RESTRICTED

M.A.C. REPORT NO. 2353

Pilot's Handbook

for

NAVY MODEL

XF3H-1 AIRPLANES

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Figure 1-1. XF3H-1 Airplane.

SECTION I
DESCRIPTION

1-1. AIRPLANE.

1-2. The McDonnell XF3H-1 is a carrier-based, single engine, single place jet interceptor fighter. Special features of the airplane are the swept-back wing and empennage, adjustable horizontal stabilizer, leading edge wing slats, and spoilers in the wings. As well as operating from ordinary landing fields, the airplane can be catapulted from a carrier deck and land in an arresting gear. The engine is an axial-flow jet-propulsion unit, Model XJ40-WE-8, with an afterburner.

1-3. AIRPLANE DIMENSIONS.

1-4. Overall dimensions of the airplane are:

Span - wings spread	35' 4"
Span - wings folded	25' 4"
Length	59' 5.5"
Height - To top of tail	13' 11"
Wing sweepback	45°

1-5. AIRPLANE GROSS WEIGHT.

1-6. The take-off gross weight of the airplane, with full fuel and rocket load, is approximately 22,595 pounds.

1-7. ARMAMENT.

1-8. Rockets are the only type of armament equipment carried in the airplane. Twenty-six folding fin rockets may be carried on racks which retract into an enclosed bay in the fuselage. Provisions are made for installation of search and fire control radar, Type AN/APS-25.

1-9. POWER PLANT.

1-10. GENERAL. The engine is an axial-flow, jet-propulsion unit, Model XJ40-WE-8, which has an afterburner.

Note

Temporarily, engine Model XJ40-WE-6 with a dummy afterburner is installed in lieu of the -8 engine.

Air intake ducts on either side of the forward fuselage supply air to the compressor. In addition, breather doors in either side of the fuselage aft of the intake ducts open during ground operation and at speeds below approximately 200 knots IAS to increase air supply to the engine. The engine is equipped with an engine-driven fuel booster pump; a dual engine-driven fuel pump comprising both a normal and an emergency pump; and a primary and emergency engine control system. (See figure 1-5.) When the XJ40-WE-8 engine is installed, a separate fuel pump and control are provided for afterburner operation.

1-11. ENGINE-DRIVEN FUEL BOOSTER PUMP.

1-12. The engine-driven booster pump receives fuel from the tank booster pumps and delivers it to the dual pump. In case the booster pump fails, a by-pass line opens automatically to allow fuel to continue to flow to the engine.

1-13. DUAL ENGINE PUMP.

1-14. The dual engine pump, consisting of a normal and an emergency pump, supplies fuel under high pressure to the engine fuel regulators. The pumps are identical and in case the normal pump fails, the emergency pump automatically takes over and supplies fuel to whichever fuel regulator is operating. The pilot may select the emergency pump, if desired, by means of a switch in the cockpit. Switching of fuel pumps, whether automatic or manual, has no effect whatsoever on operation of the fuel regulators or engine control which are separate units.

1-15. PRIMARY ENGINE CONTROL SYSTEM.

1-16. The primary engine control system is made up of an electronic power regulator, a power scheduler, engine-driven governor-alternator, fuel regulator and exhaust nozzle control. The power regulator is the center of the control system. It receives rpm signals and electrical power from the governor-alternator; position signals from the power scheduler, fuel regulator and nozzle control; and temperature signals from turbine outlet thermocouples. In response to changes in these signals, the power regulator adjusts the fuel regulator valve and the exhaust nozzle actuator. The power scheduler merely transmits to the regulator information on position and movement of the throttle.

1-17. EMERGENCY ENGINE CONTROL SYSTEM.

1-18. In case the governor alternator output signal fails, the emergency fuel regulator will automatically take over and supply fuel to the engine, or the pilot may select the emergency system when other types of failures occur. When operating on the emergency system, fuel flow is controlled by a manually operated throttle valve. Overspeed protection is provided, as well as barometric compensation which maintains approximately the rpm selected by the throttle with changes in altitude. Although some acceleration control is available on the emergency system, the throttle must be moved slowly and carefully in the low rpm range to avoid exceeding temperature limits or causing engine surge or stall. The exhaust nozzle control is manually operated by throttle movement when operating on the emergency system and the minimum nozzle area is preset on the ground to prevent overtemperature operation at military power under these conditions. Other than this, the emergency system provides no temperature control and care must be taken to prevent exceeding the turbine outlet temperature limits.

1-19. THROTTLE.

1-20. The throttle lever, located on the left side of the cockpit (9, figure 1-3), is spring loaded against the inboard edge of the throttle guide. To start the engine, the throttle is moved outboard from OFF to CRANK position (with engine master switch ON), thereby opening an air valve between the starter and the auxiliary power unit which starts engine rotation. Advancement of the throttle, while releasing outboard pressure on it, will allow the throttle to slip into IDLE position where a stop is provided to prevent shutting off the fuel supply inadvertently when retarding the throttle. Advancing the throttle from IDLE increases engine power by resetting the power scheduler which transmits electric signals to power regulator. On this engine, 100% rpm will be obtained at a throttle position somewhere below MILITARY stop and further throttle advancement will close the nozzle area, thereby increasing turbine outlet temperature and thrust. Maximum temperature should be obtained at the MILITARY position. The stop at the MILITARY position prevents pushing the throttle accidentally into the afterburner operating range. Just prior to reaching the MILITARY stop, the throttle lever actuates the afterburner (or emergency) boost pump in the aft fuselage tank and opens the afterburner fuel shutoff valve. The MAXIMUM position is provided for use of the afterburner when installed.

1-21. The throttle grip contains a speed brake switch and a microphone button. (See 10 and 11, figure 1-3.)

1-22. THROTTLE FRICTION ADJUSTMENT LEVER. Throttle lever friction can be adjusted by means of the friction adjustment lever just inboard of the throttle. (See 13, figure 1-3.)

1-23. THROTTLE CATAPULT GRIP. A grip for holding the throttle open during catapult take-off is located outboard of the MAXIMUM position of the throttle. (See 18, figure 1-3.)

1-24. ENGINE MASTER SWITCH.

1-25. The engine master switch on the throttle quadrant (30, figure 1-3) controls the primary fuel shutoff valve, the two main booster pumps (one in forward tank and center one in aft tank), supplies electrical power to the engine power regulator and completes electrical circuits for starting the engine.

1-26. STARTER.

1-27. Engine starting is accomplished by means of a pneumatic starter operating from an auxiliary power unit which supplies low pressure, high volume compressed air for starting. The APU air line connects to the airplane starter system at a receptacle on the left side of the fuselage below the wing. The starter has no cut-out timer and will continue to operate until the air valve on the starter cart is closed, (or air line is disconnected from airplane) or until throttle is retarded to OFF in case of an aborted start. In addition to being used for starting, the APU can be used during ground operation for air conditioning the cockpit and the radar and rocket compartments. The APU can be carried as an external store for ferrying purposes.

1-28. IGNITION.

1-29. GENERAL. Ignition is required only during engine starting, since the mixture in the combustion chamber will burn continuously after once being ignited. Electrical power is supplied automatically to the spark plugs for ignition when the engine master switch is ON and engine rpm reaches safe 'light-off' rpm during the starting procedure. The ignition coils will continue to be energized until rpm reaches that called for by the throttle setting. Time and duration of ignition is determined by the power regulator. Should engine speed at any time drop 600 rpm below the speed called for by the throttle setting when operating on the primary control, ignition will be reinitiated automatically.

1-30. EMERGENCY IGNITION. An emergency ignition switch, located on the panel outboard of the throttle (8, figure 1-3), is provided for supplying re-ignition in flight. The emergency ignition switch should be used for all engine air restarts even though it may be possible at times to get ignition automatically through the power regulator. This switch does not receive power from the primary electrical system and therefore will not be affected by an electrical system failure.

1-31. EMERGENCY FUEL CONTROL SWITCH.

1-32. The emergency fuel control switch on the engine control panel on the left console (28, figure 1-3) permits the pilot to bring the emergency control system into operation. Moving the switch momentarily to SELECT EMERG. cuts out the primary control system, allowing the emergency system to take over. If the switch is used to test emergency system operation on the ground, the primary system is brought back into operation by moving the emergency fuel system switch momentarily to RESET PRIM. However, the primary system should be switched back in at the same throttle setting at which it was cut out. A light forward of the switch illuminates when the emergency system is operating.

1-33. ENGINE FUEL PUMP SWITCH.

1-34. The emergency engine-driven fuel pump may be turned on by means of the engine fuel pump switch on the center panel below the instrument panel.. (See 17, figure 1-2.) Moving the switch from NORMAL to EMERG. cuts out the normal pump and turns on the emergency pump. A light adjacent to the switch (16, figure 1-2) illuminates when the emergency pump is operating.

1-35. <u>OIL SYSTEM</u>.

1-36. Engine lubrication is provided by a pressure-type oil system with scavenge pump return to a five-gallon tank. The pilot has no control over the oil system.

1-37. OIL SPECIFICATION AND GRADE. For oil specification see figure 1-7.

1-38. <u>FUEL SYSTEM</u>.

1-39. GENERAL. Seven self-sealing fuel tanks are installed in the airplane, three in the fuselage and two

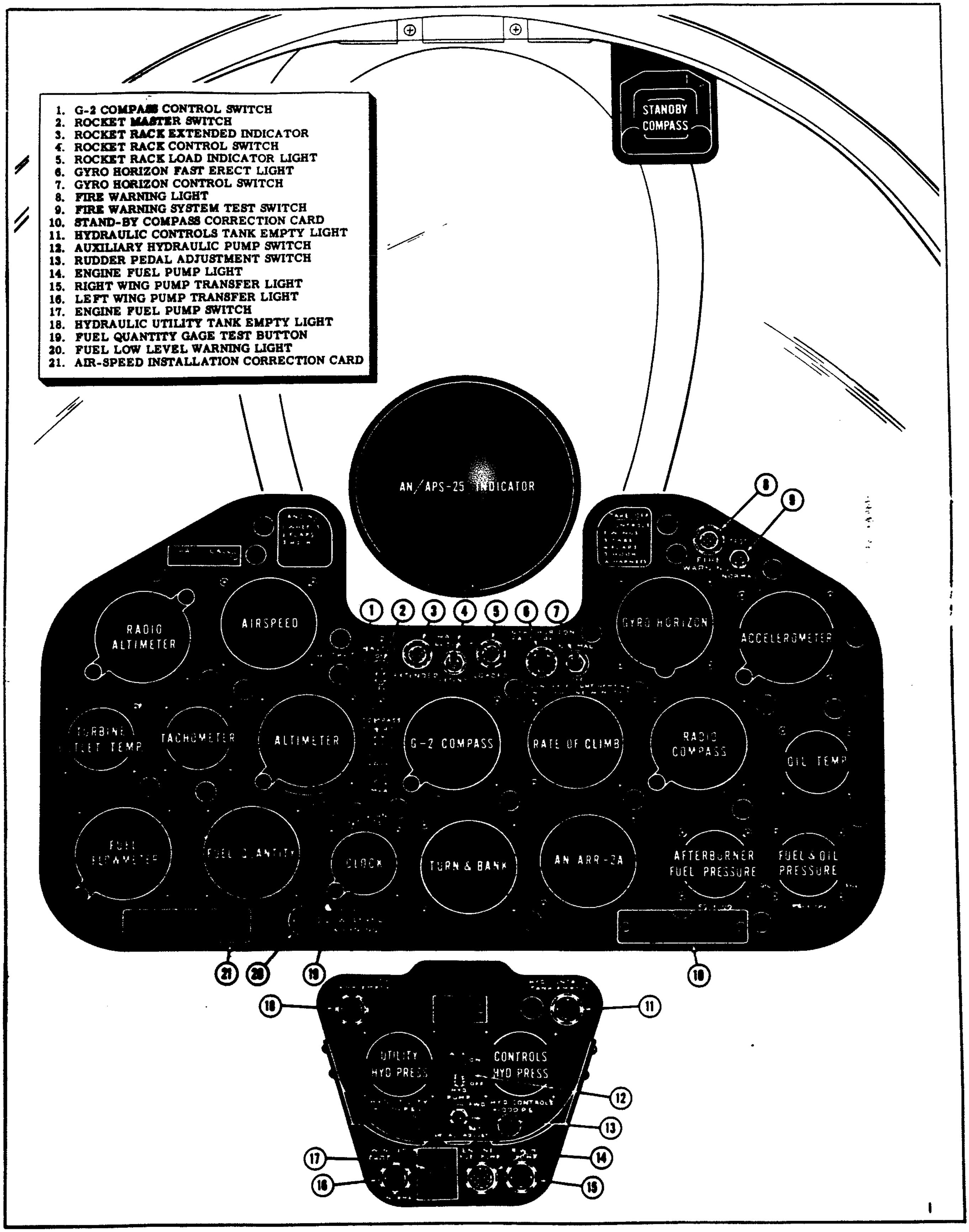

Figure 1-2. Cockpit - Forward View

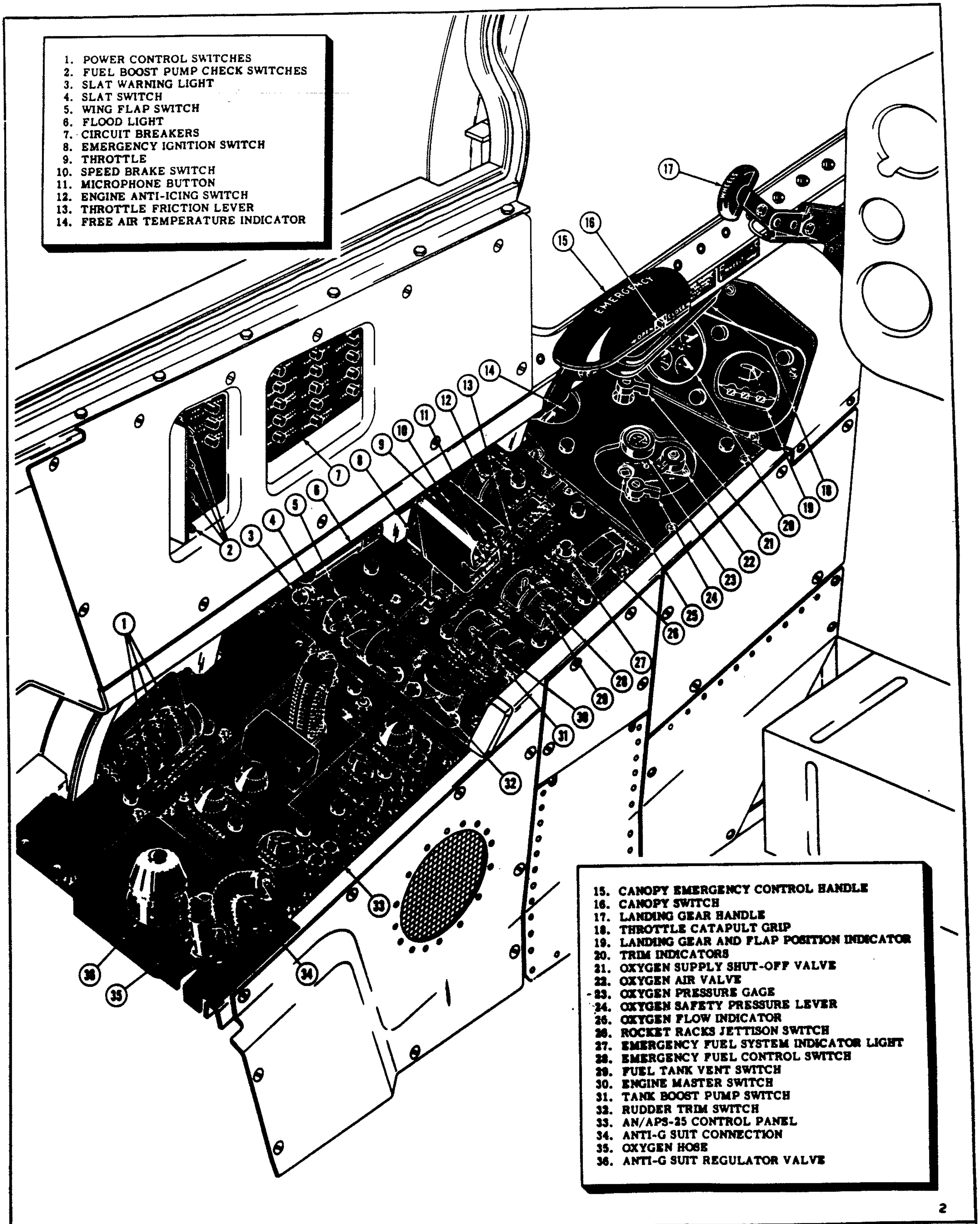

Figure 1-3. Cockpit - Left Side

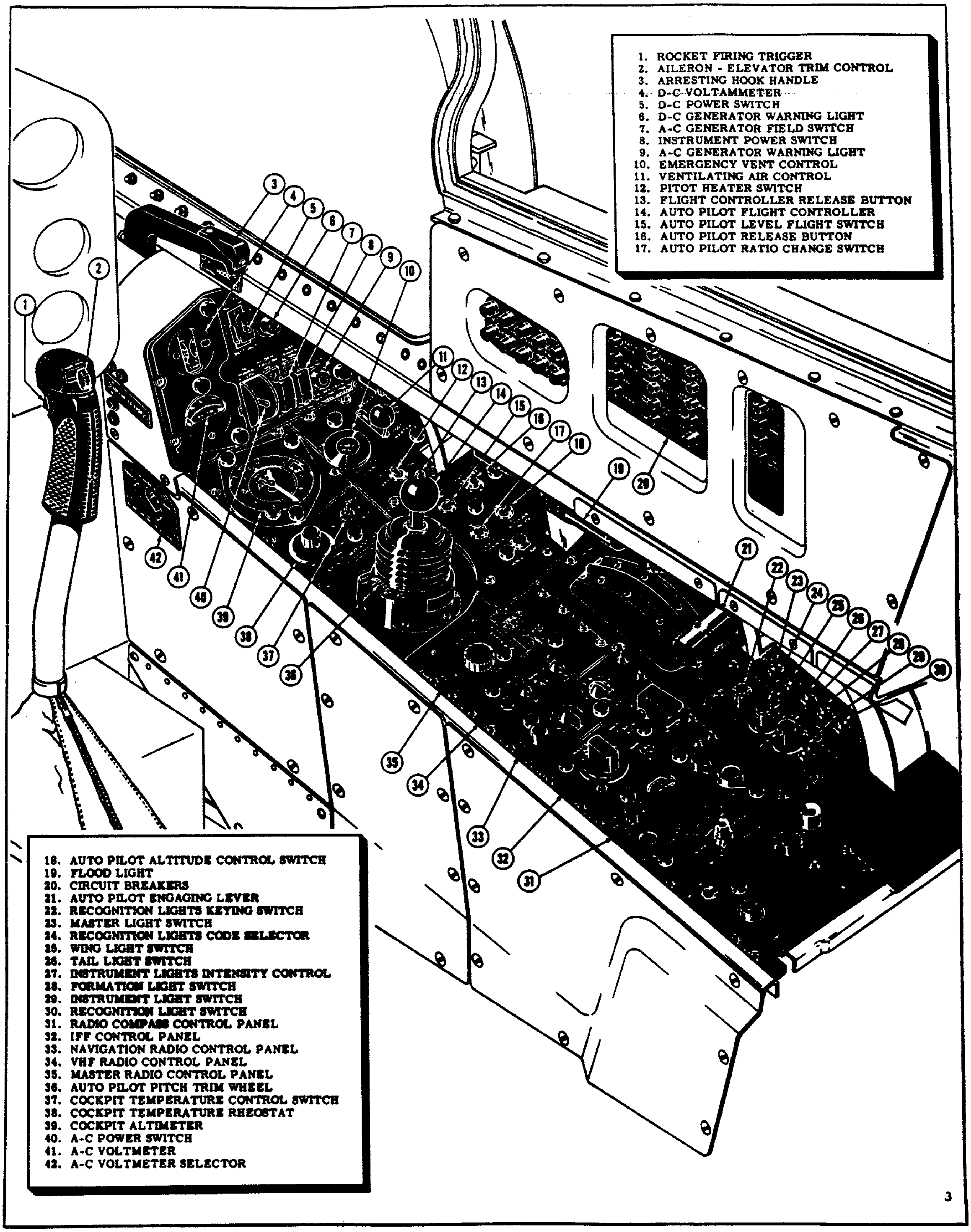

Figure 1-4. Cockpit - Right Side

in each wing. (See figure 1-5.) No external fuel tanks are carried. Fuel is supplied to the engine from booster pumps in the forward and aft fuselage tanks. Center tank fuel flows by gravity feed to both the forward and aft tanks. Three boost pumps are installed in the aft tank, one main pump for normal operation, one which operates only during negative g maneuvers or 90° climb, and the other for afterburner or emergency operation. Another main boost pump is installed in the forward fuselage tank. Wing tank fuel is transferred to the center fuselage tank by a transfer pump in each outboard tank and to the forward tank by gravity feed. A fuel level control valve prevents the wing transfer pumps from overfilling the center tank.

1-40. FUEL SPECIFICATION AND GRADE. See figure 1-7.

1-41. TANK CAPACITIES.

1-42. In addition to normal gravity filling of tanks, pressure refueling is provided through a valve under each outboard wing tank, and one under the aft fuselage tank. When tanks become full during pressure refueling, the refueling valve is automatically closed. Some variation in tank capacities will occur with different refueling methods as follows:

	TOTAL VOLUME		PRESSURE FILLING		GRAVITY FILLING	
	GALS	POUNDS	GALS	POUNDS	GALS	POUNDS
Forward Tank	100	650	89	579	98	637
Center Tank	212	1378	208	1352	212	1378
Aft Tank	203	1320	203	1320	203	1320
Wing Tanks (4)	260	1690	252	1638	252	1638
TOTAL	775	5038	752	4889	765	4973

1-43. FUEL QUANTITY GAGE AND FUEL FLOWMETER.

1-44. A fuel level gage, indicating total internal fuel in pounds, and a fuel flowmeter, giving rate of fuel flow in pounds per hour, are located on the instrument panel. (See figure 1-2.) In addition, the flowmeter incorporates a totalizer dial which indicates total pounds of fuel remaining in the system. A knob on the flowmeter is used to preset the totalizer dial for the total pounds of fuel in the tanks after refueling.

Note

The fuel flowmeter is provided only when the XJ40-WE-8 engine is installed.

1-45. FUEL QUANTITY GAGE TEST BUTTON. Operation of the fuel quantity gage can be checked by means of a test button located on the instrument panel. (See 19, figure 1-2.) When the test button is depressed, the gage needle should rotate counterclockwise, indicating that the gage is working. The needle will return to the original reading when the test button is released.

1-46. WING TANK TRANSFER LIGHTS.

1-47. Two wing tank transfer lights, one for each wing, are located on the center panel below the instrument panel. (See 15 and 16, figure 1-2.) The lights come on when wing tank fuel starts to transfer and remain on as long as fuel is being transferred.

1-48. FUEL LOW LEVEL WARNING.

1-49. Warning of low fuel level is given by a red light on the instrument panel (20, figure 1-2) which illuminates when the fuel gage indicates 1000 pounds of fuel remaining. Inasmuch as the low level warning light operates off the quantity gage, the light cannot be depended upon if the gage should malfunction.

1-50. BOOSTER AND TRANSFER PUMPS.

1-51. The main booster pumps, one in the forward fuselage tank and the center one in the aft tank, are energized when the engine master switch is turned ON. The negative g boost pump in the aft tank is automatically turned on during a 90° climb or inverted flight. The afterburner or emergency boost pump in the aft fuselage tank is turned on just before the throttle reaches the MILITARY position or it can be turned on by a switch located on the engine control panel on the left console. Both wing tank transfer pumps come on after the engine is started and the generator is supplying power to the secondary bus. The wing tank transfer pumps are turned off automatically when the fuel quantity gage indicates 2000 pounds remaining in the system.

1-52. BOOST PUMP CHECK SWITCHES. The fuel booster pumps may be tested on the ground by means of four check switches (2, figure 1-3) located on the left aft circuit breaker panel. Holding a switch on cuts out all other booster pumps to allow reading fuel pressure of each pump individually. However, since the fuel pressure reading is taken at a point downstream of the fuel shutoff valves, the engine master switch must be on to open the main shutoff valve. The afterburner pump check switch opens the afterburner shutoff valve as well as turning on the afterburner boost pump.

Note

Wing tank transfer pumps can be checked when engine is not running by turning the d-c power switch on (with external power connected) and having a crewman under the wing either listen or feel for pump operation.

1-53. TANK BOOST PUMP SWITCH. The afterburner boost pump in the aft tank, which normally operates only during afterburner operation, can be turned on in case any of the other boost pumps become inoperative. A tank boost pump switch on the engine control panel (31, figure 1-3) is used to turn the pump on.

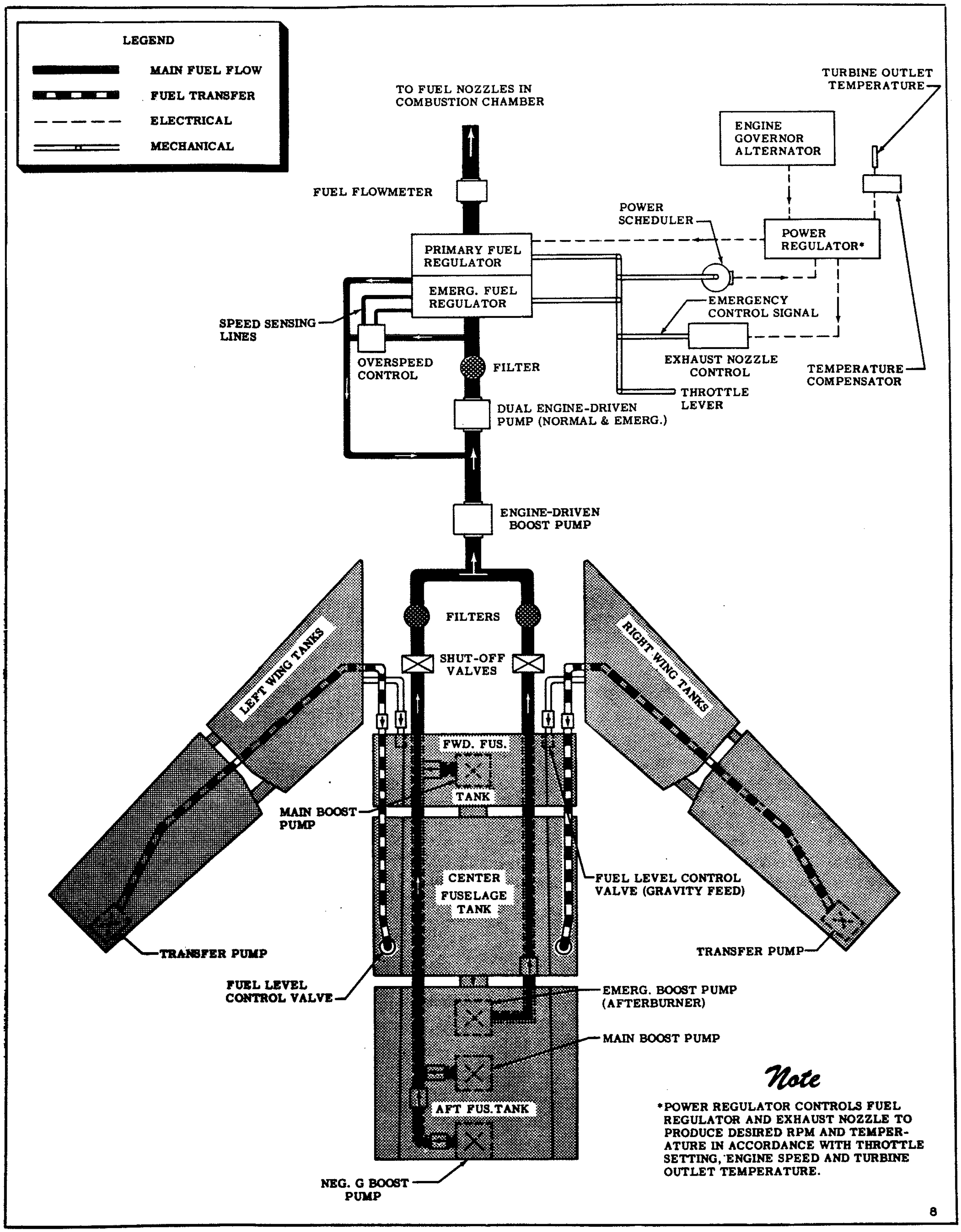

Figure 1-5. Fuel System

1-54. FUEL TANK VENT SWITCH.

1-55. Control of fuel tank pressurization is provided by the fuel tank vent switch on the throttle quadrant. (See 29, figure 1-3.) Before take-off the switch must be set at the desired pressure, normally 3 PSI. With the switch at 3 PSI, vent regulating valves are closed when the gear is retracted on take-off. During climb, tank internal pressure is built up by reduced atmospheric pressure and by boiling fuel. If pressure exceeds 3 psi, the regulating valves will release the excess pressure. For combat, the tank vent switch should be positioned at 2 PSI. The 0 PSI position is for emergency use only. In case a tank is damaged by gunfire, having pressure at zero will allow the tank to seal more quickly. In case of electrical failure, the regulating valves open and tanks will bleed to atmospheric pressure. During dives and negative g maneuvers, the vent valve is automatically closed to prevent loss of fuel in these attitudes.

1-56. ELECTRICAL SYSTEM.

1-57. Electric power is supplied by a 28 volt d-c system powered by an engine-driven d-c generator, and an a-c system powered by an engine-driven a-c generator. A 24 volt storage battery serves as a stand-by power source to supply power to part of the system when the generators are inoperative or d-c generator output is insufficient to close the reverse-current relay. An inverter is provided as a stand-by in case the a-c generator fails and will automatically take over supplying alternating current to essential instruments and equipment.

1-58. ELECTRICAL POWER DISTRIBUTION.

1-59. Direct current power distribution is made through three busses; a primary bus, a secondary bus and a monitored bus. The primary and secondary busses are energized when either generator or an external power source is supplying the system. The monitored bus is d-c supplied but is energized only as long as both the a-c and d-c generators are operating (or when d-c external power is supplied). All essential equipment operates from the primary bus, except a few items which operate directly off the battery. The secondary and monitored busses power equipment not essential to flight and requiring heavy current. The a-c generator supplies alternating current in three phases. Equipment requiring heavy a-c loads and not essential to flight are powered through a-c monitored busses which are energized only as long as both the a-c and d-c generators are operating. Should the d-c generator fail, the a-c generator will automatically supply d-c power, through a transformer-rectifier, to the primary and secondary d-c busses. However, if both generators fail, only the primary bus will operate off the battery (unless the d-c power switch is moved to the BATT. ONLY position).

1-60. ELECTRICAL SYSTEM INDICATORS.

1-61. A d-c voltammeter and an a-c voltmeter are located on the electrical control panel to the right of the instrument panel. An a-c voltmeter selector switch on the side of the console below the voltmeter permits checking the voltmeter for 'Phase A', 'Phase B' or 'Phase C' readings to see that they are balanced.

1-62. EQUIPMENT ELECTRICALLY OPERATED OR CONTROLLED.

1-63. See figure 1-6.

1-64. ELECTRICAL SYSTEM CONTROLS.

1-65. D-C POWER SWITCH. The d-c power switch is located on an electrical control panel to the right of the instrument panel. (See 5, figure 1-4.) Positions of the switch are BATT. GEN., BATT. ONLY, and OFF. The BATT. ONLY position is used only in the event both generators fail and it is desired to energize the secondary bus. In this case, battery power will be supplied to equipment on both the primary and secondary busses.

1-66. D-C GENERATOR WARNING LIGHT. In case of d-c generator failure, or if generator output drops below that required to close the reverse current relay, a red warning light (6, figure 1-4) adjacent to the d-c power switch will illuminate. This indicates that equipment powered by the monitored bus is inoperative and that the a-c generator is supplying the primary and secondary busses.

1-67. A-C POWER SWITCH. The a-c power switch located on the electrical control panel (40, figure 1-4), has OFF, AC GEN and EXT PWR positions.

1-68. A-C GENERATOR FIELD SWITCH. The a-c generator field switch on the electrical control panel (7, figure 1-4) must be ON to supply power to the a-c circuits.

1-69. INSTRUMENT POWER SWITCH. The instrument power switch on the electrical switch panel (8, figure 1-4) is normally positioned at AC GEN. In this position, the inverter will automatically take over in event the a-c generator fails and supply a-c power to essential instruments and equipment. The STANDBY INVERTER position is used to turn off the a-c generator warning light following a failure and for testing inverter operation before take-off.

1-70. A-C GENERATOR WARNING LIGHT. Failure of the a-c generator will be indicated by illumination of a red warning light located outboard of the a-c power switch on the electrical control panel. (See 9, figure 1-4.) When this occurs, the inverter automatically takes over and supplies a-c power to essential equipment but the instrument power switch must be positioned at STANDBY INVERTER to turn off the light.

1-71. CIRCUIT BREAKERS. All d-c electrical circuits are protected by push-to-reset circuit breakers or circuit breaker switches. Panels mounting the circuit breakers are located on each side of the cockpit above the consoles. (See 7, figure 1-3 and 20, figure 1-4.) The a-c circuits powered from the inverter are protected by fuses which are not replaceable in flight.

DIRECT CURRENT

Battery Bus

Auxiliary Hydraulic Pump
Auxiliary Power Unit (Pod)
Canopy
IFF Destructor
Radio Compartment Light
Wing Folding

Primary Bus

Aileron Gear Shift
Arresting Hook
Emergency Cabin Air Shutoff
Engine Control
Feel System Ram Air Scoop
 Heaters
Flaps
Flight Controls
Free Air Temperature Gage
Fuel Boost Pumps
 Main - Fwd Fus Tank
 Negative G
Fuel Low Level Light
Fuel Vent Regulator Valve
G-2 Compass
Hydraulic System Cross-Over Valve
Inverter
Landing Gear Control
Oil Temperature Gage
Power Cylinder Heaters
Radios (AN/ARC-1 & AN/ARN-6)
Rockets & Rocket Racks
Slats
Speed Brakes
Stabilizer Emergency Actuator
Trim Position Indicator
Trim Tabs
Utility Hydraulic System
 Depressurization
Wheel & Flap Position Indicator

Secondary Bus

Cockpit Temperature
Damper Dan (Flight Stabilizer)
Fuel Boost Pumps
 Main - Aft Fus Tank
 Emerg. (Afterburner)
Fuel Transfer Pumps

Gear & Hook Warning Lights
IFF (AN/APX-6)
Pitot Heater
Rocket Bay Temperature
Rudder Pedal & Seat Adjustment
Wing & Tail Lights

} **Both Generators Out - This Equipment Inoperative (Unless D-C Power Switch Is Moved To 'BATT ONLY'.)**

Monitored Bus

Auto Pilot
Computer
Radar (AN/APS-25)

} **Either Generator Out - This Equipment Inoperative**

ALTERNATING CURRENT

Auto Pilot
***Cabin Temperature Control**
Computer
***Fire Detector**
Flight Stabilizer
Radar (AN/APS-25)
Rocket Bay Temperature

*Instruments:
 Afterburner Fuel Pressure
 Fuel & Oil Pressure
 Fuel Flowmeter
 Fuel Quantity Gage
 G-2 Compass
 Gyro Horizon
 Hydraulic Press Gages

} **A-C Generator Out - This Equipment Inoperative**

*Operated by inverter
if A-C Generator fails

4

Figure 1-6. Equipment Electrically Operated or Controlled

1-72. EXTERNAL POWER RECEPTACLES. Two external power receptacles, one a-c and one d-c, are located under the right wing near the leading edge at the wing root.

1-73. HYDRAULIC SYSTEM.

1-74. GENERAL. Two separate hydraulic systems are provided; a power control system for operation of the flight controls and a utility system from which all other hydraulic units operate. Refer to paragraph 1-84 for description of the power controls hydraulic system.

1-75. UTILITY HYDRAULIC SYSTEM.

1-76. Hydraulic pressure from the utility system is used to operate the landing gear, wheel brakes, tail skid, arresting hook, wing flaps, wing slats, speed brakes, canopy, rocket racks and wing-fold mechanism. An engine-driven pump supplies hydraulic pressure for operation of the units and an accumulator is provided for pressure storage. However, the system is depressurized in flight when all units are in their inoperative positions and the output of the pump is then blocked by an electrically actuated depressurization valve. When any hydraulic control is operated, the valve opens and the system becomes pressurized for operation of the selected unit. The valve automatically closes to depressurize the system only when all units are in their normal flight position; that is, gear and flaps up, slats and speed brakes in, canopy closed and rocket racks retracted. Pressure is maintained in the system under all other operating conditions. In event of an electrical failure, the depressurization valve automatically opens to pressurize the system. Hydraulic fuses in the landing gear, flap and rocket rack systems will prevent loss of fluid in event of a damaged line. An electric auxiliary pump is provided primarily for ground check of the utility hydraulic system but could be used in flight should the engine driven pump fail.

1-77. HYDRAULIC FLUID SPECIFICATION. See figure 1-7.

1-78. UTILITY SYSTEM INDICATORS.

1-79. A utility system hydraulic pressure gage is provided on the hydraulic panel below the instrument panel. (See figure 1-2.) A light above the gage (18, figure 1-2) will illuminate in the event the utility hydraulic reservoir becomes empty.

1-80. AUXILIARY HYDRAULIC PUMP SWITCH.

1-81. Operation of the electric auxiliary hydraulic pump is controlled by the auxiliary hydraulic pump switch on the hydraulic control panel. (See 12, figure 1-2.) Turning the switch on starts the pump which will supply hydraulic pressure to the utility system.

Note

The auxiliary pump is also controlled by the canopy controls (both external and internal) and the external rocket rack switch when engine is not running.

1-82. FLIGHT CONTROLS.

1-83. GENERAL. The primary flight controls are operated by conventional stick and rudder pedals. However, the control surfaces are hydraulically actuated through irreversible power cylinders, with an artificial feel system provided to simulate normal control force characteristics. Trim controls are provided which trim the artificial feel for aileron, elevator, and rudder and in addition, adjust the tabs on the ailerons and rudder surfaces. No elevator trim tab is provided but the complete horizontal stabilizer is adjustable. The stabilizer is not normally operated by the pilot but is adjusted automatically with elevator movement through a follow-up system. Spoilers as well as ailerons are provided for lateral control. Above approximately 500 knots IAS (or in event of hydraulic power failure) an aileron gear shift system operates automatically to increase the mechanical advantage between the stick and ailerons.

1-84. HYDRAULIC POWER CONTROL SYSTEM.

1-85. Hydraulic pressure for operation of the flight controls is supplied by an engine-driven pump with an accumulator provided for pressure storage. (The power controls hydraulic system is a separate system independent of the utility hydraulic system.) Pump pressure is supplied to the power cylinders which are connected to, and actuate, the control surfaces; that is, the ailerons, spoilers, elevator, horizontal stabilizer and rudder. The stabilizer cylinder is operated through a follow-up valve which is actuated by the elevator, whereas the other cylinders are operated directly from the cockpit controls. Movement of the stick or rudder pedals positions a valve in the related power cylinder which allows hydraulic system pressure to act upon the cylinder piston and move the control surface. When stick and rudder pedal movement is stopped, flow of hydraulic fluid through the cylinder is cut off and a hydraulic lock is effected, until the cockpit controls are moved again. This irreversible feature of the cylinder prevents any forces from the surfaces being transmitted back to the pilot's controls. Inasmuch as the pilot would have no feel in the controls with this arrangement, an artificial feel system is provided to give the desired feel characteristics in the controls. In the event hydraulic pressure is lost, the ailerons, spoilers, elevator and rudder are controlled manually by movement of the stick and rudder pedals. However, the stabilizer is controlled by the trim switch on the stick which actuates an emergency electrical actuator. (Refer to paragraph 1-98.)

Note

Power cylinder heaters are provided which operate automatically, coming on at approximately -18°C and remaining on until temperature rises above -4°C.

1-86. HYDRAULIC POWER CONTROLS SYSTEM INDICATORS. A power controls hydraulic pressure gage is provided on the panel below the instrument panel. (See figure 1-2). A light above the gage (11, figure 1-2) will illuminate in the event the power controls reservoir becomes empty.

1-87. ARTIFICIAL FEEL SYSTEM.

1-88. Individual feel systems are provided for the ailerons, elevator and rudder. Proper feel loads are fed to the pilot's controls through a bellows, spring and bob-weight arrangement for elevator feel; by a bellows and spring for rudder feel; and by a spring alone for aileron feel. Elevator and rudder forces are fed to the controls according to changes in airspeed which affect the pressure on the bellows and adjust the loads felt in the controls accordingly. In addition, the bob-weight supplies elevator feel in response to changes in normal load factor. Feel system forces are trimmed out by trim controls in the cockpit. The trim tabs on the ailerons and rudder are electrically synchronized with the feel system trim actuators and are positioned at the same time in order to maintain trim in event of a power failure. The rudder artificial feel system bellows can be turned off from the cockpit, if desired, in event of a hydraulic power failure. However, the aileron and elevator feel systems cannot be disconnected and if hydraulic power fails, both the artificial feel forces and the aerodynamic forces from the control surfaces will be felt by the pilot.

Note

The airscoops for rudder and elevator feel systems contain heaters which may be turned on by means of the pitot heater switch.

1-89. SPOILERS.

1-90. To aid lateral control, single-acting spoilers are provided in the wings, extending from the upper surface at a point just forward and inboard of the ailerons. The spoiler in each wing is approximately 5 feet long and is made up of slats on curved arms which extend up and forward into the airstream. Operated by an irreversible power cylinder, the spoiler in the down-going wing extends when the control stick is moved in that direction; the opposite spoiler remains flush with the wing surface. Spoilers are very effective at high speeds when the ailerons are relatively ineffective, and conversely, the spoilers provide little rolling force at low speeds but the ailerons are most effective in this range.

1-91. AILERON GEAR SHIFT.

1-92. A gear shift arrangement is incorporated between the stick and aileron such that at approximately 500 knots, or in event of a hydraulic power failure, the mechanical advantage between stick and ailerons is increased by reducing the maximum throw of the ailerons to one-sixth of normal. The spoiler-stick relationship is unchanged and thus at high speeds or in emergencies the spoilers are the primary means of lateral control.

1-93. POWER CONTROL SWITCHES.

1-94. Three power control switches are located on the left aft console (1, figure 1-3) one for elevator and stabilizer and one each for rudder and aileron (and spoiler). All three switches are usually in the ON position and the power control system is operated normally. However, a bar over the switches can be lowered to turn all three systems OFF simultaneously, if necessary. Shutting a switch OFF cuts off hydraulic pressure to the related power control cylinders. Turning the elevator and stabilizer switch OFF also makes the follow-up system and the elevator feel system trim actuator inoperative so that the stabilizer can be adjusted separately to trim out stick forces. (Refer to paragraph 1-100.) With hydraulic pressure off, the elevator feel trim actuator will travel to its extreme position to minimize the bellows feel force. The rudder feel system bellows is turned off with the rudder power control switch. Aileron feel remains operative even with power off.

1-95. TRIM CONTROLS.

1-96. AILERON AND ELEVATOR TRIM CONTROL. A combination aileron and elevator trim control is provided on the control stick grip. (See 2, figure 1-4.) Moving the trim control to left or right adjusts the aileron feel trim and also sets the aileron tabs on the ailerons. A synchronizer in the aileron system maintains the feel trim and actual trim tabs in balance and stops one actuator if it gets ahead of the other system. For instance, if the aileron feel trim begins to lead the actual tab on the aileron surface, the synchronizer will stop the feel trim actuator until the tab catches up. When the trim control on the stick is moved fore or aft, it adjusts the elevator feel trim. However, in case of hydraulic failure in the elevator power control system, fore and aft movement of the trim control will adjust the horizontal stabilizer instead of elevator feel trim.

1-97. RUDDER TRIM SWITCH. A rudder trim switch is located just aft of the throttle quadrant. (See 32, figure 1-3.) Holding the switch at LEFT or RIGHT adjusts the rudder feel trim and at the same time sets the trim tab on the rudder. A synchronizer maintains the two trim actuators in balance.

1-98. HORIZONTAL STABILIZER ADJUSTMENT. Longitudinal trim is accomplished by means of the adjustable stabilizer which, under normal operating conditions, is not directly controlled by the pilot but is adjusted automatically through a stabilizer-elevator follow-up system. Whenever the elevator is moved more than one degree, the stabilizer moves, at a slower rate, to again center the elevator. In event hydraulic pressure is lost, operation of the stabilizer is automatically shifted to the trim control on the stick grip, which may be used to adjust the stabilizer electrically. If both a hydraulic and an electrical failure occur, pressure from an accumulator provides power to the follow-up valve so the stabilizer is operated through elevator movement again, but the stabilizer will then move only in the direction to decrease airspeed and permit a safe landing.

1-99. TRIM POSITION INDICATOR. A single indicator on the left instrument subpanel (20, figure 1-3) shows the condition of the artificial feel trim system for aileron, rudder, and elevator, and also shows the position of the horizontal stabilizer. Since the aileron and rudder tabs are synchronized with their respective feel system trim actuators, these indicators also serve as tab position indicators.

1-100. RUDDER PEDAL ADJUSTMENT.

1-101. The position of the rudder pedals is adjusted electrically by means of a switch at the bottom of the hydraulic control panel. (See 13, figure 1-2.) Both rudder pedals are moved simultaneously by holding the switch at FWD or AFT as required.

1-102. SURFACE CONTROLS LOCK.

1-103. The controls are locked by means of two cables that are joined at one end in a single ball fitting which attaches to the stick while the other ends of the cables are hooked onto the rudder pedals. The ball fitting slips into a slot in the control stick and the other ends of the cables slip over a hook on the inside of each rudder pedal. After the locking cables are installed, the safety belt should be fastened in front of the control stick and tightened to complete the controls locking. (See figure 2-3.)

1-104. WING SLATS.

1-105. GENERAL. Wing slats along the leading edge of each wing are hydraulically operated for extension and retraction and are electrically controlled by the pilot. When the slats are extended they move forward and down to form a slot in the wing leading edge. This action changes the air flow over the upper surface of the wing, increasing the available lift and resulting in lower stalling speeds. The slats in both wings move simultaneously as both are operated by a single hydraulic motor. In the retracted position, the slats are held flush with the wing contour. If slats are out and airspeed is increased above 200 knots IAS, the slats will automatically close. No emergency system is provided for slat operation other than that supplied by the auxiliary hydraulic pump. The slats cannot be operated in event of a complete electrical failure.

1-106. WING SLAT SWITCH.

1-107. The wing slat switch is located just aft of the engine control panel (4, figure 1-3) and is normally positioned at IN. Moving the slat switch to OUT actuates a hydraulic motor to extend the slats; to retract the slats the switch is returned to IN. A red light adjacent to the slat switch (3, figure 1-3) illuminates whenever the slats are not in the position called for by the switch.

1-108. WING FLAPS.

1-109. Hydraulically operated flaps extend from aileron to fuselage on each wing. The flaps are electrically controlled by means of a flap switch located on a panel just aft of the engine control panel. (See 5, figure 1-3.) To fully lower or raise the flaps, the switch is placed in the DOWN or UP position. Intermediate flap positions can be selected by returning the flap switch to STOP when flaps reach the desired position. If flaps are down and an airspeed of 200 knots IAS is exceeded, an airspeed switch causes the flaps to be retracted to the full up position. Flap position is shown on a combination wheel and flap position indicator to the left of the instrument panel. (See 19, figure 1-3.) The only emergency provision for operating the flaps is that provided by the auxiliary hydraulic pump. However, without electrical power the flaps cannot be lowered or raised.

1-110. SPEED BRAKES.

1-111. The speed brakes, located on either side of the aft fuselage, are hydraulically operated and electrically controlled. A rotary switch on the throttle grip controls the speed brake valve. (See 10, figure 1-3.) The OUT position of the switch is momentary, the IN position is fixed. If utility hydraulic pump fails, the speed brakes can be operated by the auxiliary hydraulic pump. However, in event of a complete electrical failure, the speed brakes cannot be operated.

1-112. AUTOMATIC PILOT.

1-113. A type P-3 automatic pilot is installed in the airplane and all controls for it are located on the right console. The G-2 compass on the instrument panel is used in conjunction with the auto pilot to maintain the airplane heading.

1-114. AUTO PILOT CONTROLS.

1-115. ENGAGING LEVER. Auto pilot servo clutches are engaged or disengaged simultaneously by means of the engaging lever on the right console. (See 21, figure 1-4.) Electrical power is available for operation of the auto pilot whenever both generators are operating, but a 3-1/2 minute warm-up period should be allowed before engaging the auto pilot.

1-116. RELEASE BUTTON. A push-button on the auto pilot control panel on the right console (16, figure 1-4) is depressed in order to disengage the auto pilot electrically.

1-117. FLIGHT CONTROLLER. While on auto pilot, the airplane can be made to climb, dive, or execute coordinated turns by means of a flight controller located on the right console. (See 14, figure 1-4.) The controller is normally held in a center detent and a button on top of the grip must be depressed to be able to move the controller out of the detent. Moving the controller right or left will produce a coordinated turn in the selected direction; forward and aft movement controls pitch.

1-118. PITCH TRIM WHEEL. To change longitudinal trim in order to compensate for cg changes due to use of fuel, a pitch trim wheel (36, figure 1-4) is provided just inboard of the flight controller.

1-119. ALTITUDE CONTROL. An altitude control switch on the auto pilot control panel (18, figure 1-4) is turned ON to maintain the airplane at a particular barometric altitude. Before turning the altitude control switch ON, the flight controller must be centered with the airplane in level flight. With altitude control engaged, the flight controller may be used to make a turn and the altitude control will maintain altitude in the turn if turn is not too steep. If the controller is moved to adjust pitch, the altitude control will be disengaged but will be re-engaged when controller is centered again.

1-120. LEVEL FLIGHT SWITCH. A level flight switch on the auto pilot panel (15, figure 1-4) is used to return plane to level flight. When the level flight switch is turned ON, the airplane goes to wings level and the altitude control is automatically engaged. The altitude control will be locked on regardless of position of flight controller or altitude switch. The flight controller is ineffective when the level flight switch is on.

1-121. RATIO CHANGE SWITCH. To give better performance at low speeds, a ratio change switch on the auto pilot panel can be turned ON. (See 17, figure 1-4.) This provides more surface control for a given altitude deviation.

1-122. LANDING GEAR.

1-123. GENERAL. The landing gear and main wheel fairing doors are hydraulically operated and sequenced but gear operation is electrically controlled. Nose gear doors are operated through linkage to the nose gear. The main gear retracts inboard into the wing; the nose gear retracts aft into the fuselage. Up-locks are hydraulically operated but the gear is locked down by overcenter locks. Gear retraction time is two seconds. A tail skid under the aft fuselage extends and retracts with the gear. Power brakes are provided on the main wheels. A conventional wheel and flap position indicator is located on a panel to the left of the instrument panel.

1-124. LANDING GEAR HANDLE.

1-125. A landing gear handle at the left of the instrument panel (17, figure 1-3) electrically controls the gear hydraulic selector valve, as well as the tail skid valve. The handle has only DOWN and UP positions. When the landing gear handle is moved to either position, a red light in the handle will illuminate and remain on until gear is locked in the selected position. If gear handle is inadvertently moved to UP when airplane is on the ground, a switch on the gear scissors prevents gear retraction as long as weight of airplane is on the gear.

1-126. LANDING GEAR EMERGENCY LOWERING.

1-127. An air bottle supplies emergency pressure for lowering the gear in event of a hydraulic or electrical failure. When the gear handle is pulled out, it opens an emergency valve which admits air pressure to unlock the gear up-locks, allowing gear to fall free. The main gear extends and locks by gravity; the nose gear has a compressed air shock strut which forces it down and locked against the airstream.

1-128. WHEEL BRAKES.

1-129. Power brakes on the main wheels are conventionally operated by toe pedals. Boost pressure for brake control is provided by the utility hydraulic system.

1-130. ARRESTING HOOK AND BARRIER GUARD.

1-131. The arresting hook and barrier guard are controlled by a handle to the right of the instrument panel. (See 3, figure 1-4.) When the handle is moved to DOWN, the hook is unlocked and free falls to the down position and the barrier guard is extended. A red light in the handle illuminates when the hook handle is moved to DOWN and remains on until the hook is full down. When hook handle is returned to UP, the hook is retracted hydraulically. However, the barrier guard must be restowed manually.

Note

An approach light on the nose gear illuminates when the hook is lowered, if the gear is down and lights master switch is on. If gear is down but hook is not, the approach light flashes as a warning to the LSO.

1-132. CATAPULTING EQUIPMENT.

1-133. Provisions for catapulting the airplane from a carrier deck consist of a catapult hook and a holdback fitting. The hook is located under the center of the fuselage and is stationary while the holdback fitting is on the tail skid which extends and retracts with the landing gear.

1-134. WING FOLDING.

1-135. The outer panel on each wing can be folded hydraulically from the deck. Before the wings can be folded, wing lock pins must be released. Access to the wing fold controls is through a door under each wing just inboard of the fold line. When the access door is opened, a red warning pin pops up from the top surface of the wing, visible from the cockpit, as a warning to the pilot that the door is open and the locks possibly unlocked. Two handles are located on the folding mechanism, one to release the down-lock and the other to release the up-lock. The wing fold switch is mounted on the down-lock release handle and has FOLD and EXTEND positions. Holding the switch at either position starts the auxiliary hydraulic pump and actuates the wing fold hydraulic valve. (Since the wing fold switch is powered directly from the battery, the d-c power switch need not be on for wing folding.) To fold the wing, the down-lock release handle is pulled down, the up-lock handle is pushed up and then the fold switch held at FOLD until the wing is locked in the folded position. To spread the wing, the up-lock release handle must be pushed up, the down-lock handle pulled down and the wing fold switch held at EXTEND until wing is locked down. The access door must be closed to retract the warning pin.

1-136. CANOPY.

1-137. GENERAL. The canopy is operated hydraulically by pressure from the utility hydraulic system or, when engine is not running, by the auxiliary hydraulic pump. In any open position, an irreversible mechanism holds the canopy open and will withstand a 40 g crash load. Normally the canopy is controlled electrically either from inside or outside the airplane. In an emergency the canopy can be opened by a pneumatic system, which is also used to jettison the canopy in flight prior to seat ejection. When the canopy is released for seat ejection, it pulls a safety pin from the seat catapult firing mechanism which prevents seat ejection until after the canopy leaves the airplane.

1-138. CANOPY CONTROLS.

1-139. EXTERNAL CANOPY BUTTONS. The canopy is operated from outside the airplane by means of two spring-loaded push buttons located on the left side of the airplane just aft of the air intake duct. (See figure 2-2.) One button is marked OPEN, the other, CLOSED.

1-140. CANOPY SWITCH AND EMERGENCY OPENING CONTROL. From within the cockpit, the canopy is controlled by a toggle switch on the emergency control handle located above the left console. (See 16, figure 1-3.) To operate the canopy normally, the spring-loaded switch is held at OPEN or CLOSE until the canopy reaches the desired position. When opening the canopy, it will take about two seconds for the seals to bleed before canopy will operate. In case of emergency, the canopy can be opened by pulling aft on the emergency handle, thereby directing air pressure to an air motor for opening the canopy.

CAUTION

After once pulling the emergency canopy control back, it should not be pushed forward again until the canopy has opened fully. If the handle is pushed forward before the air motor stops turning, it will damage the gears in the motor.

1-141. CANOPY JETTISON CONTROL. The canopy is jettisoned when the leg braces on the seat are pulled up in preparation for seat ejection.

1-142. EXTERNAL CANOPY EMERGENCY OPENING CONTROL. An external handle for opening the canopy in an emergency is located on left side of fuselage near aft end of canopy. Pulling up on this handle will actuate the emergency pneumatic system to open the canopy. If canopy should not open when emergency system is actuated, a handle on the aft end of the canopy frame can be used to pull canopy open manually.

1-143. EJECTION SEAT.

1-144. GENERAL. A catapult is provided aft of the seat to eject seat and pilot from the airplane in event an emergency exit is necessary. Leg braces on either side of the seat, foot stirrups forward of the seat bucket and a face curtain above the headrest are used only for seat ejection. A safety pin in the seat firing mechanism prevents firing the catapult until after the canopy is jettisoned. When the seat is ejected by pulling the face curtain, anti-g suit, oxygen, microphone and headset connections automatically disconnect at a single fitting on the left console. A drogue parachute, stowed aft of the headrest, is automatically released by a gun following ejection to stabilize the seat.

Note

The seat provides for a PK-2 pararaft kit.

1-145. SEAT CONTROLS.

1-146. SEAT VERTICAL ADJUSTMENT SWITCH. The seat is raised or lowered electrically by means of a toggle switch on the right side of the seat. Holding the switch at UP or DOWN energizes the actuator to move the seat; when the switch is released, the seat will stop.

1-147. SHOULDER HARNESS LOCK HANDLE. The shoulder harness inertia reel lock handle, located on left side of seat, is conventionally operated for normally locking and unlocking the shoulder harness. In addition, the inertia reel will automatically lock the shoulder harness under a 2 to 3 g forward deceleration, as in a crash landing. The shoulder harness is also automatically locked before seat ejection when the face curtain is pulled down.

1-148. SEAT EJECTION CONTROLS. Only two controls need to be operated for seat ejection. Pulling the leg braces up into position jettisons the canopy. (The braces are connected under the seat so that both of them can be positioned by pulling either handle.) To fire the seat, the face curtain handles above the headrest are pulled down, thereby locking the shoulder harness and firing the seat catapult. The catapult is fired when the face curtain is three inches from the bottom of its travel.

Note

A safety pin in the seat catapult firing mechanism prevents pulling the trigger lever until after the canopy is jettisoned.

The drogue parachute is automatically released by a static line approximately 32 feet long which fires the drogue gun when the seat is that far above the airplane. The static line then falls away and the chute opens to stabilize the seat.

1-149. INSTRUMENTS.

1-150. GENERAL. Most of the instruments are electrically operated by power from the electrical system. (See figure 1-6.) The tachometer and turbine outlet temperature indicator are self-generated electrical instruments and are not powered by the electrical system.

1-151. AIRSPEED INDICATOR.

1-152. The airspeed indicator is a conventional airspeed indicator with the addition of a maximum airspeed indicating mechanism which normally indicates maximum allowable airspeed for the existing flight altitude. A yellow pointer shows indicated airspeed; a red and white striped pointer is meant to show maximum allowable airspeed. However, on this airplane the maximum allowable airspeeds are above the limits of the indicator (as shown in figure 2-1) and therefore, the striped pointer can be used for reference purposes only since it cannot be set above 1.0 Mach number. The indicator is preset for the maximum Mach number and the striped pointer will move to indicate the airspeed corresponding to that Mach number at the existing flight altitude.

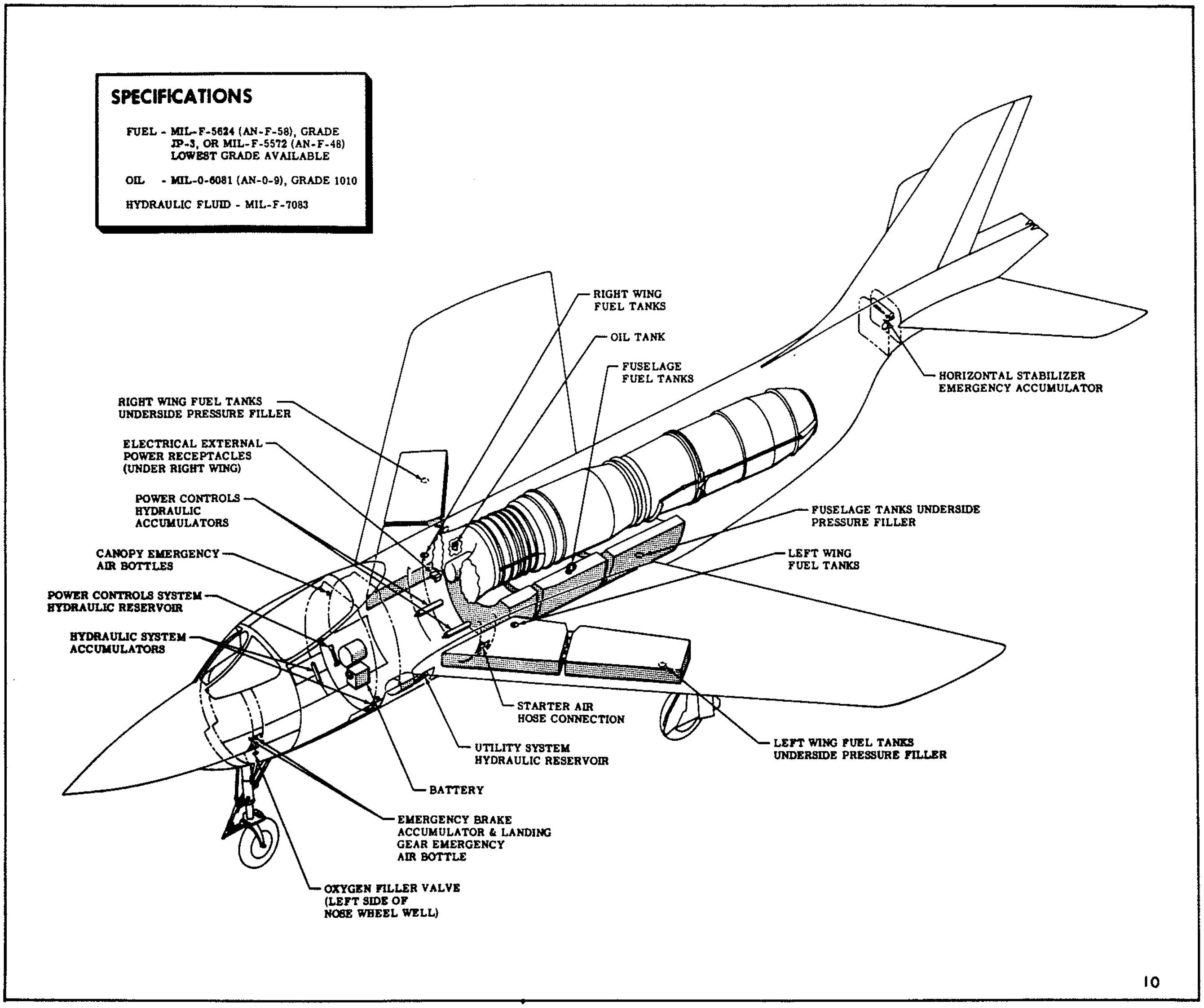

Figure 1-7. Service Points

1-153. GYRO FAST ERECT SWITCH.

1-154. The gyro horizon is electrically driven and contains an automatic fast erecting feature. A warning light on the instrument panel (6, figure 1-2) illuminates when the quick-erection unit in the indicator system is energized. The light will go off when the gyro rotor is brought up to operating speed. However, if the light should remain on longer than one minute, the switch adjacent to it (7, figure 1-2) should be turned OFF to prevent the instrument from being damaged.

1-155. G-2 COMPASS.

1-156. The G-2 compass is a non-tumbling directional gyro which does not require caging. A switch adjacent to the compass (1, figure 1-2) may be turned to FREE DG and the compass used as a standard directional gyro if desired. If so used, the indicator must be reset periodically to the bearing taken from the stand-by compass. A stand-by compass correction card is provided at the bottom of the instrument panel. (See 10, figure 1-2.)

1-157. ENGINE FIRE DETECTOR SYSTEM.

1-158. Warning of engine fire is given by illumination of a red light at the top right of the instrument panel. (See 8, figure 1-2.) Operation of the warning system and the light can be checked by means of a test switch adjacent to the warning light. (See 9, figure 1-2.) The switch is spring-loaded in the NORMAL position and is held at TEST until the warning light illuminates, indicating proper operation of the detection circuits and the light. The warning light is a push-to-test type, permitting a check of bulb condition independent of system operation.

1-159. OPERATIONAL EQUIPMENT.

1-160. Information concerning the following operational equipment is supplied in Section IV of this handbook: Rockets; oxygen; communications and associated electronic equipment; cockpit pressurization and air conditioning; windshield defrosting; engine anti-icing, anti-g suit; lighting and pitot heat.

SECTION II
NORMAL OPERATING INSTRUCTIONS

2-1. BEFORE ENTERING COCKPIT.

2-2. RESTRICTIONS.

a. The limit airspeed for operating the landing gear, arresting hook, and canopy is 250 knots IAS; for wing flaps and slats, the limit is 200 knots IAS.

The maximum permissible acceleration is 4.0g

~~b. See figure 2-1 for maximum allowable airspeed and acceleration limits.~~

The maximum permissible speed is 500 knots or a Mach number of 1.0.

~~c. Steady yaw with rudder pedal force up to 300 pounds is permissible at any speed.~~

~~d. Do not do rudder kicks of 300 pounds pedal force above 225 knots IAS.~~

d ~~e~~. Do not fishtail airplane to build up yaw angles in excess of 5 degrees at any speed. ~~Do not fishtail at all above 500 knots IAS.~~

e. Deleted

THESE RESTRICTIONS ARE SUBJECT TO CHANGE; LATEST SERVICE DIRECTIVES AND ORDERS MUST BE CONSULTED.

OPERATING FLIGHT STRENGTH DIAGRAM

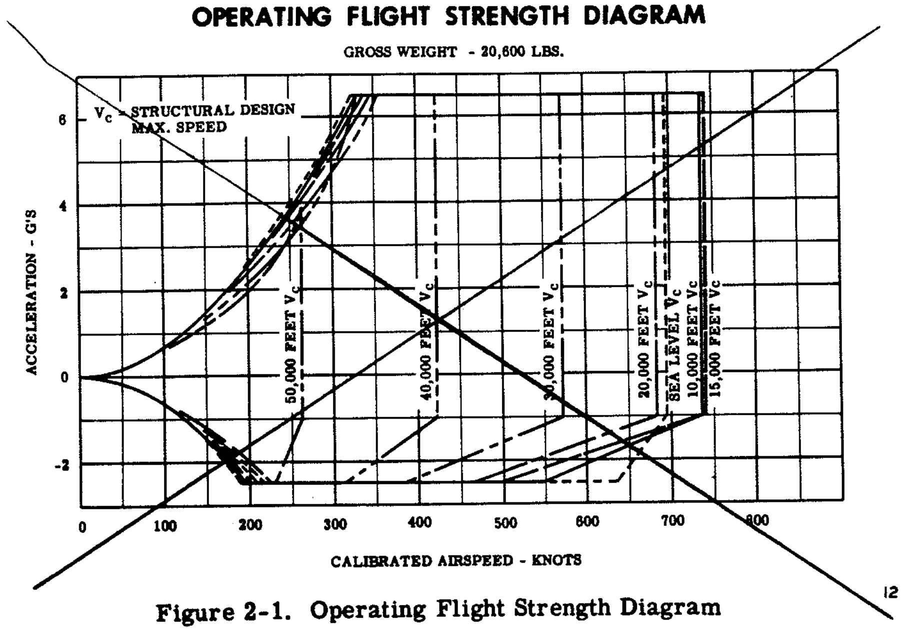

Figure 2-1. Operating Flight Strength Diagram

2-3. TAKE-OFF GROSS WEIGHT AND BALANCE.

Note

Refer to Handbook of Weight and Balance Data, AN 01-1B-40, for loading information.

2-4. Check take-off and anticipated landing gross weight and balance. Make sure total weight of fuel, oil, armament, oxygen, and special equipment carried is suited to the mission to be performed.

2-5. PREFLIGHT CHECK.

a. Make sure airplane has been serviced with required amounts of fuel, oil, hydraulic fluid and oxygen.

b. Check inlet ducts clear.

c. Pitot tube and radar cooling inlet uncovered.

d. Check gear oleo strut extension, tires for slippage and proper inflation. Check for hydraulic fluid leaks.

e. Be sure ground locks are removed from main and nose gear.

f. Fuel caps and all access doors secured.

g. Check tail pipe for cracks or excessive distortion.

h. Examine overall condition of airplane exterior.

i. Arresting hook locked up.

j. Hydraulic accumulator and pneumatic system air pressure gages checked.

k. Wheels chocked.

2-6. ENTRANCE TO COCKPIT.

2-7. The cockpit is accessible from left side of airplane only. Three kick-in steps or handholds are provided on left side of fuselage forward of air intake duct, and the nose gear and nose gear door are used as steps. (See figure 2-2.) The canopy is operated by means of two electrical push buttons located on left side of fuselage just aft of the air duct inlet.

WARNING

The steps are just forward of the air inlet duct and, consequently, no personnel should be allowed to use them when engine is running.

2-8. ON ENTERING COCKPIT.

2-9. STANDARD CHECK.

a. Rocket master switch OFF.

b. Controls unlocked; check controls for freedom of movement and proper travel, watching control surfaces for correct response.

c. Signal deck crew to plug in external electrical power source. Check all circuit breakers in.

d. Adjust seat and rudder pedals.

e. Set anti-g suit regulator valve HI or LO as desired.

f. Power control switches ON.

g. AN/APS-25 radar controls OFF.

h. Run trim controls through complete cycle to check operation, observing indicator and tabs for correct response. Set trim for take-off.

i. Engine master switch OFF.

j. Tank boost pump switch NORMAL.

k. Fuel tank vent switch set as desired (3 PSI normally, 2 PSI for combat).

l. Rocket rack jettison switch OFF (guard down).

m. Throttle OFF.

n. Engine anti-icing switch OFF.

o. Oxygen regulator air valve NORMAL OXYGEN, pressure 1800-1850 psi. (If pressure is less than 1800 psi, have system charged before flight.)

p. Gear handle DOWN.

q. Check fuel quantity; set totalizer dial.

r. Altimeter and clock set.

s. G-2 compass switch at COMPASS CONTROL.

t. Rocket rack switch RETRACT.

u. Gyro horizon erect switch NORMAL.

v. Accelerometer set.

w. Hold fire warning switch at TEST and check that light comes on.

x. Hydraulic Panel - Auxiliary hydraulic pump switch OFF, engine fuel pump switch NORMAL.

y. Arresting hook handle UP.

z. D-C power switch BATT. GEN; a-c power switch A-C GEN; a-c field switch ON; instrument power switch A-C GEN.

aa. Cabin altimeter set; cabin temperature switch AUTO.

ab. Pitot heat switch OFF.

ac. Automatic pilot DISENGAGE.

ad. Lights off.

ae. Check operation of communication equipment.

af. Check operation of oxygen equipment.

ag. Wings spread and locked. Be sure that warning pins are not showing.

ah. Before night or instrument flights, check all lights and instruments.

2-10. FUEL SYSTEM MANAGEMENT.

2-11. Although fuel system control is essentially automatic, requiring no tank selection, the following checks are necessary:

a. After starting engine, check each booster pump separately.

b. Emergency boost pump switch OFF for all normal operation.

c. Check emergency engine control system prior to take-off as described in paragraph 2-22.

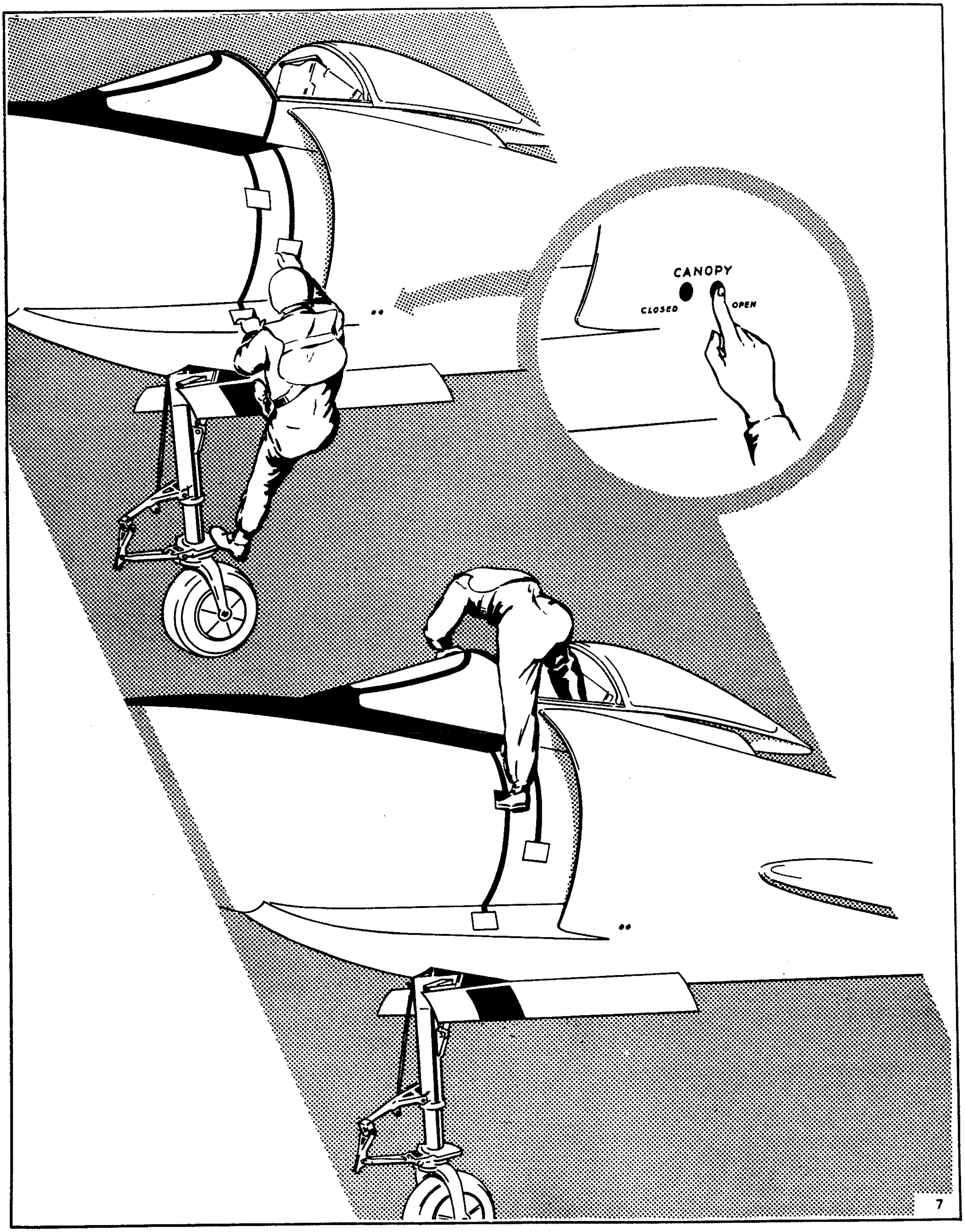

Figure 2-2. Entering Airplane

d. Before take-off, be sure tank vent switch is at 3 PSI.

e. For combat, move tank vent switch to 2 PSI.

f. Frequently check that wing tank transfer lights are on, indicating wing tank fuel is being transferred. The lights will go out when fuel transfer has stopped.

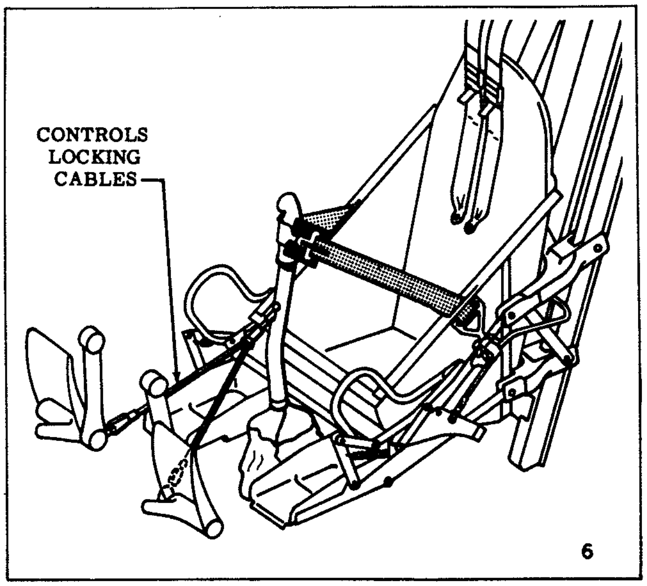

Figure 2-3. Surface Controls Lock

2-12. STARTING ENGINE.

2-13. Start engine with airplane headed into wind whenever possible. If operating from an airfield, start and run up engine on a concrete surface whenever practicable, to minimize the possibility of dirt and foreign objects being drawn into engine.

WARNING

Before starting engine, make sure areas at intake ducts and aft of tail pipe are clear of personnel, aircraft and vehicles.

Check that auxiliary power unit (compressed air) is connected to airplane, as well as an electrical external power source.

2-14. STARTING ENGINE ON PRIMARY SYSTEM. Start engine as follows:

a. Throttle OFF.

b. Engine master switch ON. Wait 15 seconds for electronic tubes in power regulator to warm up before starting. However, if engine preheat switch is installed for preheating tubes (on airplanes with power regulators No. 61F758-1 through -7 and -9 installed), hold preheat switch ON for 15 seconds before starting and until throttle is advanced to IDLE. (Do not hold preheat switch on longer than 5 minutes.)

c. Check for go-ahead signal from starter-cart operator, indicating that starting compressor is operating and ready for an engine start.

d. Hold throttle outboard at CRANK for at least 5 seconds and then move it to IDLE.

CAUTION

Do not let throttle slip back into OFF position while advancing it to IDLE or the start will be aborted.

Do not re-engage starter when engine is turning over or coasting as it will damage the starter.

e. Engine will accelerate to approximately 11% rpm, light off (as indicated by sudden increase in turbine outlet temperature), and then continue to accelerate to idle (about 42% rpm) without any throttle manipulation.

CAUTION

During acceleration to idle, engine speed should increase smoothly. If turbine outlet temperature exceeds 760°C for more than 5 seconds, or 930°C at any time, shut down immediately and have power regulator checked.

Note

The emergency fuel system light may illuminate until approximately 7% rpm is reached. However, if the light is still on at 11% rpm, hold emergency fuel system switch at RESET PRIM. If light still does not go out, shut down engine and investigate.

f. When engine is started, signal ground crew to remove air hose and have external electrical power source disconnected.

Note

Starter will not cut out automatically but will continue to operate until the air valve on the starter cart is closed or until throttle is retarded to OFF in event of an aborted starting attempt.

g. Check engine instruments within following ranges:

Oil temperature	38° - 99° C
Oil pressure	100 - 130 psi
Fuel pressure	10 - 50 psi

Turbine outlet temperature within limits (as given in engine log book).

2-15. STARTING ENGINE ON EMERGENCY SYSTEM. Should it be necessary to start engine on the emergency system, make start as follows:

a. Throttle OFF.

b. Engine master switch ON.

c. Check for go-ahead signal from starter cart operator.

d. Move throttle to CRANK and hold there until engine rpm reaches about 11%, then advance throttle to IDLE.

e. Immediately turn emergency ignition switch on and hold emergency fuel control switch at SELECT EMERG.

f. When engine lights off, retard throttle as necessary to prevent temperature from exceeding 930°C at any time or 760°C for more than 5 seconds. Remember that temperature must be controlled manually when operating on emergency system.

g. Advance throttle to IDLE as soon as possible, maintaining temperature below limits.

CAUTION

When operating on emergency system, never jam throttle open as it will cause excessive turbine outlet temperature and severe compressor stall.

h. Switch to primary fuel control system by holding fuel control switch at RESET PRIM.

i. Check engine instruments for desired readings.

2-16. GROUND TESTS.

2-17. No engine warm-up is necessary. As soon as engine stabilizes at idling speed with normal gage readings, the throttle can be opened to full power. After engine is started, check the following:

a. Booster pumps - Hold each boost pump switch on individually and check fuel pressure gage for 25 to 30 psi.

b. Surface controls - Check for free and correct movement. Check controls hydraulic pressure gage.

c. Hydraulic system - Test by operating flaps or speed brakes through one complete cycle. Check utility hydraulic system pressure.

d. At 45% rpm, check d-c voltmeter for approximately 28 volts, and check ammeter for reading. (Generator will not charge below approximately 45% rpm.) Check a-c voltmeter at all three phases by using voltmeter selector. All three readings should be in balance.

e. Test inverter operation by moving instrument power switch momentarily to STANDBY INVERTER and check a-c voltmeter.

2-18. TAXIING.

2-19. Observe the following instructions for taxiing:

a. Release brakes and allow airplane to roll forward before starting a turn.

b. Once the airplane is moving, allow it to roll using the lowest rpm possible.

c. Use brakes for steering.

d. Avoid excessive jockeying of throttle during taxiing.

e. Minimize taxi time, as airplane range is considerably decreased by high fuel consumption during taxiing.

Note

Fuel consumption during taxiing is approximately 22-1/2 pounds per minute at idling rpm.

2-20. BEFORE TAKE-OFF.

2-21. Make the following checks before take-off:

a. Controls for free and correct movement.

b. Wings spread and locked; warning pins down.

c. Slats OUT. Check indicator light off.

d. Trim settings: elevator, rudder and aileron neutral.

e. Wing flaps full down for optimum take-off.

f. Canopy open.

g. Hook up.

h. Shoulder harness locked.

2-22. Check emergency fuel control as follows:

a. With engine idling, hold emergency fuel control switch at SELECT EMERG. until indicator light comes on.

b. If rpm remains same as on primary, advance throttle slowly to MILITARY. Check that 100% rpm is obtained and turbine outlet temperature is within limits shown in figure 2-4.

WARNING

If 100% rpm and the temperature shown in figure 2-4 are not obtained, do not attempt a take-off as the engine may not deliver full thrust.

c. Check engine instruments in desired ranges as given in paragraph 2-14, g.

d. Retard throttle to IDLE and then hold emergency fuel control switch at RESET PRIM. until indicator light goes out.

e. Run up engine to MILITARY again and check engine instrument readings while operating on primary fuel control.

f. While at full power, check emergency engine pump by moving engine fuel pump switch to EMERG. and checking that light comes on. If there is no change in rpm or turbine outlet temperature, the emergency pump is operating properly. Return switch to NORMAL and check that light goes out.

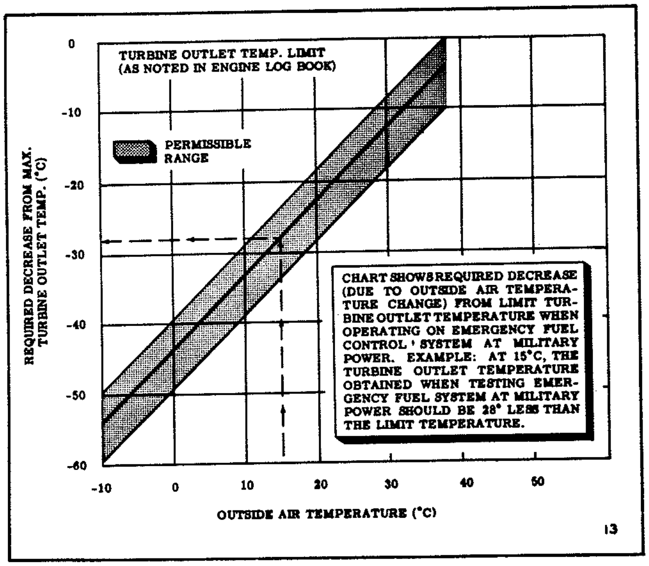

Figure 2-4. Emergency Fuel System Test-Decrease in Turbine Outlet Temperature

2-23. TAKE-OFF.

2-24. FIELD TAKE-OFF.

a. Pull stick back until full nose-up stabilizer is obtained.

b. With throttle at full MILITARY power, release brakes and begin take-off run.

c. Maintain directional control by using brakes until rudder control becomes effective.

d. Estimated take-off speeds are as follows:

GROSS WEIGHT (Pounds)	TAKE-OFF SPEED (IAS-Knots)
23,000	120
21,000	115
19,000	110

e. Refer to take-off chart (figure A-1) for take-off distances.

Note

Refer to paragraphs 3-10 and 3-11 for procedures in case of engine failure during take-off.

2-25. CATAPULT TAKE-OFF.

a. Shoulder harness locked.

b. Increase throttle friction adjustment.

c. Place back and head firmly against back pad and headrest.

d. Place feet against rudder pedals with legs stiff.

e. Brace right arm.

f. Advance throttle to MILITARY position and hold with catapult grip. (With afterburner installed, advance throttle to MAXIMUM.)

g. Check engine instruments.

2-26. AFTER TAKE-OFF.

2-27. When airplane is definitely airborne:

a. Brake wheels.

b. Landing gear handle UP. Check indicator for up and locked indication. (Gear will retract in approximately 2 seconds.)

c. Close canopy.

d. Wing flaps UP below 200 knots IAS.

e. Retract slats below 200 knots IAS.

Note

If flaps and slats are allowed to retract automatically (above 200 knots IAS), be sure to reposition flap switch to STOP and slat switch to IN. Otherwise, the flaps and slats will extend again when airspeed is subsequently decreased below 200 knots IAS.

f. Level off and accelerate to best climbing speed. (See figures A-1 and A-2 for climb data.)

2-28. CLIMB.

2-29. Climb at 100% rpm and maximum allowable turbine outlet temperature (as given in engine log book). Refer to climb charts for recommended airspeeds to be used during climb and for estimated rates of climb and fuel consumption.

CAUTION

Do not operate at 100% rpm and limit temperature for longer than 20 minutes (30 minutes in an emergency).

2-30. DURING FLIGHT.

2-31. FLIGHT CHARACTERISTICS.

2-32. Information to be supplied when available.

2-33. STALLS.

2-34. Estimated stall speeds are as follows.

STALL SPEEDS (IAS - KNOTS)
POWER OFF

GROSS WEIGHT (Pounds)	GEAR & FLAPS UP SLATS IN	GEAR & FLAPS DOWN SLATS OUT
23,000	130	110
21,000	125	105
19,000	120	100

POWER ON
GEAR & FLAPS DOWN, SLATS OUT

GROSS WEIGHT (Pounds)	MILITARY POWER (Without Afterburner)	MAXIMUM POWER (With Afterburner)
23,000	105	100
21,000	100	95
19,000	95	90

2-35. AUTOMATIC PILOT OPERATION.

2-36. To operate the auto pilot during flight:

a. Trim airplane for straight and level flight.

b. Flight controller centered.

c. Move engaging lever forward to ENGAGE.

d. With flight controller centered, airplane will maintain heading of G-2 compass.

e. To maintain a specific altitude, turn altitude control switch ON, with flight controller centered.

f. Coordinated turns may be executed by moving flight controller left or right. If altitude control switch is ON, turn will be made holding altitude constant. However, should controller be moved fore or aft, the altitude control will be disengaged automatically but will re-engage when controller is centered again.

g. At low speed, turn ratio change switch ON to obtain better performance.

h. To disengage auto pilot, either press the release button or move engaging lever to DISENGAGE.

2-37. APPROACH.

a. Shoulder harness locked.

b. Rocket master switch OFF.

c. Landing gear down below 250 knots IAS. Check indicator for gear down and locked; red light out.

d. Hook down for carrier, up for field landing. Check hook indicator light.

e. Slats OUT below 200 knots IAS. Check that indicator light is out.

f. Wing flaps DOWN.

g. Canopy open.

h. Make approach at approximately 85% to 90% rpm.

i. Check instruments for desired ranges.

2-38. LANDING.

2-39. NORMAL LANDING.

a. On final approach, maintain airspeed of approximately 140 knots IAS.

b. Use power approach and when landing is assured, retard throttle to IDLE.

c. Touchdown speed is approximately 100 to 110 knots.

d. Touch main wheels, tail well down; hold nose wheel off as long as possible.

e. Raise flaps before taxiing. Retract slats.

2-40. WAVE-OFF.

a. Open throttle to full power.

b. Gear UP.

c. After safe altitude and speed are attained, retract flaps and slats.

Note

If slats and flaps should blow up automatically (above 200 knots IAS) be sure to reposition flap switch to STOP and slat switch to IN. Otherwise, flaps and slats will extend again when airspeed is decreased below 200 knots IAS.

d. Arresting hook UP.

2-41. STOPPING ENGINE.

2-42. In order to reduce possibility of an engine fire after shut-down, stop engine as follows:

a. Run up engine to approximately 100% rpm for 10 seconds.

b. Retard throttle to IDLE and run engine at idle speed for 10 seconds.

c. Retard throttle rapidly to OFF (holding throttle outboard to pass idle stop).

d. Turn engine master switch OFF immediately after retarding throttle.

e. Turn all switches OFF.

Note

Do not shut down engine when operating on the emergency fuel control unless absolutely necessary. Since the primary fuel control valve remains in whatever operating position it was in at time of switchover, the next start may be a hot start.

2-43. BEFORE LEAVING AIRPLANE.

a. Install surface control lock.

b. Complete flight forms.

c. Chock wheels.

d. Close canopy.

e. Have barrier crash guard stowed after carrier landing.

SECTION III
EMERGENCY OPERATING INSTRUCTIONS

3-1. FIRE.

Note

There is no fire extinguishing equipment on this airplane.

3-2. ENGINE FIRE DURING STARTING.

3-3. If fire detector light comes on, or there is other indication of fire when starting engine:

a. Throttle OFF.

b. Engine master switch OFF.

c. Power switches (both d-c and a-c) OFF.

3-4. ENGINE FIRE DURING FLIGHT.

3-5. If fire warning light comes on in flight:

a. Reduce power and airspeed to see if light goes out. If light goes out, continue flight at reduced power, landing as soon as possible.

b. If light does not go out and a dead-stick landing is possible, shut down engine and make a forced landing.

c. However, if light does not go out and a landing is not feasible, shut down engine. If light then goes out and remains out, restart engine. Should warning light come on again, abandon airplane.

3-6. ELECTRICAL FIRE.

3-7. Circuit breakers and fuses protect most of the electrical circuits and will tend to isolate an electrical fire. However, if an electrical fire occurs, turn a-c and d-c power switches OFF.

CAUTION

If necessary to turn off power switches, most of the electrical equipment will be inoperative.

3-8. ENGINE FAILURE.

3-9. ENGINE FAILURE DURING TAKE-OFF.

3-10. ENGINE FAILURE BEFORE LEAVING THE GROUND. If engine fails before leaving ground, retard throttle to OFF and brake as required.

3-11. ENGINE FAILURE AFTER LEAVING GROUND. If engine fails on take-off, immediately turn emergency ignition switch ON and move emergency fuel switch to SELECT EMERG. If engine does not restart, prepare for landing, accomplishing as much of following as possible:

a. Gear handle UP.

b. Throttle OFF.

c. Engine master switch OFF.

d. If flaps have been raised, move switch to DOWN.

e. Land straight ahead, changing direction only enough to miss any obstacles.

f. Electrical power switches OFF just before ground contact.

3-12. ENGINE FAILURE DURING FLIGHT.

3-13. FUEL SYSTEM FAILURE. Sudden loss of fuel pressure and decrease in engine rpm indicate failure of some part of the primary fuel control system, and necessitate operation on the emergency system.

a. Retard throttle.

b. Turn emergency ignition switch ON.

c. Hold emergency fuel control switch at SELECT EMERG. momentarily.

d. Advance throttle slowly.

Note

If engine stalls or surges, retard throttle as necessary to eliminate the stall and readvance it very carefully.

e. In operating on the emergency system, remember that temperature must be manually controlled; therefore, open the throttle gradually, especially in the low rpm range, to avoid exceeding temperature limits or causing engine surge or stall.

f. If flame-out occurs before emergency system can take over, attempt to restart engine as described in paragraph 3-14.

3-14. RESTARTING ENGINE IN FLIGHT. If sufficient altitude is available when engine fails, attempt to restart engine as follows:

a. Throttle OFF immediately after flame-out.

b. Slow airplane down to obtain windmilling speed of approximately 25% rpm.

Note

Starts can be made at windmilling speeds from 14% to 42% rpm.

c. Master switch ON.

d. Emergency ignition switch ON.

e. Hold engine fuel control switch at SELECT EMERG. momentarily.

f. Open throttle to IDLE and wait 10 seconds for light-off.

Note

A minimum of 3 seconds is required to obtain ignition. If ignition does not occur in 10 seconds, it is unlikely that a light-off can be obtained and another throttle setting should be used.

g. If ignition is not obtained, advance throttle very slowly about one inch, if below 25,000 feet. Above 25,000 feet, slowly retard throttle about a half inch below IDLE.

h. After light-off, adjust throttle as necessary to keep temperature within limits.

i. Hold engine fuel control switch at RESET PRIM. to return control to primary system.

j. Turn emergency ignition switch OFF.

CAUTION

If emergency ignition switch is not turned off, the engine ignition coil will burn out in less than 15 minutes.

3-15. FORCED LANDING.

3-16. In case an engine failure during flight necessitates a forced landing, proceed as follows:

Note

See figure 3-1 for recommended airspeeds to use to obtain maximum distance or minimum sink in a glide with engine dead.

a. Jettison rocket racks.

b. Throttle and engine master switch OFF if forced landing is caused by complete engine failure.

c. Shoulder harness locked.

d. Canopy open.

e. Do not lower gear unless absolutely certain that available landing area is suitable for a wheels-down landing.

f. When sure of making field, extend slats and lower flaps.

g. Without power, the airplane will sink very rapidly. Maintain airspeed well above stall speed. (Refer to paragraph 2-34 for stall speeds.)

h. Just before ground contact, turn electrical power switches OFF.

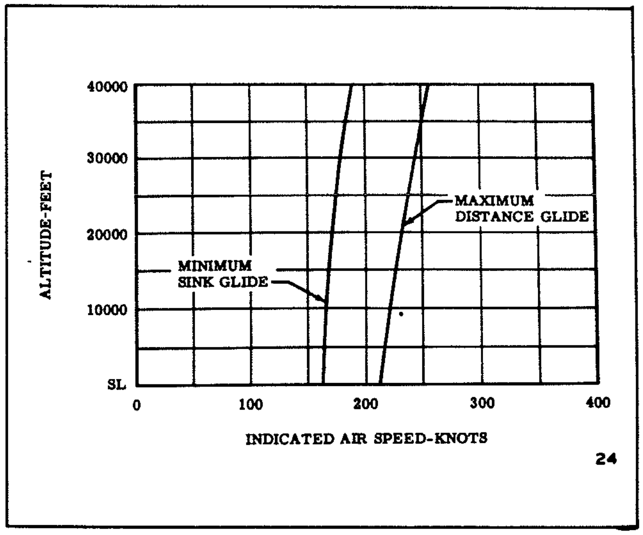

Figure 3-1. Glide Speeds with Dead Engine

3-17. DITCHING.

3-18. Ditch the airplane only as a last resort. All emergency survival equipment is carried by the pilot; consequently, there is no advantage in riding the airplane down. However, if altitude is insufficient for emergency exit and ditching is unavoidable, proceed as follows:

a. Follow radio distress procedure.

b. Jettison rocket racks.

c. See that no personal equipment will foul as you leave the cockpit. Disconnect oxygen hose and anti-g suit.

d. Check gear up and speed brakes in.

e. Shut down engine.

f. Make sure safety belt is tight and shoulder harness locked.

g. Canopy full open.

h. Slats out.

i. Lower flaps.

j. Make normal approach and flare out to normal landing attitude, being careful to keep nose high.

3-19. EMERGENCY EXIT - SEAT EJECTION.

3-20. In all cases of emergency exit in flight, escape must be accomplished by means of seat ejection as shown in figure 3-2. Observe the following precautions during the procedure:

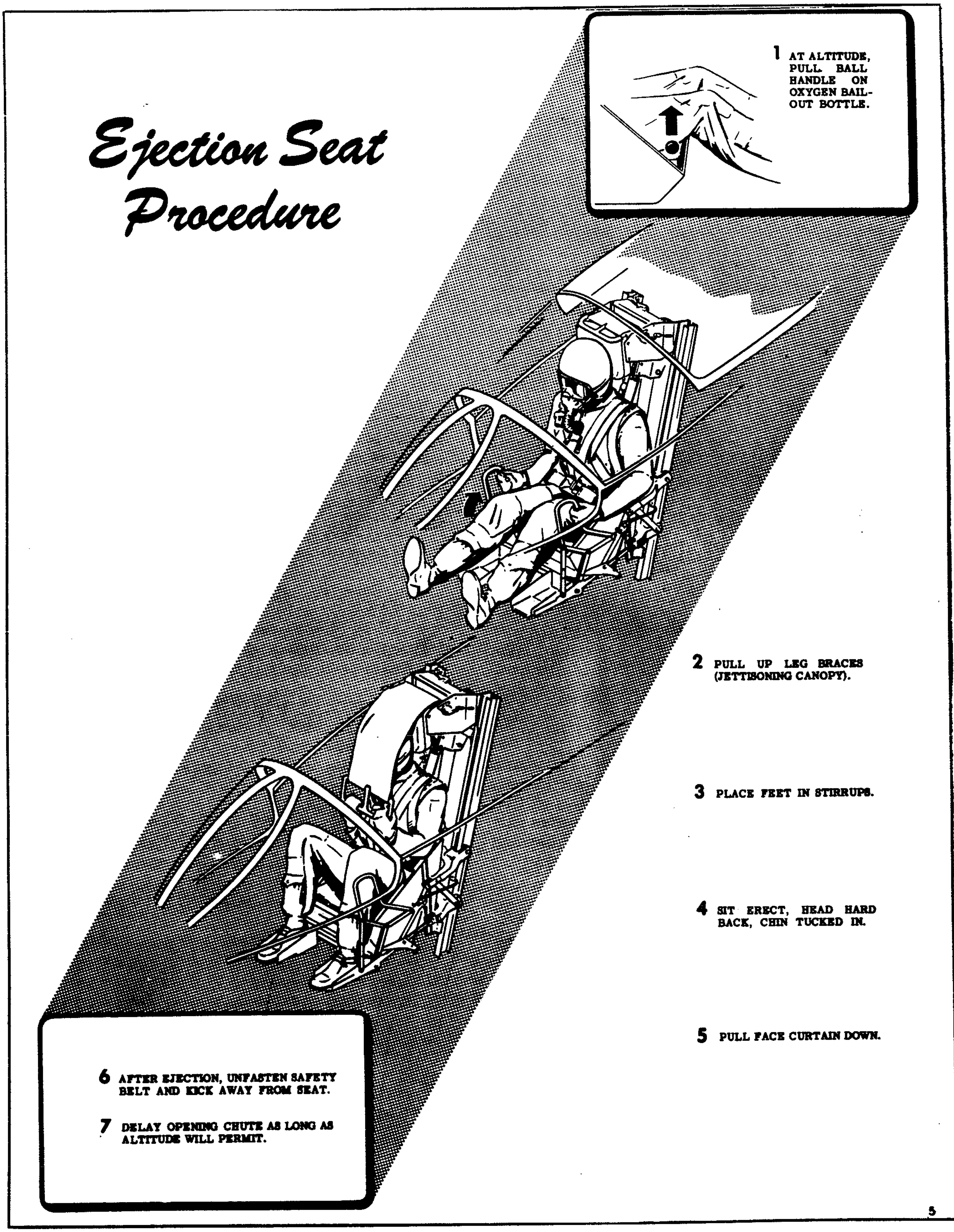

Figure 3-2. Ejection Seat Procedure

a. Reduce airspeed if possible.

b. With feet in stirrups, hold heels hard aft to insure toe clearance upon ejection.

c. Be sure to sit erect with head pressed against headrest. The erect sitting position is important to prevent spinal injury. However, keep chin tucked in as it is preferable to have head slightly forward of being centered over the spine rather than aft.

d. Reach overhead with palms aft, and grasp face curtain handles, keeping elbows close together. Pull curtain down, thereby locking shoulder harness and firing seat catapult. Inasmuch as catapult is fired when curtain is three inches from bottom of travel, be sure to grip handles firmly to prevent releasing curtain involuntarily during ejection.

e. After ejection hold face curtain down until time to leave the seat.

f. When at high altitude, delay opening parachute until a safe altitude is reached, to avoid effects of anoxia and cold.

3-21. ELECTRICAL SYSTEM EMERGENCY OPERATION.

3-22. A-C GENERATOR FAILURE.

3-23. If the a-c generator fails (as indicated by illumination of a-c warning light), essential instruments will be transferred automatically to the inverter. Turn instrument switch to STANDBY INVERTER to turn off the warning light.

3-24. D-C GENERATOR FAILURE.

3-25. If the d-c generator warning light illuminates (indicating d-c generator failure or drop in d-c generator output), equipment on the monitored bus will be inoperative. The primary and secondary busses will then be supplied d-c power by the a-c generator through the transformer rectifier.

3-26. D-C AND A-C GENERATOR.

3-27. Should both generators fail, turn off all nonessential equipment (pull circuit breakers if necessary) to conserve battery power. The battery supplies power to the primary bus automatically under these conditions. If it is desired to operate equipment on the secondary bus, pull circuit breakers for equipment not to be used, and then move d-c generator switch to BATT. ONLY. (See figure 1-6 for list of equipment that is electrically operated or controlled.)

CAUTION

With both generators inoperative, the battery will last approximately 10 minutes at the most.

3-28. COMPLETE ELECTRICAL FAILURE.

3-29. In case of a complete electrical failure, or if it is necessary to turn off all electrical power, all fuel boost pumps will be inoperative. Consequently, it will probably be necessary to decrease altitude and speed to maintain satisfactory engine operation. If possible, descend to 5000 feet and slow down to 300 knots IAS.

3-30. HYDRAULIC SYSTEM EMERGENCY OPERATION.

3-31. Should the utility hydraulic pump fail, turn the auxiliary pump on to operate necessary units. However, auxiliary pump output pressure is low and any operation from it will be very slow.

3-32. FLIGHT CONTROLS EMERGENCY OPERATION.

3-33. POWER CONTROLS HYDRAULIC FAILURE.

3-34. Should the power controls hydraulic system fail, the flight controls must be operated normally without benefit of hydraulic power. The elevator-stabilizer follow-up system and elevator feel trim will be inoperative but the stabilizer can be adjusted electrically by means of the trim control on the stick. With no hydraulic pressure, the airplane is controllable but maneuvering stick forces will be high.

3-35. POWER CONTROLS ELECTRICAL FAILURE. In case of complete electrical failure, the trim controls are inoperative. However, the airplane can be flown with the unbalanced feel system forces and stick forces will not be excessive. Stick forces will be slightly higher but the airplane can be flown easily and a normal landing made.

3-36. POWER CONTROLS HYDRAULIC AND ELECTRICAL FAILURE. If both an electrical and a hydraulic failure occur, the flight controls must be operated manually with no trimming other than that given by the emergency stabilizer follow-up system which will trim the stabilizer only in the direction for decreasing airspeed. Inasmuch as the follow-up will be slow, stick movement may have to be slower too and time allowed for stabilizer operation to take effect.

3-37. ARTIFICIAL FEEL SYSTEM FAILURE.

3-38. Should the artificial feel system fail to operate properly, any forces encountered can be overcome by the pilot and the airplane can be flown and landed safely. Or, if desired, the related power controls switch can be turned off and the controls operated manually with feel allowed to feed back from the surfaces.

WARNING

Failure of the bellows in the elevator feel system makes the stick go forward suddenly, causing airplane to nose down. This can be easily overcome by the pilot if he has time, the danger being if such failure occurs at low altitude while flying at high speed.

3-39. LANDING GEAR EMERGENCY EXTENSION.

3-40. If landing gear fails to lower normally:

a. Pull gear handle hard aft to actuate emergency pneumatic system.

b. If necessary, yaw airplane to lock main gear down.

c. Check gear position indicator.

3-41. CANOPY EMERGENCY OPENING.

3-42. To open canopy from inside in an emergency, pull red canopy emergency handle full aft to actuate pneumatic system. From outside the airplane, the emergency canopy handle on left side of fuselage can be pulled to actuate the pneumatic system to open the canopy. If canopy does not open after emergency system is actuated, a handle on the aft end of canopy can be used to pull canopy open manually.

CAUTION

After once pulling the canopy emergency handle, do not push it forward again until canopy has opened fully. If it should be pushed forward before the air motor stops turning, it will damage the gears in the motor.

3-43. OXYGEN SYSTEM EMERGENCY OPERATION.

3-44. Should symptoms occur suggestive of the onset of anoxia, immediately turn oxygen safety lever to ON. If the oxygen regulator becomes inoperative pull ball handle on oxygen bail-out bottle and descend below 10,000 feet as soon as possible.

3-45. PRESSURIZATION SYSTEM EMERGENCY OPERATION.

3-46. If smoke or fumes enter the cockpit, turn oxygen air valve to 100% oxygen (oxygen mask on) and pull emergency vent control up.

3-47. ROCKET RACK JETTISON.

3-48. To jettison rocket racks, lift guard on rocket jettison switch (26, figure 1-3) and move switch to JETTISON.

SECTION IV
OPERATIONAL EQUIPMENT

4-1. ROCKET EQUIPMENT.

4-2. Rockets are the only type of armament equipment provided in the airplane. Twenty-six folding-fin rockets (2.75 inch HVAR) may be carried on two launchers within an enclosed bay in the fuselage. The launchers are hydraulically operated for extension and retraction but are electrically controlled, either automatically through the AN/APS-25 radar or manually by the pilot. The AN/APS-25 is used for rocket fire control as well as for search operations. In an emergency, the rocket racks can be jettisoned.

4-3. ROCKET CONTROLS.

4-4. MASTER SWITCH. The rocket master switch is located at the top center of the instrument panel (2, figure 1-2) and must be turned ON before any rocket controls will operate.

Note

The rocket circuits are inoperative whenever the nose gear door is open or the landing gear is down.

A rocket rack disabling switch is provided in the left main wheel well for use by the ground crew. This switch must be positioned at NORMAL for rocket equipment to operate.

4-5. ROCKETS LOADED INDICATOR. When the rocket tubes are loaded, a red light at the top of the instrument panel (5, figure 1-2) will illuminate when the rocket racks extend. After all rockets are fired, the light will go out.

4-6. ROCKET RACK CONTROL SWITCH. The rocket racks may be operated by means of a switch at the top center of the instrument panel. (See 4, figure 1-2.) Moving the rack switch to EXTEND will lower the rocket racks and a red light adjacent to the switch will illuminate when the racks are fully extended.

4-7. ROCKET FIRING TRIGGER. The trigger on the control stick grip (1, figure 1-4) is used to fire the rockets. When using the AN/APS-25 radar to aim and fire rockets, pressing and holding the trigger will extend the launchers, fire the rockets and then retract the racks again. This sequence may be interrupted at any time by releasing the trigger. If radar is not being used, the racks must be extended by means of the rack switch before firing rockets with the trigger.

4-8. ROCKET RACK JETTISON SWITCH. The rocket racks may be jettisoned in an emergency by means of a jettison switch on the left console inboard of the throttle. (See 26, figure 1-3.) When the switch is positioned at JETTISON, the racks are extended hydraulically and then released.

4-9. FIRING ROCKETS.

4-10. To fire rockets without use of radar:

a. Rocket master switch ON.

b. Rocket rack switch EXTEND. Check that both the rack position light and the racks loaded light illuminate.

c. To fire rockets, depress trigger on stick grip.

d. After firing all rockets, as indicated by load lights going out, move rack switch to RETRACT. Check that rack position light goes out.

4-11. COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT.

4-12. TABLE OF COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT.

TYPE	DESIGNATION	USE	ILLUSTRATION
VHF Command Radio	AN/ARC-1	Two-Way Communication	34, figure 1-4
Navigation Receiver	AN/ARR-2A	Navigation Receiver	33, figure 1-4
Radio Compass	AN/ARN-6	Reception of Voice and Code Communication; Position Finding, Homing	31, figure 1-4
IFF	AN/APX-6	Identification	32, figure 1-4
Radar (Alternate Installation for Radio Compass)	AN/APS-25	Search and Fire Control	33, figure 1-3

4-13. OPERATION OF COMMUNICATIONS AND ASSOCIATED EQUIPMENT.

4-14. VHF COMMAND RADIO - AN/ARC-1.

a. Radio master switch ON.

b. Turn CHAN SEL switch to desired channel.

c. For normal reception, turn GUARD-BOTH-MAIN T/R switch to BOTH. This position provides for simultaneous reception of the selected channel and the monitored channel. If there is too much interference or noise on this setting, switch to the MAIN T/R or GUARD position as desired.

d. To transmit, press microphone button on throttle.

e. The VHF radio is turned off by the radio master switch.

4-15. NAVIGATION RECEIVER - AN/ARR-2A.

a. Radio master switch ON.

b. Turn PITCH selector on navigation control panel to the NAV position.

c. Set CHAN SEL switch to desired channel.

d. Adjust SENS knob for desired volume, setting to lowest audible signal.

e. Vary pitch as required by adjusting PITCH knob.

f. To turn receiver off, turn off radio master switch.

4-16. RADIO COMPASS - AN/ARN-6.

a. Radio master switch ON.

b. Turn compass control switch to desired type of operation: LOOP, ANT., or COMP.

c. Select one of the four frequency bands, and tune station desired with tuning crank.

d. Adjust audio control for desired output.

e. To turn radio compass off, rotate compass control switch to OFF.

4-17. IFF - AN/APX-6.

WARNING

Before take-off, insert destructor plug in face of IFF equipment (accessible through nose wheel well). Remove plug immediately after landing.

a. Radio master switch ON.

b. Rotate code selector to desired position (given by commanding officer). The STBY position may be used to warm up the radio (no transmitting or receiving) in preparation for immediate use.

c. Position mode switches as directed by commanding officer.

d. To turn IFF off, move code selector to OFF or turn radio master switch OFF.

4-18. OXYGEN SYSTEM.

4-19. A high-pressure oxygen system is installed in the airplane with oxygen supplied from a single cylinder installed on left side of fuselage beneath the cockpit. A pressure-breathing diluter demand oxygen regulator is located on the left console forward of the throttle. Only a pressure-breathing demand oxygen mask should be used with this regulator. The regulator incorporates an oxygen flow indicator, pressure gage, air valve and a safety pressure lever. An oxygen supply shutoff valve is provided on the same panel. The oxygen cylinder may be recharged at a filler valve located on left side of the nose wheel well.

OXYGEN DURATION - HOURS

ONE 514 CU. IN. CYLINDER
FULLY CHARGED (1800 PSI)

COCKPIT ALT - FEET	AIR VALVE 'ON' NORMAL OXYGEN	AIR VALVE 'OFF' 100% OXYGEN
5,000	7.5	.95
10,000	9.75	1.20
15,000	9.00	1.45
20,000	7.00	1.84
25,000	4.09	2.30
30,000	3.13	3.07
35,000	4.22	4.22
40,000	7.00	7.00

Figure 4-1. Oxygen Consumption Table

4-20. OXYGEN SYSTEM CONTROLS

4-21. AIR VALVE. The air valve (22, figure 1-3) is usually set at NORMAL OXYGEN position and the proper mixture of air and oxygen is then delivered to the mask upon inhalation. When the air valve is moved to 100% OXYGEN, a continuous flow of oxygen is allowed to by-pass the regulator and enter the mask.

4-22. SAFETY PRESSURE LEVER. Turning the safety pressure lever on the regulator (24, figure 1-3) to ON admits a flow of oxygen to the mask at a slightly higher pressure than normal. Use of safety pressure is for preventing inboard leakage at the edges of the mask during high altitude operation when negative pressure inside the mask might otherwise be created by inhalation. Safety pressure should not be used below 35,000 feet cabin altitude because the increased pressure will result in increased oxygen consumption.

4-23. OXYGEN SUPPLY SHUTOFF VALVE. The oxygen supply shutoff valve, located outboard of the regulator (21, figure 1-3), is used to turn off flow of oxygen from the cylinder.

4-24. OXYGEN SYSTEM PREFLIGHT CHECK.

4-25. Before each flight requiring use of oxygen, make following checks:

a. Check pressure gage for reading of approximately 1800 psi. If pressure has decreased by more than 50 psi in twelve hours, the system is leaking and should be checked before flight.

b. Test regulator for leakage by obstructing outlet of breathing tube with the hand. If flow indicator opens in less than 30 seconds, excessive leakage exists.

c. Test breathing tube couplings, regulator diaphragm and diluter. Check valve for leakage by inserting a spare mask tube quick disconnect fitting into open end of the disconnect. Blow into open end of disconnect until flow indicator opens. Seal end of disconnect with tongue. If flow indicator does not close within 5 seconds, leakage is within acceptable limits. If leakage exists, check couplings, outlet and breathing tube clamps for tightness.

d. Put on mask. Place thumb on end of breathing tube and inhale very lightly. If there is no leakage, mask will adhere tightly to face and a definite resistance to inhalation is felt. If mask leaks, tighten mask suspension straps.

WARNING

Do not use a mask that leaks.

e. Check for leakage between cylinder and regulator by turning off oxygen supply. After five minutes watch pressure gage and turn on oxygen supply. If gage pointer jumps, leakage is indicated and system should be checked before flight.

f. Fully engage mask hose to oxygen system breathing hose.

g. Attach tube clothing clamp to parachute harness or clothing, allowing free head movement. (Do not clamp tube to shoulder harness.)

h. Breathe several times and observe flow indicator for verification of positive flow of oxygen.

4-26. OXYGEN SYSTEM NORMAL OPERATION.

4-27. Use oxygen on all flights above 10,000 feet, and on all night flights above 5,000 feet.

a. Oxygen supply shutoff lever on.

b. Check that pressure gage reads approximately 1800 psi.

c. Set air valve to NORMAL OXYGEN for all normal flight conditions.

d. Put on mask. Engage mask hose to oxygen system breathing tube and attach clip to parachute harness (or clothing) sufficiently high on chest to permit free movement of head.

WARNING

Do not clamp tube to shoulder harness.

e. Check mask fit by squeezing mask tube and inhaling lightly. If there is no leakage, mask adheres tightly to face and a definite resistance to inhalation is felt. If mask leaks, tighten mask suspension straps. Do not use a mask that leaks.

f. While on oxygen, frequently check the pressure gage, flow indicator, mask fit and hose connection.

Note

Flow indicator does not 'blink' above 41,000 feet but remains open. However, the positive pressure felt in the mask indicates that oxygen is being delivered and no apprehension need be felt if flow indicator remains open.

g. Upon completion of flight, turn oxygen supply valve off.

4-28. COCKPIT PRESSURIZATION AND AIR CONDITIONING.

4-29. Air for cockpit pressurization is extracted from the engine compressor and delivered to the cockpit under pressure at a preselected temperature, for either heating or ventilating. The air enters the cockpit through outlets forward of the pilot's feet and through defroster outlets at the windshield. A pressure regulator automatically controls cockpit pressure as follows: from sea level to 5,000 feet, the cockpit is unpressurized; between 5,000 and 13,160 feet, cockpit altitude is maintained at 5,000 feet; and above 13,160 feet, a constant pressure differential of 3.3 psi is maintained between cockpit and outside air. (See figure 4-2.) A cockpit altimeter is provided on the right forward console. (See 39, figure 1-4.)

Note

The radar and rocket compartments are also air conditioned by this system but the temperature control in these compartments is entirely automatic and not controlled by the pilot.

4-30. PRESSURIZATION AND AIR CONDITIONING CONTROLS.

4-31. COCKPIT TEMPERATURE CONTROLS. Temperature of air admitted to the cockpit is controlled by a temperature rheostat and control switch on the right forward console. (See 38 and 37, figure 1-4.) The temperature rheostat sets a thermostat which controls an air mixing valve to proportion cooled and heated air to give the desired cockpit temperature. The air is cooled by passage through a refrigeration unit. When the air temperature control switch is at AUTO, cockpit air is automatically maintained at the temperature selected by the rheostat. In case the automatic temperature control system fails, the air mixing valve may be actuated by holding the air temperature control switch at either HOT or COLD as desired.

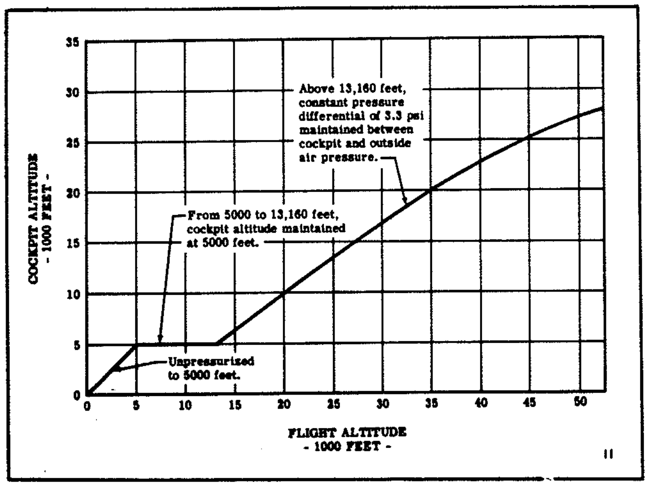

Figure 4-2. Cockpit Pressurization Schedule

4-32. VENTILATING AIR CONTROL. The ventilating air control on the right forward console (11, figure 1-4) controls flow of air to the windshield defroster outlets and the foot outlets. With the control at the FOOT HEATER position, air is directed to the foot outlet, but at the DEFROSTER position of the control, all air is supplied to the windshield outlets.

4-33. EMERGENCY VENT CONTROL. Pulling the emergency vent control on the right console (10, figure 1-4) actuates a dump valve to depressurize the cockpit, shuts off the air supply from the engine, and opens a ram air valve to allow cold outside air to enter the cockpit. The emergency vent control may be pushed back in to reset the system for normal operation.

4-34. OPERATION OF PRESSURIZATION AND AIR CONDITIONING SYSTEM.

a. Cockpit air temperature control switch AUTO; temperature rheostat set for desired cockpit temperature.

b. Ventilating air lever at FOOT HEATER.

c. If windshield becomes fogged or frosted, move ventilating air lever to DEFROSTER in order to direct all air to the windshield.

Note

If windshield icing is frequently encountered during letdowns from altitude, turn to DEFROSTER before starting letdown.

d. If depressurization of cockpit is necessary, pull emergency vent control.

4-35. ENGINE ANTI-ICING.

4-36. Hot air from the turbine outlet is routed forward to the engine compressor section for anti-icing. An anti-icing manifold at the forward end of the compressor directs hot gases through the inlet guide vanes when the system is turned on. The system is turned on by means of an engine anti-icing switch located on the panel outboard of the throttle. (See 12, figure 1-3.)

4-37. PITOT HEATER.

4-38. The pitot heater is controlled by a switch on the right forward console. (See 12, figure 1-4.) Turning the pitot heater switch on also turns on heaters in the rudder and elevator feel system airscoops.

4-39. ANTI-G SUIT PROVISIONS.

4-40. An air pressure outlet connection on the left rear console provides for attachment of the air pressure intake tube of the pilot's anti-g suit. (See 34, figure 1-3.) Air pressure for inflation of the anti-g suit bladders is conducted from the engine compressor through a pressure regulating valve (36, figure 1-3) located on the left console. The regulating valve may be set for either HI or LO range. Acceleration above 1.75g causes the valve to open and inflate the anti-g suit. For each additional 1g acceleration force, a corresponding 1.5 psi (HI setting) or 1 psi (LO setting) air pressure is exerted in the suit. A button on top of the valve can be depressed manually to inflate the suit momentarily to check operation of the valve.

4-41. LIGHTING EQUIPMENT.

4-42. EXTERIOR LIGHTS.

4-43. Exterior lights consist of wing and tail lights, recognition lights on top and bottom of fuselage, formation lights in each wing, and an approach light on the nose gear. All exterior lights, except the approach light, are controlled from the lights control panel on the right rear console.

4-44. MASTER SWITCH. The master switch (23, figure 1-4) must be positioned at STDY or FLASH before any of the lights will illuminate. With master switch at STDY, all lights will burn steadily when the related light switches are turned on. At the FLASH position, the wing and tail lights will flash automatically when the wing and tail light switches are turned on. In either position, electrical power is supplied to the flasher coder unit.

4-45. WING AND TAIL LIGHT SWITCHES. The wing and tail lights are controlled by separate switches (25 and 26, figure 1-4) and are turned on by positioning the switches at either BRT or DIM. If master switch is at FLASH when wing and tail light switches are turned on, the lights will flash automatically through operation of the flasher coder.

4-46. FORMATION LIGHT SWITCH. The formation lights in the wings are turned on and burn steadily when the formation light switch (28, figure 1-4) is positioned at either BRT or DIM (with master switch on). The formation lights burn steadily regardless of whether the master switch is at the STDY or FLASH position.

4-47. RECOGNITION LIGHT CONTROLS. Recognition lights on top and bottom of the fuselage are turned on by positioning the recognition light switch (30, figure 1-4) at BRT or DIM. The recognition lights are also controlled by the keying switch and code selector on the lights control panel. (See 22 and 24, figure 1-4.) The keying switch may be positioned at STDY for steady burning, at KEY for manually flashing the lights with the keying switch, or at CODE, whereby the lights automatically flash the code letter set on the code selector. When the key is operated manually, a light on the panel illuminates with each depression of the key.

4-48. APPROACH LIGHT. The approach light is mounted on the nose gear and illuminates when both the gear and arresting hook are down (if master switch is on). If the gear is down but the arresting hook is not, the approach light flashes as a warning to the LSO.

4-49. INTERIOR LIGHTS.

4-50. A cockpit light switch and intensity control on the lights control panel (27 and 29, figure 1-4) are used to control interior lighting; that is, flight and engine instrument lights, console and flood lights. The intensity control adjusts the brilliancy of interior lights and turns the flight instrument lights on or off. With the cockpit switch at ALL and intensity control on, all lights in the cockpit will illuminate. With the switch at FLIGHT & ENGINE, only these lights will come on, and at the FLIGHT position, the flight lights can be turned on by means of the intensity control.

APPENDIX I
OPERATING DATA

A-1. FLIGHT PLANNING.

A-2. GENERAL. A group of charts on the following pages presents estimated performance data on the airplane. Charts based on flight test data will be provided when available. All charts are based upon operation of the XJ40-WE-6 or -8 engine without afterburner except one chart which gives take-off and climb performance with afterburner operating. Fuel quantities are given in pounds so that the charts can be used with either of the fuels listed. Conversion factors are given at the bottom of each chart. All charts are based on operation in NACA standard atmosphere.

A-3. TAKE-OFF, CLIMB AND LANDING CHART.

A-4. Figure A-1 and A-2 give take-off and landing ground run distances and total distances over a 50-foot obstacle. The data are based upon operation from a land base with dry, hard-surface runways. Distances given represent high-performance take-offs and landings. Two take-off charts are provided, one with afterburner operating and one without. Since charts are based on operation at standard temperature, take-offs at higher temperatures will, of course, require a longer take-off run. Recommended approach speeds are also given on the landing chart.

A-5. The climb charts (figures A-1 and A-2) show best climb speed, fuel consumed, time to climb, distance covered and rate of climb at military power with and without afterburner operating. Fuel allowance for warm-up, taxi and take-off is listed after the SEA LEVEL line. Fuel requirements listed at other altitudes include this allowance plus the fuel required to climb from sea level.

A-6. FLIGHT OPERATION INSTRUCTION CHARTS.

A-7. To facilitate flight planning, cruise data (figure A-3) are presented for obtaining maximum range and range at maximum continuous power. Performance is tabulated for various gross weights, fuel loads and altitudes. Operating data on any one chart should be used only when the airplane initial cruising gross weight is within the weight limits of that chart. For most accurate results, when enough fuel has been consumed to cause gross weight to decrease to the limits of the next chart, the operating data in the corresponding column of that chart should be used. However, this is not essential since ranges computed from the chart corresponding to initial cruising gross weight will be slightly conservative. No allowances are made for wind, navigational errors, combat, formation flight or other contingencies, so such allowances must be made as required. A typical range example is given on each chart.

AIRPLANE MODEL XF3H-1

TAKE-OFF, CLIMB & LANDING CHART

MILITARY POWER (WITHOUT AFTERBURNER)

ENGINE XJ40-WE-6 or -8

TAKE-OFF DISTANCE-FEET

GROSS WEIGHT LBS.	HEAD WIND KNOTS	AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
		GROUND RUN	TO CLEAR 50' OBJ	GROUND RUN	TO CLEAR 50' OBJ	GROUND RUN	TO CLEAR 50' OBJ
23000	0	3480	4415	4271	5369	5345	6706
	15	2742	3479	3395	4268	4308	5405
	25	2269	2879	2849	3581	3645	4573
	35	1851	2349	2341	2942	3025	3796
	45	1472	1868	1892	2378	2475	3105
21000	0	2770	3550	3395	4280	4117	5240
	15	2152	2762	2672	3368	3277	4171
	25	1764	2265	2214	2791	2750	3500
	35	1418	1820	1799	2268	2256	2872
	45	1114	1429	1433	1806	1824	2321
19000	0	2160	2850	2565	3325	3200	4067
	15	1652	2180	1988	2577	2502	3180
	25	1341	1770	1634	2118	2086	2652
	35	1063	1402	1306	1692	1686	2143
	45	819	1080	1026	1330	1347	1712

NOTES:

Take-off with full flaps and slats out.

CLIMB DATA

GROSS WEIGHT 23000 LBS.

ALTITUDE FEET	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM
SEA LEVEL	375	540	0	0	6440
15000	331	858	2.8	18	4440
30000	278	1208	7.4	50	2300
35000	260	1350	9.9	69	1640
40000	231	1563	14.5	102	660
45000					

GROSS WEIGHT 21000 LBS.

ALTITUDE FEET	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM
SEA LEVEL	375	540	0	0	7170
15000	329	823	2.4	16	5020
30000	278	1128	6.5	44	2730
35000	258	1247	8.5	59	2060
40000	230	1398	11.9	83	1040
45000	205	1794	24.1	168	150

GROSS WEIGHT 19000 LBS.

ALTITUDE FEET	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM
SEA LEVEL	375	540	0	0	8060
15000	328	792	2.2	14	5710
30000	276	1054	5.6	38	3260
35000	257	1152	7.4	51	2530
40000	229	1270	9.9	69	1480
45000	204	1462	15.6	110	480

1. Fuel used includes a warm-up and take-off allowance equivalent to 5 minutes at maximum continuous power.
2. Fuel flow values include a 5% safety factor.

LANDING DISTANCE-FEET

GROSS WEIGHT LBS.	BEST CAS APPROACH	AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
		GROUND ROLL	TO CLEAR 50' OBJ	GROUND ROLL	TO CLEAR 50' OBJ	GROUND ROLL	TO CLEAR 50' OBJ
22000	118	2279	3367	2482	3648	2711	3963
20000	113	2070	3085	2261	3350	2474	3643
18000	107	1866	2800	2035	3034	2222	3294

NOTES:

Distances are for landing with full flaps and slats out.

1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.
2. MIL-F-5624 (AN-F-58), grade JP-3, fuel weighs 6.32 pounds per gallon.
3. MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.

LEGEND

CAS - Calibrated Air Speed
FPM - Feet Per Minute

DATA AS OF: 1 August 1951 **BASED ON:** Estimated Data 21

Figure A-1. Take-Off, Climb and Landing Chart - Military Power (Without Afterburner)

AIRPLANE MODEL
XF3H-1

TAKE-OFF, CLIMB & LANDING CHART

MAXIMUM POWER (WITH AFTERBURNER)

ENGINE
XJ40-WE-8

TAKE-OFF DISTANCE-FEET

GROSS WEIGHT LBS.	HEAD WIND KNOTS	AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
		GROUND RUN	TO CLEAR 50' OBJ	GROUND RUN	TO CLEAR 50' OBJ	GROUND RUN	TO CLEAR 50' OBJ
23000	0	1875	2488	2241	2903	2716	3442
	15	1478	1961	1782	2308	2189	2774
	25	1223	1622	1495	1936	1852	2347
	35	998	1324	1228	1591	1537	1948
	45	793	1052	993	1286	1258	1594
21000	0	1530	2080	1823	2430	2192	2845
	15	1189	1616	1435	1912	1745	2265
	25	975	1325	1189	1584	1464	1900
	35	783	1065	966	1288	1201	1559
	45	615	836	769	1025	971	1260
19000	0	1235	1745	1459	2008	1758	2351
	15	945	1335	1131	1556	1375	1838
	25	767	1084	929	1279	1146	1533
	35	608	859	743	1022	926	1239
	45	468	661	584	803	740	990

NOTES:

Take-off with full flaps and slats out.

CLIMB DATA

ALTITUDE FEET	GROSS WEIGHT 23000 LBS.					GROSS WEIGHT 21000 LBS.					GROSS WEIGHT 19000 LBS.				
	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM	CAS KNOTS	FUEL USED LBS	FROM SEA LEVEL TIME MIN	FROM SEA LEVEL DISTANCE	RATE OF CLIMB FPM
SEA LEVEL	523	540	0	0	18050	523	540	0	0	19900	523	540	0	0	22100
15000	422	1003	1.0	9	12650	422	960	.9	8	14000	422	918	.8	7	15570
30000	330	1440	2.4	21	8350	330	1351	2.2	19	9330	330	1268	2.0	17	10530
35000	302	1578	3.1	27	6850	302	1474	2.8	24	7780	302	1377	2.5	21	8800
40000	269	1740	4.0	34	4630	269	1614	3.5	30	5400	269	1498	3.1	27	6300
45000	240	1960	5.4	46	2420	240	1802	4.7	40	3120	240	1655	4.1	35	3820
50000	196	2202	7.3	62	780	197	1992	6.2	53	1300	198	1807	5.4	45	1980

1. Fuel used includes a warm-up and take-off allowance equivalent to 5 minutes at maximum continuous power.
2. Fuel flow values include a 5% safety factor.

LANDING DISTANCE-FEET

GROSS WEIGHT LBS.	BEST CAS APPROACH	AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
		GROUND ROLL	TO CLEAR 50' OBJ	GROUND ROLL	TO CLEAR 50' OBJ	GROUND ROLL	TO CLEAR 50' OBJ

NOTES:

1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.
2. MIL-F-5624 (AN-F-58) grade JP-3, fuel weighs 6.32 pounds per gallon.
3. MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.

LEGEND
CAS - Calibrated Air Speed
FPM - Feet Per Minute

DATA AS OF: 1 August 1951 BASED ON: Estimated Data 22

Figure A-2. Take-Off and Climb Chart - Maximum Power (With Afterburner)

FLIGHT OPERATION INSTRUCTION CHART

AIRPLANE MODEL XF3H-1 **EXTERNAL LOAD ITEMS**

ENGINE XJ40-WE-6 or -8 **CHART WEIGHT LIMITS** 23000 **TO** 22000 **POUNDS** NONE

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than amount of fuel to be used for cruising and move to the right or left and read available range in column for proposed cruising altitude. Add the distance which will be covered during climb as determined from corresponding climb data chart.

EXAMPLE

To determine maximum range at 15,000 feet with 4,524 pounds of fuel. Take-off gross weight is 23,000 pounds. Reserve fuel is 452 pounds.

(1) From military power climb chart, fuel required for take-off and climb is 858 pounds.
(2) After deducting reserve and fuel for climb, fuel available for cruise is 3,214 pounds.
(3) The fuel burned in climb reduces the gross weight to 22,142 pounds. The flight operation chart for chart weight limits: 23,000 to 22,000 pounds, is therefore applicable.
(4) Range is 449 nautical miles plus 18 nautical miles climbing distance, a total of 467 nautical miles.
(5) Cruise is at 332 knots (calibrated air speed).

RANGE AT MAXIMUM CONTINUOUS POWER									MAXIMUM RANGE							
ALTITUDE - 1000 FEET								FUEL - POUNDS	ALTITUDE - 1000 FEET							
S L	15	30	35	40					S L	15	30	35	40			
305	447	686	772	956				4500	417	632	880	988	1022			
271	397	610	686	847				4000	370	561	778	871	898			
237	347	533	600	739				3500	323	490	677	756	776			
203	298	457	514	631				3000	277	419	577	643	656			
169	248	380	428	524				2500	230	348	478	531	540			
135	198	304	342	417				2000	184	278	380	421	427			
102	149	228	257	311				1500	138	208	283	313	316			
68	99	152	171	206				1000	92	139	188	207	208			
34	50	76	85	102				500	46	69	93	103	103			
100	100	100	100	100				% RPM	USE RPM REQ'D TO MAINTAIN CAS SPECIFIED							
542	451	341	305	239				CALIBRATED AIRSPEED	373	332	280	258	238			
8010	5540	3460	2990	2160				FUEL CONSUMPTION (LB/HR)	4070	2970	2360	2160	2230			

NOTES:
1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.
2. MIL-F-5624 (AN-F-58), grade JP-3, fuel weighs 6.32 pounds per gallon.
   MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.
3. Fuel flow values include a 5% safety factor.

DATA AS OF: 1 August 1951 **BASED ON:** Estimated Data 23

Figure A-3. Flight Operation Instruction Chart
(Sheet 1 of 4 Sheets)

FLIGHT OPERATION INSTRUCTION CHART

AIRPLANE MODEL XF3H-1 **EXTERNAL LOAD ITEMS** NONE

ENGINE XJ40-WE-6 or -8 **CHART WEIGHT LIMITS** 22000 **TO** 21000 **POUNDS**

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than amount of fuel to be used for cruising and move to the right or left and read available range in column for proposed cruising altitude. Add the distance which will be covered during climb as determined from corresponding climb data chart.

EXAMPLE

To determine maximum range at 35,000 feet with 4,524 pounds of fuel. Take-off gross weight is 23,000 pounds. Reserve fuel is 452 pounds.

(1) From military power climb chart, fuel required for take-off and climb is 1,350 pounds.

(2) After deducting reserve and fuel for climb, fuel available for cruise is 2,722 pounds.

(3) The fuel burned in climb reduces the gross weight to 21,650 pounds. The flight operation chart for chart weight limits: 22,000 to 21,000 pounds, is therefore applicable.

(4) Range is 600 nautical miles plus 69 nautical miles climbing distance, a total of 669 nautical miles.

(5) Cruise is at 256 knots (calibrated air speed).

RANGE AT MAXIMUM CONTINUOUS POWER									MAXIMUM RANGE							
ALTITUDE - 1000 FEET								FUEL - POUNDS	ALTITUDE - 1000 FEET							
S L	15	30	35	40					S L	15	30	35	40			
305	447	687	774	967				4500	419	638	901	1020	1072			
271	397	611	687	859				4000	372	565	796	899	942			
237	348	534	601	750				3500	325	494	693	781	815			
203	298	458	515	642				3000	278	422	590	664	690			
169	248	381	429	534				2500	231	351	489	549	568			
135	199	305	343	426				2000	185	280	389	436	449			
102	149	229	257	318				1500	138	210	290	324	332			
68	99	152	171	211				1000	92	140	192	214	219			
34	50	76	86	105				500	46	70	95	106	108			
100	100	100	100	100				% RPM	USE RPM REQ'D TO MAINTAIN CAS SPECIFIED							
542	452	343	308	243				CALIBRATED AIRSPEED	372	331	278	256	238			
8010	5550	3460	3010	2250				FUEL CONSUMPTION (LB/HR)	4040	2940	2290	2070	2110			

NOTES: 1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.

2. MIL-F-5624 (AN-F-58), grade JP-3, fuel weighs 6.32 pounds per gallon. MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.

3. Fuel flow values include a 5% safety factor.

DATA AS OF: 1 August 1951 **BASED ON:** Estimated Data 23

Figure A-3. Flight Operation Instruction Chart (Sheet 2 of 4 Sheets)

FLIGHT OPERATION INSTRUCTION CHART

AIRPLANE MODEL XF3H-1 **EXTERNAL LOAD ITEMS**

ENGINE XJ40-WE-6 or -8 **CHART WEIGHT LIMITS** 21000 **TO** 20000 **POUNDS** NONE

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than amount of fuel to be used for cruising and move to the right or left and read available range in column for proposed cruising altitude. Add the distance which will be covered during climb as determined from corresponding climb data chart.

EXAMPLE

To determine maximum range at 40,000 feet with 4,524 pounds of fuel. Take-off gross weight is 22,000 pounds. Reserve fuel is 452 pounds.

(1) From military power climb chart, fuel required for take-off and climb is 1,480 pounds.
(2) After deducting reserve and fuel for climb, fuel available for cruise is 2,592 pounds.
(3) The fuel burned in climb reduces the gross weight to 20,520 pounds. The flight operation chart for chart weight limits: 21,000 to 20,000 pounds, is therefore applicable.
(4) Range is 619 nautical miles plus 92 nautical miles climbing distance, a total of 711 nautical miles.
(5) Cruise is at 237 knots (calibrated air speed).

RANGE AT MAXIMUM CONTINUOUS POWER									MAXIMUM RANGE							
ALTITUDE - 1000 FEET								FUEL - POUNDS	ALTITUDE - 1000 FEET							
S L	15	30	35	40					S L	15	30	35	40			
271	398	612	689	865				4000	374	571	815	928	987			
237	348	535	602	756				3500	327	498	709	806	854			
203	298	458	516	647				3000	280	426	604	685	723			
170	248	382	430	539				2500	233	354	501	567	596			
136	199	305	344	430				2000	186	283	398	450	471			
102	149	229	258	322				1500	139	212	297	335	349			
68	99	153	172	214				1000	93	141	197	221	230			
34	50	76	86	107				500	46	70	98	110	114			
100	100	100	100	100				% RPM	USE RPM REQ'D TO MAINTAIN CAS SPECIFIED							
543	453	344	310	256				CALIBRATED AIRSPEED	371	330	276	253	237			
8010	5550	3460	3020	2290				FUEL CONSUMPTION (LB/HR)	4020	2910	2220	1990	2000			

NOTES: 1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.
2. MIL-F-5624 (AN-F-58), grade JP-3, fuel weighs 6.32 pounds per gallon. MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.
3. Fuel flow values include a 5% safety factor.

DATA AS OF: 1 August 1951 **BASED ON:** Estimated Data 23

Figure A-3. Flight Operation Instruction Chart (Sheet 3 of 4 Sheets)

FLIGHT OPERATION INSTRUCTION CHART

AIRPLANE MODEL XF3H-1

EXTERNAL LOAD ITEMS NONE

ENGINE XJ40-WE-6 or -8 **CHART WEIGHT LIMITS** 20000 **TO** 19000 **POUNDS**

INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than amount of fuel to be used for cruising and move to the right or left and read available range in column for proposed cruising altitude. Add the distance which will be covered during climb as determined from corresponding climb data chart.

EXAMPLE

To determine maximum range at 35,000 feet with 3,600 pounds of fuel. Take-off gross weight is 21,000 pounds. Reserve fuel is 360 pounds.

(1) From military power climb chart, fuel required for take-off and climb is 1,247 pounds.
(2) After deducting reserve and fuel for climb, fuel available for cruise is 1,993 pounds.
(3) The fuel burned in climb reduces the gross weight to 19,753 pounds. The flight operation chart for chart weight limits: 20,000 to 19,000 pounds, is therefore applicable.
(4) Range is 462 nautical miles plus 59 nautical miles climbing distance, a total of 521 nautical miles.
(5) Cruise is at 252 knots (calibrated air speed).

RANGE AT MAXIMUM CONTINUOUS POWER / **MAXIMUM RANGE**

ALTITUDE - 1000 FEET								FUEL - POUNDS	ALTITUDE - 1000 FEET							
SL	15	30	35	40					SL	15	30	35	40			
237	348	536	603	760				3500	329	503	725	830	890			
203	298	459	517	651				3000	281	430	618	706	754			
170	249	382	431	542				2500	234	357	512	584	624			
136	199	306	344	433				2000	187	285	407	464	494			
102	149	229	258	324				1500	140	213	304	345	366			
68	99	153	172	216				1000	93	142	201	228	241			
34	50	76	86	108				500	47	71	100	113	119			
100	100	100	100	100				% RPM	USE RPM REQ'D TO MAINTAIN CAS SPECIFIED							
543	454	345	312	264				CALIBRATED AIRSPEED	370	329	274	252	234			
8020	5560	3470	3040	2310				FUEL CONSUMPTION (LB/HR)	3990	2880	2160	1910	1900			

NOTES: 1. All distances and speeds are in nautical units. Multiply nautical units by 1.15 to obtain statute units.
2. MIL-F-5624 (AN-F-58), grade JP-3, fuel weighs 6.32 pounds per gallon. MIL-F-5572 (AN-F-48) fuel weighs 6.0 pounds per gallon.
3. Fuel flow values include a 5% safety factor.

DATA AS OF: 1 August 1951 **BASED ON:** Estimated Data

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Figure A-3. Flight Operation Instruction Chart (Sheet 4 of 4 Sheets)

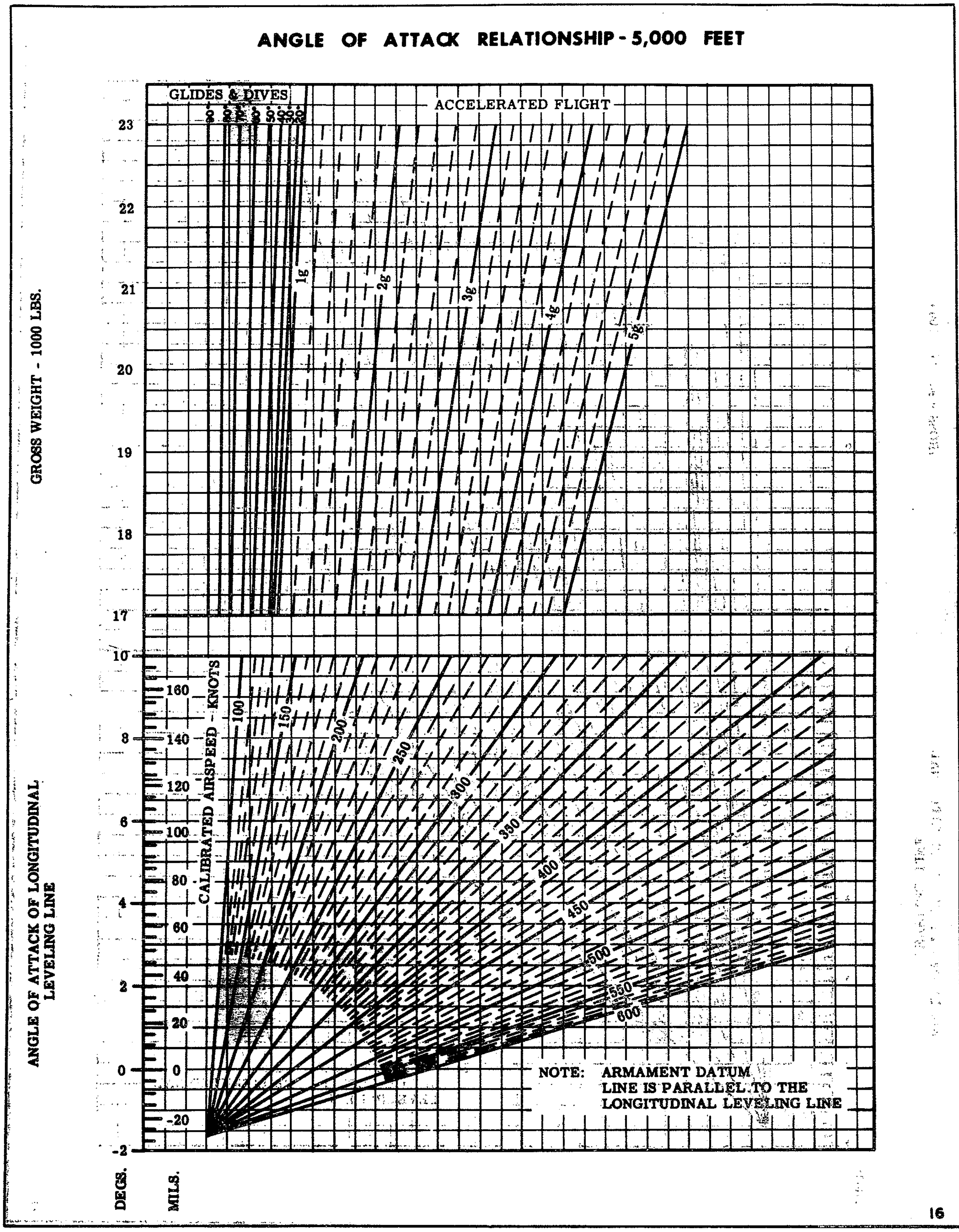

Figure A-4. Angle of Attack Relationships - 5,000 Feet

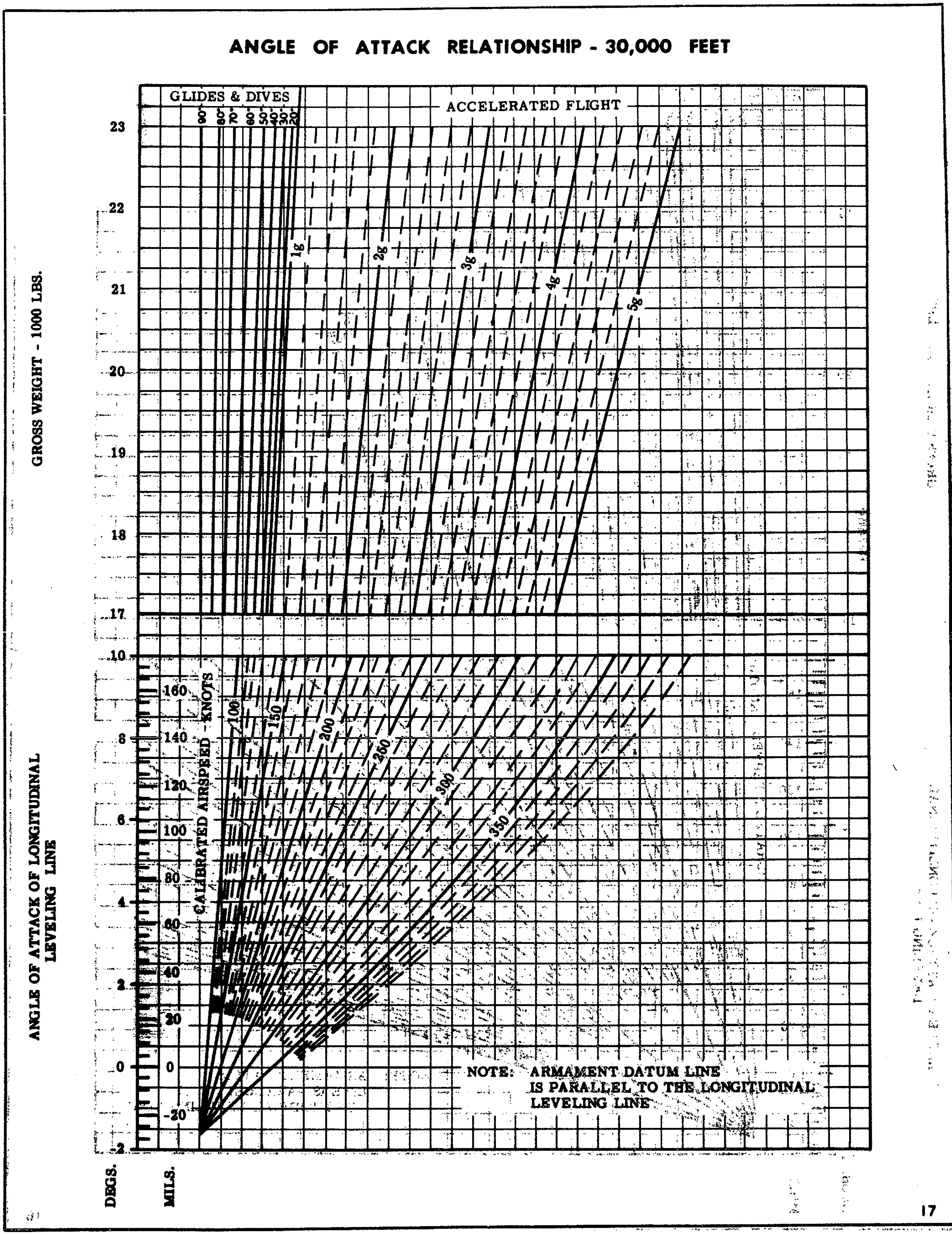

Figure A-5. Angle of Attack Relationships - 30,000 Feet

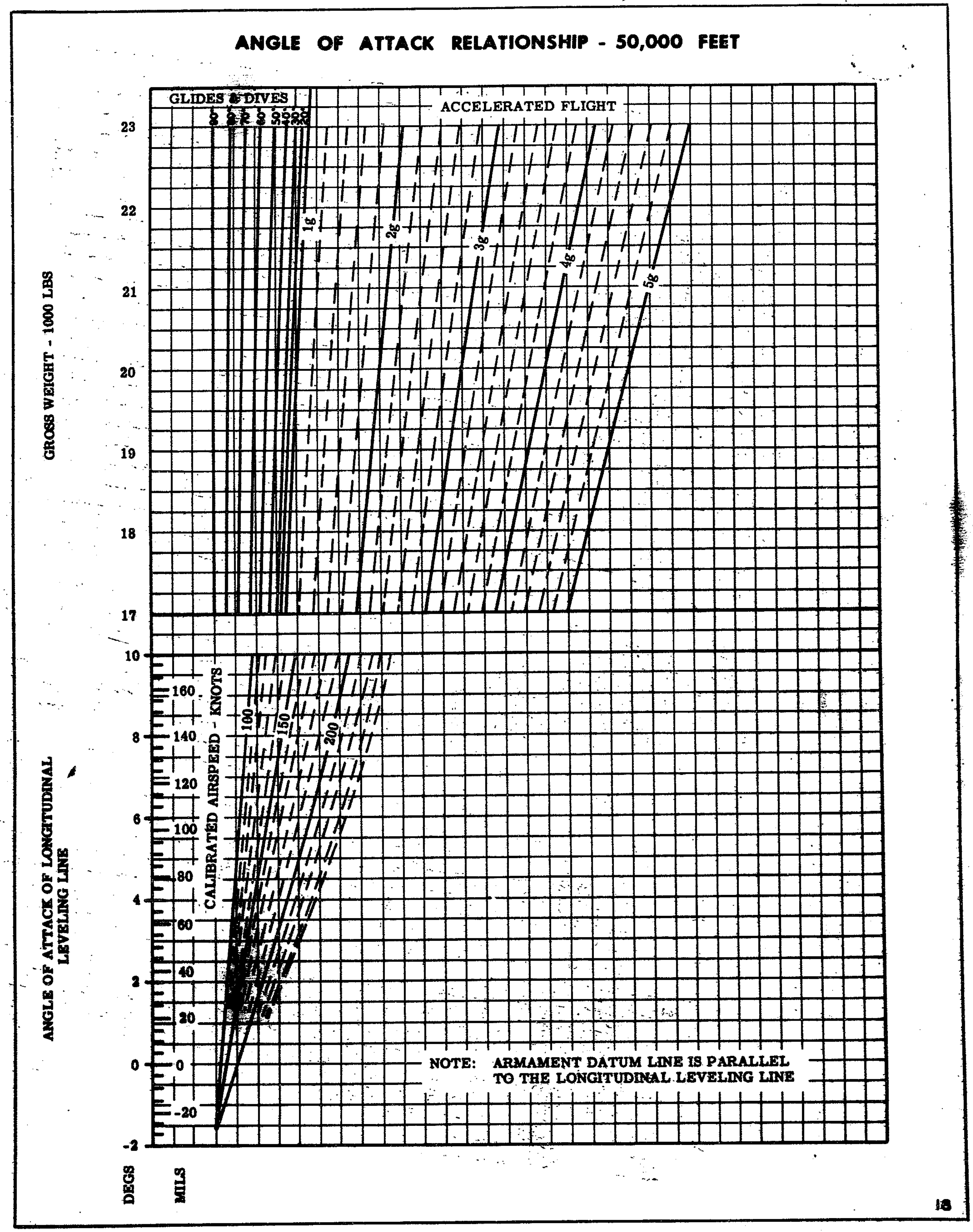

Figure A-6. Angle of Attack Relationships - 50,000 Feet