiple distribution system using the airplane's structure for ground return. Its design permits single or parallel generator operation. Energizing the generator bus also energizes the distribution, the pilot's circuit breaker, the d-c radio, the armament, and the battery busses. The battery bus supplies power from the battery to the emergency circuits in the event of generator failure. Circuit breakers and fuses protect the bus supply lines and individual circuits.

BATTERY.

The battery is in the left forward section of the center fuselage. Battery rating is 36-ampere hours at 24 volts. The battery connects directly to the battery bus and energizes the bus at all times. The battery bus voltage reading appears on the voltmeter when the voltmeter selector switch is placed in BATT BUS. A battery vent system allows boiling electrolyte to overflow into a jar in the battery compartment.

BATTERY SWITCH.

The battery switch, on the generator control panel (figure 1-19), is a three-position switch marked OFF (center position), and BATTERY (up position). The third position has no markings or function. The battery switch controls a battery contactor relay incorporated in the circuit between the battery bus and the 28-volt d-c generator bus. Placing the switch in BATTERY closes the battery contactor, completing the circuit between the battery bus and the generator bus.

Note

> Closing the battery contactor requires a minimum battery voltage of 18 volts at one ampere. The battery contactor remains closed until battery voltage drops below seven volts.

The generators then energize the generator bus and the battery bus. Also, with the generators inoperative and the battery switch in BATTERY, the battery energizes the 28-volt d-c system.

EXTERNAL POWER RECEPTACLE.

The external power receptacle in the right electrical access compartment (figure 1-18) connects to the generator bus. An indication of voltage output of the external power source appears on the voltmeter when the voltage selector switch is in the DISTR BUS position.

GENERATOR REGULATOR PANELS.

Four generators regulator panels, two in the right electrical access compartment and two in the equipment compartment, regulate and protect the 28-volt d-c electrical system. The panels contain the various circuit breakers, fuses, and relays to regulate the system voltage, to control the load division between generators, and to prevent reverse current flow.

GENERATOR CONTROL PANEL.

GENERATOR CONTROL SWITCHES.

The four generator control switches are on the generator control panel. (See figure 1-19.) Each switch is marked ON, OFF, and RESET. If the engine is operating and the generator voltage is approximately 28-volts, placing a generator switch in ON connects the generator to the generator bus and then to the battery, provided the battery switch is in BATTERY. Incorporated in the circuit between the generator and the generator bus is a reverse current relay. This relay prevents battery power from energizing the generator when the generator voltage is lower than the battery voltage. The generator field excitation circuit incorporates a trip relay (circuit breaker) which protects the circuit against overvoltage and shorting. Placing the generator switch in RESET closes the trip relay. If, upon placing the generator control switch in ON, there is no indication on the generator loadmeter, hold the switch in RESET momentarily and then return the switch to ON.

EXTERNAL POWER RECEPTACLE

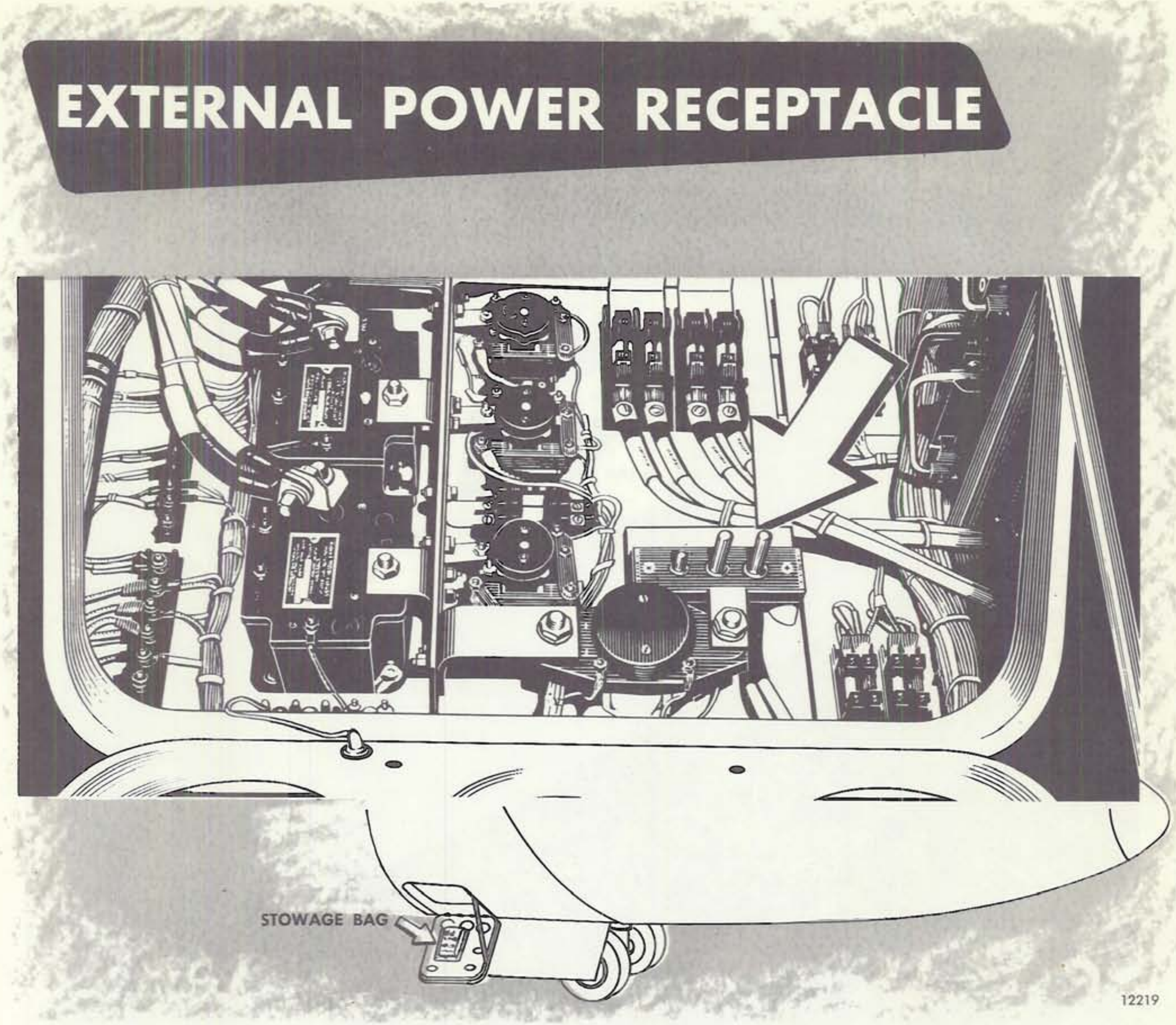


Figure 1–18

GENERATOR INDICATOR LIGHTS.

The generator indicator lights are on the generator control panel. The lights illuminate whenever the generators are inoperative or whenever generator voltage drops below battery voltage.

GENERATOR LOADMETERS.

The generator loadmeters are on the generator control panel. The loadmeters measure the direct-current load of their respective generators. The loadmeter scale is from —0.1 to 1.25. When a generator delivers its maximum rating of 300 amperes, the loadmeter indicates 1.0 (100 percent). Loadmeters interpret the electrical load as a decimal part of the rated capacity. Thus, the pilot may determine whether a generator carries its share of the load.

VOLTMETER.

The d-c voltmeter is on the generator control panel. Voltmeter calibration is in increments of 1 volt with a range from 0 to 30 volts.

VOLTMETER SELECTOR SWITCH.

The voltage of a generator or a bus appears on the voltmeter when the voltmeter selector switch is turned to one of the following positions: RAD BUS, BAT BUS, DISTR BUS, GEN 1L, GEN 1R, GEN 2L, GEN 2R. A single voltmeter on the generator control panel indicates the voltage for all switch positions.

A-C POWER SYSTEM.

The a-c power for the airplane originates from four inverters: a 2500 VA (No. 1 main) inverter, a 2500

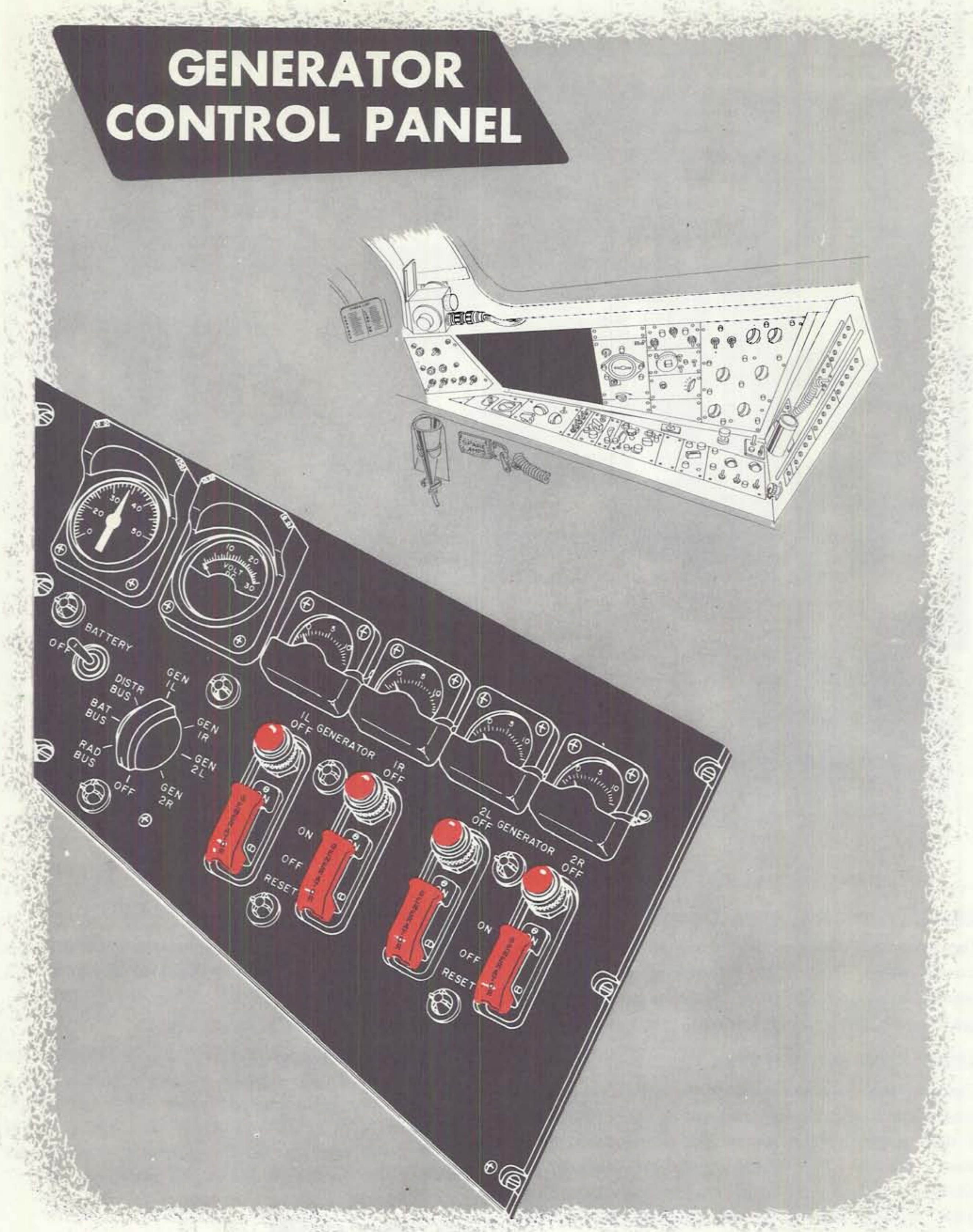


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Figure 1-19

INVERTER CONTROL PANEL

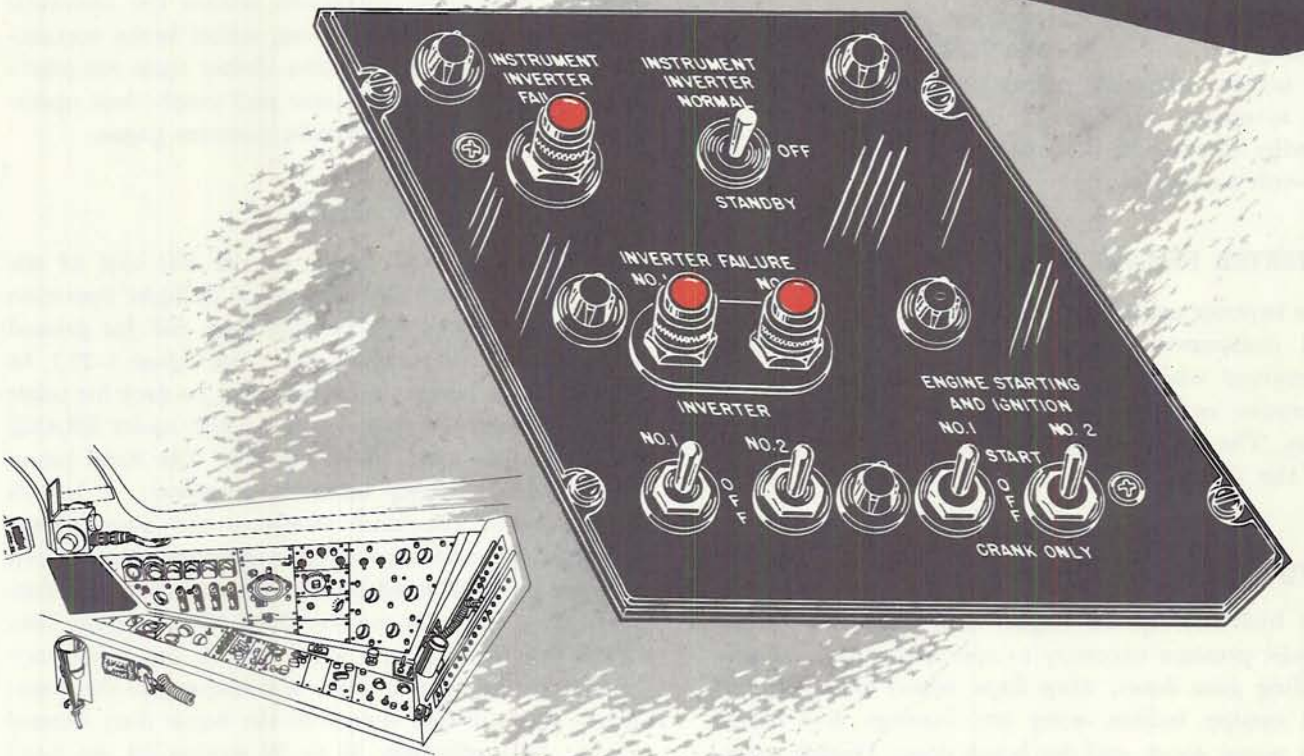

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Figure 1–20

VA (No. 2 main) inverter, a 500 VA normal instrument inverter, and a 250 VA standby instrument inverter. The a-c power distribution system consists of two 115-volt single-phase a-c busses, two 115-volt three-phase a-c busses, one 28-volt single-phase a-c bus, and two 115-volt single-phase a-c radio busses. The radio busses are in the radio junction box and all other busses are in the electrical distribution center. The No. 1 inverter (2500 VA) energizes the 115-volt single phase bus. This bus in turn supplies power to the No. 1 radio bus, the fuel quantity indicating system, the 28-volt single-phase bus, the windshield anti-icing system, and the cabin temperature control system. The 115-volt bus energizes the 28-volt bus through a 28-volt step-down transformer. The 28-volt bus supplies power for fuel flow and oil pressure indication. The No. 1 radio bus supplies a-c power to various electronic equipment. The No. 2 inverter (2500 VA) energizes the No. 2 radio bus and the No. 2 radio bus supplies power to the IFF radar circuit. The normal instrument or standby inverters energize the 115-volt three-phase a-c busses through a transfer relay. These busses supply power to the gyro compass, the flight attitude indicator, and the inverter failure indicator relay circuits.

NO. 1 AND NO. 2 INVERTER SWITCHES.

The No. 1 and No. 2 inverter switches (figure 1–20) on the inverter control panel control their respective inverters. Placing the switches in the up (ON) position closes a relay in the inverters. The closed relay allows power from the 28-volt d-c generator bus to operate the inverter. The No. 1 inverter energizes the No. 1 a-c 115-volt single-phase bus and the No. 2 115-volt single-phase bus and the No. 2 115-volt single-phase radio bus.

INSTRUMENT INVERTER SWITCH.

The instrument inverter switch (figure 1-20) on the inverter control panel controls the normal and standby instrument inverters. Placing the switch in NORMAL closes a relay in the inverter. The closed relay allows power from the 28-volt d-c pilot's circuit breaker bus to operate the normal instrument inverter. The inverter energizes the three-phase 115-volt a-c busses. Placing the switch in STANDBY closes a relay in the inverter allowing power from the 28-volt battery bus to operate the standby instrument inverter. The standby instrument inverter energizes the three-phase 115-volt a-c busses.

INVERTER FAILURE INDICATOR LIGHTS.

The inverter control panel contains the No. 1, No. 2, and instrument inverter failure lights. The lights illuminate whenever the respective inverters are inoperative or whenever the output drops below 90 volts. The 28-volt battery bus supplies power to operate the lights.

HYDRAULIC SYSTEM.

The hydraulic system (figure 1-21) supplies the hydraulic pressure necessary to operate the landing gear, landing gear doors, wing flaps, wheel brakes, canopy and canopy latches, wing and fuselage dive brakes, gun purge doors, and the bomb door. During engine operation, the power to pressurize the hydraulic system comes from independently operating pumps (one for each engine) which draw fluid from a single reservoir in the right inner wing and transmit hydraulic pressure through pressure lines to the various actuating cylinders. Fluid from the return side of the actuating cylinders replenishes the fluid in the reservoir. Compressed air from the engines pressurizes the reservoir to assure a supply of fluid to the engine-driven pumps. A reserve supply of hydraulic fluid remains in the reservoir for emergency use. A relief valve limits system pressure to 3000 (+100 −0) psi. The main accumulator is attached to the basic supply line, and an additional accumulator, smaller in volume than the main accumulator, is isolated from the system and retains pressure for emergency brake operation. Electrically controlled selector valves direct pressure to the up, close, or retract side of the actuating cylinders or to the down, open, or extend side of the cylinders, depending upon the position of the controls. Pressure exists in the actuating cylinders at all times during hydraulic pump operation, since the selector valves have no neutral position. A manually operated valve in the right wheel well bypasses hydraulic fluid, allowing the right main gear door to be closed during bomb loading. A bomb door shut-off valve in the bomb bay prohibits bomb door operation while the airplane is on the ground. The valve is manually operated and must be opened before flight. A ground shut-off valve isolates the pilot's hand pump from the system. Emergency provisions within the hydraulic system are fuses, check valves, wheel brake accumulator, and a duplicate pressure circuit from the pilot's hand pump for landing gear and bomb door operation. There are two hydraulic pressure gages.

HYDRAULIC HAND PUMP.

The hydraulic hand pump, at the left side of the pilot's seat, is used for emergency in-flight operation of the bomb door and landing gear and for ground operation by the ground crew. (See figure 1-22.) In rare cases, the hand pump may also be used for other sub-circuits in the system as described under BRAKE SYSTEM FAILURE in Section III. The hand pump obtains fluid directly from the reservoir. A branch line connects the hand pump to the main system through a ground shut-off valve. An emergency branch line connects the hand pump to the landing gear control valve and then to the bomb door supply line. With the landing gear lever in UP, the emergency section of the control valve is connected to the emergency pressure line routed to the bomb door control valve. Approximately 30 to 50 strokes on the hand pump are necessary to open the bomb door, and 100 to 150 strokes or two to three minutes of steady pumping are needed to extend the landing gear. There is very light resistance when the gear is being pumped down.

EXTERNAL HYDRAULIC HAND PUMP.

The external hydraulic hand pump (figure 1-23) is in the left electrical access compartment. The external hand pump uses the same supply line as the internal hand pump, but the pressure line goes directly to the main system pressure line. The external hand pump operates all of the airplane's hydraulic sub-circuits, depending upon the position of the various hydraulic sub-circuit selector valves. The canopy switch is adjacent to the pump. Actuation of the canopy switch positions a valve allowing the operation of the pump to raise the canopy.

GROUND SHUT-OFF VALVE.

The ground shut-off valve is to the left of the pilot's seat on the compartment floor. This valve is manually operated and is safety-wired closed for flight. The shut-off valve is used to connect the hydraulic hand pump into the common pressure line so that pressure in the line may be built up for ground operation of the various sub-circuits. In the event of extreme emergencies, the pilot may open the valve and use the hand pump to put pressure on the hydraulic system while in flight as described under BRAKE SYSTEM FAILURE in Section III.

HYDRAULIC SYSTEM PRESSURE GAGE.

A gage (figure 1-3) on the pilot's left console indicates the pressure in the common line of the hydraulic system. The indicating system consists of the gage and a pressure transmitter. If the engines are running, the gage should reflect readings which fall within the instrument range markings given in Section V.

FLIGHT CONTROL SYSTEMS.

The ailerons, elevator, rudder, and throttles control the airplane in flight. (See figure 1-24.) These primary controls receive assistance from the trim devices and the variable-incidence stabilizer. Additional controls in the form of high-drag devices are the flaps and dive brakes. The conventional elevator, rudder, and ailerons have unique mechanisms which relieve the pilot of heavy control loads. At high speeds, these mechanisms also prohibit excessive loads on the airplane's structure by indirectly restricting the travel of control surfaces. Rotation of the control wheel or movement of the rudder pedals, or longitudinal movement of the control column moves push rods to actuate the spring tabs which position the control surfaces. On the ground and at low speeds, the push rods directly deflect the control surfaces, but as airspeed increases, the resulting load on the control surfaces resists the action of the push rod. The torque-tube in the torque-tube and blowback-rod assembly twists to absorb the movement of the push rod. Twisting of the torque tube rotates the blow-back rod which deflects a spring tab. The spring tabs on the trailing edge of both ailerons, the rudder, and the port elevator give the elevator the effect of having a small aileron on the aileron or a small elevator on the elevator. The reaction resulting from moving the spring tabs into the airstream forces (flies) the surface to another position. The spring tabs operated by the torque-tube-and-blowback-rod assembly are powerful aerodynamic devices which reduce pilot effort and still maintain conventional control feel at all airspeeds. The displacement of the control surface is directly proportional to the displacement of the tab; however, the blowback rod, acting as a torsion spring, restricts tab movement. At high speeds, a large tab angle imposes high air loads on the tab, causing the blowback rod to twist in the opposite direction to the torque tube. This increases the control load felt by the pilot, thereby utilizing the pilot's strength as a limiting factor to control surface movement.

CONTROL LOCKS.

External surface control locks placed on the elevator, rudder and ailerons are the only means of locking the controls. The control column has a stowage rod which holds the control column out of the way while entering or leaving the cabin but does not lock the controls.

TRIM SYSTEM.

Each flight control system has a different method of trimming. The variable-incidence stabilizer acts as elevator trim by raising and lowering the trailing edge of the horizontal stabilizer. Trimming the aileron varies the elongation of a spring (adding bias) at the base of the control column. In effect, this shifts the neutral position of the control wheel. Actuating the rudder trim switch operates an actuator in the vertical stabilizer. This actuator rotates the blowback rod which moves the combination spring tab-trim tab.

AILERON CONTROL SYSTEM.

Mechanical linkages connect the control wheel to torque-tube-and-blowback-rod assemblies in each aileron. One end of the torque tube anchors to the aileron spar. Rotation of the control wheel causes the other end of the torque tube to twist. The blowback rod, inside the torque tube and bolted to its free end, turns as the tube twists, thereby deflecting the spring tab. The aerodynamic force on the spring tab moves the aileron.

RUDDER CONTROL SYSTEM.

The rudder pedals connect to the torque-tube-and-blowback-rod assembly inside the leading edge of the rudder. Movement of the pedals operates the rudder in the same manner that the control wheel operates the ailerons.

ELEVATOR CONTROL SYSTEM. (GROUP C AIRPLANES)

A common shaft joins the right and left elevator control surfaces, causing the surfaces to move simultaneously. Longitudinal movement of the control column deflects a spring tab to move the elevator. The elevator spring tab is identical in operation to the aileron spring tab. A balance tab on the trailing edge of the

HYDRAULIC SYSTEM—SCHEMATIC

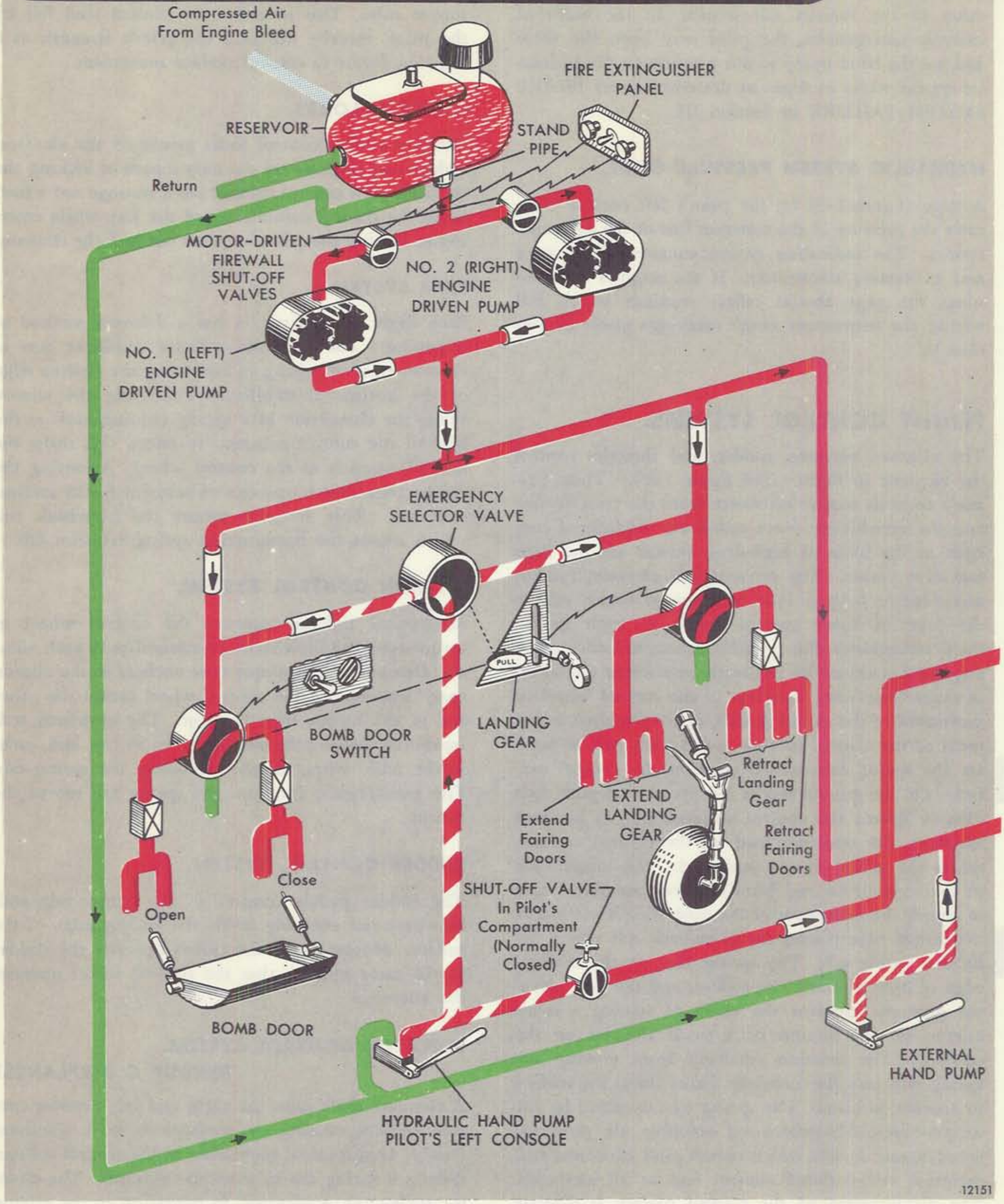

Figure 1-21 (Sheet 1 of 2)

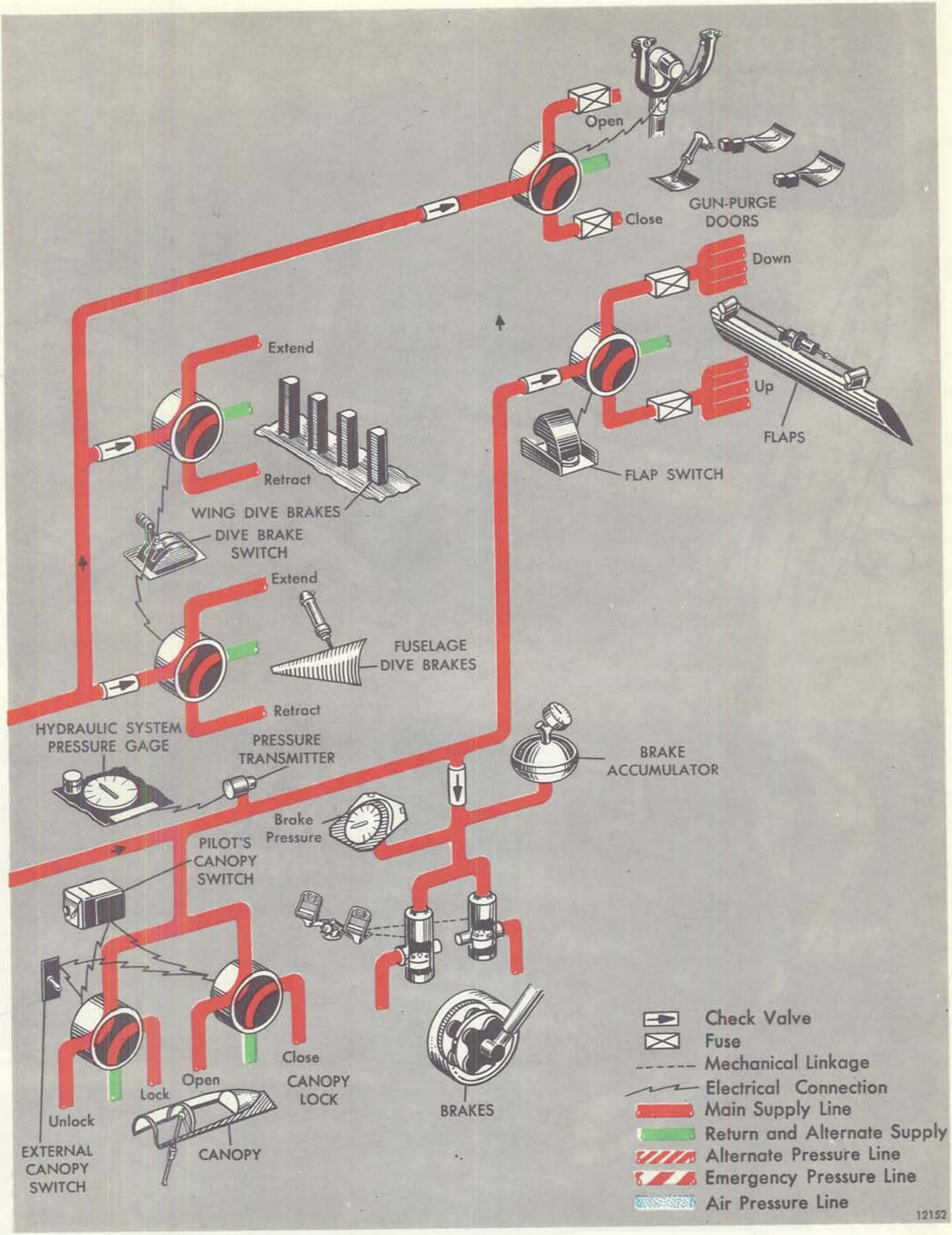

Figure 1–21 (Sheet 2 of 2)

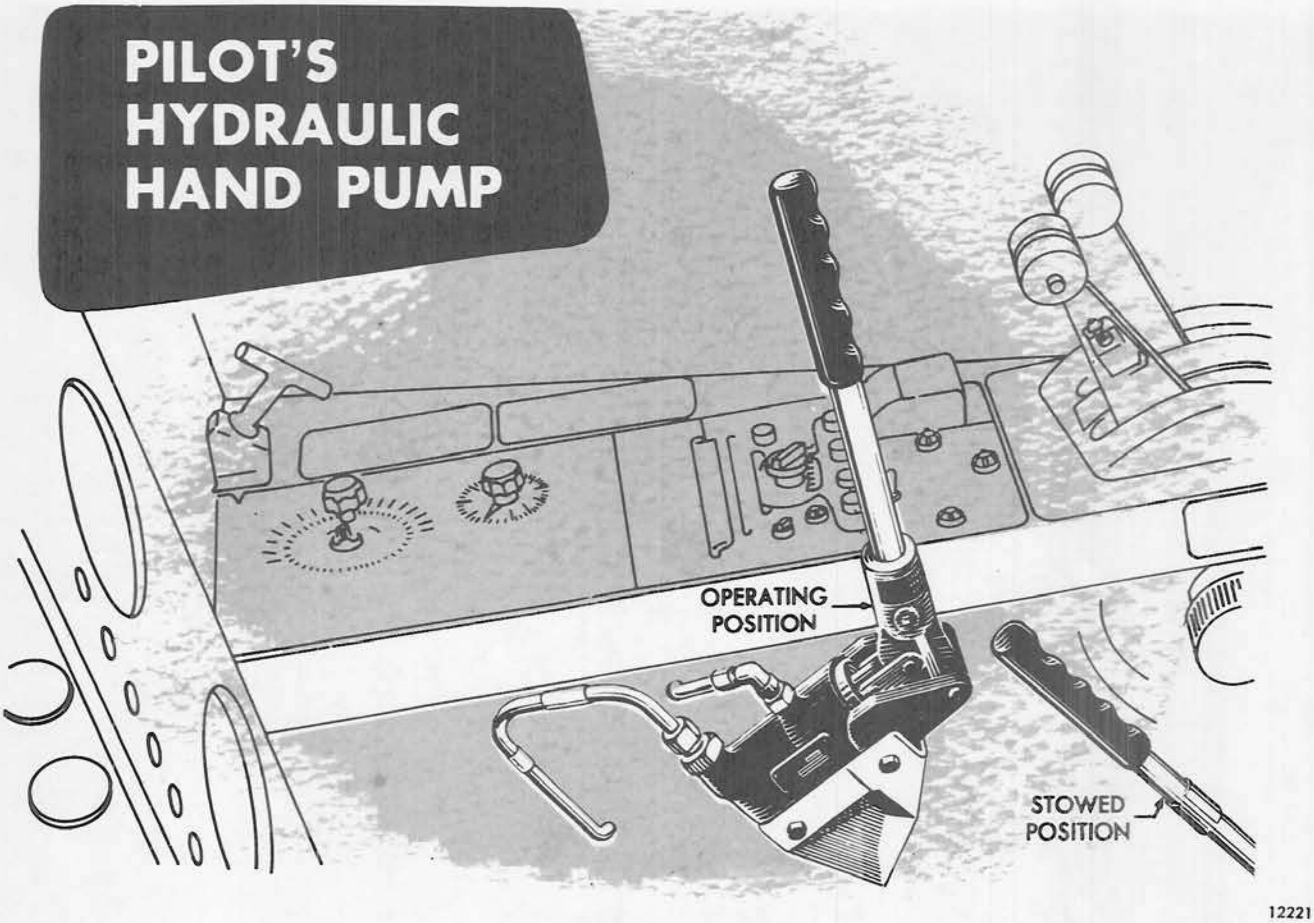

Figure 1-22

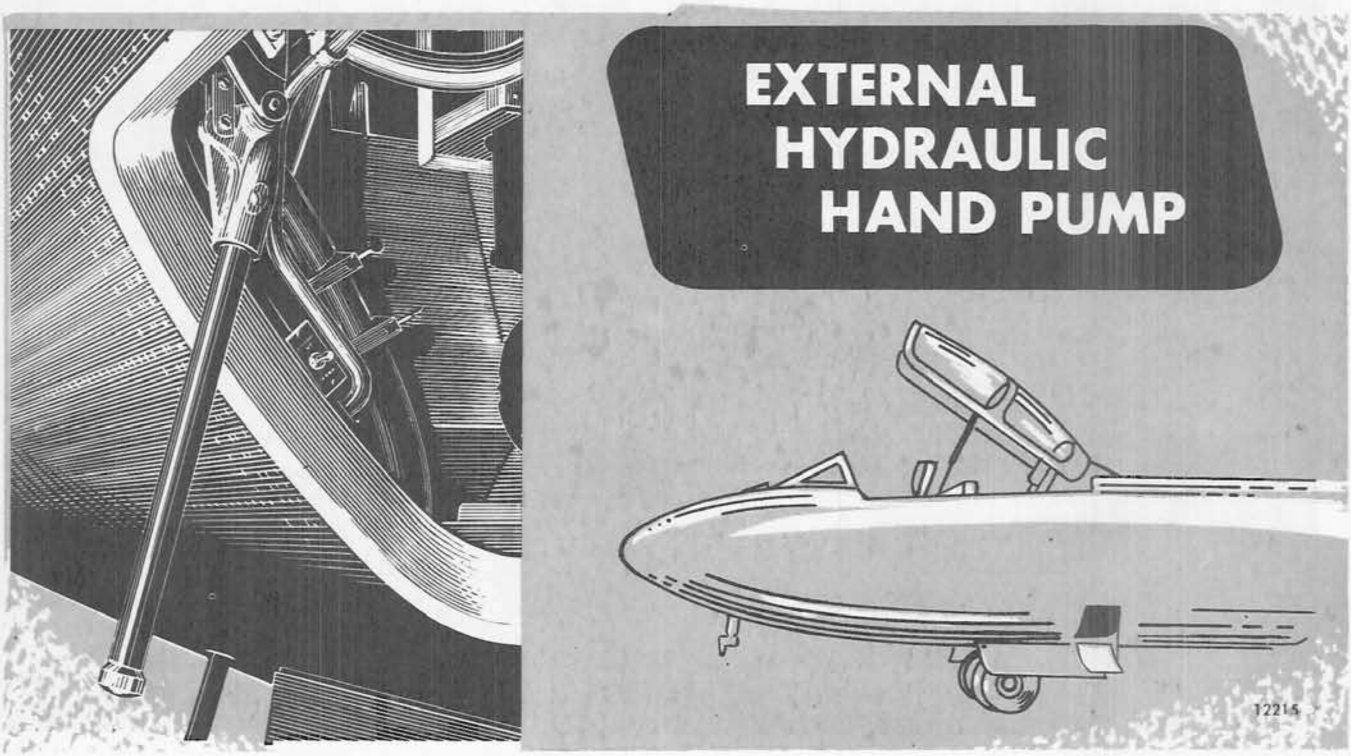

Figure 1-23

FLIGHT CONTROLS AND TORQUE TUBE-BLOW BACK ROD ASSEMBLY

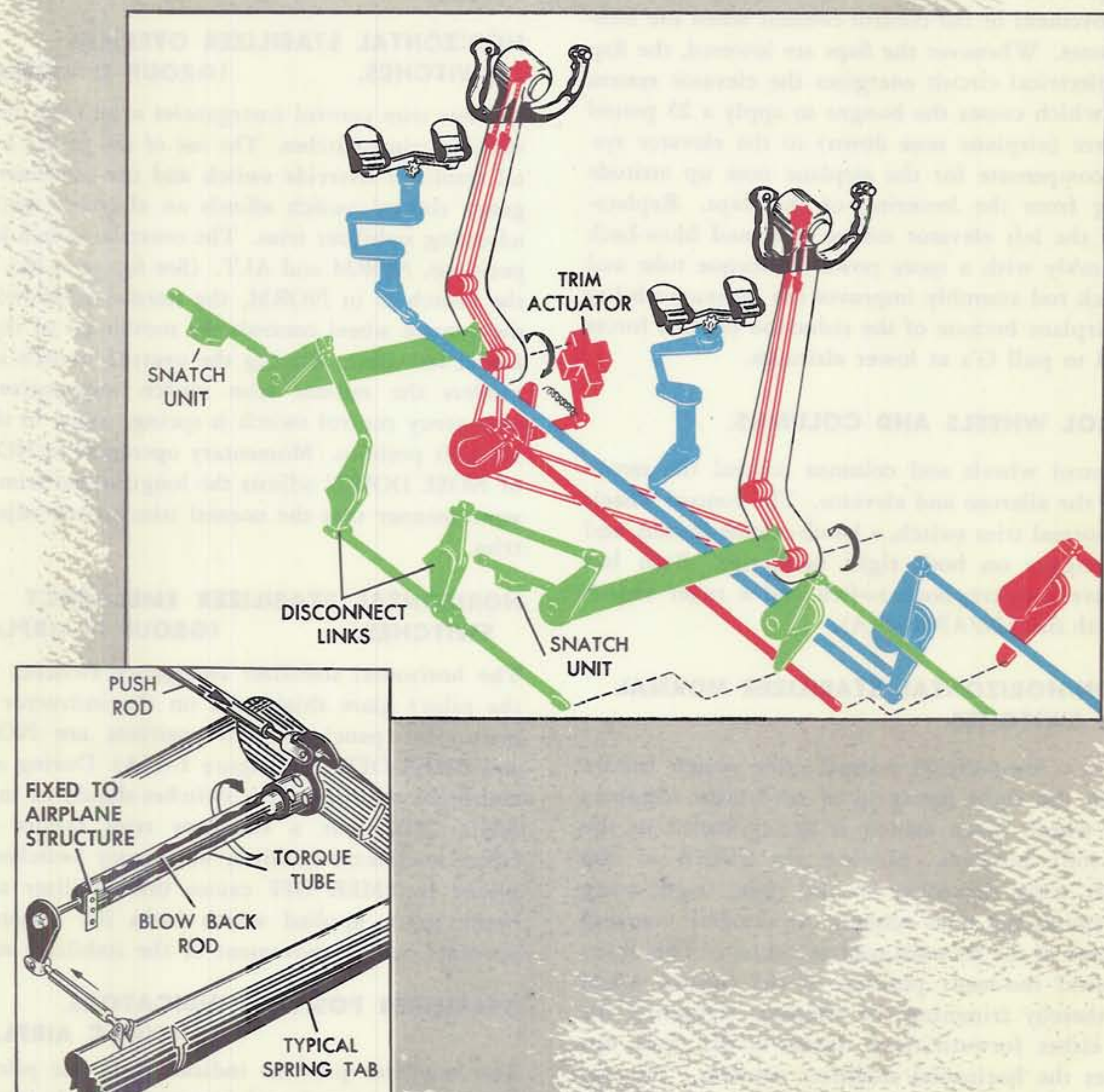

Figure 1–24

right elevator control surface aids the spring tab for elevator operation. The tab does not connect to any controls but operates solely as a function of elevator movement to further reduce pilot effort in the operation of the controls.

ELEVATOR CONTROL SYSTEM. (GROUP D AIRPLANES)

Installation of the elevator bungee and a more powerful torque tube and blow-back assembly in the left elevator comprise the only difference in the elevator systems between Groups C and D airplanes. Operation of the elevator system bungee is automatic and only requires that the pilot be alert for the slight forward movement of the control column when the bungee actuates. Whenever the flaps are lowered, the flap system electrical circuit energizes the elevator system bungee which causes the bungee to apply a 25 pound push force (airplane nose down) to the elevator system to compensate for the airplane nose up attitude resulting from the lowering of the flaps. Replacement of the left elevator torque tube and blow-back rod assembly with a more powerful torque tube and blow-back rod assembly improves the maneuverability of the airplane because of the reduction of stick forces required to pull G's at lower altitudes.

CONTROL WHEELS AND COLUMNS.

The control wheels and columns control the movement of the ailerons and elevator. The control wheels have a normal trim switch, a bomb-release button, and a gun trigger on both right handgrips. Both left grips have a microphone switch and a roger switch (used with the AN/APW-11A).

AILERON-HORIZONTAL STABILIZER NORMAL TRIM SWITCHES.

There is a five-position normal trim switch (figure 1-25) on the right handgrip of each crew members control wheel. Each switch is spring-loaded to the center (off) position. Moving the switch to the left (left wing down) or to the right (right wing down) causes the trim actuator to elongate a spring at the base of the forward control column. This shifts the neutral (no-load) position of the control wheel down, thereby trimming the ailerons. Actuating the switch either forward (nose down) or aft (nose up) energizes the horizontal stabilizer actuator. The up-and-down movement of the trailing edge of the horizontal stabilizer gives the desired elevator trim. The stabilizer actuator has two speeds of travel. On group C airplanes only, during flight with the gear up, the stabilizer actuator operates at 60 to 70 percent of full speed. The actuator operates at full speed during trimming of the stabilizer with gear down. The trim switch on the aft control wheel is the master control and its operation overrides the pilot's trim switch.

Note

The aileron trim system is inoperative when the horizontal stabilizer override switch is in the ALT position.

On group C airplanes only, both normal trim switches are inoperative when the pilot's horizontal stabilizer override switch is in ALT. The d-c power to operate the aileron and stabilizer actuators is from the 28-volt d-c generator, distribution, and pilot's circuit breaker busses.

HORIZONTAL STABILIZER OVERRIDE SWITCHES. (GROUP C AIRPLANES)

Various trim control emergencies arise from faulty or sticking trim switches. The use of the pilot's horizontal stabilizer override switch and the stabilizer emergency control switch affords an alternate method of adjusting stabilizer trim. The override switch has two positions, NORM and ALT. (See figure 1-26.) When the switch is in NORM, the normal trim switch on the control wheel controls the movement of the horizontal stabilizer. Placing the override switch in ALT renders the normal trim switch inoperative. The emergency control switch is spring-loaded to the center (off) position. Momentary operation to NOSE UP or NOSE DOWN adjusts the longitudinal trim in the same manner that the normal trim switch adjusts the trim.

HORIZONTAL STABILIZER EMERGENCY SWITCHES. (GROUP D AIRPLANES)

The horizontal stabilizer emergency switches are on the pilot's glare shield and on the instructor pilot's insrtument panel. Switch positions are NORMAL and EMER OFF. (See figure 1-24A) During all normal flight conditions, the switches should be in NORMAL. Whenever a stabilizer trim failure occurs, either horizontal stabilizer emergency switches when placed in EMER OFF causes the stabilizer actuator brake to be applied which locks the actuator and prevents further movement of the stabilizer surface.

STABILIZER POSITION INDICATORS. (GROUP C AIRPLANES)

The stabilizer position indicators on the pilot's left main control panel and instructor pilot's instrument panel operate continuously when power is on the 28-volt d-c distribution bus. (See figures 1-5 and 1-6.) A device attached to the stabilizer actuator drive shaft follows the movement of the stabilizer. The

Figure 1-24A

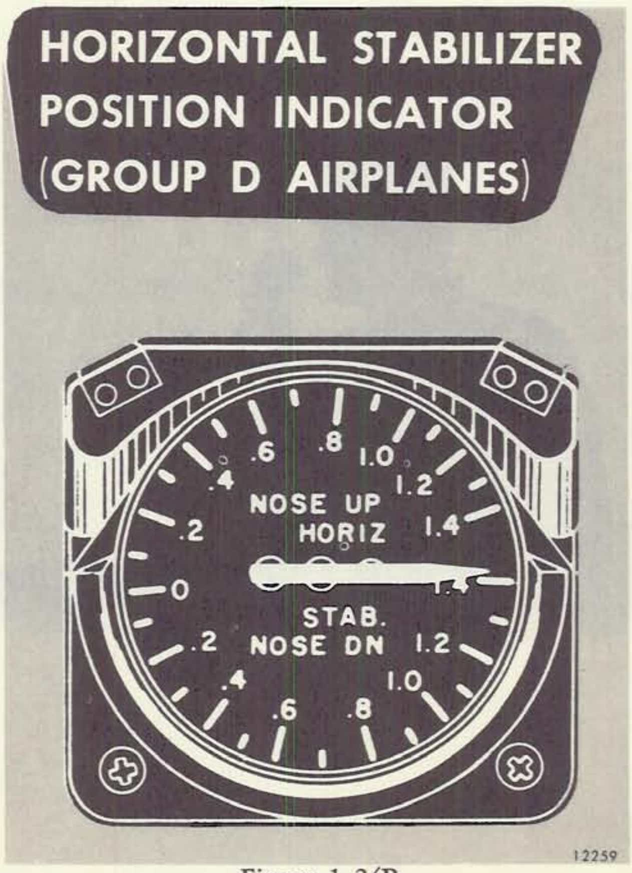

Figure 1-24B

device electrically operates the indicators to give a visual indication of the position of the horizontal stabilizer. The indicator markings range from six divisions nose down to ten divisions nose up; however, the travel of the stabilizer and the needle is 2.5 divisions nose down and 1.5 divisions nose up. A division closely approximates a degree.

STABILIZER POSITION INDICATOR. (GROUP D AIRPLANES)

Stabilizer position indicators on the pilot's canopy control box and on the instructor pilot's instrument panel (figure 1–24B) operate continuously when power is on the 28-volt distribution bus. A device attached to the stabilizer actuator drive shaft follows the movement of the horizontal stabilizer. The indicator pointer shows up and down movement of the stabilizer in tenths of a degree from 0° to 1.4°. Without electrical power or during electrical malfunction of the indicating system, the indicator pointer moves to the 3 o'clock position.

RUDDER TRIM SWITCHES.

The pilot's rudder trim switch is on the flap and trim control panel. The instructor-pilot's rudder trim switch is on his left horizontal console. (See figure 1-27.) Switch positions are NOSE LEFT and NOSE RIGHT. Placing the switch in NOSE LEFT or NOSE RIGHT causes the rudder trim tab actuator to change rudder trim. The instructor pilot's rudder trim switch is the master control switch and overrides the pilot's rudder trim switch whenever it is actuated. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the trim circuits.

RUDDER TRIM INDICATOR LIGHT.

The green rudder trim light on the pilot's left main control panel (figure 1–28) illuminates when the rudder trim tab is within one-eighth of an inch of the neutral position. However, to supply power to light the lamp, the rudder trim switch must be moved to the right or left to close the light circuit. The 28-volt d-c pilot's circuit breaker bus supplies the power for lamp illumination.

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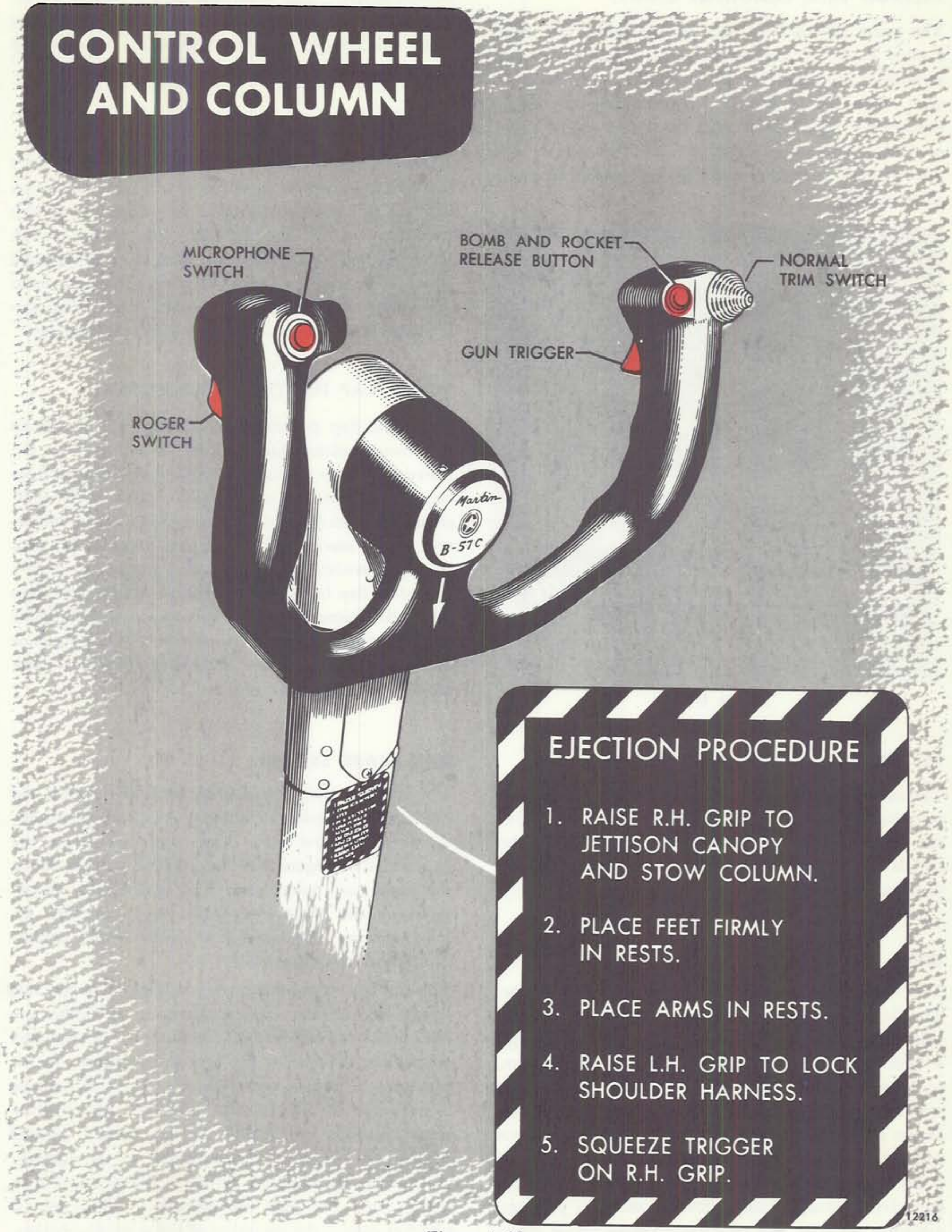

CONTROL WHEEL AND COLUMN
MICROPHONE SWITCH
BOMB AND ROCKET RELEASE BUTTON
NORMAL TRIM SWITCH
GUN TRIGGER
ROGER SWITCH
Martin
B-57C
EJECTION PROCEDURE
1. RAISE R.H. GRIP TO JETTISON CANOPY AND STOW COLUMN.
2. PLACE FEET FIRMLY IN RESTS.
3. PLACE ARMS IN RESTS.
4. RAISE L.H. GRIP TO LOCK SHOULDER HARNESS.
5. SQUEEZE TRIGGER ON R.H. GRIP.
12216

Figure 1–25

AILERON TRIM INDICATOR LIGHT.

The green aileron trim light on the pilot's left main control panel illuminates when the aileron trim tab is within one-eighth of an inch of the neutral position. However, to supply power to light the lamp, the normal trim switch must be moved to the right or left to close the light circuit. The 28-volt d-c pilot's circuit breaker bus supplies the power for lamp illuminations.

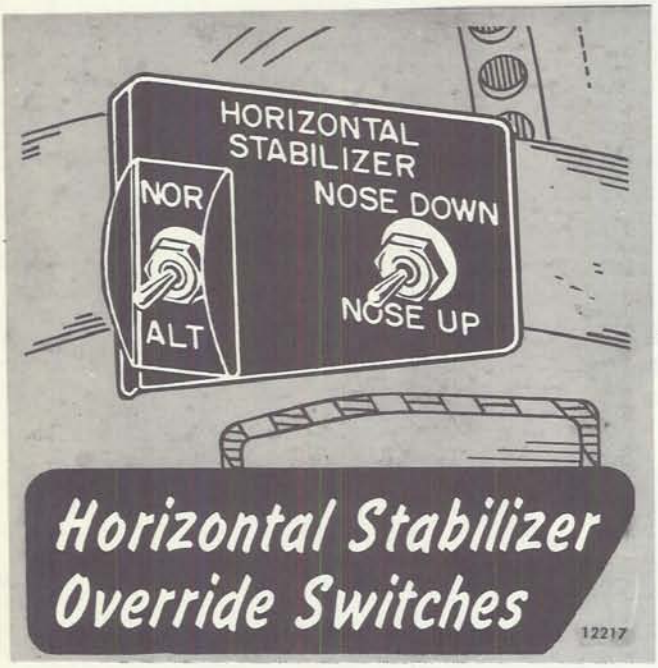


Figure 1–26

RUDDER PEDALS AND ADJUSTMENT KNOB.

The rudder pedals are of the conventional type, incorporating integral toe-operated brake pedals. Rotating the adjustment knob between the pedals moves the pedals fore and aft to adjust for the desired leg length. (See figure 1–29.)

WING FLAP SYSTEM.

The wing flaps are of the high-drag, low-lift type. The flap system consists of two inner and two outer split flaps hinged to the trailing edges of the wings, a hydraulic actuating cylinder for each flap section, an electrical control circuit, one control switch, and two flap-position indicators. The inner flaps are between the fuselage and the engine nacelle tail cones and the outer flaps are between the engine nacelle tail cones and the ailerons. Energizing the electrical control circuit causes a single control valve to position, allowing all four flap sections to move up or down simultaneously. The flaps have no intermediate position. The flaps must not be lowered above 170 knots IAS. The 28-volt d-c distribution bus supplies the power to operate the control circuit.

WING FLAP SWITCH.

The wing flap switch (figure 1–27) is on the pilot's flap and trim control panel aft of the pilot's throttles. The switch handle resembles an airfoil section. Switch markings are UP and DOWN. Placing the switch UP or DOWN electrically positions the control valve to allow hydraulic pressure to go to the up or down sides of the four actuating cylinders of the wing flap sections. The maximum down travel is 60 degrees.

WING FLAP POSITION INDICATORS.

The wing flap position indicators are on the pilot's left main control panel (figure 1–28) and on the instructor-pilot's instrument panel. Lowering the flaps causes microswitches to open the circuit to the indicators and a barber-pole design appears in the indicators. Upon reaching the full down position, the flaps close microswitches and cause the indicator to show a miniature flap in the down position. Raising the flaps causes the microswitches to open, and the barber-pole design again appears on the indicator. When the flaps are in the full up position, the indicator shows a miniature flap in the up position.

DIVE BRAKE SYSTEM.

The airplane is equipped with wing dive brakes and fuselage dive brakes to increase drag and reduce airspeed. (See figure 1–1.) The wing dive brakes are in a series of fingers in a straight line laterally along the upper and lower surface of both wings. When retracted, the wing dive brakes are flush with the wing surface. The wing dive brakes extend perpendicularly to the wing chord.

The fuselage dive brakes are two flaps on either side of the aft fuselage. When retracted, the brakes are flush with the fuselage and hinges at the forward part of the brakes to allow the brakes to open at the aft end into the slipstream. Both the wing and fuselage dive brakes are electrically controlled and hydraulically operated. A switch on the pilot's inboard throttle lever controls the operation of the fuselage brake. The opening and closing of the fuselage dive brakes open and close microswitches. These microswitches control the operation of the wing dive brakes.

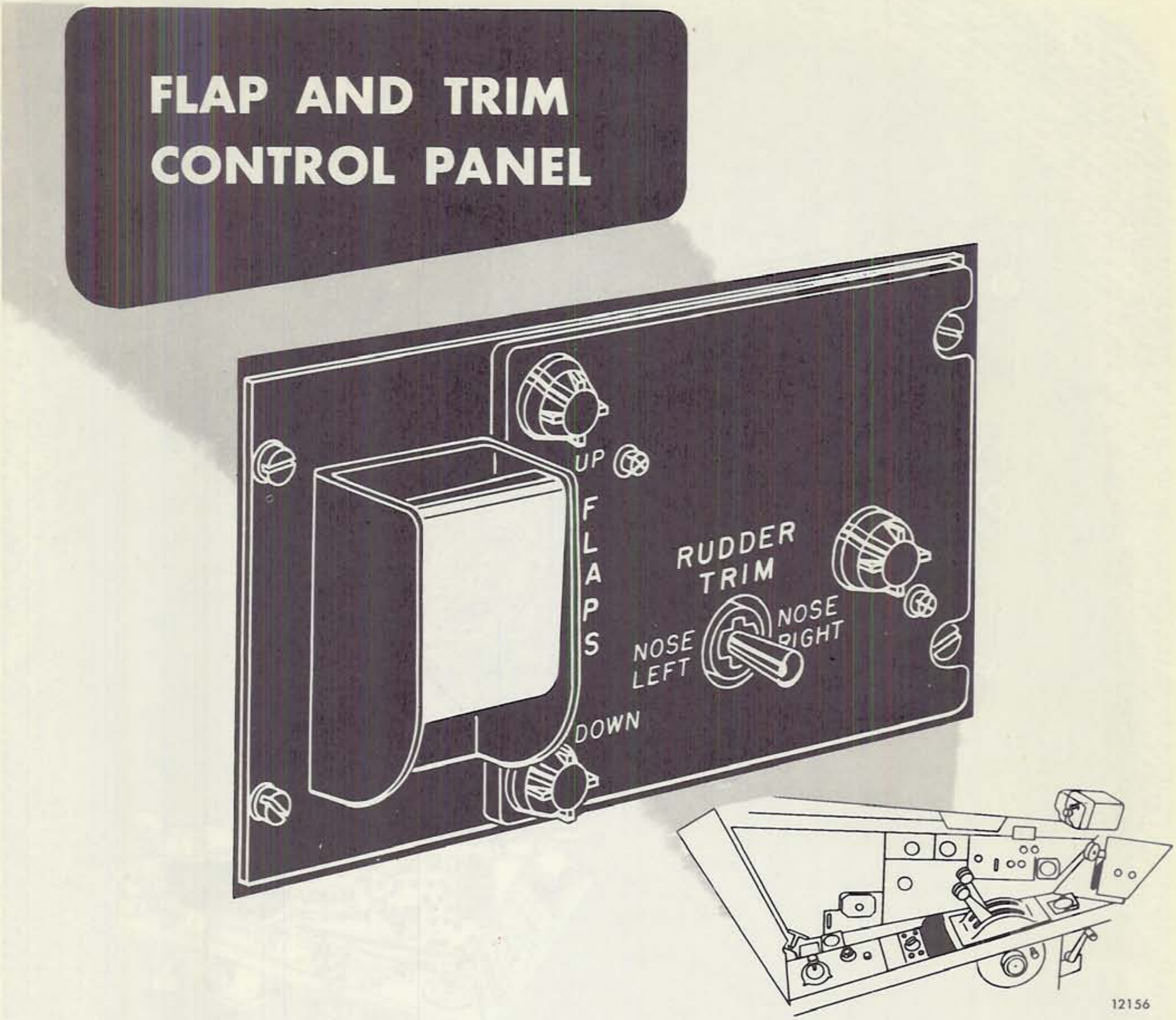


Figure 1-27

When fully opened, the fuselage brakes operate microswitches which cause the wing brakes to extend to the maximum travel. The initial movement of the fuselage brakes to the close position actuates microswitches to cause the wing brakes to retract. The wing brakes retract in advance of the fuselage brakes. There are no airspeed limitations for dive brake operation and actuation of the dive brakes does not cause the airplane to pitch up or pitch down. The 28-volt d-c distribution bus supplies the power for dive brakes control.

DIVE BRAKE SWITCHES.

The dive brake switches (figures 1-3 and 1-7) are on the pilot's and instructor-pilot's inboard throttle levers. Switch markings are EXTEND and RETRACT. Placing the switch in EXTEND positions a solenoid valve to allow hydraulic pressure to go to the extend side of fuselage actuating cylinder. Placing the switch in RETRACT causes the valve to allow hydraulic pressure to go to the retract side of the actuating cylinder. The instructor-pilot's dive brake switch overrides the pilot's dive brake switch regardless of the position of the pilot's switch. The fuselage brakes cannot be stopped in an intermediate position. Extending the fuselage brakes also extends the wing brakes.

LANDING GEAR SYSTEM.

The electrically controlled, hydraulically operated tricycle landing gear fully retracts within the wing and

Figure 1-28

fuselage contours. The main gear retracts inboard and up into wheel wells inboard of the engine, and the nose wheel retracts aft and up into the fuselage nosewheel well. When retracted, the landing gear is enclosed by fairing doors. Each main gear consists of an air-oil shock strut with a cantilevered axle, up-and-down locks, position mircoswitches, an actuating cylinder, a wheel-and-brake assembly, and a gear-operated sequence valve. The nose gear consists of an air-oil shock strut with a self-centering device, dual wheels, a drag brace, an actuating cylinder, up-and-down locks, and gear-position microswitches. Sequence valves control the order of opening and closing of the gear and fairing doors. Hydraulic pressure and mechanical locks retain the gear in the desired position. When the airplane's weight is removed from the nose wheel strut, the self-centering device aligns the nose gear for retraction, and when the weight of the airplane compresses the nose wheel strut approximately two inches, the wheels are free to caster.

LANDING GEAR CONTROL LEVER.

A two-position landing gear control lever left of the landing gear control panel (figure 1-30) electrically controls gear operation. The lever handle is wheel-shaped for distinctive identification, and it must be pulled aft to be disengaged from a detent in either the UP or DOWN position. When the landing gear control lever is placed in UP, a microswitch closes a circuit from the 28-volt d-c distribution bus to the single-acting solenoid of the landing gear control valve. The valve then allows hydraulic pressure to flow to the actuating cylinders of the gears and then to the doors in the retract direction. When retraction is completed, the actuating cylinder remains pressurized as long as the main hydraulic system is pressurized. Should the system pressure fail, the up lock hooks will hold the gear in the retracted position. Placing the landing gear control lever in DOWN causes the solenoid valve to become de-energized, permitting hydraulic pressure to extend the doors, release the up locks, and extend the gears. Ground lock pins are provided for safety purposes and must be inserted before engine shutdown. Normal gear lever movement requires a force of 5 pounds (± 1 pound). An additional 25 pounds (± 5 pounds) pressure applied to the lever enables the pilot to override the solenoid for emergency gear retraction. Gear extension opens a nacelle cowl door to permit ground engine cooling. The 28-volt d-c distribution bus supplies the power to operate the landing gear controls.

EMERGENCY LANDING GEAR DOWN HANDLES.

The pilot's emergency landing gear down handle is to the left of the landing gear control lever. The instructor-pilot's down handle is on the aft throttle quadrant. (See figures 1-3 and 1-7.) Using a handle enables the pilot or instructor-pilot to position the landing gear control valve in the down position if there is an electrical malfunction. Pulling either of the handles out (approximately 2½ inches) mechanically positions the landing gear control valve to the down position, thereby permitting normal hydraulic system pressure or hydraulic hand pump pressure to lower the gear. The forward handle remains in the out position when pulled. To reset, turn the handle one quarter turn to the right or left and a spring returns the handle to the normal (in) position. To retain the aft handle in the out position, twist the handle to create a friction lock. To reset, twist the handle to permit the handle to return to the normal position.

RUDDER PEDALS AND ADJUSTMENT KNOB

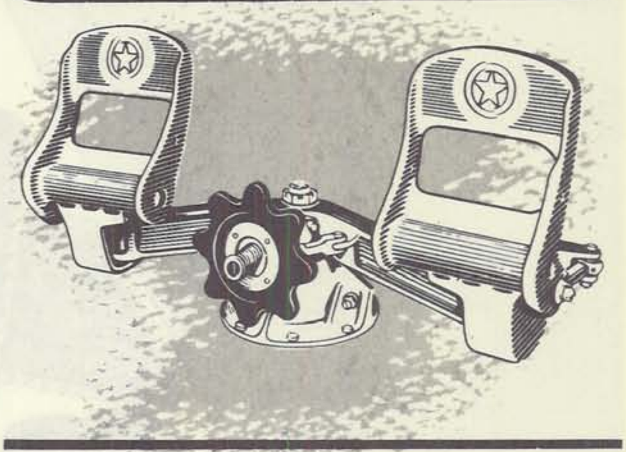


Figure 1-29

CAUTION

The pilot must place the landing gear lever in the down position when using the down handle for emergency gear extension. This prevents inadvertent retraction of the gear through resumption of electrical operation. Without electrical power, the pilot cannot retract the gear; this is important since the pilot must make a go-around with the gear down.

LANDING GEAR WARNING HORN.

When the landing gear is in any position other than down and locked, retarding the throttles below minimum cruising speed (76 ± 3 percent rpm) energizes the landing gear warning horn. Electrical power to the horn comes from the pilot's 28-volt d-c circuit breaker bus through a 5-ampere circuit breaker.

LANDING GEAR WARNING HORN RELEASE.

The warning horn release button (figure 1-3) is aft of the parking brake lever and below the throttles. Momentarily depressing the release button silences the warning horn. Advancing the throttles above minimum cruise resets the warning horn microswitch.

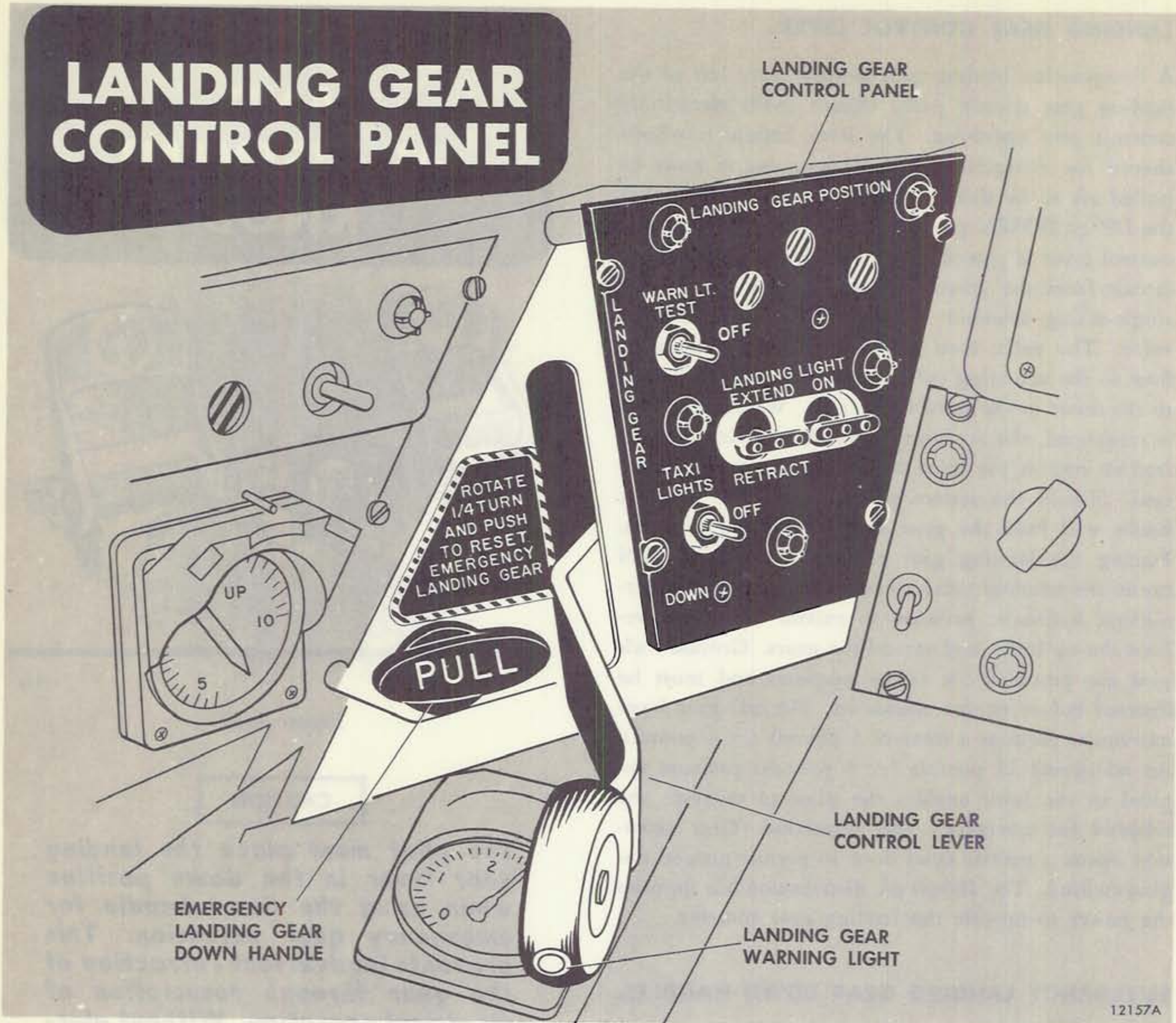


Figure 1–30

LANDING GEAR WARNING LIGHT.

Placing the landing gear control lever in UP or DOWN completes circuits to the landing gear warning light in the landing gear lever handle. (See figure 1–30.) The light illuminates when the landing gear is in an intermediate position. Also, retarding the throttles below minimum cruise speed illuminates the light when the gear is in any position other than down and locked. Electrical power for the light comes from the 28-volt d-c pilot's circuit breaker bus through a 5-ampere circuit breaker.

LANDING GEAR WARNING LIGHT TEST SWITCH.

The landing gear warning light test switch (figure 1–30) is on the landing gear control panel. Placing the switch in TEST illuminates the light in the landing gear control lever handle if the light is operative. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the circuit.

LANDING GEAR POSITION INDICATORS.

Two three-indication, three-position indicators, one on the pilot's landing gear control panel and one on the instructor-pilot's main instrument panel, represent the position of the landing gear. (See figures 1–30 and 1–6.) The indications are: 1) cross-hatching if the gear is in an intermediate position, 2) the word UP if the gear is up and locked, and 3) a miniature wheel if the gear is down and locked. Position-indication microswitches on the gear energize their respective indicators. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the indicators.

Figure 1-31

BRAKE SYSTEM.

Operation of the brake pedals actuates separate hydraulic brake valves for each wheel brake. Toe pressure on the brake pedals meters hydraulic fluid under pressure to the brakes on the main gear. A check valve isolates a brake accumulator from the main hydraulic system, and during main hydraulic system failure the brake accumulator supplies pressure for two or three brake applications. Differential main gear braking steers the airplane when taxiing.

PARKING BRAKE LEVER.

The parking brake lever (figure 1-3) is on the pilot's left console forward of the throttle friction knob. The pilot sets the parking brake by depressing the brake pedals and placing the parking brake in ON and then releasing the brake pedals. He releases the parking brake by adding further pressure on the brake pedals.

Note

Release the parking brake after the wheel chocks are in place to avoid damage to the brakes.

BRAKE PRESSURE GAGE.

The brake pressure gage (figure 1-3) on the pilot's left horizontal console indicates hydraulic pressure in the wheel brake hydraulic system. Pressure is hydraulically transmitted from the brake system to the brake pressure gage. The calibration of the gage is in increments of 500 psi. See Section V for instrument markings.

INSTRUMENTS.

The flight and engine instruments, which are on shock-mounted panels, are in full view of the pilot and instructor pilot. The majority of the instruments are electrical and they receive their power from the a-c or d-c electrical systems. The electrical system supplies the power for the directional indicators, turn and slip indicator and the attitude indicator. The airspeed indicator, Machmeter, altimeters, and vertical velocity indicator operate by air pressure supplied from the pitot-static system. A vibrator on the pilot's and instructor-pilot's main instrument panels prevents instrument lag or stick pointer indications. See Section IV for a discussion on lighting for the panels and instruments and Section V for instrument markings.

INSTRUMENT PANEL VIBRATORS.

Vibrators on the rear of the pilot's and instructor-pilot's main instrument panels prevent sticking or lagging of instrument pointers due to friction. There are no controls for the vibrators and they operate continuously when the 28-volt distribution bus is energized.

AIRSPEED INDICATOR.

The airspeed indicator on the pilot's and instructor-pilot's main instrument panels shows indicated airspeed and the maximum permissible indicated airspeed. The indicator has two pointers, a vernier drum, and a small triangular index. The indicator is marked from 50 to 650 knots in 100-knot increments. The narrow pointer registers indicated airspeed and the striped pointer registers maximum allowable indicated airspeed. The vernier drum permits the observer to read airspeed to the nearest knot. The small triangular index is preset on the ground and is set to a limiting Mach number on the face of the instrument and regulates the travel of the striped pointer. Assuming that the airplane is at sea level with a barometric pressure of 29.92 inches Hg. and the triangular index set at Mach 0.8, the striped pointer would indicate approximately 520 knots. As the airplane increases altitude, the striped pointer rotates counterclockwise, thereby indicating the maximum allowable indicated airspeed at any altitude.

MACHMETER.

The Machmeter on the pilot's main instrument panel is a primary flight instrument for indicating the speed of the airplane. Machmeter readings are more exact indications of airplane speed than indicated airspeed readings, particularly at higher altitudes. Indicator markings are in hundredths of Mach and are numbered every tenth of Mach from 0.3 to 1.0. The pitot-static system operates the indicator.

ACCELEROMETER.

During turns, loops, and similar maneuvers, the pull of centrifugal force on the airplane (and on the pilot) registers on the accelerometer. (See figure 1–5.) The calibration of the accelerometer is in terms of G, or multiples of the force of the pull of gravity. The meter has three pointers that indicate G-loads. In addition to the continuous pointer, two recording pointers (one for positive G and one for negative G) follow the continuous pointer to the maximum encountered G-load. The recording pointers return to the normal 1-G position when the knob on the lower left corner of the instrument is pressed.

EMERGENCY EQUIPMENT.

One bromochloromethane (CB) hand extinguisher and one crash axe constitute the items of portable emergency equipment in the airplane. (See figure 3–3.) The fire extinguisher is on the pressure bulkhead to the right of the instructor-pilot's seat. The crash axe is on the right side of the cabin on the door of the main radio distribution box.

CANOPY.

The canopy is a single-piece, laminated, transparent plastic bubble set in a metal frame. Its purpose is to enclose the cockpits and give the crew lateral and vertical visibility. Open hinges secure the canopy at the aft end, and a hydraulic actuating cylinder secures the canopy at the center. The canopy arcs upward for crew entrance or exit. Six hydraulically operated latches on the fuselage sill lock the canopy in the closed position. A rubber tube around the canopy inflates to form a seal for cabin pressurization. External or internal switches, handles, and hydraulic hand pumps operate the canopy to close, open, or jettison. Recirculated cabin air mixed with hot engine bleed-air defogs the canopy.

CANOPY JETTISON SYSTEM.

The canopy jettison system removes the canopy when the crew must abandon the airplane. The system is operated by three canopy release handles (one external handle, one handle on the pilot's left horizontal console, and one handle on the instructor-pilot's left horizontal console) and the right handgrips of the ejection seats. Cables connect the emergency release handles to a single M–3 initiator near the external release handle. The right handgrip of each ejection seat connects to the M–3 initiator in a similar manner; however, the use of the grip to jettison the canopy also initiates the elevator disconnect.

CANOPY EMERGENCY RELEASE HANDLES.

The two yellow internal canopy emergency release handles are aft on the pilot's left console and on the instructor-pilot's left console respectively.

Note

When used, the canopy emergency release handles should be pulled straight out from the recess to prevent binding.

The external handle is on the left side of the fuselage in an access door above the electrical access hatch. The three handles connect to a single M–3 initiator. Pulling any one of the three handles fires the M–3 initiator. The force created by the expanding initiator gas moves the canopy locks to the open position. Also, the gas fires a second and larger M–5 initiator. The force created by this initiator disconnects the canopy from the canopy hydraulic actuating cylinder and fires the canopy thruster.

Note

The canopy thruster causes the canopy to jettison toward the aft fuselage. The six-foot cable extension is adequate to keep the person pulling the release handle clear of the falling canopy. However, the person pulling the release handle should observe the falling canopy and if necessary use the outer wing for protection in case high winds or abnormal jettisoning causes the canopy to fall too far to the left.

CANOPY SEAL.

The canopy seal is a rubber tube around the base of the canopy. (See figure 4–1.) When inflated, the canopy seal prevents loss of cabin pressure. Automatically controlled air from the air-conditioning system inflates the seal. With the canopy fully down, the movement of the canopy causes the latches to lock the canopy and actuate the canopy seal pressure regulator switch. The canopy seal pressure regulator switch turns on the regulator, allowing engine compressor air to inflate the canopy seal. As the canopy latches move to allow the canopy to open, the latches release the regulator switch, thereby turning off the regulator and deflating the canopy seal. The operation of at least one engine is needed to inflate the seal.

CANOPY CONTROL SWITCH.

The three-position canopy control switch is on the pilot's left sill. (See figure 1–3.) Switch markings are OPEN (up) and CLOSE FOR FLIGHT (down). The switch has a center (off) position. Holding the switch in OPEN energizes the canopy latch solenoid to direct hydraulic pressure to the unlock side of the canopy latch-actuator cylinder. The movement of the latches to the unlock position operates three micro-

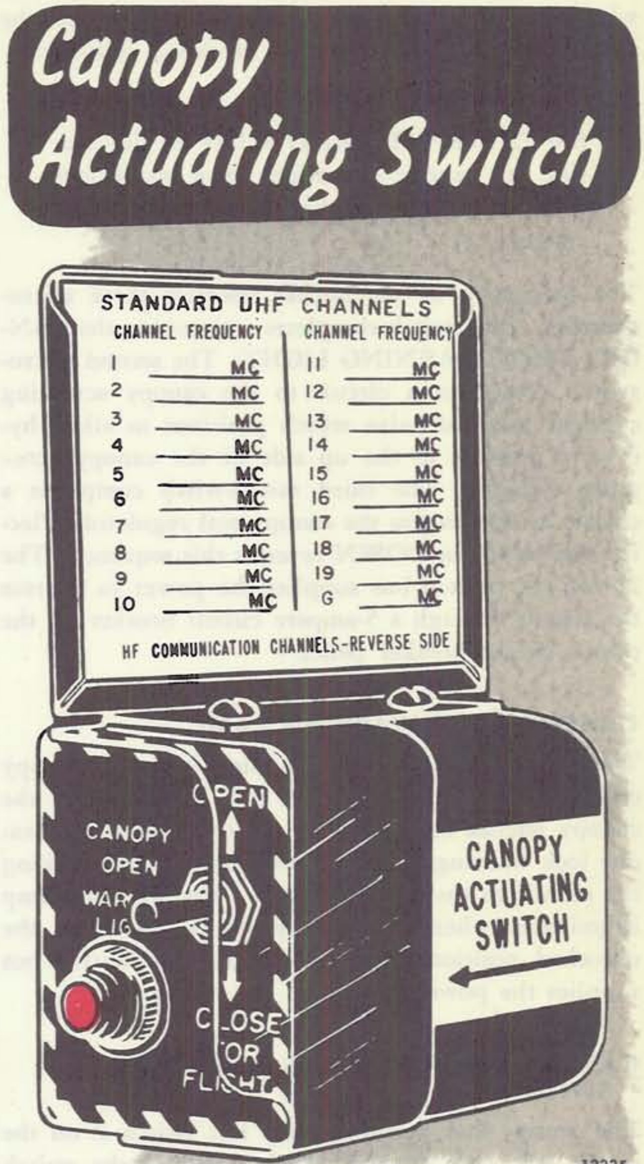


Figure 1–32

switches. One microswitch completes a circuit to the CANOPY OPEN WARNING LIGHT, the second microswitch completes a circuit to the canopy actuating cylinder solenoid, which positions to allow hydraulic pressure to the up side of the canopy actuating cylinder, and the third microswitch completes a circuit to de-enerize the canopy seal regulator. Placing the switch in CLOSE FOR FLIGHT reverses this sequence. The 28-volt d-c battery bus supplies the power to operate the circuit through a 5-ampere circuit breaker on the pilot's circuit breaker panel.

CANOPY CONTROL SWITCH, EXTERIOR.

The exterior canopy control switch (figure 1-23) is in the left electrical access compartment. Switch markings are UP and DOWN. Placing the switch in UP completes a circuit to the canopy latch solenoid valve, which positions to allow hydraulic pressure to the unlock side of the canopy latch atcuating cylinder.

Note

See EXTERNAL HAND PUMP in this section for canopy operation when insufficient pressure remains in the airplane's hydraulic system.

The movement of the latches operates three microswitches. One switch completes a circuit to the CANOPY OPEN WARNING LIGHT. The second microswitch completes a circuit to the canopy actuating cylinder solenoid valve which positions to allow hydraulic pressure to the up side of the canopy actuating cylinder. The third microswitch completes a circuit to de-energize the canopy seal regulator. Placing the switch in DOWN reverses this sequence. The 28-volt d-c battery bus supplies the power to operate the circuit through a 5-ampere circuit breaker on the pilot's circuit breaker panel.

CANOPY LOCK WARNING LAMP.

The red canopy lock warning lamp is on the canopy control box on the pilot's left sill. Movement of the canopy latches to the locked position opens the canopy lock warning lamp microswitch, thereby breaking the circuit to the warning lamp. The warning lamp illuminates when the canopy latches move to the unlocked position. The 28-volt d-c distribution bus supplies the power to operate the circuit.

CANOPY LOCK WARNING LAMP TEST SWITCH.

The canopy lock warning lamp test switch is on the pilot's left main control panel. Holding the switch in CANOPY LAMP TEST tests operation. The 28-volt d-c distribution bus supplies the power to operate the test circuit.

GLARE SHADE.

The ribbed pilot's and instructor-pilot's canopy shades (figure 1-1) slide along a track on the lower surface of the canopy. The stowage position for the pilot's shade is behind the pilot's headrest. A loop grip in the wire stiffener along the forward edge of the shade enables the pilot to move the shade forward to the windshield. The stowage position for the instructor-pilot's shade is forward of the instructor pilot above the glare shield. A strap retains the shade in the stowed position. To place the shade in position for use, loosen the strap and move the shade aft behind the instructor-pilot's headrest.

EJECTION SEATS.

In an emergency, the pilot's and instructor-pilot's ejection seat system (figure 1-33) catapults the seat and occupant clear of the airplane and releases the occupant from the seat approximately two seconds after ejection. Each seat consists of an outer frame and guide rail, a fixed headrest, inertia reel, a seat bucket, foot rests, an equipment quick-disconnect, catapult and safety belt initiators, right and left handgrips, and a vertical seat adjustment lever. The seat bucket accommodates a one-man life raft and a seat-type parachute. An inertia reel in the headrest holds the shoulder harness firmly against the occupant. The pilot's seat adjustment and equipment disconnect are on the right side of the seat; the instructor-pilot's are on the left side of the seat. Spring clips on the armrests hold the handgrips in the stowed position. A force of approximately 20 pounds is necessary to move a handgrip out of the stowed position.

SHOULDER HARNESS.

The shoulder harness straps fasten to an inertia reel in the ejection seat headrest. The straps connect to the safety belt when in use. A lock control handle in the left armrest controls the inertia reel to lock or unlock the harness; however, an unlocked harness automatically restricts a forward movement of the occupant when there is an impact force of 2 to 3 G's.

SHOULDER HARNESS LOCK CONTROL.

The shoulder harness lock control is in the left arm rest of both ejection seats. To unlock the harness, the occupant depresses the lock control handle and moves the handle to the forward position. This allows the occupant freedom to bend forward. To lock the harness, the occupant depresses the lock handle and moves the handle aft, allowing it to enter the LOCK position.

LEFT HANDGRIP.

Raising the left handgrip on either seat locks the respective shoulder harness. If, during seat ejection, the occupant fails to lock the shoulder harness by placing the lock control handle in the aft position or by raising the left handgrip, the inertia reel locks the shoulder harness to retain the occupant in the seat.

EJECTION SEAT

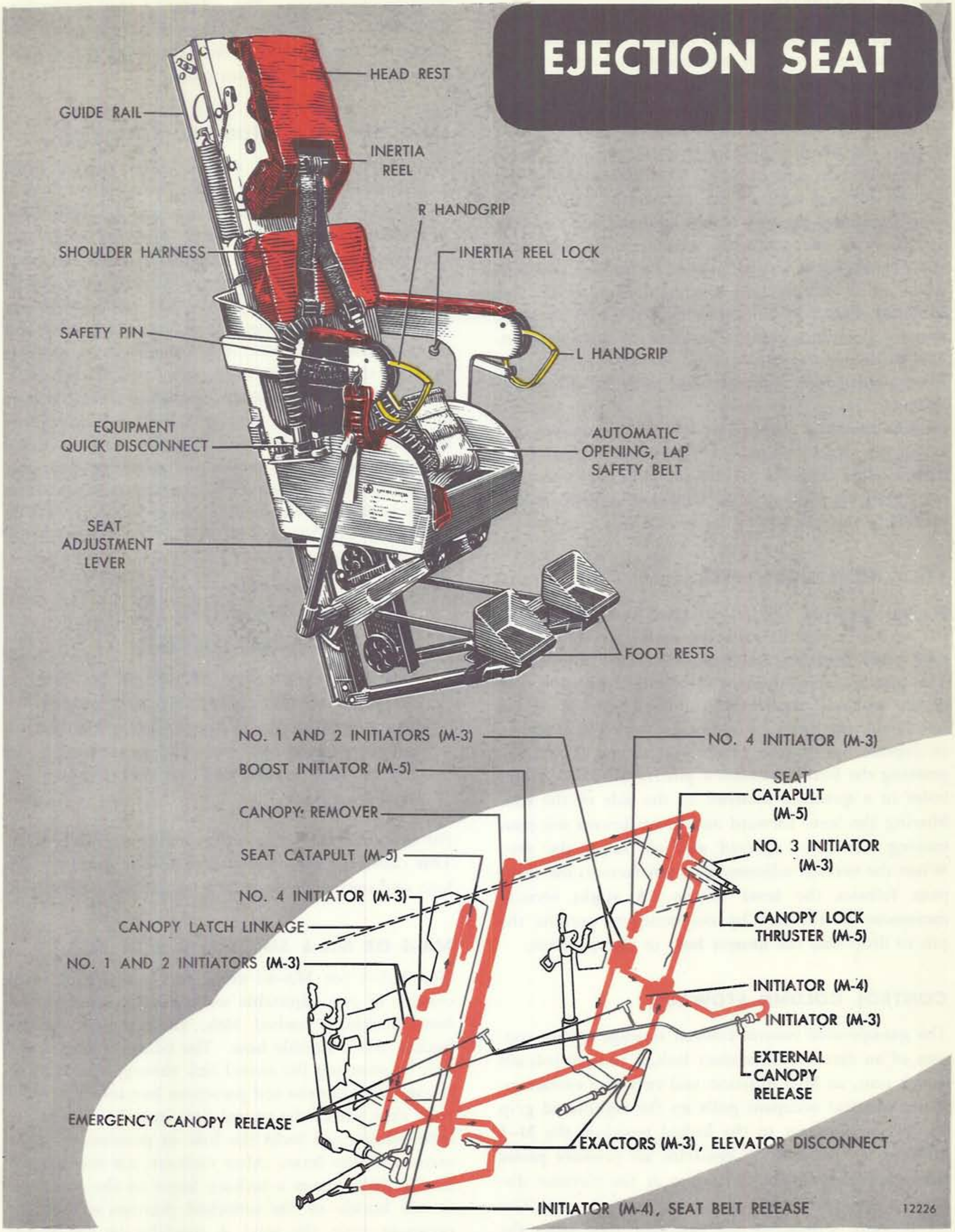


Figure 1-33

RIGHT HANDGRIP.

The right handgrip and the trigger within the loop of the handgrip on both seats control canopy jettison, and seat ejection. Raising the right handgrip fires two M-3 initiators simultaneously. The gas created by one of the M-3 initiators removes pins that disconnect the elevator linkage and releases the control column snatch unit spring. The spring slams the column forward against the instrument panel. The control column stowage system of the front and rear seats operate independently whenever the respective right handgrip is raised, while the canopy jettisons when either of the right handgrips is actuated. Gas from the second M-3 initiator fires the lock thruster, thereby moving the canopy locks to the open position. The movement of the canopy thruster pulls a pin from a third M-3 initiator. Gas from the third M-3 initiator fires an M-5 initiator which in turn fires the canopy remover. Squeezing the trigger against the raised grip fires a fourth M-3 initiator and gas from this initiator explodes the seat catapult. Each occupant must raise his right grip to the locked position before squeezing the trigger for individual seat ejection.

SEAT ADJUSTMENT LEVER.

Manual operation of the seat lever vertically adjusts the seat to a desired position, and seat ejection can take place from any position of vertical adjustment. The pilot's seat adjustment lever is on the right side of the seat and the instructor-pilot's lever is on the left side of the seat. To move the lever, it is necessary to depress the button on the end of the lever. Depressing the button releases a pin from one of several holes in a quadrant attached to the side of the seat. Moving the lever forward and down lowers the seat; moving the lever upward and aft raises the seat. When the vertical adjustment is satisfactory, the occupant releases the lever button. A slight vertical movement of the seat by the occupant permits the pin to drop into the nearest hole in the quadrant.

CONTROL COLUMN STOWAGE.

The gas-operated control column stowage system consists of an elevator disconnect link, a control column snatch unit, an M-3 initiator, and two M-2 extractors. When the seat occupant pulls up the right-hand grip of the ejection seat to the locked position, the M-3 initiator is fired and the resultant air pressure passes through tubing to the extractors at the elevator disconnect link and the control column snatch unit. The air pressure withdraws the extractor rods from the disconnect link and the snatch unit spring-loaded latching mechanism. The release of this mechanism disconnects the elevator push-pull linkage from the respective control column and slams the control column against the instrument panel.

MA-3 OR MA-4 AUTOMATIC SEAT BELT.

The MA-3 (or MA-4) automatic belt (figure 1-34) consists of two adjustable webbed belts, an eye buckle, a latch buckle, a latch buckle key, and a flexible hose. The occupant fastens the belt by inserting eye buckle through the loops of the shoulder harness and placing the eye buckle on the stud of the latch buckle. The occupant then presses the key into the spring-loaded receptacle on the side of the latch buckle and depresses the latch lever. A finger moves into position to retain the eye buckle to the stud of the latch buckle. After ejection, gas pressure through the flexible hose moves the finger out of the locked position to free the occupant from the seat. The key remains in the receptacle of the latch buckle and as the occupant separates from the seat the parachute lanyard actuates the aneroid-release device of the parachute. See AUTOMATIC OPENING SEAT BELT AND PARACHUTE in Section VII.

WARNING

Use the latch key attached to the lanyard of the automatically opening parachute. When using a manually opened parachute, insert the latch key attached to the MA-4 webbed belt.

For normal release, the occupant lifts the latch lever. This causes the spring-loaded receptacle to release the key; and moves the finger out of the locked position.

MA-5 OR MA-6 AUTOMATIC SEAT BELT.

The MA-5 (or MA-6) automatic belt (figure 1-35) consists of two adjustable webbed belts, a manual release buckle, a swivel link, an automatic release buckle, and a flexible hose. The occupant fastens the belt by inserting the swivel link through the loops of the shoulder harness and parachute lanyard. The occupant then places the swivel link into the manual release buckle and locks the link in position with the manual release lever. After ejection, gas through the flexible hose moves a locking finger in the automatic release buckle to the unlocked position to free the occupant from the seat. A shoulder on the swivel link retains the loop of the parachute lanyard, and as

MA-3 OR 4 AUTOMATIC OPENING BELT

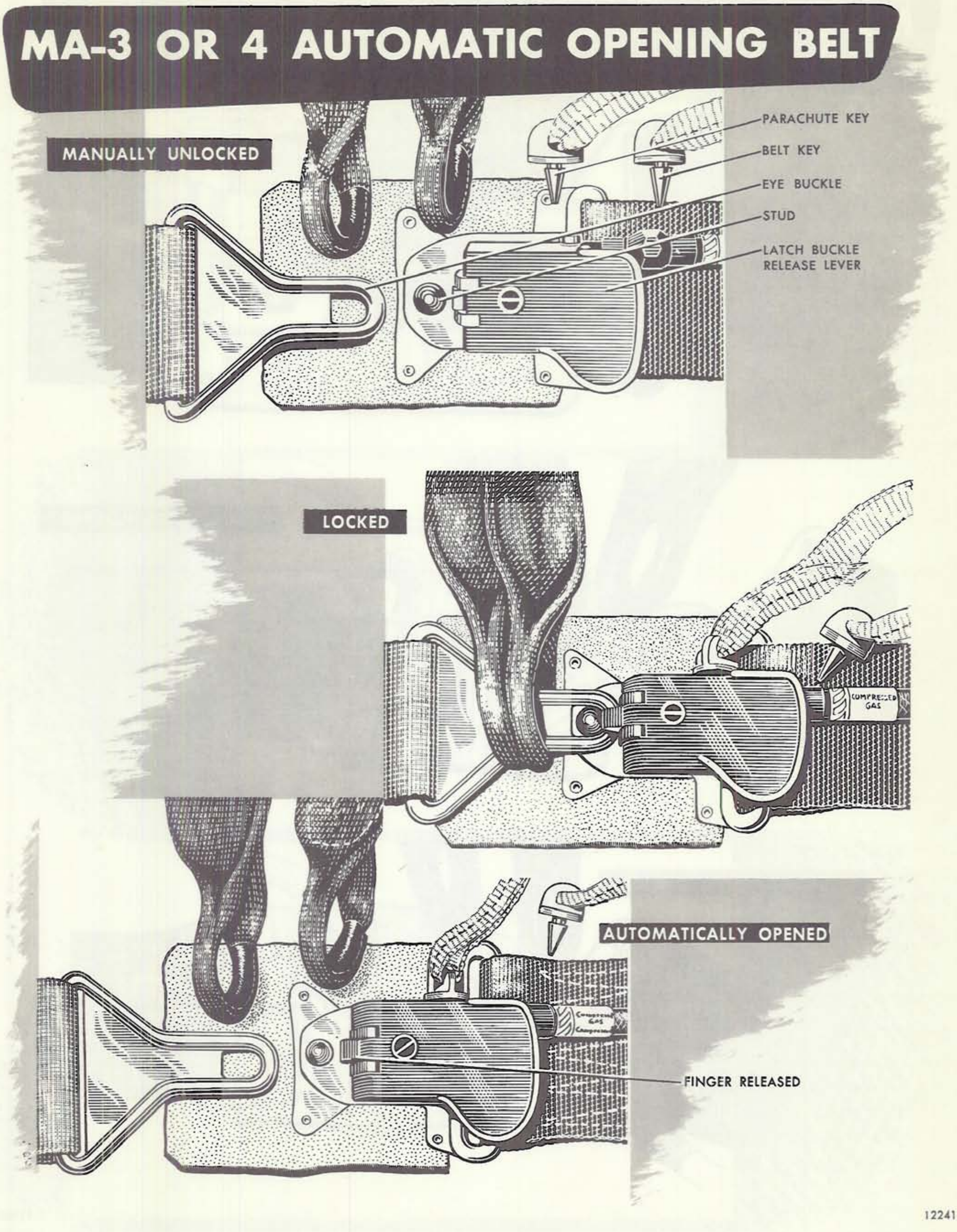


Figure 1-34

MA-5 OR 6 AUTOMATIC OPENING BELT

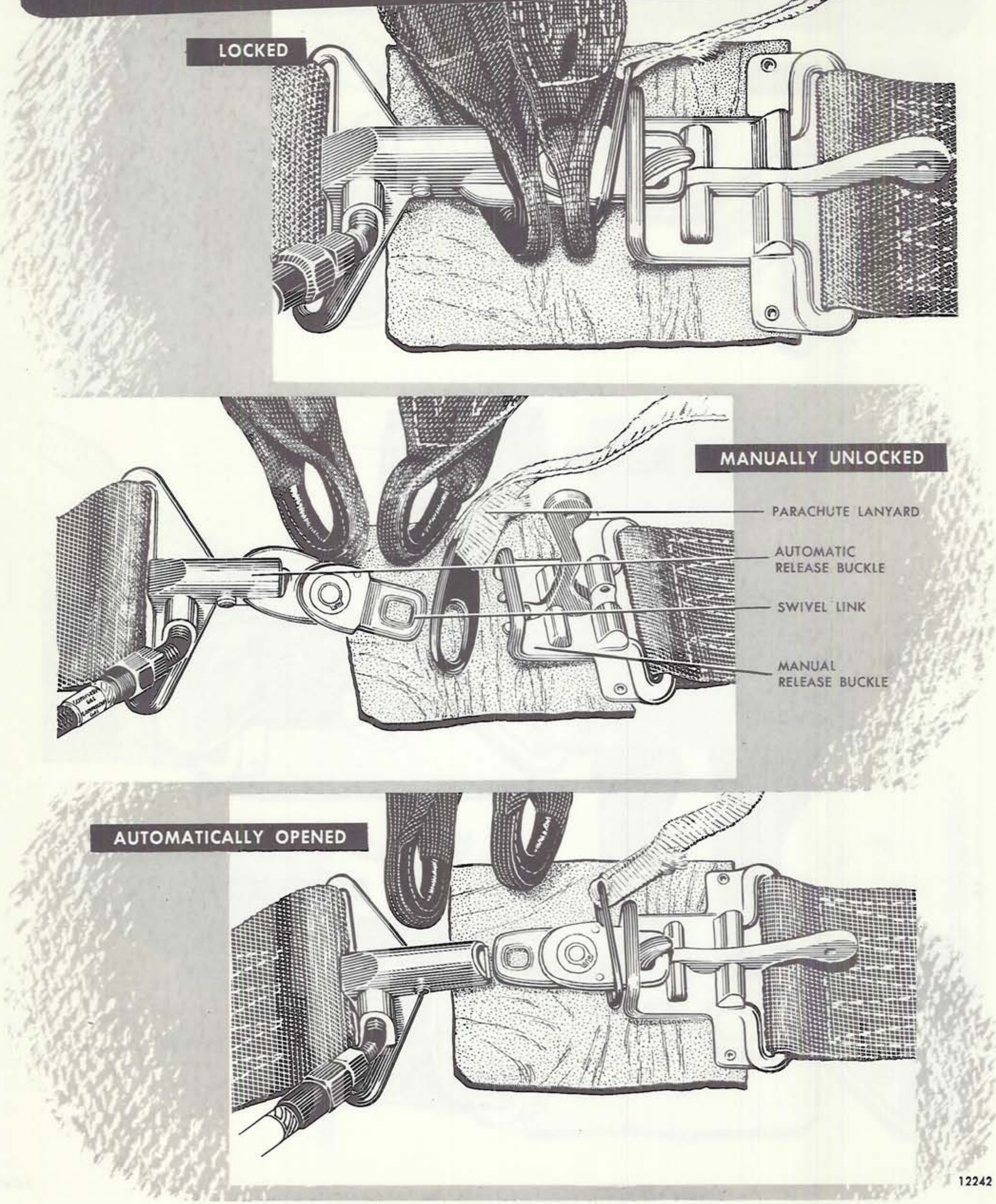


Figure 1-35

the occupant separates from the seat, the parachute lanyard acuates the aneroid-release device of the parachute. See AUTOMATIC OPENING SEAT BELT AND PARACHUTE in Section VII.

SEAT BELT AUTOMATIC RELEASE MECHANISM.

During ejection, as the seat rises along the guide rails, a telescopic tube fixed to the frame of the airplane pulls a pin to fire a slow-burning initiator. Gas from the initiator operates the release mechanism of the belt 2.5 seconds after the pin fires the initiator.

FIRE PROTECTION.

Each engine has a separate fire and overheat detection system. The system senses the presence of fire or an overheated condition in the engine area and electrically transmits this information to indicator lights on the pilot's instrument panel. Separate fire extinguishing systems for each engine route bromochloromethane from bottles in the wings inboard of the engines to the nacelles.

FIRE AND OVERHEAT DETECTION SYSTEM.

Each engine contains two detector systems—one for fire detection and one to warn the pilot of an overheated condition. (See figure 1–36.) The fire detection system consists of nine fire detectors strategically placed in each engine nacelle area forward of the fire wall, an indicator light for each engine, a detector test switch, a lamp test switch, and an overheat blinker relay for each engine. The indicator lights and detector test switch are common to both systems. An excessive amount of heat causes the temperature-sensitive fire detectors and overheat detectors to complete a circuit to the indicator light on the pilot's main instrument panel. The blinker (flasher) relay in the overheat circuit causes the indicator light to flash. The fire detectors and overheat detectors cannot distinguish between a fire or an overheat condition. However, upon observing a flashing red light, the pilot may assume that an overheat condition exists in the aft engine nacelle area, and when observing a steady red light, the pilot must assume that a fire exists in the forward engine nacelle area. The 28-volt d-c distribution bus supplies the power to operate the system.

FIRE AND OVERHEAT DETECTION LIGHTS.

A red warning light in each fire extinguisher PULL-TO-ARM knob warns the pilot of fire or an overheat condition in the engine nacelle area. (See figure 1–36.) A fire in the forward engine nacelle area causes the detectors to complete a circuit to illuminate their respective indicator light. An overheat condition in the aft engine nacelle area causes the detectors to complete a circuit through a flasher relay unit to illuminate their respective indicator light. The light goes out after the fire has been extinguished or the overheat condition alleviated. The 28-volt d-c distribution bus supplies the power to operate the light circuit.

FIRE AND OVERHEAT DETECTION TEST SWITCH.

The three-position momentary fire and overheat detection test switch is on the pilot's left main control panel. Operation of the switch checks the continuity of the fire and overheat detection circuits. Holding the switch in the FIRE position completes the fire detection circuit to illuminate both lamps in the PULL-TO-ARM knobs. Similarly placing the switch in the OVERHEAT position completes the overheat detection circuit through a flasher unit to illuminate both lamps in the PULL-TO-ARM knobs. The 28-volt d-c distribution bus supplies the power to operate the test circuit.

FIRE AND OVERHEAT INDICATOR LAMP TEST SWITCH.

The fire and overheat indicator lamp test switch is on the pilot's left main control panel. Holding the switch in the LAMP position tests lamp operation. The 28-volt d-c distribution bus supplies the power to operate the test circuit.

FIRE EXTINGUISHER SYSTEM.

The fire extinguisher system (figure 1–36) sprays bromochloromethane into the engine nacelle area. Bromochloromethane expands into a dense gas in the presence of high heat or flame. The system consists of a bottle of bromochloromethane in each wing inboard of the engines: hydraulic valves, fuel valves, and compressor air shut-off valves; an arming knob for each engine; and an agent discharge switch. One operation of the fire extinguisher system exhausts the supply of bromochloromethane. The bottles supply their respective engine nacelle areas only. The 28-volt d-c electrical system supplies the power to operate the extinguisher system.

FIRE EXTINGUISHER PULL-TO-ARM KNOBS.

The PULL-TO-ARM knobs (figure 1–5) on the main instrument panel energize the fire extinguisher system. Each knob contains a red warning light. Pulling the knobs out arms the AGENT DISCHARGE switch and causes the hydraulic, fuel, and compressor air shut-off valves to move to the closed position. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the circuit.

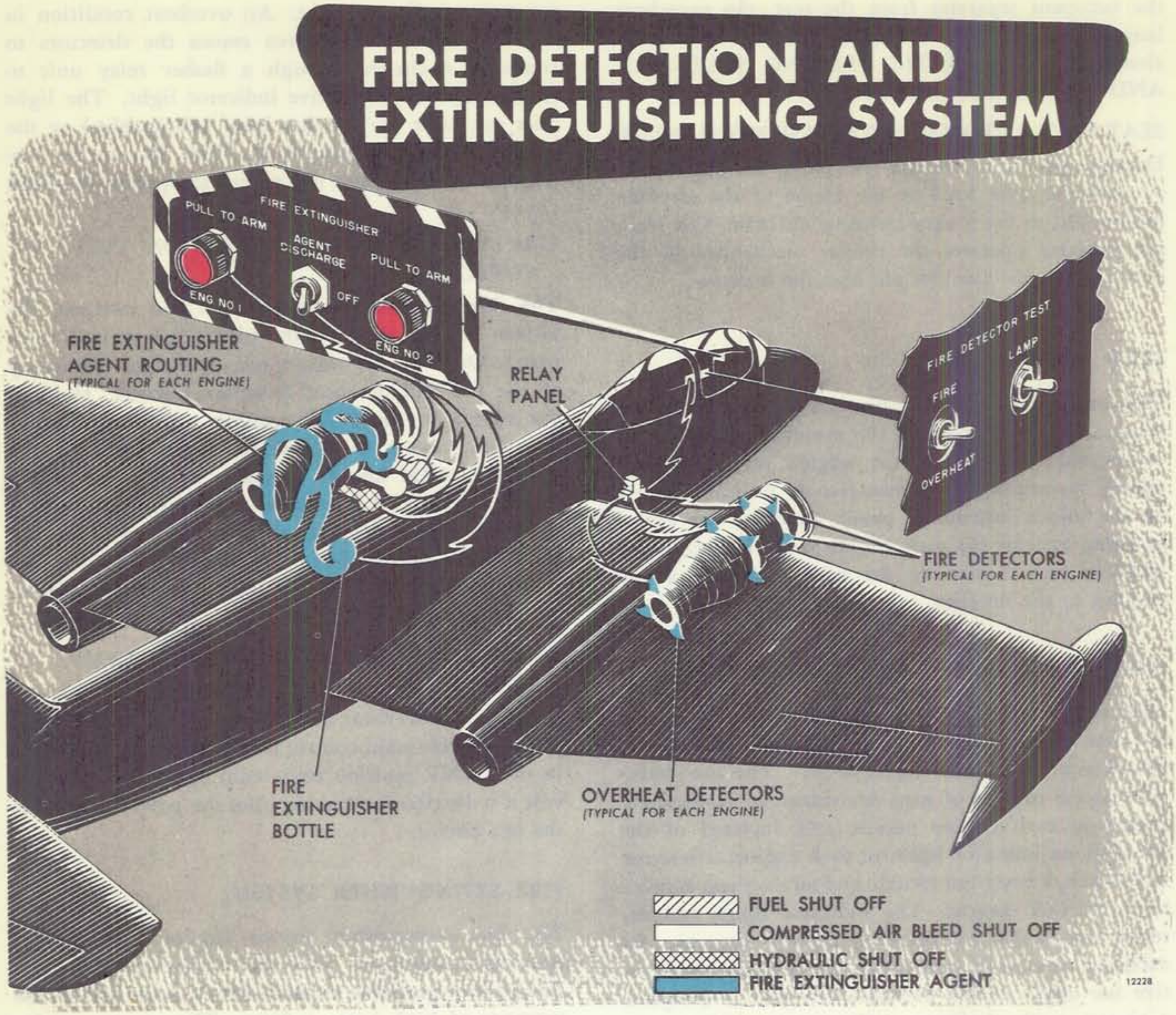


Figure 1-36

Note

Pulling the PULL-TO-ARM knob closes the air-conditioning shut-off valve. This eliminates the possibility of the toxic bromochloromethane fumes from entering the cabin through the air conditioning system. However, use 100 percent oxygen for added protection.

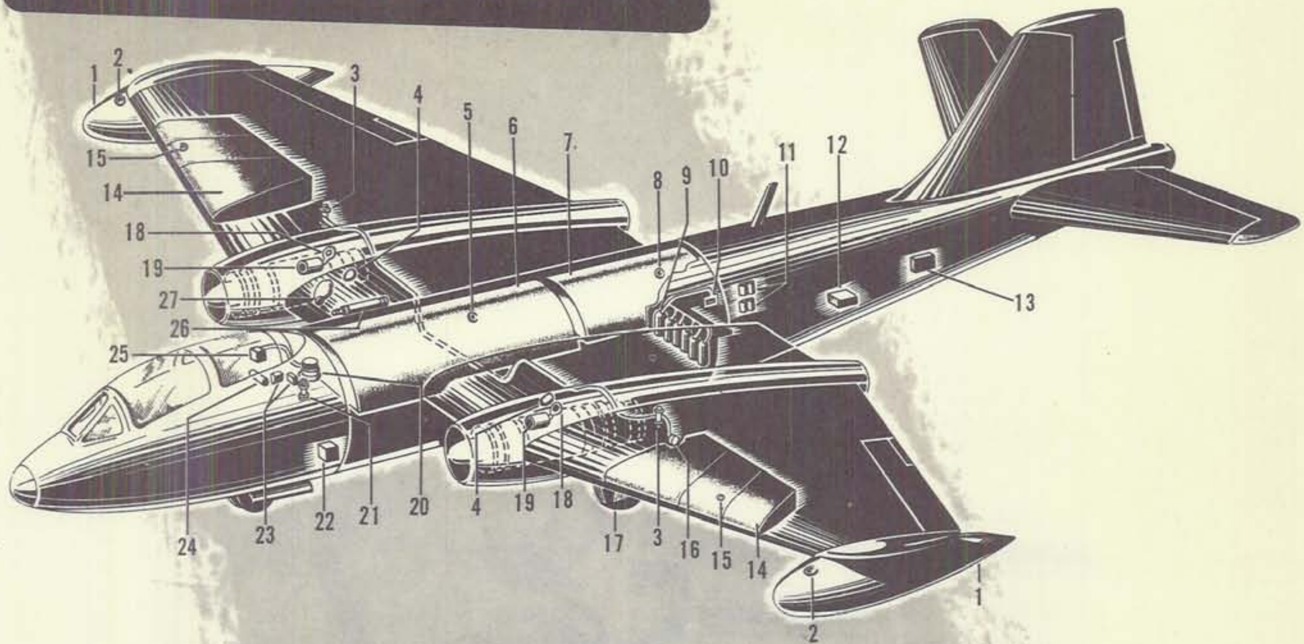
FIRE EXTINGUISHER AGENT DISCHARGE SWITCH.

The AGENT DISCHARGE switch is on the pilot's main instrument panel. (See figure 1-5.) The switch is not armed until one of the PULL-TO-ARM knobs is in the out position. When one of the PULL-TO-ARM knobs is in the out position, placing the agent discharge switch in the AGENT DISCHARGE position energizes a circuit to an explosive cartridge on the respective fire extinguisher bottle. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the circuit.

AUXILIARY EQUIPMENT.

Refer to Section IV for a discussion of the air-conditioning and pressurization system, the defogging and anti-icing systems, communication and electronic equipment, oxygen system, navigation equipment, armament equipment, and miscellaneous equipment.

SERVICING DIAGRAM



1. WING TIP FUEL TANK
2. WING TIP FUEL TANK FILLER
3. PNEUMATIC GUN CHARGING BOTTLE (GROUP A)
4. FIRE EXTINGUISHER BOTTLE
5. NO. 1 FUSELAGE FUEL TANK FILLER
6. NO. 1 FUSELAGE FUEL TANK
7. NO. 2 FUSELAGE FUEL TANK
8. NO. 2 FUSELAGE FUEL TANK FILLER
9. NITROGEN PURGE BOTTLES
10. NITROGEN PURGE BOTTLE FILLER
11. SPARE STARTER CARTRIDGES
12. AFT FUSELAGE DATA CASE
13. LIGHT LENS STOWAGE
14. WING FUEL TANK
15. WING FUEL TANK FILLER
16. PNEUMATIC GUN CHARGING FILLER (GROUP A)
17. TIRES AIR FILLER STEM
18. ENGINE OIL TANK FILLER
19. ENGINE OIL TANK
20. OXYGEN CONVERTER
21. HYDRAULIC BRAKE ACCUMULATOR
22. BATTERY
23. SPARE LAMP AND FUSE STOWAGE
24. PORTABLE FIRE EXTINGUISHER
25. OXYGEN FILLER
26. MAIN HYDRAULIC ACCUMULATOR
27. HYDRAULIC RESERVOIR AND FILLER

SPECIFICATIONS	
FUEL	MIL-F-5624A, GRADE JP-4
ALTERNATE FUEL	GRADE JP-3
EMERGENCY ALTERNATE FUEL	MIL-F-5572
OIL	MIL-L-7808
HYDRAULIC FLUID	MIL-O-5606
OXYGEN	AN-O-1c GRADE B TYPE 2 (LIQUID)
FIRE EXTINGUISHER	BROMO-CHLORO-METHANE (CB)
NITROGEN	MIL-N-6011

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Figure 1–37

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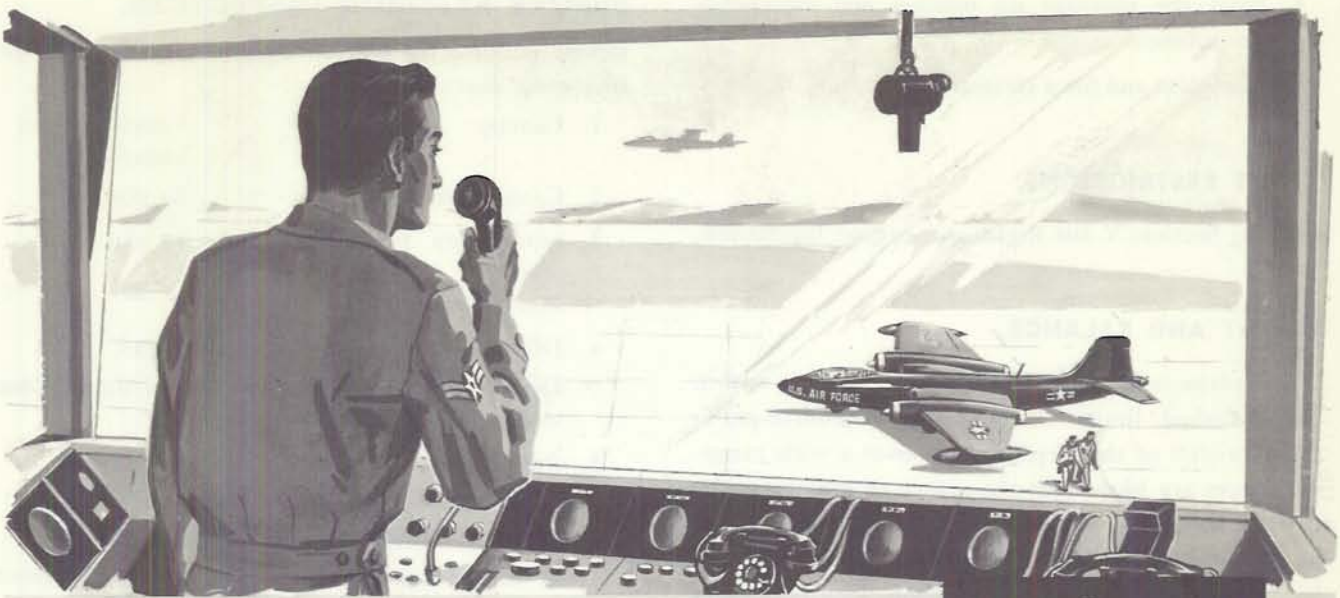

Section II
Normal Procedures

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TABLE OF CONTENTS

STATUS OF THE AIRPLANE.

FLIGHT PLANNING.

1. Accumulate the necessary weather data and flight equipment (maps, computer, pencil, flashlight, etc.) and check NOTAMS.
2. Compute cruise control data (airspeeds, power settings, gross weights, etc.) from the operating data in Appendix I of this handbook.
3. Check that the required fuel, oil, oxygen, armament, and all special equipment are suitable and in sufficient quantity for the mission to be performed.

4. Brief the observer on mission and emergency procedures.
5. Complete and file a clearance.

FLIGHT RESTRICTIONS.

Refer to Section V for flight and engine limitations.

WEIGHT AND BALANCE.

The airplane is stable if the center of gravity is within the published limits. The control-stick-force-per-G characteristics of the airplane vary over a wide range. The forces are high with the center of gravity at the forward limit and low with the center of gravity at the aft limit. The center of gravity is very close to the aft stability limit during take-off with maximum gross weight. You, the pilot, should be aware of this fact to insure that you do not inadvertently exceed the stability limits. Variation in the center of gravity of the airplane is primarily due to fuel consumption; therefore, use the correct fuel management procedures. Also, be careful when adding extra baggage or equipment to the aircraft. Refer to Section V for weight and balance limitations, to HANDBOOK OF WEIGHT AND BALANCE, T.O. 1B-1-40, and to BASIC WEIGHT CHECK LIST AND LOADING DATA, T.O. 1B-57C-5, for loading information. Before each flight:

1. Check take-off and anticipated landing gross weights.
2. Check weight and balance clearance. DD Form 365F.
3. Compute the take-off performance data.
4. Check the landing distance and final approach speed for the anticipated landing gross weight and pressure altitude.

AIRPLANE ENTRANCE. (See figure 2-1.)

For entrance:

1. Place the canopy external control switch (left electrical access compartment) in UP.
2. Actuate the external hand pump (above the canopy external control switch) to build up sufficient hydraulic system pressure to open the canopy.
3. Place a portable ladder in position for entry.

BEFORE EXTERIOR INSPECTION.

Before making the exterior inspection, complete the following checks:

1. Canopy — Condition and cleanliness
2. Canopy safety pin — In place
3. Seat safety pins, front and rear (See figure 2-2.) — In place
4. DD Form 781 — Check

   Determine the engineering status of the airplane and check for proper servicing.
5. Publications — In place

   Check the data case for the following:

   a. Radio Facility Charts (LF/MF Edition)

   b. Supplementary Flight Information Document

   c. Pilot's Handbooks—Jet, East and West

   d. Flight Handbook, T.O. 1B-57C-1
6. All armament switches — OFF or SAFE

   Place the following armament switches in the OFF or SAFE position: master guns switch, select armament switch, gun charger switch, bomb arming switch, rocket fuzing switch, bomb bay station switches, and external station switches.
7. Tip tank jettison switch — OFF
8. Landing gear lever — Down
9. Main system hydraulic pressure gage — Zero pressure
10. Emergency gear T-handle (front and rear seats) — In
11. Battery switch — OFF
12. Power distribution circuit breaker panel — All circuit breakers ON or IN
13. Seat quick-disconnect pins — In place
14. All emergency equipment — Stowed

    Check the following emergency equipment for proper stowage: hydraulic hand pump handle, crash axe, and fire extinguisher.

EXTERIOR INSPECTION. (See figure 2-3.)

At each of the following inspection points, check the condition of the airplane for miscellaneous damage, dents, etc. Also, check the security of all access doors and that all control surfaces locks and mooring lugs have been removed and stowed in the tail section.

Figure 2–1

1. LEFT NOSE SECTION.
   - a. Bomb door shut-off valve — SAFE
   - b. Personnel safety switch — SAFE
   - c. Battery compartment — Check

     Disconnect the battery and check the brake accumulator pressure gage for 850 psi min.
   - d. Left electrical access compartment — Check

     Check for proper stowage of the external hand pump handle. Also, place the following circuit breakers to the IN position: standby instrument inverter, J–2 compass, APX–6A, and helmet defog.
   - e. Shoran antenna — Condition
   - f. Static air vent — Open and clean
   - g. Nose hatch — Secure

2. RIGHT NOSE SECTION.
   - a. Pitot cover — Removed
   - b. Static air vent — Open and clean
   - c. UHF antenna — Condition
   - d. Pressure regulator static vent — Open
   - e. Right electrical access compartment — Check

     Inspect inverter for indication of overheating or scorching.

     Check security of fuses, electrical leads, and for loose equipment.

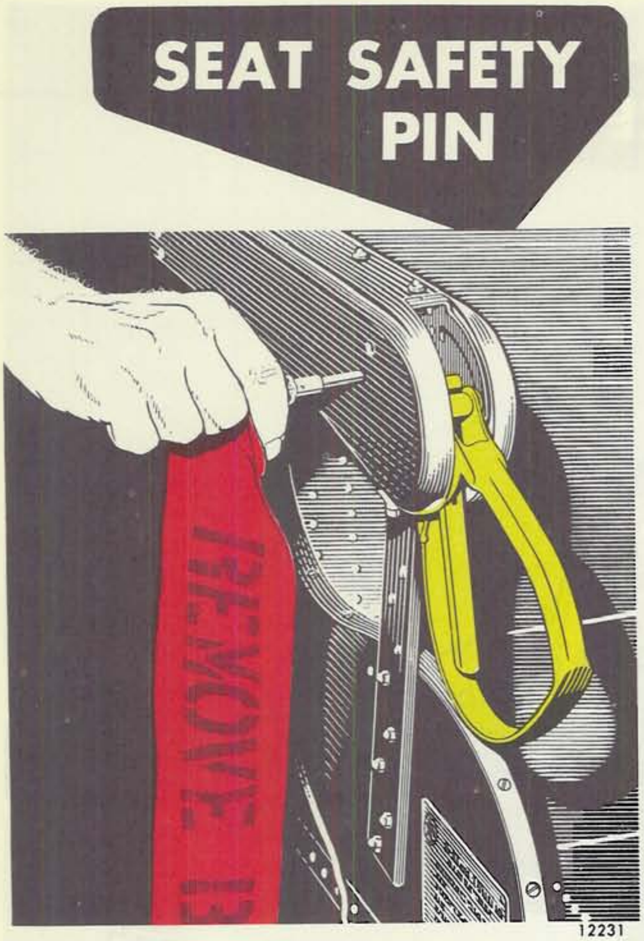

Figure 2–2

f. Right upper equipment compartment	Check

Check the oxygen filler cap for security and that the build up lever is in the BUILD UP position. Be sure the cabin pressure regulator handle is in the FLIGHT position and safety wired. The UHF radio switches must be in the BOTH, REMOTE, and VOICE position.

3. NOSE WHEEL WELL.

a. Gear lock safety pin	In place
b. Gear strut for correct inflation	6 to 9 inches
c. Condition of tires, wheels and fairing doors	Check

Check the tires and wheel assembly for slippage, and wheel lock nuts for security.

4. BOMB BAY (RIGHT SIDE).

a. Forward bomb door actuating cylinder	Leakage
b. Fuel manifolds and lines	Leakage
c. Defueling valve accumulator	Wired closed
d. No. 1 and No. 2 fuselage tank boost pumps and No. 2 probe	Leakage and connection
e. Aileron crossover rods	Possible distortion
f. Aft bomb door actuating cylinder	Leakage
g. Hydraulic equipment and lines	Leakage
h. Boost pump drains	Check for moisture

5. RIGHT WHEEL WELL.

a. Gear lock safety pin	In place
b. Gear doors, linkage, and pins	Condition
c. Fuel strainer	Security and leakage
d. Main system hydraulic accumulator	1000 psi
e. Interphone switch	NORMAL and cap in place
f. Hydraulic fluid level	Check
g. Fire extinguisher bottle	450 psi
h. Microswitches	Condition
i. Gear extender valve removed and port covered	Check
j. Gear strut for correction extension	1½ to 3 inches

Strut extension varies with airplane gross weight.

Note

The extension of both main gear struts should be equal.

k. Tire and wheel	Condition and slippage
l. Brake assembly	Condition
m. Hydraulic and fuel lines	Leakage
n. Wheel chocks	In place

6. RIGHT ENGINE.

a. Cowling	Secure
b. Ground cooling door	Secure and cable taut
c. Starter breech lock and dome	Secure

Note

Be sure that the clip is removed from the starter cartridge.

d. Front main bearing	Oil seepage

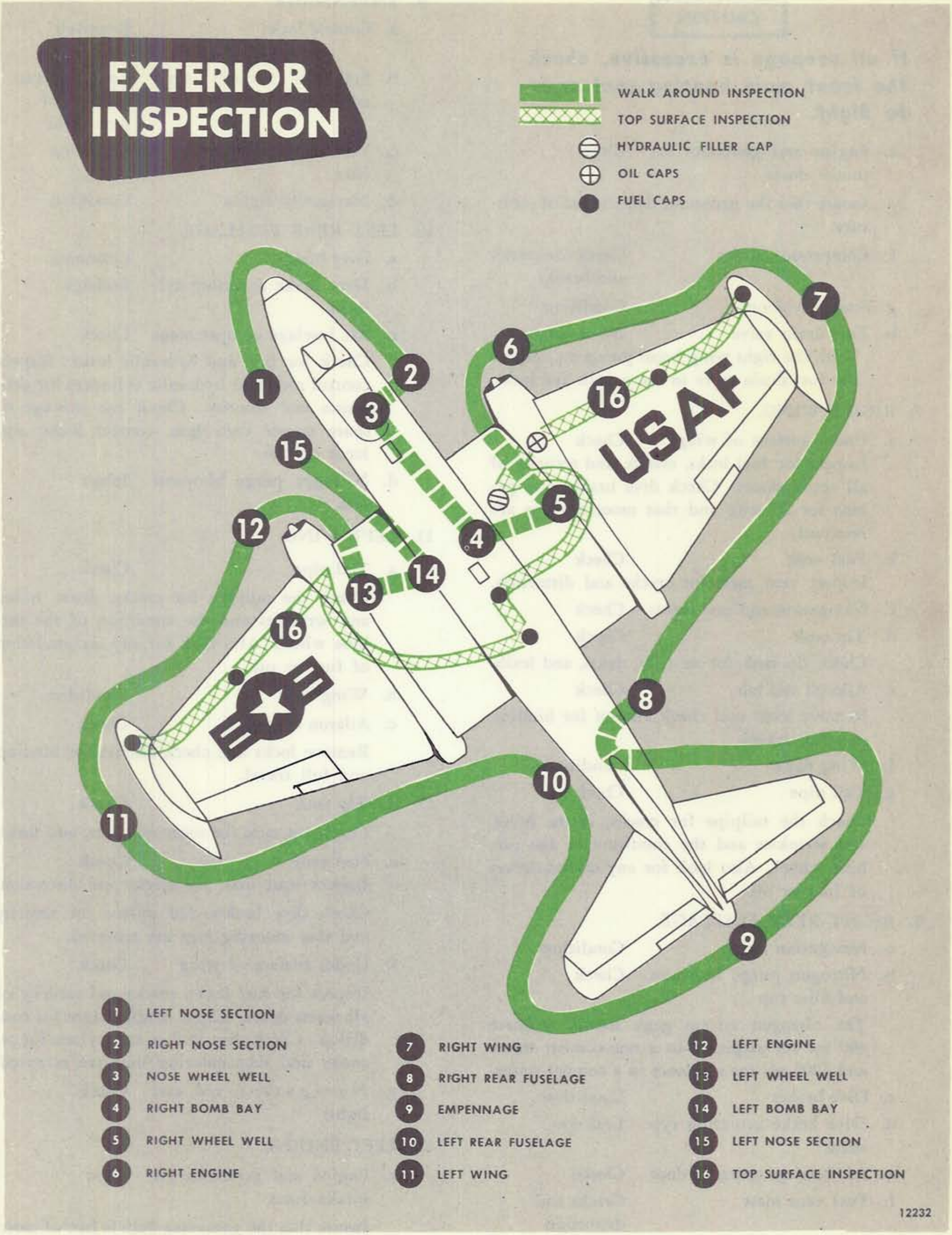
EXTERIOR INSPECTION
WALK AROUND INSPECTION
TOP SURFACE INSPECTION
HYDRAULIC FILLER CAP
OIL CAPS
FUEL CAPS
USAF
1 LEFT NOSE SECTION
2 RIGHT NOSE SECTION
3 NOSE WHEEL WELL
4 RIGHT BOMB BAY
5 RIGHT WHEEL WELL
6 RIGHT ENGINE
7 RIGHT WING
8 RIGHT REAR FUSELAGE
9 EMPENNAGE
10 LEFT REAR FUSELAGE
11 LEFT WING
12 LEFT ENGINE
13 LEFT WHEEL WELL
14 LEFT BOMB BAY
15 LEFT NOSE SECTION
16 TOP SURFACE INSPECTION
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Figure 2-3

CAUTION

If oil seepage is excessive, check the front main bearing seal prior to flight.

e. Engine and generator air intake ducts — Clear

Insure that the generator duct is free of moisture.

f. Compressor blades — Check for cracks and breaks

g. Frangible doors — Condition

h. Fuel drain valve — No leakage

With the right wing boost pump on, inspect the fuel drain valve in the nacelle for leaks.

7. RIGHT WING.

a. Under surface of wing — Check

Inspect for fuel leaks, cracks, and security of all access doors. Check dive brakes and pylons for security and that mooring lugs are removed.

b. Fuel vent — Check

Inspect vent mast for cracks and distortion.

c. Navigation and taxi lights — Check

d. Tip tank — Check

Check tip tank for security, dents, and leaks.

e. Aileron and tab — Check

Remove locks and check aileron for binding and full travel.

f. Wing flaps — Condition

g. Tail pipe — Check

Check the tailpipe for cracks, dents, holes, and wrinkles and the condition of the turbine wheel. Also look for any accumulation of fuel or oil.

8. RIGHT REAR FUSELAGE.

a. Navigation lights — Condition

b. Nitrogen purge indicator and filler cap — Check

The nitrogen system gage should indicate 400 psi for airplanes in a non-combat status and 1000 psi for airplanes in a combat status.

c. Dive brakes — Condition

d. Dive brake actuating cylinder — Leakage

e. Aft fuselage entrance door — Closed

f. Fuel vent mast — Cracks and distortion

g. Tail skid — Condition

9. EMPENNAGE.

a. Control locks — Removed

b. Stabilizer surfaces and tabs — Condition and freedom of movement

c. Variable-incidence stabilizer — Condition

d. Navigation lights — Condition

10. LEFT REAR FUSELAGE.

a. Dive brake — Condition

b. Dive brake actuating cylinder — Leakage

c. Aft fuselage compartment — Check

Check for fuel and hydraulic leaks. Inspect control rods and hydraulic cylinders for condition and security. Check the stowage of spare starter cartridges, control locks, and loose articles.

d. Nitrogen purge blow-out disk — Intact

11. LEFT WING.

a. Tail pipe — Check

Check the tailpipe for cracks, dents, holes, and wrinkles and the condition of the turbine wheel. Also look for any accumulation of fuel or oil.

b. Wing flaps — Condition

c. Aileron and tab — Check

Remove locks and check aileron for binding and full travel.

d. Tip tank — Check

Check tip tank for security, dents, and leaks.

e. Fuel vent — Check

Inspect vent mast for cracks and distortion. Check dive brakes and pylons for security and that mooring lugs are removed.

f. Under surface of wing — Check

Inspect for fuel leaks, cracks and security of all access doors. Check landing light for condition. Check dive brakes and pylons for security and that mooring lugs are removed.

g. Navigation and taxi lights — Check

12. LEFT ENGINE.

a. Engine and generator air intake ducts — Clear

Insure that the generator duct is free of moisture.

b. Starter breech lock and dome	Secure

Note

Be sure that the clip is removed from the starter cartridge.

c. Front main bearing	Oil seepage

CAUTION

If oil seepage is excessive, have the front main bearing seal checked prior to flight.

d. Cowling	Secure
e. Ground cooling door	Secure and cable taut
f. Cabin ram air inlet duct	Clear
g. Frangible doors	Condition
h. Compressor blades	Condition
i. Fuel drain valve	No leakage

With the left wing tank boost pump on, inspect the fuel drain valve in the nacelle for leaks.

13. LEFT WHEEL WELL.

a. Gear lock safety pin	In place
b. Gear doors, linkage, and pins	Condition
c. Fire extinguisher bottle	450 psi
d. Fuel strainer	Security and leakage
e. Microswitches	Condition
f. Gear extender valve removed and port covered	Check
g. Gear strut for correct extension	1½ to 3 inches

Strut extension varies with airplane gross weight.

h. Tire and wheel	Condition and slippage

Note

The extension of both main gear struts should be equal.

i. Brake assembly	Condition
j. Hydraulic and fuel lines	Leakage
k. Wheel chocks	In place

14. BOMB BAY (LEFT SIDE).

a. Forward bomb door actuacting cylinder	Leakage
b. Hydraulic valves and lines	Leakage
c. No. 1 and No. 2 fuselage tank boost pumps and probe	Leakage and connection
d. Aileron cross over and control rods	Possible distortion
e. Aft bomb door actuating cylinder	Leakage
f. Boost pump drains	Check for moisture

15. LEFT NOSE SECTION.

a. Bomb door shut-off valve	FLIGHT
b. Personnel safety switch	FLIGHT
c. Battery	Connected
d. Emergency canopy initiator safety pin	Removed
e. All hatches	Secure

16. TOP SURFACE INSPECTION.

Fuel and oil tanks	Check

Check all fuel and oil tanks for quantity. Check all filler caps and doors for security. Inspect the top surface of the wings for dents, cracks, etc., and the wing dive brakes for condition.

INTERIOR INSPECTION.

1. Parachute, shoulder harness, and seat belt	Adjusted
2. Inertia reel	Unlocked
3. Oxygen hose, bail-out bottle, and radio cord	Connected
4. Seat and rudder pedals	Adjusted
5. Parking brake	Set
6. External power	Connected
7. Star valve	Closed (safetied)
8. Electrical distribution panel circuit breakers	All ON or IN
9. Emergency canopy release T-handle	In
10. UHF radio	OFF
11. Wing flaps switch	UP
12. Throttles	OFF
13. Dive brakes switch	Retract
14. Taxi and landing lights switch	OFF
15. Fire extinguisher agent discharge switch	OFF
16. Altimeter	Set to field elevation
17. Clock	Set and operating

18. Fuel panel — Set for start

Place the fuel control switches and knobs in the following positions: Emergency fuel control switches, OFF; NO. 2 fuselage tank selector knob, flow, Wing tank tip tank selector knobs, OFF; NO. 1 and NO. 2 engine valve switches, ON; and the NO. 1 fuselage tank transfer and bypass valve knob in the flow to NO. 1 tank position.

19. Inverter switches — All OFF
20. Starting and ignition switches — OFF
21. Voltmeter selector switch to BAT BUS — Check voltage. (18 volts minimum)
22. Generator switches — ON
23. Oxygen quantity gage — 4.0 to 4.5 liters
24. Air-conditioning control panel — Check

Place the air-conditioning controls and switches in the following positions:

Dump valve guard	DOWN
Cabin pressure selector	RAM
Temperature control	AUTO

Set the temperature rheostat as desired.

25. Interphone control panel — As desired
26. Radio compass — OFF
27. APW-11A radar set — OFF
28. Windshield control panel — All switches OFF
29. Defog air knob — As desired
30. A-c and d-c circuit breakers — All in except GPI
31. Lighting control panel switches — As desired
32. IFF — OFF
33. AIC filter switch — BOTH
34. Oxygen system — Checked

a. Place the diluter lever in NORMAL OXYGEN and blow gently into the oxygen regulator hose. (A resistance to blowing indicates satisfactory operation of the demand diaphragm.)

b. Place the diluter lever in 100% OXYGEN and blow gently into the oxygen regulator hose. (A resistance to blowing indicates satisfactory operation of the demand diaphragm and diluter air valve.)

c. Don the mask and connect the mask to the regulator hose. (Breathe normally and note operation of the blinker dial.)

d. Hold breath and place the EMERGENCY pressure lever to the right or left. (A positive pressure felt within the mask indicates proper emergency oxygen flow.)

e. Depress the EMERGENCY pressure lever while holding the breath to test the mask for leakage. (A properly fitted mask will retain the EMERGENCY oxygen pressure until normal breathing is resumed.)

f. Mask hose fittings are properly seated and secure.

g. The mask hose attachment to the parachute harness is as required.

35. All indicator and warning lights — PRESS TO TEST

INTERIOR INSPECTION (NIGHT FLIGHT)

For night operation, perform all of the preceding checks, and add the following:

1. Navigation lights — ON
2. All other lights — Checked

Note

Spare lamps are in a kit on the pilot's right console. Fuses and additional spare lamps are in the right electrical access compartment and are inaccessible in flight.

BEFORE STARTING ENGINES.

When available, use an external source for starting the engines. When using battery power to start the engines, turn off all unnecessary electrical equipment.

Note

A battery contactor joins the battery to the 28-volt d-c generator bus. Placing the battery switch on completes a circuit from the battery to the battery contactor. The battery must be of sufficient voltage (approximately 18 volts) to close the contactor and join the battery to the 28-volt generator bus. Since the starting and fuel systems receive their power from the generator bus, you will be unable to start the engines if the battery voltage is low. To determine battery voltage, place the voltmeter selector switch in BAT BUS and observe the voltmeter.

WARNING

Insure that the starting and ignition switch is OFF before placing a cartridge in the starter breech. All ground personnel must be at least 25 feet from the plane of rotation of the starter turbine wheel before starting the engines. See DANGER AREAS, figure 2-4.

STARTING ENGINES.

When practicable, head the airplane into the wind when starting the engines to keep fumes out of the cabin and to aid engine cooling.

To avoid carbon-monoxide poisoning, follow this procedure during engine start, taxiing, run-up, and take-off:

1. Use 100 percent oxygen.
2. Place the cabin pressure selector switch in RAM.
3. Place the cabin pressure selector switch and oxygen diluter lever to NORMAL after take-off.

STARTING ENGINES WITH EXTERNAL POWER.

Use the following procedure when starting the engines with external power:

1. Ground crew — Clear
2. Fire detection system — Check

   Check the operation of the fire and overheat detection system and lights by placing the fire detector test switch first in FIRE, then in OVERHEAT, observing that the lights in the pull-to-arm knobs illuminate steadily in the FIRE position and blink in the OVERHEAT position.
3. Interphone — On

Note

Distinct clicks over the interphone or from outside the airplane indicates proper functioning of the timer and ignition circuit.

4. NO. 2 engine throttle — IDLE
5. NO. 2 start and ignition switch — START

Note

A faulty throttle microswitch can prevent detonation of the cartridge. If the cartridge does not detonate, attempt the start by placing the starting and ignition switch in the CRANK ONLY position.

The voltage regulators do not effectively control the generators at idle rpm; therefore, the low output voltage of the generator causes illumination of the failure warning light. Under this condition, placing the generator switch in RESET does not put the generator "on the line". To put the generator on the line, increase the generator rpm by advancing the throttle slightly or increase the load on the electrical system.

The expanding gas from the starter cartridge causes the engine to accelerate to 18 to 22 percent rpm. A timer automatically stops ignition and fuel priming after 15 ± 3 seconds. After the "light-up", the engine accelerates to 36 to 42 percent rpm (idling speed) and the oil pressure is 10 to 20 psi, the fuel flow is 1000 pph, and the exhaust gas temperature is approximately 550 degrees C. Refer to ENGINE LIMITATIONS in Section V.

6. Engine instruments — Check
7. Hydraulic system pressure gage — Check
8. Canopy — Close

Repeat steps 4 through 6 for the NO. 1 engine.

9. Landing gear ground lock pins — In sight, then stowed
10. External power source — Disconnected
11. Battery switch — BATTERY
12. Inverters — On

STARTING ENGINES WITH BATTERY.

Because you must conserve the battery for the engine start, do not use battery power to check electrical or electronic equipment before starting the engines. Use this procedure to start the engines without external power:

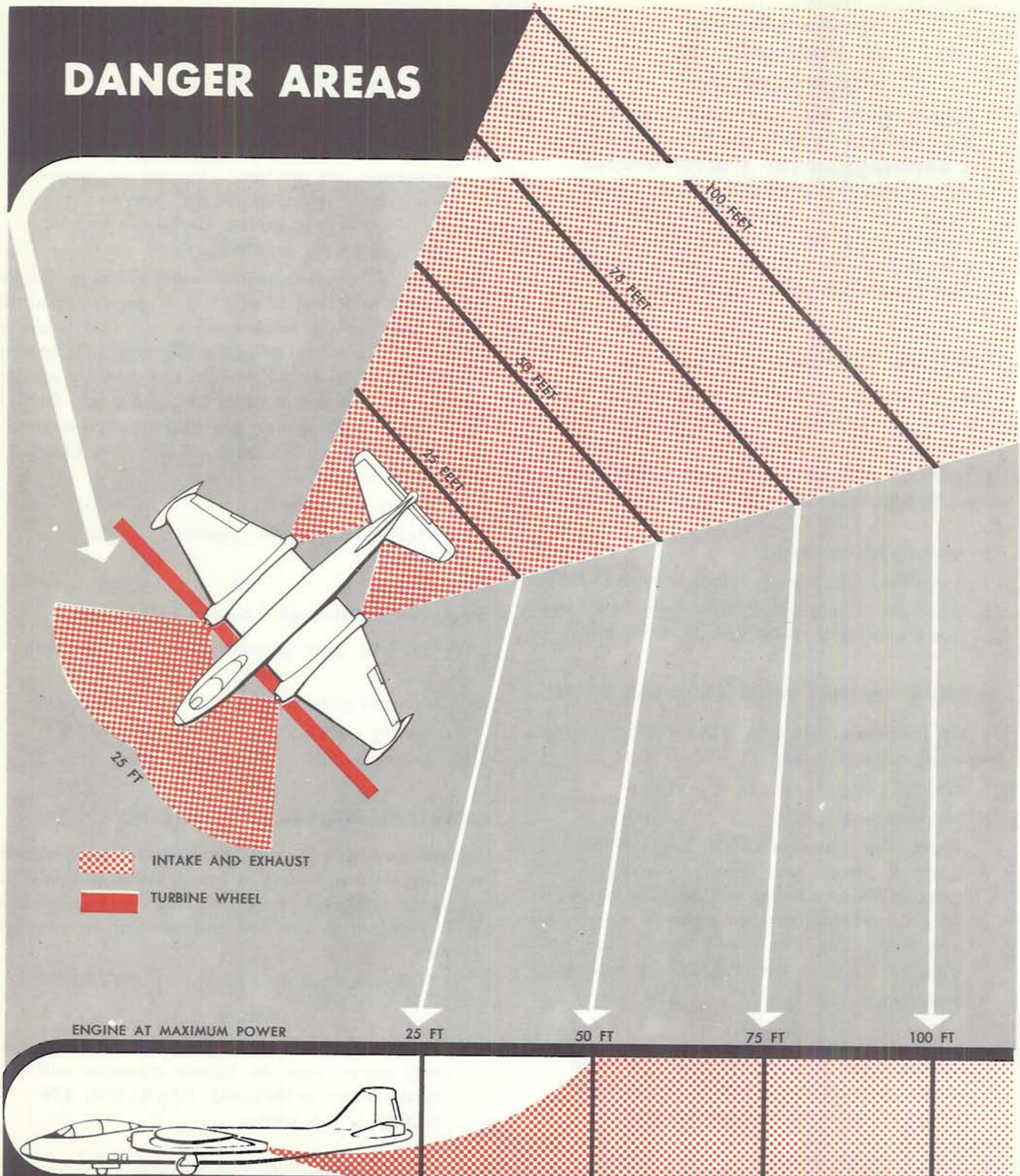
1. Voltmeter selector switch — BAT BUS

Note

If the battery voltage is 18 volts or more, you may assume that the battery contactor will close. Refer to BEFORE STARTING ENGINES in this section.

2. Ground crew — Clear
3. Battery switch — BATTERY
4. Fire detection system — Check

   Check the operation of the fire and overheat detection system and lights by placing the fire detector test switch first in FIRE, then in OVERHEAT, observing that the lights in the pull-to-arm knobs illuminate steadily in the FIRE position and blink in the OVERHEAT position.



EXHAUST TEMPERATURE	204°C (400°F)	107°C (225°F)	71°C (160°F)	54°C (130°F)
EXHAUST WAKE VELOCITY DISTRIBUTION FT/SEC	450	175	90	60

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Figure 2-4

5. Interphone ON

Note

Distinct clicks over the interphone or from outside the airplane indicate proper functioning of the timer and ignition circuit.

6. NO 2 engine throttle IDLE
7. NO. 2 start and ignition switch START

The expanding gas from the starter cartridge causes the engine to accelerate to 18 to 22 percent rpm. A timer automatically stops ignition and fuel priming after 15 ± 3 seconds. After the engine "light-up", the engine accelerates to 36 to 42 percent rpm (idling speed) and the oil pressure is 10 to 20 psi, the fuel flow is 1000 pph, and the exhaust gas temperature is approximately 550 degrees C. Refer to ENGINE LIMITATIONS in Section V.

Note

Do not turn off the battery switch if the engine fails to start. Instead, immediately attempt to start the other engine.

8. Engine instruments Check
9. Hydraulic system pressure gage Check
10. Canopy Close

Repeat steps 6 through 8 for the NO. 1 engine.

11. Gear lock safety pins In sight, then stowed
12. Inverters On

HOT START.

A faulty starter cartridge, timer, or primer can cause a hot start. The maximum permissible exhaust temperature during starting is 800 degrees C. If the exhaust gas exceeds this temperature:

1. Immediately place the throttle OFF.
2. Determine the cause of the excessive temperature.
3. Attempt a second start after eliminating the cause of the overtemperature and allowing the fuel to drain from the combustion chamber.
4. Record in DD Form 781 all starting temperatures that reach or exceed the limit. The engine requires an inspection after five hot starts.

FALSE START.

If the exhaust gas temperature does not rise before the engine accelerates to 17 percent rpm:

1. Move the throttle to OFF.
2. Eliminate the cause of the false start before making further starting attempts.
3. Be sure that surplus fuel is completely drained from the combustion chamber before attempting another start

CAUTION

Because of the excessive heat generated by the ignition coils during the starting cycle, make only two consecutive starting attempts. A 20-minute cooling period is required before making a third attempt. After 40 minutes or longer, this cycle may be repeated.

BEFORE TAXIING.

Refer to Section V for the exhaust gas temperature allowed for steady-state operation. If the exhaust temperature exceeds the maximum limit, shut down the engine immediately. Complete the following checks before taxiing.

1. Generators Check output
2. Voltmeter selector switch Check all positions
3. Aileron trim Neutral (green light)
4. Rudder trim Neutral (green light)

CAUTION

Prior to checking rudder trim, neutralize the rudder.

5. Horizontal stabilizer override NOR
6. Horizontal stabilizer (Group C airplanes) ¼ division nose down (See figure 2–5.)

Actuate the horizontal stabilizer through a complete cycle in the normal system. Then use the override switches to actuate the stabilizer through a complete cycle and return the system to normal. Have the ground crew observe the stabilizer travel during check.

6a. Horizontal stabilizer (Group D Airplanes) 0°

Actuate the stabilizer through a complete cycle. Have the ground crew observe the stabilizer travel during the check.

7. UHF radio On
8. J-2 compass J-2 COMP IN
9. Flight and engine instruments Check
10. Fuel quantity Check (all tanks)

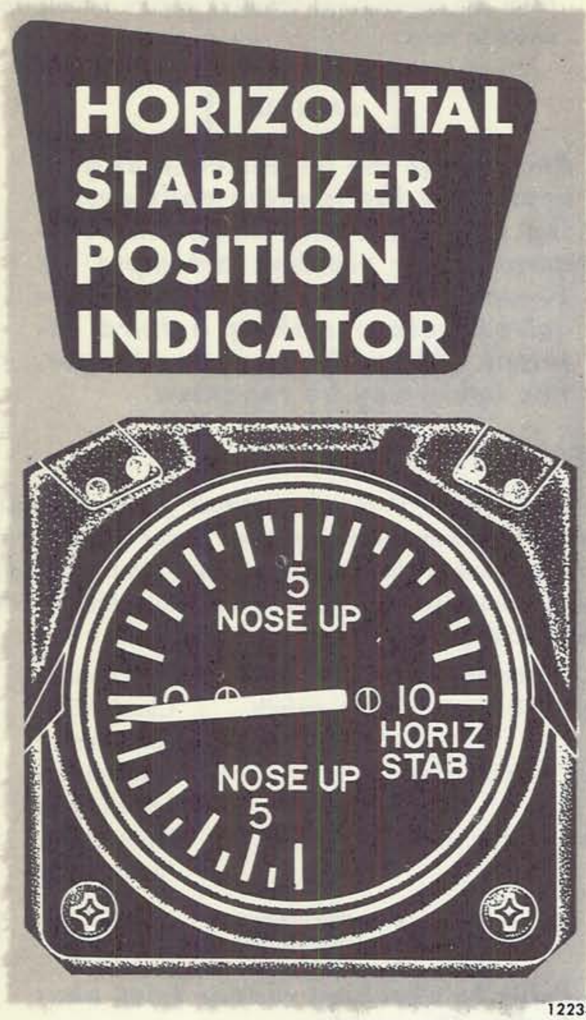

Figure 2-5

11. Fuel quantity indicator	Test
12. IFF	As desired
13. Radio compass function control	Out
14. GPI circuit breakers	In
15. Bomb door, dive brakes, and flaps (Groups C and D airplanes)	Close and retract
15a. Elevator system bungee	Check operation (Group D airplanes)

Check the operation of the elevator systems bungee by cycling the wing flap system. As the flaps retract a slight forward movement of the control column should occur.

Note

Check with the ground crew for the position of the bomb door, dive brakes, and flaps.

16. Seat safety pin	Remove and stow
17. Brake pressure	1000 psi minimum
18. UHF radio	Check
19. Chocks	Remove
20. Parking brake	OFF

CAUTION

The main system hydraulic pressure gage is a good indication of the proper functioning of the hydraulic system. Normally, the gage will show an imperceptable amount of movement and will indicate only an occasional recharge of the system at about 2½ minute intervals. When no hydraulic component is being operated and the main system gage shows a continual oscillation or shows a constant value of approximately 3500 psi, these are indications of a malfunction of the hydraulic system. If these malfunctions are permitted to continue, severe overheat of the hydraulic fluid will result. It is good pilot practice to check the gage after the gear has been retracted during climb out after take-off.

TAXIING.

Steer the airplane by applying differential pressure to the brake pedals. The engines consume approximately 8 gallons (52) pounds of fuel a minute during taxiing under normal conditions. Complete the following checks while taxiing:

1. Brakes	Check
2. Turn-and-slip indicator	Check

CAUTION

Stop taxiing and request a tow to the parking area if a loss of air charge in the nose oleo strut causes excessive noise, bottoming, or hard riding. Turning the nose wheel more than 20 degrees without air in the oleo will cause damage to the nose wheel and airplane structure.

Note

During night ground operation, the landing light should be used when necessary to supplement the taxi lights.

BEFORE TAKE-OFF.

PREFLIGHT AIRPLANE CHECK.

After taxiing to the take-off area, hold the brakes and check the following:

1.	Trim devices	Checked
2.	Cabin pressure selector switch	RAM
3.	Pitot heater switch	As desired
4.	Canopy	Closed, light out
5.	Wing flaps switch	UP
6.	Seat belt and shoulder harness	Adjusted
7.	Inertia reel	Unlocked
8.	Flight controls	Check travel, free and correct movement

CAUTION

Prior to checking rudder movement, neutralize the rudder trim.

PREFLIGHT ENGINE CHECK.

1. Check that the fuel controls are in the following positions:

Engine valve knobs	Flow
Fuel transfer and bypass valve knob	Flow to No. 1 fuselage tank
No. 2 fuselage tank knob	Flow

Note

Assure that the No. 2 fuselage tank is feeding into the No. 1 fuselage tank.

2. Advance the throttle for No. 1 engine to 90 percent rpm.
3. Place the emergency fuel control switch for No. 1 engine in EMERGENCY. The emergency fuel control warning light should come on.

Note

The engine rpm will increase or decrease immediately if the ambient conditions differ from those of a standard day. If the ambient conditions are near standard, no apparent change will occur.

4. Advance the throttle for No. 1 engine to FULL and check the rpm against figure 5–2.

CAUTION

If the results obtained in step 4 are not within the value specified in figure 5–2, maintenance will be required.

5. If the results are satisfactory, retard the throttle slowly to IDLE, and place the emergency fuel control switch in OFF when the rpm drops to 60 percent during deceleration. This will return the engine to the normal fuel control system.
6. Repeat the above procedure for No. 2 engine.
7. Check the engine instruments for satisfactory readings.

TAKE-OFF.

1. Align the airplane with the runway and check the heading indication.
2. Depress the brakes.
3. Advance throttles to FULL and check engine instruments for normal readings.
4. Partially tighten the throttle friction knob to prevent "creepback" during take-off.
5. All warning lights — Out
6. Release the brakes and commence the take-off. Use the brakes for directional control until there is positive rudder response (approximately 60 knots).

Note

When the brakes are released, hold the control column well forward of neutral to prevent the airplane from assuming the take-off attitude before it has reached the optimum take-off speed of approximately 110 knots IAS for an approximate gross weight of 45,000 pounds. If the take-off attitude is assumed before the optimum take-off speed, the increased drag lengthens the take-off run. If operating at maximum gross weight, the optimum take-off speed is approximately 120 knots IAS.

7. When the airplane attains optimum take-off speed, relax the forward pressure on the controls to allow the nose to rise slightly. A slight pull is necessary for the airplane to fly off the ground.

Note

A compressor discharge pressure limiter in the fuel control unit automatically reduces the fuel flow to the engine whenever the compressor discharge pressure exceeds a certain value. This excess pressure occurs at high speeds, low altitudes, and on cold days. Learn to recognize this condtion to avoid unnecessary concern regarding the proper functioning of the engine fuel system.

CROSS-WIND TAKE-OFF.

In addition to the normal take-off procedure:

1. Increase the nose wheel lift-off speed approximately 10 to 15 knots IAS by holding the nose wheel down a little longer during ground run.
2. Anticipate drift when the airplane lifts off; then lower a wing or "crab" into the wind.

NIGHT TAKE-OFF.

Night take-off procedure is the same as daylight operation; however, a thorough knowledge of switch and light location is essential. Follow this additional procedure:

1. Adjust the cabin and instrument lights to the desired brilliance.
2. Use the runway lights for reference to maintain alignment with the runway on take-off run.

MINIMUM-RUN TAKE-OFF.

Refer to the take-off distance chart in APPENDIX I for the minimum distance required. To make a short take-off:

1. If necessary, reduce gross weight by reducing fuel load.
2. Use all the available runway.
3. Depress the brake pedals and advance the throttles to full.
4. Pull the airplane off the runway at a lower than normal airspeed (130 to 140 knots IAS).
5. Retract the gear and start climbing at 240 knots IAS.

AFTER TAKE-OFF.

When the airplane is definitely airborne:

1. Apply brakes lightly to stop the wheels from spinning.
2. Place landing gear lever in UP.

Note

Retraction time for the landing gear is approximately eight seconds.

CAUTION

When take-off is made with light gross weights, a high initial rate of climb or a reduction in power is necessary to avoid exceeding the 200 knots IAS maximum speed, for extended landing gear.

3. Accelerate to the safe single engine speed by maintaining the take-off attitude.
4. Check the landing gear warning light and position indicators for an "up" indication.
5. Place the cabin pressure selector switch in NORMAL.
6. Position the cabin temperature selector as desired.
7. Place the oxygen selector lever to NORMAL.

CLIMB.

Refer to the Performance Data Charts in Appendix I for best climb speeds and approximate time to attain a desired altitude with varied gross weights and configurations. Establish the initial climb at 340 knots IAS.

CAUTION

The maximum time allowed for use of maximum or military thrust is 30 minutes. Reduce power to 96.5 percent rpm for maximum continuous power as soon after take-off as practicable.

TRANSFERRING FUEL CONTROL.

To transfer from emergency fuel control to normal fuel control during flight, use the following procedure:

1. Set the throttle at 90% rpm.
2. Retard the throttle slowly to IDLE and place the emergency fuel switch to OFF at 60% rpm or less during the deceleration.
3. Accelerate slowly to the desired rpm.

CRUISE.

Refer to Appendix I for cruise data and to Section VII for fuel management procedure.

FLIGHT CHARACTERISTICS.

Refer to Section VI for information on flight characteristics.

DESCENT.

Refer to the descent charts in Appendix I. Before descent, complete the following checks:

1. Place the windshield anti-icing switch in ANTI-ICING position.

Note

Whenever possible, turn on the windshield anti-icing switch thirty minutes before a descent.

2. Pull the defog air knob up.

3. Turn on the defog hot air switch.
4. Adjust the defog air rheostat as desired.
5. Turn on the pitot heater.
6. Retard the throttles as necessary to avoid excessive airspeed.
7. If necessary, place the dive brake switch in EXTEND.

TRAFFIC PATTERN CHECK.

1. Alert the crew for landing.

CAUTION

When landing with the emergency fuel control switches in EMERGENCY, move the throttles slowly and smoothly to avoid engine compressor stall or overspeed.

2.	All armament switches	OFF or SAFE
3.	Fuel transfer and bypass valve knob	Flow to NO. 1 tank
4.	Applicable fuel tank (containing fuel) knob	Flow
5.	Oxygen	100%
6.	Safety belt and shoulder harness	Adjusted and tight
7.	Inertia reel	Unlocked

The remaining operations, the places at which they are to be performed, and the safe approach speeds are shown on the Typical Landing Pattern Diagram. (See figure 2-6.)

8.	Landing gear handle	DOWN

CAUTION

Do not lower the gear above 200 knots IAS.

Note

The landing gear extension time is approximately six seconds. Operation of two or more hydraulic sub-circuits at the same time will not lengthen the normal operating time.

9.	Landing gear position indicators	Down
10.	Landing gear warning light	Out
11.	Dive brakes	As desired
12.	Flaps	Down
13.	Main hydraulic system pressure gage	2500 psi minimum
14.	Brake pressure gage	1000 psi minimum

CAUTION

Do not check brake operation by depressing the pedals after an emergency landing gear extension.

Note

Lowering the flaps causes the airplane to pitch up. On rare occasions the flaps may operate slightly out of unison. You will notice it because of a moderate rolling tendency. This condition lasts for one or two seconds, and is easily controlled.

LANDING.

Land on the main landing gear and hold the nose wheel off the runway by maintaining back pressure on the control column. Avoid an extreme tail-low attitude. After touchdown, intermittently apply pressure to the brake pedals.

CAUTION

Allow a ten-minute brake cooling period with the gear extended when making a series of full-stop landings. Allow thirty minutes if the gear is retracted.

If a condition of aft center of gravity due to fuel system malfunction or improper fuel management is suspected, perform a landing-characteristic stall at altitude. Refer to STICK FORCES in Section VI.

HEAVY WEIGHT LANDING.

Normal landing techniques apply to heavy weight landings except for the necessary increase in airspeed on final approach.

NIGHT LANDINGS.

The same technique and procedure used in a normal landing apply for night landings. If there is fog, smoke, or haze, avoid using the landing light. Reflection from the light impedes vision and may distort depth perception. Be alert when the landing light is on to avoid following the light beam into the ground. Extend the landing light below 200 knots IAS.

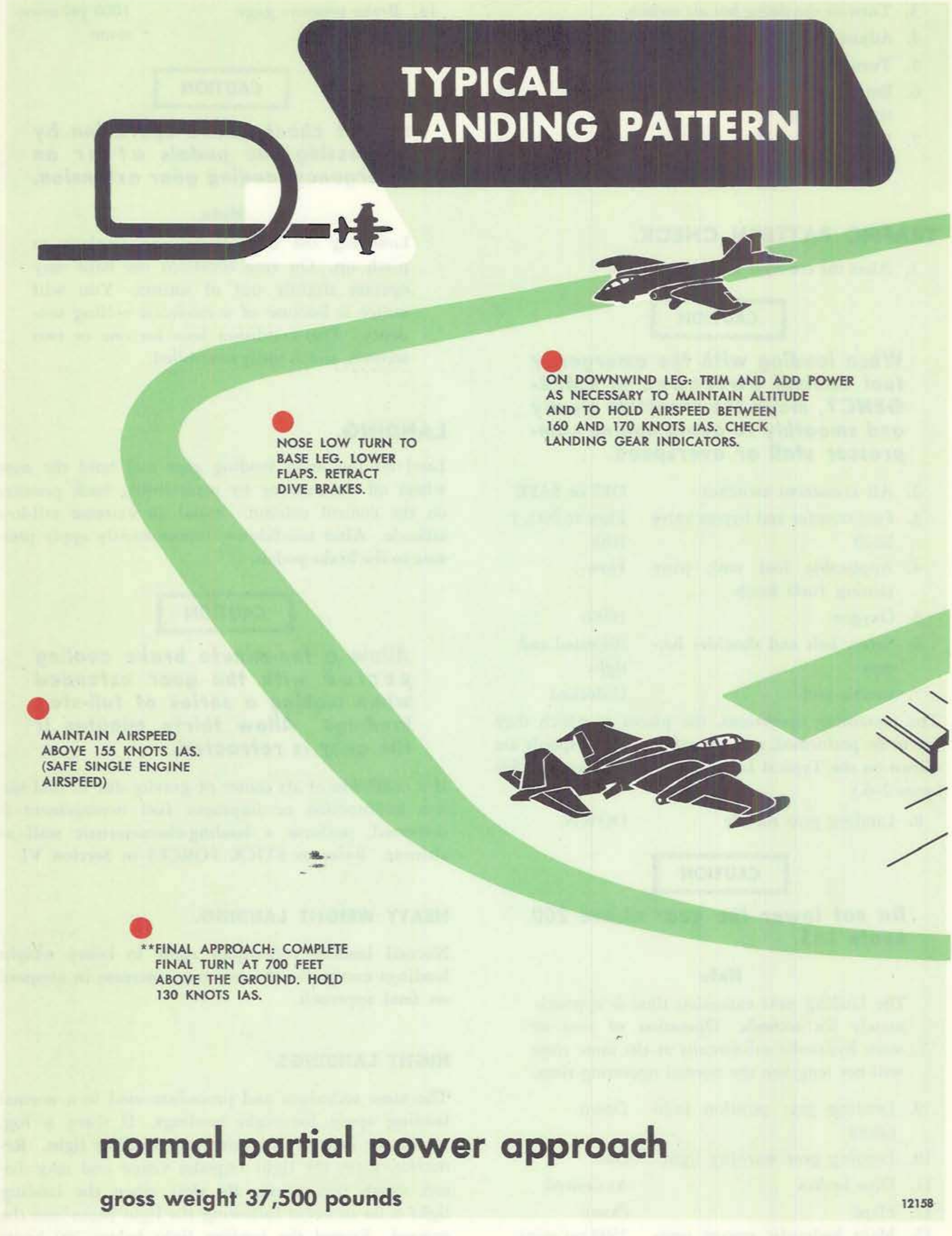

Figure 2–6 (Sheet 1 of 2)

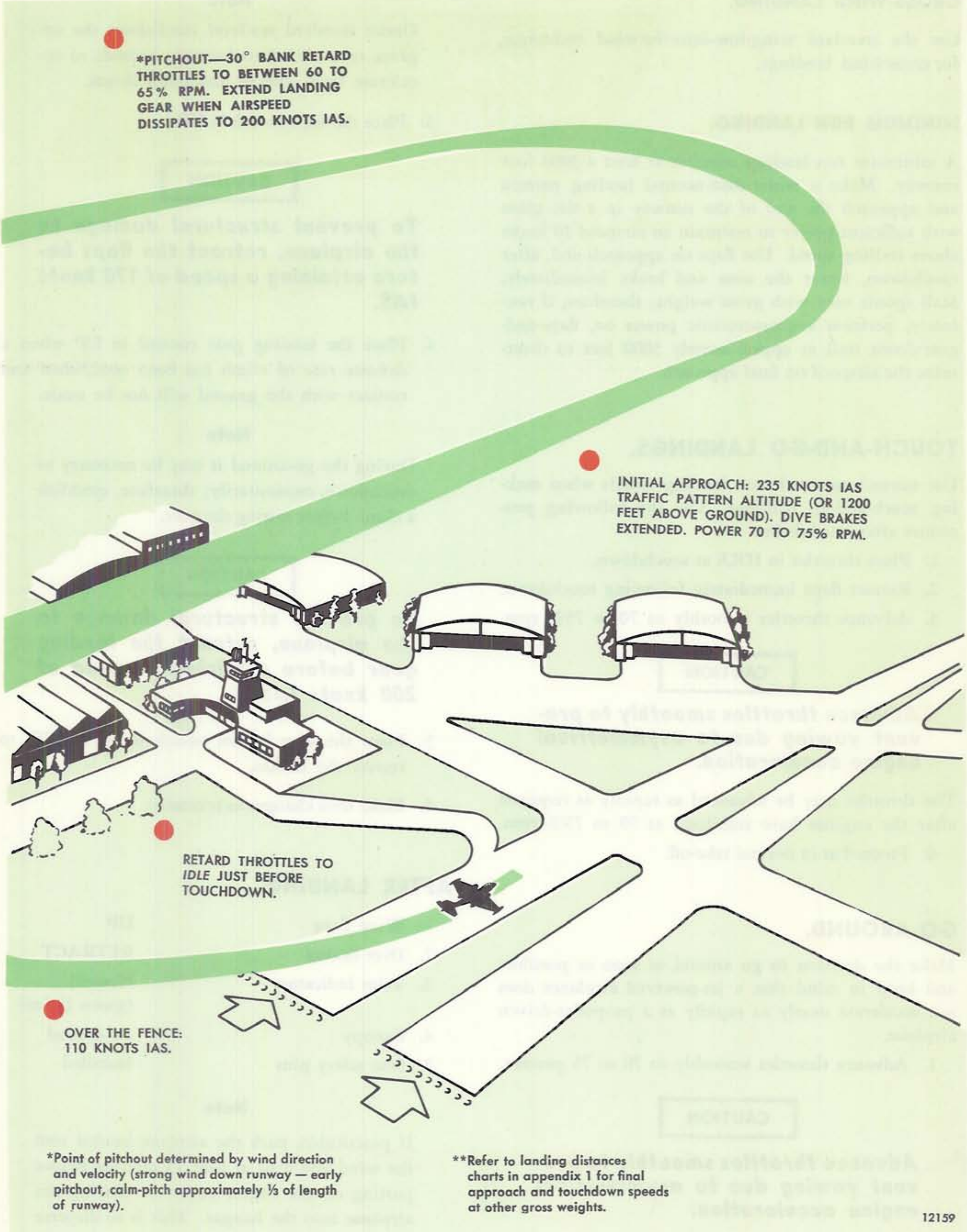

Figure 2-6 (Sheet 2 of 2)

CROSS-WIND LANDING.

Use the standard wing-low-into-the-wind technique for cross-wind landings.

MINIMUM RUN LANDING.

A minimum run landing requires at least a 3000 foot runway. Make a wider-than-normal landing pattern and approach the end of the runway in a flat glide with sufficient power to maintain an airspeed 10 knots above stalling speed. Use flaps on approach and, after touchdown, lower the nose and brake immediately. Stall speeds vary with gross weight; therefore, if necessary, perform a characteristic power on, flaps-and-gear-down stall at approximately 5000 feet to determine the airspeed on final approach.

TOUCH-AND-GO LANDINGS.

Use normal approach and landing speeds when making touch-and-go landings. Use the following procedure after touchdown.

1. Place throttles in IDLE at touchdown.
2. Retract flaps immediately following touchdown.
3. Advance throttles smoothly to 70 to 75% rpm.

CAUTION

Advance throttles smoothly to prevent yawing due to asymmetrical engine acceleration.

The throttles may be advanced as rapidly as required after the engines have stabilized at 70 to 75% rpm.

4. Proceed as in normal take-off.

GO-AROUND.

Make the decision to go around as soon as possible, and keep in mind that a jet-powered airplanes does not accelerate nearly as rapidly as a propeller-driven airplane.

1. Advance throttles smoothly to 70 to 75 percent.

CAUTION

Advance throttles smoothly to prevent yawing due to asymmetrical engine acceleration.

2. Advance throttles to FULL as rapidly as necessary after the engines stabilize.

Note

Under standard sea-level conditions, the engines take eleven to fourteen seconds to accelerate from idle to maximum thrust.

3. Place the flaps switch in UP.

CAUTION

To prevent structural damage to the airplane, retract the flaps before attaining a speed of 170 knots IAS.

4. Place the landing gear control in UP when a definite rate of climb has been established and contact with the ground will not be made.

Note

During the go-around it may be necessary to touchdown momentarily; therefore, establish a climb before raising the gear.

CAUTION

To prevent structural damage to the airplane, retract the landing gear before attaining a speed of 200 knots IAS.

5. Place the dive brakes switch in RETRACT to retract the brakes.
6. Make trim changes as necessary.

AFTER LANDING.

1.	Wing flaps	UP
2.	Dive brakes	RETRACT
3.	Trim indicators	Neutral (green lights)
4.	Canopy	As desired
5.	Seat safety pins	Installed

Note

If practicable, park the airplane headed into the wind and wait at least 15 minutes before putting on the engine covers or moving the airplane into the hangar. This is to disperse fuel fumes which might be present and which could cause an explosion.

STOPPING ENGINES.

Note

If the engines are being shut down from 95 percent rpm or above, pause for at least one minute at IDLE power to allow temperature conditions in the engines to stabilize, and then place the throttles in OFF. If engines are being shut down from below 95 percent rpm, throttles may be moved immediately to OFF.

1. Parking brake — Set
2. Throttle NO. 2 — Off

Note

Shut down the No. 2 engine first and check the hydraulic pump operation of the No. 1 engine.

3. Hydraulic pressure NO. 1 engine — Checked
4. All radios and IFF — OFF
5. Inverters — OFF
6. Oxygen supply lever — OFF
7. Throttle NO. 1 — OFF
8. Fuel panel knobs and switches — All OFF
9. Battery switch — OFF
10. Wheel chocks — In place
11. Parking brake — OFF
12. Armrest and canopy safety pins — Installed
13. All electrical switches — OFF
14. Control column — Secured
15. Canopy safety collar — In place

BEFORE LEAVING AIRPLANE.

WARNING

Be sure that the seat safety pins are in place before leaving the airplane. Personnel might fire one of the explosive charges and it could result in serious injury or death.

1. Gear lock safety pins — In place
2. Battery — Disconnected
3. Personnel safety switch — SAFE
4. Bomb bay door shut-off valve — SAFE
5. Complete DD Form 781 — Check

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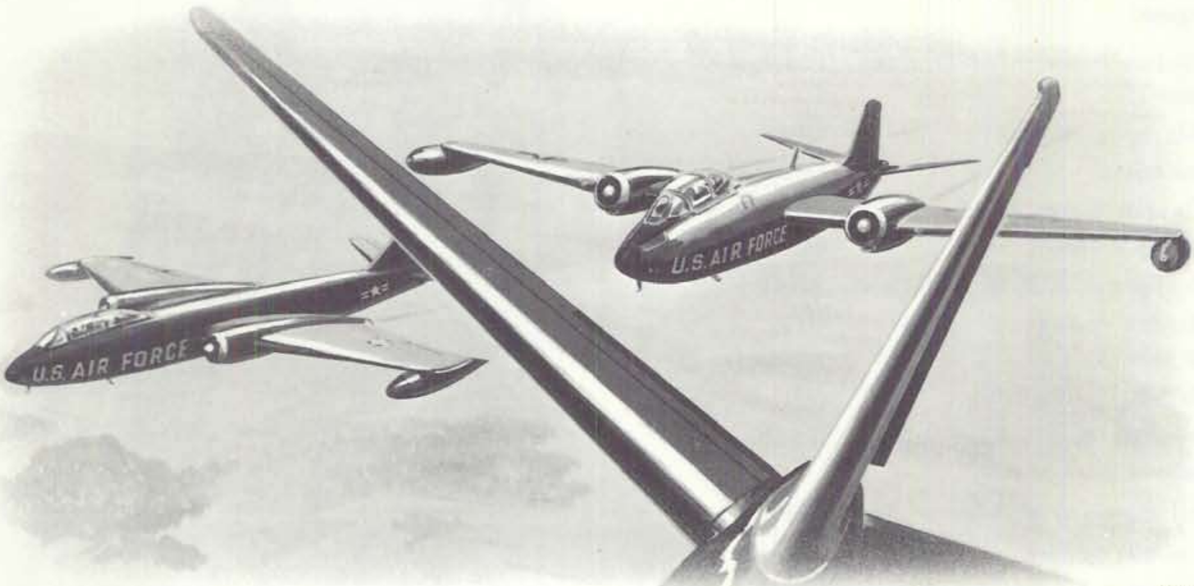

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CUT ON BLACK LINE

B-57C

CONDENSED CHECK LIST OF NORMAL PROCEDURES

T.O. 1B-57C-1

1 AUGUST 1956

Revised 1 February 1957

CUT ON BLACK LINE

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CUT ON BLACK LINE

B-57C CONDENSED CHECK LIST

BEFORE ENTERING THE AIRPLANE.

Flight Restrictions	Checked

FLIGHT PLANNING.

1. Flight data and equipment	Available and checked
2. Cruise control data	Checked
3. Fuel, oil, oxygen, armament and special equipment	Checked
4. Crew briefed on mission and emergency procedures	Checked
5. Clearance filed	Checked

BEFORE EXTERIOR INSPECTION.

1. Canopy	Condition
2. Canopy safety pin	In place
3. Seat armrest safety pins, front and rear	In
4. DD Form 781	Check
5. Publications	In place
6. All armament switches	OFF or SAFE
7. Tip tank jettison switch	OFF
8. Landing gear lever	Down
9. Main system hydraulic pressure gage	Zero pressure
10. Emergency gear T-handle	In
11. Battery switch	OFF
12. Power distribution circuit breaker panel	All circuit breakers in
13. Seat quick-disconnect pins	In place
14. All emergency equipment	Stowed

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EXTERIOR INSPECTION.

1. LEFT NOSE SECTION.

a. Bomb door shut-off valve	SAFE
b. Personnel safety switch	SAFE
c. Battery compartment	Check
d. Left electrical access compartment	Check
e. Shoran antenna	Condition
f. Static air vent	Open and clean
g. Nose hatch	Secure

2. RIGHT NOSE SECTION.

a. Pitot cover	Removed
b. Static air vent	Open and clean
c. UHF antenna	Condition
d. Pressure regulator static vent	Open
e. Right electrical access compartment	Check
f. Right upper equipment compartment	Check

3. NOSE WHEEL WELL.

a. Gear lock safety pin	In place
b. Gear strut for correct inflation	6 to 9 inches
c. Tires, wheels, fairing, and doors	Check

4. BOMB BAY (RIGHT SIDE).

a. Forward bomb door actuating cylinder	Leakage
b. Fuel manifolds and lines	Leakage

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CUT ON BLACK LINE

c. Defueling valve	Wired closed
d. No. 1 and No. 2 fuselage boost pumps and No. 2 probe	Leakage and connection
e. Aileron crossover rods	Possible distortion
f. Aft bomb door actuating cylinder	Leakage
g. Hydraulic lines	Leakage
h. Boost pump drains	Check for moisture
5. RIGHT WHEEL WELL.	
a. Gear lock safety pin	In place
b. Gear doors, linkage and pins	Condition
c. Fuel strainer	Security and leakage
d. Main system hydraulic accumulator	1000 psi
e. Interphone switch	NORMAL and cap in place
f. Hydraulic fluid level	Check
g. Fire extinguisher bottle	450 psi
h. Microswitches	Condition
i. Gear extender valve removed and port covered	Check
j. Gear strut for correct extension	1½ to 3 inches
k. Tire and wheel	Condition and slippage
l. Brake assembly	Condition and slippage
m. Hydraulic and fuel lines	Leakage
n. Wheel chocks	In place
6. RIGHT ENGINE.	
a. Cowling	Secure
b. Ground cooling door	Secure and cable taut
c. Starter breech lock and dome	Secure

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CUT ON BLACK LINE

d. Front main bearing	Oil seepage
e. Engine and generator air intake ducts	Clean
f. Compressor blades	Checked for cracks and breaks
g. Frangible doors	Condition
h. Fuel drain valve	No leakage
7. RIGHT WING.	
a. Under surface of wing	Check
b. Fuel vent	Check
c. Navigation and taxi lights	Check
d. Tip tanks	Check
e. Aileron	Check
f. Wing flaps	Condition
g. Tail pipe	Condition and warpage
8. RIGHT REAR FUSELAGE.	
a. Navigation lights	Condition
b. Nitrogen purge indicator and filler cap	Check
c. Dive brakes	Condition
d. Dive brake actuating cylinder	Leakage
e. Aft fuselage entrance door	Closed
f. Fuel vent mast	Cracks and distortion
g. Tail skid	Condition
9. EMPENNAGE.	
a. Control locks	Removed
b. Stabilizer surfaces and tabs	Condition and freedom of movement
c. Variable-incidence stabilizer	Condition
d. Navigation lights	Condition
10. LEFT REAR FUSELAGE.	
a. Dive brake	Condition
b. Dive brake actuating cylinder	Leakage
c. Aft fuselage compartment	Check

CUT ON BLACK LINE

d. Nitrogen purge blow-out disk	Intact
11. LEFT WING.	
a. Tail pipe	Condition and warpage
b. Wing flaps	Condition
c. Aileron	Check
d. Tip tanks	Check
e. Fuel vent	Check
f. Under surface of wing	Check
g. Navigation and taxi lights	Check
12. LEFT ENGINE.	
a. Engine and generator air intake ducts	Clear
b. Starter breech lock and dome	Secure
c. Front main bearing	Oil seepage
d. Cowling	Secure
e. Ground cooling door	Secure and cable taut
f. Cabin ram air inlet duct	Clear
g. Frangible doors	Condition
h. Compressor blades	Condition
i. Fuel Drain valve	No leakage
13. LEFT WHEEL WELL.	
a. Gear lock safety pin	In place
b. Gear doors, linkage and pins	Condition
c. Fire extinguisher bottle	450 psi
d. Fuel strainer	Security and leakage
e. Micro switches	Condition
f. Gear extender valve removed and port covered	Check
g. Gear strut for correct extension	1½ to 3 inches
h. Tire and wheel	Condition and slippage
i. Brake assembly	Condition and slippage

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j. Hydraulic and fuel lines	Leakage
k. Wheel chocks	In place
14. BOMB BAY (LEFT SIDE).	
a. Forward bomb door actuating cylinder	Leakage
b. Hydraulic valves and lines	Leakage
c. No. 1 and No. 2 fuselage tank booster pumps and probe	Leakage and connection
d. Aileron cross over and control rods	Possible distortion
e. Aft bomb door actuating cylinder	Leakage
f. Boost pump drains	Check for moisture
15. LEFT NOSE SECTION.	
a. Bomb door shut-off valve	FLIGHT
b. Personnel safety switch	FLIGHT
c. Battery	Connected
d. Emergency canopy initiator safety pin	Removed
e. All hatches	Secure
16. TOP SURFACE INSPECTION.	
a. Fuel and oil tanks	Checked and full Caps and doors secure

INTERIOR INSPECTION.

1. Parachute, harness, and seat belt	Adjusted
2. Inertia reel	Unlocked
3. Oxygen hose, bail-out bottle and radio cord	Connected
4. Seat and rudder pedals	Adjusted
5. Parking brake	Set
6. External power	Connected

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7.	Ground shut-off valve	Closed (safetied)
8.	Electrical distribution panel circuit breakers	All in or ON
9.	Emergency canopy release T-handles (front and rear seats)	In
10.	UHF radio	OFF
11.	Wing flaps switch	UP
12.	Throttles	OFF
13.	Dive brakes switch	RETRACT
14.	Taxi and landing lights	OFF
15.	Fire extinguisher agent discharge switch	OFF
16.	Altimeter	Set to field elevation
17.	Clock	Set and operating
18.	Fuel panel	Set for start
19.	Inverter switches	All OFF
20.	Starting and ignition switches	OFF
21.	Voltmeter selector switch to BATT	Check voltage (18 volts min.)
22.	Generators switches	ON
23.	Oxygen quantity gage	4.0 to 4.5 liters
24.	Air conditioning control panel	Check
25.	Interphone control panel	As desired
26.	Radio compass	OFF
27.	APW-11A radar set	OFF
28.	Windshield control panel	All switches OFF
29.	Defog knob	As desired
30.	A-c and d-c circuit breakers	All in except GPI
31.	Lighting control panel	As desired
32.	IFF	OFF
33.	AIC-10 filter switch	BOTH
34.	Oxygen system	Checked
35.	All indicator and warning lights	PRESS TO TEST

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CUT ON BLACK LINE

INTERIOR INSPECTION (NIGHT FLIGHT)

1. Navigation lights	ON
2. All other lights	Checked

BEFORE STARTING ENGINES.

1. Voltmeter selector switch	BAT and check voltage
2. Ground personnel	Clear
3. Use 100% oxygen	Check

STARTING ENGINES.

STARTING ENGINES WITH EXTERNAL POWER.

1. Ground crew	Clear
2. Fire detection system	Check
3. Interphone	On
4. NO. 2 engine throttle	IDLE
5. NO. 2 start and ignition switch	START
6. Engine instruments	Check
7. Hydraulic system pressure gage	Check
8. Canopy	Close

Repeat steps 4 through 6 for the NO. 1 engine.

9. Landing gear ground lock pins	In sight then stowed
10. External power source	Disconnected
11. Battery switch	BATTERY
12. Inverters	On

STARTING ENGINES WITH BATTERY.

1. Voltmeter selector switch	BAT BUS
2. Ground crew	Clear
3. Battery switch	BATTERY
4. Fire detection system	Check

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CUT ON BLACK LINE

5. Interphone	ON
6. NO. 2 engine throttle	IDLE
7. NO. 2 start and ignition switch	START
8. Engine instruments	Check
9. Hydraulic system pressure gage	Check
10. Canopy	Close

Repeat steps 6 through 8 for the NO. 1 engine.

11. Landing gear pins	In sight; then stowed
12. Inverters	On

BEFORE TAXIING.

1. Generator	Check output
2. Voltmeter selector switch	Check all positions
3. Aileron trim	Neutral (green light)
4. Rudder trim	Neutral (green light)
5. Horizontal stabilizer override switch (Group C airplanes)	NOR
5a. Horizontal stabilizer emergency switch (Group D airplanes)	NORMAL
6. Horizontal stabilizer (Group C airplanes)	¼ division nose down
6a. Horizontal stabilizer (Group D airplanes)	0°
7. UHF radio	On
8. J-2 compass	J-2 COMP IN
9. Flight and engine instruments	Check
10. Fuel quantity	Check (all tanks)
11. Fuel quantity indicator	Test
12. IFF	As desired
13. Radio compass	As desired
14. GPF circuit breakers	In
15. Bomb door, dive brakes and flaps (Group C and D airplanes)	Close and retract
15a. Elevator system bungee (Group D airplanes)	Check operation

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16. Seat safety pins	Remove and stow
17. Brake pressure	1000 psi minimum
18. Chocks	Remove
19. Parking brake	OFF

TAXIING.

1. Brakes	Check
2. Turn-and-slip indicator	Check

BEFORE TAKE-OFF.

PRE-FLIGHT AIRPLANE CHECK.

1. Trim devices	Checked
2. Cabin pressure selector switch	RAM
3. Pitot heater switch	As desired
4. Canopy	Closed, light out
5. Wing flaps switch	UP
6. Seat belt and shoulder harness	Adjusted
7. Inertia reel	Unlocked
8. Flight controls	Check travel, free and correct movement

PRE-FLIGHT ENGINE CHECK.

1. Fuel controls	Checked
2. Advance No. 1 engine throttle	90% rpm
3. No. 1 engine emergency fuel control switch	Emergency (check light)
4. No. 1 engine throttle	FULL (check rpm)
5. No. 1 emergency fuel control switches	OFF (60% rpm or less)
6. Repeat procedure for NO. 2 engine	
7. Instruments	Checked

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TAKE-OFF.

1. Align the airplane with the runway and check the heading indication.
2. Depress the brakes

3.	Throttles	FULL
4.	Throttle friction knob	Tighten
5.	All warning lights	Out
6.	Release brakes	

AFTER TAKE-OFF.

1.	Brakes	Applied
2.	Landing gear lever	UP
3.	Minimum single engine speed	155 knots
4.	Landing gear position indicators	Up indication
5.	Cabin pressure selector switch	NORMAL
6.	Cabin temperature selector switch	As desired
7.	Oxygen selector lever	Normal

DESCENT.

1.	Windshield anti-icing switch	ANTI-ICING
2.	Defog air knob	Out
3.	Defog hot air switch	ON
4.	Defog air rheostat	As desired
5.	Pitot heater switch	ON
6.	Throttles	As required
7.	Dive brakes	As required

TRAFFIC PATTERN CHECK LIST.

1. Alert crew for landing
2. All armament switches — OFF or SAFE

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3. Fuel transfer and bypass valve knob	Flow to NO. 1 tank
4. Applicable fuel tank (containing fuel) knob	Flow
5. Oxygen	100%
6. Safety belt and shoulder harness	Adjusted and tight
7. Inertia reel	Unlocked
8. Landing gear handle	DOWN and locked
9. Landing gear position indicators	Down
10. Landing gear warning light	Out
11. Dive brakes	As desired
12. Flaps	Down
13. Main hydraulic system pressure gage	2,500 psi minimum
14. Brake pressure gage	1,000 psi minimum

LANDING.

1. Downwind	Dive brakes as desired
2. Base	Airspeed 155 knots minimum
3. Final	Airspeed 130 knots minimum

AFTER LANDING.

1. Wing flaps	UP
2. Dive brakes	RETRACT
3. Trim indicators	Neutral
4. Canopy	As desired

STOPPING ENGINES.

1. Parking brake	Set
2. Throttle NO. 2	Off

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CUT ON BLACK LINE

3.	Hydraulic pressure No. 1 engine	Checked
4.	All radios and IFF	OFF
5.	Inverters	OFF
6.	Oxygen supply lever	OFF
7.	Throttle NO. 1	OFF
8.	Fuel panel knobs and switches (Group D airplanes)	All OFF
9.	Battery switch	OFF
10.	Wheel chocks	In place
11.	Parking brake	OFF
12.	Armrest and canopy safety pins	Installed
13.	All electrical switches	OFF
14.	Control column	Secured
15.	Canopy safety collar	In place

BEFORE LEAVING AIRPLANE.

1.	Gear lock safety pins	In place
2.	Battery	Disconnected
3.	Personnel safety switch	SAFE
4.	Bomb bay door shut-off valve	SAFE
5.	Complete DD Form 781	

End Condensed Check List

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Emergency Procedures

Section III

TABLE OF CONTENTS

To minimize the degree of emergencies created by the failure or malfunction of one or more components, the crew is advised to follow the procedures outlined in this section. The emergencies described are those more likely to occur, and complete understanding of the airplane and its systems is invaluable in coping with emergencies. Section IV of the handbook describes the normal and emergency operation of auxiliary systems and equipment.

ENGINE FAILURE.

Most jet-engine failures are the result of improper fuel flow caused by malfunction of the fuel control system or by incorrect operating techniques. In this airplane, the pilot receives warnings of engine failure from engine instruments and warning lights before actual engine stoppage. In the event of stoppage and where there are no obvious mechanical failures, the pilot should have no difficulty in making air starts.

ENGINE FLAME-OUT.

Prolonged maneuvers involving negative G's disrupt the normal fuel flow to the engines thereby causing flame-outs. Since the engines receive fuel from a common manifold, dual flame-outs are entirely possible, and simultaneous dual flame-outs are almost always the result of improper fuel management. With sufficient battery power, altitude, and fuel, the pilot can feasibly start one and then the other engine.

FLIGHT CHARACTERISTICS WITH ONE ENGINE INOPERATIVE.

When one engine is inoperative, the normal cruise characteristics present no difficulties and the airplane may be trimmed to fly "hands-off" at normal cruising power. However, single-engine control speed is governed by maximum rudder force in relation to rudder deflection. Below the airspeed established as the single-engine control speed, the pilot cannot exert enough effort on the rudder to hold the necessary rudder deflection when excessive thrust is applied to the operating engine. Although one engine is capable of providing sufficient hydraulic and electrical power for all basic flight requirements, the pilot must monitor all electrical loads.

WARNING

Minimum single engine control speed is 155 knots IAS.

During take-off, accelerate the aircraft to a speed above the minimum control speed (155 knots IAS) as quickly as possible to insure that adequate directional control is available in the event of an engine failure.

WARNING

Should an engine fail on take-off, exercise the utmost care in the manipulation of the throttle controlling the operating engine. Rapid advancement of the throttle may result in an uncontrollable yaw force at any speed, particularly when below the minimum single engine control speed of 155 knots IAS. (Refer to ENGINE FAILURE ON TAKE-OFF in this section.)

PROCEDURES WHEN ENCOUNTERING ENGINE FAILURE.

If a rapid drop in fuel flow occurs, place the emergency fuel control switch for the malfunctioning engine in EMERGENCY. If one engine fails in flight, do this immediately:

1. Adjust the throttle on the operating engine to maintain airspeed and directional control.
2. Retard the throttle of the malfunctioning engine to OFF to prevent flooding the engine with fuel.
3. Retrim the airplane for flight.
4. Place the engine valve knob for the inoperative engine in OFF.
5. Check for possible engine fire.
6. Reset the cabin pressure selector switch to the operating engine.
7. Turn off the generators on the inoperative engine.
8. If extended operation is required, adjust the operating engine to give the desired airspeed.

ENGINE AIR START. (NORMAL)

Air starts can be made consistently up to 16,000 feet if you follow the normal restart procedures.

CAUTION

Do not attempt to restart the inoperative engine until you are sure that it will be reasonably safe to do so.

1. Place the throttle in OFF and descend below 20,000 feet.
2. Check that the FUEL SYSTEM VALVES, and FUEL SYSTEM PUMPS circuit breakers are all in ON.
3. Place the airplane in a nose-high attitude for 15 seconds to drain any excess fuel from the combustion chamber.

Note

A nose-high attitude held for 15 seconds will disipate G forces and allow fuel to drain freely.

4. Adjust the attitude of the airplane to attain a speed between 155 knots and 220 IAS or from 14 to 22 percent rpm.
5. Place the engine valve knob in the flow position.
6. Check battery switch BATTERY.
7. Momentarily place the start and ignition switch in CRANK ONLY.
8. Immediately move the throttle to IDLE or slightly above. This opens the fuel shut-off valve and the throttle valve. An increase in exhaust gas temperature and rpm indicates the engine has started.

Note

Any delay in moving the throttle wastes a portion of the 15 ± 3 seconds ignition cycle. The ignition timer cannot be recycled until the 15 ± 3 second period has run out.

9. If the exhaust gas temperature does not increase within five to ten seconds after the throttle is open, immediately place the throttle in OFF to prevent flooding the engine with fuel.

ENGINE AIR START. (ALTERNATE)

Although air starts can be obtained above 20,000 feet, the chances of a successful air start increase at lower altitudes. Occasionally, when normal air start methods fail, it is possible to obtain a start by placing the emergency fuel control switch in EMERGENCY and following the normal air start procedure. Monitor the start carefully under these circumstances. After the start has been obtained and the engine is idling normally, continue to operate on the emergency system and make a landing as soon as possible.

ENGINE FAILURE DURING TAKE-OFF.

ENGINE FAILURE DURING TAKE-OFF BEFORE LEAVING GROUND.

If an engine should fail before leaving the ground, do this:

1. Retard both throttles immediately to IDLE.
2. Apply full braking to stop.

If the landing gear must be retracted because of insufficient remaining clearance, do this:

1. Actuate the wing tip tanks jettison switch if the tip tanks contain fuel.
2. Pull the canopy emergency release handle to jettison the canopy.
3. Place the landing gear level in UP.

Note

A force of 25 pounds is necessary to override the solenoid lock which holds the control lever in the DOWN position.

4. Place the battery switch in OFF.

ENGINE FAILURE DURING TAKE-OFF AFTER LEAVING GROUND.

If an engine fails after the airplane is airborne, do this:

1. Reduce power on operative engine to counteract yaw while accelerating to 155 knots.
2. Place the landing gear lever in UP.
3. Place the throttle for the malfunctioning engine in OFF.
4. Place the engine valve knob for the inoperative engine in OFF.
5. Check that the fire warning lights are out.
6. Gain sufficient altitude before attempting to restart the malfunctioning engine. Refer to ENGINE RE-START IN FLIGHT in this section.

If a rapid drop in fuel flow occurs during take-off, place the emergency fuel control switch for the malfunctioning engine in EMERGENCY.

CAUTION

If the engine fuel system fails on take-off or up to an altitude of 6000 feet, it is permissible to transfer to the emergency fuel system with the throttle in the FULL position provided that the engine rpm has not dropped below 85% at the time of transfer. Under all other conditions the throttle level must be retarded to IDLE prior to the transfer; failure to do so results in excessive exhaust gas temperatures and rich flame out (blow-out) and/or compressor stall.

If the engine rpm returns to the approximate take-off setting, continue to operate in the emergency system and observe normal precaution for emergency fuel control procedures.

ENGINE FAILURE DURING FLIGHT.

To determine the cruise control conditions for single-engine operation, see the Single Engine Cruise Control Charts in Appendix I. Refer to PROCEDURE WHEN ENCOUNTERING ENGINE FAILURE in this section for shutting down an engine. Also, for information concerning engine oil pressure failure and engine noise and roughness, refer to ENGINE OIL PRESSURE FAILURE in this section and ENGINE NOISE AND ROUGHNESS in Section VII.

PARTIAL POWER.

Partial power of these engines can be caused by icing, or malfunction of the engine, the engine fuel system or the airplane fuel system. For failure due to icing, refer to ICE, SNOW and RAIN in Section IX. A partial power failure due to improper fuel flow is indicated by a drop in fuel flow and should be corrected as follows after checking all fuel switches and fuel knobs on the fuel control panel and all circuit breakers placarded FUEL SYSTEM VALVES and FUEL SYSTEM PUMPS.

1. Check all fuel switches and fuel knobs on the fuel control panel for proper setting.
2. Check circuit breakers placarded FUEL SYSTEM VALVES and FUEL SYSTEM PUMPS and reset if necessary.
3. Place the emergency fuel control switch of the malfunctioning engine in EMERGENCY.
4. If power is not recovered when the emergency fuel control switch is placed in EMERGENCY, the malfunction is in a part of the engine or the airplane fuel system that affects both normal and emergency fuel flow, or in the engine itself.
5. If the cause of a partial power failure cannot be definitely established, check the fuel flow to the malfunctioning engine against the existing power setting to determine if excessive fuel is being lost. If the fuel flow is consistent with the existing power setting and the engine is otherwise operating within normal limits, you may continue to operate the engine. If the fuel flow is excessive for the power setting and/or there is a fluctuation in rpm, shut down the malfunctioning engine to avoid further damage and eliminate the possibilities of fire in the engine.
6. Trim the airplane for single-engine operation and adjust the power of the operating engine for desired cruising conditions. Refer to FLIGHT CHARACTERISTICS WITH ONE ENGINE INOPERATIVE in this section.

MAXIMUM GLIDE.

The maximum glide ranges for various altitudes are given in figure 3–1. To obtain maximum range during descent without engine power, fly at the speeds given in figure 3–1.

Note

To obtain maximum glide distance, keep gear and flaps up and the dive brakes retracted.

LANDING WITH ONE ENGINE INOPERATIVE.

If a landing is to be made with one engine inoperative, do not allow airspeed to decrease below 155 knots IAS until on final approach. The landing gear may be lowered on the downwind or base leg if 155 knots IAS airspeed can be maintained and should always be lowered in time to insure that gear will be down and locked prior to touchdown. After completing the turn on final approach, decrease the airspeed to 130 knots IAS but do not use flaps or dive brakes until a landing is assured. After the flaps are down, do not attempt a go-around unless the airplane is above 500 feet altitude.

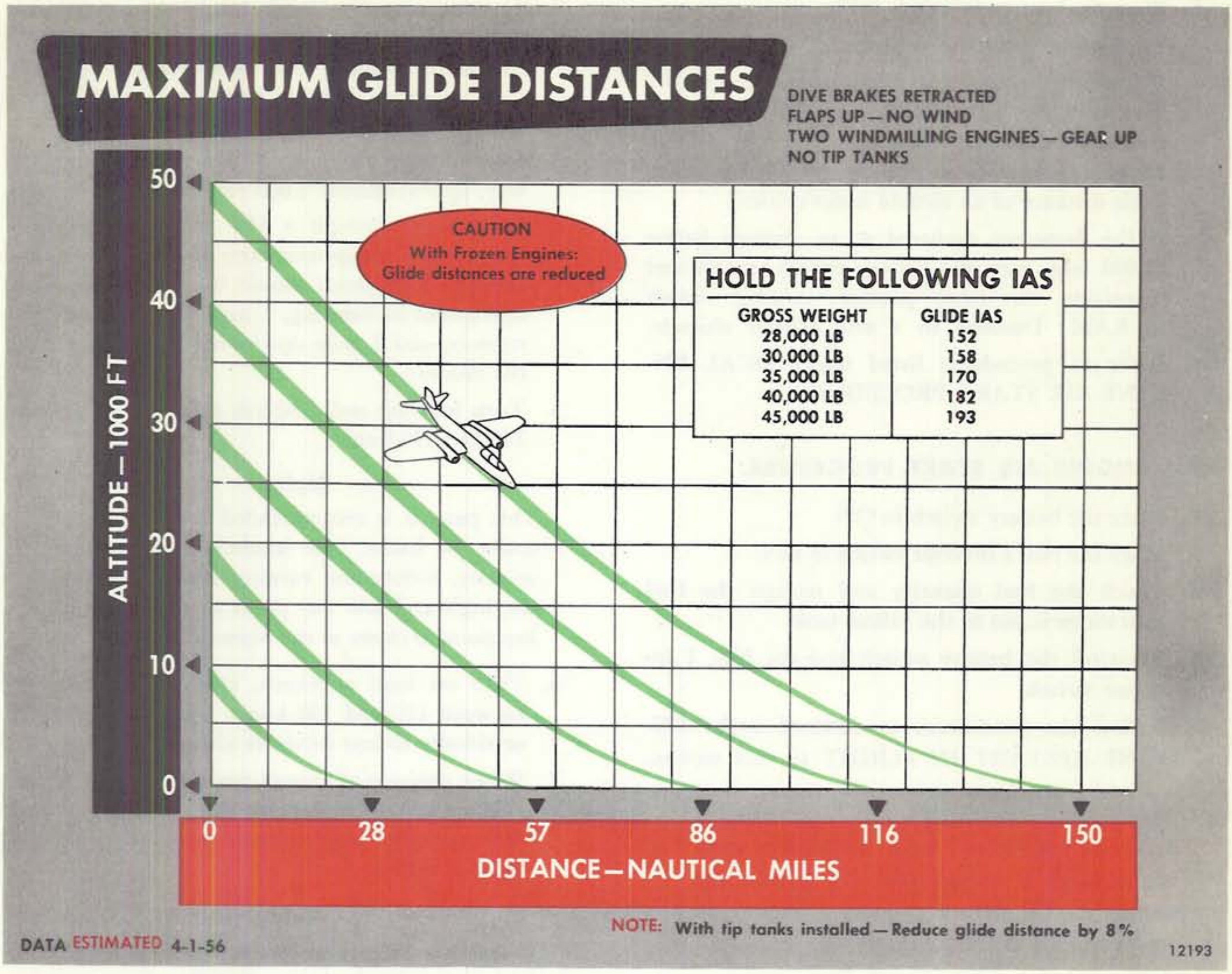


Figure 3–1

WARNING

You are committed to land when making a single-engine approach at less than 500 feet altitude with the gear and flaps extended. Under these conditions do not attempt a go-around.

DUAL ENGINE FAILURE.

The two most prominent reasons for engine stoppage are mechanical failure and fuel starvation. Because the fuel system is common to both engines, the majority of dual engine flame-outs occurring simultaneously or at short intervals result from fuel starvation. The causes of fuel starvation are improper fuel management or failure within the fuel system. During electrical system failure at high altitudes, the fuel tank boost pumps do not receive power for operation and a dual engine flame-out is possible. Below 25,000 feet, the engine-driven pumps draw enough fuel from the tanks for normal engine operation. Since the engine run-down time is approximately 30 seconds, the generators supply sufficient power to operate the flight instruments, inverters, canopy and windshield anti-icing for this period of time. At altitudes above 42,000 feet, heat and pressurization can be retained in the cabin by placing the cabin pressure selector switch in OFF. As the engines decelerate, the generators trip off the line; therefore, the battery is the only source of electrical power. When descending from 43,000 feet, place the cabin pressure selector switch in RAM to avoid canopy and windshield fogging.

If dual engine flame-out occurs, do this:

1. Place the battery switch in OFF.
2. Turn off all electrical equipment.
3. If flame-out occurred at an altitude above 43,000 feet, turn the battery switch to ON and reposition the cabin pressure selector switch to OFF. Make a rapid descent to below 30,000 feet if the glide distance of an airfield is not critical.

   If the flame-out occurred at an altitude below 43,000 feet, turn the battery switch to ON and reposition the cabin pressure selector switch to RAM. Descend to a safe relight altitude.
4. Refer to procedures listed under DUAL ENGINE AIR START PROCEDURE.

DUAL ENGINE AIR START PROCEDURE.

1. Place the battery switch in ON.
2. Place the No. 1 inverter switch in ON.
3. Check the fuel quantity and realign the fuel selector switches to the fullest tank.
4. Turn off the battery switch and the NO. 1 inverter switch.
5. Follow the procedures as outlined under ENGINE RESTART IN FLIGHT in this section.

Note

Start one engine at a time. If the first starting attempt is unsuccessful, try to start the second engine before making a second attempt to start the first engine.

LANDING WITH BOTH ENGINES INOPERATIVE. (See figure 3-2.)

Landing with both engines inoperative is mechanically feasible. All flight control systems operate normally, although trim may not be available because of the loss of electrical power. The engine windmilling rpm at normal glide speeds is below rpm required to produce electrical power from the generators. Therefore, because only battery power remains, plan to land without the use of trim, wing flaps, or dive brakes. However, sufficient hydraulic pressure will probably be available to permit extremely slow operation of all hydraulically operated units. Thus, the units desired may be used if they can be electrically actuated by remaining battery power.

In preparing for a landing with both engines inoperative, do this:

1. Establish a glide speed of approximately 160 knots.
2. At approximately 10,000 feet above the terrain, place the landing gear lever DOWN and pull emergency landing gear down handle. (Use of the emergency landing gear down handle conserves battery power.)
3. Select a high key point to the right of the runway, approximately 5,000 feet above the terrain.
4. Proceeding through a 360° approach, select a low key point approximately 1500 feet above the terrain. This point should be at the turn from downwind to base leg, 1 mile to the side of the runway, and 1 mile downwind from the end of the runway.
5. Turn base leg and establish an airspeed between 140 and 150 knots.

Note

This pattern is recommended for headwinds under 10 knots. For headwinds of greater velocity, reduce the turning radius between the high and low key point so that the low key point is closer to the runway.

6. Turn on final approach, establish an airspeed between 120 and 130 knots, and S-turn, fishtail, or sideslip to lose excessive altitude.
7. When positive of correct position relative to the runway, lower the flaps for the landing, provided that enough battery power remains to actuate the flap system.

Note

If the flap system can be electrically actuated with remaining battery power, flap operation will be extremely slow as hydraulic pressure is being produced only by the windmilling engines at low rpm.

SINGLE ENGINE GO-AROUND.

WARNING

You are committed to land when making single engine approaches at less than 500 feet with flaps and gear extended. Under these conditions, do not attempt a go-around and make the decision to go around before the flaps are extended.

If it is necessary to make a go-around, perform these operations:

1. Apply power gradually to maintain positive control.

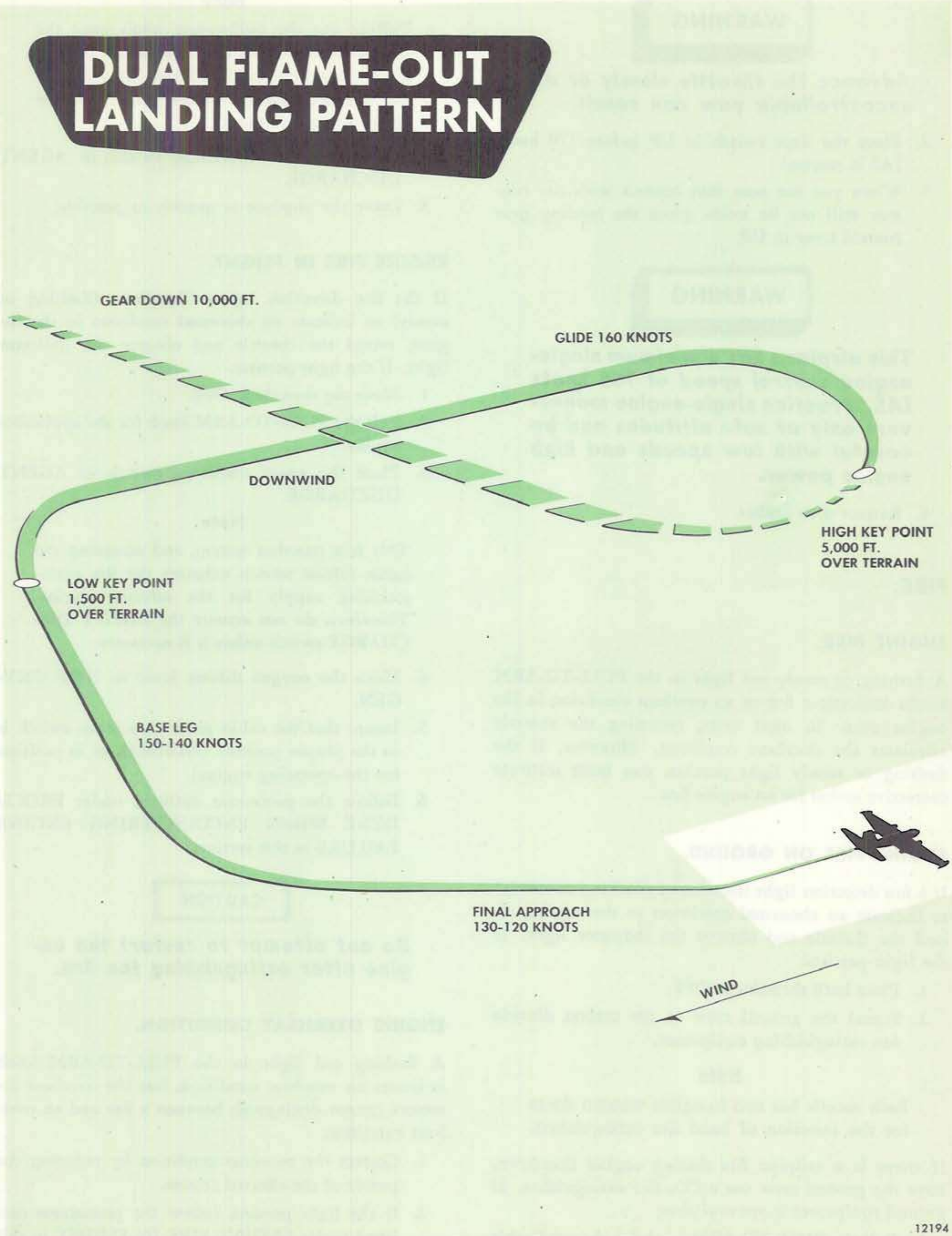

DUAL FLAME-OUT
LANDING PATTERN
GEAR DOWN 10,000 FT.
GLIDE 160 KNOTS
DOWNWIND
HIGH KEY POINT
5,000 FT.
OVER TERRAIN
LOW KEY POINT
1,500 FT.
OVER TERRAIN
BASE LEG
150-140 KNOTS
FINAL APPROACH
130-120 KNOTS
WIND
12194

Figure 3-2

WARNING

Advance the throttle slowly or an uncontrollable yaw can result.

2. Place the flaps switch in UP before 170 knots IAS is reached.
3. When you are sure that contact with the runway will not be made, place the landing gear control lever in UP.

WARNING

This airplane has a minimum single-engine control speed of 155 knots IAS. Practice single-engine maneuvers only at safe altitudes and be careful with low speeds and high engine power.

4. Retract dive brakes.

FIRE.

ENGINE FIRE.

A flashing or steady red light in the PULL-TO-ARM knobs indicates a fire or an overheat condition in the engine area. In most cases, retarding the throttle alleviates the overheat condition. However, if the flashing or steady light persists, you must institute corrective action for an engine fire.

ENGINE FIRE ON GROUND.

If a fire detection light illuminates (flashing or steady) to indicate an abnormal condition in the engine, retard the throttle and observe the indicator light. If the light persists:

1. Place both throttles in OFF.
2. Signal the ground crew to use carbon dioxide fire extinguishing equipment.

Note

Each nacelle has two frangible wooden doors for the insertion of hand fire extinguishers.

If there is a tailpipe fire during engine shutdown, have the ground crew use a CO_2 fire extinguisher. If ground equipment is not available:

1. Pull the PULL-TO-ARM knob for the applicable engine.

Note

Pulling out the pull-to-arm knob stops the flow of fuel and hydraulic fluid to the engines, closes the air bleed shut-off valves to the air-conditioning system, and arms the agent discharge switch.

2. Place the agent discharge switch in AGENT DISCHARGE.
3. Leave the airplane as quickly as possible.

ENGINE FIRE IN FLIGHT.

If the fire detection lights illuminate (flashing or steady) to indicate an abnormal condition in the engine, retard the throttle and observe the indicator light. If the light persists:

1. Move the throttle to OFF.
2. Pull the PULL-TO-ARM knob for the applicable engine.
3. Place the agent discharge switch in AGENT DISCHARGE.

Note

This is a one-shot system, and actuating the agent release switch exhausts the fire extinguishing supply for the affected engine. Therefore, do not actuate the AGENT DISCHARGE switch unless it is necessary.

4. Move the oxygen diluter lever to 100% OXYGEN.
5. Insure that the cabin pressure selector switch is in the proper position (NORMAL or in position for the operating engine).
6. Follow the procedure outlined under PROCEDURE WHEN ENCOUNTERING ENGINE FAILURE in this section.

CAUTION

Do not attempt to restart the engine after extinguishing the fire.

ENGINE OVERHEAT CONDITION.

A flashing red light in the PULL-TO-ARM knob indicates an overheat condition, but the overheat detectors cannot distinguish between a fire and an overheat condition.

1. Correct the overheat condition by reducing the power of the affected engine.
2. If the light persists, follow the procedures outlined under ENGINE FIRE IN FLIGHT in this section.

WING OR FUSELAGE FIRE.

A fire in the fuselage or the wing cannot be extinguished in flight.

1. If a system is afire, shut it off immediately.
2. If the fire gets out of control, abandon the airplane.

FIRE IN FLIGHT COMPARTMENT.

In the event of a fire in the flight compartment:

1. Connect the oxygen masks.
2. Set the oxygen regulator diluter lever to 100% OXYGEN.
3. Use the hand fire extinguisher.
4. Place the cabin pressure selector switch in RAM.
5. If the fire gets out of control, abandon the airplane.

ELECTRICAL FIRE.

Circuit breakers and fuses protect most of the circuits and tend to isolate an electrical fire. However, if the source of the fire cannot be determined, turn off all electrical equipment not absolutely essential for flight in order to isolate the fire. If you can locate the source of the fire by this procedure, gradually restore all circuits to operation except those causing or affected by the fire. If smoke or fumes are present during or after the fire proceed as follows:

CAUTION

Above an altitude of 26,000 feet, engine flame-out will almost certainly occur if there is not at least one fuel tank boost pump feeding fuel directly to the engine. Therefore, if the boost pumps must be turned off, you must descend to below 26,000 feet.

1. Cabin pressure selector switch	As required
2. Oxygen mask	Connected
3. Oxygen diluter lever	100% OXYGEN
4. Hand fire extinguisher	As necessary

Note

To prevent rapid blow-off of cabin air at high altitude, place the cabin pressure selector switch in OFF.

5. Gradually restore electrical power to determine the source of fire.

CAUTION

Make sure that the electrical circuit involved is isolated before restoring complete power.

If the source of the electrical fire is not determined, land as soon as possible, or if the fire is serious enough, abandon the airplane.

ELIMINATION OF SMOKE OR FUMES.

In the event of heavy smoke or toxic fume concentration in the flight compartment, do this:

1. Determine which engine might be causing the smoke or fumes by placing the cabin pressure selector switch in the NO. 1 ENG and then in the NO. 2 ENG position. If this reveals that the engines are the source of the smoke or fumes, then proceed with step 2 or 3.
2. If below 42,000 feet cabin altitude:

Oxygen mask	Connected
Oxygen regulator diluter lever	100% OXYGEN
Cabin pressure selector switch	RAM

3. If above 42,000 feet cabin altitude, make a rapid descent to below 42,000 feet and purge the cabin air by placing the cabin pressure selector switch in RAM.

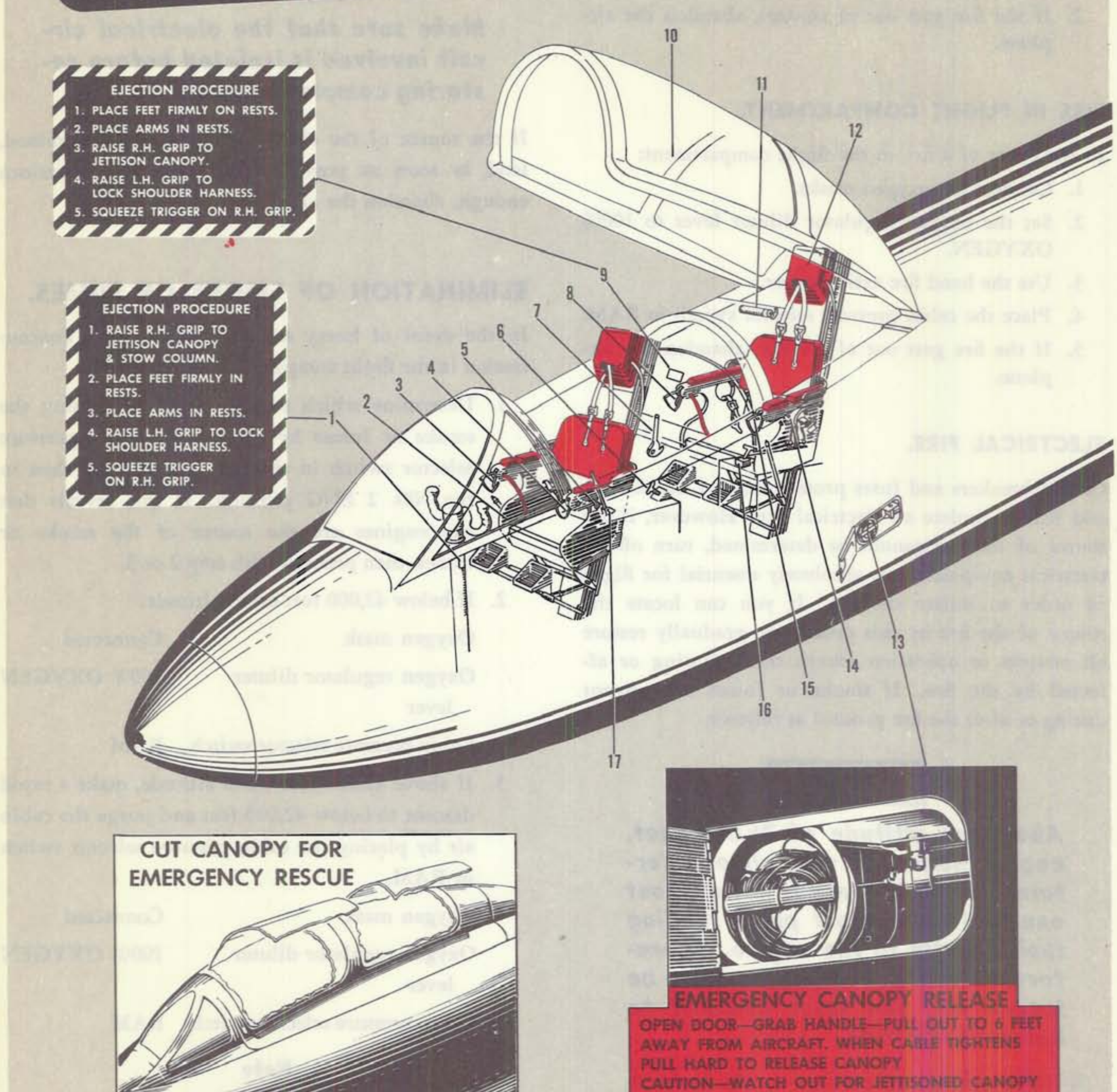
Oxygen mask	Connected
Oxygen regulator diluter lever	100% OXYGEN
Cabin pressure selector switch	RAM

Note

Ram air at high altitudes may be extremely cold. Do not leave the cabin pressure selector switch in RAM too long.

If the source of smoke is not due to malfunctioning of the air conditioning system, retain heat in the cabin by placing the cabin dump switch in the on position and leaving the cabin pressure selector switch in NORMAL.

EMERGENCY EQUIPMENT AND EXITS



1. PILOT'S EJECTION PLACARD
2. PILOT'S SEAT
3. PILOT'S (R GRIP) CANOPY JETTISON CONTROL, COLUMN STOWAGE, AND EJECTION CONTROL
4. PILOT'S (L GRIP) INERTIA REEL LOCK CONTROL
5. PILOT'S INERTIA REEL LOCK CONTROL
6. PILOT'S EMERGENCY CANOPY RELEASE
7. CRASH AXE
8. INSTRUCTOR PILOT'S (R GRIP) CANOPY JETTISON AND EJECTION CONTROL
9. INSTRUCTOR PILOT'S EJECTION PLACARD
10. JETTISONABLE CANOPY
11. HAND FIRE EXTINGUISHER (C.B.)
12. INSTRUCTOR PILOT'S SEAT
13. EXTERIOR EMERGENCY CANOPY RELEASE
14. INSTRUCTOR PILOT'S INERTIA REEL LOCK CONTROL
15. INSTRUCTOR PILOT'S (L GRIP) INERTIA REEL LOCK CONTROL
16. INSTRUCTOR PILOT'S EMERGENCY CANOPY RELEASE
17. HYDRAULIC HAND PUMP

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Figure 3-3

LANDING EMERGENCIES.

LANDING WITH GEAR RETRACTED.

CAUTION

Whenever the terrain is unknown or unsuited for forced landing, use the ejection seat to escape from the airplane rather than attempt a forced landing. The probability of receiving severe injuries from a forced landing under adverse conditions is very high. The minimum safe ejection altitude in level flight for upward ejection seats with automatic seat belt and manual chute is 1000 feet. The minimum safe ejection altitude with automatic seat belt and an automatic parachute is 500 feet, provided the parachute lanyard is attached to the seat belt.

If it should be necessary to land with the landing gear retracted, proceed as follows:

1. Notify the other crew member to prepare for a crash landing.
2. Advise the control tower of the existing emergency and request an application of foam to the runway when time of landing has been determined.
3. Reduce the fuel load but retain empty or nearly empty tip tanks.

Note

If wing tip tanks are installed and they are full of fuel, actuate the tip tank jettison switch. If the tip tanks are empty, or nearly empty retain them; they will act as skids and will prevent a wing tip from digging in, especially on soft surfaces, and causing the airplane to cartwheel.

4. Jettison all internal and external stores and close the bomb door.
5. Unfasten the parachute harness buckles and readjust safety belt and shoulder harness.
6. Turn off all unneeded electrical equipment.
7. Set up landing pattern using a flat, power-on approach.
8. Jettison the canopy when airspeed reduces to 180 knots IAS or below.

WARNING

Before pulling the canopy emergency release handle, bottom the ejection seat to avoid any possibility of being struck by the canopy.

9. Just before touchdown perform the following:
   a. Place the throttle in OFF.
   b. Pull the pull-to-arm knobs and place the agent discharge switch in the AGENT DISCHARGE position.
   c. Lock the shoulder harness.

CAUTION

You cannot bend forward when the inertia reel is locked; therefore, before locking the reel, cut all switches not accessible from the locked position.

   d. Disconnect the radio cord and oxygen hose.
   e. Place the battery and generator switches in OFF.
   f. Make contact with the ground in a normal-landing attitude at the lowest possible airspeed and rate of descent consistent with safe control of the airplane. Do not stall in. If necessary, "stick" the airplane on the ground.
10. After the airplane comes to a complete stop, get out as soon as possible.

LANDING WITH ONE MAIN GEAR UP OR UNLOCKED.

If one main gear remains in the up position or does not lock in the down position, retract the gear and make a wheels-up landing in accordance with the instructions under LANDING WITH GEAR RETRACTED.

LANDING WITH MAIN GEAR EXTENDED AND NOSE GEAR UP OR UNLOCKED.

Touch down on main gear and hold the nose off the runway as long as possible.

LANDING WITH FLAPS UP.

When landing without the use of wing flaps, add approximately 10 knots to speeds used during a normal landing.

EMERGENCY EXIT.

Two methods of emergency exit from the airplane are available. In flight, use the ejection seat system. If the airplane is on the ground and emergency exit is necessary, do this:

1. Insert seat safety pins.
2. Actuate the canopy control switch to OPEN.
3. If the canopy control switch fails to open the canopy, pull the canopy emergency release handle (pilot's or instructor pilot's) to jettison the canopy.

CAUTION

Watch out for the jettisoned canopy.

4. If the canopy cannot be opened according to the procedures in 2 and 3, use the crash ax to chop through the canopy.

EMERGENCY ENTRANCE.

To gain emergency entrance to the airplane on the ground, follow the procedures shown in figure 3-3.

DITCHING.

Ditching is a last resort. Since all survival equipment is carried by the crew on their persons, there is no advantage to be gained in riding the airplane down. However, if altitude is not sufficient for bail-out and ditching is unavoidable, do this:

1. Notify the other crew member to prepare for ditching.
2. Place the IFF switch in EMERGENCY.
3. Actuate the master jettison switch if it is desirable to jettison stores and tip tanks.

Note

The construction of the rotary bomb door is such that the presence of bombs on the closed door may tend to reduce the cave-in of the door. If the tip tanks are empty and the sea is calm, do not jettison the tanks as they will provide additional buoyancy.

4. If stores are jettisoned, place the bomb door switch in CLOSE.
5. Check that the landing gear lever is in UP.

CAUTION

The landing gear must be retracted. If the gear is extended, the airplane will dive into the water upon contact.

6. Place the dive brakes switch in EXTEND.
7. Place the wing flaps switch in DOWN.
8. Disconnect all personal equipment except the oxygen hose.
9. Unbuckle the parachute harness.
10. When the airspeed has dropped to 180 knots IAS or less, jettison the canopy by pulling the canopy emergency release handle.
11. Check that the seat belt and shoulder harness are secure and lock the inertia reel.

CAUTION

The pilot cannot bend forward when the inertia reel is locked. Therefore, cut all switches not accessible before locking the inertia reel.

12. Insert the seat safety pins.
13. Make the landing into the wind. If the sea is rough, land in a direction parallel to the waves and on top of a wave crest if possible.
14. Place the throttles in OFF.
15. Make the touchdown as slowly as possible with a slightly nose-high attitude.
16. After the airplane has stopped, abandon it immediately; the airplane may sink rapidly.

Note

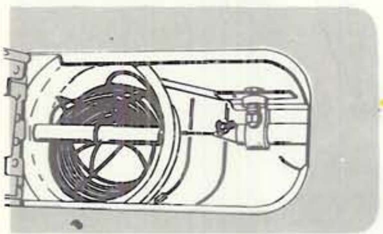
In the event of ditching and sinking in water where you find yourself unable to immediately escape due to any number of factors, it is possible for you to survive under water with your oxygen equipment until you can free yourself and escape. The diluter-demand-type oxygen regulator is a suitable under-water breathing device when the regulator is set at 100% OXYGEN. The mask must be in place and tightly strapped, and that the regulator must be set at 100% OXYGEN, but remember the bail-out bottle cannot be used under water.

SEAT EJECTION.

When immediate escape from the airplane is necessary follow the procedures shown on figure 3-5.

EMERGENCY ENTRANCE AND EXIT

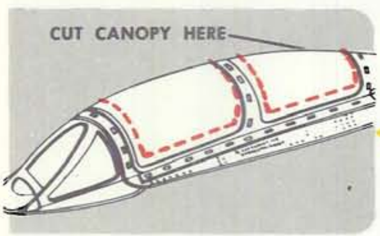
1\. If the canopy has not been jettisoned by the pilot, and time and conditions permit, actuate the external canopy release switch to the UP position and use the hydraulic hand pump to open the canopy.



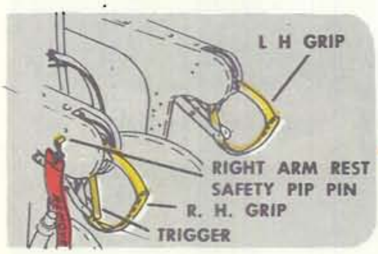
2\. If the canopy will not open electrically, open the canopy emergency release door, pull the handle out to six feet away from the airplane. When the cable tightens, pull hard to release the canopy.

WARNING

WATCH OUT FOR THE JETTISONED CANOPY



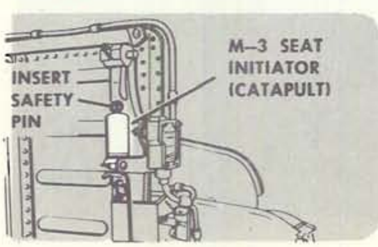
3\. If the canopy cannot be removed after performing steps 1 and 2, chop openings in the canopy with a fire ax as shown.



4\. If both seat hand-grips are in the normal (down) positions, complete the rescue operation.

WARNING

Keep clear of the seat hand-grips at all times. If the right-handgrip is inadvertently raised by rescue personnel, the canopy remover will be fired, and the trigger may be accidentally actuated and the seat ejected.



5\. If the right-hand grip is raised, the seat catapult will be armed to fire, therefore, before continuing rescue operations, a safety pin must be inserted in the M-3 seat catapult initiator to prevent inadvertent firing of the ejection seat.

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Figure 3-4

EJECTION PROCEDURES

1 RAISE RIGHT AND LEFT GRIP TO JETTISON CANOPY, STOW AND LOCK SHOULDER HARNESS.

2 PLACE FEET FIRMLY IN RESTS.

3 PLACE ARMS IN RESTS.

NOTE: IF AT HIGH ALTITUDE PULL PLUG ON BAILOUT BOTTLE.

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Figure 3-5 (Sheet 1 of 2)

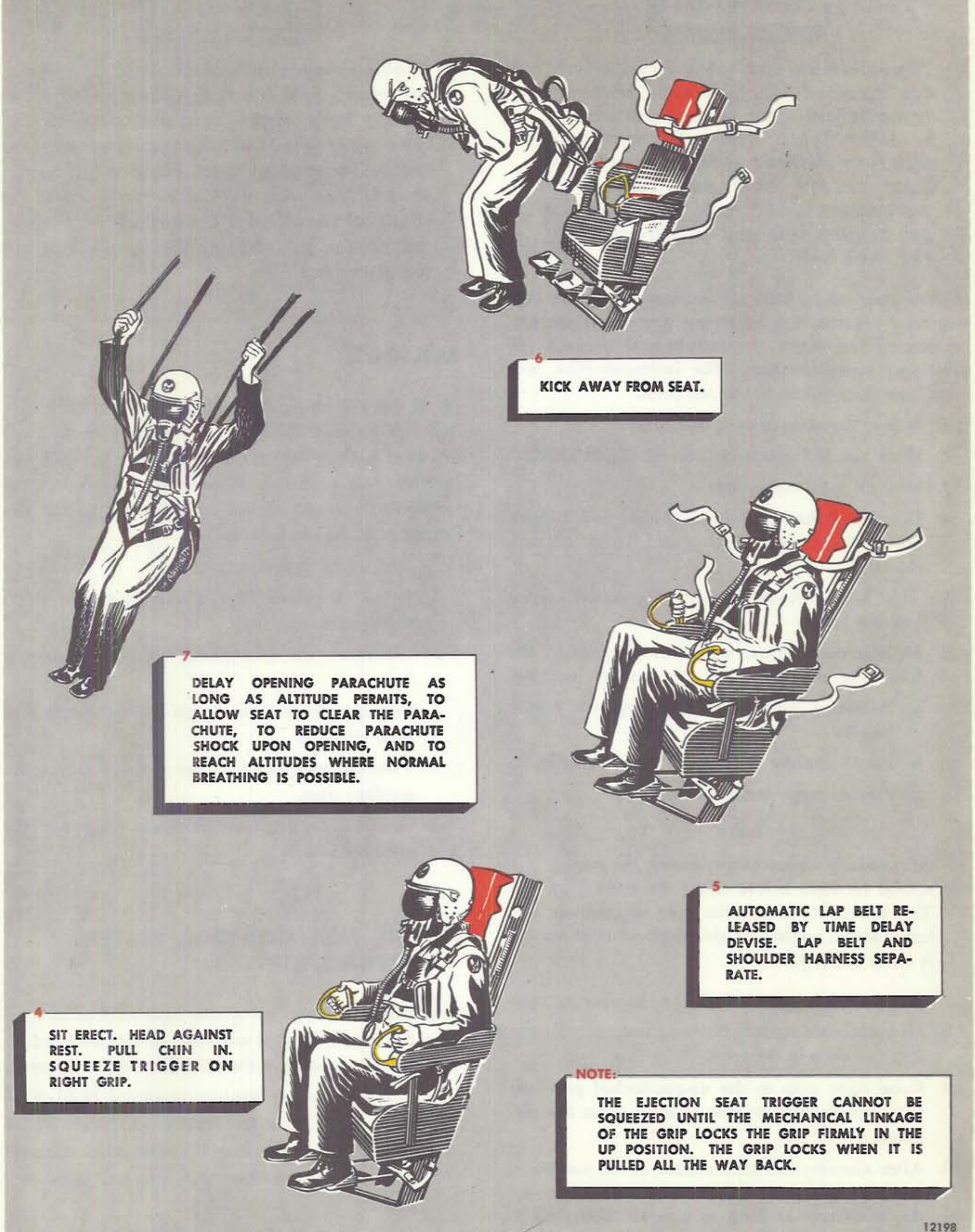

Figure 3-5 (Sheet 2 of 2)

WARNING

The minimum safe ejection altitude for upward ejection seat with automatic belt and manual parachute is 1000 feet. The minimum safe ejection altitude with an automatic seat safety belt and automatic parachute is 500 feet, provided the parachute lanyard is attached to the seat belt.

If immediate escape from the airplane is not necessary and time permits, the following procedures are recommended and are to be coordinated between the pilot and instructor-pilot. The instructor-pilot will eject from the airplane before the pilot.

1. Follow the radio distress procedure.
2. Place the IFF master switch in EMERGENCY.
3. Stow all loose equipment.
4. Disconnect the microphone headset lead, oxygen hose, and helmet defogging lead if they are connected.
5. If at high altitude, pull the plug on the oxygen bail-out bottle.
6. Jettison the canopy, using the controls in the following sequence until the canopy jettisons:
   a. Instructor pilot's canopy emergency release handle.
   b. Pilot's canopy emergency release handle.
   c. Pilot's canopy control switch.

   Note

   All available means of jettisoning the canopy should be tried before using the right grip. This procedure allows the pilot to maintain longitudinal control of the airplane until he is ready to eject.

7. Raise the left grip to lock the shoulder harness.
8. Sit erect, head against the head rest, chin in, and feet and arms in the rests.
9. Raise right grip to the up-and-locked position; then squeeze the trigger to eject from the airplane.
10. After ejecting and after release of the automatic seat belt, kick free of the seat and delay opening the parachute as long as altitude will permit. This procedure will prolong the duration of the oxygen in the bail-out bottle.

WARNING

Normal longitudinal control of the airplane will be lost after raising the pilot's right grip because of the operation of the control column stowage system. Under these conditions you will have only very limited longitudinal control of the airplane by using the stabilizer trim switch.

BAIL-OUT.

In all cases of emergency exit in flight, use the ejection seat system. This is the safest method of escape in either high or low speed flight since it avoids the possibility of colliding with the empennage. If the ejection seat system should malfunction, use the following procedure to bail out:

1. Stow all loose equipment.
2. Jettison the canopy by pulling the canopy emergency release handle.
3. Disconnect the microphone headset and oxygen hose.
4. Pull the plug on the oxygen bail-out bottle if at high altitude.
5. Trim the stabilizer full nose down; then roll the airplane over.
6. Unfasten the seat safety belt and fall out of the airplane.

ENGINE FUEL CONTROL SYSTEM MALFUNCTION.

If an engine fuel control system malfunctions, as indicated by a loss of power and drop in fuel flow indication, attempt to correct the condition in this manner:

1. Check all circuit breakers placarded FUEL SYSTEM VALVES and FUEL SYSTEM PUMPS for proper setting and reset if necessary. If this does not correct the condition proceed with step No. 2.
2. Place the emergency fuel control switch of the malfunctioning engine in EMERGENCY.

CAUTION

If the engine fuel control system fails on take-off or up to 6000 feet, you can transfer to the emergency fuel system at FULL throttle, if the engine has not dropped below 85% at the time of transfer. Under all other conditions retard the throttle to IDLE prior to the transfer. Failure to do this causes excessive exhaust gas temperatures, rich flame-out and/or compressor stall. The emergency fuel control does not incorporate the compensatory features of the normal fuel control. Therefore, rpm and exhaust temperature limits may be exceeded if you do not make accelerations slowly and smoothly.

3. If the use of emergency fuel control does not correct the condition and the engine is still operating, refer to PARTIAL POWER FAILURE in this section.
4. If the use of emergency fuel control does not correct the condition and the engine has flamed-out, attempt to start the engine as described under ENGINE RE-START IN FLIGHT in this section.

ENGINE-DRIVEN FUEL PUMP FAILURE.

If both main pumps of the engine-driven fuel pump assembly fail completely, engine flame-out results and the engine cannot be restarted. Normal engine operation will not be affected, however, by the loss of one gear pump or by the loss of one gear pump and the centrifugal pump, provided that the boost pumps of the airplane fuel system are operating.

AIRPLANE FUEL SYSTEM FAILURE.

NO. 1 OR NO. 2 FUSELAGE TANK BOOST PUMP FAILURE.

The No. 1 and No. 2 fuselage tanks each have two boost pumps and it is unlikely that all four pumps would fail simultaneously. In the event of boost pump failure, do this:

1. Check that all fuel system circuit breakers are on or in.

CAUTION

Above an altitude of about 26,000 feet, engine flame-out will almost certainly occur if there is not at least one fuel tank boost pump feeding fuel directly to the engines. Since fuel is normally fed from the No. 1 tank to the engines, this means that if both boost pumps in that tank are inoperative, normal flight above approximately 26,000 feet is not possible. Under these conditions and just prior to flame-out, a rapid fluctuation of the fuel flow will be evident.

2. In the event of failure of both boost pumps in the No. 1 fuselage tank, position the fuel transfer and bypass valve knob to feed fuel directly to the engines from the No. 2 fuselage tank, the wing tanks, or the wing tip tanks. Turn the No. 1 fuselage boost pumps switch to OFF on Group C airplanes. If necessary, fuel may be recovered from the No. 1 tank even though the boost pumps have failed but continued flight is limited to altitudes below 26,000 feet due to the limited suction action of the engine-driven fuel pumps. Recover the fuel in the No. 1 fuselage tank only if the other tanks have been exhausted.

WARNING

When drawing fuel from the No. 2 fuselage tank or the wing tanks directly to the engines, observe the fuel quantity indicator to avoid flame-out. Delivery rates from the tip tanks are sufficient for satisfactory engine operation only at low power and at low altitudes.

3. If both No. 2 fuselage tank boost pumps fail below 26,000 feet, fuel may be recovered by positioning the fuel transfer and bypass valve knob to the flow to engines position and by placing the No. 2 fuselage tank knob in the flow position. Under these conditions, the No. 1 fuselage tank boost pumps should be off on Group C Airplanes.

NO. 1 FUSELAGE TANK FUEL LEVEL SHUT-OFF VALVE FAILURE.

Malfunctioning of the No. 1 tank fuel level shut-off valve will cause large quantities of fuel to be dumped overboard out of the fuselage vent mast. This will generally be noticeable prior to take-off. However, during flight, if the airplane is apparently consuming abnormally large amounts of fuel, temporarily halt the transfer of fuel to the No. 1 tank and check to see that all fuel vent circuit breakers are in and that the fuel consumption is normal from the No. 1 tank to the engines and from all other tanks to the No. 1 fuselage tank. If fuel consumption is abnormally high from the No. 1 fuselage tank, the valve is malfunctioning. Transfer fuel intermittently to the No. 1 tank as needed without relying on the No. 1 fuselage tank fuel level shut-off valve.

WING TANK BOOST PUMP FAILURE.

Failure of a wing tank boost pump prevents the flow of fuel from that tank. Trim change and fuel quantity indication enable the pilot to determine the operation of the wing tank boost pump. If a wing tank boost pump is inoperative, check the applicable circuit breaker before turning off the wing-tank—tip-tank selector switch. If fuel fails to flow from any one of the wing or tip tanks causing extensive lateral trim correction, draw fuel from the opposite tank in the same wing to decrease the necessary lateral trim correction. For example, if the left tip tank fails to supply fuel while the right tip tank supplies fuel normally, and an out-of-lateral trim condition occurs, discontinue drawing fuel from the right and left tip tanks and draw fuel from the left wing tank until the lateral trim returns to neutral. Continue drawing fuel from the tanks in any manner that maintains lateral trim. Refer to procedures under TIP TANK FUEL SYSTEM FAILURE in this section.

TIP TANK FUEL SYSTEM FAILURE.

Excessive use of aileron trim may indicate uneven feeding from a tip tank. Maneuver the airplane in an attempt to start the flow of the fuel from the tip tank by inducing positive and negative G loads. If these maneuvers fail to start the fuel flow, check the aileron control above 10,000 feet with the aircraft in landing configuration. After establishing the amount of aileron control required to maintain level flight, jettison the heavy tank, if necessary. (See TIP TANK JETTISON in this section). If the heavy tip tank cannot be emptied or jettisoned, empty the wing tank on the heavy side and leave the wing tank on the light side full to create the best landing situation. Although landings have been made with one tip tank empty and the other full, do not attempt them unless it is absolutely necessary and then only under the best conditions. Make your touchdown at a speed approximately 130 knots to maintain lateral control with full aileron.

BOMB DOOR FERRY TANK BOOST PUMP FAILURE.

If the boost pump in the bomb door ferry tank fails, place the ferry tank boost pump selector switch in OFF and select the next tank to be used. Fuel in the ferry tanks cannot be recovered nor can the tank be jettisoned.

TIP TANK JETTISON.

To jettison the tip tanks, place the tip tank jettison switch in TIP TANK ONLY. The tip tanks will also jettison if the master jettison switch is actuated and the tip tank jettison switch is in NORMAL. It is not necessary to turn the wing tip tank fuel selector knob to OFF when jettisoning, because a flapper valve closes the line. Do not jettison empty tip tanks above 365 knots; full tip tanks under 160 knots.

BOMBS AND EXTERNAL STORES JETTISON.

During an emergency, all bombs and external stores can be jettisoned in an unarmed condition by momentarily actuating the master jettison switch.

Note

If the wing tip tanks are to be retained the tip tank jettison switch must be OFF. If the tip tank switch is in NORMAL when the master jettison switch is actuated, the wing tip tanks will be jettisoned as well as the stores.

ENGINE OIL PRESSURE FAILURE.

GROUND OPERATION.

Normal operating oil pressure is between 20 and 35 psi. Oil pressure between 10 and 20 psi and between 35 and 40 psi is undesirable; however, it is possible to operate the engines extensively within these pressure areas. Retard the throttle to reduce oil pressure in excess of 40 psi. Stop the engine and land as soon as possible when the oil pressure falls below 10 psi. One minute of continuous engine operation with zero oil pressure is satisfactory for continued service. Over one minute but less than two and one-half minutes is satisfactory for continued service, provided:

1. No abnormal engine noise exists.
2. The oil pressure pump strainer and the oil scavenge pump are checked and found free of metallic particles.
3. No indication of damage or metallization exists. No oil pressure for a period exceeding two and one-half minutes is cause for engine removal.

IN FLIGHT.

One minute of continuous engine operation with zero oil pressure is permissible. Over one minute but less than two and one-half minutes engine operation may be continued at the pilot's discretion; after landing, inspection should be made as in items No. 1 to No. 3 of ENGINE OIL PRESSURE FAILURE, GROUND OPERATION, this section.

ELECTRICAL POWER SUPPLY SYSTEM FAILURE.

GENERATOR FAILURE.

1. If a generator fails, as indicated by voltage reading of zero, a loadmeter reading of zero, the generator indicator light being on, and normal indications for the remaining three generators, place the indicated generator switch in OFF. No monitoring of the electrical load is required. (See figure 3–6.)
2. If a generator fails, as indicated by a loadmeter reading of zero and the generator indicator light being on, but with a normal voltage reading and the remaining three generators indicating normal:
   a. Place the indicated generator switch momentarily in RESET and return it to ON.
   b. If the generator indicator light is out and the loadmeter indication is normal, leave the generator switch in ON.
   c. If the generator indicator light remains on and the loadmeter indicates a zero reading, place the generator switch in OFF.
   d. No monitoring of the electrical load is required.
3. If a generator fails, as indicated by a low voltage reading and a high loadmeter reading:
   a. Place the generator switch for the indicated generator in OFF.
   b. Check the loadmeters of the remaining generators for indications that the electrical load is approximately in balance.
   c. No monitoring of the electrical load is required.
4. If any two generators fail (assuming both engines are operating) and either or both cannot be reconnected to the electrical system by following the procedures given in 1, 2, and 3 above:
   a. Place both indicated generator switches in OFF.

CAUTION

For two-generator operation at 50,000 feet altitude and cruise-combat speeds, the amount of monitoring required is high and the type of equipment that must be shut off may reduce the effectiveness of some missions and may even preclude the completion of others. Two operating generators have a system capacity of 396 amperes (0.65 per loadmeter, 1.3 total), while the predicted maximum continuous amperes required for this flight condition is 542 amperes (0.9 per loadmeter, 1.8 total) or 146 amperes (0.25 per loadmeter, 0.5 total) more than two-generator output. Therefore, it is extremely important that the electrical loads be monitored to prevent overloading the generators.

   b. One way to obtain the required amount of monitoring is to limit the use of fuel pumps to two at a time and to turn off both the S–4 Shoran and the APG–31 Gun Ranging Radar. The electrical system loading will then be below the system's two-generator capacity and will operate safely.

Note

For two-generator operation at altitudes of 36,500 feet and below, no monitoring is required.

ELECTRICAL FAILURE

NO. OF GENERATORS OPERATING	NO. OF ENGINES OPERATING	BATTERY POWER	MAXIMUM ALLOWABLE LOADMETER READING PER GENERATOR	GENERATING SYSTEM OUTPUT (AMPERES)	REMARKS
4	2	Yes	.7*	792	Normal operation, 50,000 ft. altitude no monitoring required.
3	2	Yes	.7*	594	Normal operation, 50,000 ft. altitude. No monitoring required.
2	2	Yes	.7*	396	Unnecessary loads must be monitored. Maximum loadmeter reading at 50,000 ft. altitude is .7.
1	2	Yes	.7*	220	Unnecessary loads must be monitored. Maximum loadmeter reading at 50,000 ft. altitude is .7.
0	2	Yes	0	Depends upon conditions of battery†	Since fuel booster pumps are necessary at altitudes above 26,000 ft. the battery can be used to operate necessary fuel booster pumps during let down to 26,000 ft. It is imperative that all loads except necessary fuel booster pumps and standby instrument inverter be turned off.
0	2	No	0	0	No power available for flight instruments or for relite in case of flame-out. Engines will probably flame-out when operating above 26,000 ft. with no power for the fuel booster pumps. The center of gravity cannot be controlled without fuel booster pumps.
2	1	Yes	.95	540	The altitude for single-engine operation is limited to 36,500 ft. Tactical mission considered aborted. No monitoring of loads required for all other remaining operating conditions.
1	1	Yes	.95*	300	Altitudes limited to 36,500 ft. Loads (all but 2 fuel pumps) shall be monitored so that loadmeter reading of remaining generator does not exceed 1.0.
0	1	Yes	0	Depends upon condition of battery†	Altitude limited to approximately 26,000 ft. Supply loads on battery bus only. Preserve battery for relite attempts in case of flame-out. (Battery switch in OFF position.)
0	1	No	0	0	Altitude limited to approximately 26,000 ft. No electrical power available.
0	0	Yes	0	Depends upon condition of battery†	Only battery bus should be energized. (Battery switch in OFF position.) Engine relight is possible depending upon the condition of the battery.
0	0	No	0	0	Refer to glide distance in this section. No electrical power available.

† Life expectancy of battery depends upon the state of charge, its temperature, and rate of discharge.

*Maximum allowable loadmeter readings at different altitudes.

ALT. FEET	ALLOWABLE LOAD PER GENERATOR	
	Amperes	Aircraft loadmeter reading
Ground Operation	110	.35
S.L. to 35,000	300	1.0
40,000	280	.9
45,000	245	.8
50,000	220	.7

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Figure 3-6

5. If two generators are lost because of engine failure:
   a. Place both generator switches for the malfunctioning engine in OFF.
   b. No monitoring of electrical load is required.

Note

The capacity of the two operating generators at the airplane's single engine service ceiling is sufficient to supply the electrical system without monitoring.

6. If two generators are lost because of engine failure and one of the remaining generators fails, as indicated by any of the conditions in paragraphs 1 through 3:
   a. Place the generator switches for the inoperative generators in OFF.

Note

As a result of an engine failure, the mission will probably have to be aborted. The system's electrical loads should be monitored, commensurate with the gross weight of the airplane and the altitude at which it is flying. The electrical load must not exceed the electrical system's capacity for single-engine, single-generator operation so that the effectiveness of the airplane will be maintained on the return flight to base. The generator rating for maximum operational altitude of 36,500 feet, for light gross weight is 294 amperes 0.95 loadmeter reading.

   b. Monitoring may be done by turning off power for special weapons, bomb control, gun ranging radar, gun charging, gun heaters, recirculating blower, Radar Beacon APW-11A, inverters, and by limiting the use of fuel boost pumps to two at a time.

7. If all four generators indicate failure:
   a. Immediately place the battery switch in OFF if the airplane is below 26,000 feet altitude.

WARNING

Above an altitude of about 26,000 feet, engine flame-out occurs if there is not at least one fuel tank boost pump feeding fuel directly to the engines.

   b. Turn off all non-essential electrical loads.
   c. Place the battery switch in ON and, one at a time, place each generator switch in RESET, note the voltage, and place the switch in OFF.
   d. After checking all the generators, place the battery switch in OFF.
   e. If normal voltage is indicated by any or all generators, place the switch for the generators that indicated normal voltage in ON one at a time.
   f. If the electrical system is functioning properly, place the battery switch in ON and turn on needed electrical equipment.

CAUTION

Be careful not to overload the generator or generators now supplying the electrical system.

If none of the generators can be returned to the electrical system, leave the generators switches in OFF, leave the battery switch in OFF, and land as soon as possible.

Note

If it is necessary and sufficient battery power remain, the battery will operate the master jettison circuit, standby inverter circuits, and the C-4A lights. These circuits operate regardless of the position of the battery switch.

CIRCUIT BREAKERS.

If a circuit breaker opens disconnecting power to any circuit, it indicates an overload or short in that circuit. If the circuit breaker reopens after being reset, do not use that circuit.

NO. 1 AND NO. 2 INVERTER FAILURE.

If the No. 1 or No. 2 inverter fails during flight, the No. 1 and No. 2 inverter failure indicator light illuminates. If one of these lights should illuminate, place its respective inverter switch in OFF. Because there is no alternate source of power for the a-c circuits if the No. 1 or No. 2 inverter fails, all circuits supplied by the inoperative inverter will be out.

Note

When the No. 1 inverter fails during flight, the following instruments probably will retain the same readings as were indicated immediately prior to the No. 1 inverter failure: the fuel quantity gage, No. 1 and No. 2 engine oil pressure indicators, the No. 1 and No. 2 engine fuel flow indicators, and the main system hydraulic pressure indicator.

INSTRUMENT INVERTER FAILURE.

If the instrument inverter fails in flight, as indicated by the inverter failure light, place the instrument inverter switch in STANDBY. In this position, the standby instrument operates the flight attitude indicator and the J-2 compass.

Note

When the instrument inverter fails during flight, J-2 compass will retain the same reading as was indicated immediately before the inverter failed. The vertical gyro indicator will assume an erratic position.

COMPLETE ELECTRICAL FAILURE.

WARNING

Loss of boost pump pressure may cause erratic engine operation above an altitude of 26,000 feet. Engine flame-out will almost certainly occur if there is not at least one fuel tank boost pump feeding fuel directly to the engines. Since fuel is normally fed from the No. 1 fuselage tank to the engines, this means that if both the boost pumps in that tank are inoperative, normal flight above 26,000 feet is not possible. Under these conditions and just prior to flame-out, a rapid fluctuation of the fuel flow will be evident.

CAUTION

When electrical power has been lost, the emergency fuel control system cannot be put into operation.

Note

During complete electrical failure, all a-c instruments retain the same readings as were indicated immediately before the electrical failure occurred. All d-c instruments will assume an off-scale position or revert to zero.

If the entire electrical system fails or if it becomes necessary to turn off the battery and generators, much of the auxiliary equipment and many controls will be inoperative. Flight without electrical power is limited and should be conducted as follows:

1. If it is possible, reduce airspeed and adjust trim before turning off the electrical power. Trim control is not available without electrical power and the trim devices will continue to maintain the positions they had at the time of electrical failure.
2. The fuel system will not continue to operate if electrical power is not available. All fuel boost pumps, except the engine-driven fuel boost pump, will cease operation. Therefore, a reduction in altitude and rpm may be necessary for satisfactory engine operation.
3. If possible, check that the fuel transfer and bypass valve knob is in the flow from No. 1 tank position, before turning off electrical power. The No. 1 fuselage tank is the main service tank to which fuel from all other tanks is normally transferred. (This procedure is recommended since more fuel is in the No. 1 tank than in any other tank during flight.)

WARNING

If all electrical power is lost, the fuel quantity indicator is inoperative. However, the pointer remains in position and gives a false reading.

4. Land as soon as possible. The landing gear and bomb door will operate satisfactorily, but the flaps and dive brakes will be inoperative.

WARNING

The external stores, internal stores, and wing tip tanks cannot be released without electrical power.

HORIZONTAL STABILIZER SYSTEM MALFUNCTION. (GROUP C AIRPLANES)

The maximum speed at which a runway stabilizer can be safely controlled is 250 knots IAS. If stabilizer failure occurs at full nose-up trim, you can still make a flaps-up landing safely. If stabilizer failure occurs at full nose down trim, a full flaps landing can be made safely. If failure of the stabilizer normal control system should occur, do this:

1. Place the horizontal stabilizer control switch in ALT.

2. Actuate the stabilizer emergency control switch to position the stabilizer.

Note

When the horizontal stabilizer control override switch is in ALT, the aileron trim control system is inoperative.

HORIZONTAL STABILIZER MALFUNCTION. (GROUP D AIRPLANES)

Full nose-down trim failure can be controlled at maximum airspeeds using about 80 pounds of stick force for an airplane with an aft cg condition. With a forward cg condition, full nose-down trim failure can be controlled at maximum airspeeds using about 135 pounds stick force. Full nose-up trim failure cannot be overcome at maximum airspeeds. Under this condition the airplane will climb, the airspeed will decrease, and at about 350 knots IAS the trim can be overpowered to attain level flight. If failure of the stabilizer trim system occurs:

1. Place the stabilizer emergency switch in EMERG OFF.
2. Place the stabilizer POWER circuit breaker in OFF.

HYDRAULIC SYSTEM FAILURE.

If the hydraulic system fails, a wheel brake accumulator which is isolated from the main system by a check valve provides fluid for emergency operation of the wheel brakes. Emergency operation of the landing gear and bomb door is possible by the use of the pilot's hydraulic hand pump which supplies pressure to a duplicate pressure line to the control valves for the landing gear and bomb systems. There is enough fluid in the emergency portion of the hydraulic reservoir for opening the door and extending the landing gear. If the bomb door is closed at the time of hydraulic system failure, and it is necessary to open the door before landing in order to release the bomb load, the landing should be made with the door open. If, after approximately 50 strokes of the hand pump, there is no indication of pressure build-up or bomb door operation, make no further attempt to operate the bomb door. For other hydraulic system failures, see BRAKE SYSTEM FAILURE and LANDING GEAR EMERGENCY EXTENSION in this section.

EXCESSIVE HYDRAULIC FLUID TEMPERATURES.

Loss of accumulator precharge pressure is a major factor in attaining a high frequency of pressure oscillation and excessive hydraulic fluid temperatures. The temperature of the hydraulic fluid will become excessive when a high pressure drop is combined with high fluid flow over an extended period of time. This condition can also be the result of pressure regulator failure in the cut-in position requiring the output of both pumps to be passed through the main relief valve and will be evident by a continuous 3500 psi indication on the main hydraulic system pressure gage. High temperatures will occur in approximately 20 minutes. This may cause hydraulic system failure due to pump failure or loss of fluid through leakage induced by the high temperatures. Use of the emergency procedures described in this section will then be required for bomb door and landing gear operation. Excessive fluid temperatures can also be caused by very rapid continuous oscillation of system pressure, when the sub-circuits are not being operated, between the normal cut-in pressure of 2600 + 100 — 0 psi and the normal cut-out pressure of 3000 + 100 — 0 psi. Rapid fluctuation of system pressure is the result of considerable increase in the system internal leakage rate. Fluctuation of system pressure will be indicated by the main hydraulic system pressure gage. Operation of each sub-circuit may stop the internal leakage and fluctuation. The operation of one sub-circuit should be completed before actuating another. This will assist in determining the circuit in which internal leakage existed.

LANDING GEAR SYSTEM FAILURE.

MAIN LANDING GEAR EMERGENCY EXTENSION.

If the landing gear fails to extend in the normal manner, do this:

1. Place the landing gear lever in DOWN.
2. Pull the emergency landing gear down handle all the way out.
3. Operate the hydraulic hand pump.

Note

The hand pump requires approximately 100 to 150 strokes to extend the landing gear, and landing gear extension may require as much as three minutes.

CAUTION

If the bomb door is closed at the time of the hydraulic system failure and it is necessary to open the door before landing to release the bomb load, land with the door open. The emergency portion of the hydraulic reservoir contains only enough fluid for opening the bomb door and extending the landing gear.

NOSE LANDING GEAR EMERGENCY EXTENSION.

If the nose gear fails to extend normally, it can be the result of damage to the nose gear door locking mechanism. Reduce the airspeed well below the 200-knot limitation and apply sufficient engine power while attempting to extend the gear. If repeated cycling fails to obtain extension of the nose gear, operate the hand pump with the gear in the extended position. The forces on the hand pump will be exceedingly high but in some cases it will be possible to obtain slightly more pressure on the nose gear lock mechanism than by the normal system.

BRAKE SYSTEM FAILURE.

In the event the main hydraulic system fails, the wheel brake accumulator has sufficient pressure for two or three applications of the brakes. However, only one continued application is recommended when the main hydraulic system has failed.

CAUTION

If the main hydraulic system fails, do not depress the pedals while in flight, since all brake system pressure will be lost. Save the brake pressure for landing. Although the brake circuit contains enough fluid for two or three applications of the brakes, after touchdown is made, apply the brakes gradually and do not let up until stopped. After the airplane has been brought to a complete stop on the runway, do not attempt taxiing under any conditions because total brake failure will occur in a very short period of time.

Note

In the event pressure has been lost in the brake system and the landing gear is down and locked, open the ground shut-off valve and use the hydraulic hand pump to charge the brake accumulator. Do not use this method to lower the flaps or operate any other system. If the flaps are lowered by this means, it is entirely possible that they could not be raised. The possibility of both hydraulic pumps malfunctioning at the same time is highly improbable. However, if this should happen, the valve and hand pump may be used as a last resort to lower the flaps.

If the brake system has failed and pressure cannot be built-up by emergency means, do this:

1. If there are at least 10,000 feet of landing clearance, including the runway and clear area beyond, make the landing with the landing gear extended.
2. If there is less than 10,000 feet landing clearance, land with the gear extended and retract the gear when it becomes apparent that insufficient roll-out distance remains. Raising the nose-wheel and leaving the flaps down after touchdown decreases the landing roll distance.

Note

See LANDING WITH GEAR RETRACTED in this section.

CUT ON BLACK LINE

B-57C

CONDENSED CHECK LIST OF EMERGENCY PROCEDURES

T.O. 1B-57C-1
1 AUGUST 1956
Revised 1 February 1957

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CHECK LIST OF EMERGENCY PROCEDURES

ENGINE FAILURE DURING TAKE-OFF.

With sufficient runway remaining.

1. Throttles	OFF
2. Brakes	Apply

With insufficient runway remaining.

1. Throttles	OFF
2. Brakes	Apply
3. Wing tip tanks	Jettison
4. Canopy emergency release handle	Pull
5. Landing gear	UP
6. Battery switch	OFF

After becoming airborne

1. Throttle on operating engine	Reduce to maintain directional control while accelerating to safe single-engine speed of 155 knots
2. Landing gear	UP
3. Throttle on dead engine	OFF
4. Engine valve knob for dead engine	OFF
5. Fire warning lights	Check OUT to eliminate possibility of fire

ENGINE FAILURE IN FLIGHT.

1. Throttle on operating engine	Adjust to maintain airspeed and directional control
2. Throttle on dead engine	OFF
3. Trim system	Retrim to maintain level flight

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CUT ON BLACK LINE

4. Engine valve knob for dead engine	OFF
5. Fire warning lights	Check OUT to eliminate possibility of fire
6. Cabin pressure selector switch	Reset to operative engine
7. Generators on dead engine	OFF

SINGLE ENGINE AIR START PROCEDURE.

1. Throttle	OFF
2. Fuel system circuit breakers	In (ON)
3. Drain fuel from engine	Nose-high attitude for 15 seconds
4. Windmill engine	Air speed 155 to 220 knots IAS: 14 to 22% rpm
5. Engine valve knob	Flow position
6. Battery switch	BATTERY
7. Ignition switch	To CRANK ONLY momentarily
8. Throttle	IDLE or slightly above

DUAL ENGINE FAILURE.

1. Battery switch	OFF
2. All electrical equipment	OFF
3. Battery switch	BATTERY
4. Cabin pressure selector switch	OFF
a. Above 43,000 feet	OFF
b. Below 43,000 feet	RAM

DUAL ENGINE AIR START PROCEDURE.

1. Battery switch	BATTERY
2. No. 1 inverter switch	ON
3. Fuel selector switches	Fullest tank

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4. Battery switch	OFF
5. No. 1 inverter switch	OFF
6. Throttle	OFF
7. Fuel system circuit breakers	In (ON)
8. Drain fuel from engines	Nose-high attitude for 15 seconds
9. Windmill engine	Airspeed 155 to 220 knots IAS; 14 to 22% rpm
10. Engine valve knob	Flow position
11. Battery switch	BATTERY
12. Ignition switch	To CRANK ONLY momentarily
13. Throttle	IDLE or slightly above

SINGLE ENGINE LANDING.

1. Maintain safe single engine control speed (155 knots) until on final approach.

2. Landing gear	DOWN in time to insure down and locked prior to touchdown
3. Final approach	130 knots IAS
4. Flaps	DOWN when landing assured

LANDING WITH BOTH ENGINES INOPERATIVE.

1. Glide speed	Approximately 160 knots
2. Landing gear	DOWN, 10,000 feet above terrain
3. High key point	Select 5,000 feet above terrain
4. Low key point	Select 1,500 feet over the terrain
5. Base leg	Turn with IAS 140 to 150 knots
6. Final approach	IAS 120 to 130 knots. Side-slip and "S" turn to lose excessive altitude

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LANDING WITH GEAR RETRACTED.

1. Notify the crew to prepare for crash landing.	
2. Advise control tower of emergency and request foam on runway just prior to landing.	
3. Reduce fuel load but retain empty or nearly empty tanks.	
4. Jettison all internal and external stores and close bomb door.	
5. Unfasten parachute harness and readjust lap belt and shoulder harness.	
6. All unneeded electrical equipment	OFF
7. Landing pattern	Set up flat with power on
8. Canopy	Jettison with IAS 180 knots or below
9. Flaps	DOWN
10. Throttle	OFF
11. Touchdown	Normal landing attitude
(After Touchdown)	
12. Battery switch	OFF
13. Abandon airplane as soon as possible.	

DITCHING.

1. Notify the crew to prepare for ditching.	
2. IFF switch	EMERGENCY
3. Actuate master jettison switch if it is desirable to jettison stores.	
4. Bomb door switch	CLOSE
5. Landing gear	UP
6. Dive brakes	EXTEND
7. Flaps	DOWN
8. Disconnect all personal equipment except oxygen hose.	
9. Unbuckle parachute harness.	
10. Airspeed 180 knots or less	Jettison canopy
11. Check seat belt and shoulder harness secure and locked.	

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CUT ON BLACK LINE

12. Insert seat safety pins.
13. Make landing into wind. If sea is rough, land parallel to waves, on top of wave crest.
14. Throttles — OFF
15. Make touchdown as slowly as possible with slightly nose-high attitude.
16. After airplane has stopped, abandon it immediately.

SINGLE ENGINE GO-AROUND.

1.	Throttle of operating engine	Advance gradually as airspeed increases to maintain directional control
2.	Dive brakes	RETRACT
3.	Flaps	UP
4.	Landing gear	UP as soon as climb is established

ENGINE FIRE.

1.	Fire extinguisher PULL-TO-ARM knob	Pull
2.	Agent discharge switch	AGENT DISCHARGE
3.	Throttle	OFF
4.	Oxygen	100%

ENGINE FIRE ON GROUND.

1.	Throttles	OFF
2.	Carbon dioxide fire extinguishing equipment	Signal for use by ground crew
	(If ground crew not available.)	
1.	Fire extinguisher PULL-TO-ARM knob	Pull

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CUT ON BLACK LINE

2. Agent discharge switch	AGENT DISCHARGE
3. Throttle	OFF
4. Pilot	Leave airplane as soon as possible

WING OR FUSELAGE FIRE.

1. Cabin pressure selector switch	RAM
2. If system fire	Shut down system feeding fire
3. If fire is uncontrollable	Bail out

FIRE IN FLIGHT COMPARTMENT.

1. Oxygen regulator	100%
2. Hand fire extinguisher	Use as necessary
3. Cabin pressure selector switch	RAM
4. If fire uncontrollable	Bail out

ELECTRICAL FIRE.

1. All non-essential electrical equipment	OFF
2. Cabin pressure selector switch	As required
3. Oxygen regulator	100%
4. Hand fire extinguisher	Use as necessary
5. Electrical equipment	Restore units individually to determine faulty circuit

ELIMINATION OF SMOKE OR FUMES.

(Below 42,000 feet)

1. Cabin pressure selector switch	NO. 1 ENG and NO. 2 ENG to determine source of smoke or fumes

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CUT ON BLACK LINE

2. Oxygen regulator	100%
3. Cabin pressure selector switch	RAM

(Above 42,000 feet)

1. Cabin pressure selector switch	NO. 1 ENG and NO. 2 ENG to determine source of smoke or fumes
2. Oxygen regulator	100%
3. Cabin pressure selector switch	RAM after rapid descent to below 42,000 feet

LANDING GEAR SYSTEM FAILURE.

1. Landing gear lever	DOWN
2. Emergency landing gear handle	OUT, all the way
3. Hydraulic hand pump	Operate manually as required
4. Landing gear	DOWN and locked

HORIZONTAL STABILIZER SYSTEM MALFUNCTION. (GROUP C AIRPLANES)

1. Stabilizer control switch	ALT
2. Stabilizer emergency control switch	Actuate to position stabilizer as desired

HORIZONTAL STABILIZER SYSTEM MALFUNCTION. (GROUP D AIRPLANES)

1. Stabilizer emergency switch	EMERG OFF
2. Stabilizer POWER circuit breaker	OFF

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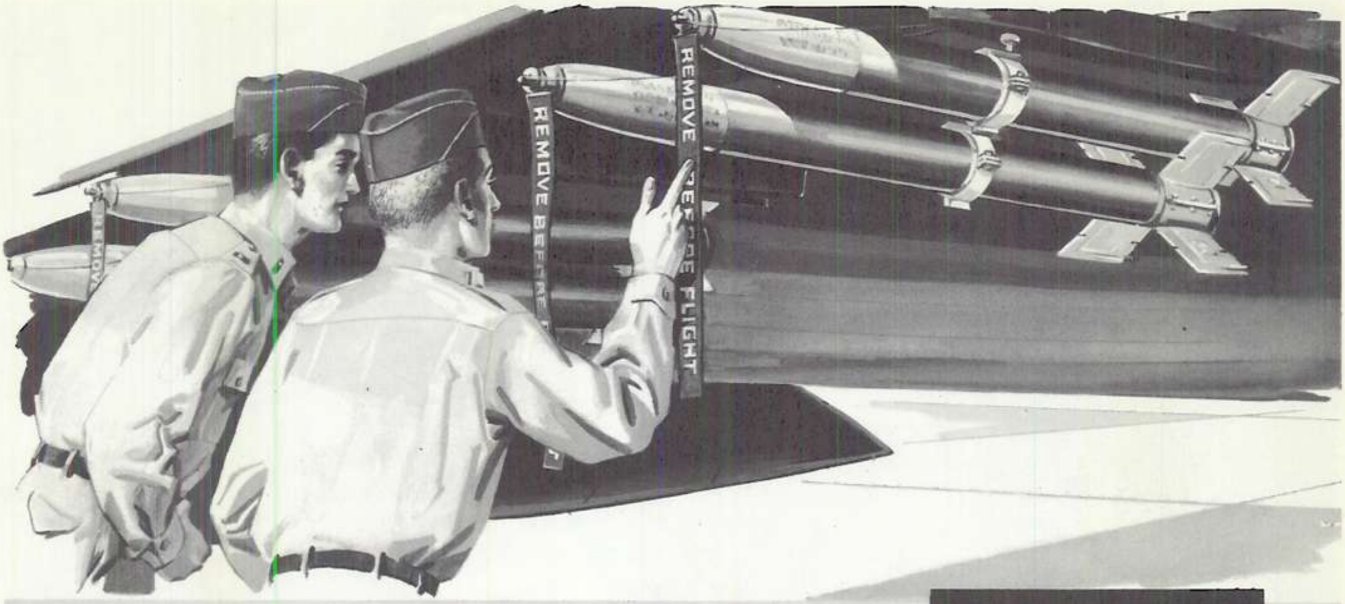
SEAT EJECTION.

1. Right and left grips	Raise to jettison canopy, lock shoulder harness, and stow control column
2. Feet	Place in rests
3. Arms	Place in rests
4. Body	Erect, head against rest, chin in
5. Trigger on right grip	Squeeze

End of Check List for Emergency Procedures



DESCRIPTION AND OPERATION OF

Auxiliary Equipment — Section IV

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TABLE OF CONTENTS

AIR-CONDITIONING AND PRESSURIZATION SYSTEM.

The air-conditioning and pressurization system (figure 4-1) heats, ventilates, and pressurizes the cabin. The system also supplies air for canopy and windshield defogging, windshield anti-icing, and for pressure in the canopy seal.

CABIN PRESSURIZATION AND HEATING.

A shut-off valve in the ducts from each engine permits one or both engines to supply hot pressurized air to the cabin. One engine supplies enough air to the system for normal operation. Air pressure from the engines varies with engine rpm; therefore, an automatic venturi airflow regulator incorporated in the system maintains a constant system pressure. Hot air from the thirteenth stage of the engine compressor(s) passes through a refrigeration unit for cooling. An electrically controlled modulating valve regulates the mixing of refrigerated air with hot engine compressor air to give the selected cabin temperature. Air enters the cabin through the canopy defogging nozzles or through the pilot's and instructor pilot's air outlets, and a cabin pressure regulator automatically opens and closes to regulate the cabin pressure. Opening the ram-air shut-off valve and the cabin safety valve permits unrestricted cabin ventilation; however, ventilating the cabin with ram air causes a rapid loss of cabin pressure and heat. Cabin pres-

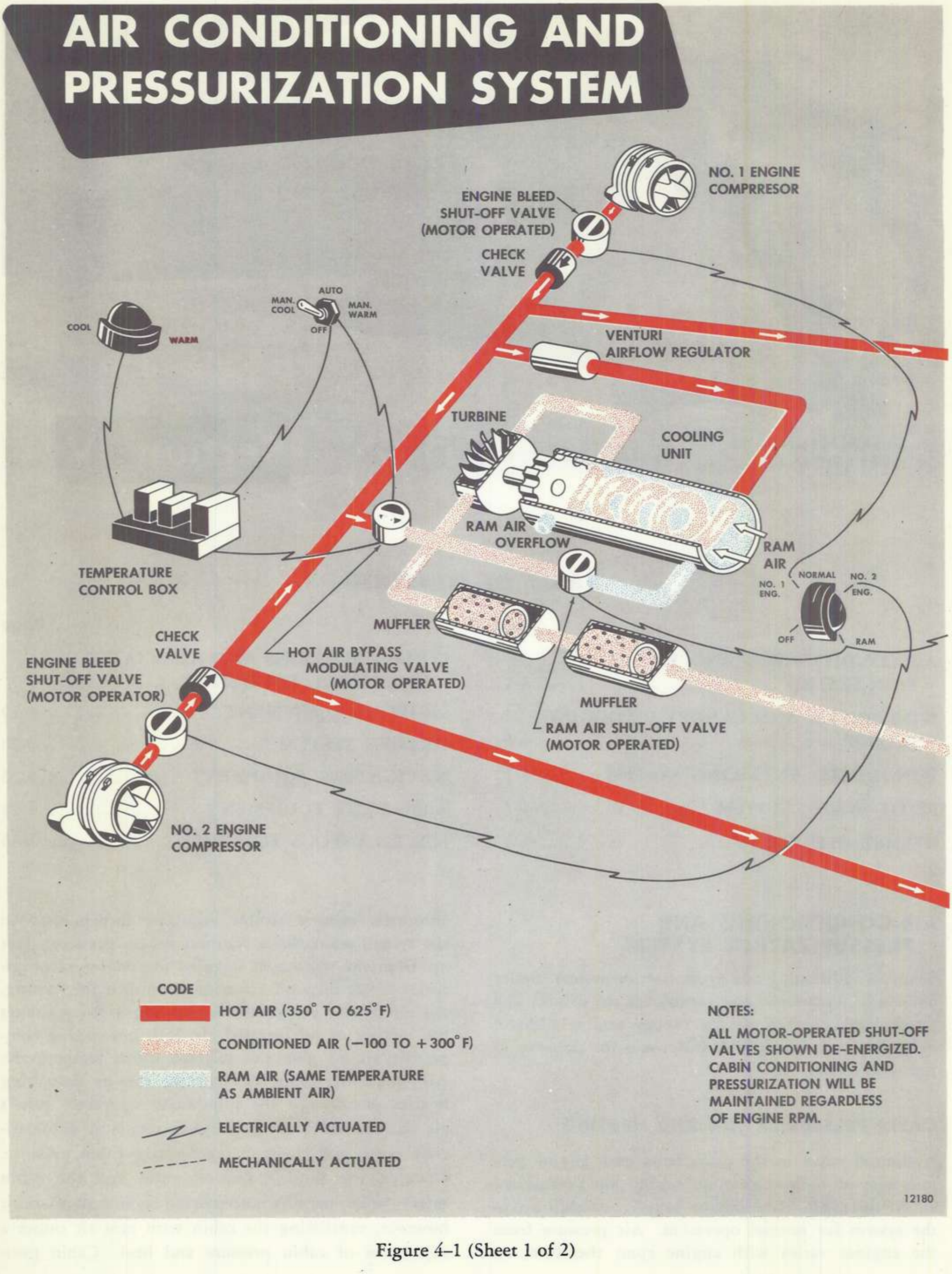

Figure 4–1 (Sheet 1 of 2)

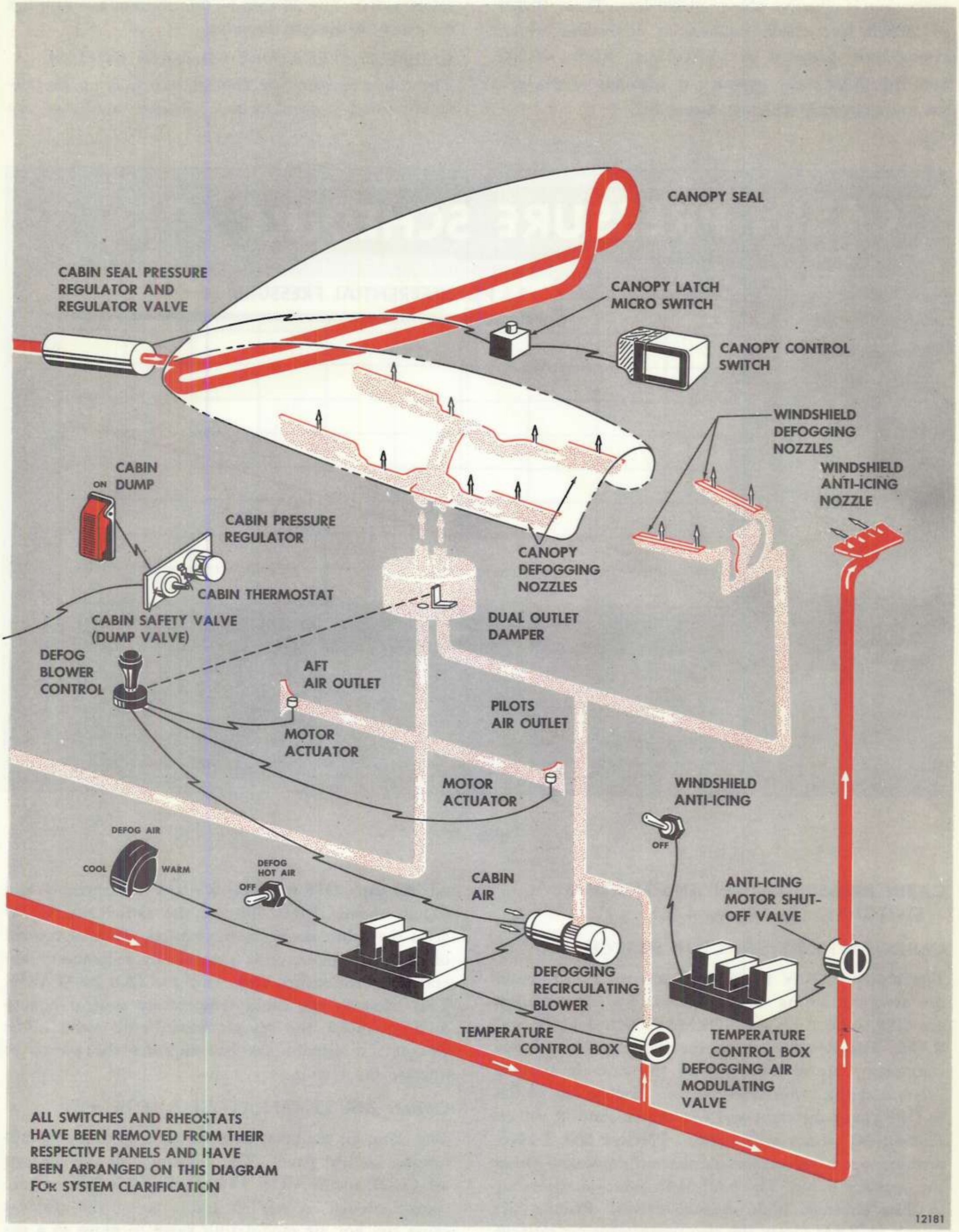

Figure 4–1 (Sheet 2 of 2)

surization is effective above 10,000 feet. From 10,000 to 20,500 feet, cabin pressure is equivalent to an atmospheric pressure of 10,000 feet. Above 20,500 feet the differential pressure is constant at 3.5 psi. See cabin pressure schedule, figure 4–2.

safety valve. The 28-volt d-c distribution bus supplies the power to operate the valves.

CABIN TEMPERATURE CONTROL SWITCH.

The cabin temperature control switch is on the air-conditioning control panel. Switch markings are AUTO (up), OFF (center), WARM (lower right), and COOL (lower left). Placing the switch in AUTO arms the cabin temperature rheostat. Manual control of cabin temperature is possible by momentary operation of the switch from OFF to COOL or WARM. This bypasses the cabin temperature control box to directly adjust the hot-air modulating valve. The 28-volt d-c distribution bus supplies the power to operate the circuit.

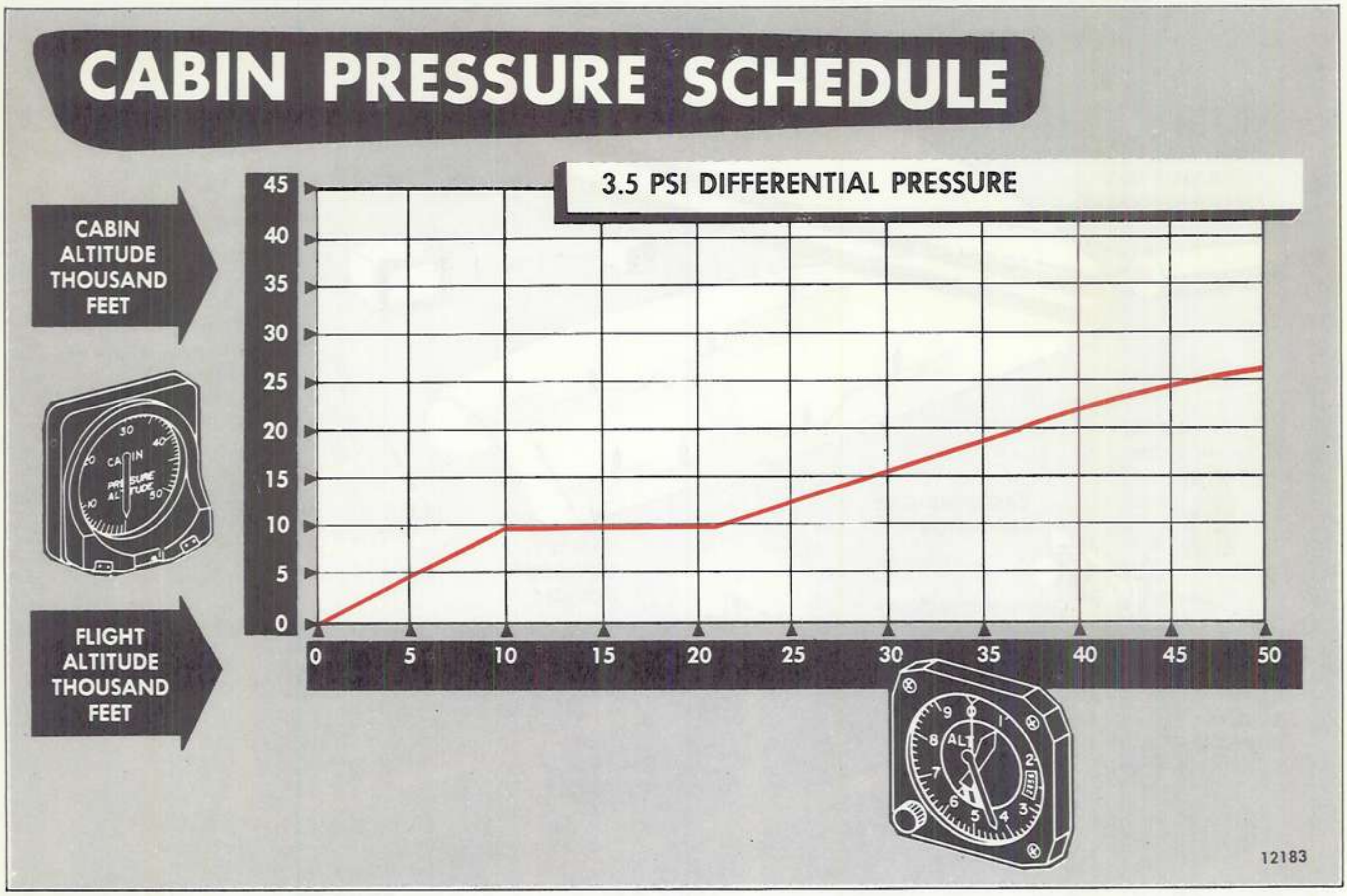

Figure 4–2

CABIN PRESSURIZATION AND HEATING SWITCHES. (See figure 4–3.)

CABIN PRESSURE SELECTOR SWITCH.

The rotary CABIN PRESSURE selector switch is on the air-conditioning control panel. Switch markings are OFF, NO. 1 ENG., NORMAL, NO. 2 ENG. and RAM. The switch controls the right and left engine compressor air shut-off valves, the ram-air shut-off valve, and the cabin safety valve. Placing the switch in OFF closes the right and left engine shut-off valves. Placing the switch in the NO. 1 ENG or NO. 2 ENG position opens the respective shut-off valve and closes the opposite valve. The NORMAL position allows air to flow through both shut-off valves. Placing the switch in RAM closes the two compressor air shut-off valves, opens the ram-air shut-off valve, and the cabin

CABIN AIR TEMPERATURE RHEOSTAT.

The cabin air temperature rheostat is on the air-conditioning control panel. The markings for the rheostat are COOL and WARM. Placing the cabin temperature control switch in AUTO and rotating the rheostat cause the hot air modulating valve to move to a desired position between fully opened and fully closed, depending on the direction of rheostat rotation. A thermostat and a temperature control box regulate the modulating valve to maintain the selected temperature. The 28-volt d-c distribution bus supplies the power to operate the circuit.

3. Position the cabin pressure temperature rheostat to select a desired temperature.
4. Before leaving the airplane and de-energizing the 28-volt system, place the selector switch in OFF.

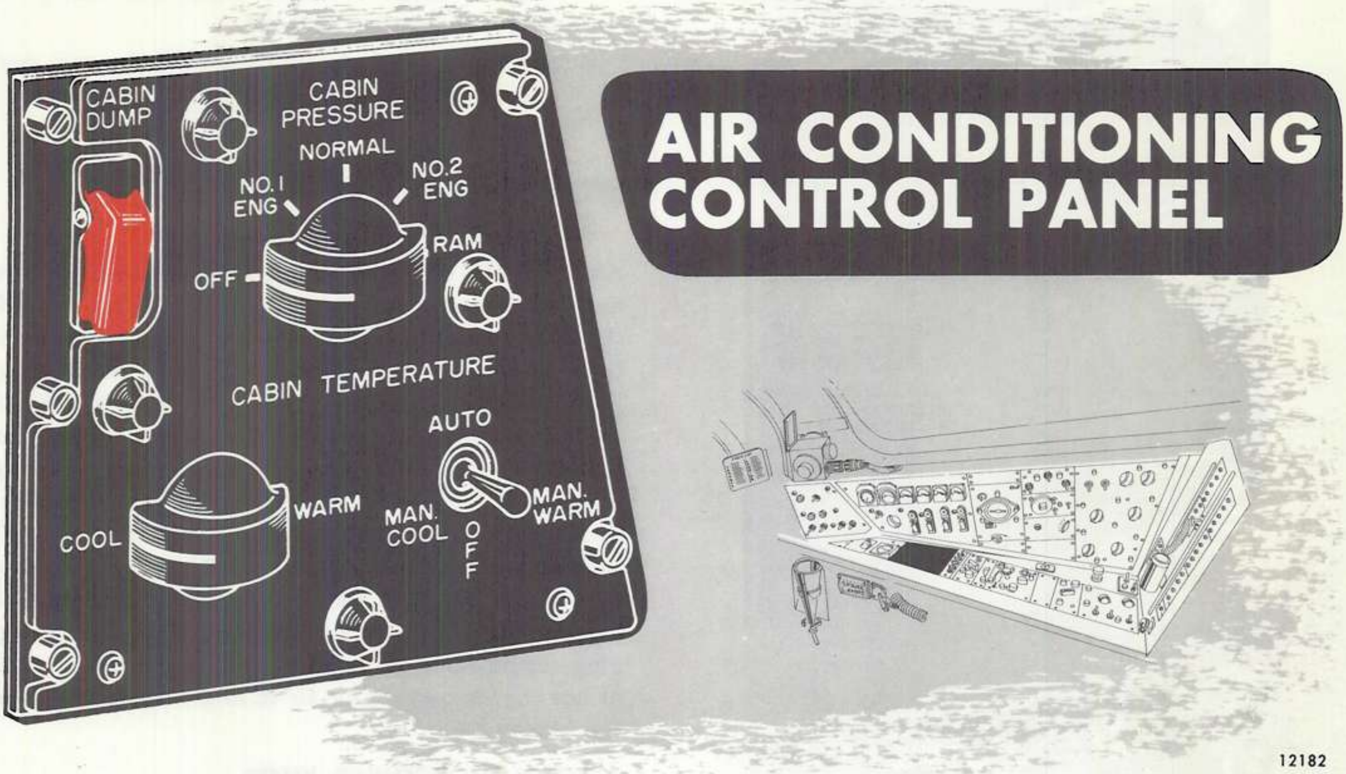

Figure 4-3

CABIN DUMP SWITCH.

The guarded two-position CABIN DUMP switch on the cabin air-conditioning panel controls the cabin safety valve. Raising the guard and placing the switch in the up position opens the cabin safety valve. The 28-volt d-c distribution bus supplies the power to operate the circuit.

CABIN PRESSURE ALTITUDE INDICATOR.

The cabin pressure altitude indicator on the generator control panel indicates cabin pressure. Comparing the cabin pressure altitude indication with the altimeter enables the pilot to evaluate cabin pressurization.

CABIN PRESSURIZATION AND HEATING, NORMAL OPERATION.

1. After starting the engines, place the cabin pressure selector switch in RAM for taxiing and take-off.
2. After take-off, place the selector switch in NORMAL and place the cabin temperature control switch in AUTO.

CABIN PRESSURIZATION AND HEATING, EMERGENCY OPERATION.

ENGINE FAILURE.

1. Place the cabin pressure switch in the operating engine position.
2. Compare the cabin pressure altitude indicator with the altimeter to evaluate system operation.

HEATING SYSTEM MALFUNCTION.

To regulate cabin temperature during heating system malfunction:

1. Momentarily move the cabin temperature control switch to COOL or WARM and then to OFF.
2. Reduce altitude and place the cabin pressure selector switch in RAM if heat becomes excessive.

Note

Electrically operated valves control the temperature. During electrical failure, the valves remain in the position held at the time of the electrical failure.

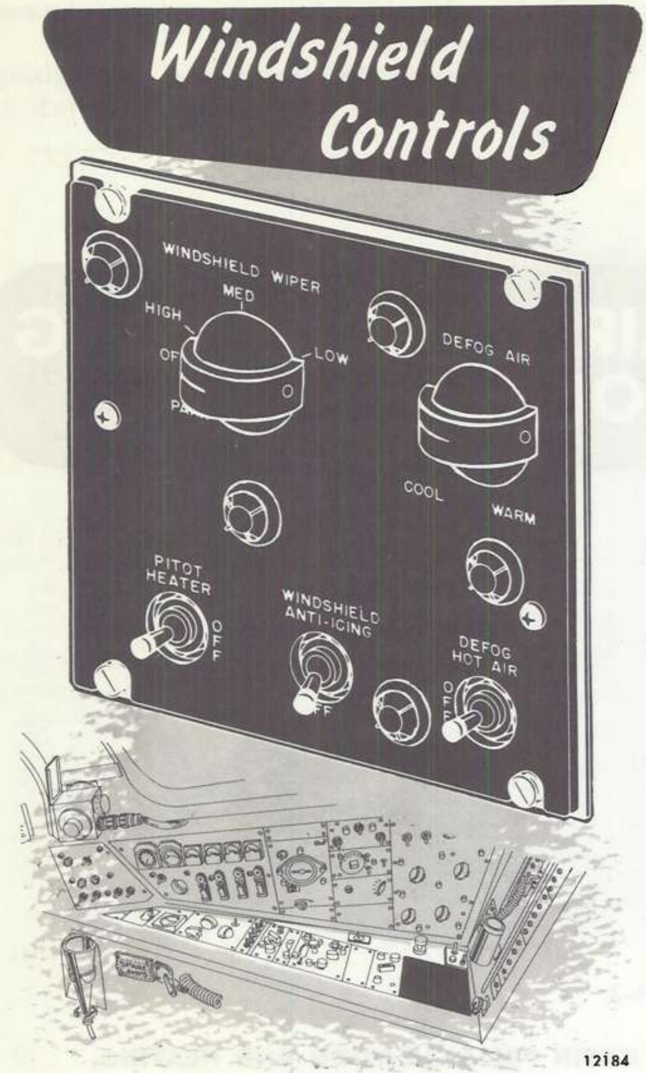

Figure 4-4

ENGINE BLEED-AIR-DUCT RUPTURE.

1. Place the selector switch in NO. 1 ENG position and check system operation by observing the cabin pressure indicator.
2. If the cabin pressure decreases after the switch is in the NO. 1 ENG position, place the selector switch in the NO. 2 ENG position and check system operation by observing the cabin pressure indicator.
3. If cabin pressure decreases after the selector switch is in NO. 1 ENG and NO. 2 ENG, place the selector switch in OFF and if necessary reduce altitude or land.

ENGINE BLEED-AIR CONTAMINATION.

1. Place the oxygen selector to 100 percent.
2. Place the cabin pressure selector switch in the NO. 1 ENG position.
3. If contamination persists with the selector switch in the NO. 1 ENG position, place the selector switch in NO. 2 ENG position.
4. If contamination persists with the selector switch in the NO. 1 ENG and NO. 2 ENG positions, reduce altitude if above 18,000 feet and place the selector switch in RAM.
5. If desired, after clearing the cabin by ram ventilation, repeat steps 1 through 4.

WINDSHIELD- AND CANOPY-DEFOGGING SYSTEM.

Air from the air-conditioning and pressurization system plus hot engine compressor air defogs the windshield and canopy. During the heating and pressurization not requiring windshield and canopy defogging, air enters the cabin through the CANOPY NOZZLES and not through the pilot's and instructor-pilot's air outlets. During heating and pressurization requiring windshield and canopy defogging, shut-off valves divert the air from the canopy nozzles to the pilot's and instructor pilot's air outlets. The defogging and recirculating blower forces the cabin air through a separate duct to the windshield and canopy. A defogging air-modulating valve permits a desired amount of hot engine compressor air to mix with the air from the blower.

DEFOGGING BLOWER KNOB.

The defogging blower knob on the pilot's right console controls the canopy and windshield defogging and air circulation within the cabin. Pulling the defogging blower knob all the way out (on) mechanically positions a damper that closes the cabin conditioned air inlet and opens the recirculating and defogging air inlet. The final 1/8 inch of travel (out), actuates a microswitch which energizes the recirculating blower and the defogging control circuits. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the circuits.

DEFOG HOT AIR SWITCH.

The windshield and canopy DEFOG HOT AIR switch (figure 4-4) is on the windshield control panel. It is marked DEFOG HOT AIR and OFF. The switch circuit is operative only after the DEFOGGING BLOWER KNOB on the right console is pulled all the way out. Placing the switch in DEFOG HOT AIR arms the defog air rheostat. The 28-volt auxiliary distribution bus supplies the power to the control circuit through the DEFOG AIR switch.

DEFOG AIR RHEOSTAT.

The DEFOG AIR rheostat, marked COOL and WARM, is on the windshield control panel. Rotating the rheostat clockwise causes a heating coil to raise the mercury level in a thermostat. When the mercury rises sufficiently, it completes a circuit to the "more heat" relay. Closing the "more heat" relay completes a circuit to open the hot-air modulating valve, thereby raising the temperature of the air delivered to the windshield and canopy. Rotating the rheostat counterclockwise reduces the mercury level. When the mercury lowers sufficiently, it completes a circuit to the "less heat" relay. Closing of the "less heat" relay causes the hot-air modulating valve to close, thereby lowering the temperature of the air delivered to the windshield and canopy. The 28-volt d-c distribution bus supplies the power to operate the circuits.

WINDSHIELD ANTI-ICING SYSTEM.

The windshield anti-icing system (figure 4–1) distributes a stream of hot air to the outside surface of the windshield through an external nozzle. The air-conditioning and pressurization system supplies the hot air for the windshield anti-icing system; therefore, the air-conditioning and pressurization system must be operating to de-ice the windshield. A grid of tungsten wire embedded in the windshield glass senses windshield temperature. Since the electrical resistance of the sensing element varies with the windshield temperature, the variation of resistance causes the shut-off valve to adjust the amount of hot air flowing to the windshield.

WINDSHIELD ANTI-ICING SWITCH.

The two-position WINDSHIELD ANTI-ICING switch (figure 4–4) is on the windshield control panel. Placing the switch in ANTI-ICING energizes relays in the windshield anti-icing temperature control box and completes a circuit to the shut-off valve. Placing the switch in OFF de-energizes the relays and closes the shut-off valve. The 28-volt d-c distribution bus supplies the power to operate the system.

WINDSHIELD ANTI-ICING SYSTEM, NORMAL OPERATION.

1. Place the cabin pressure switch in the NORMAL, NO. 1 ENG, or NO. 2 ENG positions.
2. Place the windshield anti-icing switch in WINDSHIELD ANTI-ICING.

PITOT STATIC SYSTEM.

The pitot static system supplies dynamic and static air pressure to the airspeed indicator, Machmeter, and the vertical velocity indicator. Static plates are on both sides of the nose section and the pitot head is on the under surface of the nose.

PITOT HEATER SWITCH.

The two-position PITOT HEATER switch on the windshield control panel controls the heating element in the pitot head. Switch markings are PITOT HEATER and OFF. Placing the switch in PITOT HEATER energizes the heating element. There are no devices in the circuit to limit the heating of the element; therefore, turn the pitot heater switch off during ground operation. The 28-volt d-c pilot's distribution bus supplies the power to operate the circuit.

HELMET DEFOGGING.

Helmet defogging rheostats control the electrical power to the heating element in the pilot's and instructor pilot's helmet face piece. Rheostat markings are OFF and HEAT. The pilot's rheostat is on his right console, and the instructor pilot's rheostat is on his left console. To operate, move the rheostat clockwise, out of OFF until desired heat is obtained. The 28-volt d-c battery bus supplies the power to operate the system.

Note

> The helmet defog circuit breakers are in the left electrical access compartment. These circuit breakers are inaccessible during flight, and must be placed IN during the exterior inspection.

COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT.

All electronic and communication equipment controls are at the pilot's and instructor pilot's stations. (See figure 4–5 for equipment and range data.) The airplane has nine antennas for the operation of the existing equipment. See figure 1–1 for antenna locations. The 28-volt d-c radio bus and the NO. 1 and NO. 2 a-c radio busses supply the power to operate the communications and electronics equipment.

INTERCOMMUNICATION SET AN/AIC–10.

The intercommunication set receives signals from all communications equipment on the airplane. Manipulation of the switch on the pilot's interphone control panel (right horizontal console) or the instructor pilot's interphone control panel (left console) enables the user to receive a single signal or to mix two or more signals. The equipment used by the pilot or instructor-pilot is the control panels, headsets, microphones, and press-to-talk switches on the control wheels and inboard throttles. Three features of the

COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT

TYPE	DESIGNATION	FUNCTION	PRIMARY OPERATOR	RANGE	LOCATION OF CONTROLS
UHF COMMAND	AN/ARC-27	AIR TO AIR, AIR TO GROUND COMMUNICATIONS	PILOT	LINE OF SIGHT	PILOT'S LEFT CONSOLE
RADIO COMPASS	AN/ARN-6	VOICE RECEPTION AND RADIO NAVIGATIONAL AID	PILOT, INSTRUCTOR-PILOT	200 MILES	PILOT'S RIGHT CONSOLE, INSTRUCTOR-PILOT'S RIGHT CONSOLE
MARKER BEACON	AN/ARN-12	AURAL AND VISUAL INDICATIONS OF COURSE AND CONE OF MARKERS	INSTRUCTOR-PILOT, PILOT	ALL ALTITUDES	AN/AIC-10 CONTROL PANEL, MARKER BEACON RADAR WARNING SWITCH
INTERPHONE	AN/AIC-10	CREW INTERCOMMUNICATION	PILOT, INSTRUCTOR-PILOT, MAINTENANCE PERSONNEL	CABIN	PILOT'S RIGHT CONSOLE, INSTRUCTOR-PILOT'S LEFT CONSOLE, RIGHT WHEEL WELL
IFF	AN/APX-6A	AUTOMATIC AIRCRAFT IDENTIFICATION	PILOT	LINE OF SIGHT	PILOT'S RIGHT CONSOLE
RADAR BEACON	AN/APW-11A WITH INDICATING GROUP AN/APA-90	NAVIGATIONAL AND BOMBING-AID RADAR GUIDANCE SYSTEM	PILOT	LINE OF SIGHT	PILOT'S RIGHT CONSOLE
SHORAN	S-4 SHORAN	NAVIGATIONAL AND BOMBING-AID RADAR GUIDANCE SYSTEM	INSTRUCTOR-PILOT	LINE OF SIGHT	INSTRUCTOR-PILOT'S RIGHT CONSOLE
RADAR WARNING	AN/APS-54	AURAL AND VISUAL INDICATIONS OF AIRBORNE INTERCEPTION	INSTRUCTOR-PILOT	15 MILES	INSTRUCTOR-PILOT'S LEFT CONSOLE
GROUND POSITION INDICATOR	AN/ASN-6	COMPUTES AND INDICATES LATITUDE AND LONGITUDE	INSTRUCTOR-PILOT	—	INSTRUCTOR-PILOT'S LEFT CONSOLE

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Figure 4-5

set insure high intelligibility at all altitudes: 1) the air-damped headphones that enable the vibrations of the diaphragm to become move vigorous as the air becomes thinner due to increases in altitude, 2) the barometric switches that automatically adjust sound volume during changes in altitude, and 3) the automatic volume control. A control box in the right wheel well enables the crew to talk to ground personnel.

INTERCOMMUNICATION SET AN/AIC-10 CONTROL PANEL.

The pilot's interphone control panel (figure 4-6) is on the pilot's right horizontal console, and the instructor pilot's interphone control panel is on the instructor pilot's left console. The control panels contain a rotary function-selector switch, a volume control knob, a NORMAL-AUX LISTEN switch, and a row of audio mixing switches along the top of the control panel. The 28-volt d-c radio bus supplies the power to operate the intercommunication set.

FUNCTION SELECTOR SWITCH.

A rotary function selector switch is on the pilot's and instructor pilot's intercommunication set control panel. The position of the switch determines the equipment used for transmission and reception. Switch markings are CALL, INTER, HOT-MIC, COMM, and ADF. Rotating the function selector switch to CALL and depressing a microphone switch enables the user to

INTERCOMMUNICATION CONTROLS

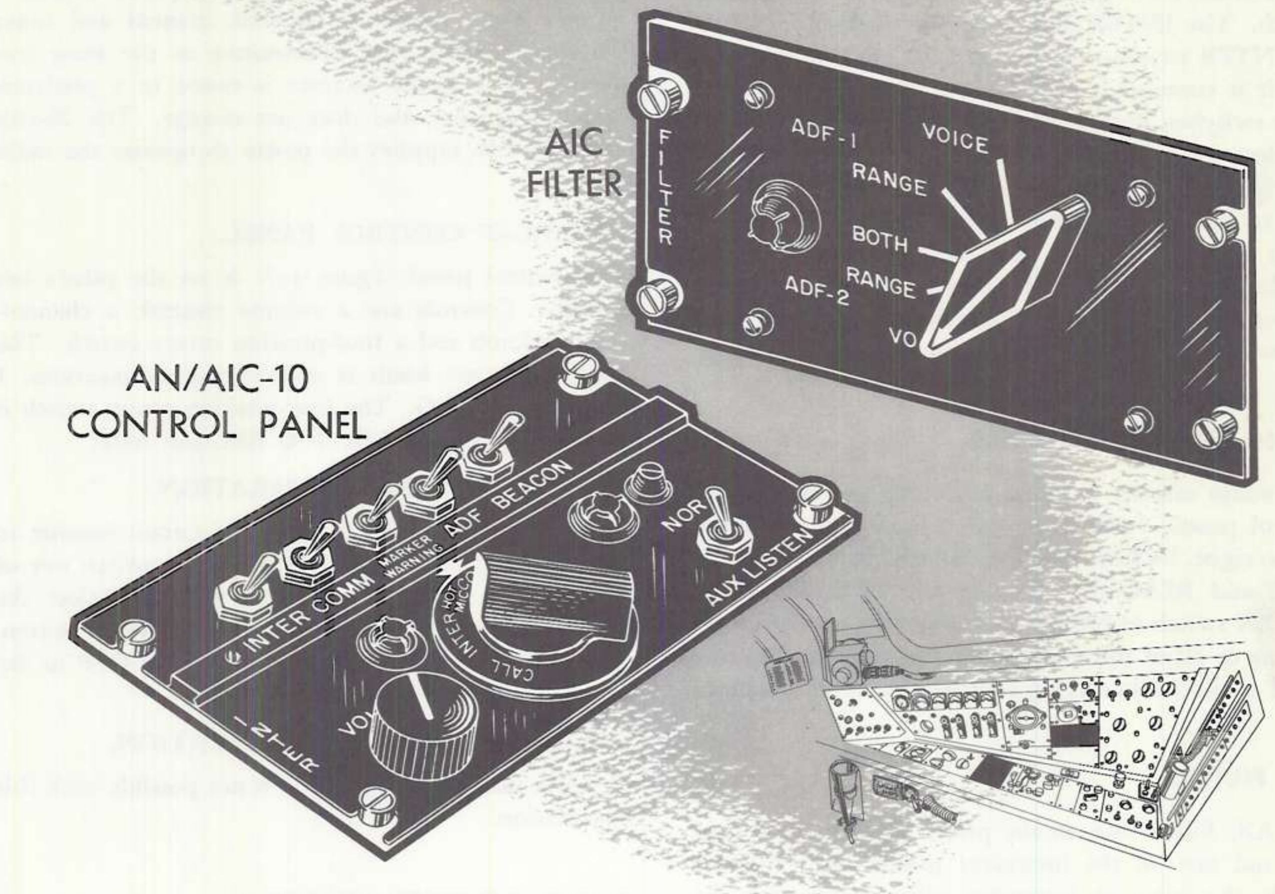

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Figure 4-6

communicate with the other crew member regardless of the position of the latter's function selector switch or mixing switches. Placing the switch in INTER and depressing a microphone switch enables the user to talk to the other occupant if the latter also has his function selector switch in INTER or has his INTER mixing switch in the up position. However, a conversation cannot take place unless both rotary function selector switches are in INTER or HOT-MIC. Rotating the function selector switch to COMM enables the user to transmit and receive with the uhf set. Placing the function selector switch in HOT-MIC enables the user to converse with the other crew member without depressing a microphone switch, provided the latter also has his function selector switch in HOT-MIC. The HOT-MIC function enables the crew to use the interphone while monitoring the uhf radio. Depressing a microphone switch with the function selector switch in HOT-MIC energizes the AN/ARC-27 transmitter. Placing the function selector switch to ADF permits the user to monitor the radio compass exclusively.

MALFUNCTION OF AN/AIC-10.

In the event of intercommunication set malfunction, it is possible to listen (but not transmit) by placing the NORMAL-AUX LISTEN switch in AUX LISTEN. In this position, both headsets are in parallel, thereby permitting reception from the other control panel. Operation in this function reduces the strength of the signal to the headsets with a consequent reduction in volume. During individual panel operation in AUX LISTEN, there is a definite switching priority of the audio mixing switches and the function selector switch. The INTER switch has first priority. While the INTER switch is in the up (on) position no other circuit is connected, regardless of the position of the other switches. Placing the INTER switch in the down position passes priority to the switch immediately to the right of the INTER switch. Priority continues to pass to the right in this manner along the line of audio mixing switches. All switches to the left of the desired switch must be down. Placing all audio mixing switches off (down), enables the function selector switch to control the selection of the equipment.

AUDIO MIXING SWITCHES.

The audio mixing switches are along the top of the control panel. Individual switch markings are, from left to right, INTER, COMM, MARKER WARNING, ADF, and BEACON. Placing the NORMAL-AUX LISTEN switch in NORMAL enables the user to monitor one or all of the available facilities by placing one or all of the audio-mixing switches in the up position.

AIC FILTER.

The AIC filters, one on the pilot's right vertical console and one on the instructor pilot's right console, enable the pilot or instructor pilot to separate the simultaneous voice-range broadcast from the radio range stations. Switch markings are VOICE, RANGE, BOTH, RANGE, and VOICE in that order from the top to the bottom of the panel. The first two (top) VOICE-RANGE positions are for one ADF system and the last two (bottom) RANGE-VOICE positions are for a second ADF system. Since the airplane has only one ADF system, the last two (bottom) positions are inoperative. The BOTH position is common to ADF-1, ADF-2. Placing the switch in VOICE enables the listener to hear only the voice transmission from the radio range station. Placing the switch in RANGE enables the listener to hear only the range transmission, and placing the switch in BOTH enables the listener to hear the range and voice transmissions simultaneously.

RADIO SET AN/ARC-27.

The radio set AN/ARC-27 provides air-to-air or air-to-ground communication in the uhf spectra from 225.0 to 399.9 megacycles. The set includes a stub antenna on the bottom right side of the nose section, a transmitter and two receivers (guard and main) in the equipment compartment, and a control panel on the pilot's left console. There are 1750 frequencies available in 100 kilocycle steps. Eighteen frequencies can be preset in any order within the operating range of the equipment. Rotating the preset channel-selector knob selects the desired channel and tunes the main receiver and transmitter to the same frequency. The guard receiver is tuned to a predetermined frequency and does not change. The 28-volt d-c radio bus supplies the power to operate the radio set.

AN/ARC-27 CONTROL PANEL.

The control panel (figure 4-7) is on the pilot's left console. Controls are a volume control, a channel-selector knob and a four-position rotary switch. The channel-selector knob is marked for 19 positions, 1 through 18 and G. The four-position rotary switch is marked OFF, T/R, T/R + G REC and ADF.

AN/ARC-27, NORMAL OPERATION.

To turn on the radio, put the uhf circuit breaker to IN and rotate the four-position rotary switch out of OFF to the mode of operation desired. Select the channel desired and depress the microphone button. Place the four-position rotary switch to OFF to de-energize the equipment.

AN/ARC-27 EMERGENCY OPERATION.

In-flight emergency operation is not possible with this installation.

RADIO COMPASS AN/ARN-6.

The radio compass AN/ARN-6 (figure 4-8) is an airborne navigational aid and a general communications receiver. The components of the set are a sense antenna mounted on top of the center fuselage, a loop antenna behind the instructor-pilot's headrest, a receiver in the electrical equipment compartment, the pilot's and instructor pilot's control panels and ADF tuners on the right horizontal consoles, and the pilot's and instructor-pilot's radio compass indicators on the main instrument panels. By individual or combined use of the loop and sense antennas, the compass can be used for weather report reception, position-finding, and homing. Many radio range stations do not have uhf transmitters, but all have uhf receivers. Transmission on uhf and reception

Figure 4-7

on radio compass establish two-way radio communications with range stations for position reports, weather requests, etc. The 28-volt d-c radio bus supplies the power through a 10-ampere circuit breaker to operate the radio compass.

RADIO COMPASS CONTROLS.

The control unit on the pilot's and instructor-pilot's right horizontal console contains all the controls for operating the AN/ARN-6 radio compass. The various knobs and switches on the unit for control of the radio compass are a function-control knob, a frequency TUNING crank, a VOLUME control, a CW-VOICE switch, a frequency-band selector, and a LOOP rotator switch.

RADIO COMPASS FUNCTION CONTROL.

Knob position markings for the function control are OFF, ADF, ANT, LOOP and CONT. Rotating the knob from OFF to any one of the other positions turns the set on. Placing the knob in ADF combines the functions of the sense and loop antennas for homing and automatic direction finding. With the knob in ANT, only the sense antenna receives signals for set

RADIO COMPASS AND CONTROLS

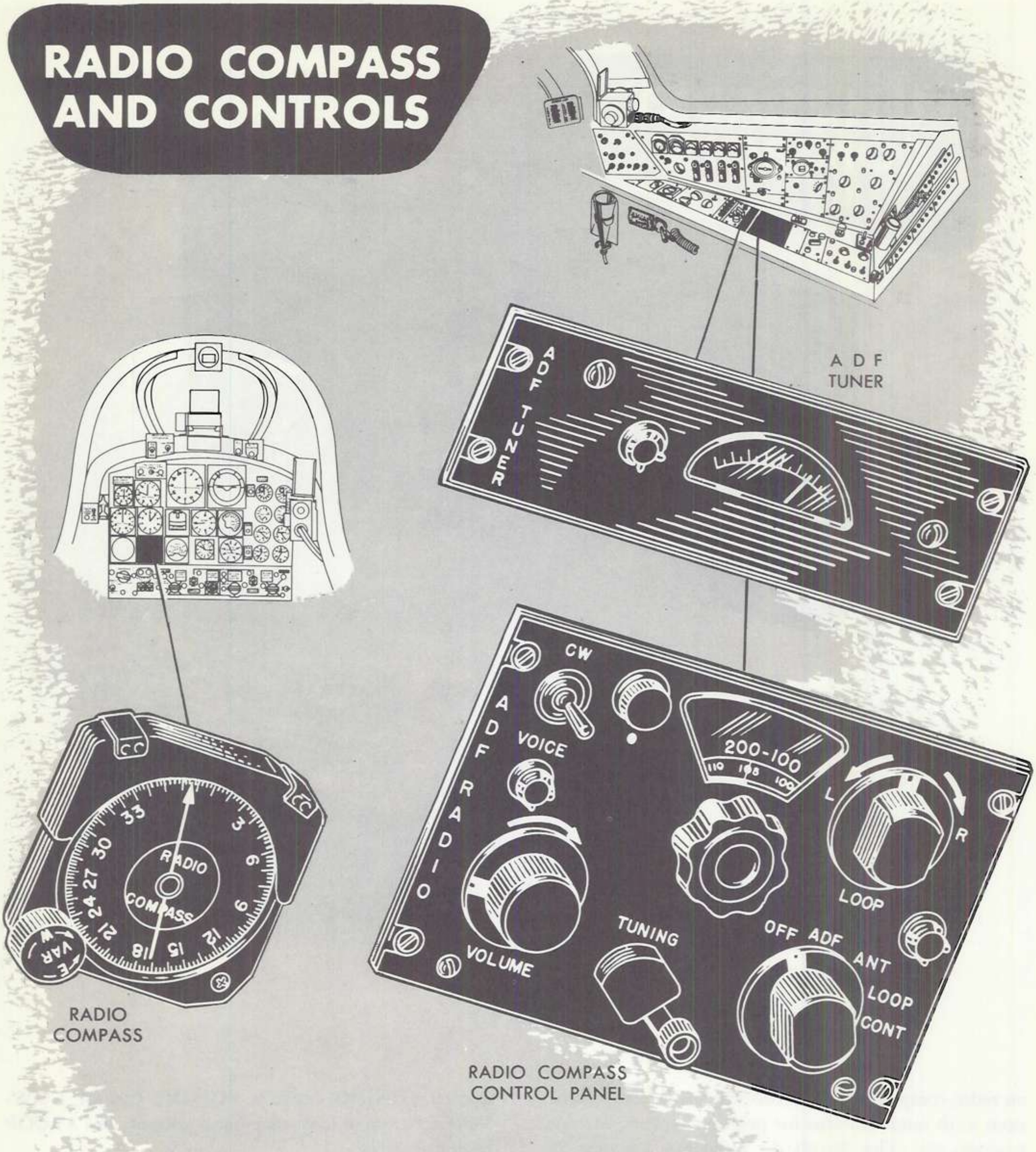

Figure 4-8

operation. The LOOP position allows the operator to use the loop antenna for aural-null operation. To transfer control of the set from the instructor pilot to the pilot or from the pilot to the instructor pilot, momentarily place the knob in CONT.

RADIO COMPASS TUNING CRANK.

Rotation of the TUNING crank permits selection of a desired frequency shown on the calibrated dial at the top of the control unit.

RADIO COMPASS BAND SELECTOR KNOB.

Rotation of the band-selector knob permits selection of any one of four bands of receiver frequencies. Band ranges are 100 to 200 kcs, 200 to 410 kcs, 410 to 850 kcs, and 850 to 1750 kcs. Rotating the band-selector knob changes the band's calibrated range scale in the window above the knob.

RADIO COMPASS VOLUME CONTROL.

The VOLUME control enables the operator to adjust the audio level to the interphone system.

RADIO COMPASS CW-VOICE SWITCH.

To obtain greater accuracy in tuning, place the CW-VOICE switch in CW. When the switch is in ADF, you can hear a 900-cycle tone along with station modulation. Tune to a zero beat in the ANT or LOOP position.

RADIO COMPASS LOOP ROTATOR SWITCH.

Switch position markings are L and R. Turning the switch to L rotates the loop antenna to the left. Turning the switch to R rotates the loop antenna to the right. When released, the switch springs back to the neutral position. The amount of deflection of the switch governs the speed of the loop rotation. To attain maximum speed of loop rotation, turn the switch to the maximum L or R position.

ADF TUNER.

The TUNE TO MAX (ADF Tuner) is on the pilot's and instructor pilot's right horizontal console immediately forward of the pilot's and instructor-pilot's AN/ARN-6 control panel. Maximum needle deflection to the right indicates proper tuning of a desired signal.

RADIO COMPASS INDICATORS.

The radio compass indicator for the pilot and instructor-pilot are on the main instrument panels. The radio compass needle indicates the direction of a tuned station relative to the airplane's heading.

RADIO COMPASS OPERATION.

To turn on the radio compass, rotate the function-control knob to the LOOP position and operate the L-R switch to determine proper loop operation and to determine which panel has control. If there is no pointer rotation, place the function control switch momentarily in CONT to gain control. After gaining control of the set, place the function control switch in ANT; then:

1. Place the ADF audio mixer switch on intercommunication control panel in the up position.
2. Place the CW-VOICE switch in CW.
3. Rotate the band-selector knob to the band scale containing the desired frequency.
4. Adjust the volume control as necessary.
5. Rotate the TUNING crank to the desired frequency and tune to the maximum needle deflection on the ADF tuner.
6. Place the CW-VOICE switch in VOICE.

To operate the set for automatic direction finding, place the function control knob in ADF. To operate the set for aural-null operation, place the function control knob in LOOP and use the loop rotator knob for loop rotation.

MARKER BEACON AN/ARN-12.

Applying power to the electrical system causes the marker beacon to operate continuously. The set receives 75 megacycle transmissions from the ground. An indicator light on the pilot's and instructor-pilot's main instrument panel flashes as the airplane passes over a marker transmitter, thereby giving a navigational fix. Also, placing the BEACON switch on the interphone control panel in the BEACON position and the marker beacon radar warning switch in MARKER BEACON enables the pilot or instructor-pilot to hear the coded marker identification. Pressing the lamp case completes a circuit to test the lamp operation. The 28-volt d-c radio bus supplies the power for marker beacon receiver operation.

MARKER BEACON-RADAR WARNING SWITCH.

The MARKER BEACON-RADAR WARNING switch is on the pilot's right console. Placing the switch in MARKER BEACON enables the crew to listen to the aural code transmitted from a marker beacon. However, the MARKER BEACON audio mixing switch on the interphone control panel must be in the UP position. See RADAR RECEIVING SET AN/APS-54 for switch function at the RADAR WARNING position.

IFF RADAR SET AN/APX-6A.

The IFF radar set AN/APX-6A (figure 4-9) enables an aircraft to identify itself automatically when challenged by suitably equipped friendly surface or airborne radar. The radar set is a transponder rather than a transmitter since it does not originate signals. The set receives signals from a remote radar station and amplifies these signals. The originating radar station picks up the amplified signal and reproduces it visually on its radar scope. The 28-volt d-c radio bus and the 115-volt a-c No. 2 radio bus supply the power to operate the set.

IFF CONTROL PANEL.

The control panel (figure 4-9) on the pilot's right vertical console enables the pilot to select all opera-

Figure 4-9

tional conditions of the transponder by means of the following switches:

1. *Master switch.* This control is a five-position rotary switch. The five positions are: OFF, STDBY, LOW, NORM, and EMERGENCY.
2. *MODE 2 switch.*
3. *MODE 3 switch.*
4. *I/P MIC switch.*

IFF MASTER SWITCH.

Rotating the MASTER switch from OFF to any other position turns on the equipment. Operation of the master switch does not turn on panel illumination. The pilot must run a "parrot" check with ground or airborne radar to assure the proper functioning of the equipment. Placing the master switch in STDBY energizes the set so that it is ready for immediate use but no replies from a challenging radar are answered. Placing the master switch in LOW causes the set to reply in mode 1. The reply is of low intensity. This is particularly useful to the interrogating radar when the airplane is flying nearby. Placing the switch in NORM causes the set to reply in mode 1 and the reply is of normal intensity. Placing the switch in EMERGENCY causes the set to transpond a distinctive emergency reply of normal intensity. To rotate the switch to EMERGENCY, depress the button at the lower left corner of the control panel.

MODE SELECTOR SWITCHES.

The two mode-selector switches to the right of the master switch are the controls for transponder operation in MODE 2 and MODE 3. Switch markings are MODE 2—OUT and MODE 3—OUT. Placing either switch in the mode position causes the set to reply in the selected mode. The master switch and the mode selector switches operate independently; therefore, an individual reply or any combination of replies is possible. However, the master switch must be in LOW or NORMAL for set operation.

Note

Placing the master switch in EMERGENCY causes the set to transpond an emergency reply regardless of the position of mode selector switches.

I/P-MIC SWITCH.

The three-position I/P-MIC switch is at the right of the control panel. Switch markings are I/P (up), OUT (center), and MIC (down). The switch enables the pilot to identify his position to interrogating radar by momentarily changing the transponder to a different mode. To identify his position, the pilot places

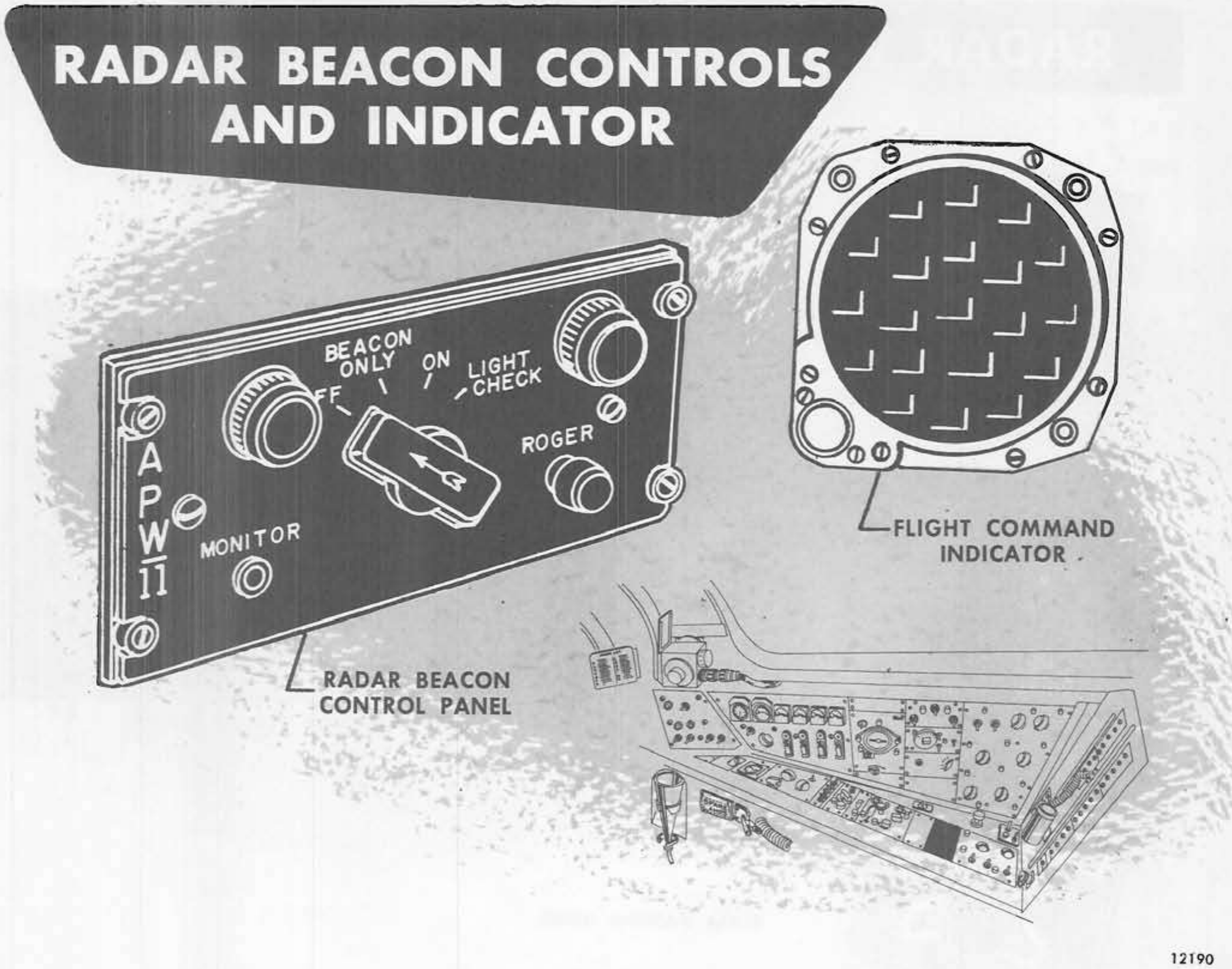

Figure 4-10

the switch momentarily in the I/P position. An observer using the interrogating radar notes the change in modes to determine on the radar scope the position of the airplane. An alternate method of identifying position is to place the switch in the MIC position and to use the microphone button on the control wheel or on the throttle. When the MIC position is in use, the airplane's uhf radio must be on. The mode change remains in effect for thirty seconds after releasing the switch or microphone button. The transponder then replies in the mode originally selected.

RADAR SET AN/APW-11A WITH INDICATING GROUP AN/APA-90.

Radar Set AN/APW-11A, (figure 4-10) used in conjunction with the Indicating Group AN/APA-90, serves as a navigational and bombing-aid radar guidance system. In navigational operations, intelligence obtained from a ground station can help determine aircraft speed, heading, and altitude. In bombing-aid operations, the pilot receives tactical instructions visually. The pilot controls the radar set AN/APW-11A. Actuate the BEACON mixing switch on the pilot's interphone control panel, for radar beacon reception. Tactical instructions for the pilot are indicated by the flight command indicator. A roger switch on the left hand grip of the control wheel is connected in parallel with the roger switch on the AN/APW-11A control panel. This switch cancels all previous indications on the flight command indicator and acknowledges receipt of all indications. The 28-volt d-c radio bus supplies the power to operate the equipment.

RADAR SET AN/APW-11A WITH INDICATING GROUP AN/APA-90, NORMAL OPERATION.

The radar set AN/APW-11A control panel is on the pilot's right console. The control is a four-position

RADAR WARNING CONTROLS

Figure 4-11

switch marked OFF, BEACON ONLY, ON, and LIGHT CHECK, and a ROGER button. To energize the equipment place the four-position switch to ON. Place the switch to OFF to de-energize the equipment.

RADAR RECEIVING SET AN/APS-54.

Radar Receiving Set AN/APS-54 transmits visible and audible warning to the pilot when an airborne interception or an airborne gun-laying radar system is in position to offer a potential threat to the airplane. The visible warning is displayed by indicator lights on the pilot's indicator panel and the instructor-pilot's AN/APS-54 control panel (figure 4-11). The red lights illuminate when radar signals arrive from the direction of the nose, the tail, or both. The green light (instructor-pilot's panel only) illuminates during an absence of signals. The audible warning is an audio tone in the headset and corresponds to the pulse rate frequency (high pulse rate for airborne radar and medium or low pulse rate for gun-laying or ground radar) of the intercepted signals. The audible tones are monitored through the AN/AIC-10 Intercommunication set. A test switch on the instructor-pilot's control panel tests operation of the visible and audible warning systems. The 28-volt d-c radio bus and the No. 1 a-c radio bus supplies the power to operate the equipment.

NORMAL OPERATION.

Place the AN/APS-54 power switch to ON. Place the pilot's interphone MARKER WARNING switch on and the marker beacon-radar warning switch to

RADAR WARNING. Set the panel controls as follows: delay switch OUT, audio switch BOTH, and audio-gain maximum (fully clockwise). Place the test switch to UP. An audio tone in the headset, illumination of both red nose and tail warning lights, and extinguishing of the green light, indicator proper system operation. The audio switch selects tones from the nose, tail, or both positions. The audio gain control governs the amplitude of the signals. Place the delay switch IN to delay signal indication. Delay time is two seconds. Place the delay switch OUT for instant signal indication.

S-4 SHORAN SYSTEM.

The S-4 shoran system is a highly accurate, short-range, navigational and bombing radar device. In navigational function, the equipment aids in computing a fix on the airplane's position. In bombing functions, the equipment automatically compensates for the variables of flight that affect the accuracy of bombing and provides data which enable flight to the true release point. At the release point, the bombs are automatically dropped whether the target is visible or not. The equipment is operated by the instructor-pilot, but both the pilot and the instructor-pilot receive indications from the system. Power for the system comes from the No. 1 radio bus and the 28-volt d-c radio bus through three circuit breakers on the main radio circuit breaker panel.

SHORAN COMPUTER UNIT.

The computer unit is on the instructor-pilot's right console. (See figure 4-12.) Flight variables automatically feed into the computer as the airplane approaches the release point. The computer determines the release point and the instant of release. At a predetermined distance from the bomb-release point, power is automatically supplied to the bomb carrier door control circuit to open the door. At the release point, power is automatically supplied to the bomb release circuits to release the bombs.

SHORAN RANGE INDICATOR.

The shoran range indicator is on the instructor-pilot's right console. (See figure 4-12.) A transmitter in the airplane sends out radar signals which are received by two shoran ground stations and retransmitted. The range indicator receives these retransmitted signals and indicates them visually on the range indicator scope. The instructor-pilot then superimposes the returned video signals upon reference marker pulses on the scope to reveal the distance to each station. Distances are indicated on station-miles dials and vernier counters. This locates the point on the earth's surface directly below the airplane. Prior to receiving video pulses, preset the indicator by means of the various controls and indicators on its panel.

SHORAN COMPARATOR.

The shoran comparator (figure 4-12), located to the right of the instructor-pilot's feet, receives timing signals and the returned drift station video from the shoran range indicator. Deviations of returning video pulses are visually indicated to the pilot and instructor pilot.

SHORAN POSITION DEVIATION INDICATOR.

Two shoran position deviation indicators, one on the pilot's main instrument panel and the other on the instructor pilot's instrument panel give instantaneous rate-of-approach and displacement-from-track data. This enables the pilot to fly the airplane precisely along a predetermined flight path.

SHORAN MILES-TO-RELEASE INDICATOR.

The shoran miles-to-release indicator on the instructor pilot's instrument panel indicates the miles remaining to the release point. The indicator is calibrated in one-mile increments from zero to nine. One revolution of the indicator needle represents ten miles; therefore, the needle recycles every ten miles.

AN/ALE-2 CHAFF DISPENSER.

The AN/ALE-2 Chaff Dispenser equipment is foi protection and evasion from hostile radar. The system consists of two control panels on the instructor pilot's left console, and two dispenser pads. The pads are on the left and right wing inboard pylons. The 28-volt d-c radio bus supplies the power to operate the equipment.

C-1282/ALE-1 CONTROL PANELS.

Two C-1282/ALE-1 control panels (figure 1-7) are on the instructor-pilot's left console. Each panel controls the operation of its respective chaff dispenser pod. Controls are an ON-OFF power switch, CHAFF RESERVE subtractive counters, a SIGNAL lamp, and a speed selector switch placarded INTERVALOMETER-CONTINUOUS FPM. The chaff reserve counter indicates the number of chaff packages available for dispensing. The speed-selector switch selects variable-speed or intervalometer-controlled chaff dispensing. For variable-speed control, the selector speed is marked numerically in feet-per-minute positions: 2.5, 5, 10, 20, 40, and 80. For intervalometer-controlled dispensing, there is a choice of four timed intervals between chaff package release: A (5 sec. off), B (10 sec. off), C (15 sec. off), and D (20 sec. off). E and F positions dispense single packages. Select position E for packages with 3⅝ inches to 4 inches

SHORAN COMPUTER AND INDICATOR

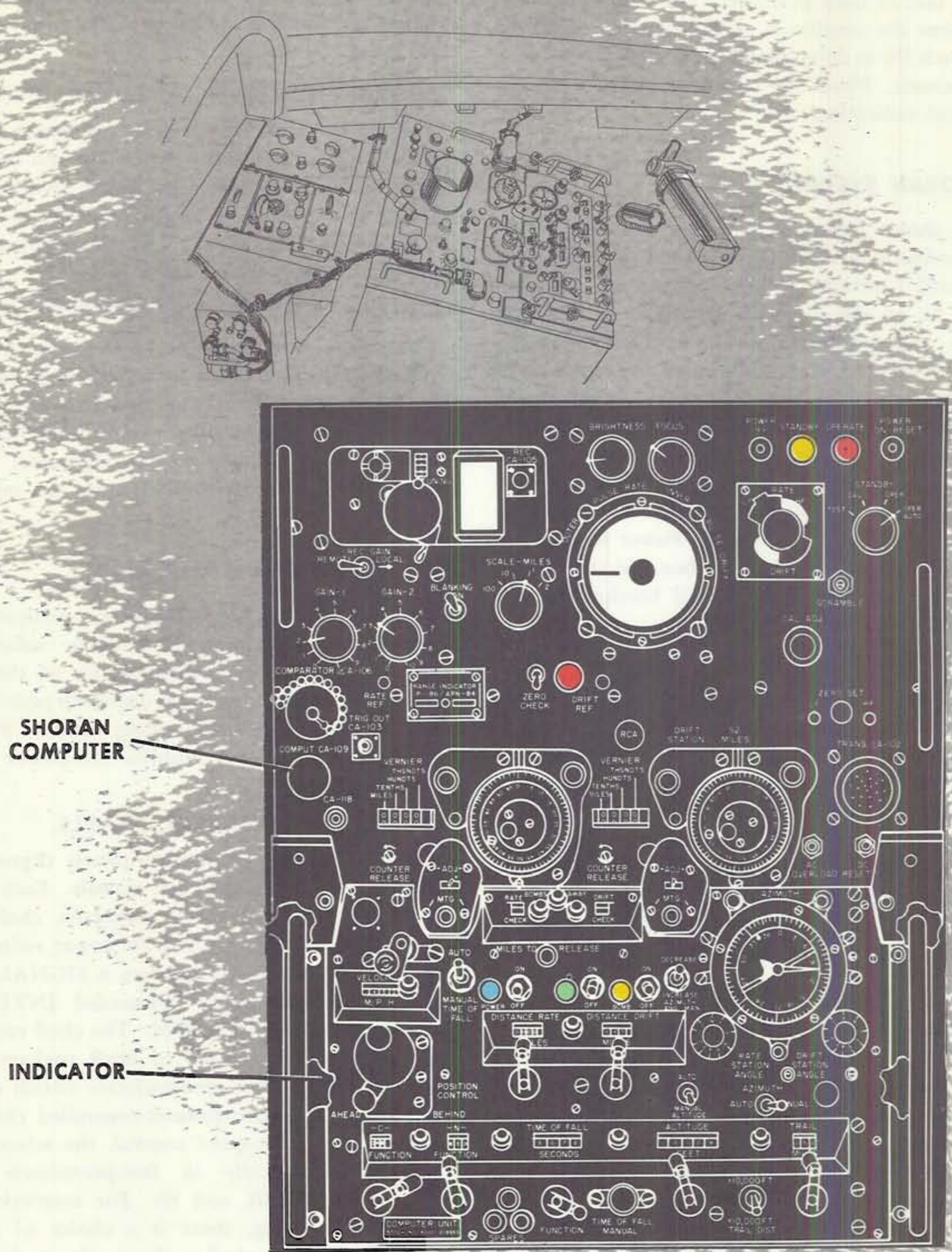

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Figure 4-12

between centers and position F for packages having 2½ inches between centers.

The SIGNAL light indicates the operation of the stripper unit. With numerical selections, the light goes out as each chaff package is stripped and relights ready for the next package. With alphabetical selections the SIGNAL light remains out, illuminating only during the stripping of each package.

AN/ALE-2 NORMAL OPERATION.

1. Set the CHAFF RESERVE counter to correspond with the number of chaff packages in the respective pod.
2. Place the speed selector switch to the desired position.
3. Place the power switch in ON.
4. Monitor the SIGNAL light for proper operation of equipment.

LIGHTING EQUIPMENT.

NAVIGATION LIGHTS.

The navigation lights (figure 1-1) consist of two clear lights on top of the fuselage center section, two clear lights on the bottom of the fuselage center section, a yellow light and a white light on the top and bottom of the tail cone, a red light in the left wing tip, a red light on the left tip tank, a green light in the right wing tip, and a green light on the right tip tank. Two switches on the pilot's lighting control panel control the lights and the 28-volt d-c distribution bus supplies the power to operate them.

NAVIGATION LIGHTS SWITCHES.

The two navigation lights switches are on the pilot's lighting control panel. (See figure 4-13.) Switch position markings for one of the switches are FLASH, OFF, and STEADY. Switch position markings for the second switch are BRIGHT and DIM. Placing the first switch from OFF to STEADY turns on the navigation lights and causes the lights to glow steadily. Placing the switch from OFF to FLASH turns on the lights and causes the light to flash. The clear lights at the top and bottom of the fuselage glow steadily in either switch position. Operating the DIM-BRIGHT switch controls light intensity.

LANDING LIGHT.

A high-intensity lamp within the lower surface of the left wing supplies the illumination for night landings. The airspeed limitation for light extension is 200 knots IAS.

LANDING LIGHT SWITCHES.

Two switches on the landing gear control panel control landing light operation. (See figure 1-30.) The markings for one switch are EXTEND and RETRACT. The markings for the second switch are ON and OFF. The EXTEND-RETRACT switch controls the light motor to raise or lower the light and the OFF-ON switch controls lamp operation. The EXTEND-RETRACT switch has a neutral position. The switch must be in the neutral position when the light is fully up or down. The 28-volt generator bus supplies the power to operate the motor and illuminate the lamp.

TAXI LIGHTS.

Two lights, one mounted in the leading edge of each wing tip, furnish limited illumination for night ground operation. The taxi lights switch on the landing gear control panel controls this circuit. The 28-volt d-c distribution bus supplies power for operation.

TAXI LIGHTS SWITCH.

The taxi lights switch is marked TAXI LIGHTS and OFF. Placing the taxi lights switch to TAXI LIGHTS turns the lights on. (See figure 1-30.) Placing the switch in OFF turns the lights off.

INSTRUCTOR-PILOT'S SPOTLIGHT.

The instructor-pilot's spotlight is on the aft glare shield. The spotlight switch is on the instructor-pilot's main instrument panel. Placing the switch from the center position to the ON (up) position causes the spotlight to illuminate. Placing the switch from ON to the center position turns the light off.

C-4A LIGHTS.

Two C-4A lights (figures 1-4 and 1-8), one on the pilot's right circuit breaker panel and one on the pressure bulkhead to the right of the instructor-pilot's seat, are convenient portable lights for map reading and general illumination. The light assemblies consist of a stowage rod, a coiled electrical wire, a metal case housing the lamp, and a detachable red lens. Appearing on the lamp casing are a button switch and a rotary switch. The button switch and the rotary knob switch control lamp operation. The 28-volt d-c battery bus supplies power to operate the lamp.

C-4A LIGHT CONTROLS.

A spring-loaded button switch on the lamp casing is the control for momentary lamp operation. Depressing the button causes the lamp to illuminate; releasing the button causes the lamp to go out. Rotating the rotary switch from one of the extreme positions causes the light to illuminate and remain illuminated. Light intensity depends on the amount of switch rotation. Depressing two clips on the sides of the red lens enables the operator to remove the red lens. To use the light for illuminating a specific object in the cabin, remove the lamp from its stowed position.

Note

To avoid discharging the battery, turn off the C-4A lamps before leaving the airplane.

PILOT'S CONSOLE AND INSTRUMENT LIGHTS.

The pilot's console and instrument lights furnishes white illumination for the pilot's station. The lights are divided into four groups, engine instrument, flight instrument, left console and right console lights, and include both lucite panel and instrument ring lights. Each group is controlled by a rheostat. The rheostat varies light intensity and is placarded OFF and BRT. The rheostats are on the pilot's lighting control panel. (See figure 4–13.) The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the system.

INSTRUCTOR-PILOT'S CONSOLE AND INSTRUMENT LIGHTS.

The instructor-pilot's console and instrument lights furnish white illumination for the instructor-pilot's station. The lights are divided into two groups and include both lucite panel and instrument mask lights. Each group is controlled by a rheostat. The rheostat varies light intensity and is placarded OFF BRT. The rheostats are on the lighting control panel. (See figure 4–13.) The 28-volt d-c circuit breaker bus supplies the power to operate the system.

PILOT'S RED AND WHITE FLOODLIGHTS.

The pilot's station has red floodlights for general illumination and white floodlights to provide a color contrast to reduce visual distortion. The floodlight system is controlled by two rheostats on the pilot's lighting control panel. The rheostats control the intensity of all the floodlights from dim to bright and also have an OFF position. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the system.

WARNING LIGHTS.

There are warning lights of variable brilliance for the emergency fuel control, fuel pressure, the landing gear and the inverter warning lights.

WARNING LIGHTS SWITCH.

A warning lights switch, on the pilot's auxiliary lighting control panel, controls the intensity of the warning lights. (See figure 4–13.) The switch has two positions: BRIGHT and DIM.

THUNDERSTORM LIGHTS SWITCH.

The thunderstorm lights under the glare shield and above the consoles are controlled by a three-position switch on the pilot's auxiliary lighting control panel. Place the switch in the up position for steady illumination and hold the switch in the down position for momentary illumination. Placing the switch in OFF (center) turns the lights off.

INSTRUCTOR-PILOT'S RED AND WHITE FLOODLIGHTS.

The instructor-pilot's station is equipped with red and white floodlights for general illumination of the console, and the instrument panel. The floodlights are controlled by two rheostats on the instructor-pilot's lighting control panel. (See figure 4–14.) The rheostats control light intensity from dim to bright and also have an OFF position. The 28-volt d-c distribution bus supplies the power to operate the system.

COMPARTMENT DOME LIGHTS.

Compartment dome lights are in the right electrical access compartment, the bomb door area, the electronic compartment, the equipment compartment, the electrical distribution center, and the gun bays. The right electrical access compartment light and switch are on the same bracket, located over the access door. The bomb door area has two lights, one at each end, controlled by a switch at the forward end of the bomb door area on the right side. The electronic compartment lights are controlled by a switch in the electronic compartment above the aft fuselage access door. Each gun bay has two lights, one over the inboard guns and one over the outboard guns. The gun bay lights are controlled by a switch on the forward side of the spar, inside the gun bay access door. The equipment compartment has one light and two switches. Each switch is in the equipment compartment inside and aft of each hatch. The electrical distribution center light is controlled by a switch inside and forward of the access door on the lower right side of the forward fuselage. Electrical power for the dome lights is supplied by the 28-volt d-c generator bus.

OXYGEN SYSTEM.

A five-liter high-flow oxygen converter supplies oxygen to the low-pressure (70 psi) system. The converter

PILOT'S LIGHTING CONTROLS

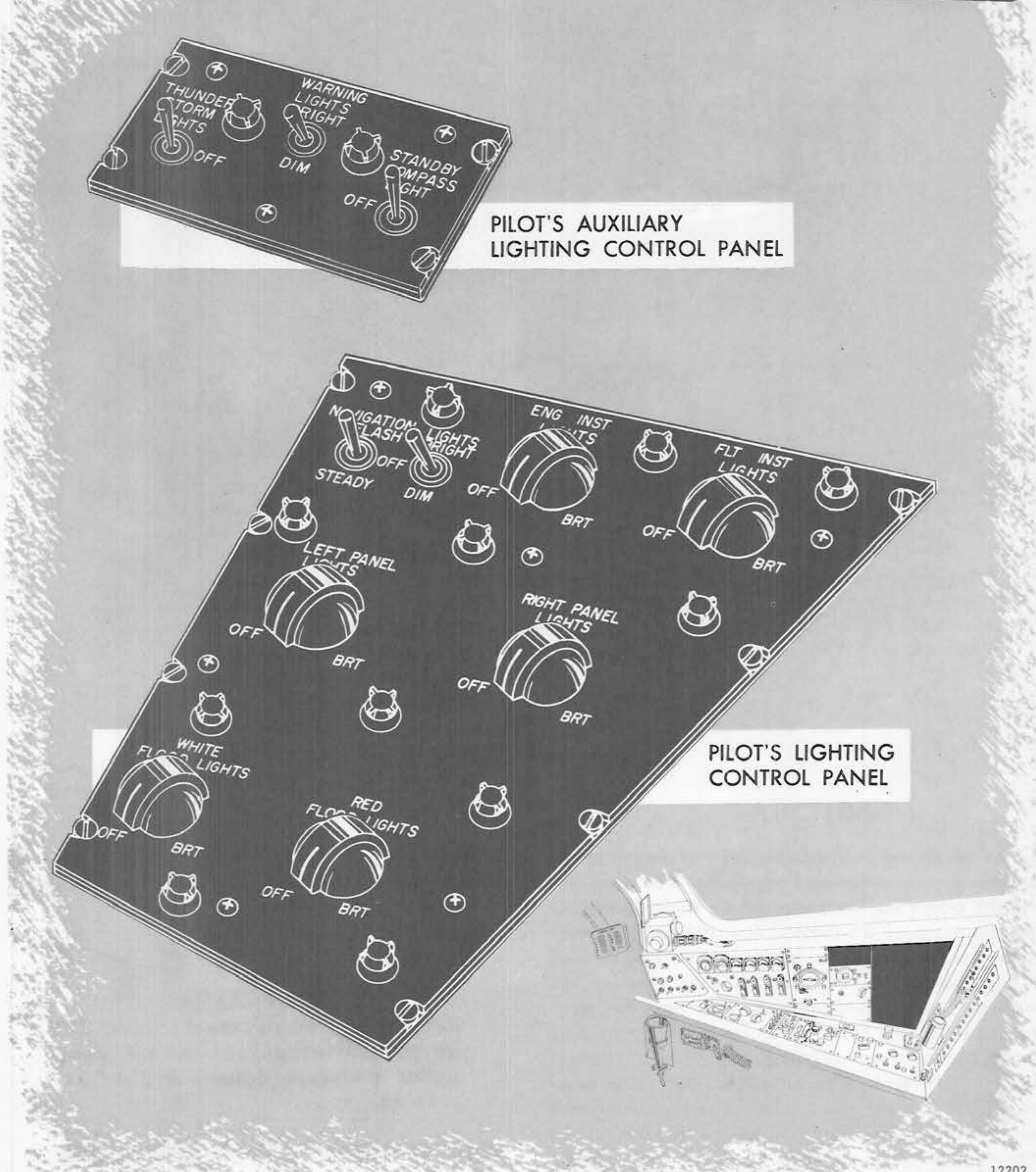

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Figure 4-13

INSTRUCTOR PILOT'S LIGHTING CONTROLS

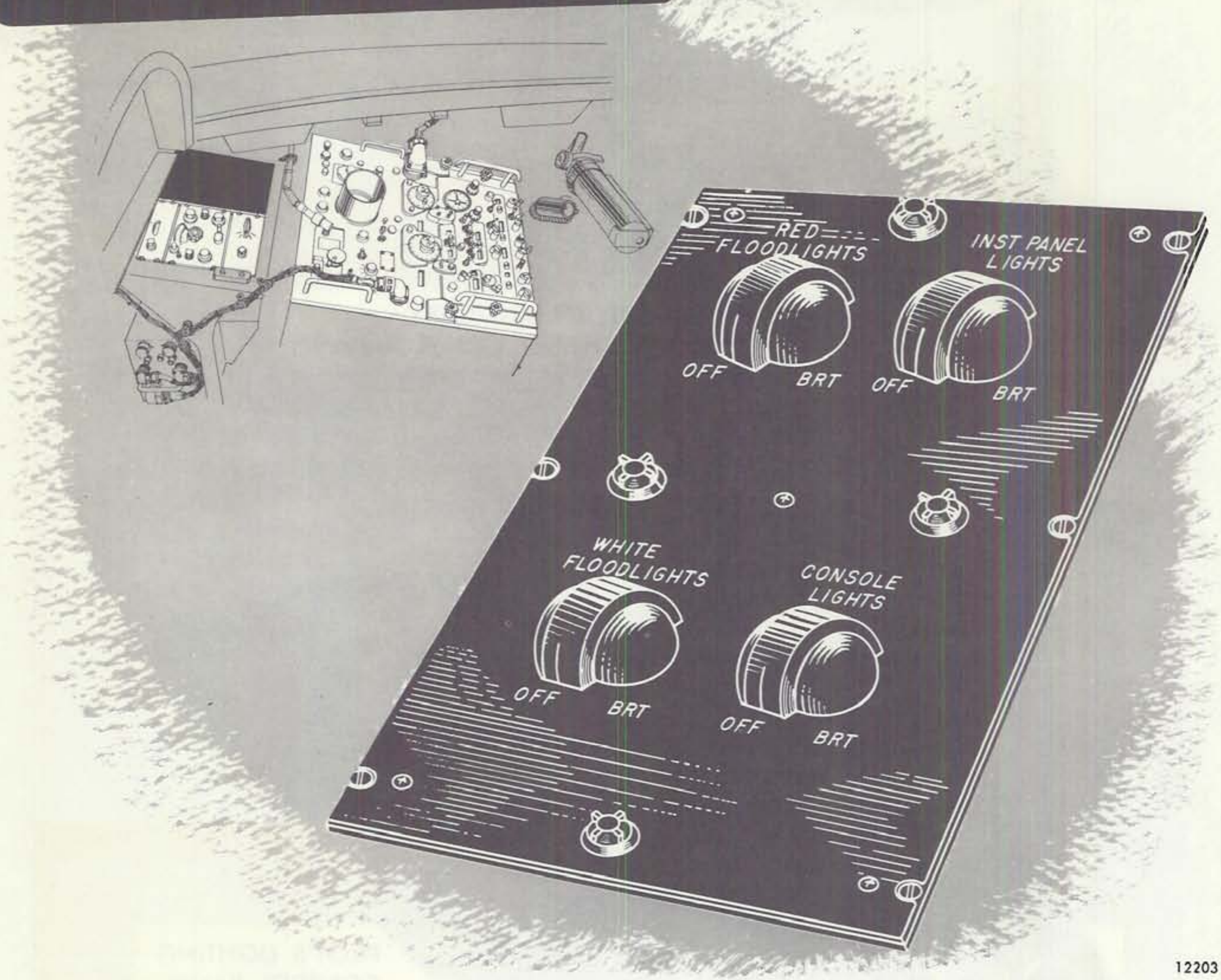

Figure 4–14

in the equipment compartment delivers oxygen to two automatic pressure-demand regulators. The regulators (at the pilot's and instructor-pilot's station) combine the functions of an oxygen flow indicator, pressure gage, and regulator. The converter is serviced through a quick-disconnect filler valve. During servicing, the converter vents to the atmosphere through the build-up-and-vent valve. Both valves are in the right equipment compartment. Placing the build-up-and-vent valve in the build-up position closes the system to atmospheric pressure and a relief valve prevents system pressure from exceeding 100 psi. A bracket on the compartment door prevents the door from closing until the build-up-and-vent valve handle is in the build-up position. An oxygen duration table is shown in figure 4–15. Refer to figure 1–37 for the location of the filler valve and converter and for oxygen specifications.

WARNING

Keep oxygen equipment clean. Oil or grease in contact with oxygen under pressure causes fire or explosion.

PRESSURE-DEMAND OXYGEN REGULATORS.

A Type D–2 automatic pressure-demand oxygen regulator (figure 4–16) at each crew station controls oxygen

OXYGEN DURATION

CABIN ALTITUDE FEET	GAGE QUANTITY — LITERS				
	5	4	3	2	1
40,000	12 hr 00 min	9 hr 36 min	7 hr 12 min	4 hr 48 min	2 hr 24 min
	12 hr 00 min	9 hr 36 min	7 hr 12 min	4 hr 48 min	2 hr 24 min
35,000	12 hr 00 min	9 hr 36 min	7 hr 12 min	4 hr 48 min	2 hr 24 min
	12 hr 00 min	9 hr 36 min	7 hr 12 min	4 hr 48 min	2 hr 24 min
30,000	8 hr 42 min	6 hr 48 min	5 hr 12 min	3 hr 30 min	1 hr 48 min
	8 hr 54 min	7 hr 06 min	5 hr 18 min	3 hr 36 min	1 hr 48 min
25,000	6 hr 42 min	5 hr 18 min	4 hr 00 min	2 hr 42 min	1 hr 24 min
	8 hr 24 min	6 hr 42 min	5 hr 00 min	3 hr 24 min	1 hr 42 min
20,000	5 hr 12 min	4 hr 12 min	3 hr 12 min	2 hr 00 min	1 hr 00 min
	9 hr 30 min	7 hr 36 min	5 hr 42 min	3 hr 48 min	1 hr 54 min
15,000	3 hr 54 min	3 hr 06 min	2 hr 48 min	1 hr 36 min	0 hr 48 min
	11 hr 30 min	9 hr 12 min	6 hr 54 min	4 hr 36 min	2 hr 18 min
10,000	3 hr 18 min	2 hr 42 min	2 hr 00 min	1 hr 18 min	0 hr 42 min
	11 hr 30 min	9 hr 12 min	6 hr 54 min	4 hr 36 min	2 hr 18 min

RED BOXES INDICATE DILUTER LEVER SET AT 100 PERCENT OXYGEN

BLACK BOXES INDICATE DILUTER LEVER SET AT NORMAL OXYGEN

BELOW 1 LITER — MAKE EMERGENCY DESCENT TO ALTITUDE NOT REQUIRING OXYGEN

CONVERTER: I-TYPE A-3 CREW: 2

12200

Figure 4–15

flow from the converter to the mask. The regulator automatically mixes the correct ratio of cabin air and 100% oxygen. A diluter air valve in the regulator controls the flow of cabin air into the regulator. As cabin altitude increases, the diluter air valve closes, permitting less cabin air to mix with the 100% oxygen. A demand diaphragm in the regulator operates a demand valve. Inhalation causes the diaphragm to open the demand valve to permit the flow of diluted oxygen to the mask. A faulty demand diaphragm or a faulty diluter air valve allows oxygen to leak out of the regulator during exhalation. Perform a blow-back test as described under OXYGEN SYSTEM BLOW BACK TEST in this section before flight to detect regulator malfunction. The regulator controls are an oxygen supply lever, an oxygen-diluter lever, and an

EMERGENCY PRESSURE lever. While in use, the oxygen system stabilizes at 70 psi as long as there is liquid oxygen in the converter. Check DD Form 781 to insure that the system has been serviced before flight.

OXYGEN-REGULATOR DILUTER LEVER.

The oxygen-diluter lever on the oxygen regulator is a manual control for selecting 100% oxygen or diluted oxygen. Placing the lever in NORMAL OXYGEN causes the regulator to mix a proper ratio of cabin air to oxygen; however, above 30,000 feet cabin altitude the user receives 100% oxygen in the NORMAL OXYGEN position. Placing the lever in 100% OXYGEN causes the user to receive 100% oxygen at any altitude.

OXYGEN-REGULATOR SUPPLY LEVER.

The oxygen-regulator supply lever on the oxygen regulator controls the oxygen supply shut-off valve. Placing the lever in ON opens the shut-off valve. The opened shut-off valve releases oxygen under pressure from the converter to the regulator at 70 to 100 psi. Placing the lever in OFF shuts off the valve.

EMERGENCY PRESSURE LEVER.

The EMERGENCY pressure lever is on the oxygen regulator. Placing the lever to the right or left increases the oxygen pressure from the regulator to the mask for additional pressure. Returning the lever to the center position restores normal operation. Depress the lever to obtain maximum oxygen pressure to the Mask for a preflight check of mask.

OXYGEN PRESSURE GAGE AND FLOW INDICATOR.

The combination pressure gage and flow indicator is on the oxygen regulator. As long as there is liquid oxygen in the converter, the pressure gage indicates a pressure between 70 and 100 psi. Gage markings are from 0 to 500 in 100 psi increments. Since the airplane has a low-pressure system, the needle normally does not exceed the 1 on the face of the gage. The flow indicator blinker dial exposes four luminescent painted segments in tea-shaped windows every time the user inhales.

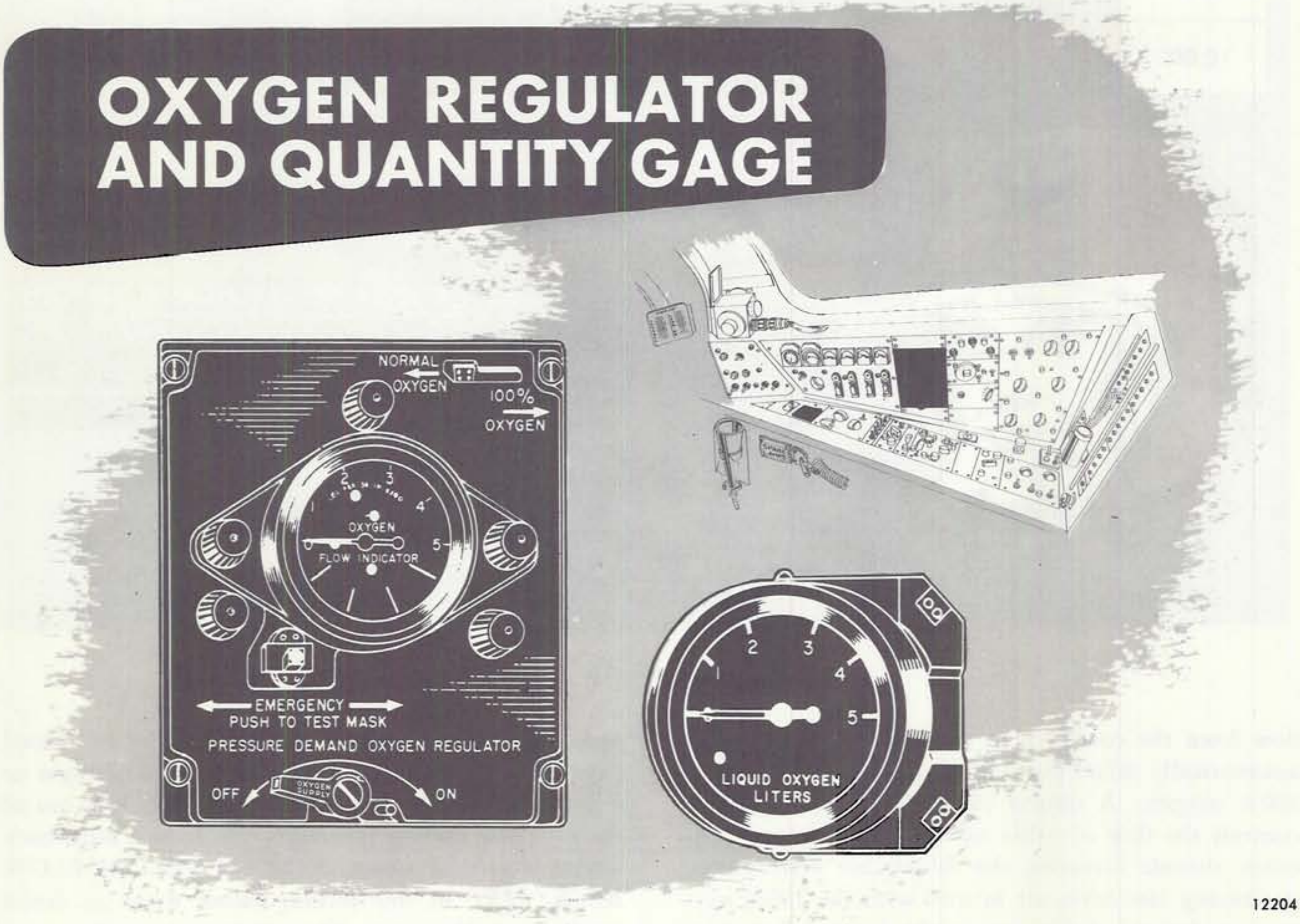

Figure 4-16

OXYGEN QUANTITY GAGE.

The oxygen quantity gage is on the pilot's right console. It indicates the quantity of liquid oxygen in the converter. The gage indicates the quantity in one-liter increments from 0 to 5 liters. The gage should read between four and four and one-half liters when the system is fully charged. Do not be alarmed if the indicator does not read five liters since it is impossible to charge the liquid oxygen converter to five liters. Use the oxygen duration chart (figure 4–16) to determine oxygen duration for the indicated supply.

OXYGEN SYSTEM BLOW-BACK TEST.

The oxygen regulator contains demand diaphragm and diluter air valve. The diaphragm operates a demand valve and controls the flow of oxygen according to the suction created in the regulator by the user. The diluter air valve controls the flow of air into the regulator, decreasing the flow with increases in altitude so that the suction in the regulator creates a greater load on the diaphragm, thus giving more oxygen. A damaged diaphragm will allow air to enter the regulator during inhalation, thus decreasing the oxygen-air ratio. Therefore, a damaged diaphragm or faulty diluter air valve will allow oxygen to leak out of the regulator at all times during positive pressure breathing. To check the operation of the regulator before take-off on each flight, conduct a blow-back test as follows: (Also see figure 4–17.)

1. Place the diluter lever in NORMAL OXYGEN and blow gently into the oxygen regulator hose. A resistance indicates satisfactory operation of the demand diaphragm and diluter air valve.
2. Place the diluter lever in 100% OXYGEN and blow gently into the oxygen regulator hose. A resistance indicates satisfactory operation of the demand diaphragm and diluter air valve.
3. Don the mask and connect the mask to the regulator hose. Breathe normally and note operation of blinker dial.
4. Hold breath and place the EMERGENCY pressure lever to the right or left. A positive pressure felt within the mask indicates proper emergency oxygen flow. This positive pressure is approximately 0.07 psi more than cabin altitude.
5. To test the mask for leakage, depress the EMERGENCY pressure lever while holding the breath. Oxygen pressure from the regulator enters the mask at approximately 0.5 psi above cabin altitude. A properly fitted mask retains this pressure until normal respiration continues.
6. Check that the mask hose fittings are properly seated and secure.

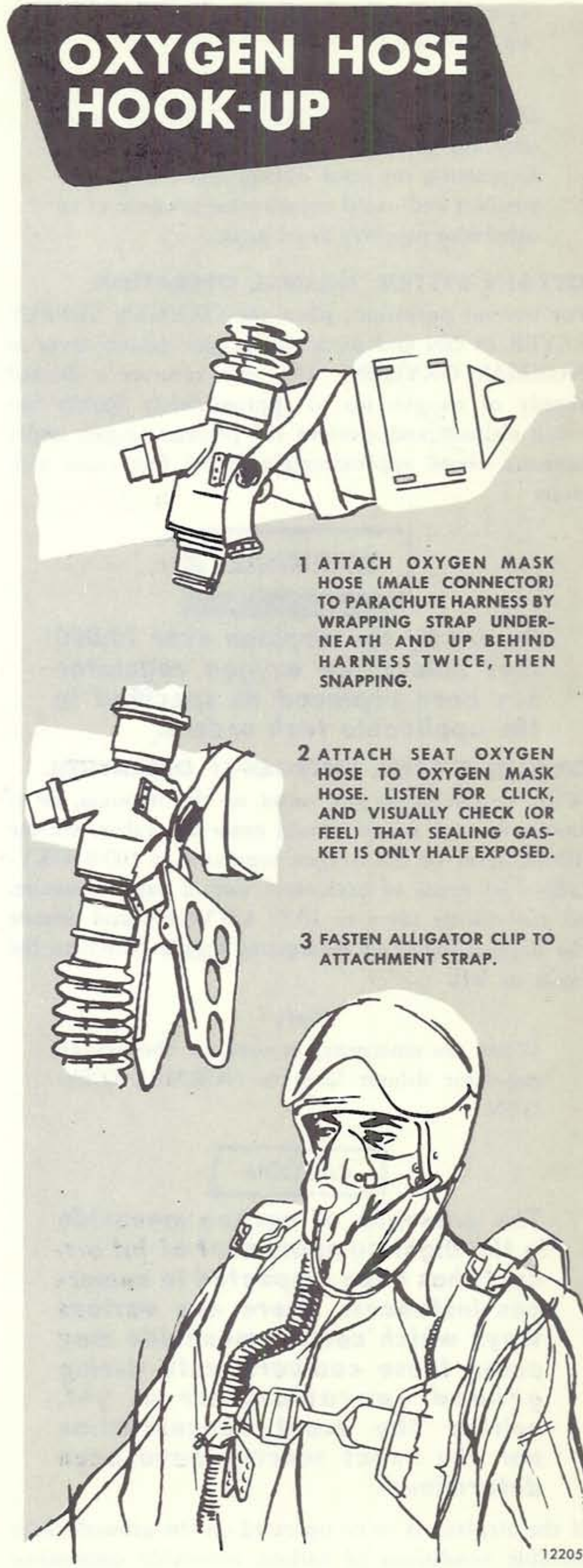

Figure 4–17

7. Check the mask hose attachment to the parachute harness in accordance with the instructions on figure 4–17.

Note

Depress the PUSH-TO-TEST-MASK lever only for preflight mask and helmet testing. Depressing the lever during flight causes discomfort and could cause maladjustment of an otherwise properly fitted mask.

OXYGEN SYSTEM, NORMAL OPERATION.

For normal operation, place the OXYGEN SUPPLY LEVER in ON and place the oxygen diluter lever in NORMAL OXYGEN. The user receives a diluted supply of oxygen up to approximately 30,000 feet cabin altitude and receives 100 percent oxygen under pressure above approximately 30,000 feet cabin altitude.

WARNING

Do not fly the airplane over 10,000 feet unless the oxygen regulator has been replaced as specified in the applicable tech orders.

OXYGEN SYSTEM, EMERGENCY OPERATION.

With symptoms of the onset of the hypoxia, or if smoke or fuel fumes should enter the cabin, set the diluter lever of the oxygen regulator at 100% OXYGEN. In event of accidental loss of cabin pressure, set the diluter lever to 100% OXYGEN and actuate the oxygen regulator emergency toggle switch to the right or left.

Note

When the emergency is over, set the oxygen regulator diluter lever to NORMAL OXYGEN.

CAUTION

The presence of carbon monoxide in the flight compartment of jet aircraft has been suspected in numerous instances. There are various ways which carbon monoxide may enter these compartments during ground operation, but as yet, neither the exact concentration nor the exact sources have been determined.

If the airplane is to be operated on the ground under possible conditions of carbon monoxide contamination, such as during runup or taxiing directly behind another operating jet aircraft, or during runup with its tail into the wind, the following procedure shall be used:

1. Before starting engines, all crew members must don oxygen masks, connect hoses to oxygen regulator, and place diluter lever at the 100% OXYGEN position.
2. Whenever contamination is suspected, 100 percent oxygen must be used during ground operation and take-off.
3. After contamination is no longer suspected, place the diluter lever of the oxygen regulator in NORMAL OXYGEN.

WARNING

Return the oxygen diluter lever to NORMAL OXYGEN as soon as possible because the use of 100 percent oxygen throughout a long mission will so deplete the oxygen supply as to be hazardous to the flight crew.

NAVIGATION EQUIPMENT.

J–2 COMPASS SYSTEM.

The J–2 compass system indicates the airplane's heading. The direction-seeking characteristics of the magnetic compass combined with the stability of a gyro give headings without northerly turning error, oscillation, or swinging. Operating within 85 degrees from level flight (climbs, dives, and banks), the gyro strikes mechanical stops at 85 degrees, causing subsequent heading indications to be inaccurate within ± 5°. After five minutes or less of level flight, the gyro recovers and automatically begins to give correct heading indications. The compass system receives its heading information from a compass transmitter remotely installed in the right horizontal stabilizer. An amplifier receives a relatively weak signal from the compass transmitter, increases the strength of the signal, and directs this information to torque motors which slave the gyro. The transmitter is accurate between the latitudes of 78 degrees north and 69 degrees south. An out-of-slave function permits the compass to operate as a directional gyro in polar areas. The compass requires both a-c and d-c power. The a-c power is supplied from 115-volt phase B and phase C busses and from the No. 2 radio bus. The d-c power is supplied from the 28-volt d-c battery bus. A one-ampere circuit breaker in the left electrical access compartment controls operation of the J–2 compass system.

Note

The J-2 compass circuit breaker is in the left electrical access compartment. This circuit breaker is not accessible during flight and must be placed in during the exterior inspection.

J-2 COMPASS SWITCH.

The J-2 COMP switch (figure 1-3) is on the pilot's left horizontal console. The switch is marked IN and SLAVE OUT. Placing the switch in the IN position completes the slaving circuits from the remote compass transmitter to the gyro torque motors. Placing the switch in SLAVE OUT de-energizes the circuit from the transmitter to the motors. While out of slave, the gyro acts as an independent directional gyro.

J-2 COMPASS SLAVE REINITIATE BUTTON.

The SLAVE REINITIATE button (figure 1-3) is on the pilot's left horizontal console. Depressing the button closes a circuit to supply high voltage for two to three minutes to the gyro torque motors, thereby accelerating the gyro erection and alignment. Allow a ten-minute interval before again depressing the button, to allow a thermal time switch to cool.

J-2 COMPASS INDICATOR.

The compass indicators (one on the pilot's main instrument panel and one on the instructor-pilot's main instrument panel) furnish the crew magnetic heading indications without a northerly turning error, oscillation, or swing. (See figure 1-5 and 1-6.) A settable dial knob enables the user to rotate the dial index to the desired heading. A selsyn unit transmits heading information from the gyro to the compass indicator. The 115-volt a-c 400-cycle B and C phase bus supplies the power to operate the compass.

J-2 COMPASS NORMAL OPERATION.

The compass will operate if the engines are running and the instrument inverter switch is in NORMAL or STANDBY, if the engines are shut-down and the instrument inverter switch is in STANDBY, or if external power is supplied and the instrument inverter switch is in NORMAL. After turning on the equipment, allow three minutes to elapse so that the gyro in the directional gyro control comes up to operating speed, levels, and aligns the indication on the slaved gyro compass indicator with the remote control compass transmitter.

J-2 COMPASS, EMERGENCY OPERATION.

If any one of the three inverters should fail, the J-2 compass will continue to operate only as a directional gyro. During an inverter failure, the J-2 compass system will not supply data to the S-4 shoran system or to the AN/ASN-6 system. Complete failure of either the a-c or d-c electrical systems causes the J-2 compass to be inoperative.

STANDBY COMPASS.

A conventional magnetic compass is on the windshield frame directly in front of the pilot. (See figure 1-5.) During electrical system failure or malfunctioning of the J-2 compass, use the standby compass as a navigational aid. The standby compass correction card is on the pilot's glare shield.

STANDBY COMPASS LIGHT SWITCH.

The STANDBY COMPASS LIGHT switch (figure 4-13) is on the pilot's auxiliary lighting control panel. The switch is marked STANDBY COMPASS LIGHT and OFF. Placing the switch from OFF to STANDBY COMPASS LIGHT causes illumination of the standby compass. The flight instrument light rheostat must be on to energize the circuit. The 28-volt d-c pilot's circuit breaker bus supplies the power to operate the lamp.

SHORAN EQUIPMENT.

Refer to COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT in this section.

RADIO COMPASS.

Refer to COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT in this section.

LATITUDE AND LONGITUDE COMPUTER SET AN/ASN-6.

Latitude and Longitude Computer Set AN/ASN-6 (Ground Position Indicator) is a dead-reckoning navigation system. The system continuously solves for and indicates the ground position of the airplane in degrees and minutes of latitude and longitude, regardless of the speed of the airplane. Both manual and automatic inputs are fed to the system. The automatic inputs are provided by the J-2 compass for magnetic heading and by the pitot-static system through a transmitter for true airspeed. The instructor-pilot manually sets the figures for wind force, wind direction, and magnetic variation through the use of computer controls. A-c power for the system is supplied by the No. 2 radio bus, and d-c power by the 28-volt d-c radio bus. The system is operable whenever these busses are energized. No power switch is provided.

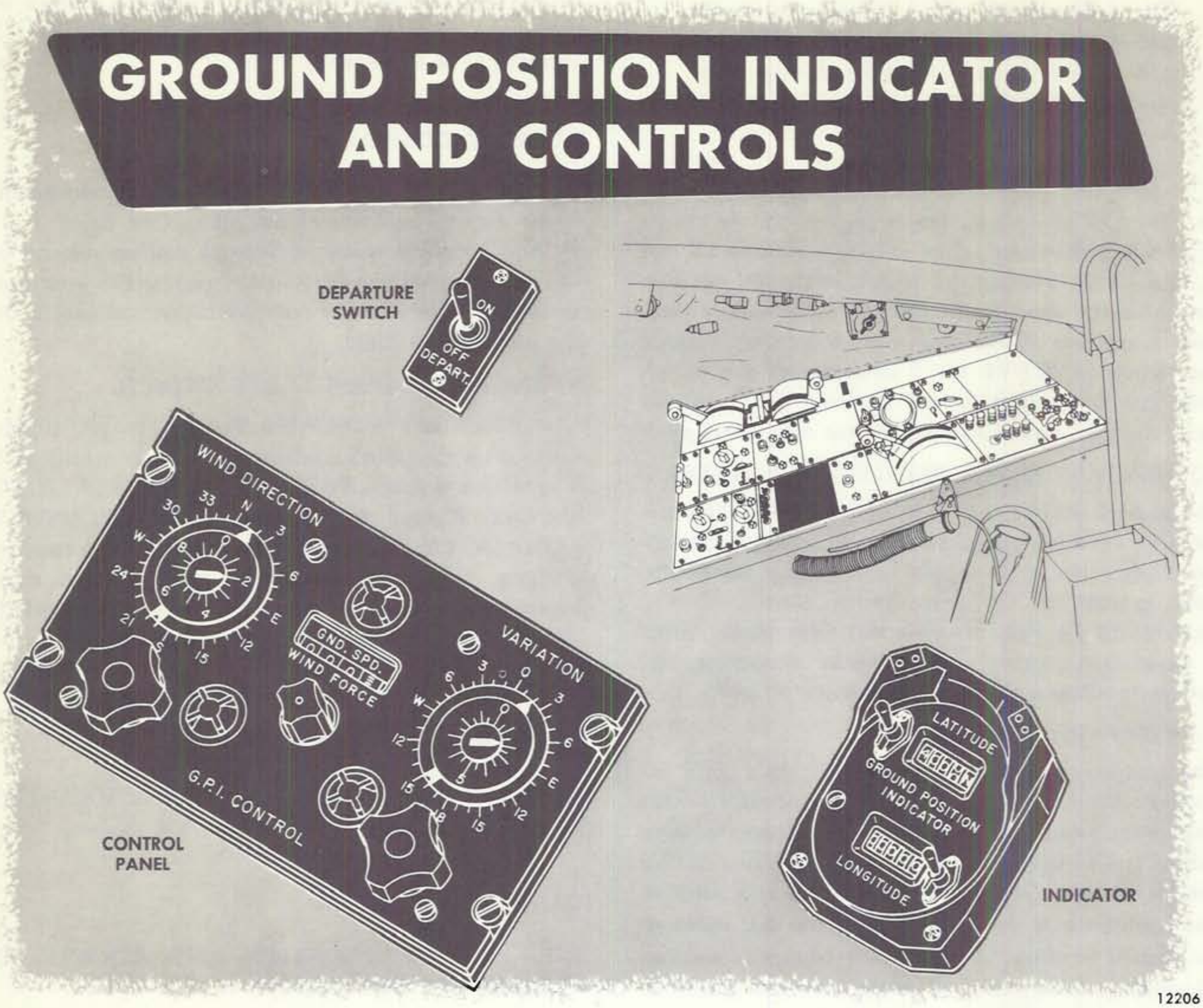

Figure 4–18

COMPUTER CONTROLS.

The computer controls, on the instructor-pilot's left console, permit the manual adjustment of wind force, wind heading, and magnetic variation to be transmitted to the computer. (See figure 4–18.) Located on the panel are three knobs labeled: WF, WD, and VAR. These knobs control three indicators also located on the panel and labeled: WIND FORCE, WIND DIRECTION, and VARIATION. These knobs are connected to the indicators, and turning one of them causes its respective indicator to turn. In the case of the wind direction and wind force knobs, turning the knobs in a clockwise direction causes their respective indicators to show an increase in the reading. In the case of the variation knob, turning it in a clockwise direction will show a decrease in westerly variation or an increase in easterly variation, whichever may be the presetting.

DEPARTURE SWITCH.

A departure switch on the instructor-pilot's instrument panel, permits the retention of the airplane's point of departure position data on the latitude and longitude counters until the airplane is airborne and generating change of position. The switch is labeled LAT-DEPART and has two positions: ON and OFF. Placing the switch in OFF applies 28-volt d-c power to a locking relay in the computer. This relay then opens the circuits to the latitude and longitude counters and causes them to remain at the positions they had when the switch was actuated. Placing the switch in ON causes the locking relay to close the circuits to the counters and they will then begin indicating a change of position.

GROUND POSITION INDICATOR.

The ground position indicator, on the instructor-pilot's instrument panel, continuously indicates the ground position of the airplane. In addition to indicating the position visually, the indicator also transmits this information to the latitude and longitude computing system. The ground position is indicated by a latitude counter and a longitude counter on the face of the indicator. The counters automatically indicate whether the latitude is north or south and whether the longitude is east or west.

GROUND POSITION INDICATOR COUNTER RESET SWITCHES.

Two counter reset switches are on the front of the ground position indicator. These switches permit setting the initial co-ordinates of the point of departure or any other point desired. Each switch controls a motor, and the direction of rotation depends on the displacement of the switch. The reset switches may also be used to reset the counters while the system is in operation.

LATITUDE AND LONGITUDE COMPUTER SET AN/ASN-6, NORMAL OPERATION.

1. Check that both GPI circuit breakers on the a-c, d-c circuit breaker panel are pushed in.
2. Position the wind force, wind direction, and variation knobs so that their respective indicators reflect a zero reading.
3. Actuate the counter reset switches until the counters reflect the correct co-ordinates on the indicator.
4. Place the departure switch in OFF.
5. Before take-off, place the mean wind direction, wind force, and magnetic variation for climb on the computer control indicators. As soon as practicable after take-off, determine the actual wind conditions and adjust the indicators as necessary. If leaving a check point, place the actual wind conditions and magnetic variation on the indicators.
6. Place the departure switch in ON during take-off or when leaving a check point.

ARMAMENT EQUIPMENT.

The basic armament equipment in the airplane consists of fixed wing guns, internal stores carried on the rotary bomb carrier door, and rockets or external stores carried on pylons under the wings. A Mark 8 Mod 8 (modified) Gunsight, mounted on the pilot's glare shield, is the sight for the guns, the rockets and low-level bombing.

GUNNERY EQUIPMENT. (GROUP A)

Note

Group A gunnery equipment is on AF airplanes 53-3825 through 53-3831.

The gunnery equipment consists of eight M3 50-caliber machine guns. Four guns are mounted in a horizontal bank in a gun bay outboard of the engine nacelle in each wing. Each gun can fire 300 rounds of ammunition for a total of 2,400 rounds for the airplane. In addition, each gun is electrically heated and pneumatically charged. All controls for the guns are electrical.

WARNING

To prevent inadvertent firing of the M3 50-caliber guns while the airplane is on the ground, make absolutely sure that the master guns switch is OFF.

PNEUMATIC GUN-CHARGING SYSTEM. (GROUP A)

Each M3 50-caliber gun is equipped with a pneumatic gun charger. Pressure is maintained by an air compressor and two air storage bottles. A relief valve at each bottle protects the bottle and system from excessive pressures. A fuse in each gun line prevents loss of the entire system should a line fail. A line tapped into the engine compressor bleed line augments the pneumatic compressor at altitudes above 35,000 feet. The system is controlled by a gun charger switch on the armament control panel. The operation of the compressor is controlled by two pressure switches in the system; one completes the circuit to energize the compressor when system pressure is low, and the other breaks the circuit to de-energize the compressor when the pressure in the system is normal. Power for the system comes from the pilot's 28-volt d-c circuit breaker bus. A pressure gage is located in the outlet line of the compressor before it branches off to the air bottle in each wing. A ground charging valve adjacent to the pressure gage is used for charging the system before flight rather than using the compressor in the airplane.

GUN-CHARGERS SWITCH. (GROUP A)

The gun-chargers switch, on the armament control panel, permits clearing the guns if a misfire should occur. The switch is of the momentary type and has three positions: RELEASE, RETRACT, and OFF. When the switch is placed momentarily in RETRACT, and chargers place the guns in a hold-back condition. Held momentarily in the RELEASE position, the switch causes the gun chargers to return the guns to the battery position.

MASTER GUNS SWITCH. (GROUP A)

The master guns switch, marked GUNS, is on the armament control panel. The switch has three positions: GUNS, SIGHT AND RADAR, and OFF. When guns are to be fired, the switch must be in the GUNS position. When the switch is in this position, circuit will be completed from the 28-volt d-c distribution bus to the gun firing switch and the gunsight light switch. When rockets are to be fired or bombs dropped, and the gunsight is to be used, the master guns switch must be in SIGHT AND RADAR. When the switch is in this position, the circuit will be completed from the distribution bus to the gunsight light switch, but the circuit to the gun firing switch will be open. When the switch is in the OFF position, both circuits are broken.

GUN-FIRING TRIGGER (GROUP A)

The gun-firing switch, in the right handgrip of the control wheel, is the trigger for the gun. When the master guns switch is in the GUNS position, the gun-firing switch is energized. Depressing this switch closes the circuit to the gun controls in the wings, causing the guns to fire. The switch supplies power from the 28-volt d-c distribution bus.

GUN-HEATERS SWITCH. (GROUP A)

The gun-heaters switch, located on the armament control panel, controls the heaters for each 50-caliber gun. During extreme cold or icing conditions, placing the switch in HEATERS keeps the guns from freezing. When the switch is placed in this position, a circuit to the heaters is energized and the heaters warm up the guns. Power for the heaters comes from the 28-volt d-c distribution bus.

FIRING M3 50-CALIBER GUNS. (GROUP A)

To fire the M3 50-caliber guns, proceed as follows:

1. Check that the gun compressor circuit breaker is ON.
2. If extreme cold or icing conditions exist, place the gun heaters switch in the HEATERS position.
3. Place the master guns switch in the GUNS position.
4. Set the gunsight tilting knob to the GUNS position.
5. Place the gunsight light switch in the GUNSIGHT ON or ALTERNATE ON position.
6. Adjust the gunsight light rheostat to desired reticle brilliance.
7. Actuate the gun-firing trigger.

Note

If the guns fail to fire after actuating the gun-firing switch, place the chargers switch in the RETRACT and RELEASE positions alternately a few times to clear the guns.

CAUTION

After firing has been completed, place the master guns switch in OFF to safety the guns.

GUNNERY EQUIPMENT. (GROUP B)

Note

Group B gunnery equipment is on AF airplanes 53-3832 and up.

The gunnery equipment consists of four M39 20-millimeter guns. Two guns are mounted in a horizontal bank in a gun bay outboard of the engine nacelle in each wing. The guns are fixed to fire downward at 3 degrees 36 minutes from the flight path and converge at a point 3,250 feet in front of the airplane. Each gun can fire 290 rounds of ammunition, totaling 1,160 rounds for the airplane. The guns have a rate of fire in excess of 1,500 rounds per minute. All controls for the guns are electrical, with the exception of the manual chargers.

GROUND CHARGER CABLES. (GROUP B)

Each M39 20-millimeter gun is equipped with a manual gun charger. To ready the guns for firing, the armorer must charge each gun separately three times prior to flight. The guns cannot be charged in flight.

MASTER GUNS SWITCH. (GROUP B)

Refer to MASTER GUNS SWITCH (GROUP A) in this section.

GUN-FIRING TRIGGER. (GROUP B)

The gun-firing switch, in the right handgrip of the control wheel, is the trigger for the guns. When the master guns switch is in the GUNS position, the gun-firing switch is energized. When the trigger is depressed, a circuit is completed to the open side of the air purge control valve solenoid. When this valve opens, hydraulic pressure opens the two air-purge intake doors, one of which is located in the leading edge of each wing. After the intake doors open, outside air pressure passes through air-purge exhaust openings under the guns to purge the gun bay areas of all gases. When these doors have fully opened, microswitches complete circuits to fire the guns. The guns cease firing immediately after release of the trigger, but the purge doors remain open for a two-minute period to ensure the expulsion of all gases.

GROUND FIRING SWITCH. (GROUP B)

A ground-firing switch, mounted on the left canopy sill, permits the guns to be fired while the airplane is on the ground by bypassing the landing gear gun cutout relay. The gun-firing switch is placarded OFF and GROUND FIRING. The guns fire when the switch is held in the momentary GROUND FIRING position and the gun-firing trigger is squeezed.

FIRING M39 20-MILLIMETER GUNS. (GROUP B)

To fire the M39 20-millimeter guns, proceed as follows:

Note

Before take-off, make sure that all the guns have been charged, as there are no provisions for charging the guns in flight.

1. Place the master guns switch in the GUNS position.
2. Set the gunsight tilting knob to the GUNS position.
3. Place the gunsight light switch to the GUNSIGHT ON or ALTERNATE ON position.
4. Adjust the gunsight light rheostat to desired reticle brilliance.
5. Actuate the gun firing trigger.

CAUTION

After firing has been completed, place the master guns switch in OFF to safety the guns.

GUNSIGHT.

An illuminated Mark 8 Mod 8 (Modified) Gunsight, mounted on the pilot's glare shield on the centerline of the airplane, is the sight for the guns and rockets and for low-level bombing. (See figure 4-19.)

Note

The Mark 8 Mod 8 Gunsight is an interim sight. When available, a computing gunsight will be installed to be used with the MA-1 Fire Control System.

The sight is of the collimator type, and the pilot observes the reticle image on an adjustable reflecting glass plate through which the target is also visible. There is a soft rubber crash pad on the rear of the sight. The adjustable reflector plate can be tilted to allow 4 degrees elevation and at least 8½ degrees depression of the reticle image with respect to the detent lock position of the reflector plate. An index plate placarded B (bombs), O (reflector position at 45 degrees), R (rockets), and G (guns) permits the sight to be adjusted for use when firing the guns or rockets or when bombing at low levels.

GUNSIGHT TILTING KNOB.

The knurled tilting knob, on the left side of the gunsight, elevates or depresses the reticle image. The tilting knob is turned up or down to align the index pointer with one of the four modes of operation, B (bombs), O (reflector position at 45 degrees), G (guns), or R (rockets).

GUNSIGHT LIGHT SWITCH.

The gunsight light switch, on the left side of the fuel control panel (figure 1-16), controls the lamp for the reticle image in the sight. The switch has three positions: GUNSIGHT ON, ALTERNATE ON, and off (neutral). The lamp is of the dual-filament type, so that, if the filament which is controlled by the GUNSIGHT ON position burns out, the other filament will light when the switch is placed in the ALTERNATE ON position. Power for the light comes from the 28-volt d-c distribution bus. The master guns switch on the armament control panel must be in the guns or SIGHT & RADAR position for the circuit to be completed to the gunsight light switch. See MASTER GUNS SWITCH in this section.

GUNSIGHT LIGHT RHEOSTAT.

The gunsight light rheostat, on the left side of the fuel control panel (figure 1-16), controls the brilliance of the reticle image. When the gunsight light is lit, the brilliance of the image may be adjusted as desired by positioning the rheostat to any position between the BRT and DIM markings on the panel. The rheostat controls voltage from the 28-volt d-c distribution bus through the master guns switch and the gunsight light switch.

GUNSIGHT

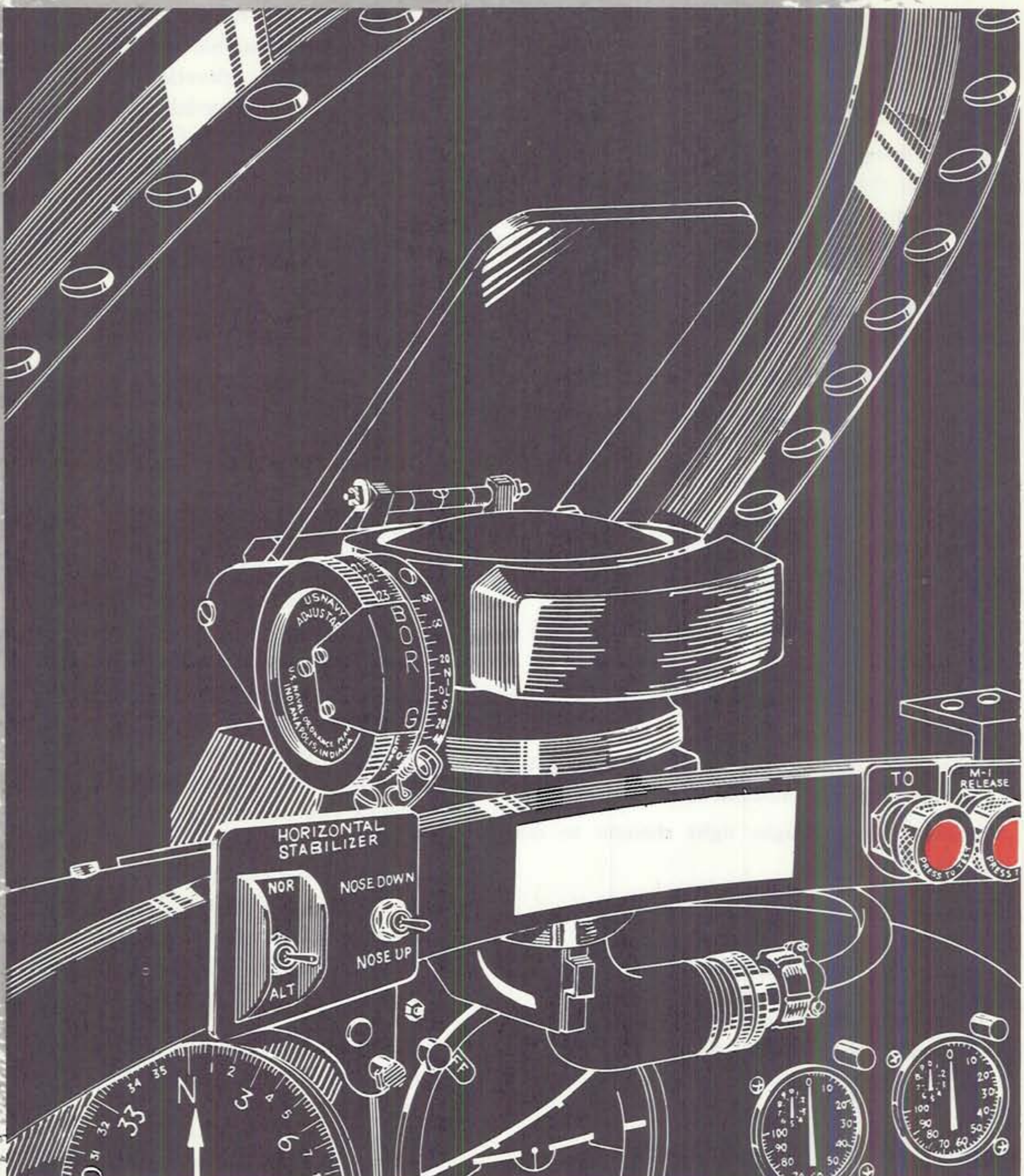

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Figure 4-19

INTERIM WARNING SYSTEM.

The interim warning system is an automatic range and warning system, used for air-to-ground gunnery only. The radar portion of an MA–1 fire control system supplies automatic range information, which is transmitted to the pilot's headset as audible signals. Preselected firing data is set in the equipment prior to take off. The system uses a non-computing gunsight.

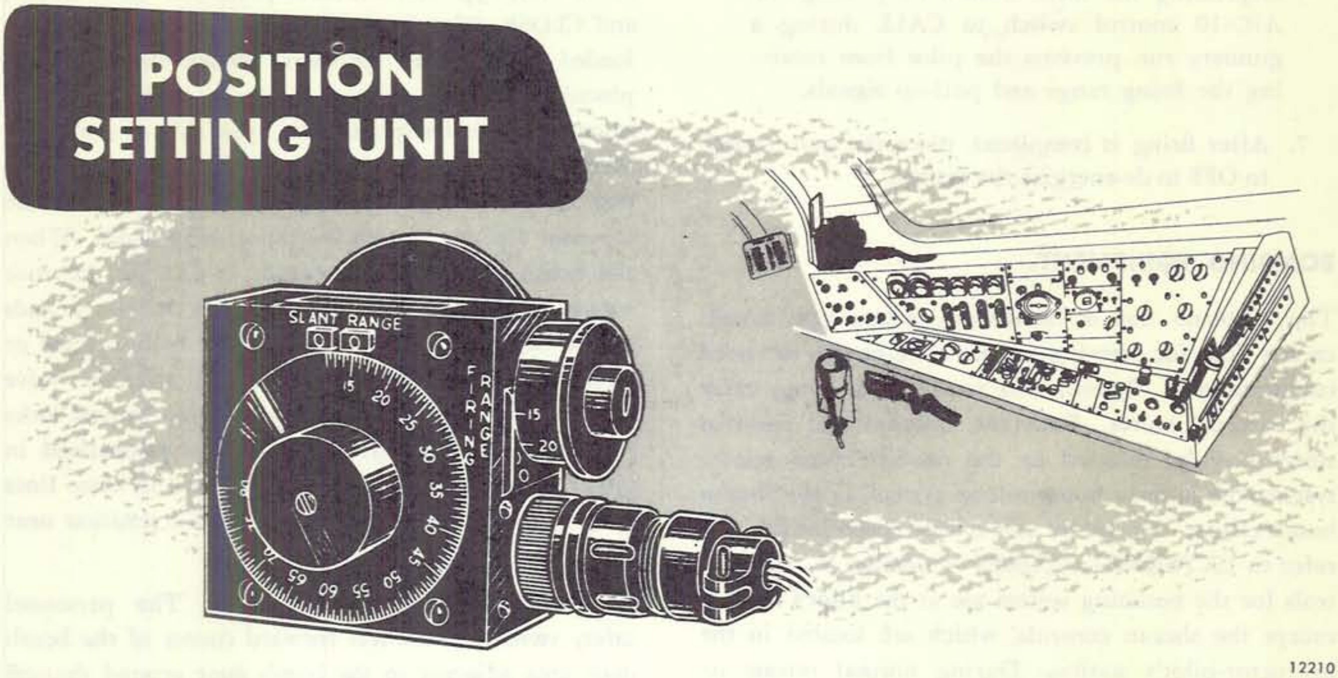


Figure 4–20

POSITION SETTING UNIT.

The position-setting unit (figure 4–20) is on the right side of the pilot's compartment above the generator control panel and is the only control necessary for operation of the interim warning system. Controls are a SLANT RANGE dial and a FIRING RANGE dial. Both dials are calibrated in hundreds of feet. A removable pull-up range computer is mounted on the position-setting unit. The 28-volt d-c radio bus and the 115-volt No. 2 a-c bus supply the power to operate the system.

NORMAL OPERATION OF THE UNIT.

1. Determine the value for the following air-to-ground gunnery conditions:

   Dive angle of 10, 20, or 30 degrees
   Pull-up acceleration of 2, 3, or 4 G's
   True air speed of 200, 300, or 400 knots
   Terrain clearance of 500, 1000, or 1500 feet

   Note

   Always use true air speed when computing slant range.

2. Rotate the inner disk of the pull-up range computer until the predetermined values appear at the appropriate part of the open window. When inserting values into the computer, follow the order listed in step 1.
3. Read the slant range value appearing at the appropriate part of the open window.
4. Set the SLANT RANGE control on the position setting unit to the computed value of slant range obtained in step 3. The value obtained from the computer represents the slant range at the time of pull-up and not the terrain clearance.
5. Determine a value for the firing range and set the FIRING RANGE control on the position-setting unit to that value. This setting determines the radar target range at which the firing range signal is transmitted to the pilot's headset.

WARNING

The preselected terrain clearance will be reduced if the following precautions are not observed. Never increase or decrease the dive angle during attack. Never increase the true air speed. Start pull-up immediately after receiving the pull-up signal. Do not decrease pull-up acceleration.

6. Place the guns switch to the GUNS or SIGHT-RADAR position to energize the system. The pilot receives two operational signals: An interrupted tone indicates that the airplane is within firing range of the target, and a siren tone indicates the point of pull-up.

Note

Depressing the mike button or placing the AIC-10 control switch to CALL during a gunnery run prevents the pilot from receiving the firing range and pull-up signals.

7. After firing is completed, place the guns switch to OFF to de-energize the system.

BOMBING EQUIPMENT.

The airplane has a horizontal, rotary-type bomb-carrier door for carrying various sized bombs in varied configurations. Pylons, two under each wing, carry the external stores. Both the internal and external stores may be released by the normal bomb release system, the jettison bomb release system, or the shoran bomb release. For buffet and release speed limitations, refer to EXTERNAL STORES in Section V. All controls for the bombing system are at the pilot's station, except the shoran controls, which are located in the instructor-pilot's station. During normal release or shoran release, all stores may be dropped singly or in train. During jettison bomb release, all stores are released simultaneously. If it is desired, the wing tip fuel tanks may be jettisoned simultaneously. If it is desired, the wing tip fuel tanks may be jettisoned simultaneously with the stores. There are provisions for carrying special weapons.

BOMB DOOR.

The removable bomb-carrier door is in the center fuselage section and can carry various sized bombs in varied configurations. (See figure 4-21.) The door is electrically controlled and hydraulically actuated to pivot 180 degrees on its horizontal axis to expose the bombs for release. At the same time, the lower surface of the door seals the cavity of the bomb door area. The door is divided into three armament bays: forward bay, middle bay, and rear bay, each having seven bomb stations. These stations are so arranged and electrically interconnected that any number of bomb racks, up to a total of 21, may be installed to accommodate various bomb loadings. Two alternate bomb racks are installed between the middle and rear bays to accommodate large stores. All stores are retained by S2A or MA-4 bomb racks, chocks, and a second layer suspension assembly of racks and chocks. Controls for the bomb door are the bomb door switch (for normal bomb release), the shoran bomb release system, or the jettison bomb release system.

BOMB DOOR SWITCH. The bomb door switch, located on the armament control panel, is of the momentary type and has three positions: OFF, OPEN, and CLOSE. (See figure 4-22.) The switch is spring-loaded to the OFF position. When the switch is placed in OPEN, power passes to a double-acting solenoid valve, energizing the open side of the valve. When the valve opens, hydraulic pressure passes to two double-acting actuating cylinders which rotate the door 180 degrees clockwise in four seconds. When the bomb door switch is placed in CLOSE, the door rotates counterclockwise 180 degrees in six seconds to the close position. With the door fully opened or closed, the respective double-acting solenoid valve remains energized. The door has no mechanical locks since the actuating cylinder lines are pressurized in either direction. Loss of hydraulic fluid in these lines normally causes the door to move to a position near full open.

PERSONNEL SAFETY SWITCH. The personnel safety switch, at the left forward corner of the bomb door area adjacent to the bomb door ground shut-off valve, is a ground handling safety feature used to open the bomb bay circuits as a precaution against inadvertent operation of the bombing equipment when personnel are working in the bomb door area. (See figure 4-23.) This switch prevents power from being supplied from the armament bus to the bombing equipment when the switch is in the SAFE position. Before flight the switch must be in the FLIGHT position.

EMERGENCY BOMB DOOR OPEN HANDLE. The emergency bomb door open handle, over the instructor pilot's left console, is used in the event the bomb door fails to open normally. (See figure 1-7.) When this handle is lifted, turned one-quarter turn clockwise, and pulled all the way out (four inches), a cable attached to the handle manually overrides the bomb door control valve solenoid and positions the valve so that hydraulic pressure from an emergency selector valve will be routed to the open side of the bomb door actuating cylinders. Pressure is routed to the emergency selector valve from the emergency pressure line of the hydraulic system by the hydraulic system hand pump.

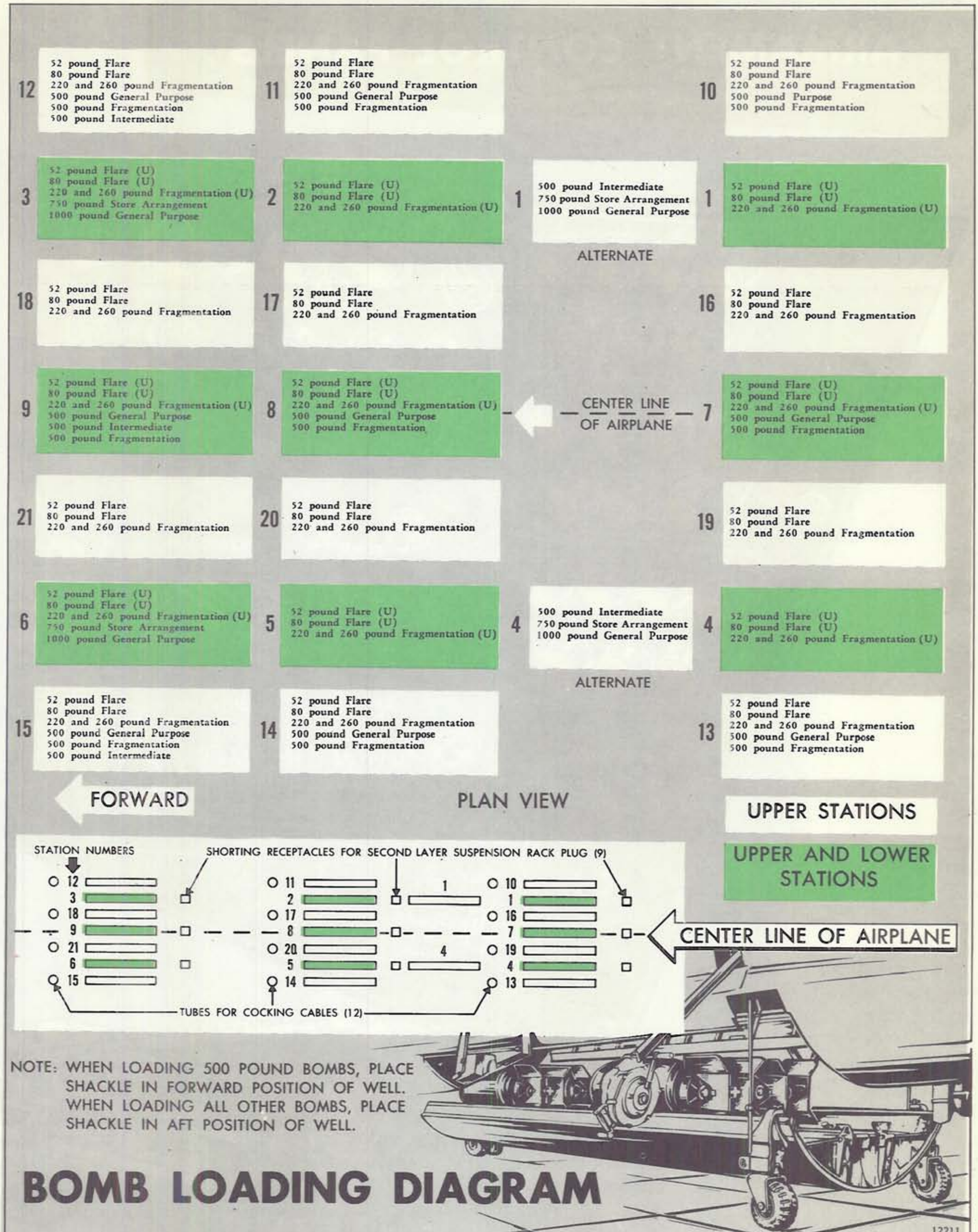

12
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound General Purpose
500 pound Fragmentation
500 pound Intermediate
11
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound General Purpose
500 pound Fragmentation
10
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound Purpose
500 pound Fragmentation
3
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
750 pound Store Arrangement
1000 pound General Purpose
2
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
1
500 pound Intermediate
750 pound Store Arrangement
1000 pound General Purpose
ALTERNATE
1
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
18
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
17
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
16
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
9
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
500 pound General Purpose
500 pound Intermediate
500 pound Fragmentation
8
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
500 pound General Purpose
500 pound Fragmentation
CENTER LINE OF AIRPLANE
7
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
500 pound General Purpose
500 pound Fragmentation
21
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
20
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
19
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
6
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
750 pound Store Arrangement
1000 pound General Purpose
5
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
4
500 pound Intermediate
750 pound Store Arrangement
1000 pound General Purpose
ALTERNATE
4
52 pound Flare (U)
80 pound Flare (U)
220 and 260 pound Fragmentation (U)
15
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound General Purpose
500 pound Fragmentation
500 pound Intermediate
14
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound General Purpose
500 pound Fragmentation
13
52 pound Flare
80 pound Flare
220 and 260 pound Fragmentation
500 pound General Purpose
500 pound Fragmentation
FORWARD
PLAN VIEW
UPPER STATIONS
UPPER AND LOWER STATIONS
STATION NUMBERS
SHORTING RECEPTACLES FOR SECOND LAYER SUSPENSION RACK PLUG (9)
12 3 18 9 21 6 15
11 2 17 8 20 5 14
10 1 16 7 19 4 13
1
4
CENTER LINE OF AIRPLANE
TUBES FOR COCKING CABLES (12)
NOTE: WHEN LOADING 500 POUND BOMBS, PLACE SHACKLE IN FORWARD POSITION OF WELL. WHEN LOADING ALL OTHER BOMBS, PLACE SHACKLE IN AFT POSITION OF WELL.
BOMB LOADING DIAGRAM
12211

Figure 4-21

ARMAMENT CONTROL PANELS

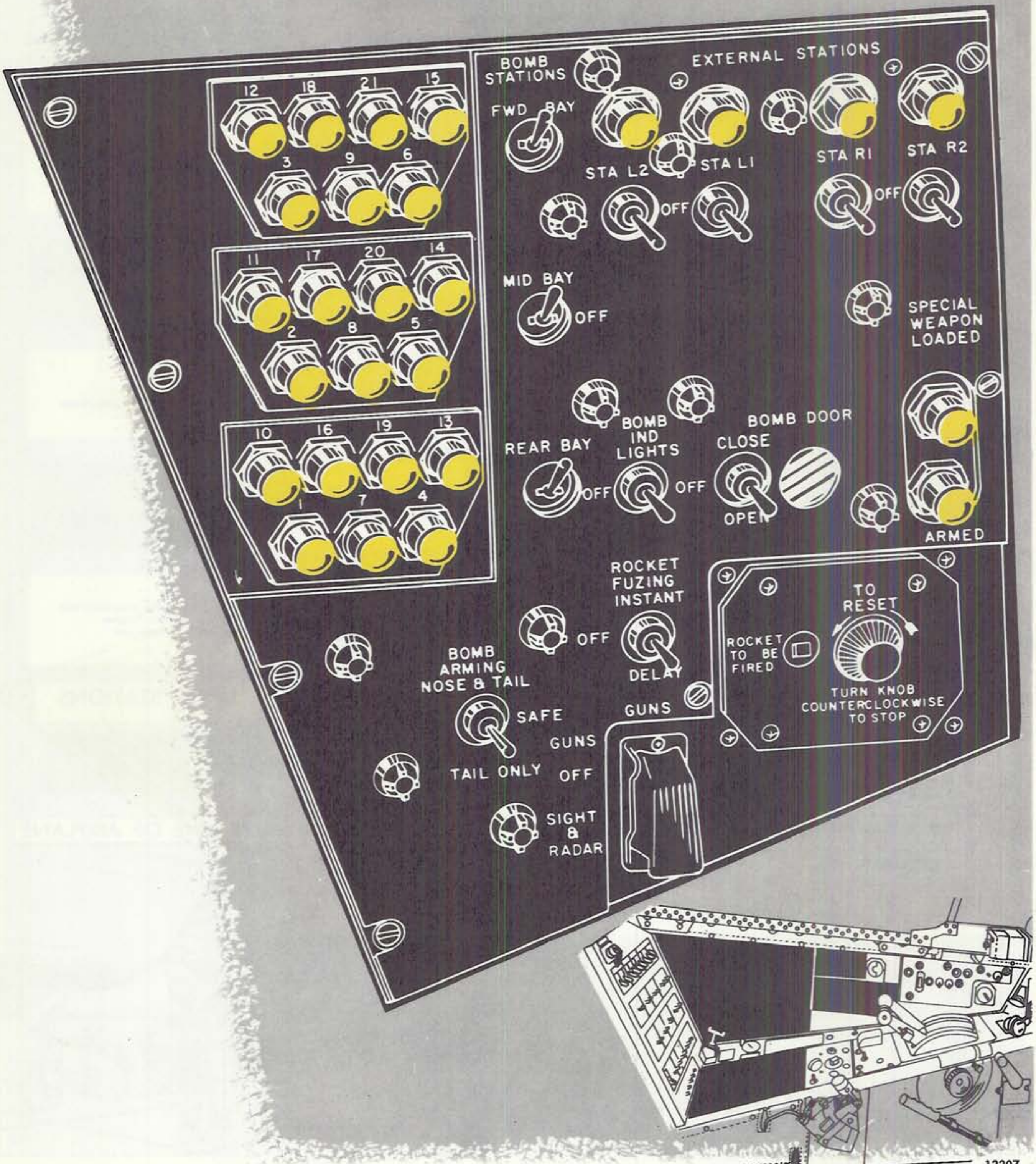


Figure 4-22 (Sheet 1 of 2)

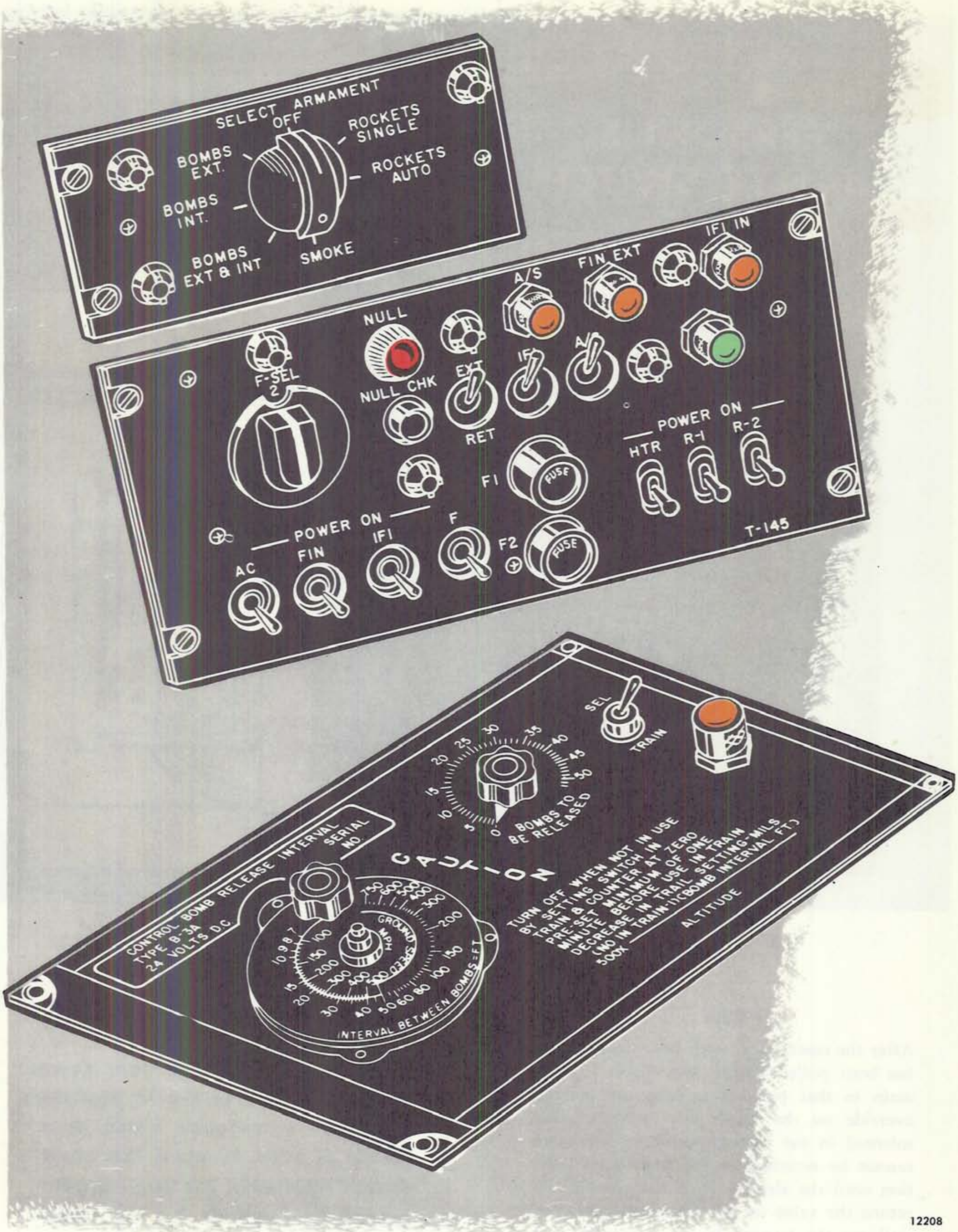


Figure 4-22 (Sheet 2 of 2)

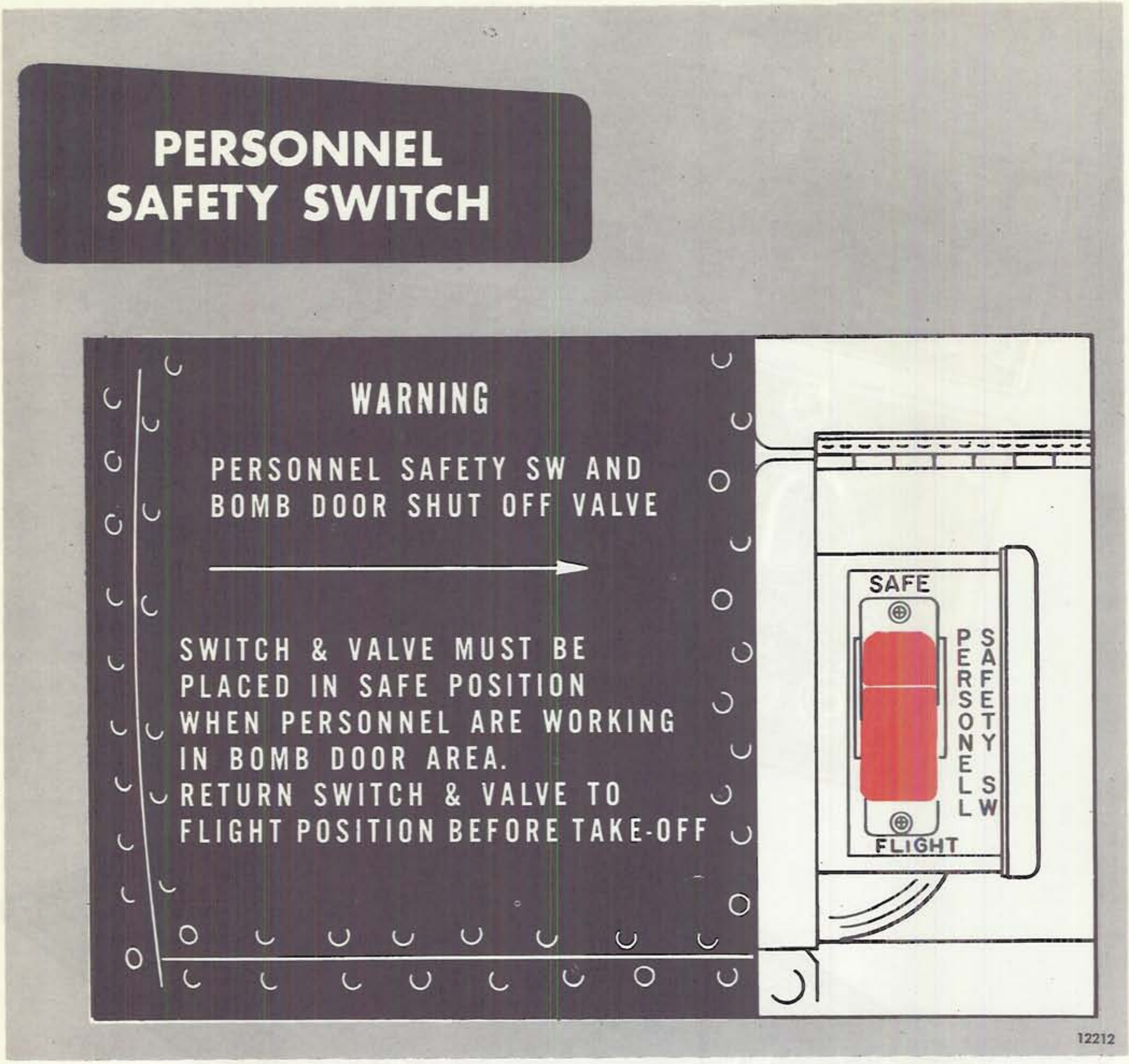


Figure 4-23

Note

After the emergency bomb door open handle has been pulled all the way out, it will remain in that position to keep the manual override on the bomb door control valve solenoid in the correct position. The valve cannot be returned to the door-closed position until the airplane is on the ground. To return the valve to the door-closed position, pull out the lanyard in the upper left forward bomb hoist access door a distance of about four inches.

CAUTION

The emergency landing gear down handle must be in the in position when the emergency bomb door handle is used to open the bomb door. Otherwise, the landing gear cannot be lowered by the emergency down handle after the bomb door is opened.

BOMB-DOOR GROUND SHUT-OFF VALVE. A manually operated bomb door ground shut-off valve, located at the left forward end of the bomb door area adjacent to the personnel safety switch, positions and locks the door during servicing operations. The valve is mechanically connected with the hinged access door which covers the personnel safety switch. When the access door is pulled out, the valve is in the off (safe) position. When the access door is pushed in, the valve is in the open (flight) position. The valve must be in the flight position prior to all flights.

BOMB-DOOR POSITION INDICATOR. The bomb-door position indicator, on the armament control panel, indicates the position of the bomb door. (See figure 4–22.) When the door is fully closed, the word *closed* appears on the indicator. When the door is fully opened, seven dots appear on the indicator. The dots are arranged in two horizontal rows, four on the top and three on the bottom, representing the position of the stores as they are ready for release. When the door is in any position other than fully open or fully closed, diagonal lines like those on a barber pole appear on the indicator.

Note

The bomb-door position indicator will not function unless the selector armament switch is in any position other than OFF.

BOMBING CONTROLS.

BOMB-AND-ROCKET RELEASE BUTTON. The bomb-and-rocket release button, located in the right handgrip of the pilot's control wheel, energizes the various stores and rocket release circuits. When the stores or rockets and their manner of release have been selected by their respective controls, depressing the release button energizes the respective circuit.

Note

Internal bomb stores will not release unless the bomb door is in the full open position.

The release button supplies power from the 28-volt d-c armament bus.

WARNING

Before pressing the bomb and rocket release button, make sure that all bomb and rocket controls are in the correct positions for the desired release to avoid accidental bomb or rocket release.

SELECT ARMAMENT SWITCH. The select armament switch, located on the select armament control panel next to the armament control panel, permits the selection of stores to be released. (See figure 4–22.) When this switch is in OFF, the armament bus is de-energized. When the switch is in any position other than OFF, the armament bus is energized and the stores may be selected for release as follows: internal, external, or both, or smoke may be selected when external chemical tanks are carried. The rockets may be released either singly or automatically by positioning the switch in either the ROCKETS SINGLE or in the ROCKETS AUTO position.

BOMB STATION SWITCHES. Three bomb station switches, located on the armament control panel, are marked FWD BAY, MID BAY, and REAR BAY. Each switch is located adjacent to the indicator lights for its respective bay. These switches enable the pilot to select the bay to be released. When any or all of the switches are placed in their respective BAY position, the bombs in the respective bays are released in ascending numerical order, either singly or in train, depending upon the position of the intervalometer train-select switch. When the intervalometer is set for train and the select armament switch is in the BOMB EXT & INT position, the internal stores will be released after the external stores.

EXTERNAL STORES SWITCHES. Four external stores switches, located on the armament control panel, select any or all of the external stores to be dropped by the normal bomb release system. (See figure 4–22.) There is one switch for each external store carried, as follows: STA L2 controls the power circuit to the left outboard pylon bomb rack; STA L1; the left inboard rack; STA R3, the right inboard racks; and STA R2, the right outboard rack. The external stores may be dropped in train or individually, depending upon the setting of the switches and the intervalometer. If both the external stores and internal stores are to be dropped in train, the external stores will be dropped first in the following order: STA L2, STA R2, STA R1, STA L1.

BOMB-ARMING SWITCH. The bomb-arming switch located on the armament control panel, is used to arm both the internal and external stores. (See figure 4–22.) The switch has three positions: NOSE & TAIL, TAIL ONLY, and SAFE. The bombs are set to explode instantly upon impact when the arming switch is set at the NOSE & TAIL position. Setting the arming switch at the TAIL ONLY position arms the bombs for delayed detonation. The bombs will be released unarmed if the switch is in the SAFE position. When the select armament switch is in the SMOKE position, placing the bomb arming switch in the NOSE & TAIL position energizes the chemical tank smoke release unit thereby causing the release of smoke. When the jettison bomb system is operating, a relay opens the arming circuit so that the bombs will be released in an unarmed condition.

BOMB INTERVALOMETER. The bomb intervalometer located on the pilot's left console, enables the pilot to release the internal and external bombs individually or in train. (See figure 4-22.) The select-train switch on the intervalometer selects the method of release. Placing the switch in the SEL position releases the bombs singly. When train release is desired, the switch must be in the TRAIN position, the ground spacing knob must be set for the interval desired, and the bomb counter must be set for the number of bombs to be released. With either method of release, the internal bombs are dropped in ascending numerical order from the bomb stations which are loaded and selected. When the select armament switch is in the BOMBS EXT & INT position, the external stores are released before the internal stores.

MASTER JETTISON SWITCH. The master jettison switch is on the pilot's left main control panel (figure 1-28). When this switch is pressed, the bomb door opens, and all stores, including external stores or rockets, are released. In addition, when the switch is actuated, a relay opens the bomb arming circuit so that the bombs will be released unarmed. Power for the jettison system comes from the battery bus.

CAUTION

The wing tip tanks will be jettisoned with the bombs and external stores or rockets if the tip tanks jettison switch is in NORMAL when the master jettison switch is actuated.

BOMBING INDICATORS.

BOMB INDICATOR LIGHTS. Twenty-one bomb indicator lights are mounted on the armament control panel. (See figure 4-22.) Each light corresponds to a bomb station. The lights are arranged in three groups of seven to correspond to the three bomb bays of the bomb carrier door. When bombs are loaded at any or all of the stations and the respective racks are cocked, the lights operate, provided the armament bus is energized and the bomb station and bomb indicator lights switches are on. When a bomb is released, its corresponding indicator light goes out.

BOMB INDICATOR LIGHTS SWITCH. The bomb indicator lights switch is located on the armament control panel. (See figure 4-22.) When bombs are loaded at any or all stations, the respective racks cocked, and the bomb station switches placed in the BAY position, actuating the bomb indicator lights switch causes the bomb indicator lights to operate if their respective station is loaded. Power for the switch comes from the armament bus.

EXTERNAL STORES INDICATOR LIGHTS. Four external stores indicator lights are on the armament control panel. (See figure 4-22.) Each light corresponds to one of the external stores stations. When external stores are loaded at any or all of the stations and the respective racks are cocked, the lights operate, provided the armament bus is energized and the external stores and bomb indicator lights switches are on. When an external store is released, its corresponding indicator light goes out.

BOMB-RELEASED INDICATOR LIGHT. A bomb-released indicator light (figure 1-5) is on the pilot's main instrument panel and another is on the instructor pilot's instrument panel. (See figure 1-6.) When stores are being released, the pulse from the intervalometer which energizes the bomb racks also energizes a circuit to the bomb-released indicator light. Therefore, every time a store is released, the indicator light will light for the time the signal is transmitted for bomb release. Power is supplied to the bomb-released light through the intervalometer from the 28-volt d-c armament bus.

Note

When a bomb is released, the corresponding bomb station indicator light on the armament control panel will go out.

BOMB RELEASE.

NORMAL BOMB RELEASE. The normal bomb release system permits selected release or train release of the internal and external stores as follows:

Note

If the gunsight is used for low-level bombing, place the master guns switch in the SIGHT & RADAR position, place the gunsight light switch in the GUNSIGHT ON or ALTERNATE ON position, adjust the gunsight light rheostat for the desired brilliance, and set the gunsight tilting knob to the B (bombs) position.

1. Position the select armament switch to the BOMBS INT, BOMBS EXT, or BOMBS EXT & INT position.
2. Place the bomb arming switch in the desired position.

3. Set the bomb intervalometer select-train switch in the SEL or TRAIN position, and if TRAIN is selected also set the ground spacing knob for the interval desired and the bomb counter for the number of bomb stations to be released.

Note

If external stores are to drop at the same time as the internal bombs, the external stores will be released first.

4. Place the bomb stations switches in the up position for the stations to be released, and if external bombs are being released, check that the external stores switches are in the ON position.

CAUTION

If the external stores switches are in the STA position, all external stores selected will be released together.

5. Place the bomb indicator lights switch in LIGHTS.
6. Place the bomb door switch in OPEN and check that the bomb door reaches the full open position by observing that the bomb door position indicator shows seven dots (representing the bombs on the bomb door).
7. Press the bomb and rocket release button in the right handgrip of the control wheel.
8. If all the selected internal bomb station indicator lights have gone out (all selected bombs released), place the bomb door switch in CLOSE.

NORMAL EXTERNAL STORES RELEASE. The external stores may be released with the internal stores as described under NORMAL BOMB RELEASE in this section, or they may be released seperately as follows:

Note

If the gunsight is used for low-level bombing, place the master guns switch in the SIGHT & RADAR position, place the gunsight light switch in the GUNSIGHT ON or ALTERNATE ON position, adjust the gunsight light rheostat for the desired brilliance, and set the gunsight tilting knob to the B position.

1. Position the select armament switch in the BOMBS EXT position.
2. Set the bomb arming switch in the desired position.
3. Place the external stores switches in STA for the stores to be released.
4. Place the bomb indicator lights switch in LIGHTS.
5. Press the bomb and rocket release button in the right handgrip of the control wheel.

SHORAN BOMB RELEASE. To release bombs by means of the shoran system, follow the procedure given under NORMAL BOMB RELEASE or NORMAL EXTERNAL STORES RELEASE in this section, with the following exceptions:

1. Do not open the bomb door because shoran control of the door is automatic.
2. Do not depress the bomb and rocket release button because release power is initiated by the shoran computer.
3. If all the selected internal bomb station indicator lights have gone out (all selected bombs released), place the bomb door switch in CLOSE.

M-1 BOMBING SYSTEM.

At the present time, there are only provisions for the installation of the M-1 bombing equipment. The text on this system will be expanded when the information is available.

MA-2 LOW ALTITUDE BOMBING SYSTEM.

The MA-2 LABS COMPUTER SET, when used with other associated equipment, permits precision low-altitude, automatic bomb release. The 28-volt d-c armament bus and the No. 2 a-c bus supply the power to operate the system.

LOW ALTITUDE BOMBING SYSTEM CONTROL PANEL. The LABS CONTROL PANEL is on the pilot's left console. (See figure 4-24.) The panel controls consist of a labs selector switch with positions OFF, DIVE ∠ IND, LABS NORM and LABS ALT and a LABS START switch with off and start positions.

LABS INDICATOR. The LABS INDICATOR is on the pilot's main instrument panel. (See figure 1-5.) The indicator is a dual-movement meter which indicates roll-and-pitch-attitude information during the bomb run, and yaw-roll and acceleration information during pull up. The indicator markings are nine divisions left (9 degrees), and nine divisions right (9 degrees) for the vertical needle. Indicator markings are HI G, LO G, nine divisions up (90 degrees) and nine divisions down (90 degrees) for the horizontal needle. Dive angle indication can be obtained by positioning the labs selector switch in the DIVE ∠ IND position.

LABS CONTROL PANEL

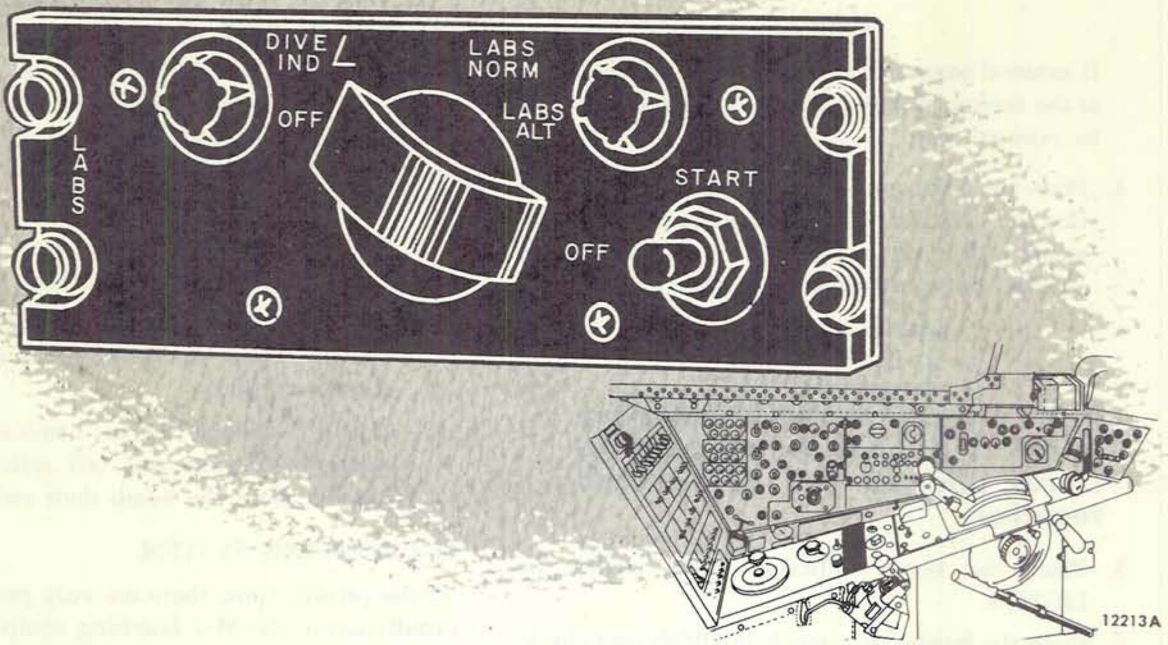


Figure 4–24

NORMAL OPERATION.

1. Place the select armament switch in the desired position.
2. Place the labs selector switch in LABS NORM.
3. Place the labs start switch in START no sooner than two minutes after positioning the labs selector switch. The sight reticle light will illuminate, and airplane pitch-and-roll movement is indicated by the labs indicator.
4. Depress the bomb release button when the airplane passes over the proper point. (The bomb release button must remain depressed until run-in, pull-up, and release are completed.)

Note

To abort a low-angle (normal) delivery, switch rapidly to LABS ALT any time during the run-in and perform a high-angle (alternate) release.

5. When the sight reticle light goes out (completion of the timing cycle), start the pull-up. The labs instrument automatically transfers from pitch to acceleration indication. Transfer from roll to yaw-roll indication occurs either when the wings are level or within ± 4 seconds after the completion of the timing cycle.
6. When the airplane has maneuvered through the selected angle, the sight reticle light will illuminate, indicating bomb release.
7. Release the bomb release button after the bomb delivery. This transfers the labs instrument indication from acceleration to pitch-attitude information, and turns the sight reticle light off.
8. Depressing the bomb release button after completion of step 6 causes the labs instrument to retain yaw-roll indication and transfer from pitch to acceleration. The sight reticle light remains off. Repeat this cycle after bomb release, and prior to recycling the labs system.
9. Place the labs start switch in OFF for a minimum of 10 seconds, and then ON when the airplane is in position to commence another run.

CAUTION

Never operate the labs start switch unless the airplane is in a relatively static state about its roll axis. Operation of the switch will cause serious damage to the equipment gyros.

10. Place the labs start switch in OFF to de-energize the system.

ALTERNATE OPERATION.

1. Place the select armament switch in the desired position.
2. Place the labs selector in the LABS ALT.
3. Place the labs start switch in START no sooner than two minutes after positioning the labs selector switch.

Note

Disregard the operation of the sight reticle light while the labs selector switch is in LABS ALT. All operations normally started at the completion of the timing cycle start when the bomb release button is depressed.

4. When the airplane passes over the target, start the pull-up. Depress the bomb release button and hold until the selected release angle is reached. Labs instrument will transfer from pitch to acceleration and roll to yaw-roll indication when the wings are level. The remaining operations are the same as for normal operation.
5. To stop the labs system at any time during operation, release the bomb release button.

SMOKE RELEASE.

When any or all of the external bomb pylons are loaded with an E-26 chemical tank, a smoke release may be made by proceeding as follows:

1. Place the select armament switch to SMOKE.
2. Place the external stores switches for the desired tanks in the STA position.
3. Actuate the bomb arming switch to the NOSE & TAIL position to release the smoke.

BOMB JETTISON RELEASE. All internal and external stores can be jettisoned by actuating the master jettison switch. This action jettisons all internal bombs, external stores, and rockets.

CAUTION

Actuating the master jettison switch also jettisons the wing tip tanks if the tip tanks jettison switch is in the NORMAL position. Therefore the tip tank jettison switch should be in the OFF position if the tanks are not to be jettisoned.

EMERGENCY BOMB DOOR OPERATION.

If the bomb door system fails, proceed as follows to open the door:

1. Check that the emergency landing gear down handle is in the normal (in) position.

CAUTION

The emergency selector valve is spring-loaded to route pressure to the bomb door control valve, but when the emergency landing gear down handle is in the out position, it overrides the spring and the valve will be positioned to route pressure to the landing gear control valve.

2. Have the instructor pilot pull the emergency bomb door open handle all the way out.
3. Operate the hydraulic hand pump.

Note

Approximately 30 to 50 light strokes of the hand pump are needed to open the door. Once the door has been opened it cannot be closed again until the airplane is on the ground.

WARNING

If after approximately 50 strokes of the hand pump there is no indication of pressure build up or bomb door operation, make no further attempt to open the door.

ROCKET EQUIPMENT.

There are fittings for the installation of eight rocket pylons, four under each wing. Four of these pylons are alternates to the four external stores pylons. Two 5-inch HVAR rockets, one mounted directly below the other, hang from each pylon. The Mk Mod 8 (Modified) Gunsight aims the rockets. Controls for normal firing and emergency release of the rockets are at the pilot's station. During normal firing, rockets can be fired singly or in salvo. The firing order is illustrated in figure 4-25.

ROCKET CONTROLS.

SELECT ARMAMENT SWITCH. Refer to BOMBING CONTROLS in this section.

ROCKET FUZING (ARMING) SWITCH. The rocket fuzing switch on the armament control panel controls the arming of the nose fuzes of rockets to be released normally. (See figure 4–22.) When the switch is set in INSTANT, the nose fuze is armed upon release to detonate upon impact. The nose fuze is unarmed if the switch is set at DELAY or OFF. However, an internal fuze will cause delayed detonation after impact on a normal release. During jettison, the nose fuze is automatically unarmed and the internal fuze is inoperative.

ROCKET INTERVALOMETER (PROJECTOR RELEASE CONTROL). The rocket intervalometer on the armament control panel controls the sequence of firing in both single firing or salvo. (See figure 4–22.) When the select armament switch has been set at the ROCKETS SINGLE position, one rocket is released each time the pilot depresses the bomb and rocket release button, and the intervalometer automatically maintains the correct firing sequence for each successive release. When the selector switch is set at the ROCKETS AUTO position and the bomb and rocket release button is depressed, the intervalometer causes the rockets to be fired in the proper salvo sequence at approximately 1/10-second intervals as long as the button is depressed. A numbered dial, visible through a window in the intervalometer housing, indicates the rocket to be fired. The dial is set at the time of rocket loading and should be set at 1 when a normal complement of rockets is carried. The reset knob on the intervalometer selects release of any particular rocket in case of misfire or other malfunction during a "single" release.

Note

If one of the lower rockets misfires, the corresponding upper rocket may be fired. However, both rockets will dive upon release and the airplane may receive superficial damage consisting of a scratched and scorched wing.

BOMB-AND-ROCKET RELEASE BUTTON. Refer to BOMBING CONTROLS in this section.

MASTER JETTISON SWITCH. Refer to BOMBING CONTROLS in this section.

FIRING ROCKETS.

To launch rockets, proceed as follows:

1. Place the master guns switch in SIGHT & RADAR.
2. Place the gunsight light switch in the GUNSIGHT ON or ALTERNATE ON position.
3. Set the gunsight light rheostat to the desired reticle brilliance.
4. Set the degrees dial on the gunsight tilting knob to 1.9 degrees on the white portion of the dial.
5. Position the select armament switch to the ROCKETS SINGLE or ROCKETS AUTO position, as desired.

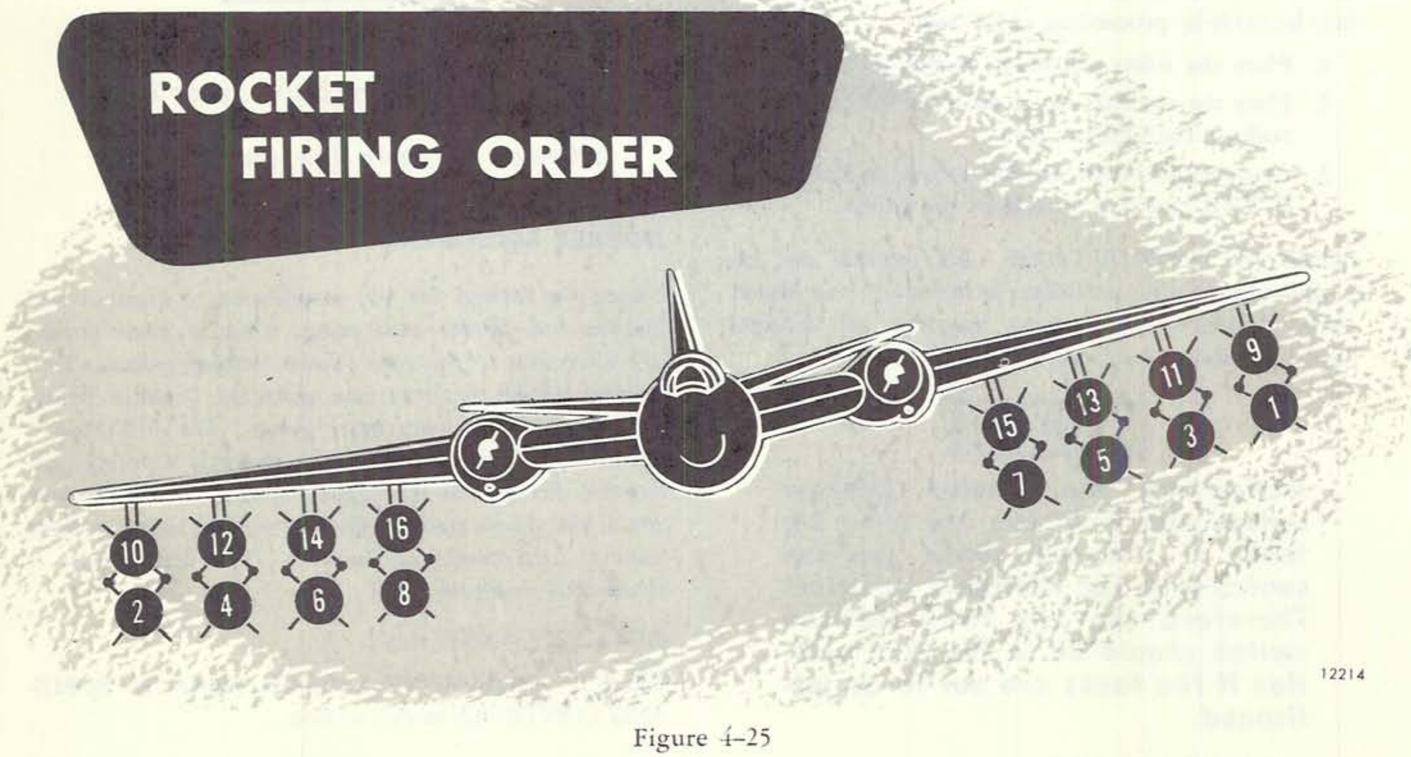


Figure 4–25

6. Set the rocket fuzing switch at INSTANT or DELAY, as desired.
7. Check that the number appearing in the window of the rocket intervalometer is 1 (one), if carrying a normal complement of rockets. If a different complement of rockets is being carried, reset the dial accordingly.
8. ROCKET JETTISON RELEASE.

All rockets may be jettisoned in the same manner as the bombs, that is, by actuating the master jettison switch. This action also jettisons all internal and external stores.

CAUTION

Actuating the master jettison switch also jettisons the wing tip tanks if the tip tanks jettison switch is in NORMAL. Therefore, the tip tank jettison switch should be OFF if the tanks are not to be jettisoned.

MISCELLANEOUS EQUIPMENT.

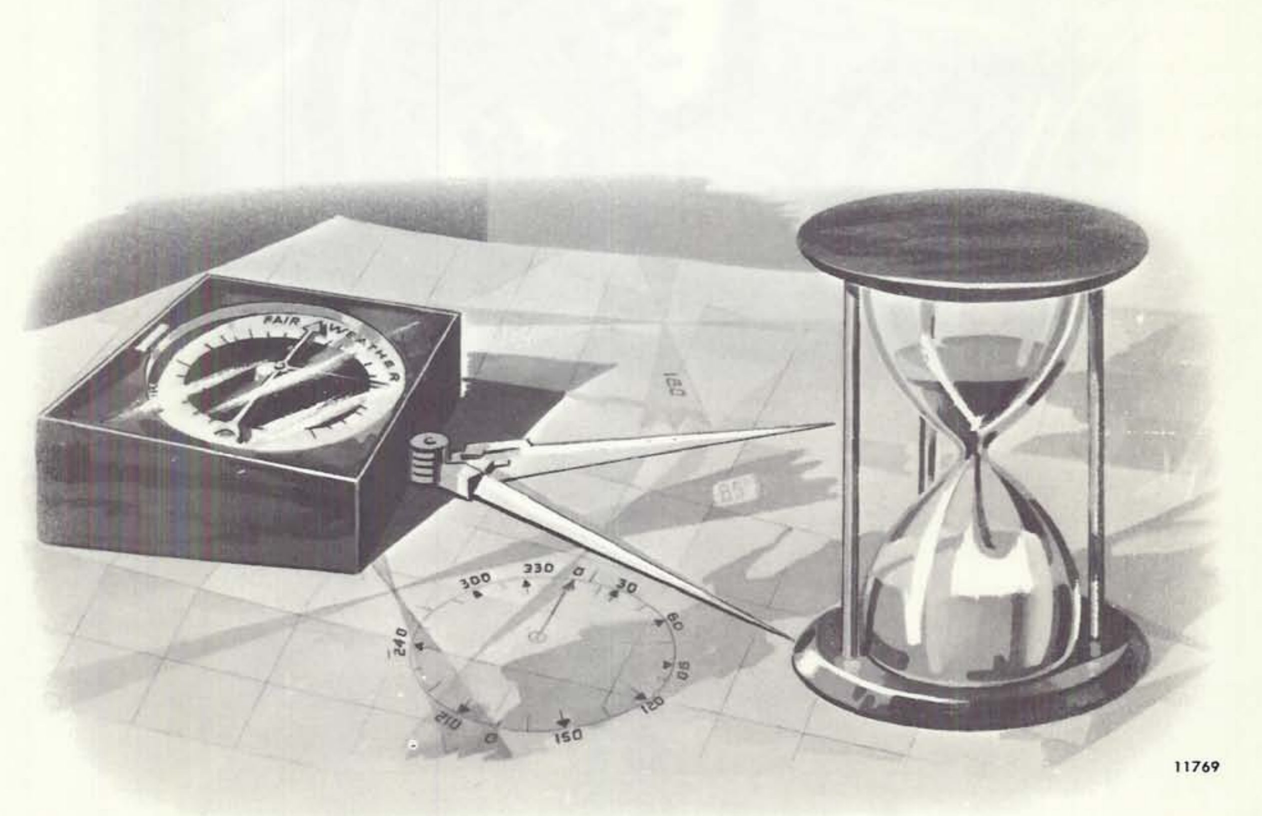
Miscellaneous equipment such as, data cases, relief tubes, stowage bags, etc. are shown on the general arrangement diagram (figure 1–1).

WINDSHIELD WIPER.

A motor-operated variable-speed windshield wiper, controlled by the pilot, is below the windshield. Power to operate the wiper comes from the pilot's circuit breaker bus through a circuit breaker on the pilot's power distribution circuit breaker panel.

WINDSHIELD WIPER SWITCH.

The windshield wiper switch, located on the windshield control panel, is marked PARK, OFF, HIGH, MED, and LOW. See figure 4–4.) The FAST position and any intermediate positions between FAST and OFF control the speed of the motor which drives the wiper. The OFF position de-energizes the motor. The wiper can be stopped on the right side of the windshield by rotating the switch from OFF to the PARK position momentarily, and then back to OFF.



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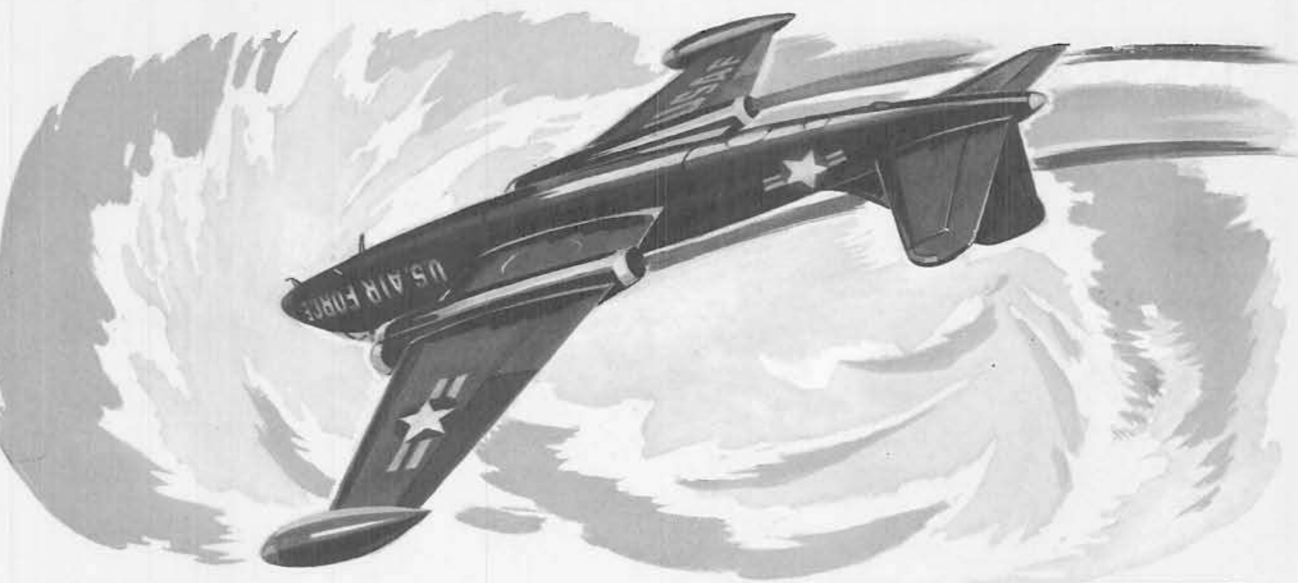

Operating Limitations

Section V

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TABLE OF CONTENTS

INTRODUCTION.

This section contains the engine and aircraft limitations that must be observed during normal operations. For instrument markings, see figure 5-1, because these limitations are not necessarily repeated in the text of this or other sections.

MINIMUM CREW REQUIREMENTS.

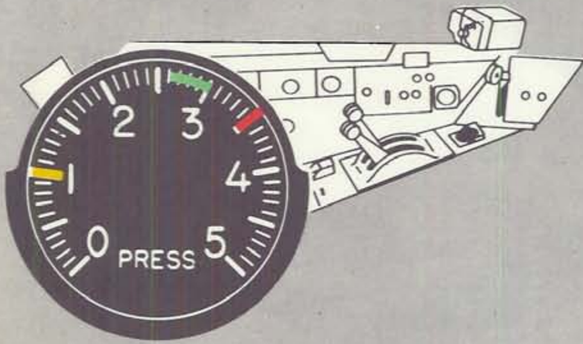
The minimum crew required for this airplane is the pilot. The aft crew station contains dual flight controls and other equipment necessary for the instructor-pilot to perform his duties.

ENGINE LIMITATIONS.

GENERAL.

All engine limitations are shown in figure 5-2. If the limits for steady-state operation, acceleration, or starting are reached or exceeded, make an entry in DD Form 781 of the magnitude and duration of the operation at or above the limits. During steady-state operation, note only the indications above the limitations. When shutting down the engine from 95% rpm or above, idle the engine for at least one minute to allow temperature conditions to stabilize, and then place the throttles in OFF. If the engines are being shut down from below 95% rpm, you can close the throttles immediately.

INSTRUMENT MARKINGS

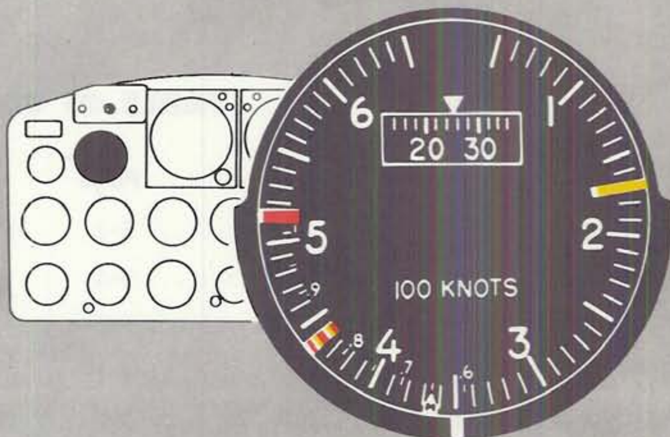


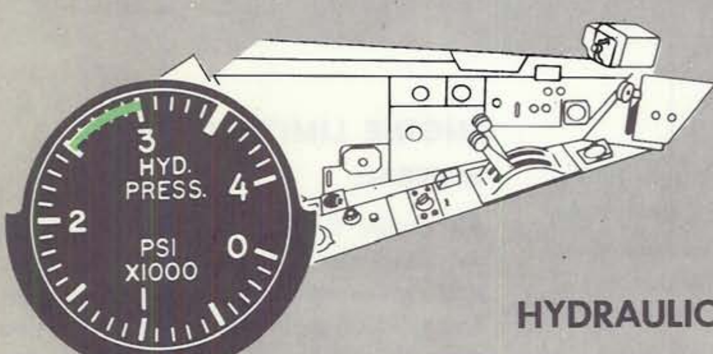
BRAKE PRESSURE

- (yellow) 1000 PSI-MINIMUM
- (green) 2600 PSI TO 3000 PSI-NORMAL
- (red) 3500 PSI-MAXIMUM

AIRSPEED

- (yellow) 170 KNOTS IAS-FLAP EXTENSION
- (white) 200 KNOTS IAS-LANDING GEAR EXTENSION
- (red/yellow/white striped) 444 KNOTS IAS-AIRSPEED LIMIT WITH TIP TANKS
- (red) 513 KNOTS IAS-AIRSPEED LIMIT WITHOUT TIP TANKS





HYDRAULIC SYSTEM PRESSURE

- (green) 2500 TO 3000 PSI
- (red) 3500 PSI

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Figure 5-1 (Sheet 1 of 2)

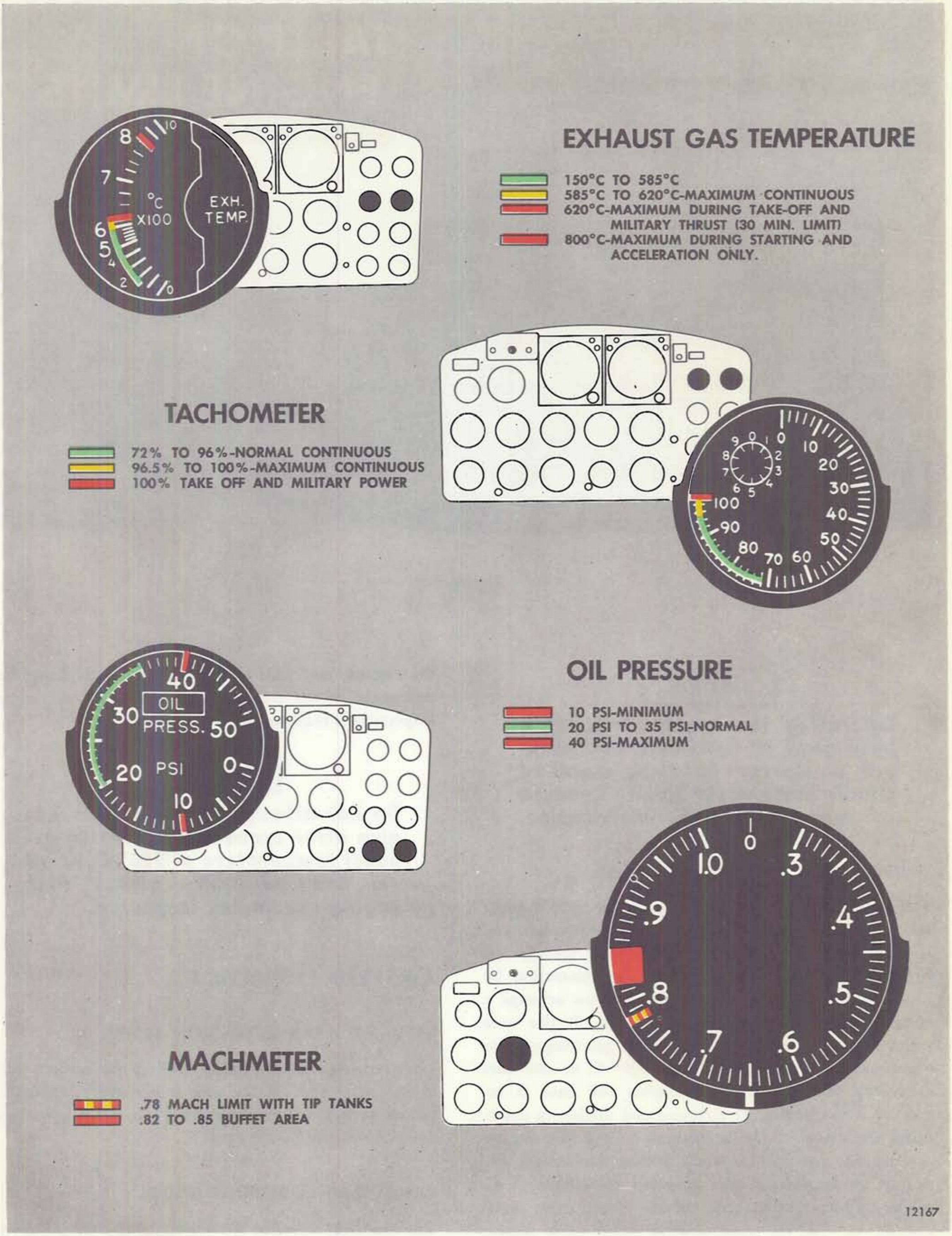
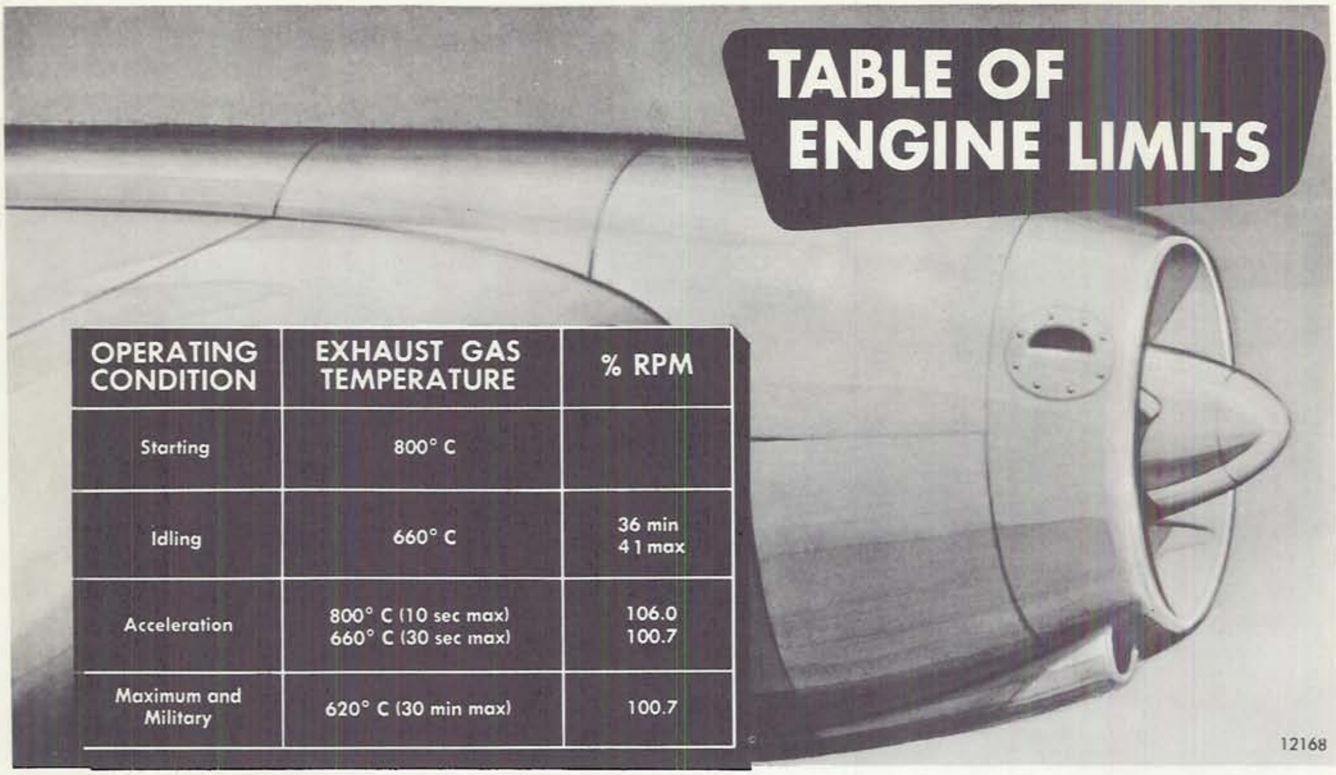


Figure 5-1 (Sheet 2 of 2)



OPERATING CONDITION	EXHAUST GAS TEMPERATURE	% RPM
Starting	800° C	
Idling	660° C	36 min 41 max
Acceleration	800° C (10 sec max) 660° C (30 sec max)	106.0 100.7
Maximum and Military	620° C (30 min max)	100.7

Figure 5-2

CAUTION

Operating the engines without a nose cowl or bellmouth and without a starter fairing installed causes compressor failure because of improper airflow distribution.

TEMPERATURE AND POWER LIMITS.

The steady-state exhaust gas temperature should never exceed 620° C except during starting or acceleration. If necessary, retard the throttle to keep within this limit. If the temperature cannot be controlled by this method, stop the engine and do not attempt a restart until an inspection can be made. If you have made five starts in which the exhaust gas temperature has risen to between 800° C and 900° C, or one start exceeding 900° C, stop the engine and have it inspected immediately. If airborne and unable to determine the cause of the malfunction, stop the engine and do not attempt a restart. Never operate the engine if the engine air inlet temperature reaches 93° C. If the engine rpm exceeds 105.5% rpm during acceleration or 102.5% rpm during steady-state flight, retard the throttle and keep below these limits. If the engine continues to overspeed, shut it down immediately. If the engine overspeeds to 106% rpm, an inspection is required before restarting.

CAUTION

Do not attempt to restart the engine after exceeding a starting exhaust temperature of 900° C, or an rpm limit of 106%, without first having the engine inspected.

AIRSPEED LIMITATIONS.

LANDING GEAR EXTENSION SPEED.

The limiting airspeed for extending the landing gear is 200 knots IAS. If the gear is lowered at speeds in excess of this value, the fairing doors, or operating mechanism may be damaged.

WING FLAP LOWERING SPEED.

The limiting airspeed for lowering the wing flaps is 170 knots IAS. Flap distortion or damage to the operating mechanism may result at speeds in excess of this limiting value.

DIVE BRAKES.

There is no limitation for the operation of the dive brakes.

CAUTION

Do not extend the dive brakes when the airplane is equipped with external wing stores. This results in severe buffeting.

BOMB DOOR OPERATION.

There is no airspeed limitation on the operation of the bomb door.

LANDING LIGHT EXTENSION.

The limitating airspeed for extending the landing light is 200 knots IAS. Damage to the light support and buffet may occur in excess of this speed.

MAXIMUM ALLOWABLE AIRSPEEDS WITH WING TIP TANKS.

When tip tanks are carried, the maximum allowable airspeed at any altitude is 444 knots IAS or 0.78 Mach, whichever is less. (See figure 5–3.)

MAXIMUM ALLOWABLE AIRSPEEDS WITHOUT TIP TANKS.

Without tip tanks, the maximum allowable airspeed up to 5000 feet is 513 knots IAS. From 5000 to 20,000 feet the limit is 0.82 Mach. From 20,000 feet up, the buffet limit is encountered between 0.83 and 0.85 mach. The airspeed limitations for normal control are shown in figure 5–3. If you exceed these values, the result is extremely heavy buffeting at low altitudes and severe longitudinal trim changes at high altitudes.

RELEASE AND JETTISON AIRSPEEDS FOR EXTERNAL STORES.

There is danger of external stores striking and damaging the airplane when dropped at excessive speeds. The maximum allowable airspeed at which empty tip tanks can be jettisoned is 365 knots IAS. Do not drop completely filled E–74 series 750-pound napalm tanks at speeds in excess of 200 knots IAS. If partly filled

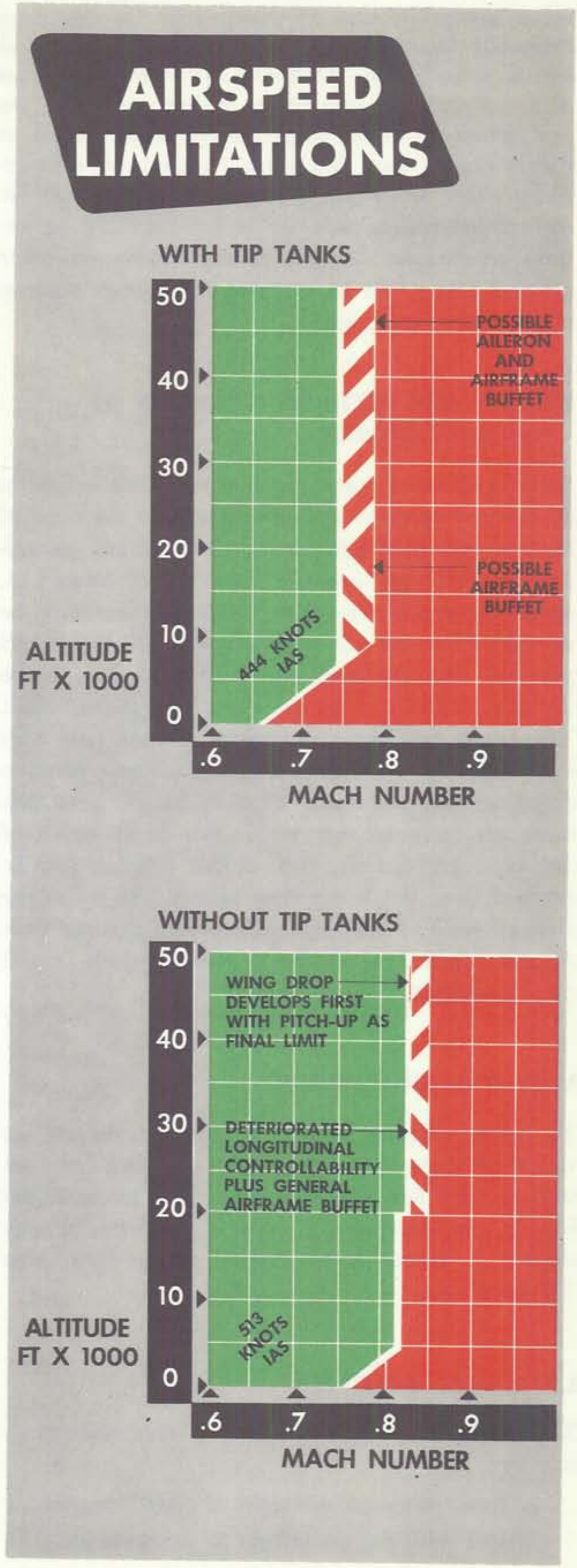


Figure 5–3

or empty, these tanks should not be dropped at any speed except in case of emergency. Do not drop externally mounted T-54 seried 750-pound bombs at speeds in excess of 350 knots IAS. This restriction does not apply to those bombs carried internally. Do not jettison five-inch, high-velocity aerial rockets at speeds greater than 200 knots IAS, except in emergency. This restriction does not include 2.75 FEAR rockets and rocket pads, for which there are no jettison restrictions. Drop-speed restrictions for other external stores will be included in the handbook as flight tests are completed.

RELEASE AND JETTISON AIRSPEEDS OF INTERNAL STORES.

As with external stores, the release of internal stores at excessive speeds can cause damage to the aircraft. Do not jettison five-hundred-pound box-fin, general-purpose bombs at speeds in excess of 400 knots IAS, except in emergency. The M-26 paraflare may be released from the bomb door up to 350 knots IAS provided that the inert stores are loaded on bomb stations 18 and 21 and are on a "no-release" basis. Tests show that these two stores are the only ones that "hang-up" or damage the airplane on separation up to the 350-knot limit. Tests have also shown that flares are more reliable when released at speeds of 300 knots IAS or less. E-53 cluster adapters may be released from the bomb door at any IAS up to the airspeed limit of the airplane, provided that the inert stores are loaded on stations 18 and 21 and are carried on a "no-release" basis.

M-39 GUN LIMITATIONS.

To insure adequate purging of gun gas, do not fire the M-39 guns at less than 190 knots IAS from sea level to 5000 feet. Test-firing the guns above 20,000 feet is not recommended, but if test-firing at this altitude is necessary, the airspeed should be at least 300 knots IAS.

LANDING DESCENT.

The maximum permissible sinking rates when landing are:

540 fpm with a gross weight of 37,600 pounds.

438 fpm with a gross weight of 44,000 pounds.

300 fpm with a gross weight of 53,400 pounds.

PROHIBITED MANEUVERS.

Do not perform the following maneuvers:

1. Intentional spins.
2. Snap rolls or any other snap maneuver.
3. Inverted flying or any maneuvers resulting in extended negative acceleration.
4. Abrupt rudder-induced maneuvers.

CAUTION

Inverted flying or any maneuver resulting in extended negative acceleration may results in engine flame-out, since there are no means of insuring a continuous flow of fuel in this attitude.

Do not make maneuvers solely by the use of trim devices. Trim devices increase the pilot's apparent strength by reducing the required stick forces. The high stick forces experienced during maneuvers without the use of trim serve to protect the crew and the airplane. Use trim devices only to reduce the maneuvering stick forces to tolerable limits, and not to zero. The use of trim in anticipation of a maneuver or to reduce maneuvering stick forces to very small values may result in airloads strong enough to cause complete structural failure of the airplane.

ACCELERATION LIMITATIONS.

The maximum allowable G for different conditions is illustrated in the Operating Flight Strength Diagrams, figure 5-4. These flight strength (V-G) diagrams define the flight speed and load factor limits at various altitudes for a given airplane gross weight. The speeds quoted are indicated readings exactly as observed during flight.

MAXIMUM ACCELERATION.

NO EXTERNAL LOAD.

The maximum allowable positive acceleration for the airplane with no external load is 5G and the maximum negative limit is 2.5G. (See figure 5-4.)

TIP TANKS INSTALLED.

A maximum allowable positive acceleration is 4G's for an aircraft with tip tanks. This acceleration limit is for both full and empty tip tanks. The negative limit varies with full or empty tip tanks. The maximum negative limit with tip tanks full is 1.33G, while a 2.05G negative acceleration is allowable with the tip tanks empty. (See figure 5-4.)

CENTER-OF-GRAVITY LIMITATIONS.

The CG limitations of the airplane are: forward 21.0% MAC, with or without tip tanks; aft 28.3% MAC, with tip tanks; and aft 28.8% MAC without tip tanks. The location of all equipment (figures 5–5, 5–6, and 5–7) has been carefully controlled for a satisfactory center-of-gravity position at all times. The greatest single cause of CG travel is the distribution of the fuel load. The normal system of sequencing fuel to the engines, as outlined in Section VII, keeps the airplane well within the CG limits.

GROSS WEIGHT LIMITATIONS.

The maximum gross weight of the B–57C is 57,000 pounds, if cargo and stores are loaded as specified in HANDBOOK OF WEIGHT AND BALANCE DATA, TO–07–1B–40. This gross weight limitation is not imposed by the structual limits of the airplane, but by the facilities available for the loading of internal and external stores. There are certain limitations associated with gross weight that affect the service life, strength, and performance of the airplane. A tabulation of these limitations follows:

Gross Weight Pounds	
55,000	Requires at least a 5400-foot take-off roll at 100% rpm, standard day at sea level, no wind.
57,000	Requires at least 10,000-foot take-off roll to clear 50-foot take-off obstacle with 100% rpm, sea level, hot day, no wind.
57,000	Maximum gross weight based on available capacity.
53,400	Sinking speed limited to 300 fpm at landing contact with runway.
49,000 to 53,400	Load factor limited to +4G and −1.33G constant with tip tanks installed.
44,000 to 49,000	Load factor limited to +4G and −2G constant without tip tanks installed.
37,500	Load factor limited to +5G and −2.3G constant without tip tanks installed. Sinking speed limited to 540 fpm at landing contact with runway.

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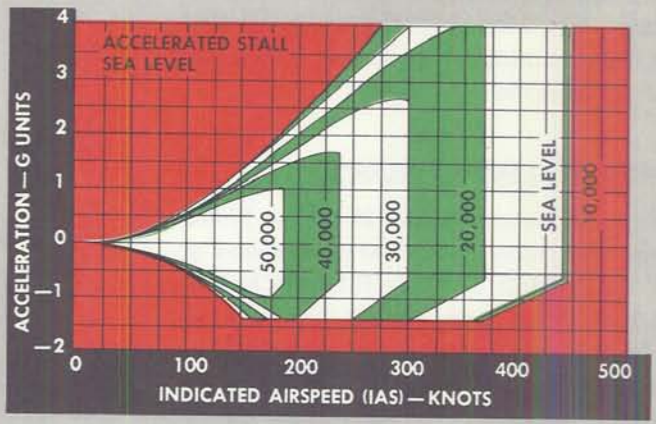
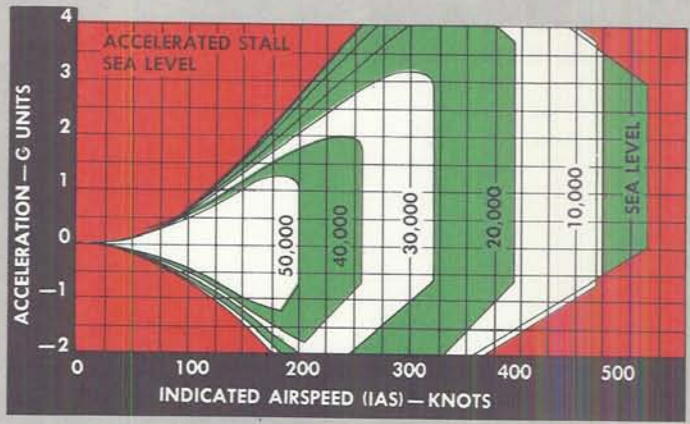
OPERATING FLIGHT STRENGTH DIAGRAMS

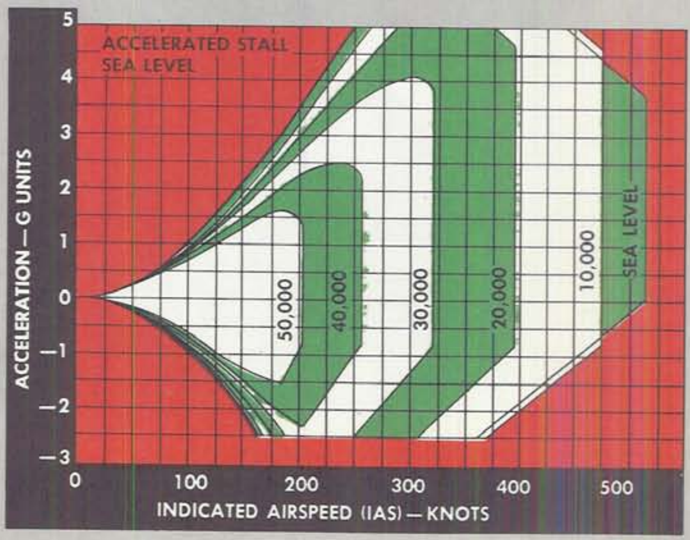
SYMETRICAL FLIGHT
WITH WING-TIP TANKS
GROSS WEIGHT — 53,400 LB



SYMETRICAL FLIGHT
WITHOUT WING-TIP TANKS
GROSS WEIGHT — 48,600 LB



SYMETRICAL FLIGHT
WITHOUT WING-TIP TANKS
GROSS WEIGHT — 37,600 LB



HOW TO USE CHART

1. Select your indicated airspeed.
2. Trace vertically your flight altitude.
3. Move horizontally to the left and find the maximum G you can pull at that airspeed and altitude before stalling. NOTE: Any G in excess of 5G is prohibited.

12170

Figure 5-4

CENTER OF GRAVITY (MAXIMUM RANGE CONDITION)

C. G. LIMITS ARE BASED UPON LANDING GEAR RETRACTED CONDITIONS

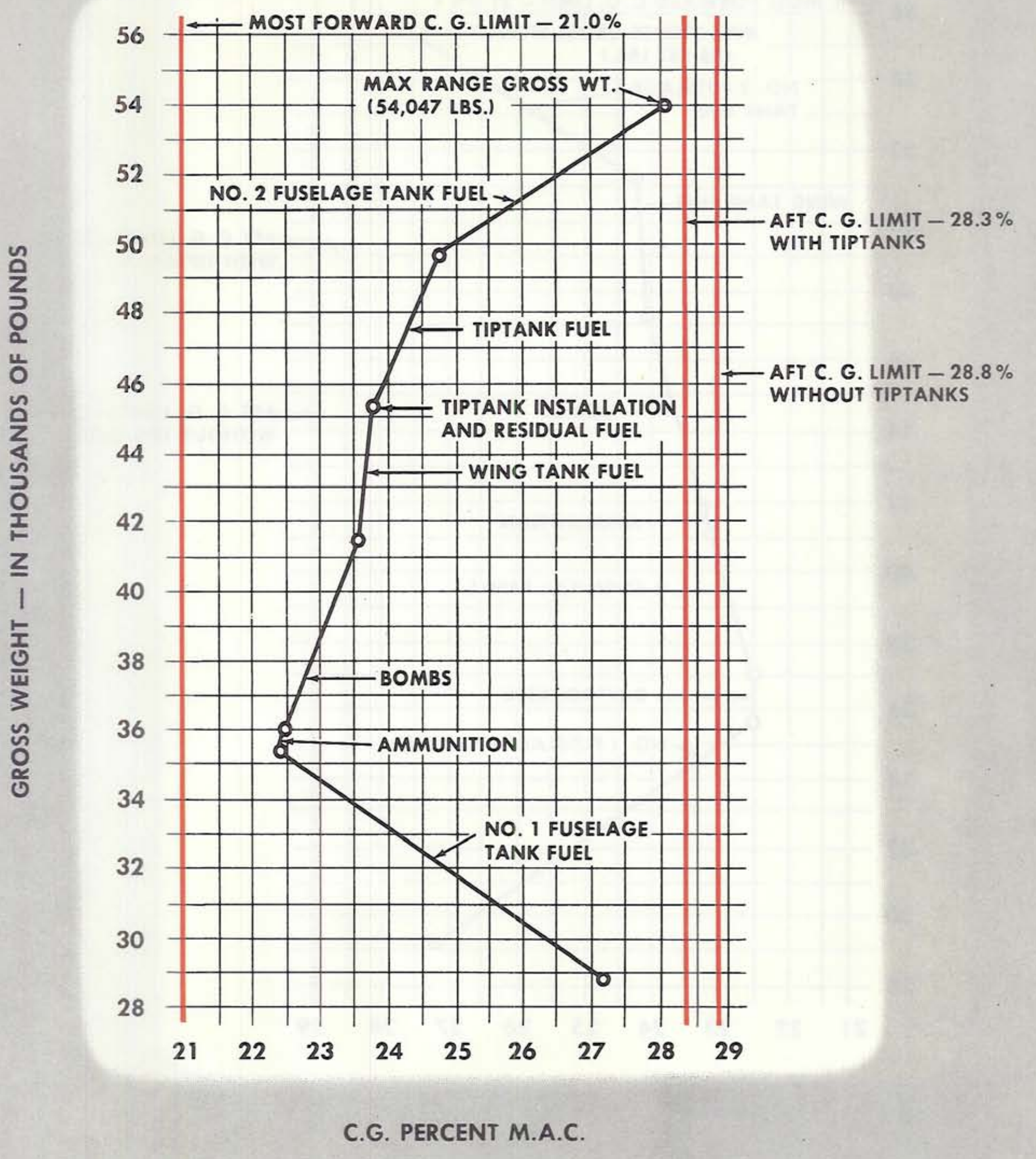


Figure 5-5

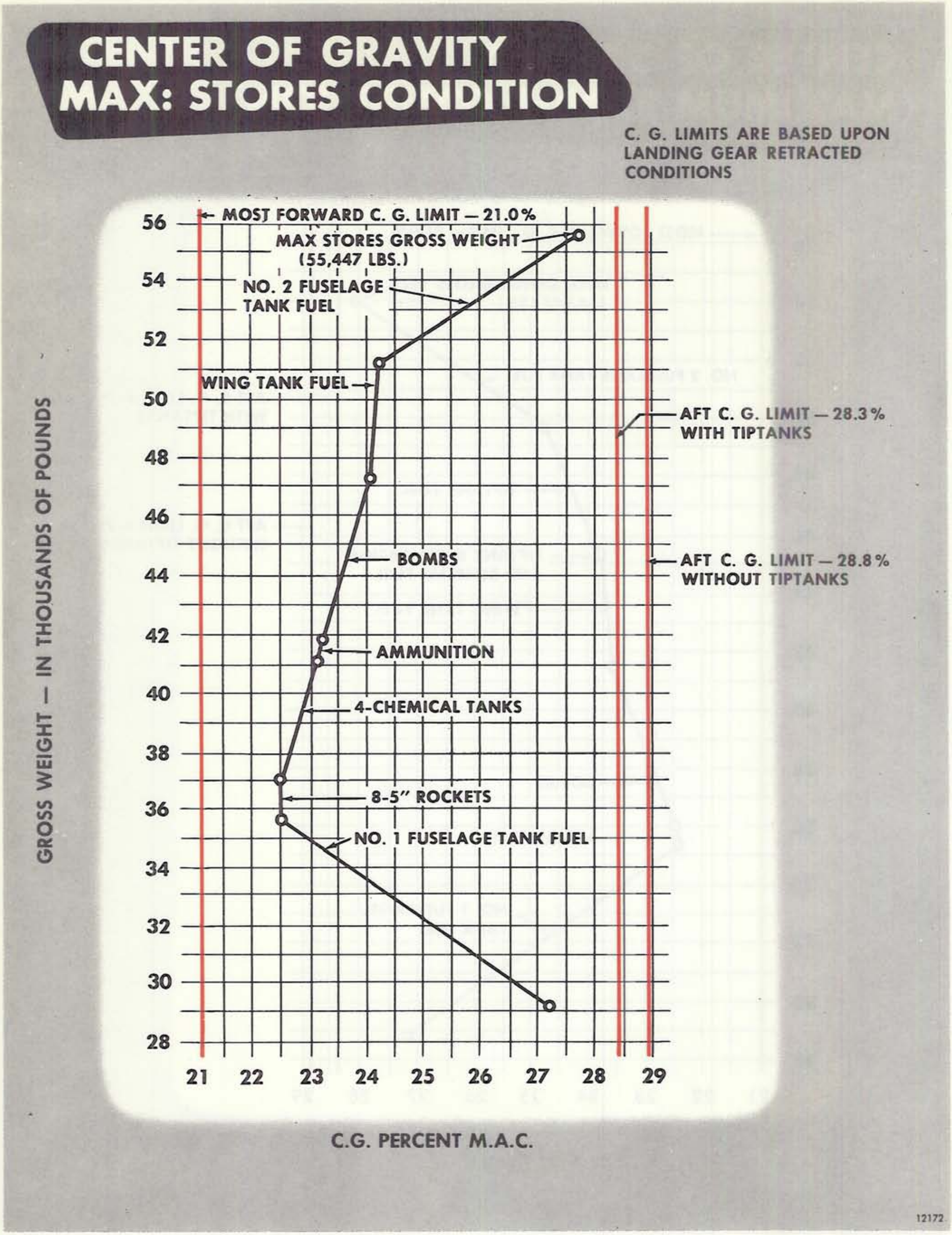

CENTER OF GRAVITY
MAX: STORES CONDITION
C. G. LIMITS ARE BASED UPON LANDING GEAR RETRACTED CONDITIONS
MOST FORWARD C. G. LIMIT — 21.0%
MAX STORES GROSS WEIGHT (55,447 LBS.)
NO. 2 FUSELAGE TANK FUEL
WING TANK FUEL
AFT C. G. LIMIT — 28.3% WITH TIPTANKS
BOMBS
AFT C. G. LIMIT — 28.8% WITHOUT TIPTANKS
AMMUNITION
4-CHEMICAL TANKS
8-5" ROCKETS
NO. 1 FUSELAGE TANK FUEL
GROSS WEIGHT — IN THOUSANDS OF POUNDS
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
21 22 23 24 25 26 27 28 29
C.G. PERCENT M.A.C.
12172

Figure 5–6

CENTER OF GRAVITY LIMITS FERRY CONDITION

C. G. LIMITS ARE BASED UPON LANDING GEAR RETRACTED CONDITIONS

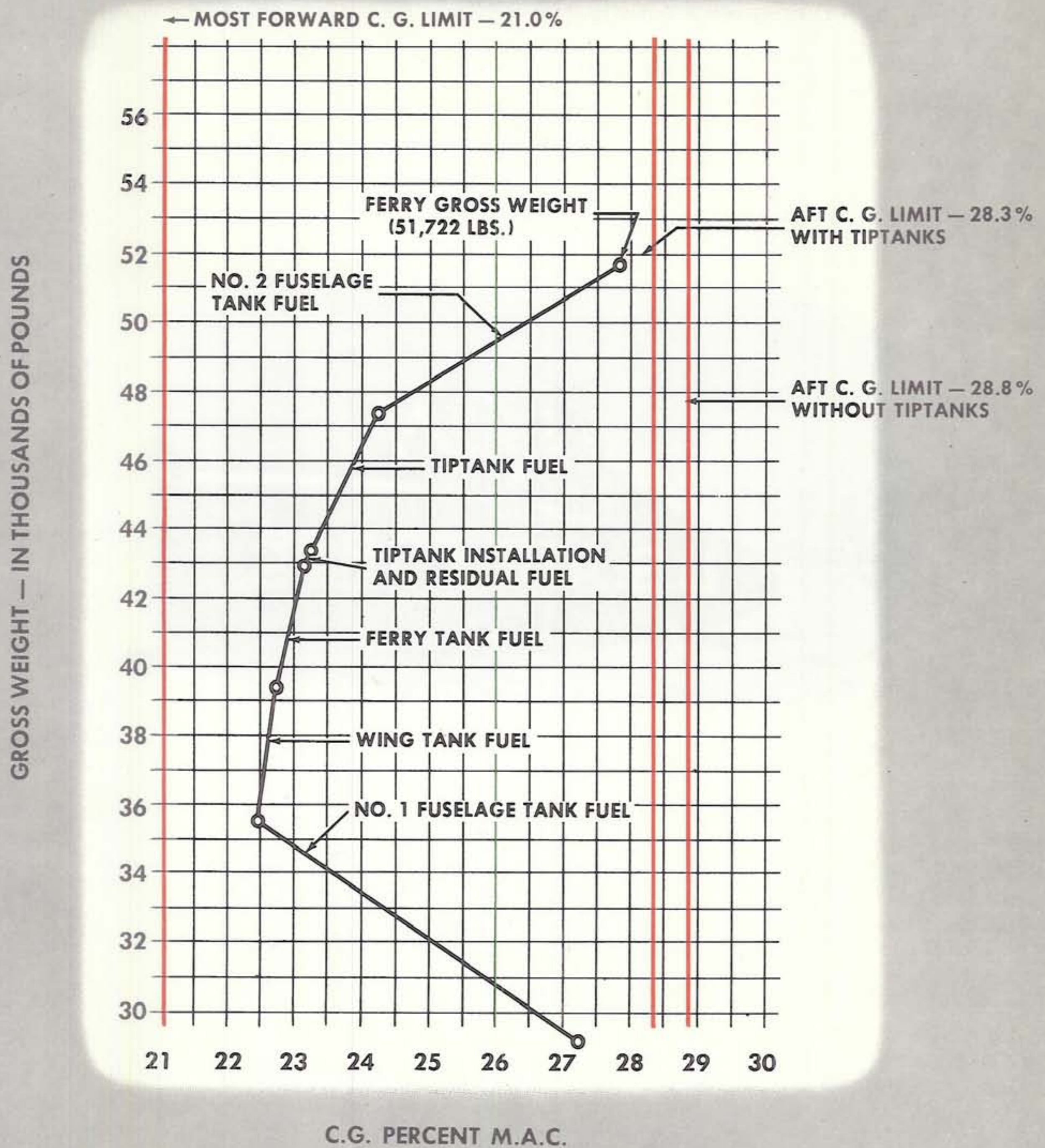
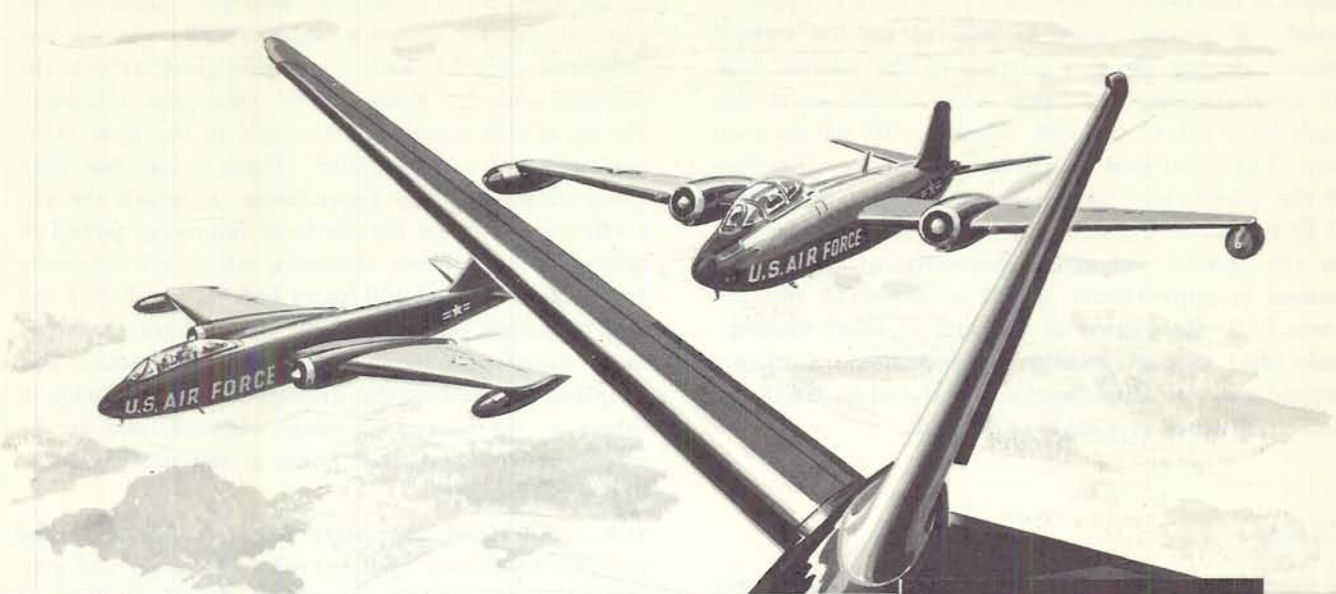


Figure 5-7

11772



Flight Characteristics — Section VI

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TABLE OF CONTENTS

INTRODUCTION.

The B-57C is a high-performance training airplane that capably duplicates the flight characteristics of its counter-part, the B-57B. It has unusually good speed acceleration for a jet-powered airplane, but unlike an airplane with reciprocating engines, it does not decelerate rapidly when the engines are throttled back. Therefore, the airplane is equipped with dive brakes to aid in deceleration from high speeds. The airplane has a relatively low wing loading and a high load-factor strength. As a result, it is unusually maneuverable and its comparatively low thrust leading results in a service ceiling over 50,000 feet. The airplane is stable about all axes throughout its speed and center-of-gravity range. As with all high-speed, high-altitude aircraft, the longitudinal stability starts to deteriorate at the Mach number where the effects of compressibility begin. At extremely high altitudes, the airplane has a certain amount of lateral-directional oscillation known as Dutch-roll. Dutch-roll is characteristic of most aircraft at these altitudes, and while annoying, it is controllable and can be stopped for short periods.

TAKE-OFF.

The take-off characteristics are slightly different from those of other airplanes with a tricycle landing gear. On the take-off roll, differential braking maintains directional control until the rudder becomes effective at approximately 60 knots IAS. The nose has a tendency to rise prematurely and a push force of approximately 30 pounds must be exerted on the control column during the first portion of the take-off roll. At approximately 100 knots IAS, relaxation of this push force allows the nose wheel to lift off the runway. The main gear oleo struts absorb the vibrations of the wheels and you may experience a false sense of flying due to the smooth ground roll. A slight pull on the control column is necessary to fly off the ground at approximate speeds between 110 and 120 knots IAS. Restriction of the rate of climb immediately after take-off permits the airplane to accelerate beyond the safe single-engine speed and to attain the best climb speed as quickly as possible.

CLIMB.

A vibration similar to that of a rough engine may develop during rapid climbs to altitude. This vibration is caused by the leading edge or "beak" of the aileron contacting the surrounding wing structure and transmitting engine vibration throughout the airplane. This condition is not dangerous and can be eliminated by reducing power. The clearance between the aileron and the surrounding structure is very close to obtain the lowest possible aileron forces. Temperature changes cause the various metal parts to expand and contract, thus producing the vibration contact.

CAUTION

If vibration through the aileron contact occurs during climb, inspect the aileron and surrounding structure after completing the flight for possible damage.

CRUISE PERFORMANCE.

The range and endurance performance of turbo-jet airplanes differs from that of aircraft with reciprocating engines in one important respect. The reciprocating engine operates most efficiently at low power outputs where the gas turbine operates most efficiently at, or near, maximum power output. Because of this characteristic, the maximum range and maximum endurance procedures for jet-power aircraft are quite different. To better understand the way the airplane is affected by maximum range and maximum endurance flying, it is best to study the airframe and the engine separately.

If the airframe is considered separately from the engine, it can be shown aerodynamically that at one indicated airspeed, with a constant gross weight, the airframe can be flown at its maximum efficiency. Flying at this airspeed will result in the most miles per pound of applied effort. There is also one indicated airspeed, a few knots lower, at which the airframe can be flown for the most hours per pound of applied effort. These airspeeds, which are relatively low (about 180 and 160 knots IAS for the B-57) and which change very little with altitude, are the maximum range and maximum endurance speeds. The airframe is flown at the greatest ratio of velocity to thrust at the maximum range airspeed, and at the minimum-thrust-required point at the maximum endurance airspeed.

When considered separately from the airframe, the gas turbine engine operates most efficiently and produces the most thrust per pound of fuel per hour at 95% to 100% rpm. This is true regardless of altitude, but the total amount of thrust produced at a constant rpm is greater at low altitudes and falls off appreciably at high altitudes.

Mount the turbo-jet engine on the airframe, and at low altitudes the most efficient engine operation (95% to 100% rpm) will produce far more thrust than the airframe requires to be propelled at its most efficient speed. If the airplane is climbed to high altitudes, there will be one altitude at which the engine can be operated at its most efficient rpm, and produce just enough thrust to propel the airframe at its most efficient indicated airspeed (180 knots IAS). Flying at this altitude, near the airplane's service ceiling, results in a maximum of miles per pound of fuel used. At lower altitudes both the engine and the airframe compromise their efficiency. The engine must be operated below its most efficient power setting, and the airframe must be flown faster than its most efficient indicated airspeed. Consult the Performance Data in Appendix I for specific range figures. An additional advantage in cruising at high altitudes is the increase in true airspeed. Two hundred knots IAS at sea level is about two hundred knots true airspeed. An IAS of 200 knots at 40,000 feet is approximately 400 knots true airspeed. An increase in gross weight requires a slight increase in the recommended cruising speeds.

To obtain maximum range with a full load of fuel, climb to maximum altitude as rapidly as possible and cruise at maximum continuous power at the recommended Mach number. Make a normal descent (RPM-IDLE, Dive brakes-EXTENDED, IAS-250 knots) when reaching the precomputed descent distance from your destination. You can obtain maximum endurance by flying at the minimum-thrust-required speed, approximately 160 knots IAS, depending on weight. Because it is difficult to stabilize at this speed, a speed of 10 to 15 knots faster is recommended. The difference in endurance is negligible, and some excess thrust is available for turns and other maneuvering.

At low altitude, engine rpm is reduced to considerably less than its most efficient setting. Therefore, more time per pound of fuel is gained by flying at a high altitude where the engine can be operated at maximum continuous power, and where this power setting is just sufficient to maintain maximum endurance speed. When deciding whether or not to climb, consider the fuel required to climb and descend. If you have less than 2000 pounds of fuel remaining in the fuel supply, it is usually to your advantage to reduce power and remain at the same altitude. In cases of emergency and when it may be impractical to climb to a high altitude, one engine can be shut down and the other engine operated at a higher rpm. When at an altitude where one engine will provide sufficient thrust, it is more economical to operate one engine at full or near full rpm than two engines, each at a reduced rpm. When operating on one engine to save fuel, the shut-down engine should be restarted prior to landing.

STICK FORCES.

The airplane is longitudinally stable throughout the center-of-gravity range of 21% MAC to 28.3% MAC with tip tanks, 21% MAC to 28.8% MAC without tip tanks.

Note

MAC stands for Mean Aerodynamic Chord; that is, the chord of an imaginary airfoil which would have force vectors throughout the flight range identical with those of the actual wing.

Under certain loading conditions when all fuel except that in the No. 1 fuselage tank is used, the forward center-of-gravity limit may be exceeded by approximately three-fourths of one percent. This presents no operational problem because stick forces at the forward cg are normally high and this slight additional forward movement has little effect. The airplane will not fully stall in this condition, but the airspeed can be reduced to near actual stall speed. At high speed with a forward cg the stick forces per G are such that the load factor that can be applied to the plane is limited by pilot strength. For example, at 21% cg and 450 knots it takes about 150 pounds of effort to pull about 2G. This factor is important during aerobatics. Refer to Stick Forces Chart, figure 6-1. It is important to keep in mind that the airplane normally operates close to its aft cg limit when fully loaded with fuel. The basic longitudinal stability is reduced as the cg approaches the aft limit, and less pilot effort on the control column is required to change the airspeed from a given trim point. The airplane's cg can easily move beyond its aft limit if fuel and equipment are improperly loaded or the fuel system is mismanaged in flight; particularly if the No. 2 fuselage tank is allowed to remain full while utilizing fuel only from the No. 1 fuselage tank. Progressively less pilot effort is required for control as the cg moves aft of its limit and after a shift of approximately 3%, the plane reaches its so-called neutral point. Here there is little feel in the elevator control system and the control column can be moved back and forth with little effort. The elevator remains effective, however, and movement of the control results in normal aircraft response. The pilot can apply destructive load factors to the plane in this condition with absolutely no effort. The airplane becomes essentially unmanageable past this neutral point, and if it begins a pitching motion in either direction, it has a tendency to continue the pitching motion by itself.

These characteristics are basic to any airplane and should not be considered peculiar to the B-57. You should know of them, however, since it is possible to create such conditions on the B-57 through carelessness in fuel management and/or equipment loading. If the plane seems unusually light on the control column or the longitudinal control seems spongy while flying, check your loading condition and handle the plane with extreme care. Reduce airspeed to between 200 and 250 knots and make all control motions as smoothly and gently as possible. Do not attempt steep turns or any other maneuvers that apply a load factor to the plane and be especially cautious of handling the plane roughly in turbulent air. Try to move the cg forward by fuel management, particularly before trying to land.

MANEUVERING FLIGHT.

The maneuverability of the B-57C is aided by spring tab assists on the control surfaces. The ailerons are designed to be fully deflected only at low indicated airspeeds and are limited to an 80-pound effort on the control wheel. The elevator also has a spring tab assist but several other factors affect elevator effectiveness. The most important of these factors is the position of the center of gravity. The plane is more

STICK FORCES

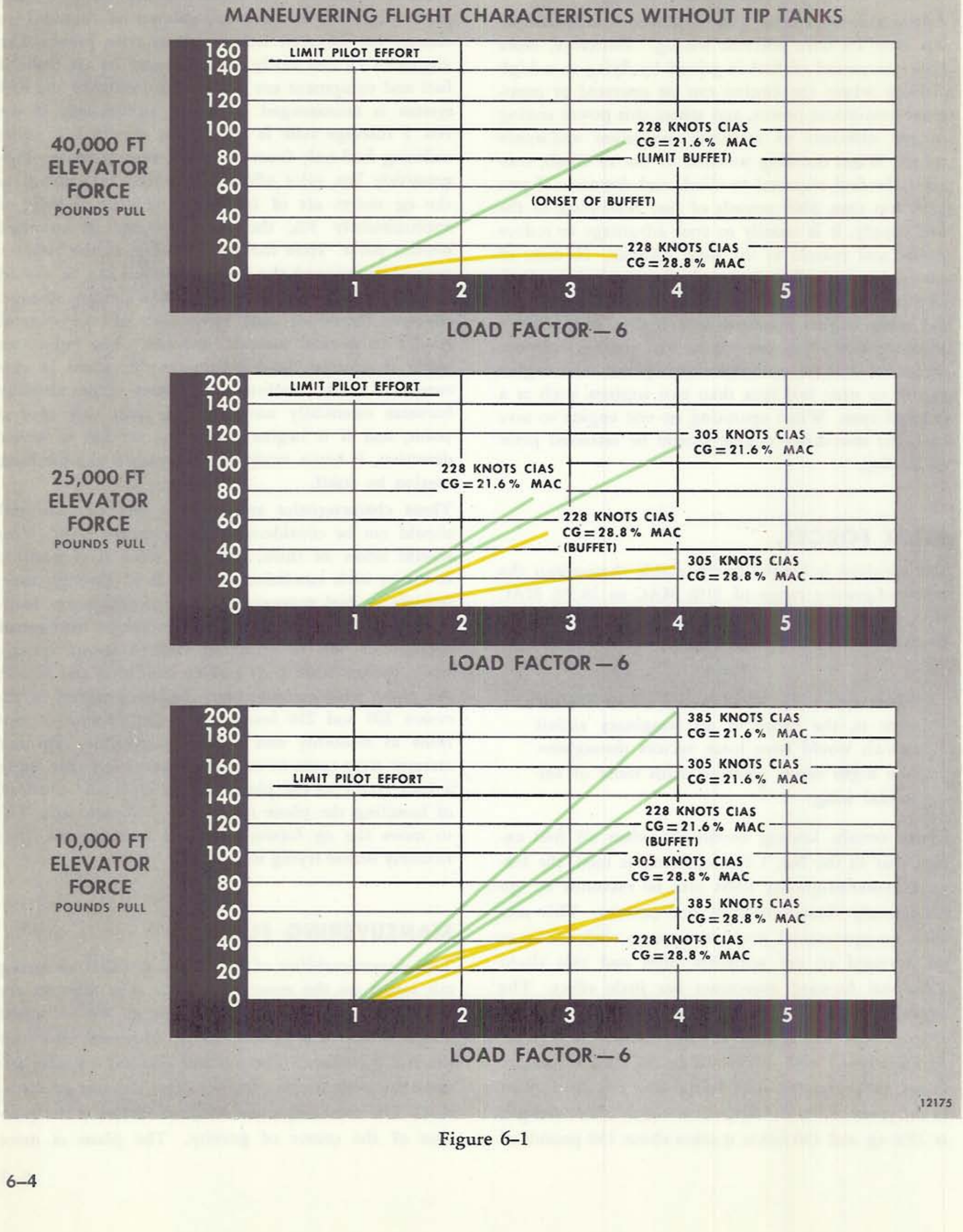

Figure 6-1

maneuverable at the aft cg positions and requires more pilot effort at the forward cg positions. Altitude also affects maneuverability or the ease with which G acceleration can be produced during turns, pullouts, loops, and other G-producing maneuvers. At the same cg, it requires less pilot effort to pull G at high altitudes than at low altitudes. On the other hand, while it requires less pilot effort to maneuver at high altitudes, less G can be produced because of lower buffet limits. Therefore, practice aerobatic maneuvers at low to medium altitudes—5000 to 15,000 feet. Practice loops at 5000 to 10,000 feet with entry speeds ranging from 375 to 425 knots IAS. Use full power during the climb portion of the loop and hold a constant 3 to 3½ positive G throughout the maneuver. Practice aileron rolls at 5000 to 10,000 feet and become proficient in performing aileron rolls before attempting an Immelman. The aileron roll can be performed between 225 and 300 knots IAS (optimum 250 knots IAS) with power settings from IDLE to FULL. If performing the aileron roll at lower power setting, keep a nose low attitude to maintain the optimum indicated airspeed; if performing the maneuver at high power settings, climb steeply to avoid excessive airspeed. Enter the roll with the nose of the airplane above the horizon to produce and stabilize an indicated airspeed that is compatible with your power setting. Apply full aileron in the desired direction of the roll with rudder in the same direction as necessary for coordination. Apply slight back pressure on the control column to produce a positive load factor and hold the controls fixed in this position until the roll is completed. A positive load factor held throughout the maneuver avoids a possible flame-out.

Enter an Immelman at 425 knots IAS, FULL power, and pull a constant 3½ positive G. Immediately after reaching the vertical climb position, look directly back over your head to locate the horizon as soon as possible. After locating the horizon, continue the maneuver until you reach an inverted dive angle of approximately 40 degrees, then execute the second half of an aileron roll. The altitude gained from the point of entry to the roll-out point is approximately 6000 to 7000 feet.

CAUTION

The airplane has not been tested for spin characteristics. Therefore, it is important to follow the recommended aerobatic procedures to avoid stalls.

HIGH-SPEED CHARACTERISTICS.

All pilots flying moderate to high performance aircraft should have a thorough understanding of the high-speed characteristics of the aircraft. Jet airplanes in general are capable of level flight cruise speeds that are very close to the flight limitations of the aircraft, whether these limitations are structural or aerodynamic. The B-57 is no exception.

WITH TIP TANKS.

With tip tanks (figure 5-3) the limiting airspeed is 444 knots IAS or 0.78 Mach, whichever is lower. It is possible to exceed this structural limit speed at lower altitudes without any particular aerodynamic effects. Above 10,000 feet the limiting airspeed is 0.78 Mach. This is primarily an aerodynamic limitation but it also approaches the structural limits with tip tanks installed. Between 7500 feet and 15,000 feet considerable airframe buffet and aileron shake occur at Mach numbers above 0.75. Even though the airspeed at which this occurs is within the placard limitations, sustained cruising at this speed may possibly result in the loosening of rivets in the ailerons. Above 20,000 feet, the placard speed of 0.78 Mach can be attained with little or no aerodynamic effects. Acceleration through the last few hundredths of this Mach number may be accompanied by light airframe buffet, aileron shake, and occasionally by light, intermittent wing dropping. Actually, the structural limitation on the tip tanks at altitudes above approximately 10,500 feet is 0.79 Mach. Very few airplanes will reach this limitation without excessive aerodynamic effects in the form of buffet, aileron shake, or wing drop.

WITHOUT TIP TANKS.

Without tip tanks (figure 5-3) the airspeed limit below 5000 feet is 513 knots IAS or 0.82 Mach, whichever is lower. The airplane can be flown to the structural limit airspeed of 513 knots IAS at all altitudes below 5000 feet without any aerodynamic effects occurring. From 5000 to 20,000 feet, the Mach limit of 0.82 is attained with little aerodynamic effects, although a light airframe buffet may occur at approximately 0.81 Mach below 5000 feet. If the airspeed is advanced beyond this limitation, buffet will usually increase. The Mach limit of 0.82 is established for this altitude range because of the aerodynamic tendencies encountered above it. At approximately 0.83 Mach the aircraft has a light "tucking" tendency and an increase in speed to 0.85 Mach may require a pull force of three to eight pounds instead of a push force to maintain initial attitude. At airspeeds between 0.86 and 0.87 Mach, the airplane pitches up sharply with the amount of pitch-up directly proportional to the entry rate at which you encounter the pitch-up area. If the airplane reaches this area with even small amounts of acceleration in airspeed, an uncontrollable pitch-up occurs, resulting in a high-speed stall at high altitudes. If the stall is penetrated deeply enough, it generally results in loss of control and entry into a spin. At lower altitudes, the pitch-up may be of sufficient magnitude to cause structural failure before the stall is reached. Above 30,000 feet, the Mach limitation is 0.83. The characteristics of the airplane are similar to those just discussed although aerodynamic buffet may not be present at a Mach reading as high as 0.85. However, above 0.85 Mach wing dropping may occur and a strong pitch-up may result in a high-speed accelerated stall.

ACCELERATION AND DECELERATION.

With Mach readings of 0.82 and 0.85 there is at least a 0.03 Mach margin before any serious aerodynamic effects occur. However, the B–57, like most jet airplanes, is very clean and accelerates extremely fast. Always remain conscious of your airspeed in dives and maneuvers and maintain a margin to regulate your airspeed within safe limits. The airplane has effective dive brakes which can be used at all airspeeds to aid in the regulation of high-speed situations. These dive brakes are much more effective at altitudes below 30,000 feet and will not immediately regulate all high-speed situations above that altitude. Decreasing power also helps to decelerate, especially at lower altitudes. Always remember that a standard Machmeter has a rather large speed tolerance. An error of 0.02 or 0.03 is not uncommon at high altitudes. Develop a feel for the aerodynamic characteristics of your plane so that you can correlate the airplane's response characteristics with the indicated Mach number, and not be totally reliant on the Machmeter. If buffet occurs before the Mach limitation is reached, be very cautious until the Machmeter can be checked for accuracy.

DIVE BRAKES.

The extension of the dive brakes at high speeds is accompanied by an increase in buffet. There is a very slight nose-down trim change with the extension of the dive brakes.

HORIZONTAL STABILIZER.

Varying the incidence of the horizontal stabilizer trims the airplane longitudinally. By using the entire surface of the horizontal stabilizer, only small changes in the angle of incidence are needed to make a large trim correction, either nose up or nose down. Therefore, at high indicated airspeeds, it is difficult to make small trim corrections without overtrimming.

SPINS.

Intentional spins are prohibited. To recover from an inadvertent spin, use the following spin recovery procedure. Fuel in the tip tanks has an adverse effect on spins and spin recovery. If there is no response to the recovery procedure, jettison the tip tanks. The recovery procedure for erect and inverted spins is the same. The G forces on the pilot indicate the type of spin. You are pressed against the seat during an erect spin, and pressed against the seat belt during an inverted spin. The recommended recovery procedure is:

1. Gear and Flaps—UP.
2. Throttle—IDLE.
3. Ailerons—Neutral.
4. Control column—Aft.
5. Rudder against the spin until rotation stops, then neutralize rudder.
6. Release back pressure on the control column after rotation stops.

If oscillation accompanies the spin, apply rudder against the rotation when the nose is well below the horizon.

Note

Wind tunnel tests of spins and spin characteristics are being made at the present time. Results of these tests will be included in the handbook when the tests are completed.

LOW-SPEED CHARACTERISTICS.

The airplane has good handling characteristics at low speeds. The controls are effective down to the stall and response is good. Sufficient longitudinal trim is available for normal conditions, and there is enough control available to override full stabilizer trim in either the full nose-up or full nose-down condition below 250 knots. With one engine inoperative the pilot cannot apply sufficient force to the rudder pedals to maintain directional control below 155 knots IAS. Therefore 155 knots IAS is the minimum safe single-engine control speed. These forces cannot be eliminated by trim.

STALLS.

The airplane has extremely safe stall characteristics although normal prestall buffet is hard to detect with the gear and flaps extended. Power-off and power-on stalls have like characteristics.

STALLS WITH GEAR AND FLAPS RETRACTED.

Stall warning in the form of general airframe roughness occurs 10 to 15 knots above the stalling speed. As the speed is reduced, the roughness increases and near the stall the control column oscillates slightly. At the stall a mild aileron snatch occurs. Aileron snatching characteristics are aggravated by any sideslip allowed to occur during the approach to the stall. There is sufficient rudder control to control any sideslips that might occur. The airplane pitches mildly nose down at the stall and may roll slightly in either direction. Recovery is easily made with or without power and sufficient aileron control is available throughout the stall.

STALLS WITH GEAR AND FLAPS EXTENDED.

The stall characteristics are generally the same as with gear and flaps retracted. The warning buffet is less noticeable because of general airframe roughness with the gear and flaps extended. Stall speeds are approximately 10 knots lower with the gear and flaps extended. See figure 6–2 for stall speeds at various gross weights and configurations.

Note

Prestall buffet is hard to detect with the gear and flaps extended.

ACCELERATED STALLS.

Accelerated stall characteristics are the same as those previously mentioned and sufficient warning is present to prevent an inadvertent entry into such a condition. Recovery from such a stall is made simply by relieving the load. The maximum accelerations attainable decrease with altitude and speed; the stick forces also decrease with altitude.

PRACTICE STALLS.

In performing practice stalls, trim the airplane to the approach speed, approximately 130 knots IAS, and complete the stall without further use of the trim. Trimming into the stall is similar to holding the stick back after the stall occurs and makes stall recovery difficult. Perform practice stalls at altitudes high enough to provide a safe recovery distance. In general, 10,000 feet above the terrain is considered satisfactory.

DIVES.

Control forces during dives are reasonable and handling characteristics are good. Be careful not to exceed the airspeed and acceleration limitations stated in Section V. Figure 6–4 shows the altitude and acceleration required to recover from dives at various altitudes. Retard the throttles and extend the dive brakes if the airspeed approaches the limit. Stick forces will be highest at high airspeeds and with a forward cg condition. Use longitudinal trim cautiously during dive recovery because overtrimming can produce G forces in excess of the airplane's limitations.

LANDING.

The airplane lands in a conventional manner and you may follow a normal landing pattern. (See figure 2–6.) During the approach to a landing, the extension of the flaps causes the nose to pitch up. For this reason, the recommended time to extend the flaps is during the nose low turn to base leg, at any speed below 170 knots IAS. A slight buffet may accompany flap extension.

Make a conventional nose-high landing. There is little or no danger of striking the tail skid unless there is an aft cg condition. At normal landing weights, the airplane can be stopped in less than 3000 feet, and even for landings at high gross weights, a 5000-foot runway is adequate. For landing distances see Appendix I.

Below gross weights of 38,000 pounds, be careful when applying the brakes to keep the tires from skidding. Above 40,000 pounds, the braking effect is noticeably less than at low gross weights. Pilots who have made most of their landings at low gross weights should remember this when undertaking heavyweight landings.

Landing with asymmetrical fuel loading in the tip tanks requires caution. Never attempt a landing with one tip tank full and the other empty unless it is impossible to jettison the tanks. If a landing in this configuration is necessary, make your touchdown at a speed of approximately 130 knots to maintain lateral control with full aileron. To repeat, attempt such a landing only under the best of circumstances.

When landing without the use of flaps, add approximately ten knots to the speeds used during normal landings.

For a go-around, make your decision as soon as possible and keep in mind that a jet engine does not accelerate as rapidly as a reciprocating engine. Advance the throttles smoothly to FULL and be alert for asymmetrical engine acceleration that produces varying amounts of yaw. Retract the flaps before reaching 170 knots IAS and retract the landing gear after establishing that contact with the ground will definitely not be made. The landing gear should be retracted before reaching 200 knots IAS and dive brakes can be retracted after completing the procedures just mentioned. Rapid trim adjustment is necessary to aid control.

ANGLE-OF-ATTACK RELATIONSHIP CURVE.

Figure 6–3 will help familiarize you with the flight characteristics of the airplane. This Angle-of-Attack Relationship Curve indicates the angle of attack of the airplane at sea level for various airspeeds and attitudes. Included on the chart is an example of its use.

STALL SPEED KNOTS IAS

ANGLE OF BANK		0°	30°	45°	60°
LOAD FACTOR		1.0G	1.2G	1.4G	2.0G
	GROSS WT--LBS				
CRUISING CONFIGURATION OR TAKE-OFF WITH GEAR DOWN	28,000	93	99	110	131
	35,000	104	111	123	146
	45,000	119	126	139	166
	55,000	130	140	155	183
	GROSS WT--LBS				
FLAPS AT 60° OR LANDING FLAPS AT 60° GEAR DOWN	28,000	81	88	97	115
	35,000	91	98	108	129
	45,000	103	111	123	146
	55,000	114	122	136	161

DATA ESTIMATED 4-1-56

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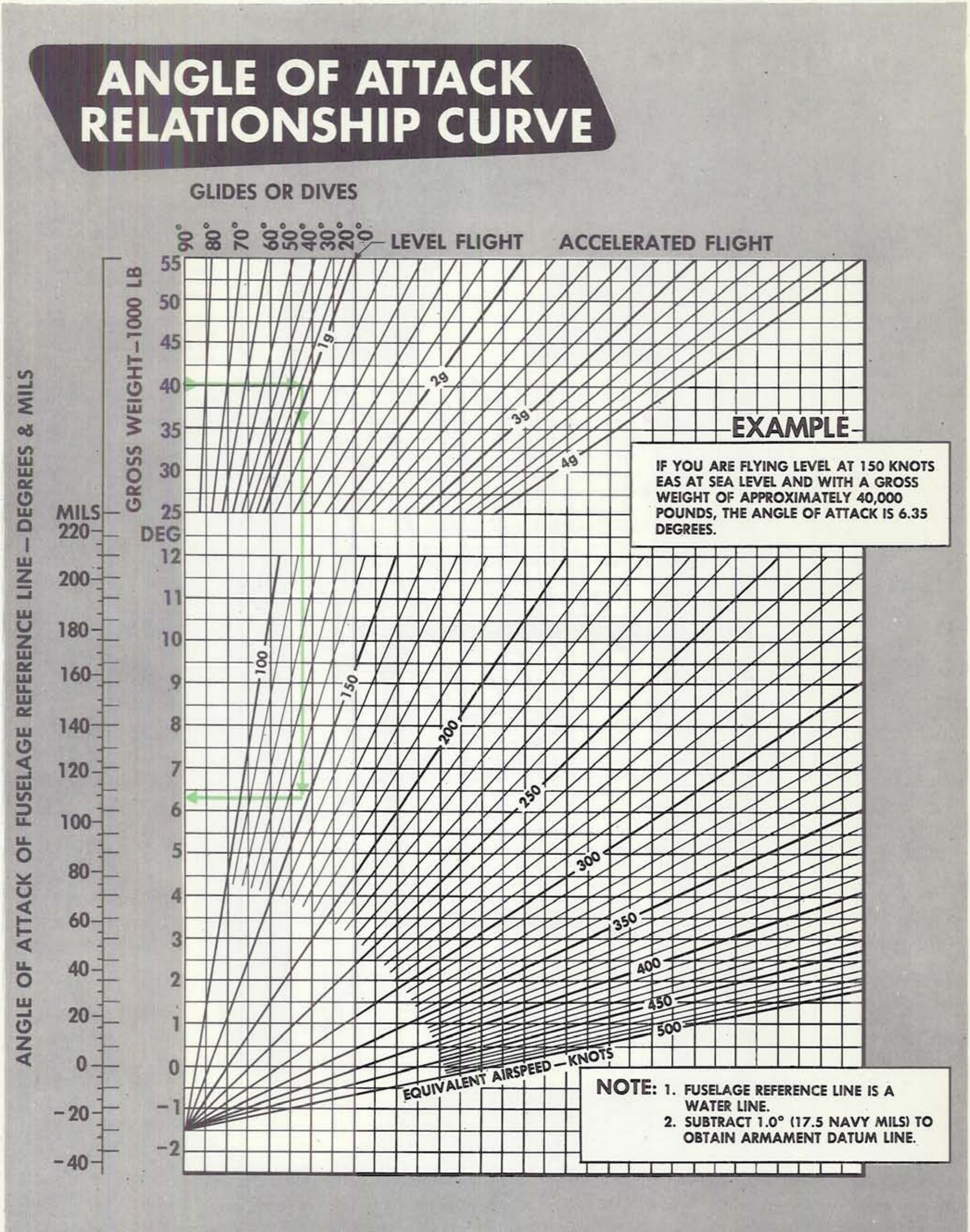
Figure 6–2



ANGLE OF ATTACK RELATIONSHIP CURVE
GLIDES OR DIVES
90° 80° 70° 60° 50° 40° 30° 20° 0°
LEVEL FLIGHT
ACCELERATED FLIGHT
GROSS WEIGHT–1000 LB
55 50 45 40 35 30 25
1g
2g
3g
4g
EXAMPLE
IF YOU ARE FLYING LEVEL AT 150 KNOTS EAS AT SEA LEVEL AND WITH A GROSS WEIGHT OF APPROXIMATELY 40,000 POUNDS, THE ANGLE OF ATTACK IS 6.35 DEGREES.
ANGLE OF ATTACK OF FUSELAGE REFERENCE LINE – DEGREES & MILS
MILS
220 200 180 160 140 120 100 80 60 40 20 0 -20 -40
DEG
12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2
100
150
200
250
300
350
400
450
500
EQUIVALENT AIRSPEED – KNOTS
NOTE: 1. FUSELAGE REFERENCE LINE IS A WATER LINE.
2. SUBTRACT 1.0° (17.5 NAVY MILS) TO OBTAIN ARMAMENT DATUM LINE.
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Figure 6-3

DIVE RECOVERY

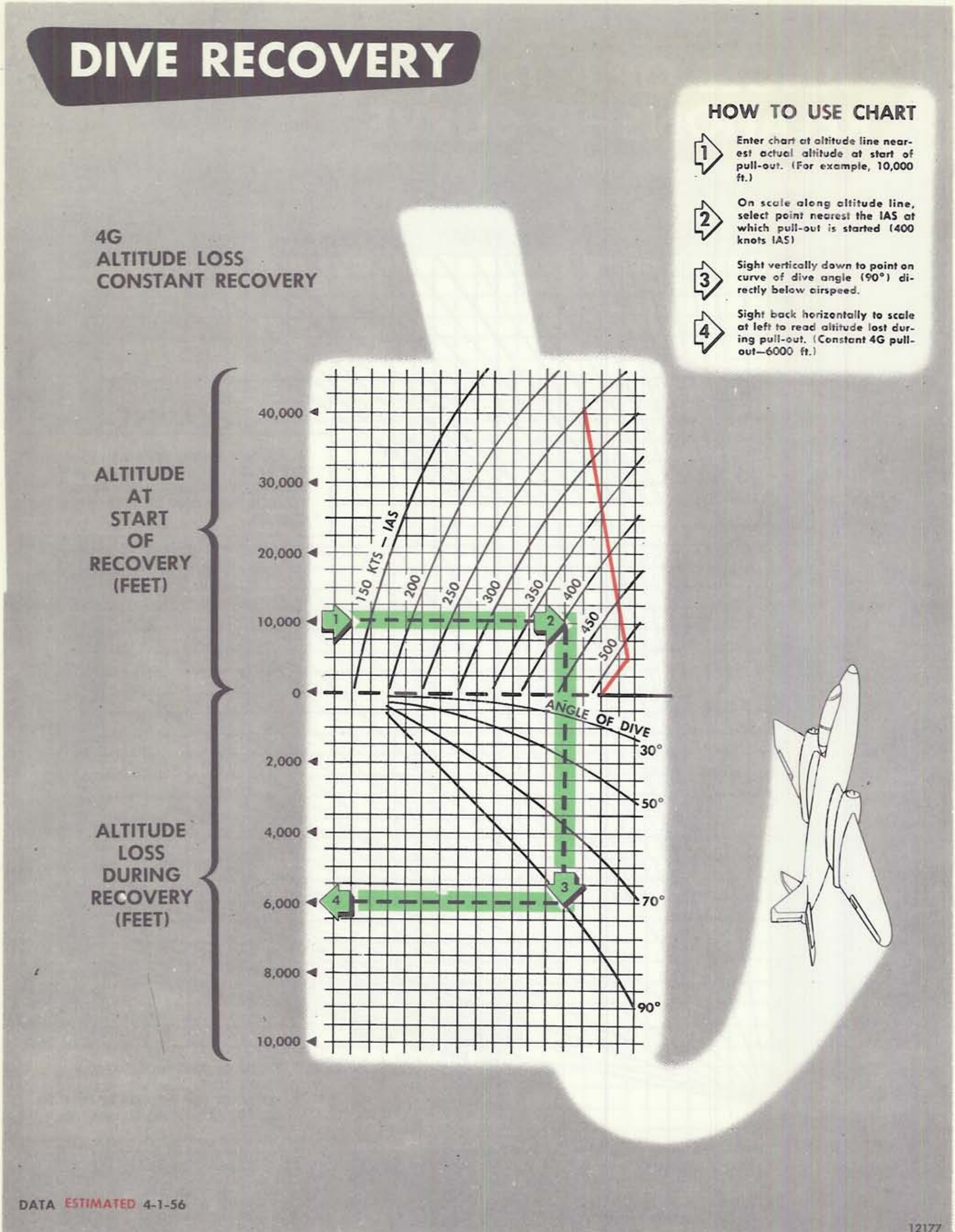

Figure 6–4 (Sheet 1 of 2)

DIVE RECOVERY

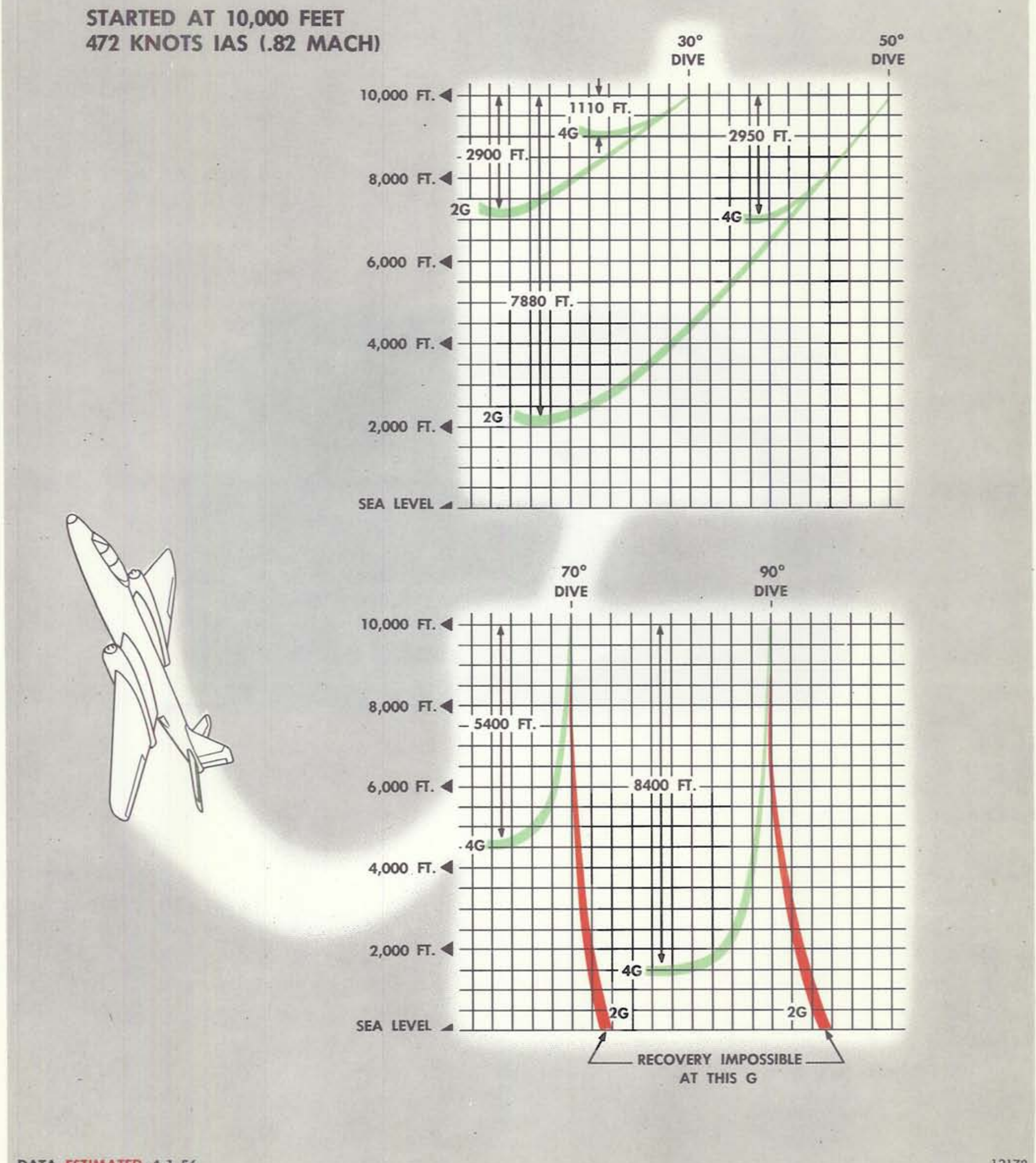

Figure 6-4 (Sheet 2 of 2)

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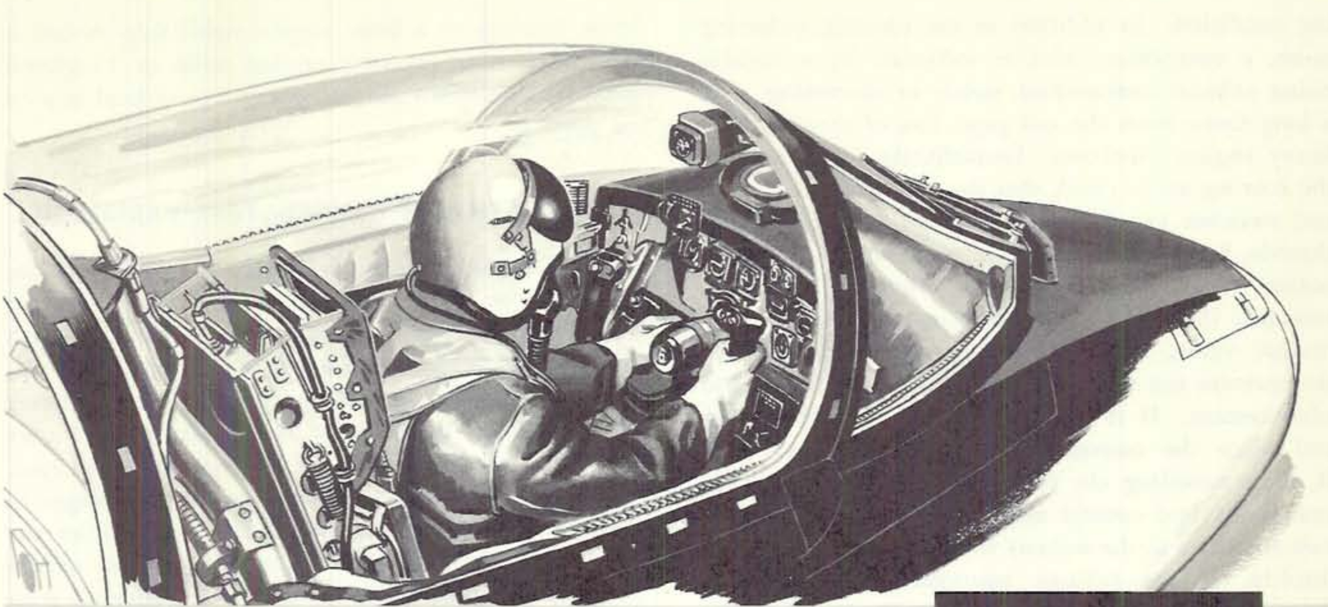

Systems Operation

Section VII

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ENGINE.

ENGINE ACCELERATION.

The maximum permissible exhaust gas temperature during an acceleration appears in Section V under ENGINE LIMITATIONS. If any limitations are exceeded during acceleration, retard the throttle until the temperature drops below the steady-state limit. Then accelerate the engine slowly by advancing the throttle gradually so that you do not exceed the acceleration temperature limit.

COMPRESSOR STALL.

The possibility of compressor stall is practically eliminated when the normal engine fuel control system is in operation. Compressor stall may occur after any rapid advancement of the throttle if either of the following conditions prevails: a malfunction in the normal engine fuel control system, or the emergency fuel control system being in operation. If the emergency fuel control system is in operation, rapid throttle advancements inject more fuel into the combustion chamber than the engine can utilize for acceleration at the existing rpm. As this additional fuel burns, the combustion pressures increase. Because of these increases in pressure, there is a corresponding increase in the pressure against the compressor discharge air. This increase of compressor discharge air pressure results in a breakdown of the airflow through the last stages of the compressor. This condition is known as compressor stall. As a result of this stall, the mass airflow through the compressor is reduced and causes a reduction in airflow through the turbine, thereby decreasing the energy available to the turbine wheel. If the engine is allowed to continue operating in this stalled condition, the temperature of the burning gases increases until engine failure occurs as a result of damage to the turbine. Compressor stall is accompanied by a roaring, pulsating noise and may occur before any engine instrument reflects the existing condition. In addition to the roaring, pulsating noise, a compressor stall is indicated by a rapidly rising exhaust temperature, steady or decreasing rpm, a long flame from the tail pipe, loss of thrust, and a heavy engine vibration. Immediately upon hearing the roaring noise, check that the emergency fuel control switches are OFF. If they are OFF retard the throttle, because there may be malfunctioning of the normal fuel control system. If, after the throttle is retarded, the exhaust gas temperatures stabilize at a normal value, readvance the throttle. The exhaust temperature rise should be normal during the throttle advancement. If it is not, retard the throttle again and place the emergency fuel control switch ON. If, after retarding the throttle and switching to the emergency fuel control system, the exhaust temperature stabilizes at the normal value, slowly advance the throttle. If the exhaust temperature continues to drop after retarding the throttle, you have a flame-out and should try an air start.

FLAME-OUT.

A flame-out is exactly what the name implies and can occur during acceleration or deceleration of the engine. Acceleration flame-out, like a compressor stall, results when more fuel is injected into the combustion chamber than the engine can utilize for acceleration at the existing rpm. The difference is that the mixture which is injected into the combustion chamber is so rich that it cannot burn and it extinguishes the flame. Flame-out can also occur during rapid engine decelerations when the amount of fuel injected into the combustion chamber may be too lean to sustain combustion at the existing rpm. Flame-out is indicated by a loss of thrust, a drop in exhaust temperature, and possibly by a loud noise similar to engine torching. If flame-out occurs, place the throttles in OFF and try an air start.

ENGINE NOISE AND ROUGHNESS.

In flight, any unusual noise or roughness that can be attributed to the engine and cannot be eliminated by variations in engine speed or altitude indicates mechanical failure. Cycle all hydraulically operated equipment to determine whether there is chatter in the hydraulic system. Placing the gun compressor circuit breaker in OFF eliminates any noise caused by gun compressor vibration. If incipient failure of the main bearing or a loose engine stabilizing mount is indicated or if excessive engine noise or roughness persists, shut down the faulty engine and land as soon as possible.

ENGINE EXHAUST TEMPERATURE VARIATION.

Turbo-jet engines equipped with fixed-area exhaust nozzles have no means of direct control of exhaust temperature. Therefore, you must be familiar with certain engine characteristics to obtain maximum airplane performance. This airplane has a fixed-area engine-exhaust nozzle. The only direct control over exhaust temperature is the adjustment of engine rpm. The exhaust temperature will vary with changes in the temperature and density of the engine inlet air, as well as with changing thermal conditions within the engine. Generally, an increase in outside air temperature or an increase in altitude causes an increase in the exhaust temperature, while an increase in airspeed decreases the exhaust temperature. Since all three factors can change singly or together, their effect on exhaust temperature is not consistent for any given rpm. You can expect the exhaust temperature to be relatively high at 100% rpm when the airplane is not moving, but as the airspeed increases during a take-off run, the exhaust temperature will drop well below the maximum operating limit. Since take-offs are made with unstabilized engines, the exhaust temperature remains below the maximum limit until it stabilizes at steady-state operation. If the exhaust temperature rises above its maximum limitation after the engine has stabilized, retard the throttle to bring the temperature down to normal.

SMOKE FROM TURBINES DURING SHUTDOWN.

During engine shutdown, fuel may accumulate in the turbine housing where heat from the turbine section may cause it to boil. This fuel may remain even though drains are provided. The presence of this residual fuel in the engine is indicated by the emission of fuel vapor or smoke from the tailpipe or the intake duct, depending on the ground wind condition. Boiling fuel, which is indicated by white fuel vapor, is not injurious to the engine but does create a hazard to personnel. The vapor may ignite with explosive violence if allowed to accumulate. The appearance of black smoke from the tailpipe indicates that fuel is burning. Extinguish the fire with a CO_2 extinguisher or serious engine damage may result.

WARNING

An accumulation of fuel in the tailpipe may explode with serious injury to personnel. All personnel must keep clear of the tailpipe for at least three minutes after engine shut-down and must keep away at all times when fuel vapor or smoke issues from the engine.

FUEL MANAGEMENT.

The No. 1 fuselage tank is the main service tank. The normal fuel-management procedure consists of transferring fuel from all other tanks to the No. 1 fuselage tank. Since the fuel system is controlled manually, the pilot must constantly check the fuel quantity. The change in weight distribution due to fuel consumption is the most important factor affecting the center of gravity. The consumption of all fuel from the No. 2 fuselage tank, before fuel is drawn from the other tanks, eliminates the center-of-gravity problem.

NORMAL FUEL MANAGEMENT PROCEDURE.

To transfer fuel to the No. 1 fuselage tank:

1. Align the No. 2 fuselage tank selector switch to allow fuel to flow to the No. 1 fuselage tank.
2. Allow the No. 2 fuselage tank to empty and turn off the No. 2 fuselage tank selector switch.
3. For airplanes using a ferry tank, place the ferry tank pump switch in the PUMP position. When the ferry tank empties (light indication), return the switch to the OFF position.
4. Align the tip-tank–wing-tank selector switches to allow fuel to flow from the tip tanks to the No. 1 fuselage tank and allow the tip tanks to empty.
5. Align the tip tank-wing selector switches to allow fuel to flow from the wing tanks to the No. 1 fuselage tank. After emptying the wing tanks, rotate the tip-tank–wing-tank selector switches to OFF.
6. Use the fuel in the No. 1 fuselage tank for the remainder of the mission.

Note

To consume all fuel in the tanks and to compensate for any asymmetrical fuel feeding from the wing and tip tanks, delay switching tanks for a few minutes after noting empty tank indications (indicator lights or quantity gage). Fuel in the No. 1 fuselage tank maintains engine operation for this period.

ALTERNATE FUEL MANAGEMENT PROCEDURE.

During operations using the NORMAL FUEL MANAGEMENT PROCEDURE, approximately 70 gallons of fuel siphon out of the wing tanks through the fuel vents during take-off and climb. To avoid loss of this fuel, use the alternate procedure for fuel management. For starting, taxiing, take-off, and climb:

1. Align the tip-tank–wing-tank selector switches to allow fuel to flow from the wing tanks to the No. 1 fuselage tank.
2. After ten minutes of flying, turn the tip-tank–wing-tank selector switches OFF and follow the NORMAL FUEL MANAGEMENT PROCEDURE.

EMERGENCY FUEL MANAGEMENT.

Under emergency conditions, fuel may be transferred from the No. 2 fuselage tank, the tip tanks, or the wing tanks directly to the engines by placing the desired tank knobs in the flow position, placing the fuel transfer valve knob in the flow-to-engines position.

When fuel is transferred from the No. 2 fuselage tank, the tip tanks, or the wing tanks directly to the engines, closely observe the quantity of fuel remaining in the tanks selected (light indication or fuel quantity indicator) to avoid a flame-out when the tanks are empty.

The maximum rate of fuel consumption for both engines at sea level with standard day temperature and both engines operating at 100% rpm is 17,000 pounds per hour. The rate of transfer of fuel from the No. 2 fuselage tank or the wing tanks is 18,000 to 19,000 pounds per hour which is sufficient for normal engine operation when bypassing the No. 1 fuselage tank. However, the rate of transfer of fuel from both tip tanks is approximately 7,000 pounds per hour, which will not sustain normal engine operation under all conditions. If the No. 1 fuselage tank is bypassed because the boost pumps in that tank are inoperative above 25,000 feet, fuel flow from the tip tanks will sustain normal engine operation with the aid of the fuel that is normally drawn from the No. 1 fuselage tank by the engine-driven fuel pump without the No. 1 fuselage tank boost pumps operating. (With respect to this emergency caused by inoperative boost pumps, it is assumed that the tip tank pressurization system is operating normally.) If no fuel is available from the No. 1 fuselage tank, fuel flow from the tip tanks sustain engine operation only at high altitudes where fuel consumption is at a minimum. In this condition, fuel flow from the wing tanks selected immediately after the tip tank low-level indicator illuminates to avoid a flame-out when the tip tank fuel supply is exhausted.

AUTOMATICALLY OPENING SEAT BELT AND PARACHUTE.

The purpose of the automatically opening seat belt and parachute is to extend the maximum and minimum altitudes for successful escape with the ejection seat. In a low-altitude ejection, the use of the automatic belt reduces the time required for separation from the seat and the opening of an automatically opening parachute. In a high-altitude ejection, using the automatic belt and parachute avoids the opening of the parachute at an altitude where the lack of oxygen would reduce the possibility of a safe descent. Also, the automatic belt retains the occupant in the seat for a sufficient length of time (2.5 seconds) to take advantage of the slower rate of deceleration caused by the combined weight of the seat and occupant.

WARNING

Never release the belt manually prior to ejection, since this causes immediate separation of the seat and occupant. At high speed without the protection of the seat, the parachute could open inadvertently; and the opening shock of the parachute may cause fatal injuries. If the belt fails to open automatically after ejection, the occupant can manually release the belt and under these circumstances, the occupant must open the parachute manually.

There may be a tendency for the user to distrust the automatic equipment; however, the automatic belt and parachute have been tested thoroughly and are completely reliable. The best human reaction is slower than the operation of the automatic belt. Also, the user may not be conscious after an actual emergency ejection. It is possible to release the belt manually anytime during or after ejection. Likewise, the user may open the parachute manually anytime before the operation of the aneroid-release device.

Section VIII
Crew Duties

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INTRODUCTION.

Each crew member has primary duties and additional duties. The primary duties are explained by the crew member's title. The additional duties are those which are performed to insure proper operation of the airplane in the air and on the ground. It is the responsibility of each crew member to be familiar with each item of equipment and to be able to inspect it thoroughly for any irregularities. Do not let this inspection become so routine that you check it off as completed without doing a thorough job. Remember, two lives and the successful completion of your flight are at stake.

INSTRUCTOR-PILOT'S DUTIES.

The primary duty of the instructor-pilot is the transitional training of his student, the pilot. In addition, he performs the checks normally performed by the navigator. He is responsible for the airplane and the safety of its crew at all times and instructs or directs the pilot as necessary. He issues all instructions governing flight and ground operations and, at his discretion, may take over control of the airplane at any time.

PILOT BRIEFING.

The instructor-pilot briefs the pilot on all details of the training flight as prescribed by the group commander. He should be sure that the pilot is aware of every detail of the flight, and he should be extremely cautious in establishing the procedures to be used to let the pilot know when he is in control of the airplane and what to do in case of emergency. All emergency procedures should be covered in detail before entering the airplane.

BEFORE EXTERIOR INSPECTION.

Enter the airplane and perform the following inspection at the aft crew station.

Seat safety pin	Installed in right armrest
Emergency canopy release handle	In
Oxygen supply lever	OFF
Landing gear emergency down handle	In

INTERIOR CHECK.

Seat belt, harness, oxygen hose and radio cord	Adjusted and connected
Seat and rudder pedals	Adjusted
Inertia reel	Unlocked
Interphone function selector switch	HOT-MIC
Interphone audio-mixing switches	As necessary
Oxygen System	

Note: the values in the original layout appear as follows:

Seat belt, harness, oxygen hose and radio cord	Adjusted and
Seat and rudder pedals	connected
Inertia reel	Adjusted
Interphone function selector switch	Unlocked
Interphone audio-mixing switches	HOT-MIC
Oxygen System	As necessary

a. Place the diluter lever in NORMAL OXYGEN and blow gently into the oxygen regulator hose. (A resistance to blowing indicates satisfactory operation of the demand diaphragm.)

b. Place the diluter lever in 100% OXYGEN and blow gently into the oxygen regulator hose. (A resistance to blowing indicates satisfactory operation of the demand diaphragm and diluter air valve.)

c. Don the mask and connect the mask to the regulator hose. (Breathe normally and note operation of the blinker dial.)

d. Hold breath and place the EMERGENCY pressure lever to the right or left. (A positive pressure felt within the mask indicates proper emergency oxygen flow.)

e. Depress the EMERGENCY pressure lever while holding the breath to test the mask for leakage. (A properly fitted mask will retain the EMERGENCY oxygen pressure until normal breathing is resumed.)

f. Mask hose fittings are properly seated and secure.

g. The mask hose attachment to the parachute is as required.

AIC filter switch	As desired
Circuit breakers	In
Clock	Set
Altimeter	Set to field elevation
Spotlight switch	As desired
Radio compass function selector switch	OFF
Lighting control switches	As desired
Fire extinguisher	Secure
C-4A Light	Secure and off
Normal trim switch	Check for freedom of movement and center

BEFORE TAXIING.

Indicator and warning lights	Press to test
Attitude indicator	Erect
Radio compass	Obtain control and check for proper operation
Seat safety pin	Remove and stow

DURING FLIGHT.

The instructor-pilot carries out his primary duties and operates the navigational equipment at his station. The operating procedures for the navigation equipment are in Section IV.

AFTER LANDING.

Radio compass	OFF
C-4A light	OFF
Lighting control switches	OFF

BEFORE LEAVING AIRPLANE.

Seat safety pin	Install
Oxygen supply lever	OFF

PILOT'S DUTIES.

The pilot's duties are those explained throughout the Flight Handbook in the operating instructions. The B-57C makes it possible for the pilot to become proficient in the performance of these duties under the guidance of an instructor-pilot.

All-Weather Operation

Section IX

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GENERAL ALL-WEATHER INFORMATION.

Flying the B-57C airplane in instrument weather conditions requires instrument proficiency and thorough preflight planning. In planning for instrument flight, remember to consider the fuel requirements for completing an instrument letdown and approach. This additional requirement reduces maximum range and endurance accordingly. The airplane has good stability characteristics and flight handling qualities for weather flying. The limitations on the aircraft result primarily from the lack of navigational equipment and anti-icing provisions. Except for some repetition necessary for emphasis or continuity of thought, this section contains only those procedures that differ from, or are in addition to, the normal operating instructions covered in Section II.

INSTRUMENT FLIGHT PROCEDURES.

ON ENTERING THE AIRCRAFT.

1. External power—ON.
2. Inverters—ON.
3. APX-6A IFF Master Switch—STANDBY, if use is anticipated.
4. Radio compass—check all positions. Set to first enroute station frequency or to local approach radio fix station.
5. UHF radio—check all channels pertinent to instrument flight.
6. Pitot heater—check operation (with crew chief).
7. Delay engine start until immediate take-off is assured. Conserve fuel by performing as many operations as possible before starting engine, including ARTC approval and clearance.

TAXIING.

1. Turn-and-slip indicator—check operation during taxi turns.
2. Directional indicator—check for proper operation.

BEFORE TAKE-OFF.

1. Attitude indicator—check operation and adjust the miniature airplane to align with the horizon bar.
2. Set the runway heading to the top of the directional indicator.
3. Pitot heater—ON as required.

TAKE-OFF AND INITIAL CLIMB PROCEDURES.

1. Maintain direction with brakes until the rudder becomes effective at approximately 60 knots.
2. At approximately 110 knots during take-off roll, raise the nose to position the miniature airplane one bar width above the horizon bar and allow the airplane to fly off at 130 to 140 knots IAS.
3. Gear UP, when the upward trend of both the altimeter and the vertical velocity indicator show that the aircraft is definitely climbing.

CAUTION

Maintain airspeed below 200 knots until the gear locks up (approximately 7 to 10 seconds).

4. Maintain take-off attitude until the airplane accelerates to its best climb speed, and anticipate a rate of climb of approximately 4,000 feet per minute at 96 percent rpm.

TURNS.

To keep control forces down and reduce your workload, limit the maximum angle of bank in climbing and level turns to 30 degrees. Steep turns also lead to overcontrolling the airplane in instrument procedures.

COMMUNICATION AND NAVIGATION EQUIPMENT.

The AN/ARN-6 radio compass is susceptible to precipitation static and false indications in the vicinity of a thunderstorm. Switching to the loop position and rotating the needle 90° from the station bearing and/or reducing IAS and/or changing altitude usually improves the reception.

DESCENTS.

The optimum power setting for fuel economy descent is IDLE. The recommended descent airspeed is 250 knots IAS or limit Mach, whichever is lower, with landing gear and flaps retracted and dive brakes extended. Increasing the descent airspeed for a higher rate of descent through icing layers slightly reduces the handling characteristics. Decreasing the descent airspeed for more comfortable turbulance penetration results in a small penalty in fuel consumption. Normally, thirty degrees of bank is the limit for high speed descending turns.

INSTRUMENT LOITERING AND HOLDING.

For best endurance airspeeds, refer to the performance charts in Appendix I. When making turns during instrument loiter, add power as necessary to hold the recommended IAS.

INSTRUMENT APPROACHES.

GENERAL.

The stability and handling characteristics for instrument flight are excellent in all configurations; however, the dive brakes are not effective at low airspeeds and their use is not recommended for approach patterns. The use of wing flaps is not recommended for instrument approaches other than GCA finals, due to the fuel penalty and buffeting encountered.

Visibility in moderate precipitation is good. Letdowns and approaches on a single engine can be made satisfactorily. Normal penetrations can be made from initial penetration altitude and go-around characteristics are satisfactory. For minimum landing roll, lower the nose and brake immediately. See figure 9-6 for landing roll distances.

RADAR RECOVERY. (See figure 9-2.)

The handling characteristics and stability in instrument conditions facilitate satisfactory radar recovery procedures. Radar control for the letdown and the turn on to final approach (GCA) offers maximum economy of fuel and time.

CAUTION

Radar recovery in precipitation or heavy clouds is not effective without an operational AN/APX-6A (IFF).

RADIO RANGE AND JET PENETRATION.

(See figures 9-3, 9-4.)

If icing is anticipated, retract the dive brakes to prevent them from icing. Also, when descending through icing layers, increase penetration speed to 350 knots but within the limit Mach to decrease engine intake duct icing. If icing builds up while the dive brakes are extended, leave them extended and descent at 250 knots or limit Mach, whichever is lower. For a penetration turn, use the 90–270° turn method, unless another method is specified.

CAUTION

Actual altitude during high rate descents may be as much as 1,000 feet lower than indicated altitude because of altimeter lag.

MISSED APPROACH PROCEDURE.

(See figures 9-3, 9-5.)

Acceleration characteristics of the aircraft are excellent. The missed approach procedure is similar to the go-around procedure outlined in Section II and presents little difficulty:

1. Advance throttles to FULL, level off and check for acceleration. Be alert for asymmetrical power conditions resulting from uneven engine acceleration.
2. Retract flaps below 170 knots IAS and landing gear below 200 knots IAS.
3. Executive missed-approach for the particular field.
4. GO-around on a single engine can be made without loss of altitude if the airspeed is at or above 155 knots IAS. At slower speeds, accelerate to at least 155 knots before attempting to hold altitude. From 135 knots IAS, you will lose approximately 400 feet of altitude in accelerating to 155 knots. Advance the throttle to at least 90 percent rpm as soon as possible and retract the gear and flaps. As rudder control becomes more effective with increasing airspeed, advance the throttles to FULL for climb.

WARNING

When making a single-engine approach at less than 500 feet with gear and flaps extended, you are committed to land. Under these conditions, do not attempt a missed approach.

GROUND CONTROLLED APPROACH (GCA).

(See figures 9-5, 9-6.)

The airplane has good handling qualities during ground control approaches. However, keep in mind that during heavy precipitation, the GCA controller may have some difficulty in keeping the airplane on the scope. Try to anticipate this condition.

ICE, SNOW, AND RAIN.

Normally, the heaviest icing takes place in clouds with strong vertical currents. Icing conditions in stratus clouds are generally light to moderate; but heavy icing conditions may occur in this type of cloud. Prolonged flights through moderate icing conditions can build up as much as a short flight through heavy icing conditions. You can expect icing when the temperature is between approximately −10°C and 5°C if fog is present or the dew point is within 4°C of the ambient temperature, conditions exist under which jet engine icing can occur without wing icing. The heaviest type of ice formation generally occurs at about −5°C. There is no anti-icing equipment on this airplane except for the windshield. Therefore, if you can avoid flight through icing conditions, make every effort to do so. Ice can build up on the engine's inlet guide vanes when the airplane is flown through areas where icing conditions prevail and may occur when no evidence of ice can be seen on the airplane. Icing on the guide vanes restricts the flow of inlet air thus causing a loss of thrust and a rapid rise in exhaust gas temperatures. The fuel control system attempts to control the loss in engine rpm by adding more fuel to the engine, thereby making the condition worse. Under severe conditions, engine failure can occur in four minutes or less. Therefore, to avoid engine icing, do this:

1. Avoid flying into areas where icing conditions may prevail, if at all possible.

2. If the ambient temperature is within the approximate range of 0°C to 5°C and sufficient moisture is present in the atmosphere:
   a. Reduce airspeed, if practicable, to minimize the rate of ice buildup.
   b. Change altitude rapidly by climb or descentling in layer clouds or vary your course as necessary to avoid cloud formations.
   c. Closely observe the exhaust gas temperature and reduce engine rpm as necessary to prevent excessive exhaust gas temperature.

WARNING

Do not attempt to fly when icing conditions are forecast at the pattern level of your proposed destination.

FLIGHT IN TURBULENCE AND THUNDERSTORMS.

BEFORE TAKE-OFF.

1. Make a complete analysis of the existing and forecast weather conditions to determine the thunderstorm areas and prepare a flight plan which avoids flight through thunderstorms.
2. Check the proper operation of all flight and engine instruments, navigation equipment, pitot heater, instrument panel lights, and the defogging systems before undertaking any instrument flights and before attempting to fly through a thunderstorm area. (See figure 9-1.)

APPROACHING THE STORM.

Power settings and the attitude of the airplane are the keys to the proper flight technique in turbulent air. The power settings and airplane attitude required for desired penetration airspeed should be established before entering the storm. If these power settings and attitude are maintained throughout the storm, the result will be a constant airspeed regardless of any false readings of the airspeed indicator.

The most turbulent air in a thunderstorm is generally in altitudes between 10,000 and 20,000 feet. The least turbulence is usually above 30,000 feet or below 10,000 feet, and the recommended penetration procedure is above or below these altitudes. Icing conditions are very common near the top of these storms. See ICE, SNOW, AND RAIN in this section. If the storm cannot be seen, you can determine its approximate nearness by radio crash static. Use the following procedure to prepare the airplane for entry into the turbulent area:

1. Adjust the throttles as necessary to obtain an airspeed derived from the Extremely Gusty Air Chart.
2. Turn the pitot heat switch on.
3. Trim the airplane.
4. Check the gyro instruments.
5. Lock the seat belt and adjust the shoulder harness (both stations) .
6. Turn off any radio equipment which static has rendered useless (both stations) .
7. Turn on the thunderstorm lights.

Note

Do not lower the landing gear or flaps. They merely decrease the aerodynamic efficiency of the airplane.

IN THE STORM.

To maintain safe flight after entering the storm, follow this procedure:

1. Expect turbulence, precipitation, and lightning; do not allow them to cause undue concern.
2. Maintain power settings and attitudes throughout the storm. If they are held constant, airspeed will remain constant regardless of the reading of the airspeed indicator.
3. Devote all attention to flying the airplane.
4. Concentrate principally on holding a level attitude by using the attitude indicator.
5. Maintain the original heading. Do not make any turns unless it is absolutely necessary.
6. Use as little elevator control as possible to maintain attitude in order to minimize stress on the airplane.

Note

The altimeter may be unreliable in thunderstorms because of differential barometric pressures. Therefore, make allowance for this error when determining the minimum safe altitude. It may amount to several thousand feet. The vertical velocity indicator is of little value during periods of high turbulence, and should not be used as a source of attitude indication.

NIGHT FLYING.

Night flying imposes no particular problem except that the landing light must supplement the taxi lights when taxiing in dark areas.

CAUTION

During ground operation, use the landing lights intermittently and limit the continuous use to two minutes.

COLD-WEATHER PROCEDURES.

Most cold weather difficulties will be encountered on the ground. The following instructions are supplementary to the normal procedures in Section II. Follow them when operating in regions of extremely cold weather.

Icing conditions in flight will not be covered here as they are discussed under ICE, SNOW, and RAIN in this section.

BEFORE ENTERING THE AIRPLANE.

1. Check that the pressurized cabin has been preheated if the temperature is below —18°C.
2. Inspect the fuel tank vents and the pitot tube. Remove any ice which may be present.
3. Check the entire airframe surface and the landing gear of the airplane for freedom from frost, snow, or ice. Brush off light snow or frost, and evaporate any ice which may have formed by using a direct flow of hot air from a portable heater.

CAUTION

- ***All ice and snow must be removed from the airplane.***
- ***Chipping or scraping ice may damage the airplane.***

4. Check all visible hydraulic lines and fittings for signs of leakage.

ON ENTERING THE AIRPLANE.

1. Carefully check the surface controls and trim devices for proper operation.
2. Operate the surface controls several times to insure that no ice has formed on the hinges.

STARTING ENGINES.

1. Start the engines in a normal manner.
2. If the temperature is —29°C, attempt a normal start. If unsuccessful, make a second starting attempt. Heat from the first starting attempt should allow a satisfactory start. If at all possible, use cartridges which have been stored in a warm place.
3. If the ambient temperature is —40°C or less, use a portable heater to blow hot air into the engine intake duct for 20 to 30 minutes to insure a successful start and to prevent the starter from being damaged if ice has seized the compressor rotor.
4. If there is no oil pressure within 30 seconds after starting, or if the pressure drops after a few minutes of ground operation, shut down the engines and check for clogged oil lines.

Note

During cold weather starts, the oil pressure may temporarily exceed the maximum limits until the oil temperature approaches normal.

WARM-UP AND GROUND TESTS.

1. Inspect all instruments for normal operation.

CAUTION

Do not turn on unneeded electrical equipment until the generators show output.

2. Operate all the hydraulic circuits except the bomb door to check for proper operation.
3. Use cabin heat as desired.

TAXIING.

1. Keep the engines running at a high enough rpm to keep up the generator output while taxiing, because low temperatures decreases the battery output.
2. Increase the normal taxi interval between airplanes and reduce the taxiing speed for approaches to an ice or snow-covered area.

Note

Take extreme care when maneuvering near other aircraft. The blast and heat may blow snow and slush which will freeze on contact.

CAUTION

Do not taxi in deep snow or slush because steering is more difficult. Brakes, landing gear, and flaps are apt to freeze after take-off. Use extreme caution when taxiing on ice-covered taxi strips or runways because excessive speeds or cross-winds can start a skid, and brakes are ineffective on ice.

Note

Taxi time on snow and ice is longer than under normal conditions; therefore, plan the shortest route to take-off to reduce fuel consumption.

BEFORE TAKE-OFF.

CAUTION

Make sure that all snow is removed from the runway or is firmly packed. If snow has been removed from the runway, be sure that the banks are piled far enough from the runway to permit a safe take-off.

WARNING

Do not attempt a take-off with a badly frosted canopy or with snow, ice, or frost on the wings or control surface.

TAKE-OFF.

1. If precipitation is present or if icing conditions are expected during or immediately following take-off, turn the pitot heat switch ON.
2. Apply the brakes and advance the throttles to take-off power. If the airplane begins to slide before take-off power is reached, immediately release the brakes and commence the take-off.

Note

Continue the engine check during the early part of the take-off run. If any portion of the engine check is not satisfactory, retard the throttles and bring the airplane to a normal stop.

AFTER TAKE-OFF.

1. After take-off from a snow or slush-covered field, operate the flaps and the landing gear several times to prevent their freezing in the up position.
2. Watch closely for icing on critical areas, and if ice begins to form, attempt flight in a more suitable area, if possible.
3. Adjust the cabin temperature selector switch to give the desired cabin temperature.
4. Under certain conditions, fog may form in the cabin and restrict visibility. Should this happen, turn the cabin temperature control rheostat to WARM until the fog clears.

DESCENT.

Note

At least 30 minutes before a descent, pull the defogging blower knob out (ON) and place the defogging hot air switch in DEFOG HOT AIR to avoid frost or icing on the canopy during descent.

LANDING.

The landing pattern is similar to the normal landing, but because of thrust augmentation caused by extremely low temperatures, the approach must be made with a flatter glide than usual.

STOPPING ENGINES.

The engines are stopped in the normal manner.

BEFORE LEAVING AIRPLANE.

1. Have the chocks in place so that the parking brake can be released. If moisture has entered the brake assembly around the brake shoe, leaving the parking brake released forestalls the possibility of the brakes freezing.
2. Be sure that the airplane is serviced with fuel and oil and that the sumps are drained before the condensates reach the freezing point.
3. Have all covers for the engine, pitot tube, and landing gear installed if there is the slightest possibility of drifting snow.
4. If a layover of several days is anticipated, have the battery removed. If the temperature is —7°C, the battery should be removed if a layover of four hours or more is expected.

HOT-WEATHER PROCEDURES.

Successful hot-weather operation requires attention and preparation other than the normal operating instructions covered in Section II.

CAUTION

Metal surfaces exposed to the sun are burning hot to the touch. Wear gloves to prevent burns.

BEFORE ENTERING AIRPLANE.

1. Check tires and shock struts carefully to assure proper inflation. Over-inflation is often encountered during high temperatures.
2. Check that all electrical equipment is completely dry.
3. Check carefully for hydraulic leaks. Heat and moisture can cause valves and packing to swell.

ON ENTERING AIRPLANE.

1. Place the cabin pressure selector switch in RAM for cabin ventilation.
2. If high humidity has caused moisture to form on the instruments and controls, direct a flow of warm air from a portable ground heater, if available, on the instruments and controls to dry them.

BEFORE STARTING ENGINES.

Check the take-off distances for the existing atmospheric conditions by using the charts in Appendix I.

STARTING ENGINES.

Start the engines in the normal manner.

Note

The engines accelerate to idle rpm much more slowly on a hot day than on a normal or cold day.

TAXIING.

CAUTION

Use the brakes as little as possible, because high temperatures retard cooling.

TAKE-OFF.

WARNING

Take-off distances in hot weather show a considerable increase over the distance required during normal operation.

CLIMB.

Follow the normal climb pattern for the existing conditions.

Note

When the fuel in the tanks is warm, it is more susceptible to vaporization losses during rapid climbs. To avoid vaporization, hold the rate of climb to the minimum requirement at the mission.

DURING FLIGHT.

Under high temperature conditions, it is necessary to increase rpm to obtain the desired combination of Mach number and altitude for the best range performance.

DESCENT.

Use the normal descent procedure.

LANDING.

Use the normal landing technique, and remember that the ground roll will be longer than usual.

WARNING

During extremely high temperature, true airspeed is much higher than indicated airspeed. Therefore, stall and touchdown speeds are higher.

STOPPING ENGINES.

Stop the engines by using the normal procedures and release the parking brakes to avoid possible damage to the brake assemblies due to excessive heat generated during taxiing.

BEFORE LEAVING AIRPLANE.

1. Have covers for the engine, canopy, and tires installed for protection from the sun.
2. Leave the canopy open for ventilation.
3. Have the fuel and oil tanks serviced.

DESERT PROCEDURES.

Desert operation which presents high temperatures with blowing sand and dust is considerably more difficult than the normal operating procedures which are covered in Section II. Damage can occur to both the airplane and the engines if the extra precautions presented here are not observed.

BEFORE ENTERING AIRPLANE.

1. Check tires and shock struts for proper inflation. Overinflation is encountered often during high temperature conditions.

WARNING

If necessary, position the airplane so that the jet blast will not blow sand toward other airplanes or personnel. Sand blown by the engines can severely damage other airplanes and can also harm personnel.

2. Inspect all control surface hinges for sand and/or excess dust, and, if present, have it removed.
3. Check the shock struts for sand and have it removed if present.
4. Remove all protective covers before entering the airplane.

ON ENTERING AIRPLANE.

1. Check all dials, flight controls, and switches for sand accumulation, and have them cleaned if sand is present.
2. Place the cabin pressure selector switch in RAM for cabin ventilation.

BEFORE STARTING ENGINES.

1. Operate all control surfaces several times to be sure that they move freely and easily.
2. Check take-off distances in Appendix I for the existing conditions.

STARTING ENGINES.

1. Complete as much of the preflight as possible before starting the engines so that ground operation is held to a minimum.
2. Start the engines by using the normal procedure.

Note

The engines will accelerate to idle rpm much more slowly on a hot day than on a cold or normal day.

CAUTION

Get the airplane into the air as soon as possible after starting the engines so that dust and sand are not drawn into the engines.

WARM-UP AND GROUND TESTS.

1. Be sure the airplane is clear of other airplanes and personnel before accelerating the engines.
2. The only warm-up period required is for the exhaust gas temperatures to stabilize.

TAXIING.

1. Use the brakes as little as possible, because high temperatures retard cooling.
2. Keep a sufficient taxi interval between airplanes to prevent blowing sand into other engines.

TAKE-OFF.

Note

Take-off distance increases appreciably in high temperatures.

WARNING

It is necessary to adhere strictly to the suggested take-off and climbing during hot-weather operation, since stalling speeds increase with temperature.

CLIMB.

Follow the normal climb procedures.

Note

Warm fuel is more susceptible to vaporization losses during rapid climbs. To avoid vaporization hold the rate of climb as low as possible.

CAUTION

Avoid flying through dust or sand storms, because grit or dust causes damage to the engines.

Under high temperature conditions, it is necessary to increase rpm to obtain the desired combination of Mach number and altitude for the best range performance.

DESCENT.

Use the normal descent procedures.

LANDING.

WARNING

During extremely high temperature true airspeed is much higher than indicated airspeed. Therefore, stall and touchdown speeds are higher.

Use normal landing technique and remember that the ground roll will be longer than usual.

STOPPING ENGINES.

1. When the airplane is taxied to a parking position, shut down the engines at once.
2. Have the chocks put in place and release the parking brakes as soon as possible, because the brake assemblies may be damaged by the excess heat generated by taxiing.
3. Have the covers for the engine, wheels, pitot tube and canopy installed as soon as practicable.

BEFORE LEAVING AIRPLANE.

1. Check that all covers are installed.
2. Leave the canopy open for ventilation.

Note

In extremely dusty locations where it is necessary to leave the canopy open for ventilation purposes, all equipment in the cabin should be protected with dust covers.

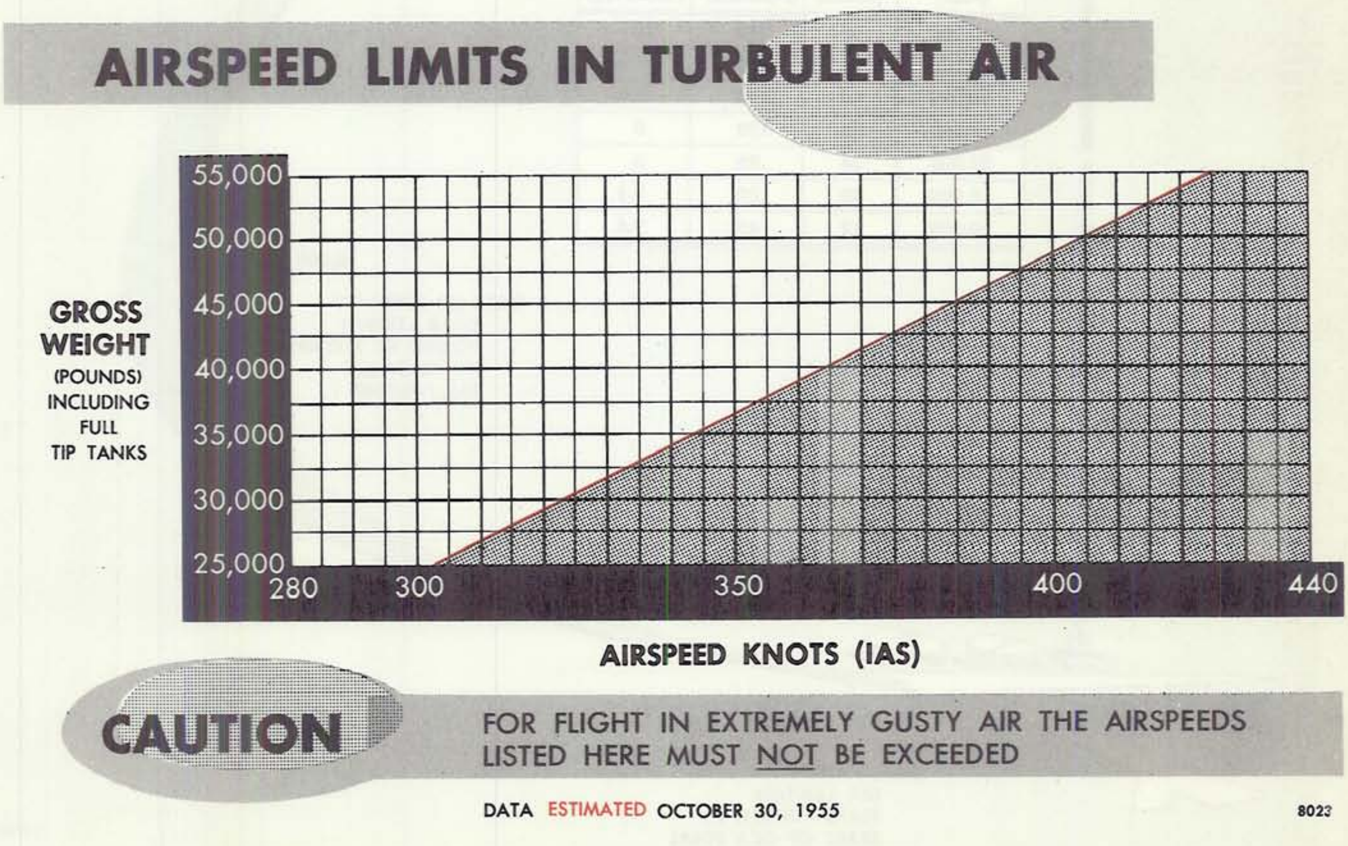
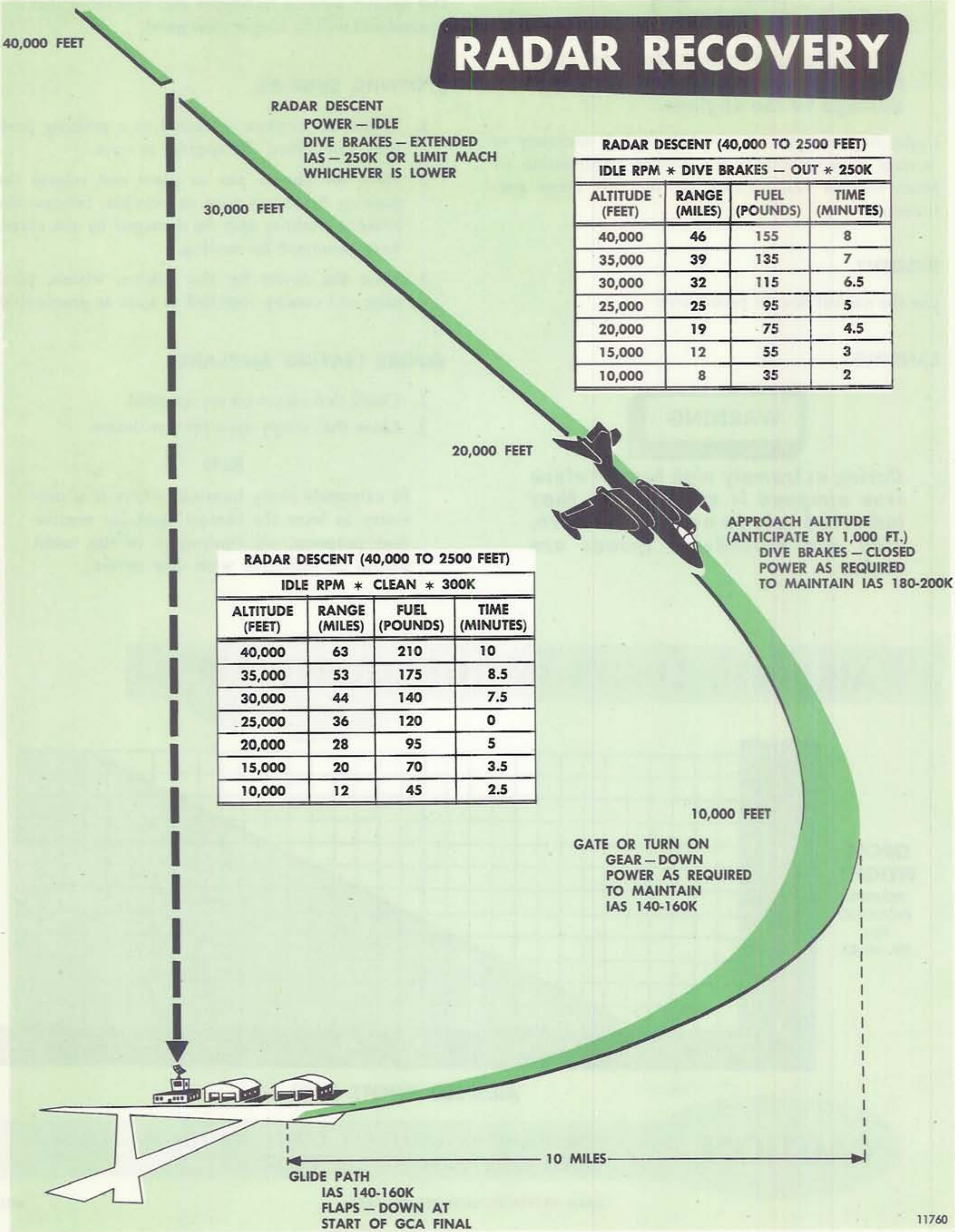


Figure 9-1

RADAR RECOVERY



RADAR DESCENT (40,000 TO 2500 FEET)

IDLE RPM * DIVE BRAKES — OUT * 250K

ALTITUDE (FEET)	RANGE (MILES)	FUEL (POUNDS)	TIME (MINUTES)
40,000	46	155	8
35,000	39	135	7
30,000	32	115	6.5
25,000	25	95	5
20,000	19	75	4.5
15,000	12	55	3
10,000	8	35	2

RADAR DESCENT (40,000 TO 2500 FEET)

IDLE RPM * CLEAN * 300K

ALTITUDE (FEET)	RANGE (MILES)	FUEL (POUNDS)	TIME (MINUTES)
40,000	63	210	10
35,000	53	175	8.5
30,000	44	140	7.5
25,000	36	120	0
20,000	28	95	5
15,000	20	70	3.5
10,000	12	45	2.5

Figure 9-2

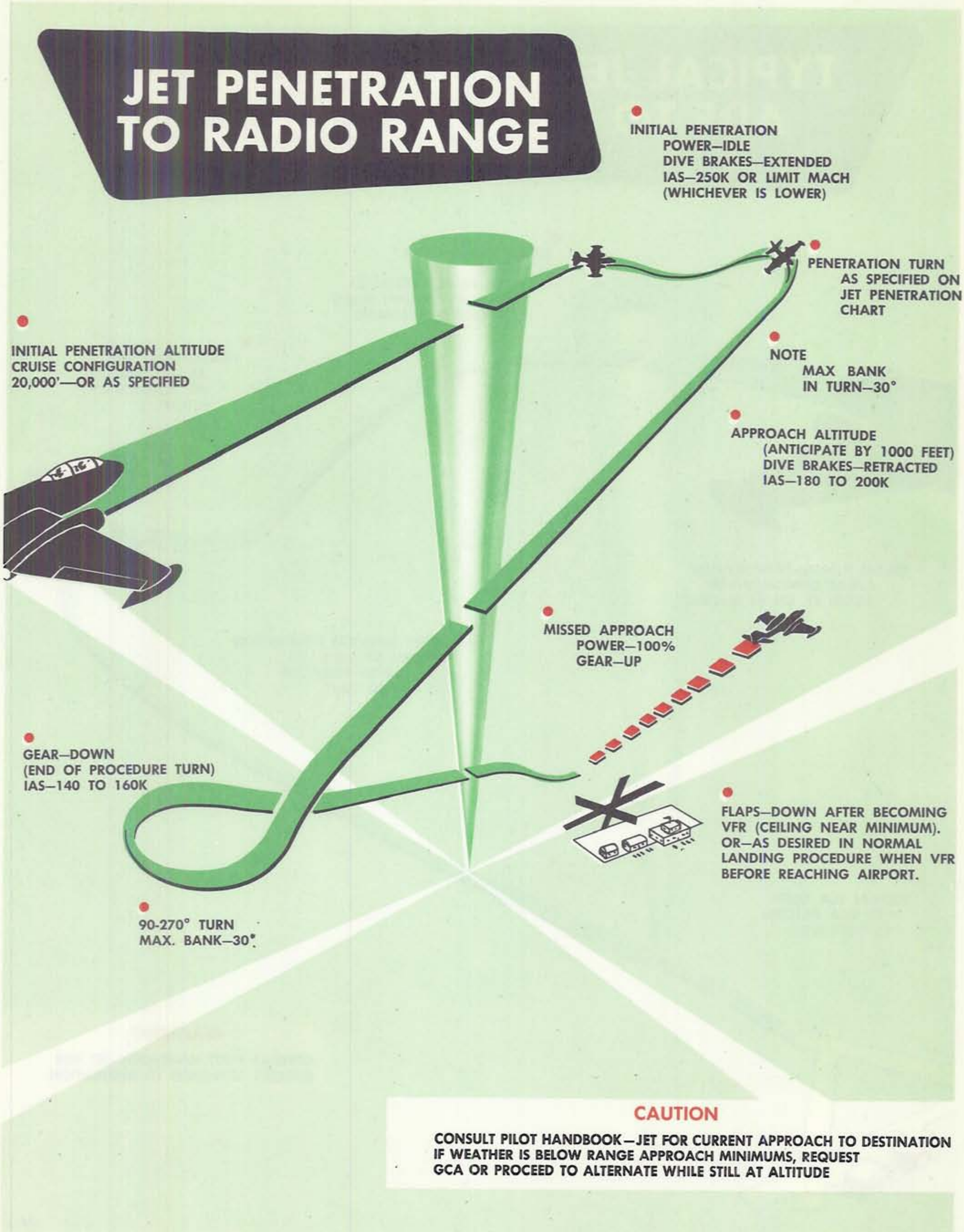

JET PENETRATION TO RADIO RANGE
INITIAL PENETRATION
POWER—IDLE
DIVE BRAKES—EXTENDED
IAS—250K OR LIMIT MACH
(WHICHEVER IS LOWER)
PENETRATION TURN
AS SPECIFIED ON
JET PENETRATION
CHART
INITIAL PENETRATION ALTITUDE
CRUISE CONFIGURATION
20,000'—OR AS SPECIFIED
NOTE
MAX BANK
IN TURN—30°
APPROACH ALTITUDE
(ANTICIPATE BY 1000 FEET)
DIVE BRAKES—RETRACTED
IAS—180 TO 200K
MISSED APPROACH
POWER—100%
GEAR—UP
GEAR—DOWN
(END OF PROCEDURE TURN)
IAS—140 TO 160K
FLAPS—DOWN AFTER BECOMING
VFR (CEILING NEAR MINIMUM).
OR—AS DESIRED IN NORMAL
LANDING PROCEDURE WHEN VFR
BEFORE REACHING AIRPORT.
90-270° TURN
MAX. BANK—30°
CAUTION
CONSULT PILOT HANDBOOK—JET FOR CURRENT APPROACH TO DESTINATION
IF WEATHER IS BELOW RANGE APPROACH MINIMUMS, REQUEST
GCA OR PROCEED TO ALTERNATE WHILE STILL AT ALTITUDE
11761

Figure 9-3


TYPICAL JET PENETRATION
ADF TO GCA PATTERN
INITIAL PENETRATION
POWER—IDLE
DIVE BRAKES—EXTENDED
IAS—250K OR LIMIT MACH
(WHICHEVER IS LOWER)
PENETRATION TURN
AS SPECIFIED ON
JET PENETRATION
CHART
NOTE
MAX BANK
IN TURN—30°
INITIAL PENETRATION ALTITUDE
CRUISE CONFIGURATION
20,000 FT OR AS SPECIFIED
ANTICIPATE MINIMUM PENETRATION
ALTITUDE BY 1000 FEET
DIVE BRAKES—RETRACTED
IAS—180 TO 200K
PREPARE FOR ENTRY
INTO GCA PATTERN
AS INSTRUCTED
WARNING
CONSULT PILOT HANDBOOK—JET FOR
CORRECT APPROACH TO DESTINATION
11762

Figure 9-4

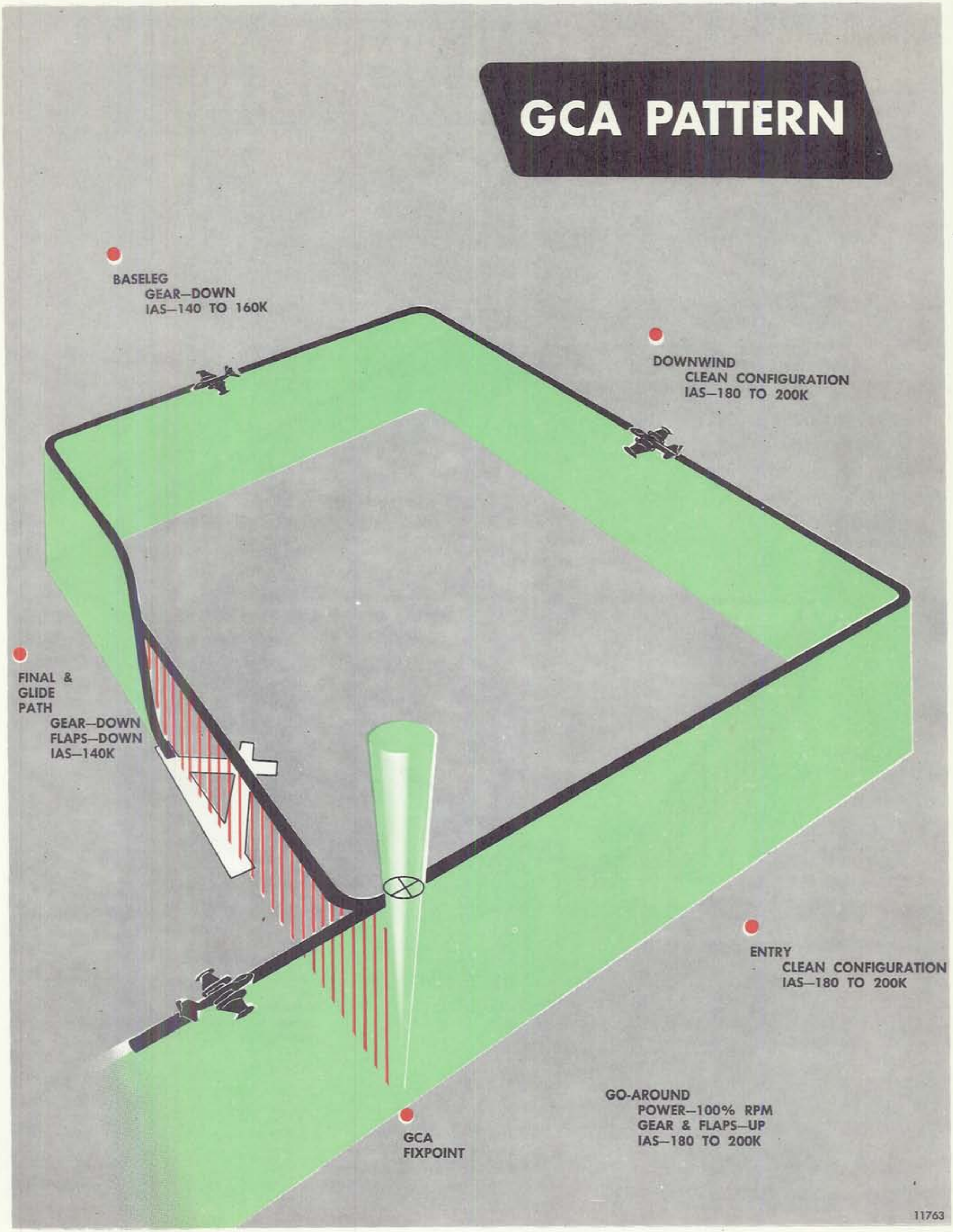

GCA PATTERN
BASELEG
GEAR—DOWN
IAS—140 TO 160K
DOWNWIND
CLEAN CONFIGURATION
IAS—180 TO 200K
FINAL &
GLIDE
PATH
GEAR—DOWN
FLAPS—DOWN
IAS—140K
ENTRY
CLEAN CONFIGURATION
IAS—180 TO 200K
GO-AROUND
POWER—100% RPM
GEAR & FLAPS—UP
IAS—180 TO 200K
GCA
FIXPOINT
11763

Figure 9-5

TYPICAL SINGLE ENGINE GCA PATTERN

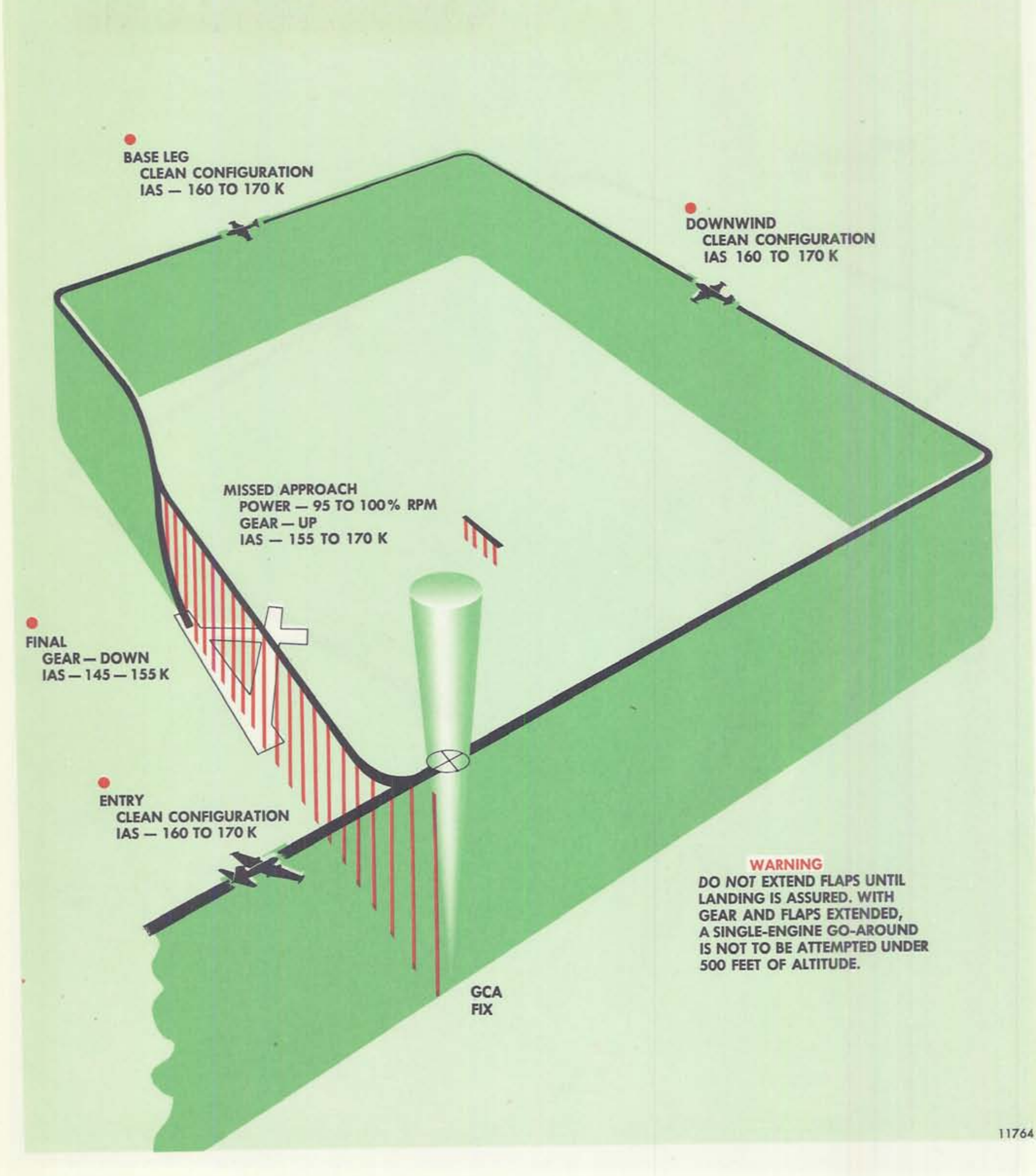


Figure 9-6

RUNWAY ROLL AFTER GCA LANDING

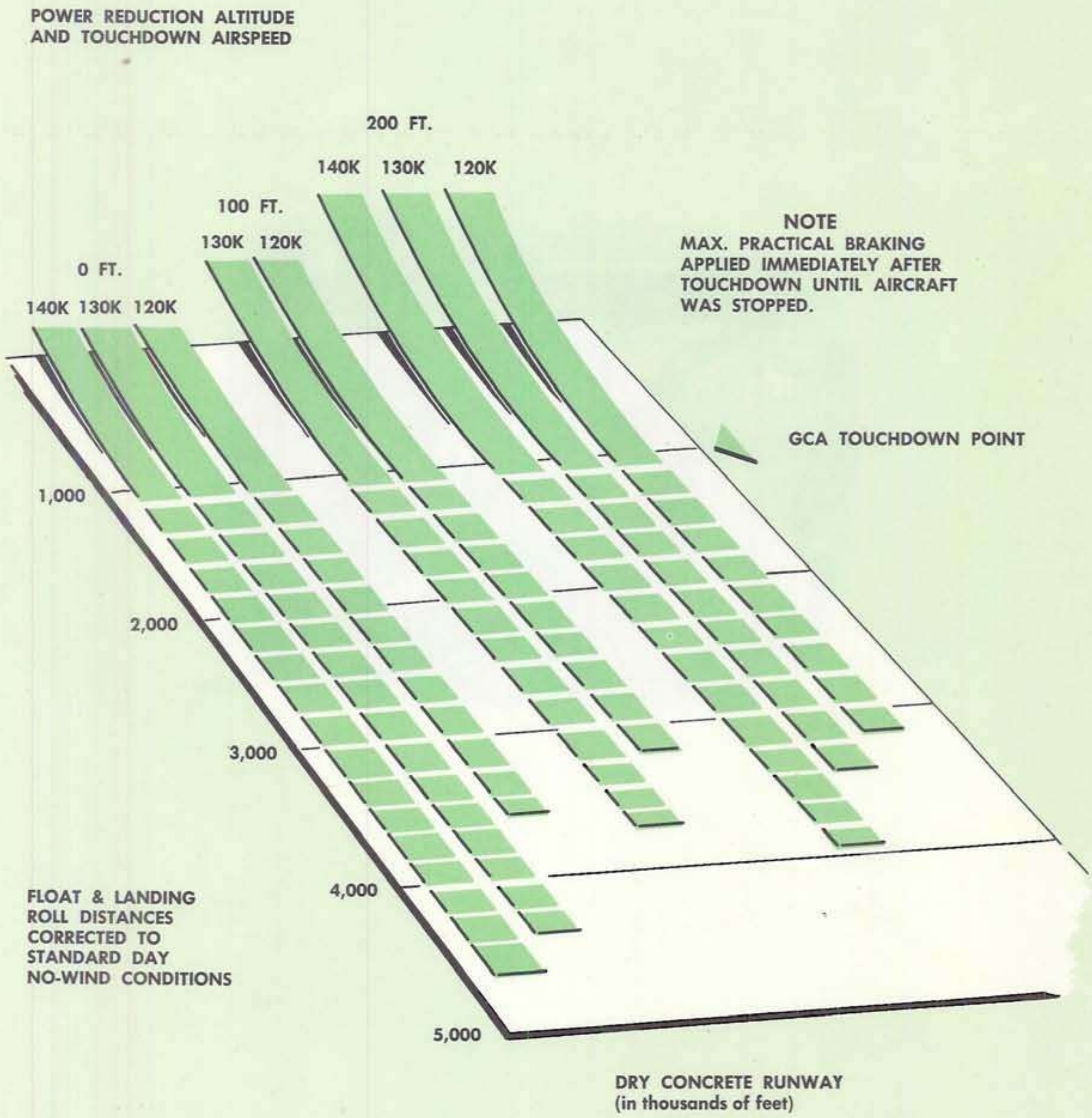
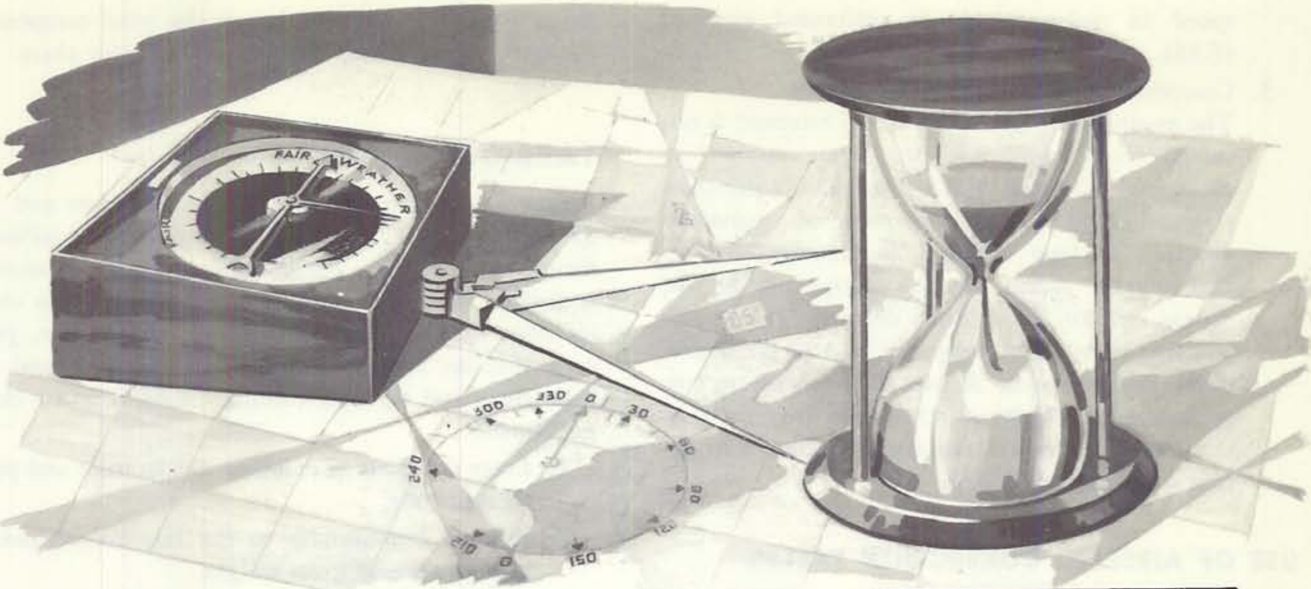


Figure 9-7

11773



Performance Data

Appendix I

12135

TABLE OF CONTENTS

INTRODUCTION.

The following charts set forth the estimated performance capabilities of this airplane. These data are based on operation in NACA standard atmospheric conditions. Additional take-off data are presented with temperature and pressure altitude as variants. The flight operation instruction charts are also applicable to operation in non-standard atmosphere if the recommended CAS values are maintained.

AIRSPEED CORRECTIONS.

1. Instrument correction to airspeed.
   The error in the individual airspeed indicator, considered negligible in most cases, may be obtained from the instrument calibration card to obtain indicated airspeed (IAS).
2. Installation correction to airspeed.
   Figures (A–3 and A–4) gives the airspeed installation correction to be applied to indicated air-

speed in order to obtain calibrated airspeed (CAS).

3. Compressibility correction to airspeed.
   The compressibility correction to airspeed is obtained from figure A-2 and when applied to calibrated airspeed (CAS) provides equivalent airspeed (EAS). The conversion of equivalent airspeed to true airspeed is accomplished by multiplying (EAS) by the reciprocal of the square root of the relative density. The vector addition of wind velocity and true airspeed provides ground speed. A free air temperature correction table (figure A-1) is also furnished, as true free air temperature must be known to obtain true airspeed (TAS).

USE OF AIRSPEED CORRECTION TABLES.

Consider an airplane flying at 15,000 feet with an indicated free air temperature of +5°C and an airspeed indicator reading of 300 knots.

Airspeed indicator reading	300 knots
Correction for installation error	+0 knots
(Gross weight approximately 40,000 pounds).	
	300 knots

The value of 300 knots is the calibrated airspeed (CAS).

Free air temperature indicator reading..	+5°C
Correction for temperature error.......	−15°C
	−10°C

The value of −10°C is the true free air temperature. Use CAS and true free air temperature with a type D-4 or type G-1 airspeed computer to determine true airspeed (TAS) of 374 knots. When the dead reckoning computer is used, the CAS (300 knots) must be corrected for compressibility. The airspeed compressibility correction table shows that 6 knots must be subtracted from CAS (300 knots) to obtain equivalent airspeed (294 knots). Use the dead reckoning computer and the values of 294 knots and −10°C to determine the true airspeed of 374 knots.

EFFECTIVE WIND.

The effective wind chart, figure A-5, is used for computing the wind component (head or tail wind) for take-off. Enter the chart at the known wind velocity. Move horizontally and intersect the line representing the wind distance in degrees, relative to the take-off runway. Move down vertically to the base line. The figure read from the base line is the wind component figure to be used with the take-off distance chart.

TAKE-OFF DISTANCE.

Figure (A-6) presents ground-run distances and the distance to clear a 50-foot obstacle for a military-thrust take-off. The distances shown are for normal technique on a dry hard-surface runway. The chart includes variable of gross weight, temperature, pressure altitude, and head wind; and may be used for both clean and tip tank configurations. Use the chart as follows:

1. Enter the chart at ambient temperature and pressure altitude.
2. Proceed horizontally to the line corresponding to your take-off gross weight.
3. Move vertically downward to Wind Baseline. If there is no headwind continue downward and read ground distance. If you have a head wind, follow the wind guide line to the correct wind value and read the distance on the ground reference line.
4. The lower portion of the chart will give the distance needed to clear a 50-foot obstacle; that is, for a ground run of 5900 feet, you need 7300 feet of runway distance to clear a 50-foot obstacle.

TAKE-OFF SPEEDS.

Figure A-7 should be used to determine the airspeed for the best take-off performance. On this chart there are curves for both the normal take-off and a maximum effort take-off. Also included are the minimum single engine control speed (155 knots) and the initial stall warning (outside ground effect). In the flaps-up configuration, initial stall warning occurs 10 to 12 knots above the stall speed.

CLIMB.

The climb charts (figure A-8 to A-17) present the estimated time to climb, distance covered, fuel used, best climb speed, and rate of climb for military and normal thrust with two engines operating. Separate charts include single engine climb data at military thrust. The fuel allowance for starting engines, taxiing, take-off, and acceleration to climb speed is listed at sea level. Fuel required at other altitudes includes 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 in an in-flight climb may be obtained in the same manner. All of the data appearing on the climb charts are presented at the tabulated gross weight for purposes of interpolation.

DESCENT.

The descent charts (figures A-18, A-19 and A-20) are based on the use of both wing dive brakes and fuselage speed brakes to obtain moderately high rates of descent. A constant Mach number speed schedule is shown for the clean airplane (M = .74). With wing tip tanks installed, this speed schedule is maintained until the airplane level flight structural limitation (434 knots EAS) is attained. The remaining descent with tip tanks installed is scheduled at this airspeed limitation. To minimize fuel consumption, idling power is used throughout the descent with both engines operating. The single engine descent data are presented for a constant Mach number schedule (M = .74), with one engine windmilling and one engine idling, dive brakes extended. Neither the fuel or time tabulated includes any allowance for loitering while awaiting landing clearance, for taxiing after landing, or for any navigational errors.

LANDING.

The landing distances presented in figure A-21 are based on the normal landing technique described in Section II. The percentage decrease noted on the charts for landing with dive brakes extended may be applied when this configuration is assumed. Dry, hard-surface runway and no wind are the only conditions shown.

MAXIMUM ENDURANCE.

Estimated airspeed, rpm, and fuel consumption for maximum endurance are presented in figures A-22 through A-27. These data are shown for all configurations used in the flight operation instruction charts and include altitudes ranging from sea level to cruise ceiling.

COMBAT ALLOWANCE.

The combat allowance chart (figure A-28) includes estimated fuel flow at military thrust, normal thrust, and level flight thrust at the proved limit of normal control. Data are shown for the clean airplane.

MAXIMUM CONTINUOUS POWER.

The maximum continuous power charts (figures A-29 through A-34) show estimated percentages of rpm, air-speed, and fuel consumption required at normal rated thrust. Configuration and weights correspond to those used in the flight operation instruction charts. Data shown for the airplane is within proved limit of normal control.

FLIGHT OPERATION INSTRUCTION CHARTS.

The flight operation instruction charts (figures A-35 to A-68) are presented to facilitate mission planning. The charted values include long-range airspeeds, fuel quantities, and altitudes in increments of 5,000 feet to the altitude where 300 fpm rate of climb at normal rated power can be maintained (cruise ceiling). In general, two range values are estimated for each fuel quantity and altitude shown. One is for continued operation at the initial altitude, and the other is maximum range obtainable by climbing to and cruising at the optimum altitudes shown for the specific initial conditions. Fuel consumed and distance covered during engine starting, taxiing, take-off, and initial climb at the start of a flight are not included in these charts. However, distances covered and fuel consumed during let-down or during in-flight climbs to optimum altitudes are taken into account. Operating conditions are shown on the lower portion of the charts. These operating conditions must be maintained if the range listed in the upper section of the chart are to be obtained. Under different wind conditions, ranges in ground miles are varied by the effect of wind on ground speed. The quoted let-down distances are affected for the same reason. Recommended CAS values also may change in order to obtain optimum ground miles per gallon. The lower half of each chart includes operating instructions to be followed when various wind conditions are encountered. Range in a wind is obtained by multiplying chart air miles by the range factor presented for the specific altitude and effective wind. Thus range factors may be used to determine the best altitude for cruise when there is a known wind difference at different altitudes. Effective wind has the same effect on the airplane ground speed as if it were a straight head wind or tail wind. The wind component in the direction of the airplane heading is the effective wind. For instance, a 100 knot wind at 30 degrees to the course is an effective head wind of approximately 85 knots. If the true airspeed of the airplane is 500 knots, the true ground speed is approximately 415 knots. The approximate rpm values quoted on any one chart are based on the gross weight of the airplane 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 navigation errors, combat, formation flight, landing, or similar contingencies.

PRE-FLIGHT RANGE PLANNING.

Select the applicable flight operation instruction charts. Determine the amount of fuel available. Available fuel is the total fuel aboard less allowances for starting engines, taxiing, take-off, initial climb, and reserve. Select a figure in the fuel column equal to, or less than, the amount available for flight planning. Interpolate as necessary. To determine maximum range at a given altitude, move horizontally right or left to the desired altitude column. The range value thus obtained must be multiplied by the correct range factor. Add the distance covered in the initial climb to obtain total range. To fly a given distance, determine range factors for the effective wind, and altitudes to be considered. From the desired distance subtract the climb distance. Divide the resultant figure by the range factor to obtain distance in cruise and descent. Enter the chart as previously. Move horizontally right or left to a calculated distance which exceeds the calculated air distance to be covered in cruise and descent. Use the operating conditions for the altitude so obtained, changing charts as fuel load decreases, or wing tip tanks are dropped. If altitude, wind, or disposable load does not remain reasonably constant, divide the flight into separate sections, planning each section individually.

IN-FLIGHT RANGE PLANNING.

To use the charts in flight, determine altitude, effective wind, and fuel available. Fuel available is equal to total usable fuel aboard less necessary reserves. Enter the flight operation instruction chart applicable to the specific airplane weight and fuel available. Move horizontally right or left to the desired altitude column. Determine the altitude at which flight is to be continued. Operating conditions for continued flight at this altitude can be found directly below. When changing charts, refer to cruising instructions on the new chart at the flight altitude. Ranges shown at optimum altitude may be obtained by immediately climbing at recommended climb procedure to this altitude. Cruising instructions at this new altitude will be found in the lower half of the chart in the column under the new altitude. In order to obtain best range, it is necessary to observe the optimum altitude when changing charts due to configuration change and weight changes.

SAMPLE PROBLEMS BASED ON JP-4 FUEL.

PROBLEM I.

Ferry Range Required—1500 nautical miles

Reserve Fuel Needed—1000 pounds

Payload (bombs)—none

Initial gross weight with wing tip tanks full—47,500 pounds with 2,972 gallons of fuel (19,318 pounds).

Effective winds—80 knot head wind above 35,000 feet

Effective winds—40 knot head wind below 35,000 feet

From the climb charts, figure A-8 to A-17 and the flight operation instruction charts for 320 gallon wing tip tanks carried the entire distance, figures A-53 and A-54, the following data are obtained.

1. Cruising Altitude (feet)	25,000	30,000	35,000
2. Fuel Capacity (pounds)	19,318	19,318	19,318
3. Reserve Fuel (pounds)	1000	1000	1000
4. Fuel used in Climb to altitude at MRP (pounds)	2385	2700	3060
5. Available Cruise Fuel (pounds)	15,933	15,618	15,258
6. Cruise and Descent Air Distance (interpolate nautical miles)	1558	1701	1797
7. Range Factor	.90	.89	.80
8. Cruise and Descent Ground Distance (6 x 7)	1400	1510	1440
9. Nautical Miles in Initial Climb	48	66	91
10. Nautical Ground Miles (8 + 9)	1448	1576	1531

These preliminary calculations indicate that the range of 1500 nautical miles may be attained at a cruise altitude of 30,000 feet. At this altitude with a 40-knot head wind the initial cruise speed, while within the weight bracket of 48,000 to 44,300 pounds, is 266 knots CAS. When gross weight reduces to the weight range of 44,300 to 39,800 pounds, airspeed reduces to 262 knots CAS and is further reduced to 255 knots CAS when operating within the weight band of 39,800 to 35,300 pounds.

PROBLEM II.

Suppose that changing winds throughout the previous range problem make an extension of range necessary. Fuel aboard is approximately 6000 pounds and empty wing tip tanks remain. Flight altitude is 30,000 feet. Gross weight is within the weight bracket of 35,300 to 30,800 pounds. Continued flight at this altitude will result in a range of approximately 540 nautical miles with a 40-knot head wind, maintaining a 1000 pound fuel reserve. However, by immediately dropping the empty wing tip tanks, a range of 575 nautical miles may be obtained with a similar reserve fuel allowance. The previous example shows that when empty wing tip tanks are installed and maximum range is essential, the wing tip tanks should be jettisoned.

MAXIMUM RANGE SUMMARY.

The maximum range summary charts (figures A-69 thru A-74) summarize the no-wind flight operating conditions for the data in the flight operation instruction charts. The maximum range summary charts presents the airspeeds, fuel flow, and percent rpm for maximum range flight at various altitudes and for various weights and configurations given in the flight operation instruction charts.

FREE AIR TEMPERATURE CORRECTION

PRESSURE ALTITUDE	CALIBRATED AIRSPEED – KNOTS							
	150	200	250	300	350	400	450	500
SEA LEVEL	2	4	7	9	13	17	21	26
5,000	3	5	8	11	15	19	24	
10,000	3	6	9	13	17	22	28	
15,000	4	7	10	15	20	25		
20,000	4	8	12	17	23	29		
25,000	5	9	14	20	26			
30,000	6	11	16	23				
35,000	7	13	19	27				
40,000	9	16	24					
45,000	12	20	29					
50,000	14	24						

REMARKS: SUBTRACT CORRECTION FROM INDICATED FREE AIR TEMPERATURE (°C) TO OBTAIN TRUE FREE AIR TEMPERATURE (°C)

DATA BASIS: ESTIMATED
DATA AS OF: 1 MAY 1953

Figure A-1

COMPRESSIBILITY CORRECTION TABLE

PRESSURE ALTITUDE	C.A.S.– KNOTS								
	150	200	250	300	350	400	450	500	550
5,000	0	0	− 1	− 2	− 2	− 3	− 5	− 6	− 8
10,000	0	− 1	− 2	− 3	− 5	− 7	−10	−13	−17
15,000	−1	− 2	− 3	− 6	− 8	−12	−16	−21	
20,000	−1	− 3	− 5	− 8	−12	−17	−23		
25,000	−2	− 4	− 7	−11	−17	−24			
30,000	−2	− 5	− 9	−15	−23				
35,000	−3	− 7	−12	−20					
40,000	−4	− 9	−16						
45,000	−5	−11	−20						
50,000	−7	−14							

REMARKS: ADD CORRECTION TO CALIBRATED AIRSPEED TO OBTAIN EQUIVALENT AIRSPEED

C.A.S: CALIBRATED AIRSPEED

DATA BASIS: ESTIMATED
DATA AS OF: 1 MAY 1953

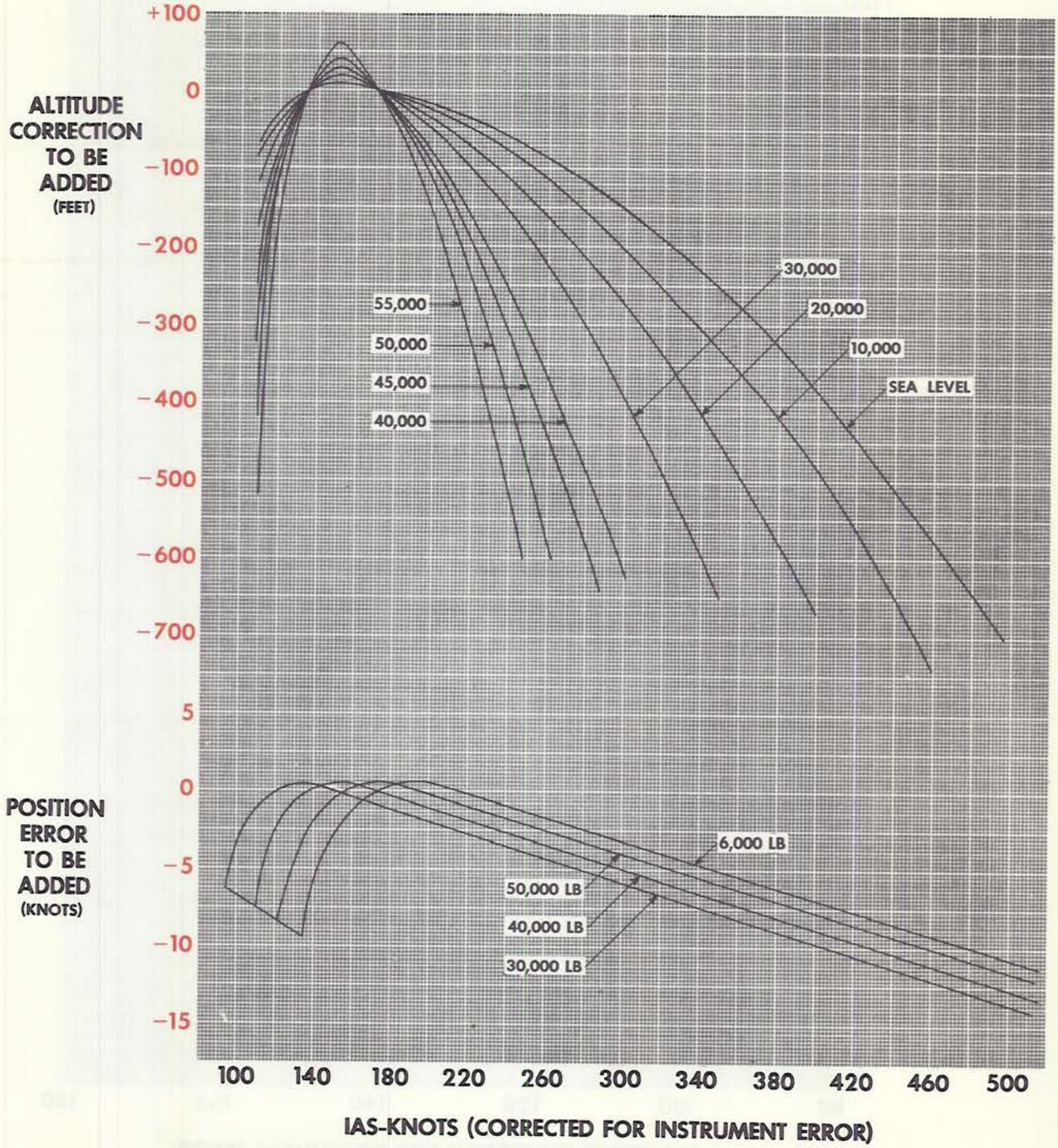
Figure A–2

AIRSPEED AND ALTITUDE CALIBRATION

CRUISE CONFIGURATION

MODEL(S): B-57C

ENGINE(S): (TWO) J65-W-5



ESTIMATED DATA 4-1-56

12237

Figure A-3

AIRSPEED AND ALTITUDE CALIBRATION

GEAR AND FLAPS DOWN

MODEL(S): B-57C

ENGINE(S): (TWO) J65-W-5

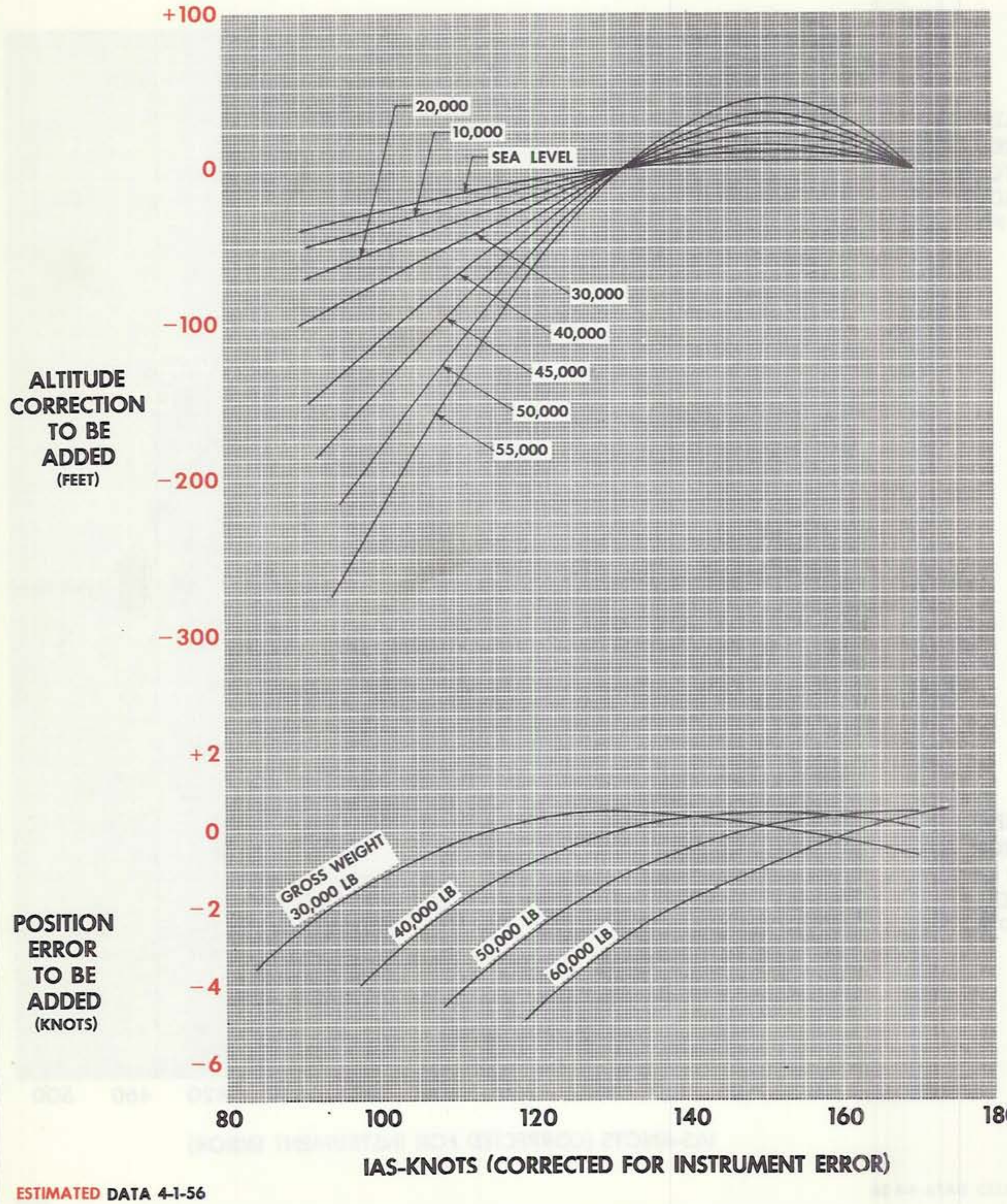
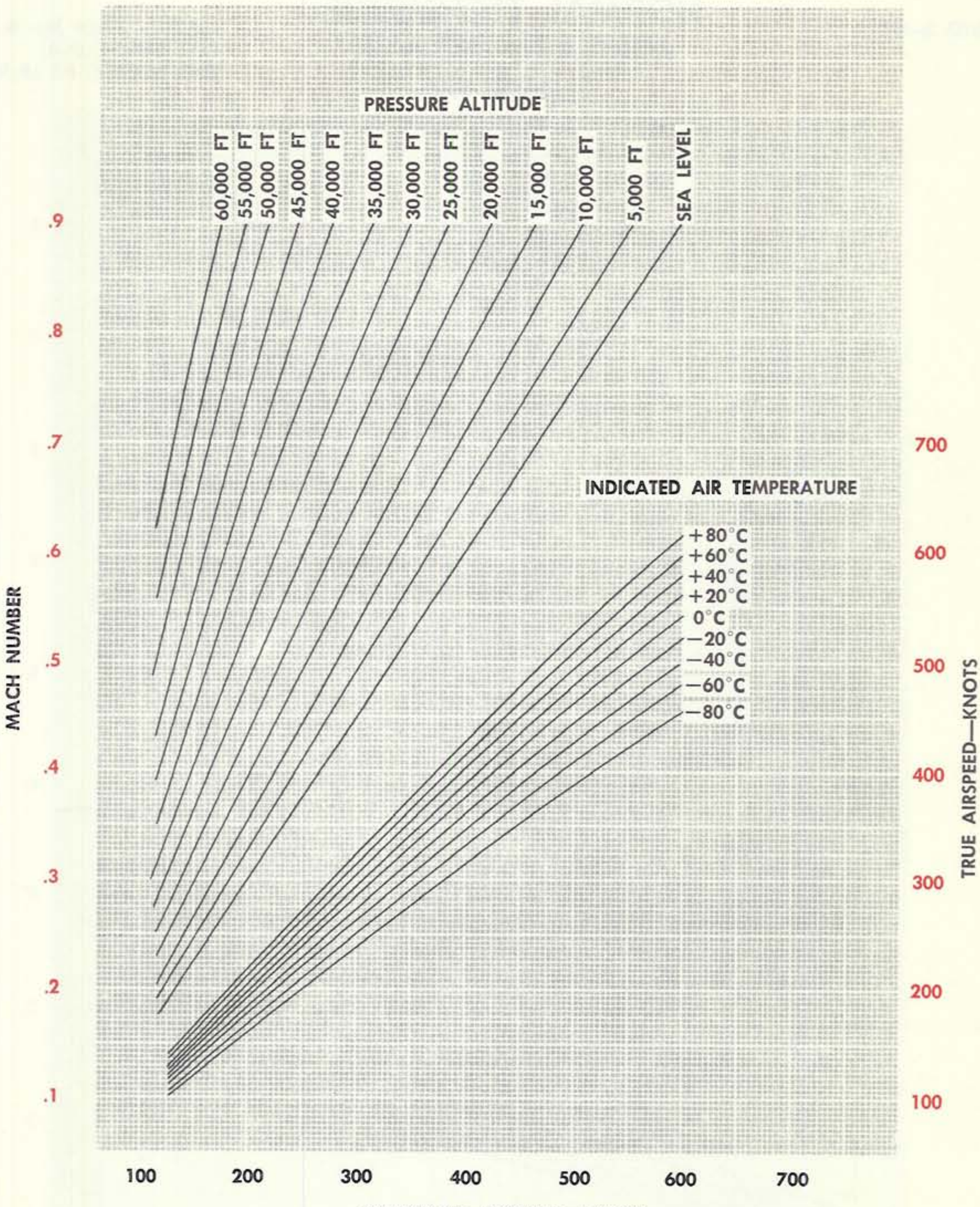


Figure A-4

AIRSPEED CONVERSION

MODEL(S): B–57C

ENGINES (TWO) J65–W–5
FUEL GRADE: JP–4
FUEL DENSITY: 6.5 LB PER GAL



DATA AS OF: 4–1–56
DATA BASIS: ESTIMATED

12255

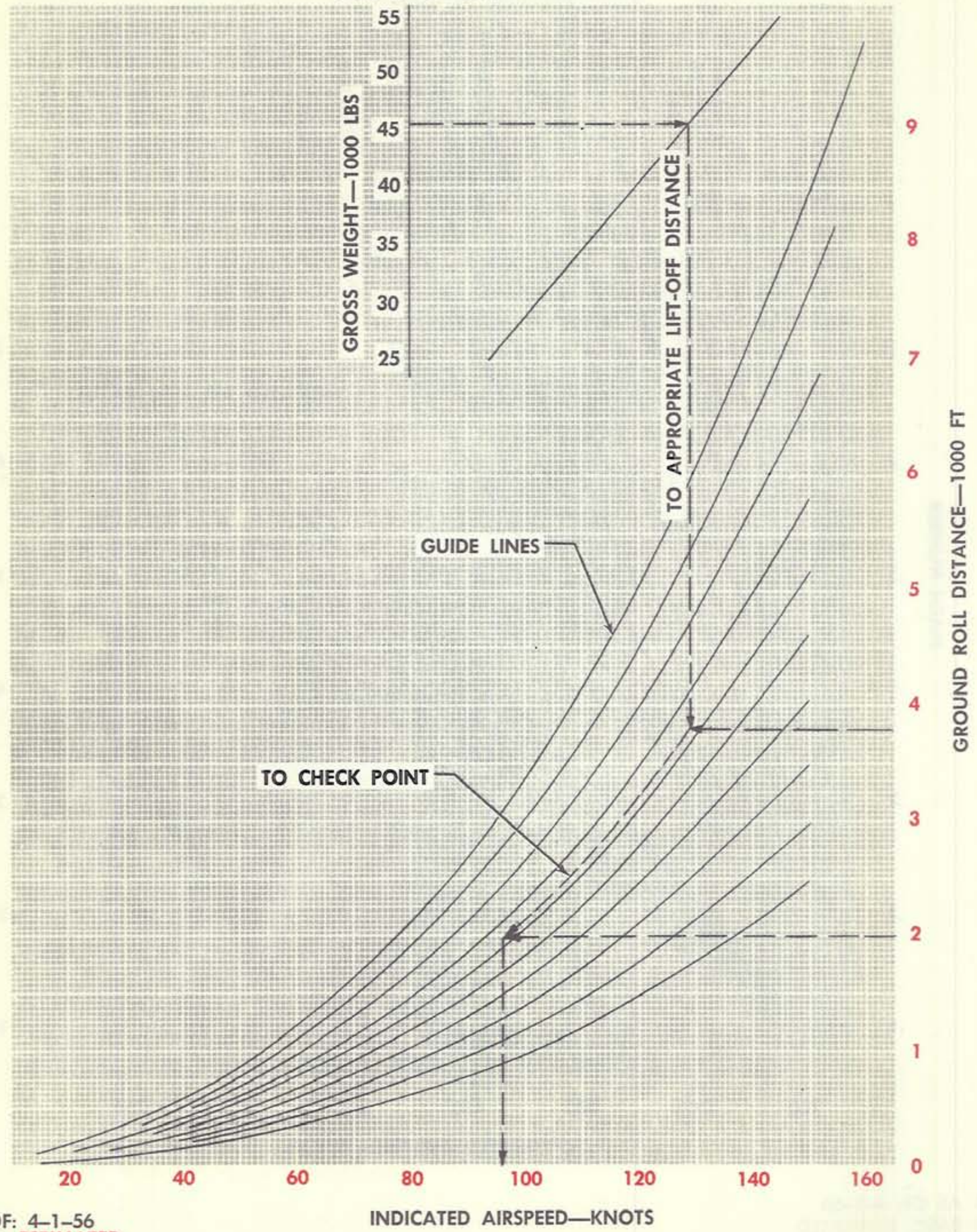
Figure A–4A

AIRSPEED AND GROUND ROLL DISTANCE DURING TAKEOFF

HARD, DRY SURFACE RUNWAY
NORMAL TECHNIQUE
MILITARY POWER
FLAPS UP

MODEL(S): B-57C

ENGINES (TWO) J65-W-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB PER GAL



DATA AS OF: 4-1-56
DATA BASIS: ESTIMATED

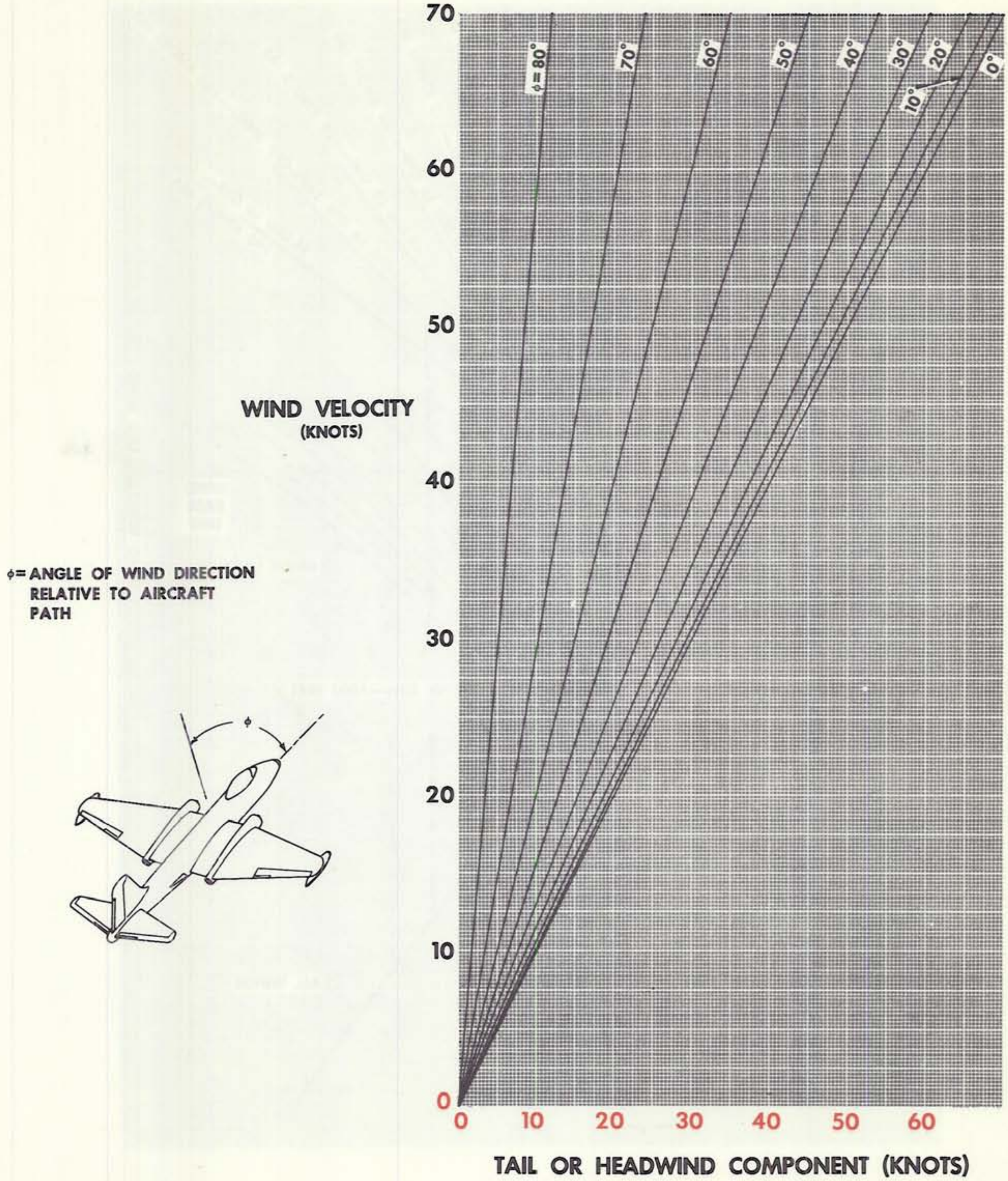
12256

Figure A-4B

EFFECTIVE WIND

MODEL(S): B-57C

ENGINE(S): (TWO) J65-W-5



DATA ESTIMATED 4-1-56

12239

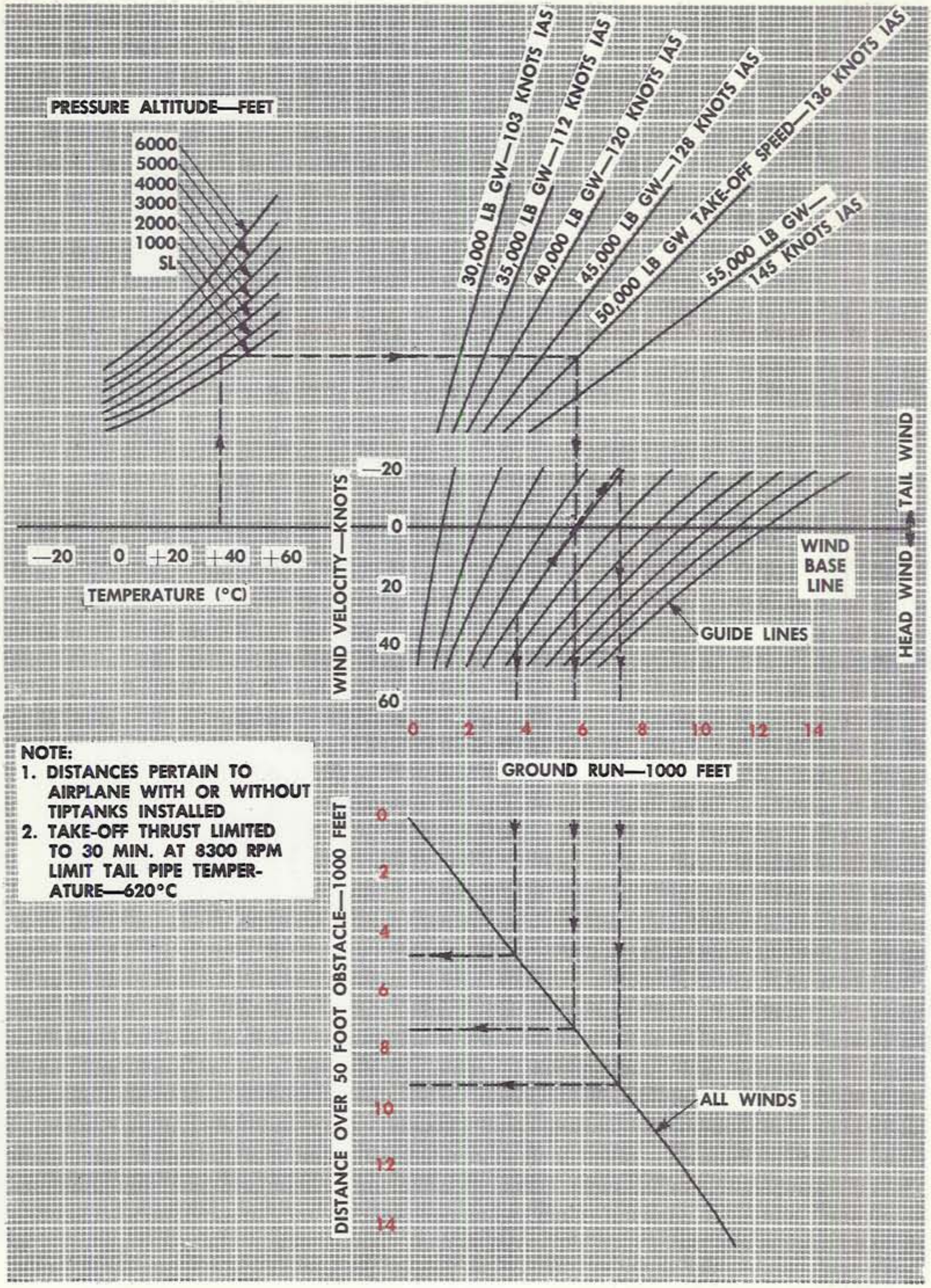
Figure A-5

TAKE-OFF DISTANCES

MILITARY POWER

MODEL(S): B-57C

ENGINE(S): (TWO) J65-W-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB PER GAL



NOTE:
1. DISTANCES PERTAIN TO AIRPLANE WITH OR WITHOUT TIPTANKS INSTALLED
2. TAKE-OFF THRUST LIMITED TO 30 MIN. AT 8300 RPM LIMIT TAIL PIPE TEMPERATURE—620°C

DATA AS OF: 4-1-56
DATA BASIS: ESTIMATED

12235

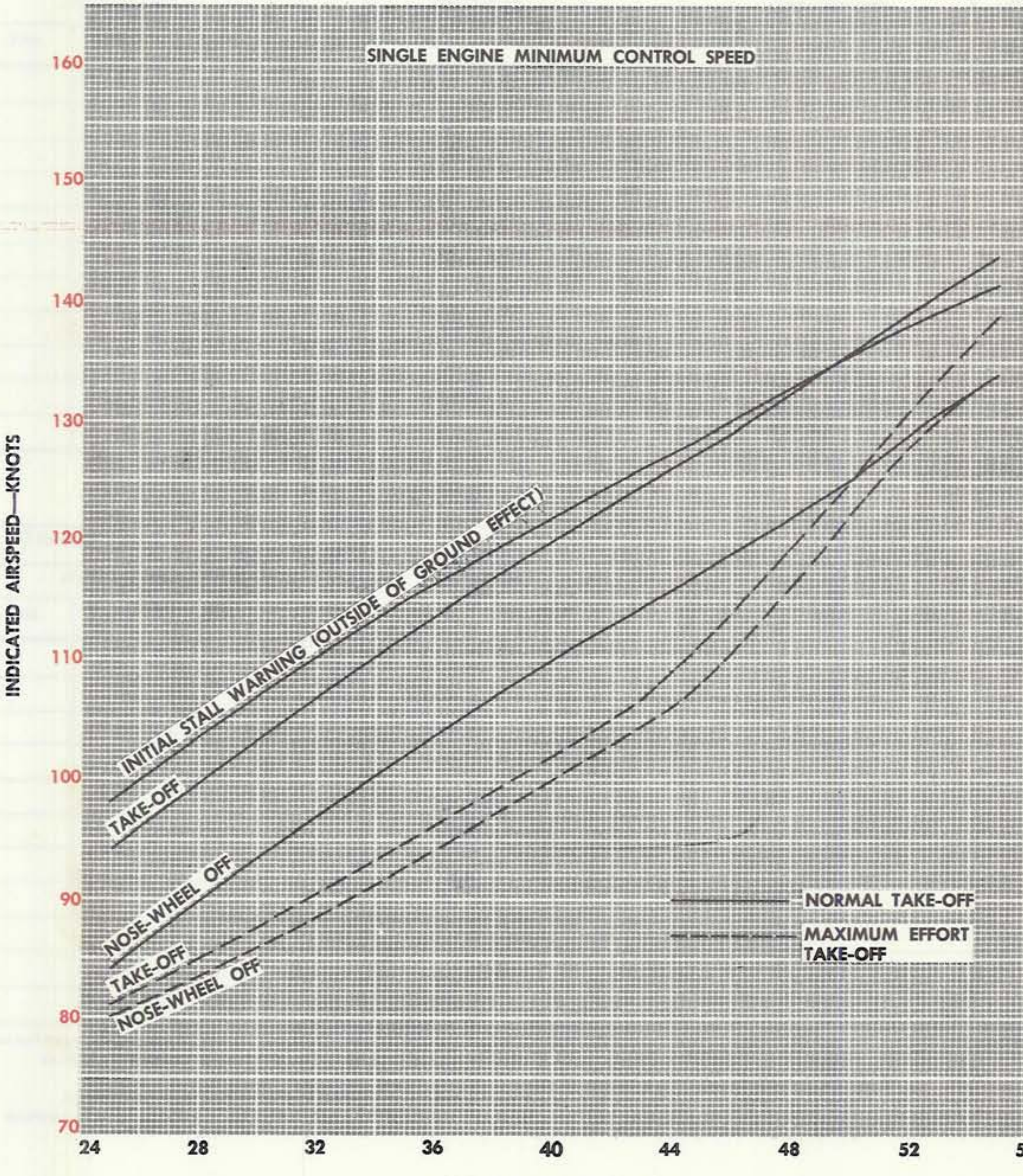
Figure A-6

TAKE-OFF SPEEDS

HARD SURFACE RUNWAY
MILITARY THRUST
FLAPS UP

MODEL(S): B-57C

ENGINE(S): (TWO) J65-W-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB PER GAL



DATA AS OF: 4-1-56
DATA BASIS: ESTIMATED

12236

Figure A–7

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL	KNOTS			FUEL	TIME	DIST.	
6400	0	0	985 (1)	314	SEA LEVEL					
5750	5	0.8	1160	312	5,000					
5100	10	1.8	1330	305	10,000					
4500	16	2.8	1500	297	15,000					
3900	23	4.0	1660	286	20,000					
3350	32	5.3	1830	271	25,000					
2800	43	6.9	2000	256	30,000					
2200	57	8.8	2180	240	35,000					
1500	74	11.6	2370	214	40,000					
750	105	16.0	2610	192	45,000					
					50,000					

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
					SEA LEVEL					
					5,000					
					10,000					
					15,000					
					20,000					
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE TO CLIMB SPEED

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED - KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-8

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): B-57B · B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 48,500 POUNDS (left side of the table below)

CONFIGURATION: CLEAN
WEIGHT: 44,000 POUNDS (right side of the table below)

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
3800	0	0	985 (1)	320	SEA LEVEL	318	985 (1)	0	0	4250
3350	7	1.4	1280	317	5,000	316	1240	1.2	6	3750
2900	17	3.0	1560	310	10,000	310	1500	2.7	15	3300
2500	28	4.8	1860	302	15,000	301	1770	4.3	25	2800
2100	42	7.0	2160	290	20,000	290	2040	6.2	37	2400
1700	60	9.6	2500	276	25,000	276	2320	8.5	52	2000
1250	82	13.0	2870	259	30,000	259	2610	11.4	71	1550
750	117	18.1	3330	241	35,000	241	2950	15.0	96	1000
					40,000	216	3450	21.[illegible]	143	400
					45,000					
					50,000					

CONFIGURATION: CLEAN
WEIGHT: 39,500 POUNDS (left side of the table below)

CONFIGURATION: CLEAN
WEIGHT: 35,000 POUNDS (right side of the table below)

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4750	0	0	985 (1)	317	SEA LEVEL	316	985 (1)	0	0	5500
4250	6	1.1	1210	316	5,000	314	1190	1.0	5	4850
3750	13	2.4	1450	308	10,000	307	1390	2.1	11	4300
3250	22	3.8	1680	300	15,000	299	1590	3.3	19	3800
2800	32	5.5	1910	289	20,000	288	1790	4.8	28	3300
2300	45	7.4	2150	275	25,000	273	1990	6.3	39	2800
1900	61	9.8	2400	258	30,000	258	2200	8.3	52	2300
1350	81	12.7	2660	241	35,000	241	2420	10.7	68	1750
700	114	17.4	3000	216	40,000	215	2660	14.2	92	1100
					45,000	192	3060	21.2	140	400
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A–9

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL W ING TIP TANKS WEIGHT: 35,300 POUNDS						CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 30,800 POUNDS				
APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5350	0	0	985 (1)	306	SEA LEVEL	305	985 (1)	0	0	6150
4750	5	1.0	1190	300	5,000	298	1160	0.9	5	5600
4190	11	2.2	1390	294	10,000	293	1330	1.9	10	4900
3650	19	3.5	1600	286	15,000	285	1510	3.0	16	4300
3100	28	4.9	1810	276	20,000	275	1690	4.2	24	3700
2600	39	6.7	2020	264	25,000	263	1870	5.7	34	2130
2100	53	8.9	2250	249	30,000	248	2050	7.6	45	2550
1590	73	11.7	2500	233	35,000	233	2240	9.8	60	2000
910	98	15.5	2770	210	40,000	209	2450	12.7	80	1350
					45,000	188	2720	17.2	113	670
					50,000					

CONFIGURATION: WEIGHT:						CONFIGURATION: WEIGHT:				
APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
					SEA LEVEL					
					5,000					
					10,000					
					15,000					
					20,000					
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUTICAL MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-10

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 53,000 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 48,800 POUNDS

APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
3350	0	0	985(1)	310	SEA LEVEL	309	985(1)	0	0	3700
2920	8	1.5	1300	305	5,000	303	1280	1.4	8	3250
2480	19	3.5	1670	298	10,000	297	1580	3.1	17	2800
2100	32	5.7	2020	290	15,000	289	1890	5.1	28	2350
1700	47	8.3	2380	280	20,000	279	2200	7.4	42	1950
1290	69	11.6	2800	266	25,000	265	2550	10.2	60	1500
840	98	16.3	3280	250	30,000	250	2940	14.0	84	1110
410	154	24.0	4060	235	35,000	235	3440	19.7	123	620
					40,000					
					45,000					
					50,000					

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 44,300 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 39,800 POUNDS

APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4100	0	0	985(1)	308	SEA LEVEL	307	985(1)	0	0	4640
3680	7	1.3	1250	302	5,000	301	1220	1.2	6	4120
3200	15	2.8	1500	296	10,000	295	1450	2.4	13	3620
2700	24	4.5	1780	288	15,000	287	1690	4.0	21	3110
2270	37	6.5	2050	278	20,000	277	1930	5.7	32	2610
1820	52	8.9	2360	265	25,000	264	2190	7.8	46	2180
1390	72	12.0	2680	250	30,000	249	2460	10.4	62	1690
880	102	16.4	3060	234	35,000	234	2760	13.8	86	1200
300	154	24.4	3660	213	40,000	211	3140	19.2	121	610
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-11

CLIMB CHART FOR MILITARY POWER

STANDARD DAY

MODEL(S): B-57B B-57C ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
8000	0	0	985 (1)	361	SEA LEVEL					
7300	4	0.6	1140	350	5,000					
6550	9	1.4	1310	336	10,000					
5800	14	2.2	1460	320	15,000					
5050	20	3.1	1620	302	20,000					
4300	28	4.2	1780	283	25,000					
3550	36	5.5	1930	263	30,000					
2800	47	7.1	2080	243	35,000					
2000	61	9.2	2260	217	40,000					
1150	84	12.4	2470	194	45,000					
350	129	19.3	2830	172	50,000					

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
					SEA LEVEL					
					5,000					
					10,000					
					15,000					
					20,000					
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT. MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-12

CLIMB CHART FOR MILITARY POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 48,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 44,000 POUNDS

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4950	0	0	985 (1)	366	SEA LEVEL	365	985 (1)	0	0	5500
4400	6	1.1	1260	354	5,000	353	1220	0.9	6	4900
3850	15	2.3	1530	342	10,000	339	1460	2.0	13	4300
3350	24	3.7	1790	326	15,000	323	1700	3.2	21	3750
2800	35	5.4	2060	306	20,000	304	1940	4.7	31	3200
2300	48	7.2	2350	287	25,000	285	2180	6.4	42	2650
1750	66	9.7	2630	267	30,000	266	2440	8.5	57	2100
1100	89	13.1	2960	245	35,000	245	2720	11.3	76	1400
400	130	19.0	3480	221	40,000	220	3090	15.7	108	750
					45,000					
					50,000					

CONFIGURATION: CLEAN
WEIGHT: 39,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 35,000 POUNDS

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
6200	0	0	985 (1)	364	SEA LEVEL	363	985 (1)	0	0	7050
5500	5	0.8	1200	352	5,000	351	1170	0.8	5	6300
4850	11	1.8	1410	338	10,000	337	1360	1.6	10	5600
4250	19	2.9	1610	322	15,000	321	1540	2.5	16	4950
3650	27	4.2	1830	303	20,000	302	1720	3.6	23	4300
3050	37	5.6	2040	284	25,000	283	1900	4.8	32	3650
2450	49	7.4	2260	265	30,000	264	2090	6.4	42	3000
1850	65	9.7	2490	244	35,000	244	2280	8.3	56	2250
1100	90	13.1	2780	219	40,000	218	2500	11.0	74	1450
350	147	20.4	3260	195	45,000	194	2810	15.7	107	650
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-13

CLIMB CHART FOR MILITARY POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 35,300 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 30,800 POUNDS

APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
6700	0	0	985 (1)	340	SEA LEVEL	339	985 (1)	0	0	7760
5910	5	0.8	1170	331	5,000	330	1150	0.7	4	6950
5230	10	1.8	1370	320	10,000	319	1310	1.6	9	6150
4570	16	2.7	1560	307	15,000	306	1470	2.4	14	5400
3920	24	3.9	1760	292	20,000	291	1635	3.4	20	4680
3310	33	5.3	1950	276	25,000	275	1800	4.6	28	4000
2700	44	7.0	2150	258	30,000	258	1970	6.0	37	3335
2090	58	9.0	2370	238	35,000	238	2140	7.6	47	2620
1320	79	11.8	2600	214	40,000	213	2320	9.9	63	1820
600	114	16.1	2950	190	45,000	189	2550	13.3	88	1020
					50,000	169	2870	21.1	137	260

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
					SEA LEVEL					
					5,000					
					10,000					
					15,000					
					20,000					
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: Naut. MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-14

CLIMB CHART FOR MILITARY POWER

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 53,000 POUNDS						CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 48,800 POUNDS				
APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
4250	0	0	985 (1)	345	SEA LEVEL	344	985 (1)	0	0	4700
3750	8	1.2	1290	335	5,000	334	1260	1.1	7	4150
3250	15	2.8	1600	324	10,000	323	1550	2.5	14	3600
2750	27	4.4	1920	311	15,000	310	1830	4.0	24	3050
2250	39	6.5	2250	296	20,000	295	2120	5.7	36	2550
1760	56	9.2	2590	280	25,000	279	2430	8.0	49	2050
1280	78	12.2	2980	261	30,000	260	2760	10.6	69	1550
780	110	17.0	3470	240	35,000	240	3150	14.4	95	1050
100	189	28.8	4360	216	40,000	216	3750	21.5	145	350
					45,000					
					50,000					

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 44,300 POUNDS						CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 39,800 POUNDS				
APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL			KNOTS		KNOTS	FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
5250	0	0	985 (1)	342	SEA LEVEL	341	985 (1)	0	0	5820
4600	0	1.0	1230	333	5,000	332	1200	0.9	6	5200
4000	13	2.2	1490	322	10,000	321	1430	2.0	12	4500
3500	22	3.5	1740	309	15,000	308	1650	3.1	19	3950
2950	32	5.0	2000	294	20,000	293	1880	4.4	28	3350
2400	43	6.9	2270	278	25,000	277	2110	6.0	38	2800
1850	60	9.2	2550	260	30,000	259	2350	8.0	52	2250
1350	81	12.3	2860	239	35,000	239	2600	10.6	69	1700
650	119	17.3	3280	215	40,000	214	2910	14.3	98	980
					45,000	191	3460	22.6	153	250
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: Naut. MILES
TIME: MINUTES
FUEL: POUNDS/HR
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-15

CLIMB CHART FOR MILITARY POWER

STANDARD DAY

ONE ENGINE OPERATION

MODEL(S): B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 30,500 POUNDS						CONFIGURATION: WEIGHT:				
APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
2450	0	0	985 (1)	234	SEA LEVEL					
2100	9	2.2	1230	223	5,000					
1750	18	4.8	1490	213	10,000					
1400	33	8.0	1780	208	15,000					
1040	51	12.1	2100	198	20,000					
700	76	17.6	2450	188	25,000					
400	120	27.6	2990	178	30,000					
					35,000					
					40,000					
					45,000					
					50,000					

CONFIGURATION: WEIGHT:						CONFIGURATION: WEIGHT:				
APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
					SEA LEVEL					
					5,000					
					10,000					
					15,000					
					20,000					
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUTICAL MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-16

CLIMB CHART FOR MILITARY POWER

STANDARD DAY
ONE ENGINE OPERATION

MODEL(S): B-57B B-57C **ENGINE(S):** (ONE) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 48,500 POUNDS						CONFIGURATION: CLEAN WEIGHT: 44,000 POUNDS				
APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
1170	0	0	985 (1)	246	SEA LEVEL	243	985 (1)	0	0	1400
900	21	4.6	1560	242	5,000	237	1430	3.8	16	1130
660	48	11.1	2190	232	10,000	227	1940	8.9	38	860
400	89	20.5	2980	226	15,000	222	2550	15.8	68	580
140	177	41.0	4460	216	20,000	212	3390	27.2	122	300
					25,000					
					30,000					
					35,000					
					40,000					
					45,000					
					50,000					

CONFIGURATION: CLEAN WEIGHT: 39,500 POUNDS						CONFIGURATION: CLEAN WEIGHT: 35,000 POUNDS				
APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF CLIMB	FROM SEA LEVEL						FROM SEA LEVEL			RATE OF CLIMB
	DIST.	TIME	FUEL				FUEL	TIME	DIST.	
1700	0	0	985 (1)	240	SEA LEVEL	237	985 (1)	0	0	2050
1400	13	3.1	1340	232	5,000	228	1280	2.5	11	1740
1100	30	7.1	1760	222	10,000	218	1600	5.7	24	1400
800	53	12.4	2220	217	15,000	213	1960	9.8	41	1080
500	88	20.0	2800	207	20,000	203	2370	15.3	65	750
200	152	33.8	3630	197	25,000	193	2910	24.0	105	450
					30,000	183	3800	46.0	210	130
					35,000					
					40,000					
					45,000					
					50,000					

REMARKS:

(1) ALLOWANCE FOR START ENGINES, TAXI, TAKE-OFF AND ACCELERATE-TO-CLIMB SPEED.

(2) CLIMB AT RECOMMENDED CAS.

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: NAUT MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-17

DESCENT CHART

STANDARD DAY

MODEL B-57B B-57C

FUSELAGE AND WING BRAKES EXTENDED
IDLING POWER

ENGINE(S):(TWO) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 35,600 POUNDS						CONFIGURATION: CLEAN WEIGHT: 30,100 POUNDS				
APPROXIMATE				CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL						TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL				FUEL	TIME	DISTANCE	
					50,000					
4,200	34	4.8	105	200	45,000	200	91	4.2	29	4,500
5,150	26	3.7	91	220	40,000	220	78	3.2	22	5,700
6,200	20	2.8	80	250	35,000	250	68	2.4	17	7,000
7,750	15	2.0	69	280	30,000	280	60	1.8	12	8,900
9,700	11	1.5	57	310	25,000	310	49	1.2	9	11,200
12,300	7	1.0	46	345	20,000	345	39	.9	6	14,400
15,900	3	.7	31	378	15,000	378	26	.5	4	18,900
20,800	2	.4	17	415	10,000	415	14	.3	2	24,800
26,300	1	.2	6	451	5,000	451	5	.1	1	31,600
31,900	0	0	0	490	SEA LEVEL	490	0	0	0	38,000

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	
					50,000					
					45,000					
					40,000					
					35,000					
					30,000					
					25,000					
					20,000					
					15,000					
					10,000					
					5,000					
					SEA LEVEL					

REMARKS:

RATE OF DESCENT: FEET PER MINUTE
DISTANCE: Naut. MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

(1) MAINTAIN IDLE POWER THROUGHOUT DESCENT.

(2) REFER TO MAXIMUM GLIDE CHART FOR OPTIMUM DESCENT RANGE WITHOUT POWER, SPEED BRAKES RETRACTED.

DATA AS OF: 15 DECEMBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-18

DESCENT CHART

STANDARD DAY

FUSELAGE AND WING BRAKES EXTENDED
IDLING POWER

MODEL B-57B B-57C

ENGINE(S):(TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 36,500 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 31,000 POUNDS

APPROXIMATE				CAS	PRESSURE ALTITUDE	CAS	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL						TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL	KNOTS	FEET	KNOTS	FUEL	TIME	DISTANCE	
					50,000					
4,400	33	4.7	106	200	45,000	200	91	4.2	29	4,650
5,250	26	3.7	90	220	40,000	220	78	3.2	22	5,800
6,300	20	2.8	80	250	35,000	250	68	2.4	16	7,150
7,800	14	2.1	70	280	30,000	280	60	1.8	12	9,000
9,850	10	1.4	59	310	25,000	310	50	1.2	9	11,400
12,700	7	1.0	47	345	20,000	345	39	.8	6	14,600
16,400	5	.6	32	380	15,000	380	27	.5	4	19,200
20,900	3	.4	19	415	10,000	415	16	.3	2	24,700
24,300	1	.2	8	440 (1)	5,000	440 (1)	7	.1	1	28,600
25,000	0	0	0	434 (1)	SEA LEVEL	434 (1)	0	0	0	29,700

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE				CAS	PRESSURE ALTITUDE	CAS	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL						TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL		FEET		FUEL	TIME	DISTANCE	
					50,000					
					45,000					
					40,000					
					35,000					
					30,000					
					25,000					
					20,000					
					15,000					
					10,000					
					5,000					
					SEA LEVEL					

REMARKS:

(1) SPEED LIMITED BY PROVED LIMITS OF NORMAL CONTROL

(2) MAINTAIN IDLE POWER THROUGHOUT DESCENT.

(3) REFER TO MAXIMUM GLIDE CHART FOR OPTIMUM DESCENT RANGE WITHOUT POWER, SPEED BRAKES RETRACTED.

RATE OF DESCENT FEET PER MINUTE
DISTANCE: Naut MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 15 DECEMBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-19

DESCENT CHART

STANDARD DAY

ONE ENGINE OPERATION

MODEL B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 35,600 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 30,100 POUNDS

APPROXIMATE				CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE			
RATE OF DESCENT	TO SEA LEVEL			KNOTS		KNOTS	TO SEA LEVEL			RATE OF DESCENT
	DISTANCE	TIME	FUEL				FUEL	TIME	DISTANCE	
					50,000					
					45,000					
					40,000					
					35,000					
9600	13	1.8	32	280	30,000	280	27	1.6	11	11,500
11,200	10	1.3	27	310	25,000	310	23	1.1	8	13,300
13,900	7	.9	22	345	20,000	345	18	.8	5	16,400
17,300	4	.6	14	378	15,000	378	12	.5	3	20,600
21,600	3	.3	8	415	10,000	415	7	.3	2	26,000
27,400	1	.1	3	451	5,000	451	2	.1	1	33,100
34,600	0	0	0	490	SEA LEVEL	490	0	0	0	41,800

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	
					50,000					
					45,000					
					40,000					
					35,000					
					30,000					
					25,000					
					20,000					
					15,000					
					10,000					
					5,000					
					SEA LEVEL					

REMARKS:

(1) MAINTAIN IDLE POWER ON OPERATING ENGINE THROUGHOUT DESCENT.

(2) REFER TO MAXIMUM GLIDE CHART FOR OPTIMUM DESCENT RANGE WITHOUT POWER. SPEED BRAKES RETRACTED.

(3) SPEED SCHEDULE IS APPROXIMATELY M = .74

RATE OF DESCENT: FEET PER MINUTE
DISTANCE: NAUTICAL MILES
TIME: MINUTES
FUEL: POUNDS
CAS: CALIBRATED AIRSPEED KNOTS

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-20

LANDING DISTANCE - FEET

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE (S)(TWO) J65-W-5

GROSS WEIGHT LB	BEST CAS FOR APPROACH		60 DEGREE FLAPS - HARD SURFACE - NO WIND							
	POWER OFF	POWER ON	AT SEA LEVEL		AT 2000 FT		AT 4000 FT		AT 6000 FT	
			GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'
50,000	143	143	2180	4250	2310	4500	2460	4760	2620	5030
40,000	128	128	1750	3580	1850	3800	1970	4030	2100	4250
30,000	111	111	1310	2930	1400	3110	1490	3300	1570	3470
26,000	103	103	1140	2670	1220	2840	1300	3010	1370	3170

REMARKS:

(a) DATA BASED ON LANDING WITH SPEED BRAKES RETRACTED.

(b) FOR LANDING WITH SPEED BRAKES EXTENDED, REDUCE THESE DISTANCES BY 5%.

(c) THESE LANDING DISTANCES AND APPROACH SPEEDS ARE PART OF NORMAL LANDING PROCEDURE. OPTIMUM LANDING TECHNIQUE RESULTS IN SHORTER DISTANCES.

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

CAS: CALIBRATED AIRSPEED

Figure A-21

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE LB/HR.	APPROXIMATE %RPM	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE %RPM	APPROXIMATE /HR.
3240	71	150	SEA LEVEL			
2920	72	150	5,000			
2650	73	150	10,000			
2450	74	150	15,000			
2280	75	150	20,000			
2150	77	151	25,000			
2070	78	153	30,000			
2020	81	156	35,000			
2110	84	160	40,000			
2200	89	163	45,000			
2280	95	167	50,000			

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE /HR.	APPROXIMATE %RPM	CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE %RPM	APPROXIMATE /HR.
			SEA LEVEL			
			5,000			
			10,000			
			15,000			
			20,000			
			25,000			
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-22

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE(S):(TWO) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 48,500 POUNDS				CONFIGURATION: CLEAN WEIGHT: 44,000 POUNDS		
APPROXIMATE LB/HR.	APPROXIMATE %RPM	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE %RPM	APPROXIMATE LB/HR.
4200	76	188	SEA LEVEL	180	74	3900
3910	77	188	5,000	180	76	3650
3700	79	188	10,000	180	78	3420
3530	80	188	15,000	180	79	3260
3400	82	188	20,000	180	80	3130
3350	84	190	25,000	182	82	3070
3350	86	193	30,000	184	84	3030
3450	90	198	35,000	187	88	3030
			40,000	192	92	3200
			45,000			
			50,000			

CONFIGURATION: CLEAN WEIGHT: 39,500 POUNDS				CONFIGURATION: CLEAN WEIGHT: 35,000 POUNDS		
APPROXIMATE LB/HR.	APPROXIMATE %RPM	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	APPROXIMATE %RPM	APPROXIMATE LB/HR.
3700	73	171	SEA LEVEL	160	72	3460
3400	75	171	5,000	160	73	3150
3160	76	171	10,000	160	74	2900
3000	77	171	15,000	160	76	2710
2850	79	171	20,000	160	77	2570
2750	80	172	25,000	162	79	2460
2700	82	174	30,000	164	80	2400
2660	85	177	35,000	167	83	2350
2810	90	182	40,000	170	87	2460
2960	96	190	45,000	174	92	2600
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-23

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 35,300 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 30,800 POUNDS

APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB/HR.	%RPM	KNOTS		KNOTS	%RPM	LB/HR.
3470	72	156	SEA LEVEL	145	71	3280
3180	73	156	5,000	145	71	2930
2930	75	156	10,000	145	73	2670
2740	76	156	15,000	145	74	2480
2620	78	158	20,000	145	76	2340
2500	79	158	25,000	150	77	2230
2460	81	160	30,000	150	79	2140
2440	84	163	35,000	150	81	2080
2580	88	166	40,000	155	85	2180
2720	94	170	45,000	160	91	2300
			50,000			

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
/HR.	%RPM				%RPM	/HR.
			SEA LEVEL			
			5,000			
			10,000			
			15,000			
			20,000			
			25,000			
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-24

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 53,000 POUNDS				CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 48,800 POUNDS		
APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB/HR.	%RPM	KNOTS		KNOTS	%RPM	LB/HR.
4440	77	194	SEA LEVEL	185	76	4190
4200	78	194	5,000	185	77	3960
4010	80	194	10,000	185	79	3750
3880	82	194	15,000	185	81	3610
3800	84	195	20,000	187	83	3500
3780	86	195	25,000	187	85	3480
3830	89	198	30,000	190	87	3490
3940	92	202	35,000	193	91	3560
			40,000			
			45,000			
			50,000			

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 44,300 POUNDS				CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 39,800 POUNDS		
APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB/HR.	%RPM	KNOTS		KNOTS	%RPM	LB/HR.
3940	75	176	SEA LEVEL	166	74	3700
3700	77	176	5,000	166	75	3440
3470	78	176	10,000	166	77	3200
3300	79	176	15,000	166	78	3020
3200	81	178	20,000	169	79	2900
3140	83	178	25,000	169	81	2820
3120	85	180	30,000	171	83	2780
3180	88	184	35,000	174	86	2800
3340	94	188	40,000	177	91	2960
			45,000			
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN.
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-25

MAXIMUM ENDURANCE

STANDARD DAY

ONE ENGINE OPERATION

MODEL (S): B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB /HR.	%RPM				%RPM	/HR.
2600	80	142	SEA LEVEL			
2370	81	148	5,000			
2200	82	151	10,000			
2130	83	154	15,000			
2120	86	154	20,000			
2230	89	154	25,000			
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
/HR.	%RPM				%RPM	/HR.
			SEA LEVEL			
			5,000			
			10,000			
			15,000			
			20,000			
			25,000			
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-26

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S): B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 48,500 POUNDS				CONFIGURATION: CLEAN WEIGHT: 44,000 POUNDS		
APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB/HR.	%RPM	KNOTS		KNOTS	%RPM	LB/HR.
3800	88	184	SEA LEVEL	174	86	3500
3630	90	188	5,000	177	88	3320
3540	92	190	10,000	180	89	3200
3550	93	191	15,000	181	91	3180
			20,000	182	92	3300
			25,000			
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

CONFIGURATION: CLEAN WEIGHT: 39,500 POUNDS				CONFIGURATION: CLEAN WEIGHT: 35,000 POUNDS		
APPROXIMATE		CAS	PRESSURE ALTITUDE FEET	CAS	APPROXIMATE	
LB/HR.	%RPM	KNOTS		KNOTS	%RPM	LB/HR.
3200	84	163	SEA LEVEL	153	82	2880
3020	85	168	5,000	158	83	2690
2900	87	171	10,000	161	84	2550
2840	88	172	15,000	163	86	2460
2870	90	173	20,000	163	88	2500
3050	93	173	25,000	164	91	2630
			30,000			
			35,000			
			40,000			
			45,000			
			50,000			

REMARKS:

CAS - CALIBRATED AIRSPEED KN
LB/HR. - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-27

COMBAT ALLOWANCE CHART

CLEAN CONFIGURATION
STANDARD DAY

MODEL: B-57B ENGINES:(TWO) J65-W-5

AT ALTITUDE FEET	FUEL REQUIRED - POUNDS PER MINUTE		
	96.5% RPM NORMAL POWER MAXIMUM CONTINUOUS	100% RPM MILITARY POWER 30 MINUTE LIMIT	FOR LEVEL FLIGHT AT PROVED LIMIT OF NORMAL CONTROL
SEA LEVEL	—	—	210
5,000	—	—	182
10,000	—	—	163
15,000	—	—	157
20,000	150	169	
25,000	124	143	
30,000	104	111	
35,000	91	98	
40,000	65	78	
45,000			

REMARKS:

CLEAN: GROSS WEIGHT = 42,000 LB.

DATA AS OF: 1 OCTOBER 1953
DATA BASIS ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB./GAL.

Figure A-28

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/ HR	TAS KNOTS	CAS KNOTS				CAS	TAS	/HR
12,570	495 x	495 x	94	SEA LEVEL				
10,700	496 x	465 x	93	5,000				
9,610	499 x	438 x	93	10,000				
9,140	504 x	413 x	94	15,000				
8,770	501	380	96.5	20,000				
7,520	492	344	96.5	25,000				
6,350	482	310	96.5	30,000				
5,320	471	279	96.5	35,000				
4,170	464	244	96.5	40,000				
3,200	452	211	96.5	45,000				
				50,000				

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/	TAS	CAS				CAS	TAS	/HR
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

(x) PROVED LIMITS OF NORMAL CONTROL.
(COMPRESSIBILITY, BUFFET AND/OR PITCH CHANGE).

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
LB/HR - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-29

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL(S): B-57B B-57C ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 48,500 POUNDS						CONFIGURATION: CLEAN WEIGHT: 44,000 POUNDS		
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
12,780	495 x	495 x	94	SEA LEVEL	94	495 x	495 x	12,700
11,000	496 x	465 x	93.5	5,000	93.5	465 x	496 x	10,950
9,950	499 x	438 x	93.5	10,000	93.5	438 x	499 x	9,820
9,700	504 x	413 x	95.5	15,000	95	413 x	504 x	9,530
8,750	497	378	96.5	20,000	96.5	379	498	8,750
7,400	485	339	96.5	25,000	96.5	341	487	7,500
6,300	473	304	96.5	30,000	96.5	306	476	6,300
5,250	457	269	96.5	35,000	96.5	272	462	5,250
				40,000	96.5	232	444	4,000
				45,000				
				50,000				

CONFIGURATION: CLEAN WEIGHT: 39,500 POUNDS						CONFIGURATION: CLEAN WEIGHT: 35,000 POUNDS		
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
12,620	495 x	495 x	94	SEA LEVEL	94	495 x	495 x	12,600
10,860	496 x	465 x	93	5,000	93	465 x	496 x	10,750
9,720	499 x	438 x	93	10,000	93	438 x	499 x	9,640
9,360	504 x	413 x	94.5	15,000	94.5	413 x	504 x	9,220
8,740	499	380	96.5	20,000	96.5	380	500	8,750
7,500	489	343	96.5	25,000	96.5	343	490	7,500
6,300	478	308	96.5	30,000	96.5	310	480	6,320
5,250	466	274	96.5	35,000	96.5	278	469	5,280
4,000	452	238	96.5	40,000	96.5	241	459	4,120
				45,000	96.5	207	444	3,200
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
LB/HR - FUEL CONSUMPTION

(x) PROVED LIMITS OF NORMAL CONTROL (COMPRESSIBILITY, BUFFET AND/OR PITCH CHANGE).

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-30

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL : B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 35,300 POUNDS					CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 30,800 POUNDS			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
10,100	434	434	91	SEA LEVEL	91	434	434	10,100
10,100	468	438	93	5,000	93	438	468	10,100
9,300	477	420	92	10,000	92	420	477	9,300
7,500	470	384	91	15,000	91	384	470	7,400
6,000	460	348	90	20,000	90	348	460	5,900
5,000	450	313	89	25,000	88	313	450	4,800
4,200	441	281	89	30,000	88	281	441	4,000
3,500	431	251	88	35,000	87	251	431	3,300
3,100	430	225	91	40,000	89	225	430	2,900
				45,000	93	200	430	2,700
				50,000				

CONFIGURATION: WEIGHT:					CONFIGURATION: WEIGHT:			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/	TAS	CAS				CAS	TAS	/HR
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
/HR - FUEL CONSUMPTION

(1) SPEED LIMITED BY PROVED LIMITS OF NORMAL CONTROL (.75 M ABOVE 8,000 FEET ALTITUDE).

DATA AS OF: 15 DECEMBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-31

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL : B-57B B-57C

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 53,000 POUNDS					CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 48,800 POUNDS			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
10,500	434	434	92	SEA LEVEL	91	434	434	10,300
10,400	468	438	93	5,000	93	438	468	10,300
9,300	477	420	92	10,000	92	420	477	9,300
7,900	470	384	92	15,000	92	384	470	7,700
6,300	460	348	91	20,000	91	348	460	6,300
5,500	450	313	90	25,000	90	313	450	5,400
4,850	441	281	92	30,000	92	281	441	4,850
4,600	431	251	94	35,000	93	251	431	4,500
				40,000				
				45,000				
				50,000				

CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 44,300 POUNDS					CONFIGURATION: 2 X 320 GAL WING TIP TANKS WEIGHT: 39,800 POUNDS			
APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
10,300	434	434	91	SEA LEVEL	91	434	434	10,200
10,300	468	438	93	5,000	93	438	468	10,200
9,300	477	420	92	10,000	92	420	477	9,300
7,600	470	384	91	15,000	91	384	470	7,600
6,300	460	348	91	20,000	90	348	460	6,000
5,400	450	313	90	25,000	89	313	450	5,200
4,600	441	281	91	30,000	90	281	441	4,400
4,000	431	251	92	35,000	90	251	431	3,750
3,900	430	225	96	40,000	93	225	430	3,500
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
LB/HR - FUEL CONSUMPTION

(1) SPEED LIMITED BY PROVED LIMITS OF NORMAL CONTROL (.75 M ABOVE 8,000 FEET ALTITUDE).

DATA AS OF: 15 DECEMBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-32

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE						APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS	%RPM	PRESSURE ALTITUDE FEET	%RPM	CAS	TAS	/HR
6650	355	355	96.5	SEA LEVEL				
5940	362	337	96.5	5,000				
5230	362	317	96.5	10,000				
4550	368	298	96.5	15,000				
3900	365	272	96.5	20,000				
3250	362	247	96.5	25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

CONFIGURATION:
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE						APPROXIMATE		
LB/	TAS	CAS	%RPM	PRESSURE ALTITUDE FEET	%RPM	CAS	TAS	/HR
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
LB /HR - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-33

MAXIMUM CONTINUOUS POWER SUMMARY

STANDARD DAY

MODEL(S): B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION: CLEAN
WEIGHT: 48,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 44,000 POUNDS

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
6550	344	343	96.5	SEA LEVEL	96.5	347	347	6630
5860	343	318	96.5	5,000	96.5	323	348	5880
5130	335	291	96.5	10,000	96.5	302	346	5150
				15,000	96.5	277	348	4410
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

CONFIGURATION: CLEAN
WEIGHT: 39,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 35,000 POUNDS

APPROXIMATE			%RPM	PRESSURE ALTITUDE FEET	%RPM	APPROXIMATE		
LB/HR	TAS KNOTS	CAS KNOTS				CAS KNOTS	TAS KNOTS	LB/HR
6650	350	350	96.5	SEA LEVEL	96.5	354	353	6650
5900	353	328	96.5	5,000	96.5	333	358	5910
5170	353	308	96.5	10,000	96.5	313	358	5200
4500	353	288	96.5	15,000	96.5	292	360	4500
				20,000	96.5	266	355	3860
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
TAS - TRUE AIRSPEED KNOTS
LB/HR - FUEL CONSUMPTION

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-34

AIRCRAFT MODEL (S) B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 30,500 POUNDS OR LESS	EXTERNAL LOAD ITEMS NONE NUMBER OF ENGINES OPERATING:(TWO)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL (1))

IF YOU ARE AT S.L.			FUEL (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	POUNDS	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.	POUNDS	BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
180	45	365	3000	210	45	390	245	45	410	280	45	435	3000	315	45	455
120	45	190	2000	140	45	210	165	45	240	190	45	260	2000	210	45	280
60	15	---	1000	75	15	---	85	25	---	100	35	---	1000	110	35	120

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'					
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												
						80 HW							278	82	4320	242	.69	2
293	80	5000	253	.85	0	40 HW	279	80	4360	260	.84	1	267	80	3870	269	.85	2
272	78	4530	272	1.00	0	0	261	79	3970	280	1.00	1	251	79	3560	290	1.00	2
257	77	4250	297	1.16	0	40 TW	243	77	3680	301	1.16	1	233	77	3290	309	1.15	2
						80 TW							206	76	2920	319	1.34	2
						120 TW												

EFFECTIVE WIND	CRUISING AT 15000'						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.
120 HW							304	84	4260	285	.64	4
80 HW	281	82	4050	270	.72	4	279	83	3770	294	.75	5
40 HW	257	80	3550	281	.86	4	254	81	3330	301	.86	6
0	243	80	3280	302	1.00	4	239	80	3090	322	1.00	6
40 TW	225	78	3000	321	1.16	4	223	79	2840	341	1.15	6
80 TW	211	77	2810	343	1.32	4	214	78	2710	369	1.30	7
120 TW							201	77	2580	393	1.46	8

Figure A-35

AIRCRAFT MODEL (S) B-57B B-57C	HIGH ALTITUDE	EXT. LOAD NONE
ENGINE (S): J65-W-5	CHART WT. LIMITS 30,500 POUNDS OR LESS	NO. OF ENGINES OPERATING: (TWO)

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

IF YOU ARE AT 25000'			FUEL POUNDS	IF YOU ARE AT 30000'			IF YOU ARE AT 35000'			IF YOU ARE AT 40000'			FUEL POUNDS	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.
360	45	475	3000	415	45	500	470	45	515	520	45	530	3000	545	45	----
240	45	300	2000	275	45	320	315	45	340	350	45	355	2000	365	45	----
125	35	135	1000	140	35	150	160	40	---	180	40	---	1000	190	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.
283	84	3740	292	.66	6	120 HW	262	84	3260	294	.66	8	241	84	2810	295	.68	12	220	86	2530	304	.71	16	120 HW	196	91	2450	306	.71	21
269	83	3460	312	.76	7	80 HW	255	83	3110	322	.76	10	236	83	2730	329	.78	13	217	86	2500	340	.80	18	80 HW	195	95	2420	344	.81	23
251	82	3160	326	.87	8	40 HW	245	83	2900	348	.88	11	232	83	2630	360	.89	15	215	86	2480	377	.90	20	40 HW	194	90	2400	383	.90	26
238	81	2930	347	1.00	9	0	235	82	2740	372	1.00	12	227	83	2540	392	1.00	17	215	85	2460	417	1.00	22	0	194	90	2400	423	1.00	29
228	80	2800	374	1.13	10	40 TW	229	81	2670	402	1.11	13	225	82	2520	429	1.10	19	213	85	2450	453	1.09	24	40 TW	193	90	2400	459	1.08	32
215	79	2640	396	1.27	11	80 TW	218	80	2540	427	1.24	14	221	82	2460	463	1.22	21	211	85	2410	489	1.20	26	80 TW	193	90	2400	499	1.19	35
206	78	2520	422	1.41	12	120 TW	212	80	2420	458	1.36	16	214	82	2400	492	1.33	22	208	85	2380	525	1.30	28	120 TW	191	89	2350	536	1.29	37

SPECIAL NOTES

1 Climb at 100% RPM
2 Multiple Nautical units by 1.15to 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 10,000 ft. with 3000 lb. of available fuel, you can fly 245 nautical airmiles by holding 251 knots CAS. However, you can fly 410 nautical airmiles by immediately climbing to 45,000 ft. using 100% RPM. At 45,000 ft. cruise at 194 knots CAS and start let down 29 nautical miles from home. With an 80 knot headwind, the range at 45,000 ft. would be .81 x 410 or 332 nautical miles. Cruise at 195 knots CAS with this wind and start let down 23 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 FOR INTERPOLATION PURPOSES ONLY

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-36

AIRCRAFT MODEL (S) B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 48,800 TO 44,300 POUNDS	EXTERNAL LOAD ITEMS 2 X 320 GAL WING TIP TANKS CARRIED ENTIRE DISTANCE NUMBER OF ENGINES OPERATING: (TWO)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	POUNDS	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.	POUNDS	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	35	2330	19,318	1200	35	2355	1355	35	2375	1535	35	2395	19,318	1720	35	2415
985	35	2135	18,000	1110	35	2155	1255	35	2175	1415	35	2195	18,000	1590	35	2215
930	35	1985	17,000	1050	35	2005	1185	35	2025	1330	35	2045	17,000	1495	35	2060
875	35	1835	16,000	990	35	1855	1115	35	1880	1255	35	1900	16,000	1400	35	1920
820	35	1695	15,000	925	35	1715	1045	35	1740	1175	35	1755	15,000	1305	35	1775
770	35	1585	14,000	865	35	1610	980	35	1630	1100	35	1650	14,000	1225	35	1665
715	35	1490	13,000	810	35	1510	915	35	1530	1025	35	1550	13,000	1145	35	1570
665	35	1385	12,000	755	35	1410	850	35	1430	955	35	1450	12,000	1065	35	1470
610	35	1265	11,000	690	35	1290	780	35	1310	880	35	1335	11,000	980	35	1355

EFFECTIVE WIND	CRUISING AT S.L. C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 5000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 10000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW																		
80 HW													331	87	7980	301	.72	2
40 HW	307	82	6050	267	.85	0	307	84	5660	290	.87	1	307	85	5450	314	.88	2
0	288	82	5530	288	1.00	0	291	83	5320	313	1.00	1	292	84	5090	336	1.00	2
40 TW	279	81	5320	319	1.15	0	280	82	5060	341	1.14	1	278	83	4900	362	1.12	2
80 TW													263	82	4750	384	1.22	2
120 TW																		

EFFECTIVE WIND	CRUISING AT 15000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 20000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW							323	88	5480	311	.69	5
80 HW	322	87	5600	319	.78	4	310	88	5110	334	.80	5
40 HW	305	86	5240	338	.88	4	297	87	4890	358	.89	6
0	291	85	4810	360	1.00	4	285	87	4640	381	1.00	6
40 TW	277	84	4620	384	1.13	4	274	86	4430	407	1.12	6
80 TW	266	84	4520	411	1.24	4	266	85	4310	438	1.23	7
120 TW							258	85	4150	466	1.37	7

Figure A-53

AIRCRAFT MODEL (S) B-57B B-57C

ENGINE (S): J65-W-5

HIGH ALTITUDE

CHART WT. LIMITS 48,800 TO 44,300 POUNDS

EXT. LOAD
2 X 320 GAL WING TIP TANKS
CARRIED ENTIRE DISTANCE
NO. OF ENGINES OPERATING: (TWO)

IF YOU ARE AT 25000'			FUEL	IF YOU 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.	POUNDS	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.	POUNDS	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
				(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)												
1920	35	2430	19,318	2155	35	2450	2345	---	2460				19,318			
1785	35	2230	18,000	1990	35	2250	2155	---	2265				18,000			
1670	35	2075	17,000	1865	35	2095	2015	---	2110				17,000			
1565	35	1935	16,000	1745	35	1955	1890	---	1965				16,000			
1455	35	1795	15,000	1630	35	1815	1765	---	1825				15,000			
1365	35	1685	14,000	1530	35	1700	1660	---	1710				14,000			
1275	35	1585	13,000	1430	35	1605	1560	---	1615				13,000			
1190	35	1485	12,000	1330	35	1505	1450	---	1515				12,000			
1100	35	1375	11,000	1230	35	1390	1350	---	1405				11,000			

EFFECTIVE WIND	CRUISING AT 25000' C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 30000' C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 35000' C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW	295	88	4850	309	.70	7	273	90	4400	309	.70	9	250	91	4100	309	.71	13
80 HW	290	88	4650	340	.80	7	269	89	4300	344	.80	10	247	91	4060	345	.80	14
40 HW	284	88	4530	373	.90	8	266	89	4240	379	.89	11	246	91	4010	383	.90	15
0	277	88	4370	401	1.00	9	265	89	4140	415	1.00	12	245	91	3980	420	1.00	17
40 TW	270	86	4260	432	1.11	10	260	88	4100	450	1.10	13	243	91	3950	458	1.10	19
80 TW	262	86	4160	462	1.21	11	257	88	4000	485	1.21	14	242	90	3940	497	1.19	20
120 TW	257	86	4080	495	1.32	11	252	88	3940	518	1.31	15	241	90	3880	535	1.31	21

EFFECTIVE WIND	CRUISING AT 40000' C.A.S.	APPROXIMATE % RPM	/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 45000' C.A.S.	APPROXIMATE % RPM	/HR	G.S.	R.F.	LET DOWN DIST.
120 HW												
80 HW												
40 HW												
0												
40 TW												
80 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.

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at 15,000 ft. with 13,000 lb. of available fuel, you can fly 1025 nautical miles by holding 291 knots CAS. However, you can fly 1550 nautical miles by immediately climbing to 35,000 ft. at 100% RPM. At 35,000 ft. cruise at 245 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 40,000 ft. is attained. At 40,000 ft. cruise at 320 knots CAS and start let down 22 nautical miles from home. With an 40 knot tailwind, the range at optimum altitude would be 1.10 x 1550 or 1705 nautical miles. Cruise at 220 knots CAS and start let down 24 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-54

AIRCRAFT MODEL B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 53,000 TO 48,800 POUNDS	EXTERNAL LOAD ITEMS 2 X 320 GAL WING TIP TANKS CARRIED ENTIRE DISTANCE NUMBER OF ENGINES OPERATING: (TWO)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES			POUNDS	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			POUNDS	RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT. ALT.		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.		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))												
(1035)	35	(2125)	19,316	(1175)	35	(2150)	(1325)	35	(2175)	(1485)	35	(2200)	19,318	(1655)	35	(2220)
975	35	2000	18,000	1095	35	2020	(1240)	35	(2040)	(1390)	35	(2060)	18,000	(1550)	35	(2085)
925	35	1895	17,000	1045	35	1915	1175	35	1940	1320	35	1960	17,000	1470	35	1980
870	35	1795	16,000	985	35	1815	1115	35	1840	1250	35	1860	16,000	1390	35	1880
820	35	1695	15,000	925	35	1715	1045	35	1740	1175	35	1760	15,000	1310	35	1780

CRUISING AT S.L.						EFFECTIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'					
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.
						120 HW																		
						80 HW							334	87	6420	304	.74	2	326	88	5780	324	.78	4
311	83	6240	271	.85	0	40 HW	313	85	5880	296	.87	1	312	86	5630	320	.88	2	309	87	5430	344	.88	4
293	82	5740	293	1.00	0	0	297	83	5520	319	1.00	1	298	84	5310	343	1.00	2	296	86	5100	367	1.00	4
284	82	5540	324	1.14	0	40 TW	286	83	5260	347	1.14	1	286	84	5130	370	1.12	2	283	85	4840	392	1.12	4
						80 TW							269	83	4950	391	1.22	2	273	84	4680	419	1.24	4
						120 TW																		

EFFECTIVE WIND	CRUISING AT 20000'					
	C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW	325	88	5590	313	.70	5
80 HW	313	88	5260	338	.80	5
40 HW	304	87	5070	365	.90	6
0	290	67	4830	338	1.00	6
40 TW	279	86	4600	414	1.12	6
80 TW	271	85	4480	443	1.23	7
120 TW	263	85	4330	473	1.36	7

Figure A-55

AIRCRAFT MODEL (S) B-57B B-57C ENGINE (S): J65-W-5				**HIGH ALTITUDE** CHART WT. LIMITS 53,000 TO 48,800 POUNDS									EXT. LOAD 2 X 320 GAL WING TIP TANKS CARRIED ENTIRE DISTANCE NO. OF ENGINES OPERATING: (TWO)			
IF YOU ARE AT 25000'			FUEL	IF YOU 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.	POUNDS	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.	POUNDS	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
				(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)												
(1840)	35	(2240)	19,318	(2055)	35	(2255)	(2220)	35	(2270)				19,318			
(1720)	35	(2100)	18,000	(1925)	35	(2120)	(2080)	35	(2130)				18,000			
1635	35	2000	17,000	1830	35	2015	1975	35	2030				17,000			
1545	35	1900	16,000	1730	35	1915	1875	35	1930				16,000			
1455	35	1795	15,000	1630	35	1815	1765	35	1825				15,000			

EFFECTIVE WIND	CRUISING AT 25000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 30000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW	300	89	5000	315	.70	7	273	90	4470	310	.70	9
80 HW	292	88	4820	344	.79	7	270	90	4410	345	.80	10
40 HW	287	88	4660	376	.89	8	267	89	4290	380	.90	11
0	279	88	4470	404	1.00	9	265	89	4220	416	1.00	12
40 TW	273	87	4370	437	1.11	10	262	89	4180	453	1.10	13
80 TW	265	87	4300	467	1.20	11	257	88	4130	486	1.20	14
120 TW	261	87	4200	500	1.32	11	254	88	4030	520	1.31	15

EFFECTIVE WIND	CRUISING AT 35000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 40000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW	251	92	4170	310	.71	13						
80 HW	247	91	4120	346	.81	14						
40 HW	246	91	4080	384	.90	15						
0	245	91	4040	421	1.00	17						
40 TW	243	91	4000	459	1.10	19						
80 TW	242	91	4000	496	1.19	20						
120 TW	241	91	3950	535	1.30	21						

EFFECTIVE WIND	CRUISING AT 45000' C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
120 HW						
80 HW						
40 HW						
0						
40 TW						
80 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.

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at 15,000 ft. with 18,000 lb. of available fuel, you can fly 1390 nautical miles by holding 296 knots CAS. However, you can fly 2060 nautical miles by immediately climbing to 35,000 ft. at 100% RPM. At 35,000 ft. cruise at 245 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 40,000 ft. is attained. At 40,000 ft. cruise at 220 knots CAS and start let down 22 nautical miles from home. With an 80 knot headwind, the range at optimum altitude would be .80 x 2060 or 1648 nautical miles. Cruise at 220 knots CAS and start let down 18 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-56

AIRCRAFT MODEL B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 53,000 TO 48,800 POUNDS	EXTERNAL LOAD ITEMS 2 X 320 GAL WING TIP TANKS DROPPED WHEN EMPTY NUMBER OF ENGINES OPERATING:(TWO)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	POUNDS	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.	POUNDS	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	35	2215	19,318	(1210)	35	(2240)	(1365)	35	(2265)	(1535)	35	(2295)	19,318	(1710)	35	(2310)
995	35	2080	18,000	1135	35	2105	(1280)	35	(2130)	(1445)	35	(2160)	18,000	(1605)	35	(2175)
945	35	1980	17,000	1075	35	2005	1215	35	2030	1370	35	2055	17,000	1525	35	2070
890	35	1875	16,000	1020	35	1900	1150	35	1925	1295	35	1950	16,000	1445	35	1970
840	35	1760	15,000	965	35	1785	1090	35	1810	1225	35	1830	15,000	1365	35	1850

EFFECTIVE WIND	CRUISING AT S.L. C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 5000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 10000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW																		
80 HW													334	87	6420	304	.74	2
40 HW	311	83	6240	271	.85	0	313	85	5880	296	.87	1	312	86	5630	320	.88	2
0	293	82	5740	293	1.00	0	297	83	5520	319	1.00	1	298	84	5310	343	1.00	2
40 TW	284	82	5540	324	1.14	0	286	83	5260	347	1.14	1	286	84	5130	370	1.12	2
80 TW													269	83	4950	391	1.22	2
120 TW																		

EFFECTIVE WIND	CRUISING AT 15000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 20000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW							325	88	5590	313	.70	5
80 HW	326	88	5780	324	.78	4	313	88	5260	338	.80	5
40 HW	309	87	5430	344	.88	4	304	87	5070	365	.90	6
0	296	86	5100	367	1.00	4	290	87	4830	388	1.00	6
40 TW	283	85	4840	392	1.12	4	279	86	4600	414	1.12	6
80 TW	273	84	4680	419	1.24	4	271	85	4480	443	1.23	7
120 TW							263	85	4330	473	1.36	7

Figure A-57

AIRCRAFT MODEL B-57B B-57C ENGINE (S): J65-W-5	HIGH ALTITUDE CHART WT. LIMITS 53,000 TO 48,800 POUNDS	EXT. LOAD 2 X 320 GAL WING TIP TANKS DROPPED WHEN EMPTY NO. OF ENGINES OPERATING: (TWO)

IF YOU ARE AT 25000'			FUEL	IF YOU 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.	POUNDS	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.	POUNDS	BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
				(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)												
(1945)	35	(2330)	19,318	(2145)	35	(2345)	(2295)	35	(2365)				19,318			
(1830)	35	(2195)	18,000	(2015)	35	(2215)	(2160)	35	(2230)				18,000			
1740	35	2090	17,000	1915	35	2110	2055	35	2120				17,000			
1650	35	1990	16,000	1815	35	2005	1950	35	2020				16,000			
1560	35	1875	15,000	1730	35	1890	1845	35	1905				15,000			

EFFECTIVE WIND	CRUISING AT 25000'						CRUISING AT 30000'						CRUISING AT 35000'					
	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	300	89	5000	315	.70	7	273	90	4470	310	.70	9	251	92	4170	310	.71	13
80 HW	292	88	4820	344	.79	7	270	90	4410	345	.80	10	247	91	4120	346	.81	14
40 HW	287	88	4660	376	.89	8	267	89	4290	380	.90	11	246	91	4080	384	.98	15
0	279	88	4470	404	1.00	9	265	89	4220	416	1.00	12	245	91	4040	421	1.00	17
40 TW	273	87	4370	437	1.11	10	262	89	4180	453	1.10	13	243	91	4000	459	1.10	19
80 TW	265	87	4300	467	1.20	11	257	88	4130	486	1.20	14	242	91	4000	496	1.19	20
120 TW	261	87	4200	500	1.32	11	254	88	4030	520	1.31	15	241	91	3950	535	1.30	21

EFFECTIVE WIND	CRUISING AT 40000'						CRUISING AT 45000'					
	C.A.S.	APPROXIMATE % RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	APPROXIMATE % RPM	/HR	G.S.	R.F.	LET DOWN DIST.
120 HW												
80 HW												
40 HW												
0												
40 TW												
80 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.

BASED ON: ESTIMATES

DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at Sea Level with 17,000 lb. of available fuel, you can fly 945 nautical miles by holding 293 knots CAS. However, you can fly 1980 nautical miles by immediately climbing to 35,000 ft. at 100% RPM. At 35,000 cruise at 245 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 40,000 ft. is attained. At 40,000 ft. cruise at 221 knots CAS and start let down 22 nautical miles from home. With an 80 knot headwind, the range at optimum altitude would be .80 x 1980 or 1585 nautical miles. Cruise at 221 knots CAS and start let down 18 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-58

AIRCRAFT MODEL (S) B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 30,500 POUNDS OR LESS	EXTERNAL LOAD ITEMS NONE NUMBER OF ENGINES OPERATING: (ONE)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL [2])

IF YOU ARE AT S.L. (RANGE IN AIRMILES) BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	FUEL POUNDS [1]	IF YOU ARE AT 5000' (RANGE IN AIRMILES) BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	IF YOU ARE AT 10000' (RANGE IN AIRMILES) BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	IF YOU ARE AT 15000' (RANGE IN AIRMILES) BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	FUEL POUNDS [1]	IF YOU ARE AT 20000' (RANGE IN AIRMILES) BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
205	25	255	3000	235	25	280	260	25	300	290	25	315	3000	320	25	335
135	15	150	2000	155	20	165	175	25	185	195	25	205	2000	215	25	220
70		---	1000	80		---	90		---	100	--	---	1000	110	--	---

EFFECTIVE WIND	CRUISING AT S.L. C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 5000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW												
80 HW												
40 HW	271	88	4170	231	.82	0	260	89	3700	239	.83	1
0	248	86	3670	248	1.00	0	241	87	3330	258	1.00	1
40 TW	226	84	3330	266	1.18	0	221	85	3070	278	1.17	1
80 TW												
120 TW												

EFFECTIVE WIND	CRUISING AT 10000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 15000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW												
80 HW	272	92	3830	233	.70	2	258	92	3500	240	.71	2
40 HW	250	90	3420	249	.84	2	241	90	3190	260	.85	3
0	232	87	3090	268	1.00	2	224	88	2910	279	1.00	3
40 TW	217	86	2890	292	1.16	2	211	87	2720	305	1.16	3
80 TW	205	85	2730	318	1.34	2	203	87	2610	334	1.33	4
120 TW												

EFFECTIVE WIND	CRUISING AT 20000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
120 HW	266	96	3670	236	.61	3
80 HW	247	93	3280	252	.73	4
40 HW	232	92	3000	272	.86	4
0	219	90	2810	296	1.00	5
40 TW	201	89	2640	321	1.15	6
80 TW	199	88	2530	349	1.31	6
120 TW	194	88	2470	383	1.47	7

Figure A-59

AIRCRAFT MODEL (S) B-57B B-57C

ENGINE (S): J65-W-5

HIGH ALTITUDE

CHART WT. LIMITS 30,500 POUNDS OR LESS

EXT. LOAD NONE

NO. OF ENGINES OPERATING: (ONE)

IF YOU ARE AT 25000' RANGE IN AIRMILES BY CRUISING AT 25000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	FUEL POUNDS	IF YOU ARE AT 30000' RANGE IN AIRMILES BY CRUISING AT 30000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 35000' RANGE IN AIRMILES BY CRUISING AT 35000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	IF YOU ARE AT 40000' RANGE IN AIRMILES BY CRUISING AT 40000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.	FUEL	IF YOU ARE AT 45000' RANGE IN AIRMILES BY CRUISING AT 45000'	OPT ALT. 1000 FT.	BY CRUISING AT OPT. ALT.
350	--	----	3000													
235	--	----	2000													
120	--	----	1000													

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL)

CRUISING AT 25000' C.A.S.	APPROXIMATE % RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 30000' C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 35000' C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 40000' C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 45000' C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
--	--	---	--	---	--	120 HW																			120 HW						
241	96	3170	271	.75	7	80 HW																			80 HW						
226	94	2940	291	.86	7	40 HW																			40 HW						
216	93	2740	317	1.00	8	0																			0						
204	92	2610	341	1.14	9	40 TW																			40 TW						
198	91	2510	371	1.28	9	80 TW																			80 TW						
194	91	2470	406	1.43	10	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 15,000 ft. with 3000 lb. of available fuel, you can fly 290 nautical airmiles by holding 224 knots CAS. However, you can fly 315 nautical airmiles by immediately climbing to 25,000 ft. using 100% RPM. At 25,000 ft. cruise at 216 knots CAS and start let down 8 nautical miles from home. With a 40 knot tailwind the range at 25,000 ft. would be 1.14 x 315 or 359 nautical miles. Cruise at 204 knots CAS with this wind and start let down 9 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- Nauticalmiles
( ) RANGE IN PARENTHESIS FOR INTERPOLATION PURPOSES ONLY

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-60

AIRCRAFT MODEL (S) B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 35,000 TO 30,500 POUNDS	EXTERNAL LOAD ITEMS NONE NUMBER OF ENGINES OPERATING: (ONE)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL POUNDS (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL POUNDS (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.		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.		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))												
460	20	650	7000	520	20	665	585	20	690	645	20	705	7000	705	20	710
395	20	530	6000	445	20	550	500	20	570	550	20	590	6000	605	--	---
330	20	425	5000	370	20	445	415	20	460	460	20	480	5000	505	--	---
265	20	325	4000	295	20	340	330	20	360	365	20	380	4000	400	--	---
200	20	230	3000	225	20	245	250	20	265	275	20	285	3000	300	--	---
130	10	140	2000	150	15	150	165	--	---	185	--	---	2000	205	--	---
65	--	---	1000	75	--	---	85	--	---	90	--	---	1000	100	--	---

CRUISING AT S.L.						EFFEC-TIVE WIND	CRUISING AT 5000'						CRUISING AT 10000'						CRUISING AT 15000'						EFFEC-TIVE WIND	CRUISING AT 20000'					
	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.
						120 HW																			120 HW	---	--	----	---	---	---
						80 HW							277	93	4130	240	.71	2	263	94	3790	247	.72	2	80 HW	250	94	3530	256	.74	4
280	89	4460	240	.83	0	40 HW	271	90	4070	251	.84	1	260	91	3740	260	.85	2	249	92	3530	270	.85	3	40 HW	239	93	3320	282	.86	4
259	88	4000	259	1.00	0	0	252	88	3680	270	1.00	1	244	89	3450	282	1.00	2	236	91	3270	294	1.00	3	0	230	93	3100	310	1.00	5
243	86	3700	283	1.18	0	40 TW	237	87	3470	295	1.16	1	231	89	3250	308	1.16	2	226	90	3130	323	1.15	3	40 TW	213	92	3010	338	1.14	6
						80 TW							225	88	3170	340	1.32	2	219	89	3030	354	1.30	4	80 TW	212	91	2900	367	1.29	6
						120 TW																			120 TW	212	91	2900	407	1.44	7

Figure A-61

AIRCRAFT MODEL (S) B-57B B-57C

ENGINE (S): J65-W-5

HIGH ALTITUDE

CHART WT. LIMITS 35,000 TO 30,500 POUNDS

EXT. LOAD NONE

NO. OF ENGINES OPERATING: (ONE)

IF YOU ARE AT 25000'			FUEL	IF YOU 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.		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'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW												
						80 HW												
						40 HW												
						0												
						40 TW												
						80 TW												
						120 TW												

CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW						
						80 HW						
						40 HW						
						0						
						40 TW						
						80 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.

BASED ON: ESTIMATES

DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at 5000 ft. with 3000 lb. of available fuel, you can fly 225 nautical airmiles by holding 252 knots CAS. However, you can fly 245 nautical airmiles by immediately climbing to 20,000 ft. using 100% RPM. At 20,000 ft. cruise at 230 knots CAS and start let down 5 nautical miles from home. With an 80 knot tailwind, the range at 20,000 ft. would be 1.29 x 245 or 316 nautical miles. Cruise at 212 knots CAS with this wind and start let down 6 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-62

AIRCRAFT MODEL (S) B-57B B-57C	FLIGHT OPERATION INSTRUCTION CHART	EXTERNAL LOAD ITEMS
ENGINE(S) J65-W-5	STANDARD DAY CHART WT. LIMITS 39,500 TO 35,000 POUNDS	NONE NUMBER OF ENGINES OPERATING: (ONE)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

(RANGE FIGURES INCLUDE ALLOWANCES FOR PRESCRIBED CLIMB & DESCENT TO SEA LEVEL[1])

IF YOU ARE AT S.L. — RANGE IN AIRMILES: BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	FUEL[1] POUNDS	IF YOU ARE AT 5000' — BY CRUISING AT 5000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	IF YOU ARE AT 10000' — BY CRUISING AT 10000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	IF YOU ARE AT 15000' — BY CRUISING AT 15000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	FUEL[1] POUNDS	IF YOU ARE AT 20000' — BY CRUISING AT 20000'	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.
765	15	1085	12,000	870	15	1105	975	15	1125	1075	15	1140	12,000			
700	15	965	11,000	790	15	985	885	15	1005	980	15	1020	11,000			
635	15	855	10,000	715	15	870	800	15	895	885	15	910	10,000			
570	15	755	9,000	645	15	770	720	15	795	790	15	810	9,000			
510	15	655	8,000	570	15	675	635	15	695	700	15	710	8,000			
440	15	560	7,000	495	15	575	550	15	600	610	15	610	7,000			
380	15	470	6,000	430	15	485	475	15	500	520	--	---	6,000			
315	15	380	5,000	355	15	390	395	15	410	435	--	---	5,000			
250	15	295	4,000	285	15	305	320	--	---	350	--	---	4,000			
190	15	210	3,000	215	15	225	240	--	---	265	--	---	3,000			
130	--	---	2,000	145	--	---	165	--	---	180	--	- --	2,000			

CRUISING AT S.L. — C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 5000' — C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW						
						80 HW						
288	91	4770	248	.84	0	40 HW	278	92	4390	259	.85	1
269	89	4330	269	1.00	0	0	263	90	4040	282	1.00	1
256	88	4080	296	1.17	0	40 TW	250	90	3830	309	1.16	1
						80 TW						
						120 TW						

CRUISING AT 10000' — C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 15000' — C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 20000' — C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
												120 HW						
284	94	4440	247	.72	2	269	95	4120	254	.73	2	80 HW						
270	93	4120	272	.85	2	257	94	3880	281	.85	3	40 HW						
255	91	3820	295	1.00	2	248	93	3640	308	1.00	3	0						
246	91	3650	324	1.15	2	240	92	3530	340	1.14	3	40 TW						
240	90	3580	358	1.29	2	235	92	3450	373	1.27	4	80 TW						
												120 TW						

Figure A-63

AIRCRAFT MODEL (S) B-57B B-57C	HIGH ALTITUDE	EXT. LOAD NONE
ENGINE (S): J65-W-5	CHART WT. LIMITS 39,500 TO 35,000 POUNDS	NO. OF ENGINES OPERATING:(ONE)

HIGH ALTITUDE

IF YOU ARE AT 25000'			FUEL	IF YOU 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.		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'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW												
						80 HW												
						40 HW												
						0												
						40 TW												
						80 TW												
						120 TW												

CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW						
						80 HW						
						40 HW						
						0						
						40 TW						
						80 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.

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at 5000 ft. with 10,000 lb. of available fuel, you can fly 715 nautical miles by holding 263 knots CAS. However, you can fly 870 nautical miles by immediately climbing to 15,000 ft. at 100% RPM. At 15,000 ft. cruise at 248 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 20,000 ft. is attained. At 20,000 ft. cruise at 230 knots CAS and start let down 5 nautical miles from home. With an 80 knot headwind, the range at optimum altitude would be .74 x 870 or 640 nautical miles. Cruise at 250 knots CAS and start let down 4 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-64

AIRCRAFT MODEL (S) B-57B B-57C

ENGINE(S) J65-W-5

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WT. LIMITS 44,000 TO 39,500 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: (ONE)

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: 1 OCTOBER 1953

BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL POUNDS (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL POUNDS (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.		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.		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))												
950	15	1290	15,158	1070	15	1310	1190	15	1325	1305	15	1340	15,158			
875	15	1170	14,000	980	15	1190	1090	15	1205	1195	15	1220	14,000			
810	15	1070	13,000	910	15	1090	1005	15	1110	1105	15	1130	13,000			
740	15	975	12,000	830	15	995	920	15	1015	1015	15	1035	12,000			
680	15	880	11,000	760	15	900	840	15	920	925	15	940	11,000			
615	15	795	10,000	690	15	810	765	15	830	840	15	850	10,000			
555	15	705	9,000	620	15	725	690	15	745	760	15	760	9,000			
495	15	620	8,000	555	15	640	615	15	655	675	--	----	8,000			
435	15	535	7,000	490	15	555	545	15	570	595	--	----	7,000			
380	15	455	6,000	425	15	475	470	15	490	520	--	----	6,000			

CRUISING AT S.L. C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 5000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	CRUISING AT 10000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW												
						80 HW							291	96	4800	256	.73	2
295	92	5020	255	.85	0	40 HW	287	93	4770	269	.85	1	280	94	4500	283	.86	2
280	90	4680	280	1.00	0	0	273	91	4420	293	1.00	1	265	93	4190	306	1.00	2
267	90	4480	307	1.15	0	40 TW	267	91	4140	327	1.15	1	260	93	4090	341	1.14	2
						80 TW							254	92	3990	374	1.28	2
						120 TW												

CRUISING AT 15000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.	EFFECTIVE WIND	CRUISING AT 20000' C.A.S.	% RPM	LB/HR	G.S.	R.F.	LET DOWN DIST.
						120 HW						
---	--	---	--	----	---	80 HW						
270	96	4280	293	.86	3	40 HW						
260	95	4030	322	1.00	3	0						
253	95	3980	356	1.12	3	40 TW						
249	94	3910	391	1.26	4	80 TW						
						120 TW						

Figure A–65

AIRCRAFT MODEL (S) B-57B B-57C ENGINE (S): J65-W-5	HIGH ALTITUDE CHART WT. LIMITS 44,000 TO 39,500 POUNDS	EXT. LOAD NONE NO. OF ENGINES OPERATING: (ONE)

IF YOU ARE AT 25000'			FUEL	IF YOU 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.		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'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE							APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/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.

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at S.L. with 15,158 lb. of available fuel, you can fly 950 nautical miles by holding 280 knots CAS. However, you can fly 1290 nautical miles by immediately climbing to 15,000 ft. at 100% RPM. At 15,000 ft. cruise at 260 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 20,000 ft. is attained. At 20,000 ft. cruise at 230 knots CAS and start let down 5 nautical miles from home. With an 80 knot tailwind, the range at optimum altitude would be 1.29 x 1290 or 1660 nautical miles. Cruise at 212 knots CAS and start let down 6 nautical miles from destination.

LEGEND

EFFECTIVE WIND-HW, Headwind, TW, Tailwind- Knots
R.F.-Range factor-Ratio of ground distance to air miles 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-66

AIRCRAFT MODEL (S) B-57B B-57C

ENGINE (S): J65-W-5

HIGH ALTITUDE

CHART WT. LIMITS 48, 500 TO 44, 000 POUNDS

EXT. LOAD NONE

NO. OF ENGINES OPERATING:(ONE)

IF YOU ARE AT 25000'			FUEL	IF YOU 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.		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'						EFFECTIVE WIND	CRUISING AT 30000'						CRUISING AT 35000'						CRUISING AT 40000'						EFFECTIVE WIND	CRUISING AT 45000'					
	APPROXIMATE							APPROXIMATE						APPROXIMATE						APPROXIMATE							APPROXIMATE				
C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.	C.A.S.	% RPM	/HR	G.S.	R.F.	LET DOWN DIST.		C.A.S.	% RPM	/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.

BASED ON: ESTIMATES
DATA AS OF: 1 OCTOBER 1953

EXAMPLE

If you are at 5000 ft. with 14,000 lb. of available fuel, you can fly 950 nautical miles by holding 282 knots CAS. However, you can fly 1085 nautical miles by immediately climbing to 10,000 ft. at 100% RPM. At 10,000 ft. cruise at 274 knots CAS. When reduced weight allows, continue climbs to and cruises at higher altitudes until 20,000 ft. is attained. At 20,000 ft. cruise at 230 knots CAS and start let down 5 nautical miles from home. With an 40 knot headwind, the range at optimum altitude would be .86 x 1085 or 934 nautical miles. Cruise at 239 knots CAS and start let down 4 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 FOR INTERPOLATION PURPOSES ONLY

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-67

AIRCRAFT MODEL (S) B-57B B-57C ENGINE(S) J65-W-5	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY CHART WT. LIMITS 48,500 TO 44,000 POUNDS	EXTERNAL LOAD ITEMS NONE NUMBER OF ENGINES OPERATING:(ONE)

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: 1 OCTOBER 1953 BASED ON: ESTIMATES

LOW ALTITUDE

IF YOU ARE AT S.L.			FUEL (1)	IF YOU ARE AT 5000'			IF YOU ARE AT 10000'			IF YOU ARE AT 15000'			FUEL (1)	IF YOU ARE AT 20000'		
RANGE IN AIRMILES				RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES				RANGE IN AIRMILES		
BY CRUISING AT S.L.	OPT. ALT. 1000 FT	BY CRUISING AT OPT.ALT.	POUNDS	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.	POUNDS	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))												
915	10	1140	15,158	1120	10	1165	1125	10	1180				15,158			
850	10	1070	14,000	950	10	1085	1050	10	1105				14,000			
790	10	1005	13,000	885	10	1020	980	10	1030				13,000			
735	10	935	12,000	820	10	950	910	10	965				12,000			
675	10	860	11,000	760	10	875	840	10	890				11,000			
615	10	785	10,000	695	10	805	770	10	820				10,000			

EFFECTIVE WIND	CRUISING AT S.L.						CRUISING AT 5000'					
	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.
120 HW												
80 HW												
40 HW	302	93	5390	262	.85	0	296	95	5140	278	.85	1
0	288	92	5030	288	1.00	0	282	93	4780	303	1.00	1
40 TW	276	91	4790	316	1.15	0	276	93	4640	338	1.15	1
80 TW												
120 TW												

EFFECTIVE WIND	CRUISING AT 10000'						CRUISING AT 15000'						CRUISING AT 20000'					
	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.
120 HW																		
80 HW																		
40 HW	291	96.5	5130	298	.86	2												
0	274	95	4600	317	1.00	2												
40 TW	273	95	4600	356	1.13	2												
80 TW	268	94	4470	390	1.26	2												
120 TW																		

Figure A–68

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) B-57B B-57C | ZERO WIND | ENGINE(S): (TWO) J65-W-5

CONFIGURATION. CLEAN WEIGHT: 30,500 POUNDS					CONFIGURATION: WEIGHT:			
APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE	
%RPM	MI/ LB						MI/	%RPM
78	.0600	.41	272	SEA LEVEL				
79	.0705	.43	261	5,000				
79	.0815	.46	251	10,000				
80	.0923	.48	243	15,000				
80	.1044	.52	239	20,000				
81	.1185	.58	238	25,000				
82	.1358	.63	235	30,000				
83	.1541	.68	227	35,000				
85	.1694	.73	215	40,000				
90	.1767	.74	194	45,000				
				50,000				

CONFIGURATION. WEIGHT:					CONFIGURATION: WEIGHT:			
APPROXIMATE		MACH NO.	CAS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE	
%RPM	MI/						MI/	%RPM
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB- NAUT MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-69

MAXIMUM RANGE SUMMARY

STANDARD DAY

ZERO WIND

MODEL(S) B-57B

ENGINE(S): (TWO) J65-W-5

CONFIGURATION: CLEAN WEIGHT: 48,500 POUNDS					CONFIGURATION: CLEAN WEIGHT: 44,000 POUNDS			
APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
82	.0539	.45	298	SEA LEVEL	293	.44	.0556	81
82	.0611	.49	299	5,000	290	.48	.0633	81
83	.0685	.54	299	10,000	287	.52	.0714	82
85	.0767	.59	298	15,000	286	.56	.0799	83
86	.0852	.64	296	20,000	284	.62	.0890	84
87	.0960	.68	283	25,000	277	.67	.1010	85
88	.1057	.71	266	30,000	262	.70	.1130	86
90	.1116	.73	244	35,000	244	.73	.1212	88
				40,000	221	.74	.1250	93
				45,000				
				50,000				

CONFIGURATION: CLEAN WEIGHT: 39,500 POUNDS					CONFIGURATION: CLEAN WEIGHT: 35,000 POUNDS			
APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
80	.0570	.43	286	SEA LEVEL	279	.42	.0586	79
81	.0656	.46	280	5,000	271	.45	.0679	80
81	.0745	.50	275	10,000	263	.47	.0778	80
82	.0836	.54	272	15,000	259	.51	.0878	81
83	.0938	.59	270	20,000	255	.56	.0986	81
84	.1063	.64	267	25,000	254	.61	.1117	82
85	.1200	.68	256	30,000	247	.66	.1272	83
86	.1320	.72	241	35,000	235	.70	.1429	84
90	.1380	.74	220	40,000	220	.74	.1532	88
				45,000	195	.74	.1550	93
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB NAUT MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-70

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) B-57B | ZERO WIND | ENGINE(S): (TWO) J65-W-5

CONFIGURATION. 2 X 320 GAL WING TIP TANKS
WEIGHT: 35,300 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 30,800 POUNDS

APPROXIMATE		MACH NO.	CAS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE	
%RPM	MI/LB		KNOTS		KNOTS		MI/LB	%RPM
79	.0569	.41	268	SEA LEVEL	261	.39	.0583	78
80	.0653	.44	264	5,000	254	.42	.0678	78
80	.0743	.47	259	10,000	247	.45	.0777	79
81	.0842	.51	254	15,000	241	.48	.0882	79
82	.0947	.55	251	20,000	236	.52	.1003	80
83	.1068	.60	246	25,000	232	.56	.1135	81
84	.1210	.64	240	30,000	226	.61	.1290	82
85	.1358	.69	230	35,000	222	.67	.1463	83
89	.1454	.73	219	40,000	214	.72	.1605	87
				45,000	193	.73	.1672	92
				50,000				

CONFIGURATION.
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE		MACH NO.	CAS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE	
%RPM	MI/						MI/	%RPM
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB NAUT MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-71

MAXIMUM RANGE SUMMARY

STANDARD DAY

MODEL(S) B-57B B-57C

ZERO WIND

ENGINE(S): (TWO) J65-W-5

CONFIGURATION. 2 X 320 GAL WING TIP TANKS
WEIGHT: 53,000 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 48,800 POUNDS

APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/ LB						MI/ LB	%RPM
82	.0511	.44	293	SEA LEVEL	288	.44	.0521	82
83	.0578	.49	297	5,000	291	.48	.0589	83
84	.0647	.54	298	10,000	292	.53	.0660	84
86	.0719	.59	296	15,000	291	.58	.0734	85
87	.0804	.63	290	20,000	285	.62	.0821	87
88	.0904	.67	279	25,000	277	.67	.0918	88
89	.0985	.71	265	30,000	265	.71	.1002	89
91	.1041	.73	245	35,000	245	.73	.1057	91
				40,000				
				45,000				
				50,000				

CONFIGURATION. 2 X 320 GAL WING TIP TANKS
WEIGHT: 44,300 POUNDS

CONFIGURATION: 2 X 320 GAL WING TIP TANKS
WEIGHT: 39,800 POUNDS

APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/ LB	%RPM
81	.0539	.43	282	SEA LEVEL	276	.42	.0554	80
82	.0606	.47	282	5,000	274	.45	.0628	81
83	.0685	.51	282	10,000	270	.49	.0712	82
84	.0766	.55	279	15,000	267	.53	.0802	83
85	.0860	.60	275	20,000	264	.58	.0904	84
86	.0966	.65	268	25,000	259	.63	.1019	85
88	.1064	.69	258	30,000	250	.67	.1134	86
89	.1150	.72	243	35,000	236	.71	.1252	87
94	.1199	.74	220	40,000	221	.74	.1314	92
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB NAUT MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-72

MAXIMUM RANGE SUMMARY

STANDARD DAY

ZERO WIND

MODEL(S) B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION. CLEAN
WEIGHT: 30,500 POUNDS

CONFIGURATION:
WEIGHT:

APPROXIMATE %RPM	APPROXIMATE MI/LB	MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE MI/	APPROXIMATE %RPM
86	.0675	.37	248	SEA LEVEL				
87	.0774	.40	241	5,000				
87	.0868	.42	232	10,000				
88	.0960	.45	224	15,000				
90	.1055	.48	219	20,000				
93	.1149	.53	216	25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

CONFIGURATION.
WEIGHT:

CONFIGURATION:
WEIGHT:

APPROXIMATE %RPM	APPROXIMATE MI/	MACH NO.	CAS	PRESSURE ALTITUDE FEET	CAS	MACH NO.	APPROXIMATE MI/	APPROXIMATE %RPM
				SEA LEVEL				
				5,000				
				10,000				
				15,000				
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB - NAUT. MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-73

MAXIMUM RANGE SUMMARY

STANDARD DAY

ZERO WIND

MODEL(S) B-57B B-57C

ENGINE(S): (ONE) J65-W-5

CONFIGURATION. CLEAN
WEIGHT: 48,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 44,000 POUNDS

APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
92	.0573	.44	288	SEA LEVEL	280	.42	.0598	90
93	.0634	.46	282	5,000	273	.45	.0663	91
95	.0690	.50	274	10,000	265	.48	.0730	93
				15,000	260	.51	.0798	95
				20,000				
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

CONFIGURATION. CLEAN
WEIGHT: 39,500 POUNDS

CONFIGURATION: CLEAN
WEIGHT: 35,000 POUNDS

APPROXIMATE		MACH NO.	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	MACH NO.	APPROXIMATE	
%RPM	MI/LB						MI/LB	%RPM
89	.0621	.41	269	SEA LEVEL	259	.39	.0648	88
90	.0698	.43	263	5,000	252	.42	.0734	88
91	.0772	.46	255	10,000	244	.44	.0816	89
93	.0847	.49	248	15,000	236	.47	.0900	91
				20,000	230	.51	.0982	93
				25,000				
				30,000				
				35,000				
				40,000				
				45,000				
				50,000				

REMARKS:

CAS - CALIBRATED AIRSPEED KNOTS
MI/LB NAUT MILES PER POUND

DATA AS OF: 1 OCTOBER 1953
DATA BASIS: ESTIMATES

FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL

Figure A-74

ALPHABETICAL INDEX

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BOLD FACE TYPE INDICATES ILLUSTRATIONS

BOLD FACE TYPE INDICATES ILLUSTRATIONS

BOLD FACE TYPE INDICATES ILLUSTRATIONS

BOLD FACE TYPE INDICATES ILLUSTRATIONS

BOLD FACE TYPE INDICATES ILLUSTRATIONS

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