McDONNELL 119A

USAF - UCX

familiarization manual

McDONNELL Aircraft Corporation

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FOREWORD

This Familiarization Manual has been prepared to aid in Flight Evaluation of the McDonnell Model 119A (USAF-UCX) prototype. As in any prototype aircraft items are subject to change. Therefore, personnel evaluating the Model 119A will be thoroughly briefed by McDonnell flight test personnel.

CONTENTS

McDONNELL model 119A USAF - UCX

DESCRIPTION

AIRPLANE

The Model 119A is a small four-engine utility jet transport designed to carry passengers or cargo over long distances at high altitudes and high speeds. Its appearance is characterized by all metal construction, swept wing of full cantilever construction, four turbo-jet engines mounted on pylons, a single swept vertical tail, a swept horizontal tail, tricycle landing gear and a pressurized fuselage of semi-monocoque construction. The cabin access door is located on the left side of the fuselage just forward of the wing. The engines are individually mounted in pods on pylons under the wing for maximum safety and to provide good accessibility for maintenance. The Model 119A is powered by four Westinghouse J34 engines rated at 3400 pounds of thrust while production models will use four Pratt and Whitney JT12A-6 (J60-P-3) engines. The designed take-off gross weight of the 119A is 45,500 pounds and the normal landing gross weight is approximately 29,000 pounds.

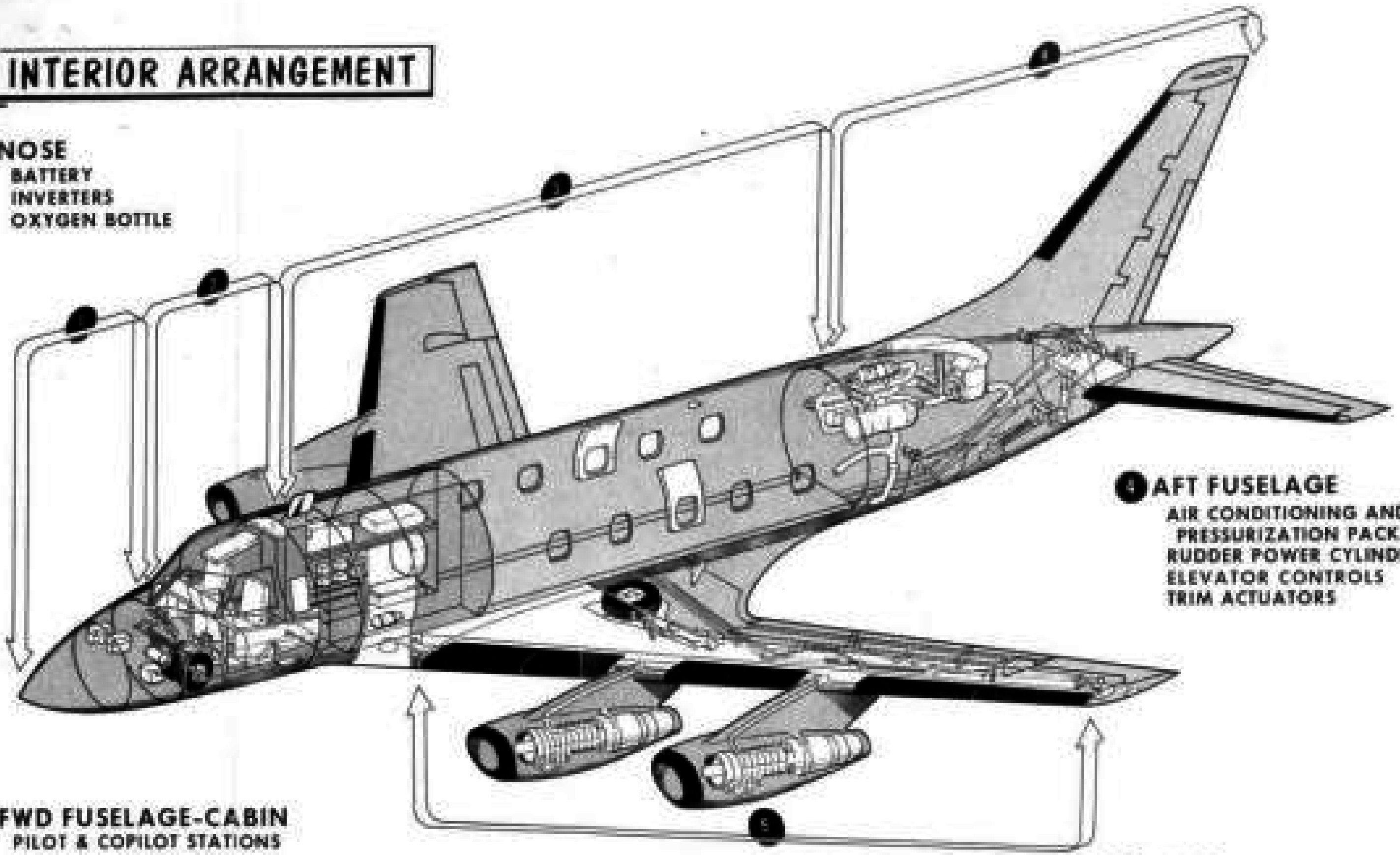
Interior Arrangement

The crew compartment contains accommodations for pilot and co-pilot (Figure 1-1). Pilot's and co-pilot's seats are adjustable for maximum comfort. Dual control columns and adjustable swinging type rudder pedals are incorporated. The cockpit side window panels can be opened. The main instrument panel contains the flight and engine instruments. An overhead control panel contains a telelight panel, engine control switches and engine fire extinguisher controls. Audio controls and other electrical switches are located on pilot's and co-pilot's console panels (Figures 1-3, 1-4, 1-5).

Dimensions

Principal dimensions of the Model 119A are shown in Figure 1-2.

INTERIOR ARRANGEMENT



1 NOSE
- BATTERY
- INVERTERS
- OXYGEN BOTTLE

2 FWD FUSELAGE-CABIN
- PILOT & COPILOT STATIONS
- MAIN INSTRUMENT PANEL
- LEFT CONSOLE
- RIGHT CONSOLE
- OVERHEAD CONSOLE
- DUAL CONTROL COLUMNS
- DUAL RUDDER PEDALS
- CIRCUIT BREAKER PANELS
- NOSE WHEEL

3 CENTER FUSELAGE-CARGO AREA
- FLIGHT TEST EQUIPMENT
- BAGGAGE COMPARTMENT
- AIR BOTTLE (DOOR OPERATION)
- CABIN DOOR
- EMERGENCY ESCAPE HATCHES

4 AFT FUSELAGE
- AIR CONDITIONING AND PRESSURIZATION PACKAGE
- RUDDER POWER CYLINDER
- ELEVATOR CONTROLS
- TRIM ACTUATORS

5 WING
- FLAP AND SPEED BRAKE CONTROLS
- AILERON CONTROLS
- MAIN LANDING GEAR
- ENGINES J34 WE-34
- FUEL CELLS

Figure 1-1

PRINCIPAL DIMENSIONS

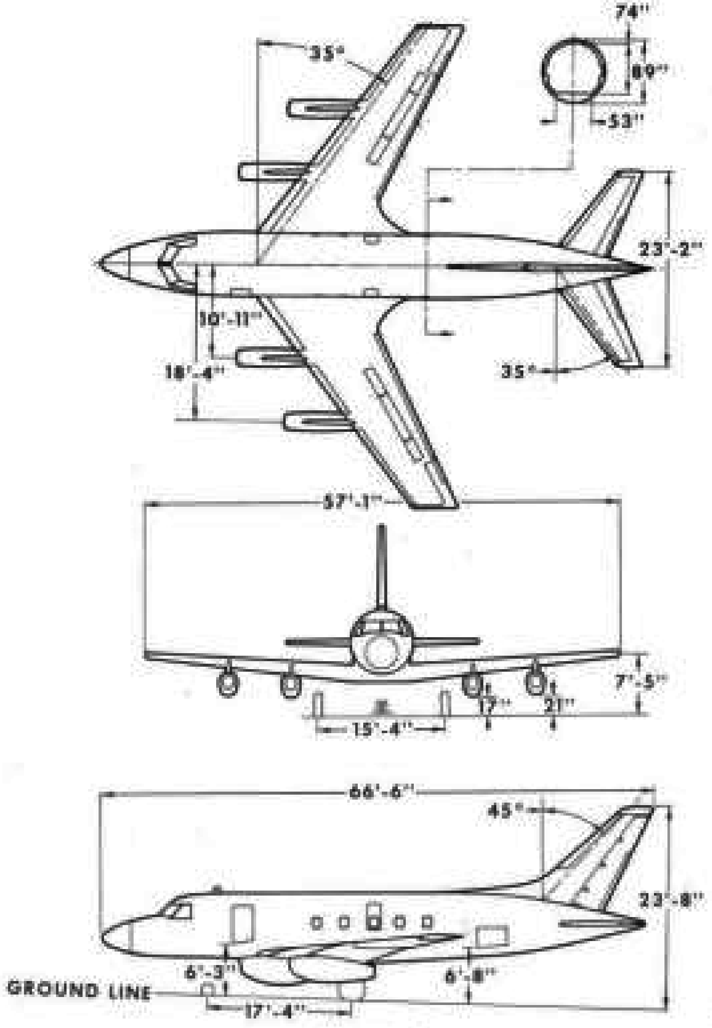
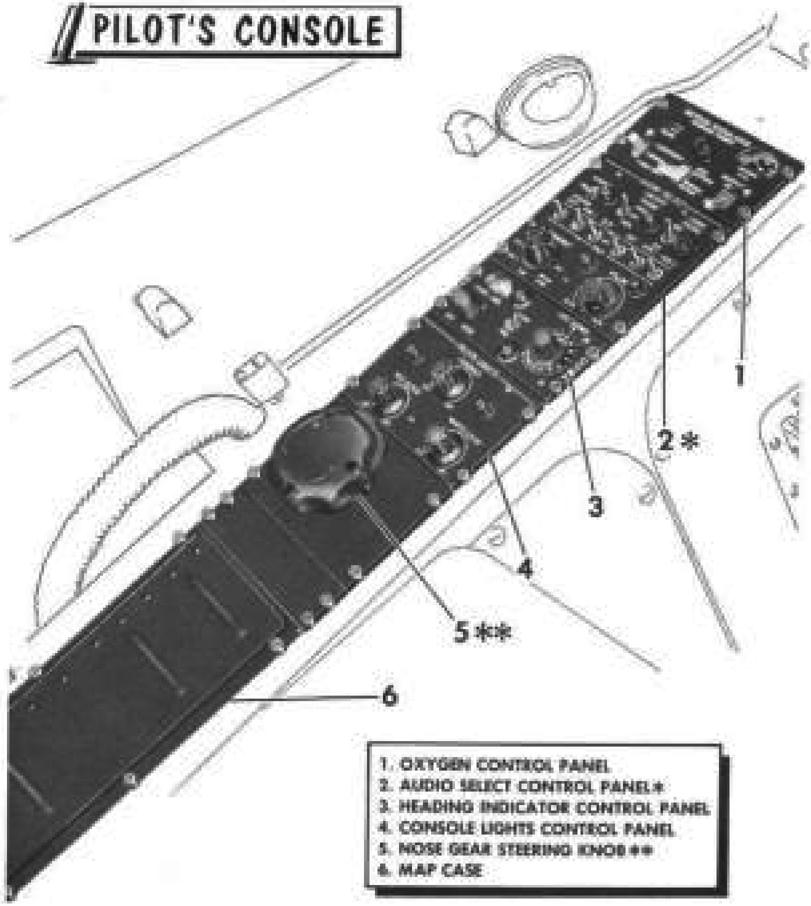


Figure 1-2

PILOT'S CONSOLE



1. OXYGEN CONTROL PANEL
2. AUDIO SELECT CONTROL PANEL*
3. HEADING INDICATOR CONTROL PANEL
4. CONSOLE LIGHTS CONTROL PANEL
5. NOSE GEAR STEERING KNOB **
6. MAP CASE

* THE AUDIO SELECT PANEL HAS BEEN MOVED TO THE OVERHEAD PANEL AND IS NOW LOCATED JUST AFT OF THE TELELIGHT PANEL (3, FIGURE 1-5).

** THE NOSE GEAR STEERING KNOB HAS BEEN MOVED FORWARD TO REPLACE THE AUDIO SELECT PANEL.

Figure 1-3

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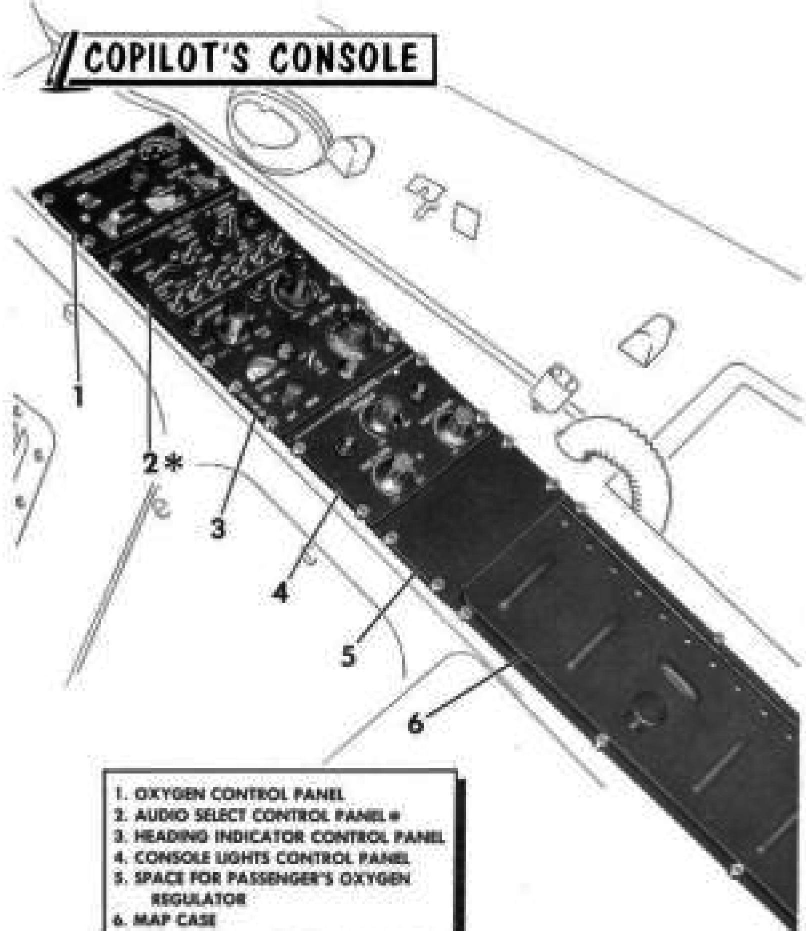
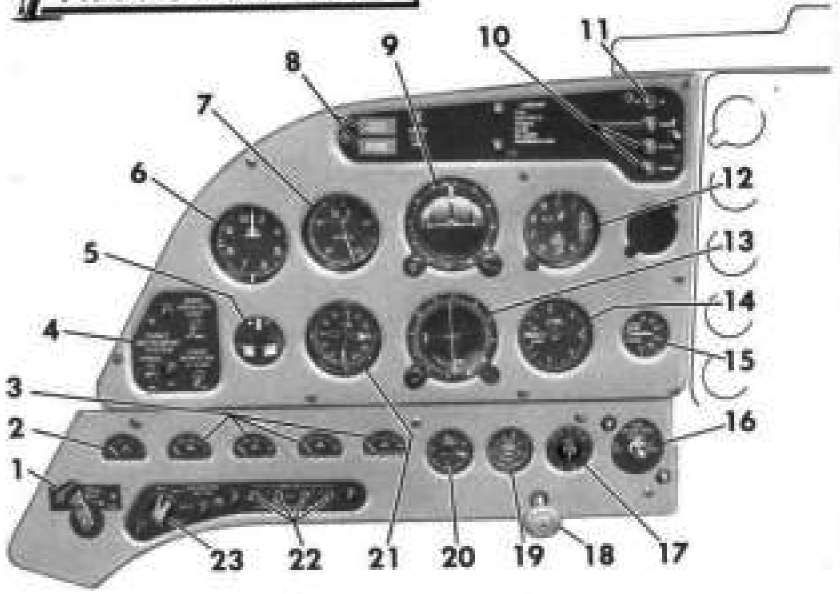
COPILOT'S CONSOLE



1. OXYGEN CONTROL PANEL
2. AUDIO SELECT CONTROL PANEL*
3. HEADING INDICATOR CONTROL PANEL
4. CONSOLE LIGHTS CONTROL PANEL
5. SPACE FOR PASSENGER'S OXYGEN REGULATOR
6. MAP CASE

* THE AUDIO SELECT PANEL HAS BEEN MOVED TO THE OVERHEAD PANEL AND IS NOW LOCATED JUST AFT OF THE TELELIGHT PANEL (3, FIGURE 1-5).

PILOT'S MAIN PANEL

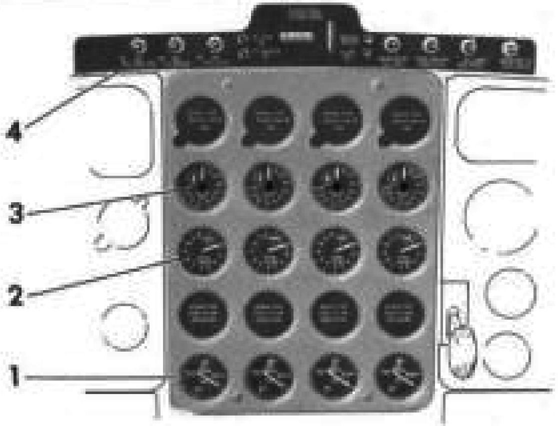


PILOT'S MAIN PANEL

1. RUDDER PEDAL ADJUSTMENT CRANK
2. VOLTMETER
3. AMMETERS
4. FLIGHT INSTRUMENT CONTROL PANEL
5. TURN AND SLIP INDICATOR
6. MACH INDICATOR
7. AIRSPEED INDICATOR
8. MASTER CAUTION AND FIRE WARNING LIGHTS
9. NAV FLIGHT DIRECTOR
10. MARKER BEACON LIGHTS
11. MARKER BEACON LIGHT INTENSITY SWITCH
12. ALTIMETER
13. SITUATION DISPLAY INDICATOR
14. VERTICAL VELOCITY INDICATOR
15. SPEED BRAKE POSITION INDICATOR
16. FUEL CROSS FEED SWITCH
17. FUEL GAGE TANK SELECTOR KNOB
18. PARKING BRAKE KNOB
19. FUEL QUANTITY GAGE AND TOTALIZER
20. HYDRAULIC PRESSURE GAGE
21. RADIO MAGNETIC INDICATOR
22. GENERATOR SWITCHES
23. VOLTMETER SELECTOR SWITCH

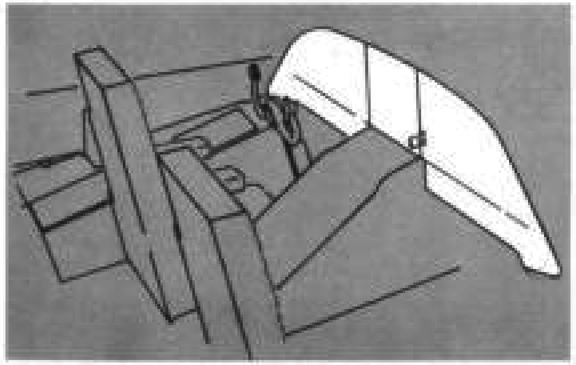
Figure 1-4

ENGINE MAIN PANEL

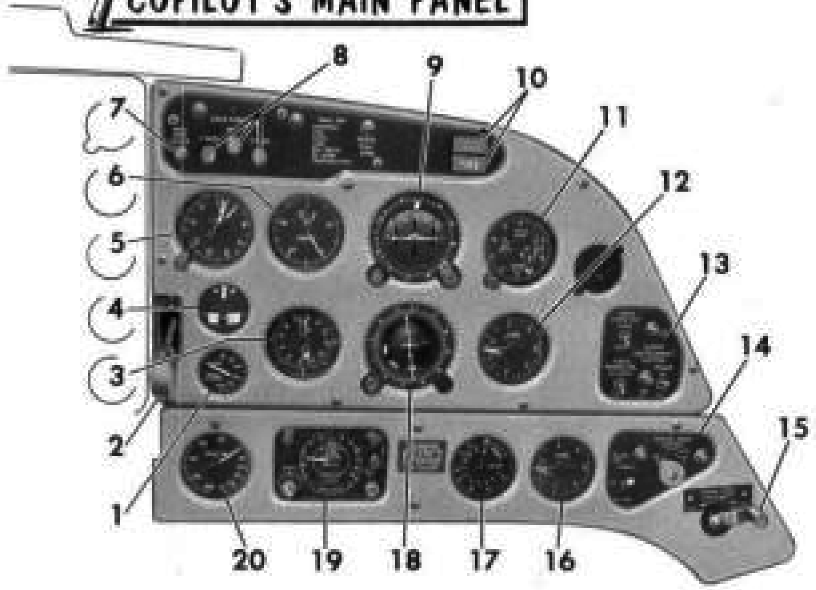


ENGINE PANEL

1. OIL PRESSURE GAGES
2. EXHAUST TEMPERATURE GAGES
3. TACHOMETERS
4. FLIGHT TEST PANEL



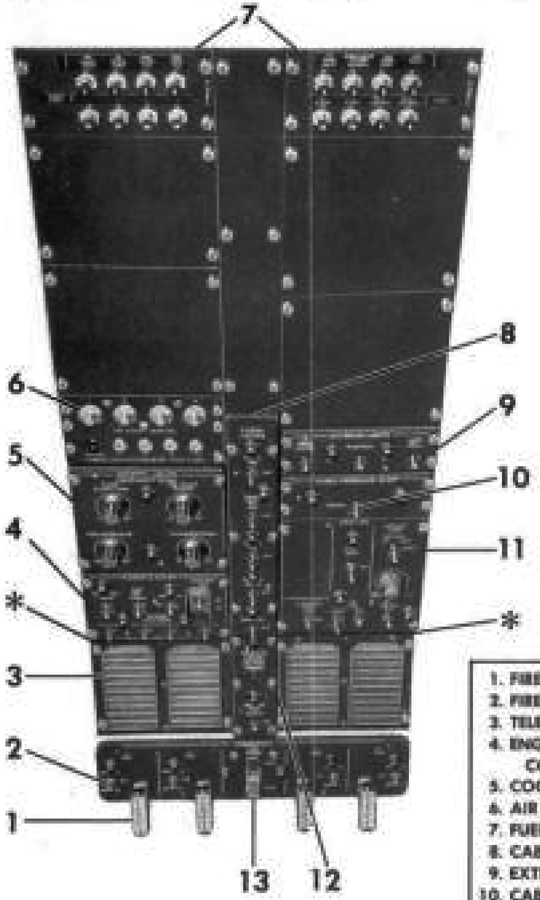
COPILOT'S MAIN PANEL



COPILOT'S MAIN PANEL

1. FLAP POSITION INDICATOR
2. LANDING GEAR HANDLE
3. RADIO MAGNETIC INDICATOR
4. TURN AND SLIP INDICATOR
5. ACCELEROMETER
6. AIRSPEED INDICATOR
7. LANDING GEAR WARNING HORN SILENCER BUTTON
8. LANDING GEAR POSITION INDICATORS
9. NAV FLIGHT DIRECTOR
10. MASTER CAUTION AND FIRE WARNING LIGHTS
11. ALTIMETER
12. VERTICAL VELOCITY INDICATOR
13. FLIGHT INSTRUMENT CONTROL PANEL
14. MANUEL PRESSURE CONTROL PANEL
15. RUDDER PEDAL ADJUSTMENT CRANK
16. CABIN RATE OF CLIMB INDICATOR
17. CABIN ALTITUDE AND PRESSURE DIFFERENTIAL INDICATOR
18. SITUATION DISPLAY INDICATOR
19. CABIN ALTITUDE CONTROL PANEL
20. STATIC AIR TEMPERATURE GAGE

OVERHEAD PANEL



* THE AUDIO SELECT PANELS (2, FIGURE 1-3) ARE NOW LOCATED JUST AFT OF THE TELELIGHT PANELS.

1. FIRE WALL SHUTOFF T HANDLES
2. FIRE EXTINGUISHER SWITCHES
3. TELELIGHT PANELS
4. ENGINE AND ELECTRICAL POWER CONTROL PANEL
5. COCKPIT LIGHTS CONTROL PANEL
6. AIR START IGNITION BUTTONS
7. FUEL SYSTEM CIRCUIT BREAKERS
8. CABIN LIGHTS CONTROL PANEL
9. EXTERIOR LIGHTS CONTROL PANEL
10. CABIN PRESSURE DUMP SWITCH
11. CABIN AIR CONDITIONING AND ANTI-ICING CONTROL PANEL
12. TELELIGHT AND WARNING LIGHT TEST PANEL
13. FUEL DUMP SWITCH

PEDESTAL PANEL

1. RUDDER TRIM KNOB
2. AILERON TRIM KNOB
3. UHF RECEIVER
4. AUTOPILOT CONTROL PANELS
5. PILOT'S AUTOPILOT PANEL
6. NO. 1 COMMUNICATION AND NAVIGATION RADIO CONTROL PANEL
7. STABILATOR TRIM POSITION INDICATOR
8. SPEED BRAKE SWITCH
9. TAXI LIGHT SWITCH
10. THROTTLES
11. STABILATOR POWER LEVER
12. INFORMATION LIGHT PANEL
13. THROTTLE FRICTION LEVER
14. LANDING LIGHT SWITCHES
15. FLAP SWITCH
16. NO. 2 COMMUNICATION AND NAVIGATION RADIO CONTROL PANEL
17. CO-PILOT'S AUTOPILOT PANEL
18. RADIO AND AUTOPILOT MASTER CONTROL PANEL
19. SPACE FOR AN ADF CONTROL PANEL
20. SPOILER HYDRAULIC POWER CUTOFF SWITCH
21. RUDDER TRIM SWITCH
22. WINDSHIELD WIPER KNOB

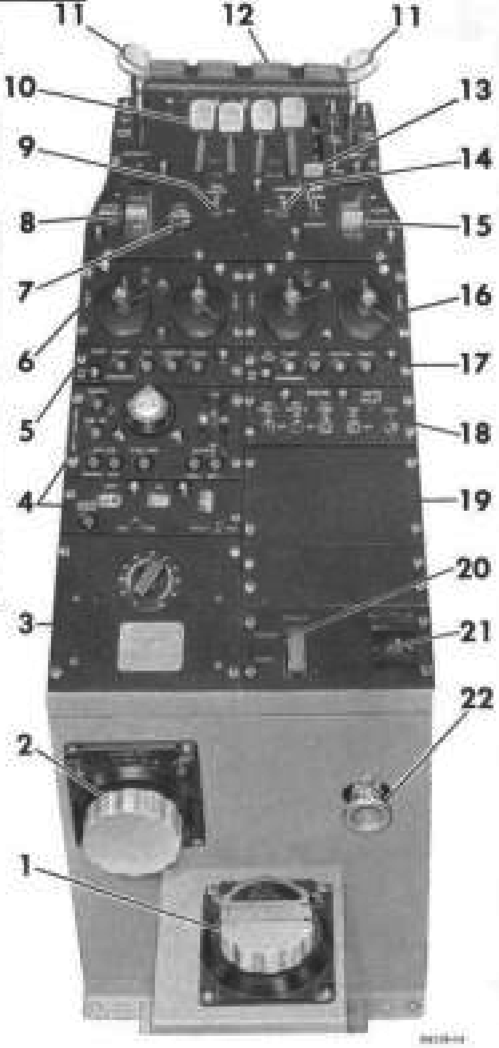


Figure 1-5

BRIEFING NOTES

BRIEFING NOTES

AIRCRAFT SYSTEMS

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AIR CONDITIONING AND PRESSURIZATION SYSTEM

The air cycle refrigeration and pressurization system (Figure 2-1) is supplied by engine bleed air. Bleed air is extracted from compressor discharge ducts on each engine and routed through the wing-fuselage junction tunnel, to flow control or flow limiter valves and into a common manifold. This manifold is routed to a heat exchanger. Ram air is received at the dorsal air intake and used as heat exchanger coolant and ejected overboard. The cooled bleed air from the heat exchanger discharge is routed through the cooling air turbine to the water separator and to the cabin plenum chamber. Some heat exchanger discharge air by-passes the turbine and water separator and is routed through a mixing valve, for temperature modulation, and into the cabin plenum chamber. For additional temperature modulation bleed air is extracted prior to the heat exchanger and routed through a mixing valve and into the plenum chamber. Up-stream of this mixing valve bleed air is

AIR CONDITIONING, PRESSURIZATION & DE-ICING FLOW DIAGRAM

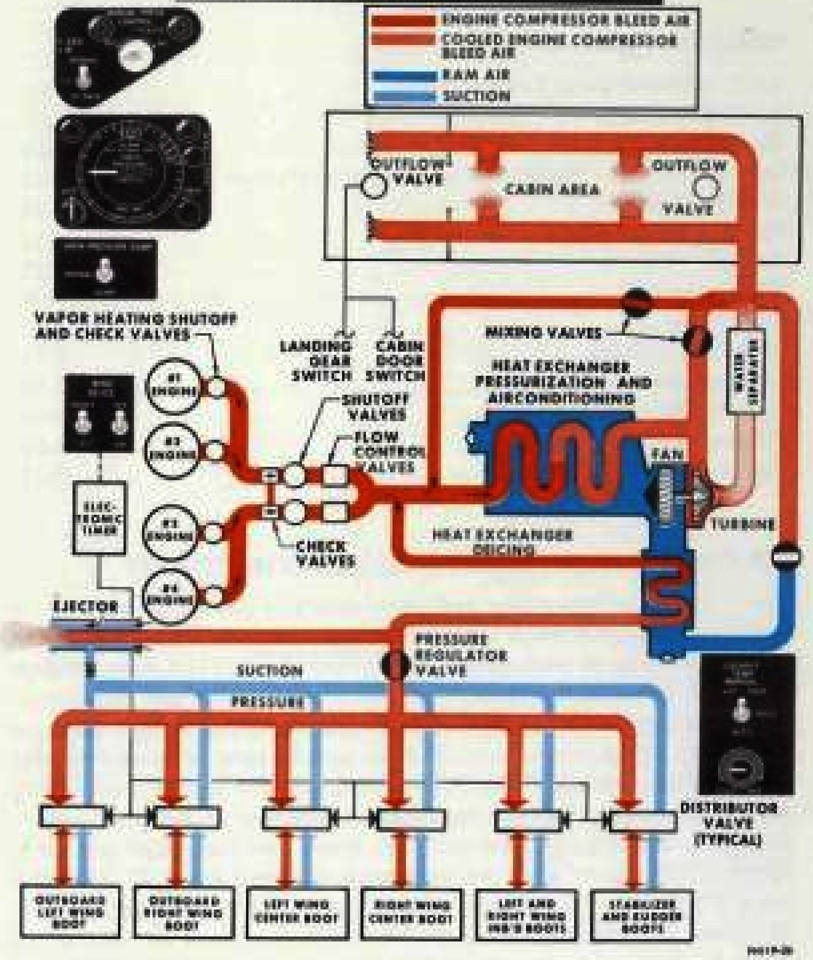

Figure 2-1

extracted for water separator de-icing. Temperature is controlled by a switch on the overhead heat control panel which has an "auto" for automatic regulation, and a manual "hot" and "cold" position. A thermostat is located in the cabin for measuring cabin temperature. Cabin pressurization is obtained through the same heat and air conditioning system extracing bleed air from the engine compressor discharge section. Pressure is controlled from the cabin pressure control panel, located in the co-pilot's panel, and consists of cabin rate of climb, dual altimeter instruments and the pressure control unit. Pressure is regulated by two cabin outflow regulator valves, one located below the cabin forward of the wing and one located aft of the aft pressure bulkhead. The outflow valves are adequately sized to minimize the cabin pressure dump occurring during take-off. A solenoid valve, electrically connected to the landing gear scissors, functions to dump any residual cabin pressure at a comfortable rate upon touchdown of the airplane. Means are also provided for emergency cabin pressure dump. Static pressure reference is obtained from a port open to the aft fuselage compartment and located above the aft pressure bulkhead plenum chamber. Vacuum pressure is obtained from the vacuum source for the wing and tail de-ice system.

Normal Operation

Placing the bleed air switch (R. H. sub-instrument panel) in the "normal" position opens the package shutoff valve supplying engine bleed air to the air conditioning system. This action also closes the ram air valve. The cockpit temperature switch is then placed in the "auto" position and a cockpit temperature is selected by adjusting the cockpit temperature selector. This puts the cabin temperature control into operation, which automatically opens and closes the dual mixing valve to maintain the required temperature setting. The limits on this temperature selector are 60° F in the full cold position and 90° F in the full hot position. The temperature control will automatically control the cockpit temperature at the selected temperature.

Manual override of the automatic temperature control is achieved by use of the cockpit temperature switch. Placing this switch in either the "hot" or "cold" position directly controls the mixing valves, allowing either greater or lesser amounts of hot air by-pass. This switch is spring-loaded to return the "hold" position from either the "hot" or "cold" positions. This action cuts electrical power to the mixing valves and holds them in their last manually controlled position. The slow dump valve is energized open by the R/H main gear scissors switch, when the airplane weight is on the landing gear.

CLIMB

Prior to take-off the crew adjusts the cabin pressure controller to the aircraft's anticipated cruise altitude. This action positions an indicator hand to the corresponding cabin altitude at full differential pressure. In addition, the rate knob must be adjusted to ⅓ its travel from minimum position as an approximate adjustment. The required rate adjustment is determined from the predicted cruise altitude and the aircraft's rate of ascent which establishes the time required to reach full cabin differential pressure. Determination of the anticipated ascension time and a reading of the cabin altitude at full differential pressure minus ground altitude provides the information required to establish the desired rate of change of cabin altitude. The crew must make a mental note of the desired rate of change of cabin altitude for a final adjustment following attainment of a uniform rate of ascent. Care must be taken to assure that the aircraft is settled on its cruise altitude simultaneously with or before reaching full cabin pressure differential. Otherwise, the rate of change of cabin altitude will be equivalent to the aircraft's rate of ascent.

DESCENT

Prior to descending, the crew establishes a rate of descent. It is determined from the time required to bring the full cabin differential pressure to the pressure altitude at ground level. This estimate must include consideration of any anticipated descent pattern interruptions including those caused by a heavy traffic pattern. Approximately coincident with the moment the aircraft starts descending, the cabin altitude adjusting knob on the pressure controller should be manually dialed to a value equal to station altitude.

After the aircraft has started descending, the rate of change of cabin pressure should be adjusted to a value compatible with the aircraft's rate of descent in order to get the aircraft on the ground at the same moment that the cabin pressure alitude equals station altiude. Care must be taken to assure that the differential pressure does not reach zero before the aircraft reaches station level. Otherwise, the rate of change of cabin altitude will equal the aircraft's rate of descent.

CRUISE

No pressurization system adjustments are required if the original flight plan is followed and local barometric pressure conditions do not vary. However, if aircraft altimeters are corrected for local barometric pressure changes enroute, the cabin pressure controller must be similarly adjusted. No other system adjustments are required until descent is contemplated.

Emergency Operation

OIL CONTAMINATION

In the event of serious engine oil vapor contamination, the bleed air supply may be shut off by pulling all four circuit breakers controlling the engine bleed air shutoff valves. By selectively opening and closing each engine bleed air shutoff valve in turn, it is possible to locate the source of the contamination. The bleed air supply may also be shut off and ram air selected by placing the bleed air switch in the "off" position. If ram air temperatures are too cold for circulation into the cabin and cockpit, the ram air valve can be kept closed by pulling its circuit breaker prior to placing the bleed air switch in the "off" position.

FLOW CONTROL OR FILTER FAILURE

In case of a flow control valve failure the bleed air switch should be placed in the "by-pass" position. This closes the shutoff valve and opens the by-pass valve. The venturi flow limiter controls the flow rate and maintains reasonable limits. When the bleed air switch is placed in the "off" position both the shutoff and by-pass valve are closed and the ram inlet valve is opened permitting outside air to enter cabin.

UNSATISFACTORY TEMPERATURE CONTROL

The cockpit temperature switch can override the cockpit temperature selector by placing the cockpit temperature switch in "hot" or "cold" and thereby controlling the mixing valve directly.

EMERGENCY CABIN PRESSURE DUMP

When it is necessary to reduce rapidly the cabin pressure differential to zero, place the cabin pressure dump switch (overhead) in the "dump" position, or the switch actuated by operation of the main entrance door handle. This energizes the fast dump valve open and closed the shutoff valve or by-pass valve or ram air valve since only one of these valves are open, and dumps the cabin from full differential to ambient pressure in approximately 12 seconds through two outflow valves.

It is also possible to reduce the cabin pressure differential to zero by turning the manual control knob on the copilot's subpanel to the decrease position. This procedure allows control of the rate of dump. If the knob is turnd to the full decrease position, the cabin pressure can still be decreased at the same rate as by use of the emergency dump switch.

CABIN OVERTEMPERATURES

If the cabin inlet temperature exceeds 175° F due to a failure of the temperature control when the cockpit temperature switch is in the "auto" position, the mixing valves will be closed by the thermo switch at the inlet duct. The same corrective action will occur if the mixing valves are manually driven full open, resulting in a cabin inlet temperature that exceeds 175° F.

In case the mixing valves fail to open due to broken control wiring or valve failure, the shutoff valve or by-pass valve will be closed when the cabin inlet temperature reaches 200° F. These valves are energized closed by a thermo switch in the inlet duct. The ram air valve will remain closed unless the bleed air switch (R. H. sub-instrument panel) is placed in the "off" position.

EMERGENCY USE OF GROUND TEST VALVES IN FLIGHT

In the event the cabin pressure controller fails, allowing uncontrolled airflow to the vacuum source and/or atmosphere, cabin pressure may be lost. When this occurs, cabin pressure control may be regulated by closing both ground test valves. Cabin pressure is then controlled by use of the manual control valve.

Ground Check

Before attempting to ground check the system, the landing gear dump switch must be isolated. This can be accomplished by opening the appropriate circuit breaker. Isolation of the switch affects the pressurization system as though it were flying at station altitude. It is then possible to operate the system by adjusting the altitude knob to 1,000 feet below sea level. If a pressure source of sufficient capacity is supplied, the cabin will automatically pressurize to 1,000 feet below sea level. While this is occurring, the rate control knob can be checked at various positions and monitored with the cabin pressure rate of change indicator.

AUTOPILOT

An L-102B autopilot is installed to provide yaw dampening, automatic flight control, and automatic landing approach control.

Yaw Damper Mode

The airplane should be trimmed prior to engagement of the damper or autopilot. All autopilot circuit breakers must be "IN". Yaw damper is operative approximately 30 seconds after power is applied with "Autopilot Master" switch ON. Damper is engaged by depressing the "Damper" button. The rudder servo is of the parallel type. A force of 130 lbs. is required to overpower the servo when yaw axis of autopilot is engaged.

NOTE

Damper can be disengaged by depressing the "Autopilot Release" button on the control wheel, or by returning the "Autopilot Master" switch to "OFF".

Autopilot Mode

Autopilot is operational approximately 90 seconds after power is applied to the airplane with "Autopilot Master" switch ON. Autopilot is engaged by depressing the "Engage" button. The stabilizer trim handle must be in the "Normal" position and the "Roll Control" knob must be in "Detent". The autopilot can be disengaged by any of the following methods:

1. Depress "Damper" button.
2. Depress "Autopilot Release" button.
3. Move stabilizer trim handle to "Emergency" position.
4. Return "Autopilot Master" switch to off.

The elevator and aileron servos are of the parallel type. The elevator or aileron servos can be overpowered by a force of 25 lbs. at the control wheel. If any channel malfunctions, its circuit breaker can be pulled and the other two channels will continue to operate normally.

The "Roll Control" knob can be used to command bank angle up to 35 degrees. A lag circuit is used to prevent a sudden turn of the knob from commanding dangerously high roll rates. Bank angle is proportional to the amount of rotation of the knob from its detent. When roll control knob is returned to detent position the autopilot will roll the airplane to level and hold the heading present at the time the knob was returned to the detent.

Pitch Control

This switch may be used to command an aircraft pitch rate. There are two rates available. The first position out of the detent being the slower rate and the second position being the faster rate. The autopilot will hold the pitch angle present at the time of release (up to 20 degrees of pitch).

Special Features

Any desired heading may be obtained by selecting the heading on the flight director and then depressing the "HDG SEL" button with autopilot engaged. Altitude hold may be engaged by depressing the "Altitude-Hold" button with autopilot engaged. For rough air flying the altitude hold gain may be cut in half by use of the "Altitude-Soft" button. Automatic OMNI operation is obtained by turning the OMNI receiver to the desired frequency and depressing the "LOC-VOR-Cap- button. When aircraft reaches the desired radial, depressing the "LOC-VOR-Hold" button will cancel out cross-wind effects. Automatic Instrument Landing approach may be engaged by tuning the localizer receiver to the desired frequence and depressing the "LOC-VOR-Capture" button. After the aircraft is on the beam, depressing the "LOC-VOR-Hold" button will cancel out cross-wind effects. When the glide slope indicator shows the airplane to be in the center of the beam, depressing the "Glide Path" button will disengage altitude hold and fly the airplane down the glide slope beam.

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NOTE

Moving the roll control knob out of the detent position cancels any lateral function. Moving the pitch control switch cancels any longitudinal function. Any of the affecter special features must be reset after operation of the roll control knob or pitch control switch.

CAUTION

Do not attempt an AILAS with either Roll or Pitch axis malfunctioning.

BRAKE SYSTEM

Dual Brake System

The hydraulic system pressure, directed through two dual power brake valves, supplies the power brakes. These valves are located near the nose wheel-well and are operated in a conventional manner with linkage attached to the pilot's and co-pilot's rudder pedals. The dual brake units in each wheel are independent of each other and each unit is supplied by completely separate hydraulic plumbing. In the event of airplane hydraulic system failure, normal braking is available from two 50 cubic inch accumulators held charged by a check valve. The 50 cubic inch accumulator is capable of delivering thirteen complete brake applications. This can be readily charged by operating the Hand Pump. Emergency braking provides differential wheel brake pressures the same as normal braking; however, in case of a broken brake line downstream of the brake valve, twice pilot effort is required for same braking forces.

Skid Warning System

The skid warning system is a "foot thumper" type. The major components in the system are: two wheel driven generators, four thumper pins and four small electric thumper motors. It is controlled and operated electrically by actual skid or test circuit signals. An OFF-ON switch on the pedestal activates or deactivates the system.

NORMAL OPERATION

A wheel driven generator, a pair of thumper motors and a pair of thumper pins operate in unison to provide the skid warning. In the event a skid occurs in the wheel, a signal from the generator starts the thumper motor attached to the pilot's rudder pedal assembly and another thumper motor attached to the copilot's rudder pedal assembly. Each motor forces a thumper pin "in and out" of a hole in each pedal. The thumping against the foot of the pilot or copilot, as the pins move in and out of the holes indicates a skid has begun. An immediate reduction of foot pressure on the brake pedal will advert a full skid.

TEST CIRCUIT

When the three-position momentary test switch is in the right position, the right thumper operates, and if the switch is in the left position, the left thumpers operate. This test operation determines whether or not the skid warning system is functioning.

COMMUNICATION–NAVIGATION AND INTERCOM SYSTEM

The aircraft radio systems are designed to provide the following facilities. Two VHF transmitters, three VHF receivers, two of which have

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VOR and localizer (ILS) capabilities, two VHF glide slope (ILS) receivers, one marker beacon receiver, an ADF low frequency receiver and an intercom between pilot, copilot or between cabin and cockpit. All radio tuning controls and radio ON-OFF switches are located on the pedestal (Figure 1-5). The pilot's and copilot's "Audio Select" panels are located overhead.

Controls

The four tuning controls on the pedestal provide the following functions. The left control adjusts the command receiver and transmitter with one setting. The second tuning dial from left provides tuning for VOR 1 and ILS 1 operation. The third tuning dial sets the frequency a second VHF transmitter only. The fourth or right tuning control adjusts the frequency for VOR 2 and ILS 2 operation.

The "Audio Select" panel permits mixing of any or all audio signals received. In the event that the audio signals are lost, the switch for the signal needed should be placed in the EMER position and headset-speaker switch located on the aft end of the console, should be in HEADSET position. These positions allow for a failure in a part of the audio system by taking audio directly from the receiver's audio output. The same method of operation may be applied to the "Cockpit Phone" switch. The "Cabin Phone" light in the upper right hand corner of the panel indicates that the pilot or copilot should reply on the interphone. On the same panel a "Transmit switch with VHF 1, VHF 2, UHF, INTERCOM and OFF positions allow selection of voice transmission desired. The "Headset-speaker" switch on the number one aircraft should be kept in the speaker position for maximum output.

Radio Indicators

A Navigation Flight Director and a Situation Indicator provide precise guidance during approach under all weather conditions on the same two instruments employed for enroute navigation. VOR/ILS radio data is fed to Navigation Flight Director (Figure 2-2).

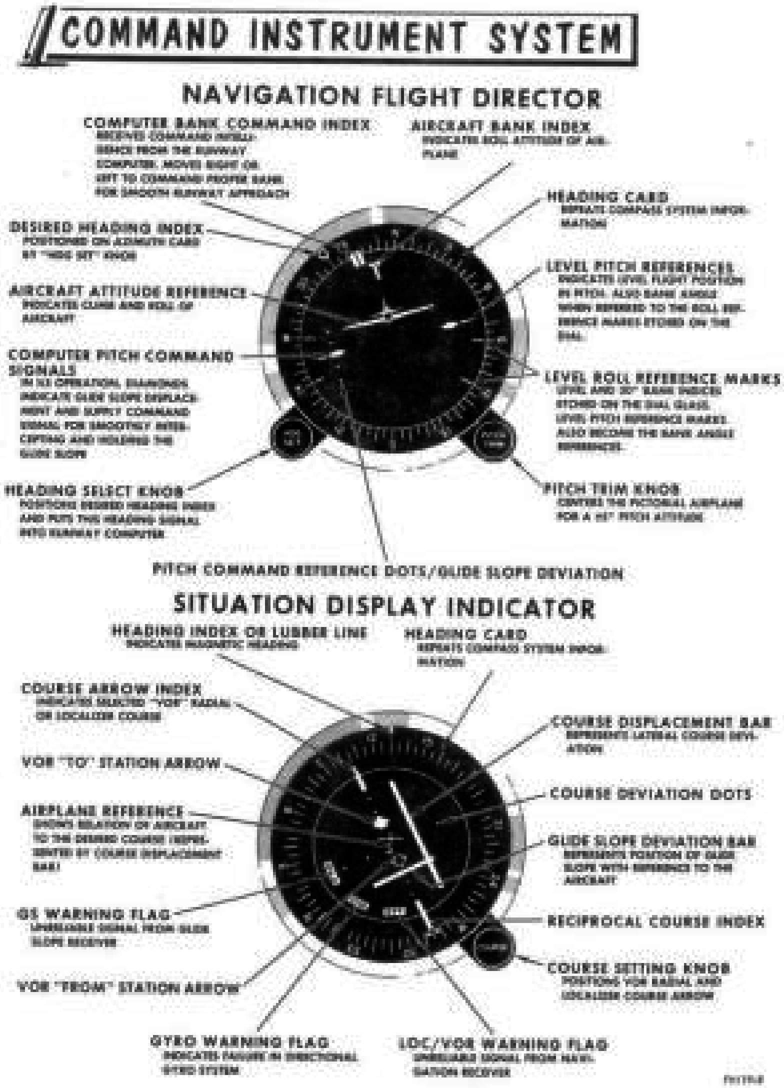


Figure 2-2

DE-ICING SYSTEM

Windshield Heating and DeFogging

The pilot's and copilot's front windshields are birdproof 1.33 inch NESA glass. A-C electrical current is used for windshield anti-icing. Electrical power for the pilot's windshield is supplied by the No. 2 inverter. The electrical power for the copilot's windshield is supplied by the No. 3 inverter. The side panel windows in the cockpit do not de-ice or defog. For maximum birdproofing, windshield heat must be on.

A 3-position switch installed in the overhead de-icing panel for each windshield is marked "OFF", "HIGH", "LOW". Normal operation requires "LOW" heat for a cold windshield and after a warm-up period the "HIGH" setting may be used. Temperature control is automatic at 110°F. No warning device is provided to indicate lack of heat to either windshield, but a telelight warning signal will show inverter failure.

Whenever external power is applied to the aircraft the control pin of the plug energizes a relay breaking the control circuit to the windshield inverters. Therefore, the inverter light will be illuminated whenever external power is applied regardless of the position of the windshield heat switch.

De-Ice Boots

The leading edges of the wing and the horizontal and vertical stabilizers are equipped with Bendix inflatable type rubber boots, utilizing engine bleed air. Boot operation is controlled electrically from the de-ice panel mounted in the cockpit overhead. The electrical power for the panel is supplied from the No. 2 DC bus. There are two modes of operation: One is for severe icing, which sequences all boots in 1 minute, the second mode is for moderate icing, sequencing all booots in 3 minutes. Constant suction from an air powered ejector pump, applied to all boots when all or any engine is in operation. This suction is regulated to 6 inches of mercury maximum by regulating valves. The pressure phase of the operation is provided by engine bleed air and regulated to 18 P.S.I.

OPERATION

Operation of the system is initiated by means of a manually operated "de-ice" switch. This prepares the system for cycling operation, through timer sequencing. A second cockpit control switch provides the option of selecting either a "light" or "heavy" ice removal capability. A short dwell time is provided between complete cycles. This swell time is longer for the light ice condition as opposed to the heavy ice condition. Each boot segment is inflated once during each complete cycle of the timer. The distribution valves are then cycled in sequence by the electronic timer thus supplying air pressure to the individual leading edge surface segments. After the inflation period each boot segment is then discharged through a port on the distribution valve, until the pressure is reduced to 0.5 P.S.I.G. The boot is then ported through the suction side of the distribution valve, which provides "hold down" of the boot in flight. Except for the inflation cycle, suction is maintained on all the boot segments at all times regardless of either "on" or "off" position of the system. Any time the de-ice system is turned off the boots will always continue to complete one entire sequence.

ELECTRICAL SYSTEM

Four 27.5V d-c generators are the basic source of electrical power for the aircraft. One 300 ampere generator is mounted on each of the four engine accessory drive pads. A 24V, 36 ampere hour battery is utilized to supply power to the d-c buses when the generators are not operating or ext power is not applied. A-C power is supplied by three 2500 volt ampere d-c to a-c inverters to the aircrafts a-c buses. (Figure 2-3).

Electrical Power Distribution

The primary d-c bus number 1 powers the number one inverter and other d-c loads. The number two primary bus powers inverters number 2 and 3 and the remaining d-c loads. Two primary buses are normally connected together by a d-c load control relay. The primary bus may be supplied by an external power source or the aircraft battery if the "Battery" switch located overhead is ON and the "Power Selector" switch located overhead is in the NORMAL position. The d-c power distribution system consists of two primary d-c buses, and a Parked

Operations Bus. Each bus is fed by three wires and each wire is protected by a current limiter. In the event of a short, the current limiter will blow and the other two wires will continue to carry the load. The parked operations bus powers those loads that would be used while the aircraft is parked or being readied for flight. This bus is provided so that it will not be necessary to enter the cockpit and turn off all switches not being used. The parked operations bus may be energized by external power or by the aircraft battery itself when the "Battery" switch is ON.

Electrical Power Controls

The "Battery" switch and the "Power Selector" switch located on the overhead and the four "Generator ON" switches on the left sub instrument panel provide the pilot with control of the d-c electrical system. For the pilot to place any one or all of the d-c generators on the line, the "Power Selector" switch should be in the NORM position, the "Battery" switch ON and each of the four "Generator switches placed momentarily to RESET and then to the ON position. If the pilot wishes, he may perform this generator switching sequence before, during or after engine start.

The pilot is provided with four ammeters and one voltmeter on the left sub instrument panel. Each ammeter indicates the output of each generator and the reading will depend on the amount of connected load, however all ammeter readings should be approximately the same. The voltmeter is provided with a selector switch to read each generator voltage. To read the voltage on a particular generator, place the "Generator" switch of that particular generator to OFF and rotate the "Voltmeter Selector" switch to the position desired. The generator voltage should be approximately 27.5 volts. Return the "Generator" switch to ON.

Inflight Electrical Failure and Corrections

Loss of a generator from the line is indicated by a warning light on the telelight panel located overhead. If a generator out condition is indicated the pilot should cycle the GEN switch of the affected generator to RESET and back to GEN ON, to see if the generator dropped off

ELECTRICAL SYSTEM DIAGRAM

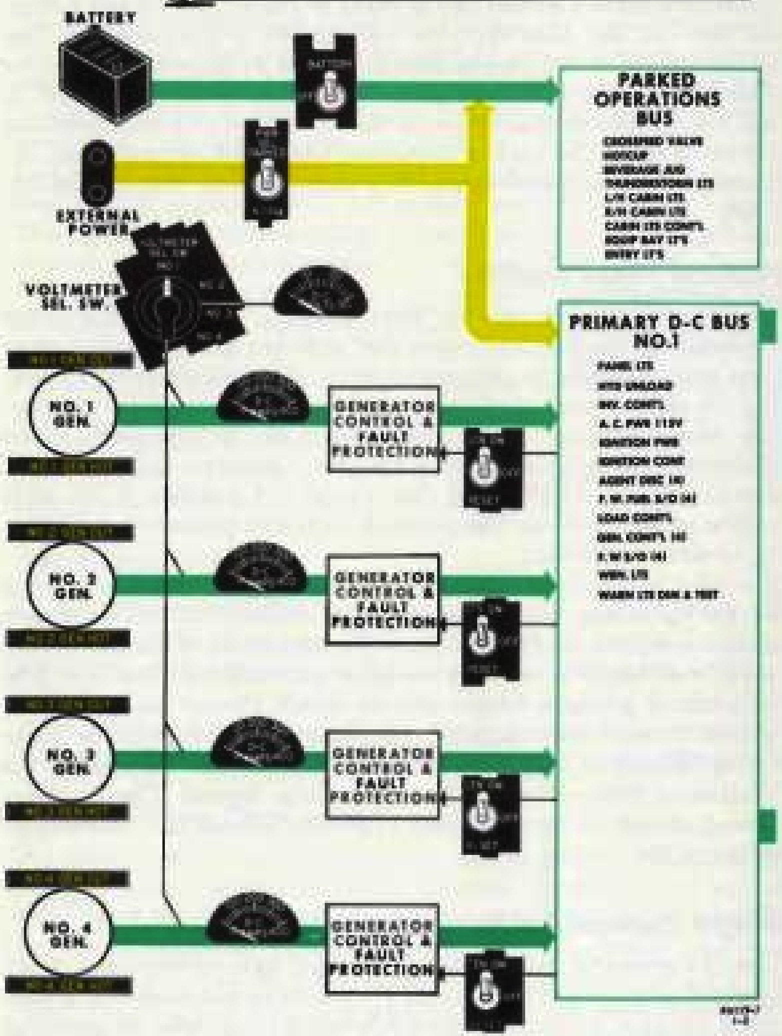
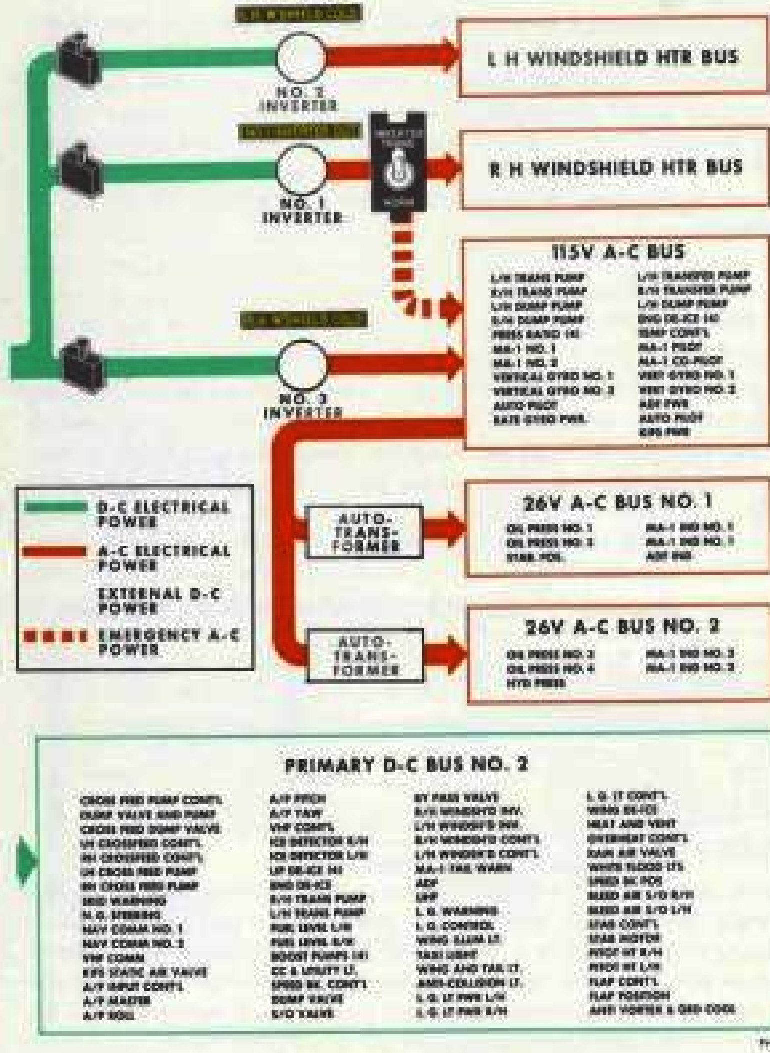


Figure 2-3



the line because of a transient condition or because of a permanent fault. Malfunctions such as overvoltage, undervoltage, feeder fault or generator unbalance will cause a generator to drop from the line. "Generator Overheat" warning lights are also provided to indicate over temperature condition. In the event of a generator over temperature condition it is recommended that the generator be removed from the line and if this does not correct the condition, the throttle should be retarded.

A-C Electrical System

Power for a-c loads is supplied by three 2500 volt ampere inverters located in the nose of the aircraft. The inverters are energized whenever the primary d-c bus is energized and may be de-energized by pulling the "Inverter Control" circuit breakers. This is the only ON-OFF control provided for the inverters. Output of the main (number one) inverter normally feeds all a-c loads in the aircraft with the exception of the pilots and copilots windshield heating loads. Inverter number two supplies power for the pilots windshield heating while inverter number three supplies power to the copilots windshield. Loss of main inverter a-c power is indicated to the pilot by a warning light on the telelight panel. In the event of main inverter failure, the pilot should throw the "Inverter" switch from NORM to TRANS. This action causes the full output of the copilots windshield heating inverter to be fed to the main a-c buses.

ENGINES

Four Westinghouse J34-WE-34 engines presently power the Model 119A aircraft. This engine weighs 1200 pounds dry (excluding build-up equipment) and delivers a guaranteed thrust of 3250 pounds. It burns JP-3 or 90/110 grade fuel at the rate of 1.04 pounds per hours per pound of thrust at normal or military power. Each engine turns a d-c generator and furnishes compressed air to a vortex valve and the air conditioning system. Each of the two inboard engines turns a hydraulic pump.

Basically the J-34 engine produces thrust in the same manner as any other jet engine; however, there is a variance in mechanical design from other types of jet engines. This engine incorporates an eleven stage spool compressor with a compression ratio of 4.1 to 1, a two stage turbine mounted on the compressor shaft and three main bearings. A variable pressure oil system (varies with rpm) lubricates the bearings, (Figure 2-4), a power-takeoff gearbox and an accessory gearbox. Three scavenging elements of a four element pressure-scavenger pump return oil to an externally mounted supply tank. To prevent oil seepage past the number one bearing and into the compressor, the bearing is vented to ram air. A fuel control regulates the fuel flow through inner and outer manifolds into a dump valve which in turn routes the fuel to the nozzles.

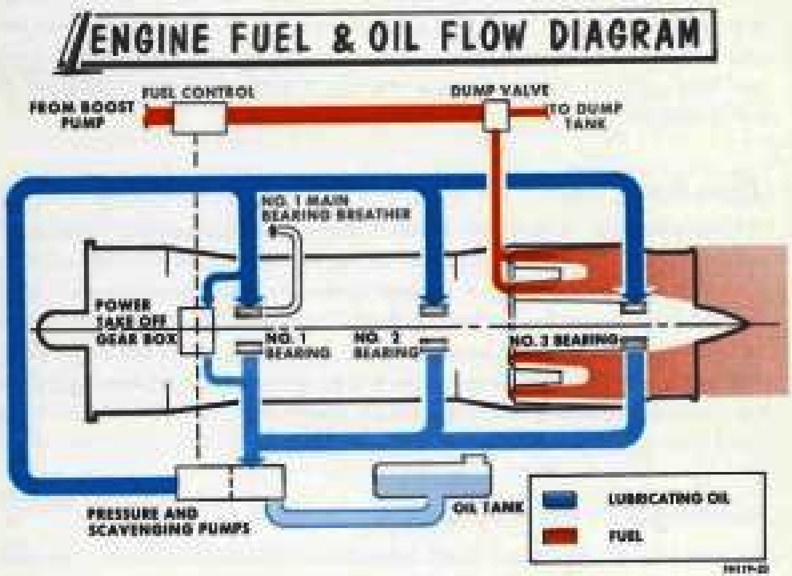


Figure 2-4

Electrical System

The electrical system is composed of the ignition and starting circuits. "Master ignition" and "starter" switches for each engine activate the respective circuit. Until the engine becomes self sustained at about 8%, both the circuits remain in operation. After the engine reaches the self sustaining speed, both circuits are de-activated.

Throttles

A throttle lever, one for each engine, is connected by a teleflex cable to the fuel control unit of the engine. The throttles are set in a quadrant, which is provided with a friction type lock, and are within easy reach of the pilot or copilot. The throttle quadrant is marked for cut off, idle, normal and military positions. To move a throttle from cut off to idle, it must be pulled up and then pushed forward. Besides controlling engine speeds, the throttles activate and deactivate the fuel boost pumps and landing gear warning buzzer through microswitches positioned in the quadrant.

"Blow Away" Jet

A blow away jet is installed on each engine to eliminate the source of most foreign object damage by eliminating the vortex formed in front of the engine. This vortex is formed whenever the engine is running on the ground and is eliminated by directing compressor bleed air at the base of the vortex. This bleed air also operates a jet pump to provide generator cooling air during ground operation. Compressor bleed air for the blow away jet and generator cooling is cut off whenever the main gear is off the ground.

Advantages of Pod Installation

Several advantages result from mounting engines in a pod. On this particular aircraft the engines can be seen from the cockpit. A pod mounted engine receives a direct flow of air into the intake as opposed to "routed air flow" for "buried" engines. Because the pod tends to be less cluttered with lines and wires, maintenance is easier. Due to position, backed up by fire walls, properly placed shutoff valves and switches, fires can be almost completely isolated from the rest of the aircraft.

Fire Warning System

A separate fire warning circuit from the sensors to a central control box is provided for each engine. Two master fire warning lights (pilot's and copilot's) are installed on the instrument panel. A fire warning light is incorporated in each fire pull handle. (One handle for per engine). Light operation may be verified by a test circuit incorporated in the system. When the switch is actuated to "fire" position all six lights glow. If an actual fire occurs in an engine the two master lights and the light in "fire pull" handle of the burning or overheating engine will illuminate.

Fire Extinguishing System

Two fire extinguisher bottles loaded with Bromotrifluormethane (C BrF_3) gas are available in each pod to extinguish a fire. The bottles are armed by a cam switch marked "fire pull". A handle is provided for each engine. This cam switch also closes the fuel shutoff valve, bleed air shutoff valve, hydraulic shutoff valve and trips the generator field relay. (Hydraulic pumps and valves are on number two and three engines only.) When the three position switch, located near the "fire pull" handle is positioned to number one, the number one bottle is discharged. When the switch is positioned to number one, the number one bottle is discharged. When the switch is positioned to number two bottle, the number two bottle is discharged. The gas from one bottle will ordinarily be enough to extinguish a fire.

FLIGHT CONTROLS

Aileron and Spoiler System

The ailerons are controlled by pilot and copilot control wheels which are interconnected. The ailerons are manually controlled at all times. Turning the control wheel 107 degrees will produce 30 degrees of aileron travel. Aileron system is of the duplicate type and is interconnected at the rear wing spar, therefore in the event of cable breakage or disconnection, one aileron will continue to operate. Spoilers, located in the top surface of the wings, operate in conjunction with the ailerons. (The spoilers also serve as speed brakes.) These spoilers are hydraulically operated and mechanically interconnected to the aileron control system. Hydraulic power for spoiler operation is from normal system pressure.

The spoilers operate in conjunction with the ailerons after 2 degrees of deflection. A hydraulic resistance force is exerted on the aileron control system to increase the pilot's and copilot's wheel forces when the speed brakes are deployed since any aileron movement in this configuration will give an increased roll rate. Ailerons deflected to 30 degrees will produce 60 degrees of spoiler deflection. Less aileron movement will produce proportionally less spoiler operation. When spoilers are deployed as speed brakes and a change in aileron deflection is desired, the increase or decrease in aileron deflection will also command in proportional increase and decrease in the extended position of the spoilers.

NOTE

If flaps are extended to 75% of their travel, the spoilers will become speed brakes and lift to 14 degrees. Any aileron movement will produce a proportional increase or decrease in spoiler extension.

Rudder Control

Directional control is accomplished by fore and aft movement of the dual suspended type rudder pedals. Rudder pedal movement is transmitted through a series of pushrods, cables and bell cranks to a hydraulic actuator with integral type control valve. Hydraulic pressure to actuate the power cylinder is furnished by the hydraulic system. In the event the basic hydraulic system becomes inoperative, the power cylinder is automatically switched to an alternate source of hydraulic power (a motor driven pump supplied by an independent hydraulic reserve tank.

The suspended type rudder pedals are connected to the pushrod and cable system by adjustable screw jacks. A flexible drive couples the screw jacks to cranks on the left and right lower edge of the instrument panel to provide fore and aft pedal adjustment.

Rudder pedal travel is ±3.25 inches and will produce a 30° left or right movement of the rudder. The rudder may be trimmed ±6 degrees by the rudder trim switch located on the lower right side of the pedestal.

Elevator Control

The elevator is controlled by individual pilot and copilot control columns which are interconnected. The control column is mechanically connected to the elevator through fail safe pushrods, bell cranks and two sets of cables. Fore and aft travel of the control column will produce 15 degrees of elevator deflection down, and 19 degrees deflection up regardless of stabilizer position. The elevator is designed to be controlled manually at all times using balance tabs. However a hydraulic power system is incorporated in the aircraft, but is deactivated.

Bobweights are installed on the pilot's elevator control column only, to provide an additional 5 lbs. G force. However, with control deflection aft of the neutral position the weight of the control column and wheel above the axis of rotation tends to cancel the effect of the bobweight.

Lateral Trim

A combination trim and balance tab is used in the left aileron and a balance tab is incorporated in the right aileron. Trim action is controlled by a handwheel on the aft end of the pedestal. A cable arrangement connected to the handwheel operates the tab.

Directional Trim

An artificial feel and trim system induces the necessary feel forces into the control system to maintain desired flight. The rudder trim actuator provides the system with 6 degrees of rudder trim either side of neutral.

The trim actuator control switch is located on the lower right side of the center pedestal.

NOTE

A handwheel located on the lower aft section of the pedestal operates a manually controlled rudder trim tab. This control wheel is safetied in the neutral position when the power operated rudder and electrical trim system are in operation.

Longitudinal Trim

Longitudinal trim is accomplished through adjustment of the horizontal stabilizer through a total of 12°. By appropriate location of the stabilizer hinge line and the elevator control rod attach point, motion of the stabilizer is utilized to bring the elevator to trail or float position and thereby to trim control forces to zero. The stabilizer is operated by an irreversible screw jack. The screw jack is operated by a drive shaft from a trim motor and gear box unit located in the pedestal. An indicator on the cockpit pedestal panel shows the stabilizer's position and bears markings to indicate a range of safe take-off positions. A trim switch on the wheel grip normally controls the stabilizer. However, this switch will be automatically deactivated whenever the autopilot master switch is "on", since the autopilot incorporates the capability of automatic longitudinal trim. If the pilot and copilot simultaneously call for trim in the opposite directions, trim will be in the direction of the first switch closed and no damage will be done to the system. Limit switches located at the stabilizer will automatically shut off the trim motor in the cockpit in the event the pilot should run the surface to its extreme position. The jack will, however, not be damaged in the event of limit switch malfunction. The trim motor and gear box transmission under the pedestal is secured in the "engaged", ("motor driven") position by placing the stabilizer trim power cutout lever on the top of the pedestal, in the full forward position where it will be retained by a suitable spring loaded over center linkage. In the event electrical power fails, this handle can be pulled aft which will disengage the motor and engage a hand crank which can be used to manually move the stabilizer. Since the handle positively disengages the drive

motor from the system, it can be used as a means of instant disengagement in the event of an electrical malfunction.

NOTE

When the manual stabilizer motor disconnect is moved from the normal to the manual operation position, it may not fully engage the operating position. However, a slight turn of the trim crank will move handle to the fully engaged position. This motion does not require pilot or copilot action but is due to spring loads. This condition also exists on returning to normal operation.

The rate of stabilizer travel when operated electrically by the pilot is approximately .4° per second. The rate when in the autopilot (automatic trim mode) is automatically slowed to considerably less than .4° per second. These rates are fast enough to give adequate trim control during the speed accelerations related to take-off and climb out, and are slow enough to avoid a dangerous condition in the unlikely event that a "runaway" trim should occur.

Flap System

The high lift configuration of the Model 119 is obtained by the use of two sets of flaps installed on the wing trailing edge. The outboard flaps are "Fowler", and the inboard are "split" type. Both sets of flaps are hydraulically powered and are actuated by the flap selector switch in the cockpit. Operation of the two sets of flaps is simultaneous and any position between fully extended and fully retracted may be selected. Total flap deflection is 35° for the Fowler flaps and 60° for the split flaps. Since synchronization of the left and right Fowler flaps is important, they are mechanically synchronized by a cable drive system which is attached to a single cylinder near the center of the fuselage. A 3-position switch, located on the right side of the center pedestal, controls a solenoid valve for operating Fowler flaps only. The flaps will maintain the selected position when the switch is placed in the "OFF" position. The flap position indicator is located on the lower left corner of the copilot's instrument panel. The Fowler flap actuator, in turn, controls a rotary valve for split flap operation. The input from Fowler actuator to split valve is thru a follow up mechanism which senses split flap position thus providing synchronization of the two sets of flaps. This same follow up mechanism synchronizes flaps during emergency hand pump operation. A hand operated pump can be used to supply emergency hydraulic pressure to operate the flaps.

NOTE

On the ground, the split flaps will tend to float to a full down position as the hydraulic pressure dissipates. However when hydraulic power is applied either externally or by the aircraft's normal system the flaps will retract.

Flap extension is limited to airspeeds less than 185 K.I.A.S. The system is protected by a warning light on the telelight panel. Warning light will light at 170 ±5 K.I.A.S.

The inboard flaps will fully extend first because of the built-in over travel of the Fowler flap. If electrical power is lost, the flaps can be lowered only with the hand pump. To use, turn the "emergency flap valve" located on the aft pilot's console to the "DOWN" position, and use the hand pump on the copilot's side of the center pedestal. If the flaps are extended and electrical and hydraulic power is lost the flaps will stay in their as-is position. If a hydraulic down line in the split flap leaks: the split flap would float up, and the Fowler flap would remain in its position at this time of failure. If the leak occurs in the Fowler down line, both Fowler and split flap would float up. A failure in the split flap follow-up cable can result in either full or zero split flap deflection, depending on the position of the valve at the time of failure. A failure in a split flap line, between the selector valve and the actuator can result in unsynchronized split flaps. The only way the Fowler flaps may become unsynchronized split flaps. The only way the Fowler flaps may become unsynchronized is for a failure to occur in the cable from actuator to either left or right flap. The broken flap would follow up and result in considerable lateral unbalance.

Speed Brakes

The speed brakes are electrically actuated, hydraulically operated, by actuators in each wing and controlled by a 3-position switch on the left forward side of the center pedestal. The control positions are

"OUT", "Speed Brake OFF", and "IN". Power is supplied by the primary D.C. bus for both the actuator and position indicator. In normal use the pilot actuates the speed brakes to the desired position and places the switch to "Speed Brake OFF". The speed brake will remain in this position. A speed brake position indicator, located on the main instrument panel, shows amount of speed brake extension.

NOTE

Speed brakes can be extended at any speed within the operational limitations of the aircraft, however they produce a nose up pitching moment as they deflect.

For stability, the speed brakes are automatically extended to 14 degrees when the flaps are lowered to 75%. This operation is accomplished by flap limit switches and auxiliary extend and retract limit switches for the speed brakes. If the speed brake switch is left in the "IN" position, the speed brake will automatically retract when the flaps return to less than 75%, however if the speed brake switch is in the "Speed Brake OFF" position, the speed brakes will remain where they are when the flaps return to less than 75% of travel. Therefore it is possible to extend the speed brakes while the flaps are beyond 75% but they will not retract below 16 degrees. If D-C power or hydraulic power is lost, no speed brake operation is possible.

FUEL SYSTEM

The model 119A is equipped with a wet wing fuel system composed of three integral wing tanks, left outer, center and right outer. (Figure 2-5). The center tank will hold 650 gallons and each outer wing tank will hold 950 gallons. In flight approximately 1.0 psi is maintained in all the tanks by two independent dive and climb vent systems. The center wing tank is intended to serve as an auxiliary fuel tank. Usually it will be filled only for extended missions. Fuel in the center wing tank is transferred through two shutoff valves to the outer wing tanks by two a-c electric motor driven pumps. Fuel transfer is controlled by the fuel level in the outer wing tanks. The outer wing tanks are the engine feed tanks. Two boost pumps are located in the aft compartment of each outer wing tank. Fuel is supplied to the engines through individual feed lines. When the volume of fuel in each outer wing tank drops

FUEL FLOW DIAGRAM

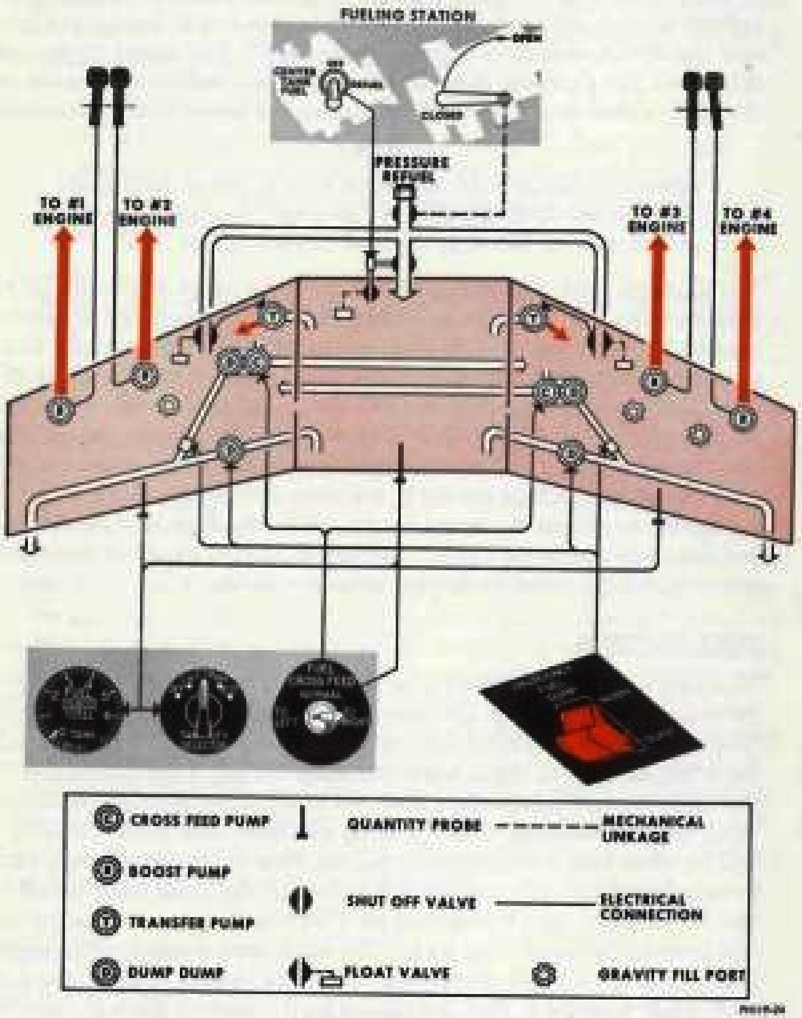


Figure 2-5

to 195 gallons, a fuel starvation indicator light automatically comes ON. Cross feed between the outer wing tanks is accomplished by two d-c electric motor driven feed pumps. These pumps are also used to dump fuel in flight. In an emergency four fuel pumps will dump fuel from the center and outer wing tanks through the climb vent line. The aircraft may be either gravity or pressure refueled. Defueling is accomplished by using the aircraft defueling pumps.

Cross Feed

A cross feed feature between the outer wing tanks is incorporated in the fuel system to eliminate wing unbalance due to fuel loading. A pump is installed in each outer wing tank and is operated by a three-position switch. By turning on the pump for the heavy wing, fuel is transferred through a common manifold into the light wing. No warning lights are installed; therefore the pilot or copilot must monitor the fuel quantity indicator during cross feed operation.

Fuel Transfer

Fuel is transferred from the center wing tank to the outer wing tanks by two a-c electric motor driven fuel transfer pumps through two fuel shutoff valves. The rate of fuel transfer is controlled by a fuel level control pilot valve in each outer wing tank. The transfer pumps are started when the master ignition switch is placed in the ON position. Each fuel transfer pump is automatically shut off when the center wing tank is empty by a fuel level sensing element located in the center tank. A fuel flow indicator in each transfer line indicates fuel transfer by lighting a light located on the pilot's information panel. This fuel transfer indicator light will illuminate on increasing flow at 5 GPM and extinguish on decreasing flow at 2 GPM.

Engine Feed

Fuel is supplied to each engine by a d-c electric motor driven fuel pump and a feed line, which are independent of any other boost pump and feed line. A motor operated fuel shutoff valve and a 10 micron emergency by-pass type fuel strainer are located in each feed line. Fuel must pass through this normally open valve and strainer before it reaches the engine fuel system. A pressure switch connected to each boost pump discharge port will light "BOOST PUMP OUT" on the telelight panel whenever the pump discharge pressure drops below 6 psi. An engine fuel starvation indicator, located in each outer wing tank, will light "FUEL QUAN LOW" on the telelight panel whenever the volume in either outer wing tank drops below 195 gallons. The motor operated fuel shutoff valve is closed only in an emergency by pulling the "FIRE HANDLE" for the engine affected. In the event a "FIRE HANDLE" is pulled, the fuel shutoff valve lights "FUEL VALVE MALFN" on the telelight panel. The light remains on approximately one second if the valve closes. The light will continue to remain ON, if the valve remains partially open.

Fuel Dump

Fuel is dumped from the aircraft in an emergency, by four pumps, two driven by d-c motors and two by a-c motors. The a-c pumps are used to dump the center wing tank fuel and the d-c pumps the outer wing tank fuel. The fuel is dumped through the climb vent line and out the wing tip trailing edge. To dump fuel the fuel dump switch, located in the center of the emergency fire panel, is placed in the DUMP position. The a-c pumps will run until the dump switch is returned to NORMAL position. The d-c pumps are automatically shut off by a float switch when all but 500 gallons are dumped from each outer wing tank. A fuel flow indicator in the dump line will light "RH or LH FUEL DUMPING" on the telelight panel. The required amount of fuel can be dumped in approximately 15 minutes assuming the emergency occurs shortly after takeoff with a full load of fuel aboard the aircraft.

Fuel Quantity System

Total fuel and individual tank quantities are indicated on one fuel quantity indicator. The readings result from electrical signals, which originate at probes in each tank. Any time signals are transmitted "total pounds of fuel" will appear in the totalizer window of the indicator. Pounds of fuel in an individual tank are indicated by the pointer; however, the pointer will indicate the fuel level in only one tank at a time. Using the "fuel quantity" tank selector, the reading in any tank

is obtained. A test signal originating at the indicator test switch will check the pointer circuits.

HYDRAULIC SYSTEM

The hydraulic sysem is closed, 3000 psi system providing primary means of operating the landing gear, brakes, flaps, spoilers, speed brakes, rudder (and elevator when activated), nose wheel steering and windshield wiper. (Figure 2-6). Hydraulic power is supplied by pumps driven by No. 2 and No. 3 engines. Filters are installed in all the systems.

Normal Operation

After starting cycle is complete on right hand inboard engine, hydraulic pressure should come up to 2500-3200 psi. The right hand pump out light located on overhead telelight panel will go out. After starting of the left hand inboard engine and hydraulic pump pressure is up to 2500-3200 psi on the left hand pump out light, located on overhead telelight panel will go out.

Emergency Hydraulic Power

Power for emergency operation of the landing gear, flaps, and wheel brakes is obtained from a hand-operated pump and an emergency selector valve bank located to the left and behind the pilot's station. This system is entirely separate from the normal system as the fluid is taken from a stand-pipe in the main reservoir.

LANDING GEAR SYSTEM

The landing gear is a conventional tricycle type and retracts fully extended into the wells. Three distinct warning signals serve the system. While the aircraft is on the ground a safety solenoid lock, which is installed in the selector handle and operated by limit switches on the main gears, prevents the selector handle from being inadvertently raised; however, a solenoid lock override circuit is incorporated. Mechanical locks retain the landing gear in the up or down position. (Up locks are external and the down locks internal inside each actuating cylinder.) Electrically controlled hydraulic power normally extends or retracts the landing gear, however emergency extension

HYDRAULIC FLOW DIAGRAM

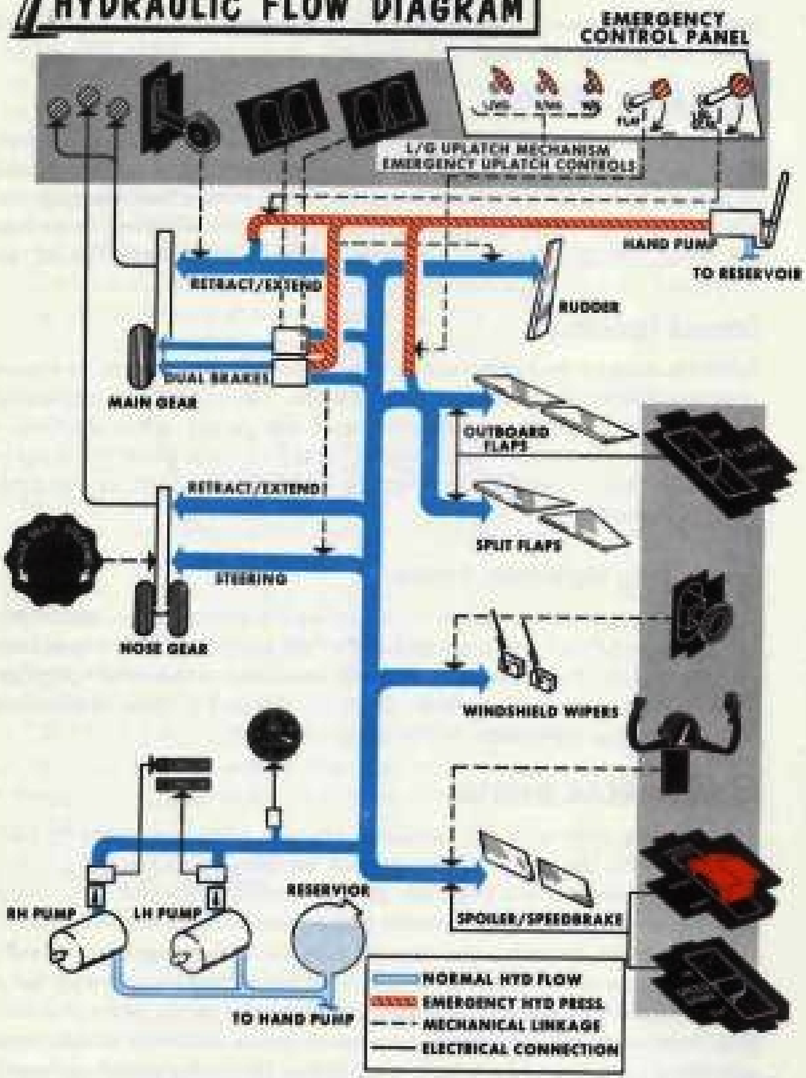


Figure 2-6

requires no power and only manual control. Emergency controls, on the left console, are readily available to the pilot and the landing gear handle, in the lower half of the main instrument panel, is within reach of pilot or copilot.

Retraction

Raising the landing gear handle closes the selector solenoid valve(s) circuit. These valves allow hydraulic fluid pressure to be routed into the selector valve. From the selector valve the fluid pressure enters the up lines to release the down locks, retract the gears into the uplocks and close the main gear inboard doors. The nose, main strut and main wheel doors are mechanically linked to the respective gears; therefore as a gear moves up the doors on the gear also move up. When the gears are locked up the mechanically operated doors are closed.

Normal Extension

Pushing the landing gear handle down causes fluid pressure to be routed into the down lines. This pressure opens the main gear inboard doors, releases the up locks, extends the landing gears and snaps the down locks into place. The mechanically operated doors are opened by the downward swing of the landing gear.

Warning System

Whenever the landing gear is unsafe a barber pole appears in the landing gear position indicator and a red light in the landing gear selector handle illuminates. As soon as the landing gear is locked in the up or down position, the unsafe indications disappear and safe indications appear. Safe indications which appear in the landing gear position indicator and are as follows: A small circle (wheel) in each window when the respective gear is locked down; the word "UP" in each window when the respective gear is locked up. When the landing gear is in the locked up position a warning buzz will sound in the pilot's and copilot's headsets or over the speaker if: The airspeed is less than 135 ±5 knots and any one of the throttles is retarded to 75% or less. Depressing a silencer button, increasing the airspeed above 150-160 knots or advancing the retarded throttle past the 75% setting will eliminate the buzzing sound. If the silencer button is depressed it is necessary to increase the airspeed above 150-160 knots or advance the throttles past the 75% setting to reset the buzzer circuit.

Emergency Extension

The type of power failure determines the emergency extension operation. If electrical power fails, pulling the emergency "T" handle (connected by a cable to the selector valve) routes fluid pressure into the down lines and the landing gear extends. In the event hydraulic power or electrical and hydraulic power fails, pulling the landing gear circuit breaker, nose, right main and left main landing gear emergency "T" handles in the order stated releases the main gear doors and the uplocks on each gear—the landing gear free falls into a down and locked position. Moving the hydraulic emergency valve from its normal position to DOWN connects the hand pump into the landing gear system only, cuts off hydraulic pressure from the engine driven pumps and permits extension of the landing gear in a normal manner if the hydraulic pumps fail. In the event that the gear will not extend when hydraulic and electrical power are available, the extension operation is the same as for an electrical failure except that the emergency "T" handle of the landing gear selector valve must be held in detent, until the aircraft is parked and the down locks are installed. (Probably due to an electrical failure between the landing gear control handle and the selector valve.)

Nose Gear Steering

The nose gear steering is hydraulically operated and electrically controlled and will turn the nose wheel up to 66° in either direction. A momentary switch built into the control activates the electrical circuit. The system has a fail safe circuit which disengages nose gear steering when the system causes a turn in the direction opposite to that called for and a limit switch on the left main gear which deactivates nose gear steering while the aircraft is airborne.

OPERATION

By depressing the control switch in the steering control, hydraulic pressure from the aircraft system is routed through a shutoff and a

servo valve into two cylinders. With the system pressurized turns are made by moving the steering control in the directions for which the turn is desired. In the event that a turn greater than desired is made, followed by an abrupt or rapid correction, steering is disengaged by the fail safe circuit. It can be re-engaged by depressing the momentary switch in the control. When the system is de-energized it functions as a damper.

LIGHTING EQUIPMENT

Exterior Lights

The aircraft "Exterior Lights" switch panel located on the overhead, controls two anti-collision lights and the wing and tail position lights. The "Wing Flood" switch is presently inoperative. The aircraft "Taxi Lights", "Landing Lights" and "Extend-Retract" switches are located on the pedestal just aft of the throttle quadrant. In the event that the landing lights are iced up and can not be extended, the lights can be turned ON to melt the ice accumulation and then extended.

Cockpit Lighting

The pilot's and copilot's instrument lights are separately controlled by two rheostats on the Cockpit-lights panel overhead (Figure 1-5). The engine instruments will be lit at the same intensity as the pilot's instrument panel. Separate control panels in the left and right consoles provide the pilot and copilot with individual control over the console lighting, red floodlights or the white floodlights. The main instrument panel utilizes both red and white floodlights while the consoles have red floodlights.

The pilot and copilot are each provided with a utility light on a coiled extension cord. Each light has a built in switch and intensity control. Thunderstorm lights are controlled by a switch on the COCKPIT-LIGHTS panel overhead. A clearance copy light is provided the copilot to use while copying instructions. It is controlled by an "Off dim bright" switch at the light base.

OXYGEN SYSTEM

The Oxygen System (Figure 2-7) is designed as secondary or emergency system to supply the crew and passengers with oxygen in case of failure in the normal cabin pressurization system. The system consists of a high pressure gaseous oxygen system supply from three 38.4 cu. ft. bottles charged to 1800 psi. The bottles are equipped with a slow opening valve, and a pressure rupture disc set at 3000 psi. The over-pressure disc is vented to the atmosphere. The oxygen feed line is routed through the aircraft to the pilot's and copilot's console and rearward to the crew and passengers' seat locations. The crew members are equipped with masks and regulators. The passenger compartment is equipped with automatic drop out oxygen masks of the non-contour type with integral demand type regulators.

Normal Operation

The following normal operation preflight check should be observed.

1. Check all bottles for full pressure and valves to the open position.

OXYGEN FLOW DIAGRAM

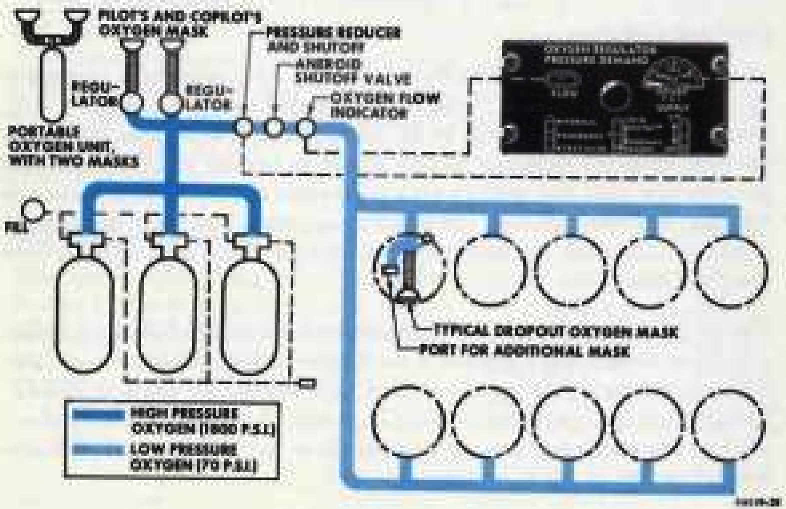


Figure 2-7

2. Check regulator supply gage for full pressure.
3. Check regulator with deluter valve first at normal oxygen and 100% oxygen as follows:
   a. Remove mask and blow gently into oxygen regulator hose. There should be resistance; no resistance indicates a leak or faulty operation.
   b. Fasten mask, turn regulator supply valve "ON", diluter valve to 100%, and breath normally into mask. Observe for proper blinker operation.
   c. Press emergency liner and hold in "test". Positive pressure should result within the mask. Hold breath to determine if there is leakage around the mask.
   d. Return diluter lever to "Normal" and "Supply"

Emergency Operation

If symptoms of hypoxia, smoke, or fumes are evident proceed as follows:

a. Supply to "ON".
b. Diluter lever to "100% O_2".
c. Emergency lever to "Emergency".
d. Notify crew and or passengers of the emergency.

WARNING LIGHTS

The warning lights listed are displayed on the overhead. Two "master caution" lights on the main instrument panel are illuminated when any one of telelights on the overhead comes on. "A telelight master caution answer" switch is provided (figure 1-5) to turn off the "master caution" light however, the telelight on the overhead will remain on until the malfunction is corrected. In the event that another telelight comes on, the "master caution" light will come on again. Two "fire" warning lights are provided on the main instrument panel and give warning to check the four "fire pull" handles for an indication of which engine may have a fire condition. The following chart lists the warning lights and gives causes and corrective action to be taken when a warning light comes on.

WARNING LIGHT ON	PROBABLE CAUSE	CORRECTIVE ACTION
NO. X GEN OUT	Generator has gone off the line.	Cycle GEN switch on left sub-instrument panel. If several attempts to return the generator to the line fail, leave the generator switch in the OFF position. Reduce electrical loads so remaining generators will not be overloaded.
NO. X GEN HOT	Overheated generator.	Remove generator from line by placing GEN switch to OFF position. If light remains on after one minute, throttle engine back to IDLE.
X BOOST PUMP OUT	No boost pump pressure for pump indicated.	Check circuit breakers on FUEL panel on overhead. Loss of pressure could cause engine to stall depending on altitude, temperature, etc.

WARNING LIGHT ON	PROBABLE CAUSE	CORRECTIVE ACTION
X FUEL VALVE MALFN	Fuel valve is not full open or full closed.	If on ground, correct before flight. If airborne with an engine fire condition, seek emergency landing field.
NO. 1 INVERTER OUT	Inverter is not supplying power to a-c buses.	Check circuit breakers. AC in the POWER CONTROL strip and AC POWER in the INVERTER CONTROL strip. If circuit breakers are not popped, place the INVERTER switch overhead to the TRANSFER position.
RH (or LH) W'SHIELD COLD	Inverter is not supplying power to the windshield because of inverter malfunction.	Check circuit breakers RH W'SHIELD or LH W'DSHIELD. Check W'DSHIELD HEAT switch for the desired HIGH or LOW setting. If circuit breaker continues to pop, no further action can be taken.

WARNING LIGHT ON	PROBABLE CAUSE	CORRECTIVE ACTION
NOTE *These warning lights will be on when external power is applied to the aircraft.*		
LH (or RH) FUEL DUMPING	Fuel is flowing in the dump line, normal during dump cycle. If light is on when DUMP switch overhead is in NORMAL position a vent valve has failed.	If undesirable dumping is indicated, the aircraft should be leveled to a 5° or less nose up attitude as soon as a safe altitude is reached.
LH (or RH) HYD PUMP OUT	Hydraulic pressure is lost. One light indicates a pump failure. Both lights indicate a system failure.	No corrective action.

WARNING LIGHT ON	PROBABLE CAUSE	CORRECTIVE ACTION
LH (or RH) FUEL QUAN	Fuel LH or RH boost pumps is low with approximately 125 gallons of fuel left.	Check opposite wing tank for fuel quantity with TANK QTY SELECTOR, left sub-instrument panel. Cross-feed as required.
FLAPS DOWN	Flaps are down and airspeed is above 170 ±5 knots.	Check FLAPS switch on pedestal for UP position. If flaps won't retract, keep airspeed below 185 knots.
CABIN DOOR OPEN	Cabin door not closed.	Close door and lock. Check light again.
NOSE TEMP HIGH	Nose equipment compartment air is above upper limit for the equipment.	Reduce temperature by placing the W'SHIELD HEAT switch to OFF.

WARNING LIGHT ON	PROBABLE CAUSE	CORRECTIVE ACTION
FIRE (on main instrument panel) check FIRE PULL handles on overhead.	Fire in engine nacelle.	Pull FIRE PULL handle overhead. Discharge fire extinguisher number one or number two at the pilot's option. A fire extinguisher switch is located next to each of the four FIRE PULL handles.
	INFORMATION LIGHT PANEL	
LH (or RH) FUEL TRANSFER	**NOTE** *These lights are provided as information lights and will come on intermittently as fuel space is available in the outer tanks.*	If no transfer is indicated, be sure the MASTER IGN switch overhead is ON. The possibility of blown fuses on the LH fuse panel should likewise be checked.

BRIEFING NOTES

BRIEFING NOTES

NORMAL OPERATING PROCEDURES

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PREPARATION FOR FLIGHT

Before entering the airplane, check that amount of fuel, oil, oxygen and special equipment is sufficient for the proposed mission. Check weight and balance to be sure that aircraft weight and c. g. limits will not be exceeded. Section VI, Performance Data, is provided for take-off, climb, cruise, and landing data.

Entrance

Cabin entry and exit is gained by use of a removable loading ramp. No other method of entry and exit is provided for normal operations.

PREFLIGHT CHECK

Exterior Inspection.

Refer to Figure 3-1.

Before Entering Cockpit

1. Crash axe—SECURED

EXTERIOR INSPECTION

A ✓ FORWARD FUSELAGE AREA

- LEFT ANGLE-OF-ATTACK TRANSDUCER PROBE FREE FROM DIRT
- LEFT NOSE EQUIPMENT BAY DOOR SECURE
- NOSE COOLING RAM AIR INLET CLEAR
- RADOME SECURE AND FREE FROM DAMAGE
- PITOT COVERS (THREE) REMOVED
- RIGHT ANGLE-OF-ATTACK TRANSDUCER PROBE FREE FROM DIRT
- RIGHT NOSE EQUIPMENT DOOR SECURE
- NOSE GEAR DOOR HINGES AND DOOR UPLATCH MECHANISM SECURE
- BRAKE ACCUMULATOR AIR PRESSURE 600-3400 PSI
- NOSE GEAR STEERING HYDRAULIC LINES SWIVEL FREELY FORE AND AFT
- NOSE GEAR POSITION INDICATOR LIMIT SWITCH FREE FROM DIRT
- NOSE GEAR GROUND SAFETY LOCK REMOVED
- TAXI LIGHT CONDITION
- STRUT FOR INFLATION
- TIRE CONDITION, SLIPPAGE MARK AND INFLATION
- TORQUE LINK PIN INSTALLED
- NOSE GEAR HYDRAULIC LINES SECURE

NOTE

WHEN MAKING THE EXTERIOR INSPECTION, CHECK ALL SURFACES FOR CRACKS, DISTORTION, CANTED OR LOOSE RIVETS, AND INDICATIONS OF DAMAGE. CHECK FOR SIGNS OF HYDRAULIC, FUEL, AND OIL LEAKS, PARTICULARLY AT FILLER POINTS.

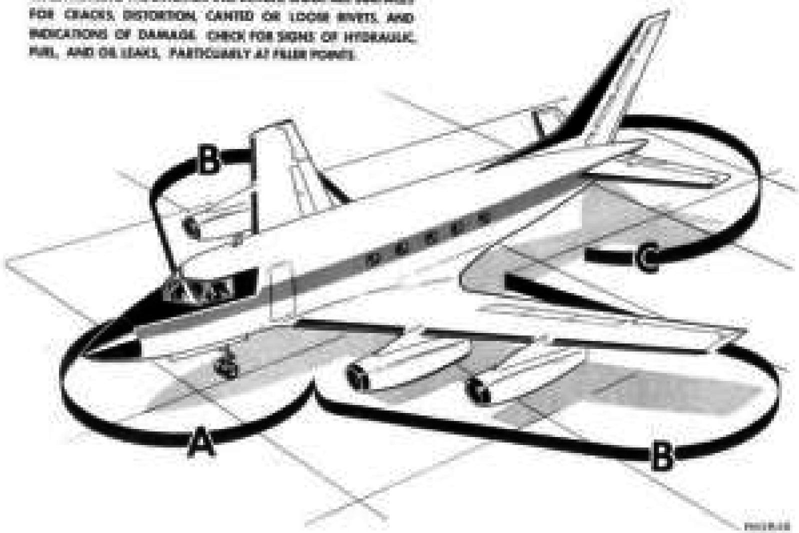


Figure 3-1

SEDR-40

B ✓ CENTER FUSELAGE AND WING AREA

- LANDING LIGHT CONDITION
- MAIN GEAR INBOARD DOOR DOWN, CHECK DOOR HINGE MECHANISM
- MAIN GEAR WELL CONDITION FOR HYDRAULIC LEAKS OR DAMAGE
- HYDRAULIC SYSTEM ACCUMULATOR AIR PRESS 1200 P.S.I.
- GEAR UPLATCH HOOK DOWN
- GEAR POSITION INDICATOR LIMIT SWITCH FREE FROM DIRT
- GROUND SAFETY LOCK REMOVED
- MAIN GEAR STRUT FOR INFLATION
- WHEELS CHOCKED
- TIRE INFLATION, SLIPPAGE MARK AND CHECK CAREFULLY FOR CUTS & BRUISES
- GEAR DOORS SECURE AND FREE FROM DAMAGE
- TAILPIPE FOR DENTS, CRACK OR FUEL ACCUMULATION
- GENERATOR COOLING AIR SCOOP CLEAR
- OIL QUANTITY AND CAP SECURE
- RED FIRE EXTINGUISHER BLOWOUT PLUG INTACT
- ALL ACCESS DOORS SECURED
- BLOWAWAY JET CLEAR
- INTAKE DUCT CLEAR
- INSPECTION OF OUTBOARD ENGINE IS THE SAME AS THE INBOARD ENGINE
- DE-ICER BOOTS FOR CUTS AND GENERAL CONDITION
- POSITION LIGHTS AND WING TIP FREE FROM DAMAGE
- AILERON, TRIM TAB, SPOILER AND FLAPS SECURE AND FREE FROM DAMAGE

C ✓ AFT FUSELAGE AREA

- AIR CONDITIONING AIR OUTLET-CLEAR
- RUDDER AND STABILIZER DE-ICER BOOTS FREE FROM CUTS OR DAMAGE
- RUDDER & STABILIZER CONDITION
- POSITION LIGHTS FREE FROM DAMAGE

2. Tool box—SECURED
3. First aid kit—SECURED
4. All hatches—LOCKED
5. Cabin door—LOCKED

   Check cabin door locked and air pressure gage reads 800-3000 psi.
6. Equipment bay—SECURED
7. Circuit breakers—CHECK
8. Current limiters—CHECKED

   Check that 12 current limiters, 6 on either side of the overhead circuit breaker panel, are intact.
9. Portable oxygen bottle—SECURED
10. Hydraulic reservoir level—CHECKED
11. Pilot's first aid kit—SECURED
12. Fire Extinguisher—SECURED

Interior Inspection

1. Seat and rudder pedals—ADJUSTED
2. Smoke masks—STOWED
3. Aileron and rudder trim—CHECK and SET

   Prior to first flight each day run aileron trim to full travel in both directions and visually check operation of aileron tab. Set rudder and aileron trim at 0°.

CAUTION

Do not operate rudder manual trim knob. Only the electrical trim switch should be used to trim the rudder.

4. Inverter transfer switch—NORMAL
5. Power selector switch—PARKED
6. Battery switch—OFF
7. Master ignition switch—OFF
8. Windshield heat switch—OFF
9. Landing gear emergency "T" handles—IN
10. Emergency flap and gear selectors—NORMAL
11. Oxygen system—ON AND CHECKED

    Refer to Oxygen System, Normal Operation, Section II.
12. Generator switches—OFF
13. Parking brakes—ON

    Build up hydraulic pressure with hand pump if required.
14. Fuel transfer selector switch—NORMAL
15. Flight instrument power switch—ON
16. Static source selector switch—STATIC
17. Landing gear handle—DOWN
18. Pressurization system—SET
    a. Altitude controller—AS DESIRED
    b. Altimeter setting—SET
    c. Rate knob—AS DESIRED
    d. Engine bleed air switch—NORMAL
    e. Cabin manual pressure control knob—FULL CLOCKWISE
19. Cabin pressure dump switch—NORMAL
20. Pitot heat switch—OFF

21. Cockpit temperature switch—AUTO
22. Cockpit temperature selector knob—CLIMATIC
23. De-icer switches—OFF
24. No smoking and seat belt light switches—ON
25. Fuel dump switch—NORMAL
26. Firewall shutoff "T" handles—IN
27. Instrumentation—SET
28. Stabilator power cutout lever—NORMAL
29. Throttles—CLOSE
30. Speed brake switch—OFF
31. Taxi light switch—OFF
32. Landing light switch—OFF
33. Landing light extend switch—RETRACT
34. Flap switch—OFF
35. Communication and navigation radio master switches—OFF
36. Autopilot master switch—OFF
37. Hydraulic power cutoff switches—NORMAL
38. Stabilizer manual trim handle—STOWED
39. Hydraulic pump handle—STOWED

BEFORE STARTING ENGINES

Before starting engines, be sure the wheels are chocked and the danger areas fore and aft are clear of personnel, aircraft and vehicles. See figure 3-2.

WARNING

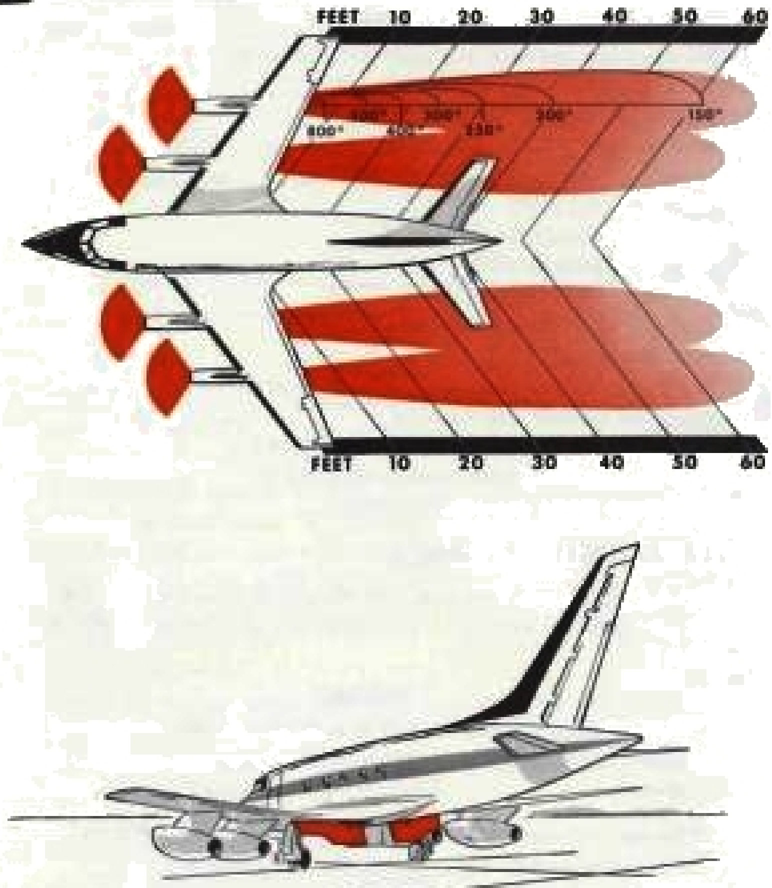
- *Suction at the intake ducts is sufficient to kill or severely injure personnel drawn into or pulled suddenly against the duct.*
- *Danger areas aft of the aircraft are created by high exhaust temperature and velocities. See figure 3-2.*

STARTING ENGINES

NOTE

Any engine may be started first, however, this procedure starts the No. 4 engine first followed by No. 3, No. 2, and No. 1.

DANGER AREAS



WARNING

WHEN HYDRAULIC POWER IS APPLIED, EITHER EXTERNALLY OR BY THE AIRCRAFT'S NORMAL SYSTEM THE FLAPS WILL RETRACT

Figure 3-2

1. Ground power unit—CONNECTED
   a. Check that the ground power unit is connected to the airplane.
   b. Check that the ground power unit is connected to the No. 4 engine.
2. Master ignition switch—ON
3. Battery switch—ON
4. Power selector switch—NORMAL
5. Intercom—CHECK

   Check intercom by contacting ground crew.

NOTE

The flight test observers speaker switch must be in the "headset" position before the pilot can control the ground crew.

6. Get clearance from ground crew that danger areas fore and aft are clear.
7. No. 4 engine start switch—START

   Momentarily actuate No. 4 engine start switch to START, then release.
8. At 8% rpm, move No. 4 throttle to an intermediate position between CLOSE and IDLE. Modulate as necessary to keep exhaust temperature within limits.

NOTE

Start should be indicated by a rise in exhaust temperature within 30 seconds after throttle is moved out of CLOSE. If the engine does not start, move the throttle to CLOSE and actuate stop-start switch.

9. Exhaust temperature gage—CHECK

   Exhaust temperature should not exceed 704° C for more than 5 seconds or 816° C at any time during transition to idle range.
10. After engine rpm reaches 25%, engine start switch—STOP-START
11. After engine has stabilized at idle rpm, check oil pressure within limits (10-30 psi).
12. No. 4 generator switch—RESET AND ON

13. Start remaining engine as indicated in steps 6 through 12.

CAUTION

The starter should not run longer than 30 seconds. Allow a 30-minute cooling period after 2 successive 30-second cycles.

NOTE

After starting No. 3 engine check that hydraulic pressure is 2500-3200 psi and the R. H. Pump Out Warning light goes out. After starting No. 2 engine, check that the L. H. Pump Out Warning light goes out.

BEFORE TAXIING

1. External power and intercom—DISCONNECTED
2. Battery switch—OFF
3. Generator load balance and output—CHECK
   a. No. 1 generator switch—ON, No. 2, No. 3 and No. 4 generator switches—OFF
   b. Voltmeter selector switch—No. 1
   c. Check voltmeter for 27.5 ± .5 volts and No. 1 ammeter for indication that generator is carrying full load.
   d. Check No. 2, No. 3 and No. 4 generators as outlined in steps a thru c. Be sure that only one generator is on at a time.
   e. Turn generator switches ON and check load balance on ammeters.
   f. After completing generator checks, check that generator warning lights on telelight panel are off.
4. Battery switch—ON
5. Windshield heat switch—LOW
6. Inverter transfer—CHECK
   a. Inverter transfer switch—TRANSFER
   b. Extend speed brakes and check hydraulic pressure gage for fluctuations.
   c. Inverter transfer switch—NORMAL
   d. Retract speed brakes and check hydraulic pressure gage for fluctuations.

7. Exterior and interior lights—AS DESIRED
8. Telelight panel—CHECK
9. Stabilizer trim—CHECK AND SET
   a. Run stabilizer trim full nose-down and then full up.
   b. While trimming move stabilizer power and lever to EMERGENCY and check that stabilizer stops trimming.
   c. Stabilizer power lever—NORMAL
   d. Trim stabilizer 6° nose-up for take-off.
10. Communication and navigation radio master switches—ON
11. Autopilot master switch—ON
12. Hydraulic level—CHECK
13. Heading indicator—SET
14. Fuel filter differential pressure switch—SET
15. Flight test master switch—ON
16. Circuit breakers—CHECK

TAXIING

1. Taxi area—CLEAR
2. Chocks—REMOVED
3. Brakes—CHECK
   After initial roll, appy brakes and check operation.
4. Nose gear steering system—CHECK
   Make slight turns using nose gear steering to check operation. Use nose gear steering whenever possible to minimize use of brakes.
5. Hydraulic pressure—CHECK
6. Flight instruments—CHECK
   While taxiing, check the turn-and-slip indicator, heading indicator, and all other flight instruments for proper operation.

BEFORE TAKE-OFF

Engine Check

1. Danger areas fore and aft of engines—CHECK
   Check that the area aft of the aircraft is clear and that the area around the intakes is free from objects that could be drawn into the intake duct.

TURNING RADIUS & GROUND CLEARANCE

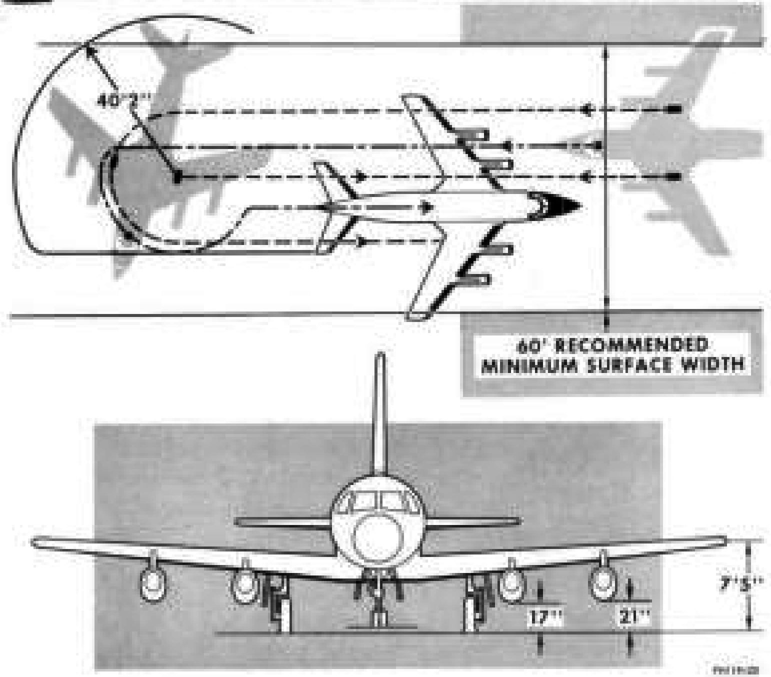


Figure 3-3

2. Rapidly advance No. 2 and No. 3 engines to OPEN
   Acceleration time from idle to Military power should be 7 to 11 seconds.
3. Check that exhaust temperature does not exceed 760° C during acceleration.
4. Check engine rpm within limits (99-101%).
5. Check oil pressure within limits (85-120 psi).
6. Visually check engines for vibration, oil leaks, etc.

7. Rapidly retard throttles to IDLE.
8. Check that engine rpm stabilizes at IDLE and oil pressure is 10-30 psi.
9. Check No. 1 and No. 4 engines as indicated in steps 2 thru 8.

Aircraft Check

1. Windshield heat–HIGH
2. Flight controls–CHECK
   Visually and manually check all flight controls for freedom of movement.
3. Heading indicator–CHECK
4. De-icing equipment–AS REQUIRED
5. Telelights–CHECK
6. Throttle friction–CHECK
7. Speed brakes–CHECK
   Extend and retract speed brakes. Visually check operation and be sure they retract fully. Set speed brakes to 20% if strong cross-wind exists.
8. Flaps–SET FOR TAKE-OFF
9. Autopilot–OFF
10. Yaw damper–OFF
11. Trim–CHECK
    Check that aileron and rudder trim are set at 0° and elevator trim is set at 6° nose-up for take-off.
12. Fuel quantity–CHECK
    Check quantity in each tank and return test selector knob to CTR to monitor center tank. The sum of the quantities of the tanks should equal the amount indicated on the fuel counter.
13. Circuit breakers–CHECK
14. Windows–CLOSED
15. Hydraulic level–CHECK
16. Safety belt, shoulder harness and seat–CHECK
17. Passengers–READY
18. Instrumentation–AS REQUIRED

TAKE-OFF

NOTE

The procedures set forth produce the results shown in the Take-Off Charts, Section VI.

1. Brakes—APPLIED
2. Throttles—80% rpm
3. Instruments and telelights—CHECK
4. Brakes—RELEASED
5. Throttles—OPEN
6. At 120 knots, ease the nose gear off the runway.
7. The airplane will fly off at approximately 130 knots IAS.

NOTE

Nose gear lift-off and take-off speeds must be increased appropriately for heavy gross weight conditions.

AFTER TAKE-OFF—CLIMB

When definitely airborne:

1. Brakes—APPLIED
2. Landing gear handle—UP

   Check gear position indicators show gear up before reaching retract limit speed (185 knots). Check that hydraulic pressure is recovering.
3. Flap switch—UP

   Flaps up before reaching flap limit airspeed (185 knots).
4. Engine instruments and telelight panel—CHECK
5. Hydraulic pressure—CHECK
6. Center tank fuel transfer—CHECK

   Check transfer lights on information light panel and fuel gages to see that fuel is being transferred from the center tank to the outer wing tank.
7. Pressurization—CHECK
8. Instrumentation—AS DESIRED
9. No smoking and seat belt light switches—OFF

10. Generators—CHECK

    Check voltage and amperage of each generator for output and load balance.
11. Windshield heat—OFF

    Turn windshield heat off above 10,000 feet if clear of clouds and no icing is anticipated.
12. Visually check engines for oil leaks, venting, or vibration.

DESCENT

1. Cabin pressurization system—SET
   a. Cabin pressure altitude—AS DESIRED
   b. Cabin pressure rate knob—AS REQUIRED
2. De-icers—AS REQUIRED
3. Windshield heat—SET

   Place windshield heat switch to LOW for 5 minutes and then to HIGH.
4. Altimeters—SET
5. No smoking and seat belt light switches—AS REQUIRED

BEFORE LANDING

1. Generators—CHECK
2. Fuel quantity—CHECK

   Check that both outer wing tanks have the same amount of fuel and that no fuel remains in center wing tank. Crossfeed as necessary to get equal amount of fuel in each outer wing tank.

NOTE

- *Any fuel remaining in the center tank must be dumped before landing if it cannot be transferred to the outer wing tanks.*
- *If necessary dump fuel to reduce weight to the maximum landing gross weight (35,500 lbs.)*

3. Pressurization—CHECK

   The maximum allowable cabin pressure differential for landing is 2 psi.

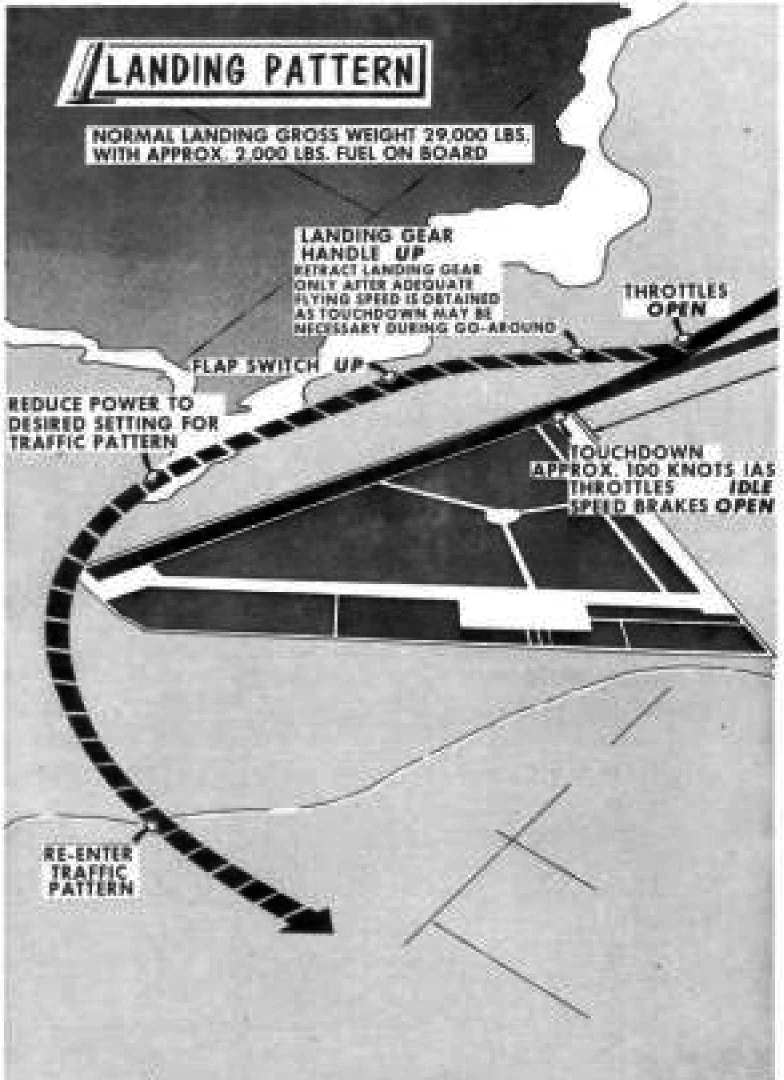
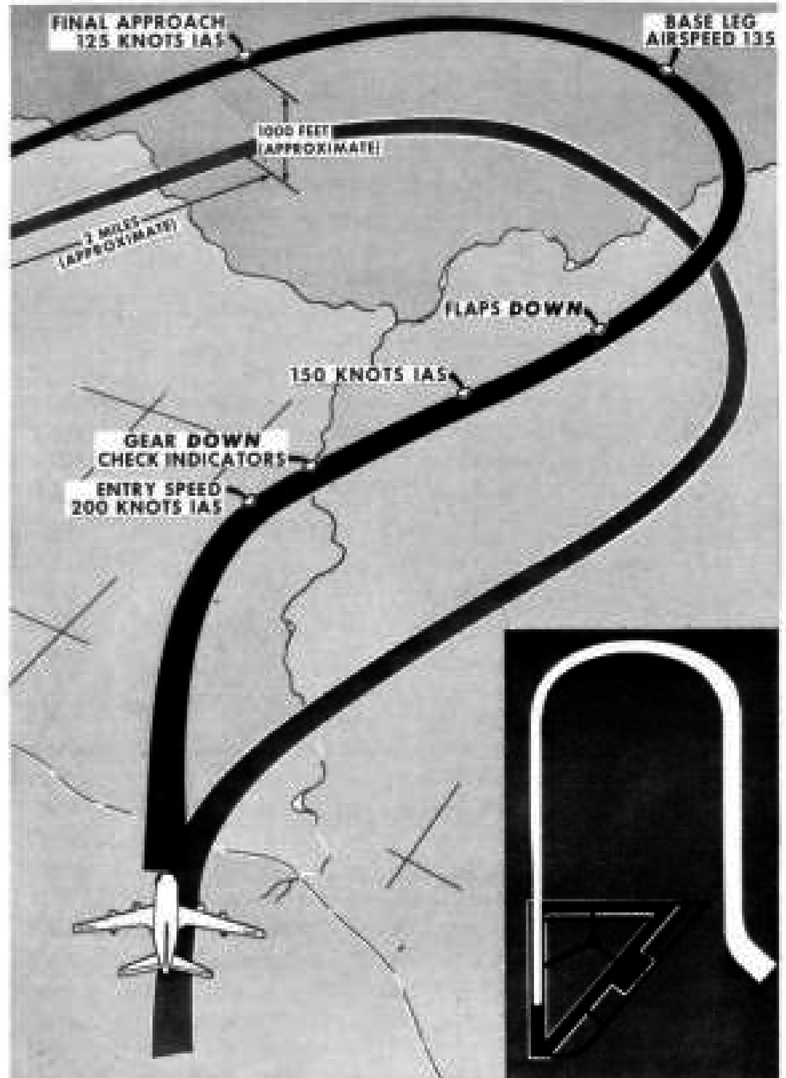

LANDING PATTERN
NORMAL LANDING GROSS WEIGHT 29,000 LBS. WITH APPROX. 2,000 LBS. FUEL ON BOARD
LANDING GEAR HANDLE UP
RETRACT LANDING GEAR ONLY AFTER ADEQUATE FLYING SPEED IS OBTAINED AS TOUCHDOWN MAY BE NECESSARY DURING GO-AROUND
THROTTLES OPEN
FLAP SWITCH UP
REDUCE POWER TO DESIRED SETTING FOR TRAFFIC PATTERN
TOUCHDOWN APPROX. 100 KNOTS IAS THROTTLES IDLE SPEED BRAKES OPEN
RE-ENTER TRAFFIC PATTERN

Figure 3-4


FINAL APPROACH 125 KNOTS IAS
BASE LEG AIRSPEED 135
1000 FEET (APPROXIMATE)
2 MILES (APPROXIMATE)
FLAPS DOWN
150 KNOTS IAS
GEAR DOWN CHECK INDICATORS
ENTRY SPEED 200 KNOTS IAS

4. Circuit breakers—CHECK
5. De-icers—CLIMATIC
6. Fuel dump switch—OFF
7. Autopilot—OFF
8. Shoulder harness—LOCKED
9. No smoking and seat belt light switches—ON

LANDING

NOTE

- *The procedures set forth produce the results shown in the Landing Distance Charts in Section VI.*
- *Approach speed and touchdown speed quoted are for a landing gross weight of 29,000 pounds (approximately 2,000 pounds of fuel remaining). These speeds must be increased approximately 1 knot per 1000 pounds with heavier landing gross weight.*

1. Enter traffic pattern.
2. Landing gear handle—DOWN
3. Adjust power to maintain 150 knots IAS on downwind.
4. Flap switch—DOWN
5. Turn base leg approximately 2 miles from runway and reduce airspeed to 135 knots IAS.
6. Turn final at 1000 feet altitude and reduce speed to 125 knots IAS.
7. Extend speed brakes to 20%.
8. Touchdown will be at approximately 100 knots IAS.
9. Throttles—IDLE
10. Speed brakes—AS DESIRED

    Extend speeds for slight additional drag or to decrease lift.
11. Lower nose gear to runway at approximately 85 knots IAS.
12. Employ normal braking technique.
13. Nose gear steering—ENGAGED

GO-AROUND

The decision to go-around should be made as early as possible. See figure 3-4. If decision is made to go-around:

1. Throttles—OPEN
2. Landing gear handle—UP

    Retract landing gear only after adequate flying speed is obtained as touchdown may be necessary during go-around.
3. Flap switch—UP
4. Reduce power to desired setting for traffic pattern.
5. Re-enter traffic pattern.

AFTER LANDING

After completing the landing roll, turn off the active runway and perform the following:

1. Windshield heat—OFF
2. De-icing equipment—OFF
3. Flaps—UP, then OFF
4. Speed brakes—IN, then OFF
5. Trim—RESET FOR TAKE-OFF
6. Test telelights and fire warning lights

NOTE

The No. 1 and No. 4 engines may be shut down for taxiing. Refer to Engine Shutdown, this section.

ENGINE SHUTDOWN

1. Brakes—SET
2. Throttles—60%
3. After rpm and exhaust temperature have stabilized, throttles—CLOSE
4. Generators—OFF
5. Communication and navigation radio master switches—OFF
6. Autopilot master switch—OFF
7. Windshield wipers—OFF
8. Exterior and interior lights—OFF
9. Master ignition switch—OFF
10. Battery switch—OFF
11. Power selector switch—PARKED
12. Wheels—CHOCKED
13. Controls—LOCKED

BRIEFING NOTES

EMERGENCY OPERATING PROCEDURES

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ENGINE FAILURE

Engine Failure During Take-Off

BEFORE REACHING V_1

If an engine fails before reaching V_1 (minimum speed at which the airplane can be controlled with one outboard engine inoperative) observe the following:

1. Throttles—IDLE
2. Speed brakes switch—OUT
3. Brakes—APPLIED
4. Nose wheel steering—ENGAGED
5. No. 1 and No. 4 throttles—CLOSE

If unable to stop on remaining runway:

6. No. 2 and No. 3 throttles—CLOSE

7. Battery switch—OFF
8. Power selector switch—PARKED

AFTER REACHING V_1

As soon as definitely airborne, complete the following:

1. Landing gear handle—UP
2. Attempt no unnecessary turns or climb until safe airspeed is attained.
3. Flap switch—UP
   Retract flaps as soon as a safe airspeed is attained.
4. Failed engine—SHUTDOWN
   a. Throttle—CLOSE
   b. Generator switch—OFF
5. Firewall shutoff "T" handle—PULL

During Flight

1. Positively determine which engine has failed.
2. Throttle—CLOSE
3. Attempt to determine cause of engine failure.

If failure can be attributed to other than mechanical failure, an air start may be attempted. If mechanical failure was the cause of engine failure:

4. Generator switch—OFF
5. Firewall shutoff "T" handle—PULL

Double Engine Failure

In the event that two engines fail, the electrical load must be reduced and, if both failed engines are on the same side, the cross feed must be used to maintain an equal amount of fuel in the outboard wing tanks.

1. Throttles on failed engines—CLOSE
2. Generators on failed engines—OFF
3. Flight test inverter circuit breaker—PULL
4. Windshield heat—OFF

NOTE

If pilot requires windshield anti-icing, pull the R/H windshield power control circuit breaker and turn windshield heat on.

5. Firewall shutoff "T" handle—PULL

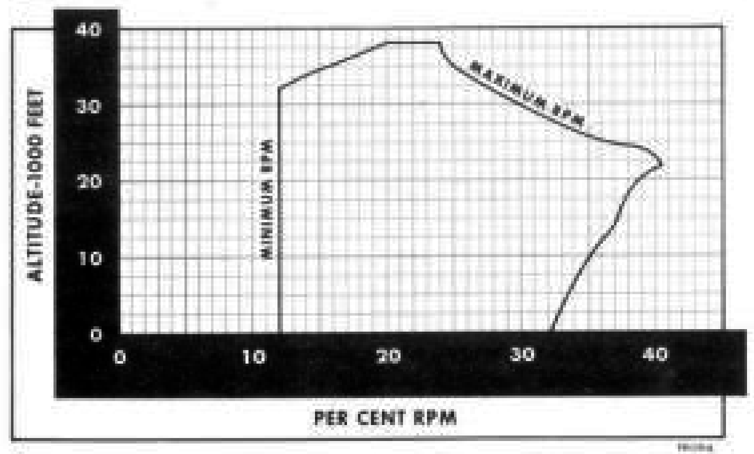
Air Start

NOTE

A flame-out is indicated by a sharp decrease in exhaust temperature and a gradual decrease in engine rpm.

1. Throttle on failed engine—CLOSE
2. Firewall shutoff "T" handle—IN
3. Check power selector switch—NORMAL
4. Check master ignition switch—ON
5. Check engine rpm in proper range for air start.

ENGINE RPM FOR AIRSTART



6. Advance throttle on affected engine to an intermediate position between CLOSE and IDLE and modulate to keep exhaust temperature within limits.
7. Exhaust temperature gage—CHECK

NOTE

The exhaust temperature should be continuously monitored during air starts. It may be necessary to retard the throttle from the IDLE position to prevent the exhaust temperature from exceeding limits.

8. Successful air start is indicated by an increase in engine rpm and exhaust temperature.
9. If engine does not start:
   a. Throttle—CLOSE
   b. Allow engine to windmill one minute to clear excess fuel.
   c. Air start ignition button—DEPRESS
   d. Repeat steps 5 thru 8.
10. Oil pressure—CHECK
11. At 40% rpm or above, generator switch—RESET AND ON

Landing with One Engine Inoperative

Landing with one engine inoperative is basically the same as a normal landing except that the pattern is expanded to avoid steep turns and the final approach speeds are slightly increased to allow for slower acceleration. Make all turns away from bad engine if it is convenient to do so.

NOTE

Do not completely trim out all rudder forces for landing. If all rudder forces are trimmed out, the airplane will tend to turn into the good engines when power is reduced for touchdown.

FIRE

Engine Fire During Starting

If the fire warning lights illuminate or there is evidence of fire during starting:

1. Throttle(s)—CLOSE
2. Generator switch(es)—OFF
3. Advise tower to alert fire trucks.
4. Master ignition switch—OFF
5. Allow engine to continue cranking for 30 seconds.
6. Engine start switch—STOP-START
7. Firewall shutoff "T" handle—PULL
8. Use fire extinguishers as necessary.

Engine Fire During Take-Off

If a fire warning light illuminates during take-off roll, it is preferable to abort immediately below V_1 speed.

1. Throttles on outboard engines and engine indicating fire—CLOSE
2. Speed brakes—OUT
3. Brakes—APPLIED
4. Nose gear steering—ENGAGED
5. Generator switches on shutdown engines—OFF
6. Firewall shutoff "T" handle—PULL
7. Make visual inspection of engine indicating fire.
8. If fire is detected, discharge fire extinguishers as necessary.

Engine Fire After Take-Off

NOTE

The following procedures are applicable only to the phase immediately after take-off. If these procedures do not eliminate the emergency, refer to Engine Fire During Flight.

1. Throttle (engine indicating fire)—IDLE
2. Landing gear handle—UP
3. Attempt no unnecessary turns or climb until safe airspeed is attained.
4. Flap switch—UP

   Retract wing flaps after safe airspeed is attained.
5. Make visual inspection on engine indicating fire.

6. If light continues flashing or there is visual indication of fire, shut down affected engine:
   a. Throttle—CLOSE
   b. Generator switch—OFF
   c. Firewall shutoff "T" handle—PULL
   d. Use fire extinguishers as necessary.

Engine Fire During Flight

1. Throttle (engine indicating fire)—IDLE
2. Visually check engine from cockpit and cabin for indications of fire.
3. Check all instruments, telelights and circut breakers.
4. If fire warning light goes out, continue flight at reduced power and land as soon as possible.
5. If fire warning light does not go out, throttle—CLOSE
6. Generator switch—OFF
7. Firewall shutoff "T" handle—PULL
8. Visually check engine.
9. If fire warning light is still on or there is visual indication of fire, discharge No. 1 extinguisher bottle.
10. If visual indication of fire remains, discharge No. 2 extinguisher bottle.

Engine Fire After Shutdown

1. External electrical power—CONNECTED
2. Throttle—CLOSE
3. Power selector switch—NORMAL
4. Master ignition switch—OFF
5. Engine start switch—START
6. Allow engine to crank approximately 30 seconds.
7. Engine start switch—STOP-START
8. Firewall shutoff "T" handle—PULL
9. Use fire extinguishers as required.

Electrical Fire

1. If below 35,000 feet and fire is severe, power selector switch—PARKED.

NOTE

With the power selector switch in PARKED, all electrical circuits including booster pumps and radios are dead. The engines should not flame-out below 35,000 with boost pumps off. (Air valves will close and pressurization will be lost.)

2. All generators—OFF
3. If fire continues, battery switch—OFF
4. All unnecessary electrical equipment—OFF
5. Check circuit breakers and reset as required.
6. Power selector switch—NORMAL
7. Stand by with fire extinguisher in critical area.
8. If throuble circuit can be determined, turn the equipment off and pull the applicable circuit breaker.
9. Battery switch—ON
10. Generator switches—ON
11. If cause of fire cannot be found, continue flight with only essential equipment operating and land as soon as possible.

NOTE

If smoke in cockpit becomes excessive, refer to Elimination of Smoke and Fumes.

ELIMINATION OF SMOKE AND FUMES

If smoke or fumes are excessive:

1. Oxygen regulator diluter lever—100% OXYGEN
2. Pilots put on smoke mask and connect oxygen hoses.
3. Cabin pressure dump switch—DUMP

NOTE

- *When the dump valve is actuated, considerable physical strains are experienced. Therefore, if conditions permit, follow procedures for minor smoke or fumes.*
- *When the dump valve switch is actuated, the cabin dump valve is opened, the hot air shutoff and bypass valves are closed and the ram air valve is opened. To get maximum*

airflow through the cockpit, depressurize manually or S/O valve, bypass valve and ram air valve circuit breakers before actuating dump switch. This procedure dumps pressure without cutting off airflow.

If smoke and fumes are minor:

1. Oxygen regulator diluter lever—100% OXYGEN
2. Pilots put on smoke mask and connect oxygen hoses.
3. Bleed air switch—OFF

   Placing the bleed air switch to OFF closes the hot air valves and opens the ram air valve to purge the cockpit. The airplane will depressurize slowly because of a check valve in the ram air line.

If smoke and fumes are coming from the air conditioning and pressurization system perform the following if time and conditions permit:

4. Oxygen diluter switch—NORMAL
5. Bleed air switch—NORMAL
6. Dump valve switch—NORMAL
7. Pull No. 1 and No. 4 firewall bleed air shutoff valve circuit breakers and increase power on No. 2 and No. 3 engines.
8. If smoke and fumes do not stop, reset No. 1 and No. 4 circuit breakers and pull No. 2 and No. 3 circuit breakers.
9. By elimination determine which engine is responsible for the smoke or fumes.
10. Reset all circuit breakers except the one on the engine responsible for the smoke and fumes.

NOTE

The windows may be opened below 200 knots, if necessary.

BAILOUT

In the event that bailout becomes necessary:

1. Alert passengers.
2. Slow airplane to 150-185 knots IAS.
3. Flap switch—DOWN

4. Engage autopilot and set for level flight.
5. Depressurize cabin manually or with cabin pressure dump switch as time permits.
6. Remove emergency escape hatches.
7. Notify passengers to bail out.

NOTE

To bail out, dive head first out of the emergency escape hatch. Refer to figure 4-1 for escape routes.

8. After passengers have bailed out, crew bail out.

LANDING EMERGENCIES

Forced Landings

WARNING

ALL forced landings shall be made with the gear extended regardless of terrain.

If a gear up landing is unavoidable, proceed with the following:

1. If time and conditions permit, burn off or dump excess fuel.
2. Shoulder harness inertia reel handle—LOCKED
3. Make normal approach.
4. Touchdown in normal landing attitude.
5. Throttles—CLOSE
6. Power selector switch—PARKED
7. Master ignition switch—OFF
8. Battery switch—OFF
9. Generator switches—OFF
10. Leave airplane as soon as possible.

Landing Gear Unsafe Indication

1. Check hydraulic pressure.
2. Check airspeed below 185 knots.
3. Recycle gear.
4. Attempt to lower gear by Emergency Gear Lowering Procedure.

EMERGENCY EXITS & ENTRANCES

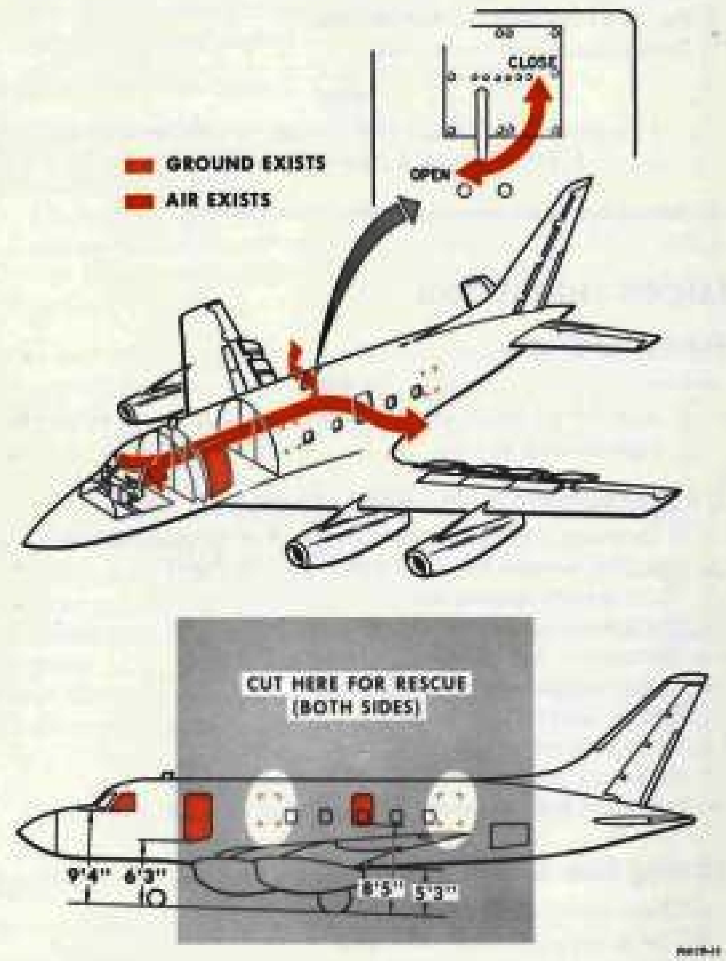


Figure 4-1

If gear still indicates unsafe:

5. Make fly-by gear check or have another aircraft make a visual check.
6. If gear appears safe, make a normal landing and observe the following precautions:
   a. Shoulder harness inertia reel handle—LOCKED
   b. Land on side of runway opposite indicated unsafe gear. Land on center of runway for unsafe nose gear.
   c. No. 2 and No. 3 throttles IDLE at touchdown; No. 1 and No. 4 throttles—CLOSE
   d. With main gear unsafe indication, lower nose gear to runway immediately upon touchdown.
   e. With nose gear unsafe indication, hold nose gear "off" until approximately 85 knots and then lower gently to runway.

NOTE

- *The elevator begins losing control effectiveness at approximately 85 knots.*
- *Allow aircraft to roll straight ahead and do not taxi after completing landing roll until maintenance personnel have installed the ground safety locks.*

Landing with One Main Gear Up or Unlocked

In the event one main gear remains up or in an intermediate position and all procedures to extend have failed, proceed as follows:

NOTE

If time and conditions permit, lighten the aircraft by burning out or dumping excess fuel.

1. Shoulder harness inertia reel handle—LOCKED
2. Make normal final approach.
3. Make normal touchdown on side of runway opposite failed gear.
4. Immediately after touchdown, throttles—CLOSE
5. Ease nose gear to runway.
6. Hold unsafe gear "off" as long as possible.

7. If right gear is up or unlocked, use nose gear steering for directional control.

NOTE

If left gear is unsafe, nose gear steering may not be available because the nose gear steering cutout microswitch is located on the left main gear.

8. All electrical switches—OFF
9. Abandon aircraft as soon as possible.

Landing with Nose Gear Up or Unlocked

In the event both main gear remain up or in an intermediate position and all procedures to extend have failed, proceed as follows:

NOTE

If time and conditions permit, lighten the aircraft by burning out or dumping excess fuel.

1. Shoulder harness inertia reel handle—LOCKED
2. Make normal final approach.
3. Make normal touchdown in center of runway.
4. Immediately after touchdown, throttles—CLOSE
5. At 85 knots, gently ease nose to runway.

NOTE

The elevator begins to lose control effectiveness rapidly at approximately 85 knots.

6. All electrical switches—OFF
7. Abandon aircraft as soon as possible.

Landing with Both Main Gear Up or Unlocked

In the event both main gear remain up or in an intermediate position and all procedures to extend have failed, proceed as follows:

NOTE

If time and conditions permit, lighten the aircraft by burning out or dumping excess fuel.

1. Shoulder harness inertia reel handle—LOCKED
2. Make normal final approach.
3. Hold normal attitude for touchdown.
4. Immediately after touchdown, throttles—CLOSE
5. All electrical switches—OFF
6. Abandon aircraft as soon as possible.

Blown Tire

1. Make normal final approach.
2. Land on side of runway opposite blown tire.
3. Make normal touchdown.
4. Use nose gear steering for directional control.
5. Use light opposite braking to slow aircraft.

CAUTION

If possible do not shut down inboard engines until adequate fire fighting equipment is available. The damaged wheel may be either very hot or on fire and fuel drained overboard after engine shutdown could contact the hot wheel causing fire.

No Flaps Landing

A no flaps landing is basically the same as a normal landing except that the pattern is expanded to avoid steep turns and the final approach speeds are increased 15 knots to preclude high sink rates.

OIL SYSTEM FAILURE

An oil system failure is recognized by a drop in oil pressure or a complete loss of oil pressure. If an oil pressure of 10 psi cannot be maintained, shut down affected engine and land as soon as practical.

FUEL SYSTEM FAILURE

Booster Pump Failure

If fuel booster pumps fail, fuel will be supplied to the engine by gravity feed. If booster pumps fail above 35,000 feet, flame-out of the affected engines may occur. Booster pump failure is indicated by illumination of the booster pump warning light when pressure drops below 6 psi. Upon illumination of a booster pump warning light, perform the following:

1. If above 35,000 feet, reduce power on affected engine.
2. Check circuit breaker for affected pump.
3. If engine flames out:
   a. If above 35,000 feet, descend to a lower altitude.
   b. Perform normal air start.
   c. Operate affected engine at reduced power setting.

Transfer Pump Failure

The failure of one transfer pump will be indicated by the slow transfer of center wing tank fuel to the outer wing tanks. If transfer pump failure is detected:

1. Use crossfeed system to transfer fuel from the outer wing tank receiving fuel to the other outer wing tank.
2. Monitor all three tanks and stop crossfeed when center tank is empty.

In the event that both transfer pumps become inoperative, it is impossible to transfer center wing tank fuel to the outer wing tanks. Therefore, the center wing tank fuel must be dumped before landing. Refer to Emergency Fuel Dumping, this section.

Emergency Fuel Dumping

If it becomes necessary to dump fuel in flight, proceed as follows:

1. Fuel dump switch—DUMP

NOTE

Transfer pumps will be stopped if they are operating when the fuel dump switch is actuated.

2. Monitor all three tanks while dumping.
3. Check that each wing tank stops dumping when fuel level in that tank reaches approximately 3100 pounds (500 gallons).

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ELECTRICAL SYSTEM EMERGENCY OPERATION

Generator Overheat

In the event a generator overheat warning light illuminates, perform the following:

1. Check voltage and amperage of overheated generator.
2. Generator switch—OFF
3. If generator overheat warning light does not go out, reduce power on that engine and follow steps 4 and 5 for Single Generator Failure.

Single Generator Failure

Failure of one generator will be indicated by illumination of a generator out light on the telelight warning panel. The remaining generators are sufficient to support the entire electrical load. In the event of generator failure, perform the following:

1. Generator circuit breaker—CHECK
2. Generator switch to RESET and then ON.
3. If the generator is still off the line, generator switch—OFF
4. Turn off windshield heat (unless de-icing is necessary) and all other unnecessary electrical equipment.
5. Check remaining generators to see that none are carrying a 300 amp load and that the existing load is evenly divided among the remaining generators.

Double Generator Failure

If two generators fail, perform the following:

1. Windshield heat—OFF

NOTE

If pilot requires windshield anti-icing, pull the R/H windshield power control circuit breaker and turn windshield heat on.

2. Attempt to reset generators.
3. If neither generator can be reset, turn off all unnecessary electrical equipment and reduce electrical load as much as possible.
4. If a flight test inverter is installed, it should be cut out, if feasible, by pulling the inverter circuit breaker on the flight test circuit breaker panel.

Inverter Failure

The loss of an inverter is indicated by illumination of an Inverter Out or Windshield Cold warning light on the telelight panel. In the event of an inverter failure, perform the following:

1. Inverter circuit breakers—CHECK
2. If main inverter is out:
   a. Windshield heat switch—LOW
   b. Inverter transfer switch—TRANS
   Placing the inverter transfer switch to TRANS position transfers the copilot's windshield inverter to the main d-c bus.
   c. Pull L/H windshield power control circuit breakers if heat is not needed for anti-icing on the pilot's windshield.

HYDRAULIC SYSTEM EMERGENCY OPERATION

Single Hydraulic Pump Failure

Failure of either hydraulic pump is indicated by illumination of a warning light on the telelight panel. Either pump is capable of supplying sufficient pressure for operation of all systems. If a hydraulic pressure low warning light illuminates, check the hydraulic pressure gage. If the hydraulic pressure is normal, only the indicated pump has failed.

Double Hydraulic Pump Failure

In the event both hydraulic pumps are lost, no hydraulic pressure is available and the spoilers, elevator power, windshield wipers, and nose gear steering are lost. The landing gear, flaps and brakes have emergency methods of operation. Refer to Landing Gear System Emergency Operation, Flap System Emergency Operation and Brake System Emergency Operation.

LANDING GEAR SYSTEM EMERGENCY OPERATION

If normal gear operation fails, the gear can be lowered by using the following procedures:

1. Landing gear circuit breaker—CHECK IN
2. Hydraulic pressure gage—CHECK
3. Hydraulic reservoir level—CHECK

4. If hydraulic pressure is up (3000 psi):
   a. Landing gear handle—DOWN
   b. Landing gear control circuit breaker—PULL
   c. Landing gear valve "T" handle—PULL AND LOCK
   Pull the "T" handle marked Landing Gear Valve and lock in the extended position with thumb type lock.
   d. If gear is not down, perform the steps 5d and 5e.
5. If hydraulic pressure is low:
   a. Landing gear handle—DOWN
   b. Landing gear circuit breaker—PULL
   c. Landing gear valve "T" handle—PULL AND LOCK
   Pull the "T" handle marked Landing Gear Valve and lock in the extended position.
   d. Three emergency uplock release "T" handles—PULL
   e. If gear does not lock after free fall, slight yawing or slipping may lock gear. Main gear can be visually checked from cabin windows.

If gear is still not down and locked:

6. Emergency landing gear valve selector—DOWN
7. Operate hand pump to release uplatches, lower, and lock gear.

NOTE

Approximately 200 cycles are required to release, extend, and lock landing gear, if it does not free fall. Only 6 to 8 cycles are required if it free falls normally.

8. Return emergency landing gear valve selector to normal position so that hand pump can be used for brakes after landing if necessary.

CAUTION

If the emergency landing gear valve selector is not returned to the normal position, the hand pump cannot be used for emergency braking.

FLAP SYSTEM EMERGENCY OPERATION

If normal flap operation fails, the flaps can be lowered by using the following procedure:

1. Flap control circuit breaker—CHECK IN

2. Flap position indicator circuit breaker—CHECK IN
3. Hydraulic pressure gage—CHECK

   If hydraulic pressure is normal (3000 psi), either the selector valve or electrical controls have probably malfunctioned.
4. Hydraulic reservoir level—CHECK
5. Reduce airspeed below 180 knots.
6. Flap switch—DOWN
7. Flap control circuit breaker—PULL
8. After gear is down and locked, emergency flap valve selector—DOWN
9. Use hand pump to extend flaps to desired setting.
10. Return emergency flap valve selector to normal so that hand pump can be used for braking after landing if necessary.

CAUTION

If the emergency flap valve selector is not returned to the normal position, hand pump cannot be used for emergency braking.

NOTE

- *Flap position indication is taken from left flowler flap.*
- *Flaps cannot be retracted with the emergency system.*

BRAKE SYSTEM EMERGENCY OPERATION

In the event of hydraulic system failure, brake hydraulic pressure is supplied by a brake accumulator. The brakes operate in the normal manner but are limited to 10 full applications. Additional applications of the brake can be obtained by recharging the brake accumulator with the hand pump. Recharge the brake accumulator as follows:

1. Emergency landing gear valve selector—NORMAL
2. Emergency flap valve selector—NORMAL
3. Actuate hydraulic hand pump.

NOTE

With the emergency landing gear and flap valve selectors in NORMAL, all hand pump pressure goes directly to the brake accumulator. This pressure will not register on the pressure gage.

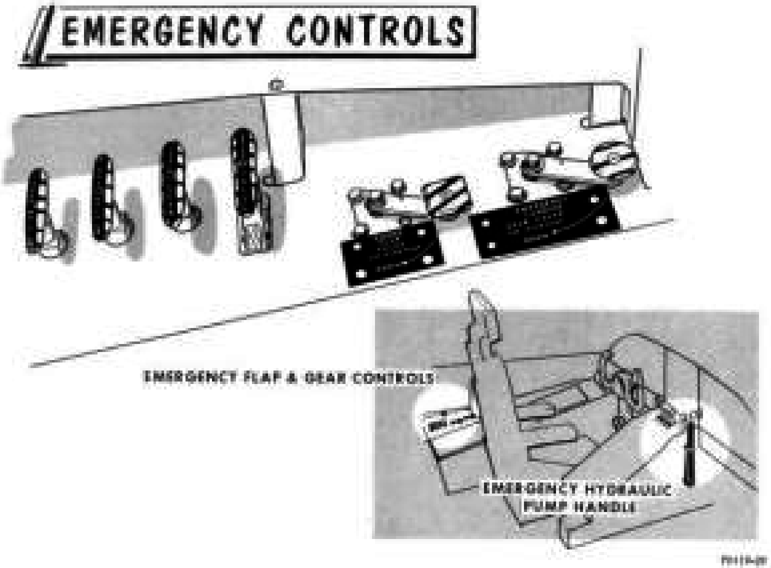

Figure 4-2

BRIEFING NOTES

BRIEFING NOTES

OPERATING LIMITATIONS

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INSTRUMENT MARKINGS

Instrument markings giving various operating limitations are shown in figure 5-1. Some markings are self-evident and are not discussed in the text.

ENGINE LIMITATIONS

Engine Speed

The time limit for military power (99%-101% rpm) is 30 minutes. A cooling period of at least 10 minutes must be allowed between successive runs at military power. There is no time limit when operation at normal power (94.4%) or less. When an engine is shut down in flight, continuous windmilling below 40% rpm should be avoided if possible.

Engine Temperature

Each engine is trimmed individually to produce it's rated thrust. This trimming results in a different maximum exhaust temperature for each engine when operating at military power. Therefore, exhaust temperature limits for military power are not given here. Whenever the engines are changed or retrimmed, the exhaust temperature gage for that engine should be marked with the proper maximum allowable exhaust temperature. The maximum allowable exhaust temperature also varies with the ambient air temperature. The correction factor from the Exhaust Temperature Correction Chart (figure 5-3) should be subtracted from the maximum allowable exhaust temperature shown by the exhaust temperature gage. All other Engine temperature limits are shown in the Engine Operating Limits Chart (figure 5-2).

INSTRUMENT RANGE MARKINGS

TACHOMETER

33%	(red)	MINIMUM
33%-94.4%	(green)	CONTINUOUS
94.4%	(red)	MAXIMUM CONTINOUS (NORMAL RATED POWER)
94.4%-101%	(yellow)	30 MINUTE LIMIT
101%	(red)	MAXIMUM

OIL PRESSURE

10 PSI	(red)	MINIMUM
10-135 PSI	(green)	NORMAL
135 PSI	(red)	MAXIMUM

EXHAUST TEMPERATURE

300°C-*	(green)	CONTINUOUS
*	(red)	MAXIMUM IN MILITARY POWER
*-816°C	(yellow)	ACCELERATION AND STARTING
760°C	(red)	MAXIMUM DURING ACCELERATION
816°C	(red)	MAXIMUM DURING STARTING (5 SECOND LIMIT)
704°		MAXIMUM DURING REMAINDER OF START

* TEMPERATURES MUST BE CORRECTED WITH EACH ENGINE CHANGE. REFER TO ENGINE TEMPERATURES, THIS SECTION.

Figure 5-1

MACH

.83 M	(red)	MAXIMUM

AIRSPEED

103-185 KNOTS —— FLAP OPERATING SPEED

HYDRAULIC PRESSURE

2000-2700 PSI	(yellow)	NORMAL WITH HYDRAULIC CONTROL ACTUATION
		SHOWS MALFUNCTION WITH CONTROLS STATIC
2700-3400 PSI	(green)	NORMAL
3400 PSI	(red)	MAXIMUM

ENGINE OPERATING LIMITS

OPERATING CONDITIONS	MAXIMUM EXHAUST TEMPERATURE	TIME LIMIT
MILITARY	REFER TO EXHAUST TEMPERATURE, THIS SECTION	30 MINUTES
NORMAL RATED		CONTINUOUS
IDLE		CONTINUOUS
STARTING	816°	5 SECONDS
	704°	MOMENTARY
ACCELERATION	760°	MOMENTARY

Figure 5-2

AIRSPEED LIMITATIONS

The maximum allowable airspeeds are as follows:

With gear and flaps retracted	As shown in Maximum Speed Restrictions, figure 5-4.
With flaps extended	185 knots IAS
Gear retraction	185 knots IAS
Gear and speed brake extension	As shown in Maximum Speed Restrictions, figure 5-4.
With pilot's window open	200 knots IAS

PROHIBITED MANEUVERS

The airplane is restricted from the following maneuvers:

1. All acrobatics.
2. Any maneuver resulting in abrupt acceleration.
3. Rolls in excess of 80° per second.
4. Elevator deflections in excess of 10° per second.
5. Landing at sink rates above 7 feet per second.

EXHAUST TEMPERATURE CORRECTION

TEMPERATURE °C	TEMPERATURE °F	CORRECTION FACTOR (TO BE SUBTRACTED)
-18	0	82
-12	10	72
-7	20	64
-1	30	55
4	40	47
10	50	40
16	60	32
21	70	26
27	80	17
32	90	8
38	100	0

Figure 5-3

MAXIMUM SPEED RESTRICTIONS

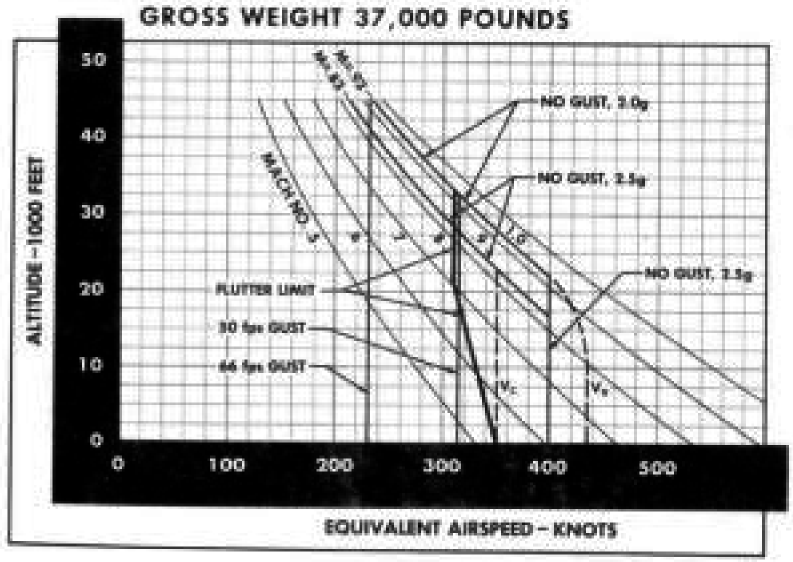

Figure 5-4

ACCELERATION LIMITATIONS

The maximum permissible acceleration for flight in smooth air at gross weights 37,000 pounds or less are shown in the Operating Flight Limits Chart, figure 5-5.

OPERATING FLIGHT LIMITS

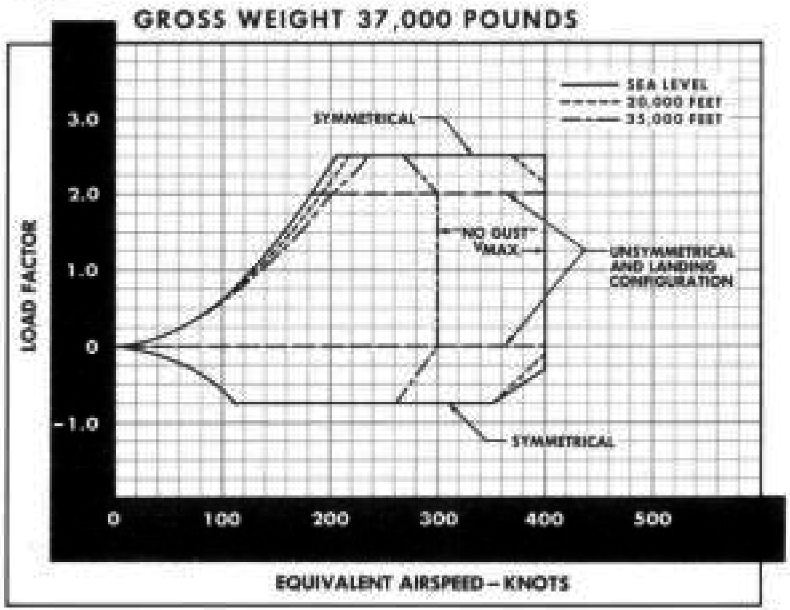

Figure 5-5

CENTER OF GRAVITY LIMITATIONS

The most forward c.g. limit for normal flight is 19% MAC. The most aft c.g. limit for flight is 33% MAC. For additional information, refer to McDonnell Memo 41-23, "Strength Placards for the Model 119A Prototype Airplane."

WEIGHT LIMITATIONS

The maximum allowable take-off gross weight is 42,620 pounds. The maximum landing gross weight is 35,500 pounds. For additional information refer to McDonnell Memo 41-23, "Strength Placards for the Model 119A Prototype Airplane."

BRIEFING NOTES

BRIEFING NOTES

PERFORMANCE DATA

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AIRSPEED POSITION ERROR CORRECTION

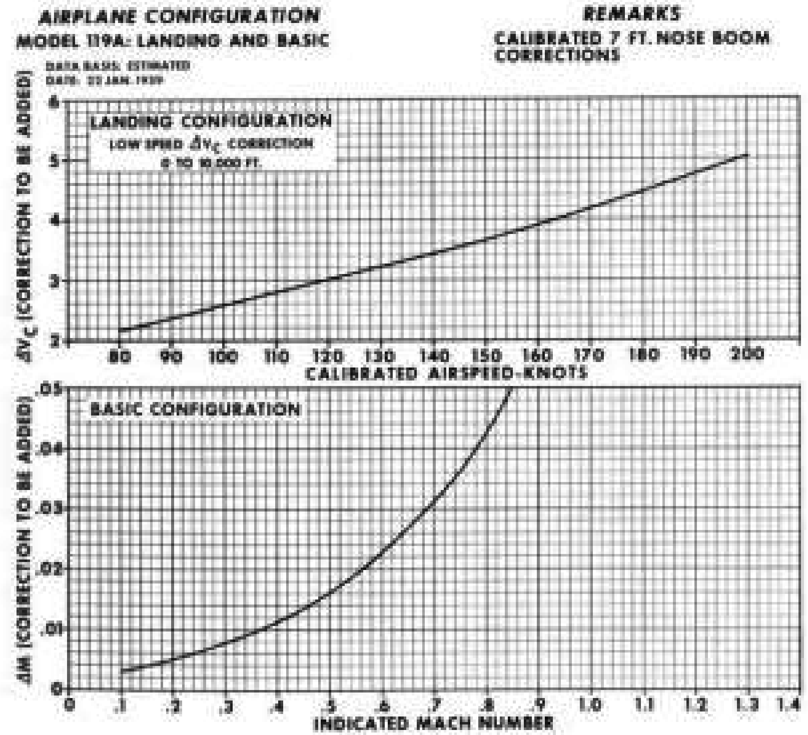


Figure 6-1

TAKE-OFF DATA CHART

AIRPLANE CONFIGRATION

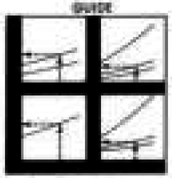
MODEL 119A: TAKE-OFF

% FLAPS { FOWLER FLAP-SF=26.25 DEG. / SPLIT FLAP-SF=45.00 DEG.

REMARKS

(4) J34-WE-34 ENGINES

SEA LEVEL STANDARD DAY



DATA BASIS: ESTIMATED
DATE: 22 JAN 1959

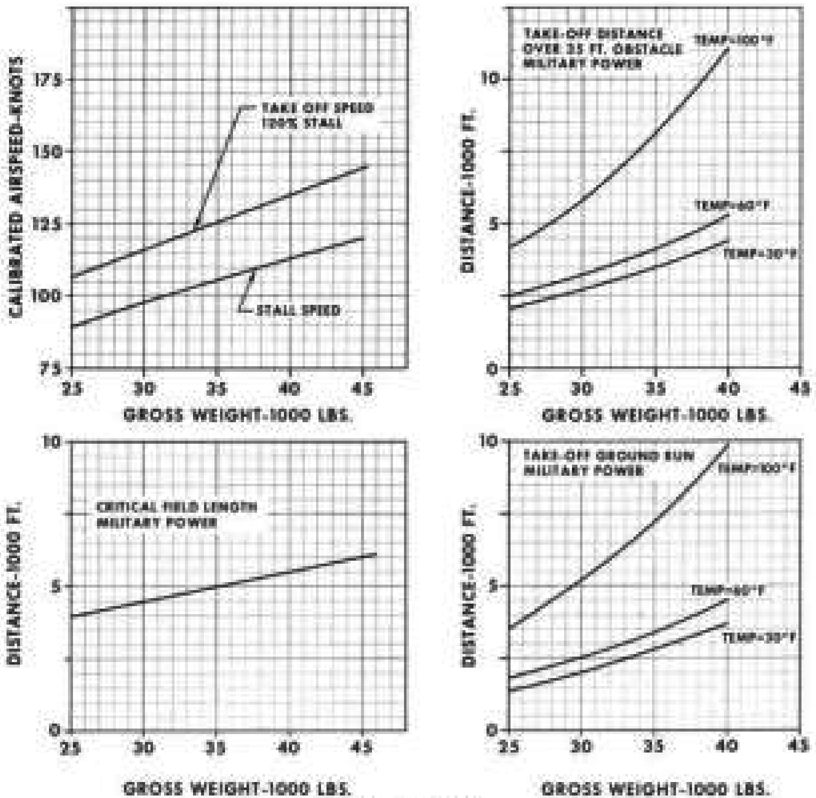


Figure 6-2

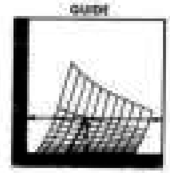
MILITARY POWER CLIMB

AIRPLANE CONFIGURATION

MODEL 119A; BASIC

REMARKS

(4) J34-WE-34 ENGINES



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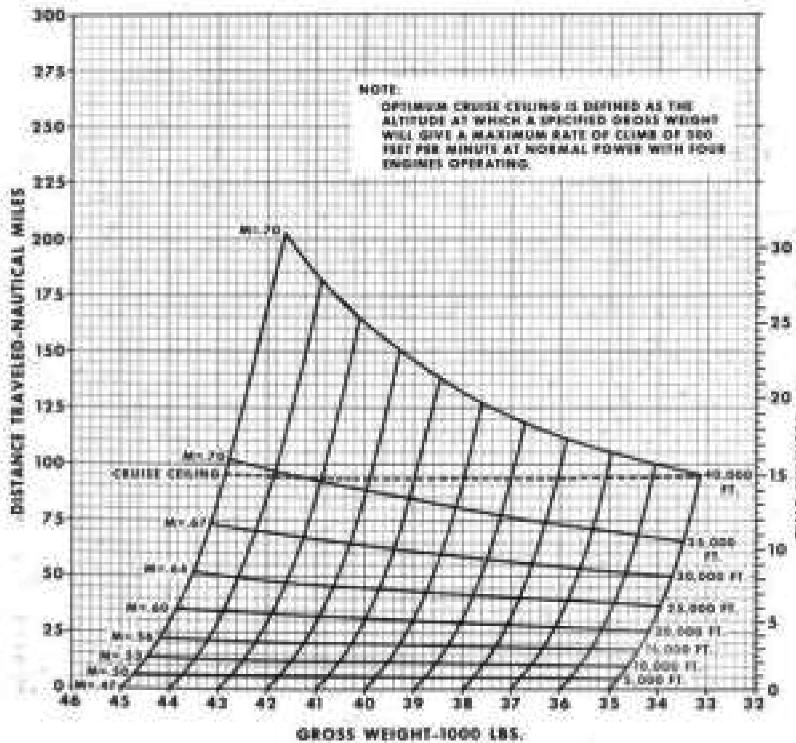
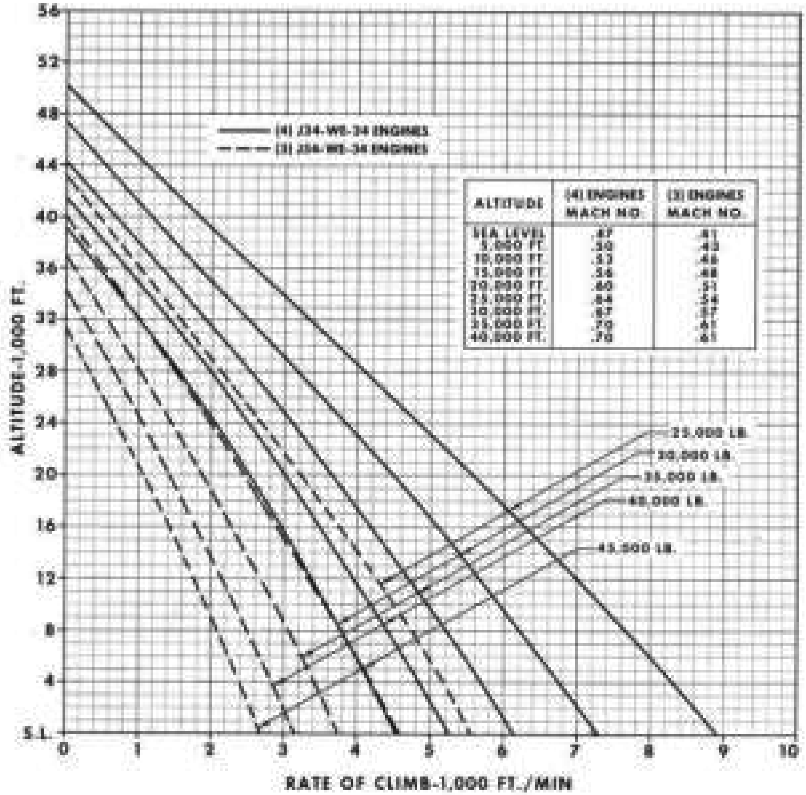


Figure 6-3

BEST CLIMB RATE
MILITARY POWER

AIRPLANE CONFIGURATION
MODEL 119A: BASIC

DATA BASIS: ESTIMATED
DATE: 22 JAN. 1959



ALTITUDE	(4) ENGINES MACH NO.	(3) ENGINES MACH NO.
SEA LEVEL	.47	.41
5,000 FT.	.50	.43
10,000 FT.	.53	.46
15,000 FT.	.56	.48
20,000 FT.	.60	.51
25,000 FT.	.64	.54
30,000 FT.	.67	.57
35,000 FT.	.70	.61
40,000 FT.	.70	.61

Figure 6-4

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SERVICE CEILINGS

AIRPLANE CONFIGURATION
MODEL 119A: BASIC

DATA BASIS: ESTIMATED
DATE: 22 JAN. 1959

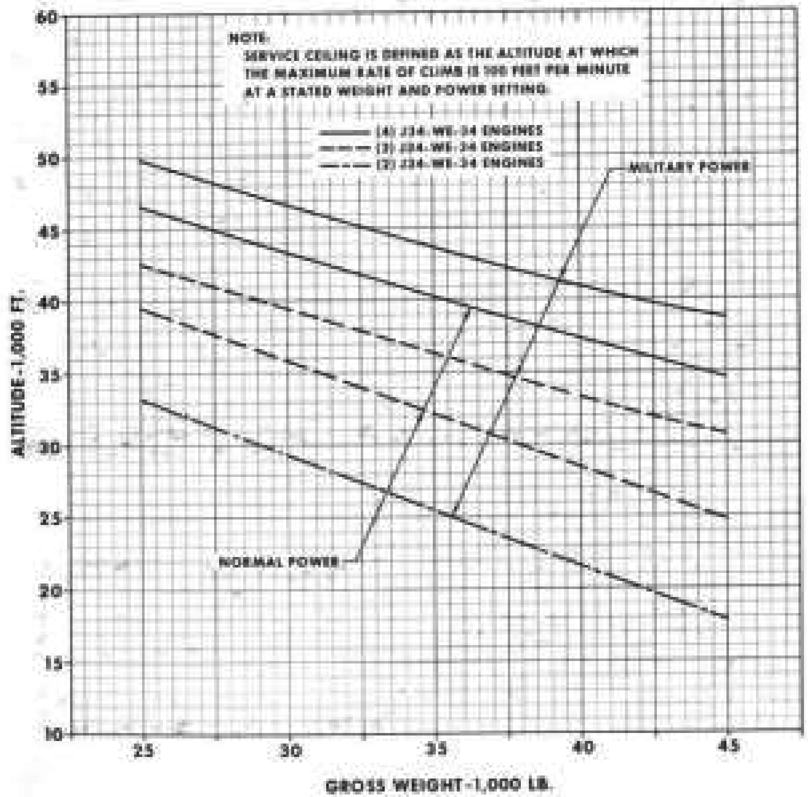
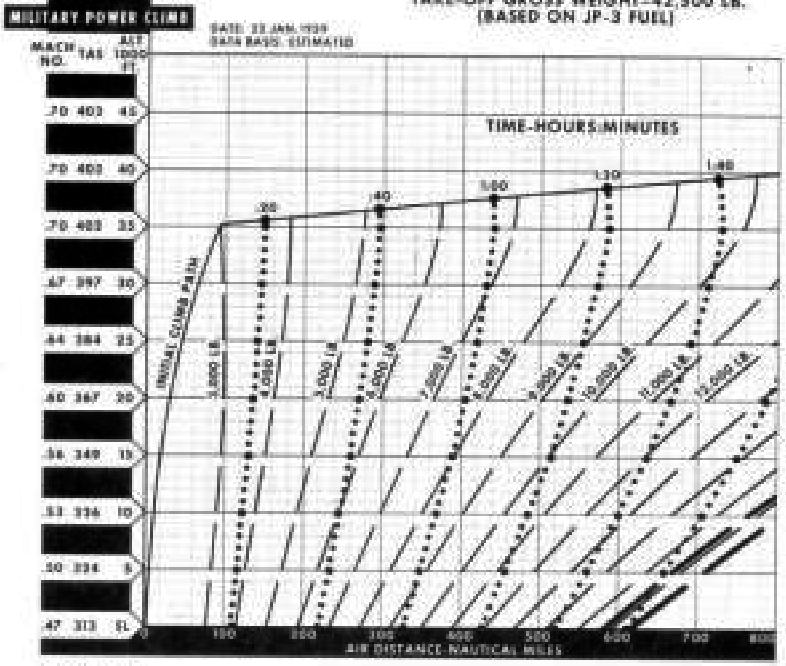


Figure 6-5

MISSION PROFILE

CONFIGURATION: BASIC
TAKE-OFF GROSS WEIGHT=42,500 LB.
(BASED ON JP-3 FUEL)



REMARKS

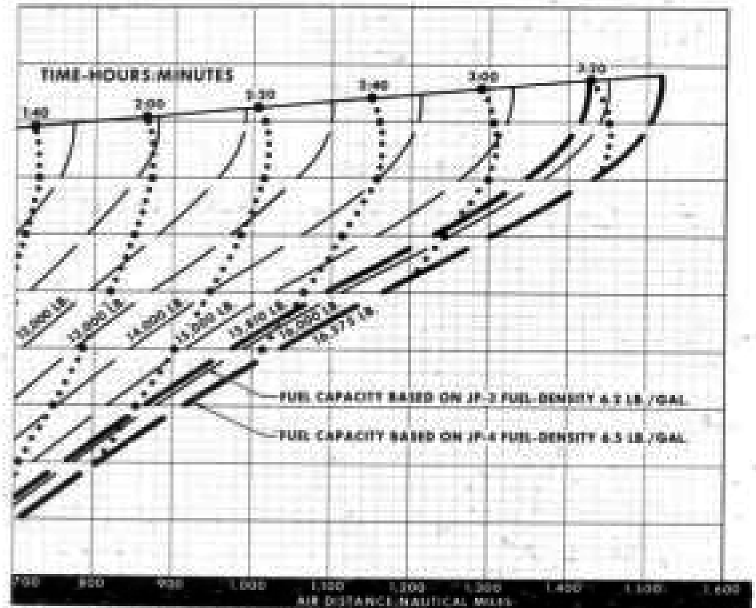
1. FUEL ALLOWANCE FOR START, TAXI, AND TAKE-OFF -945 LBS. INCLUDED.
2. NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT OR LANDING.
3. USE MILITARY POWER FOR CLIMB. (SEE MILITARY POWER CLIMB CHART FOR DETAILED INFORMATION.)
4. CRUISE FOR RECOMMEND MACH NUMBER.

LEGEND

- ▬ ▬ ZERO FUEL REMAINING
- — — FUEL CONSUMED
- •••••• TIME
- ——— CRUISE CEILING CLIMB PATH

Figure 6-6

MODEL 119A:
(4) J34-WE-34 ENGINES
ICAO STANDARD DAY



ALTITUDE FEET	CRUISE								
	FULL FUEL LOAD MINUS WARM-UP, TAKE OFF, AND CLIMB			FUEL USED 4000 LBS.			EMPTY FUEL LOAD ZERO LB. FUEL REMAINING		
	APPROXIMATE								
	MACH NUMBER	TAS KNOTS	FUEL FLOW LB./HR.	MACH NUMBER	TAS KNOTS	FUEL FLOW LB./HR.	MACH NUMBER	TAS KNOTS	FUEL FLOW LB./HR.
CRUISE-CLIMB INITIAL-35,300 FT.	.77	443	4840	—	—	—	—	—	—
FINAL-44,200 FT.	—	—	—	—	—	—	.74	427	3450
CONSTANT CRUISE ALTITUDE									
35,000 FT.	.77	443	4868	.76	440	4553	.75	431	4073
30,000 FT.	.74	433	5187	.73	430	4919	.70	412	4398
25,000 FT.	.70	422	5700	.69	417	5380	.66	396	4810
20,000 FT.	.67	411	6280	.66	404	5930	.62	379	5325
15,000 FT.	.64	398	6868	.62	389	6506	.58	363	5846
10,000 FT.	.60	381	7510	.58	371	7130	.54	344	6410
5,000 FT.	.55	359	8170	.54	351	7775	.50	326	7000
SEA LEVEL	.51	336	8828	.50	331	8433	.46	308	7594

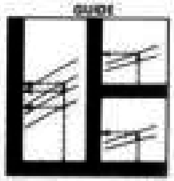
LANDING DATA CHART

AIRPLANE CONFIGURATION
MODEL 119; LANDING

FULL FLAPS
- FOWLER FLAP-δ_f=35 DEG.
- SPLIT FLAP-δ_f=60 DEG.
- SPOILER-δ_s=15 DEG

REMARKS
(4) J34-WE-34 ENGINES
IDLE THRUST
SEA LEVEL STANDARD DAY

DATA BASIS: ESTIMATED
DATE: 22 JAN 1959



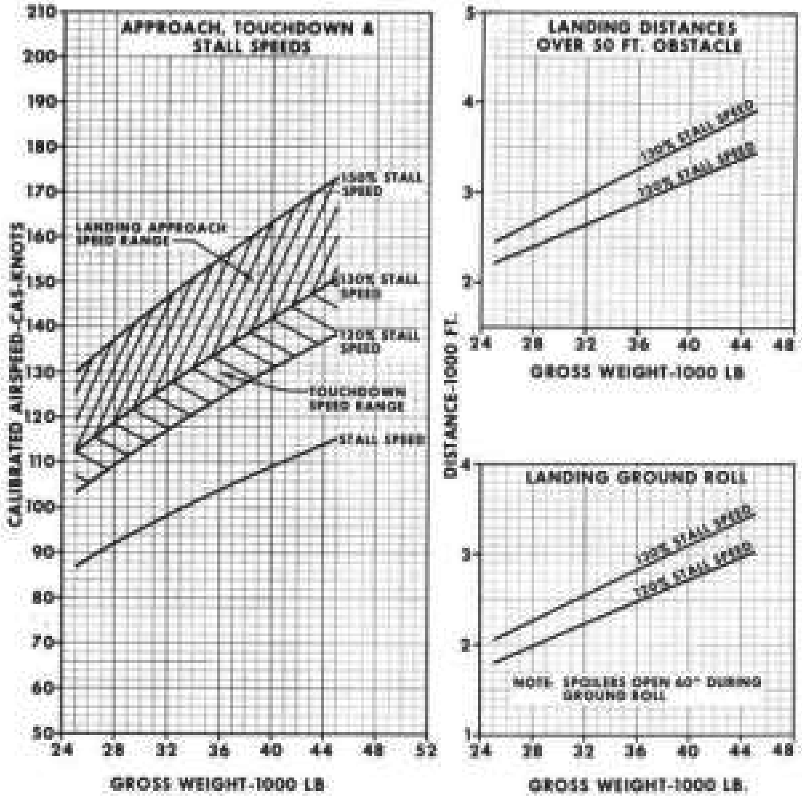


Figure 6-7

BRIEFING NOTES

BRIEFING NOTES

GROUND HANDLING AND SERVICING

GROUND HANDLING

Jacking

The Model 119 aircraft has five jack points. Two points "pull-out" of each main gear axle for wheel removal or brake maintenance. One jack point is located near the end of the aft fuselage. Three jack points, two inboard and slightly forward of each main gear and one directly aft of the nose gear, are provided to withstand the weight of the aircraft for any configuration. Three eighteen ton jacks will safely lift the aircraft, and one ten ton jack will lift a main gear. If a nose wheel must be changed, three jacks or an incline plane may be used.

Safety Locks

Down locks are provided for the flaps, nose and main landing gears. The locks are the cylindrical type, hinges along one element and spring-loaded closed. The locks are installed around the piston of the respective actuating cylinder. A removable "rudder-control column" gust lock is provided.

Mooring

Rings are provided for mooring lines at the aft fuselage jack point and at each landing gear.

Engine Start Power Source

Twenty-four volts, 1000 amperes are required to start the engine. Any power source capable of starting an F-80 or T-33 such as a "C-22" or "A-3A", will also start the Model 119.

Towing

With a light tug, tug driver, standard F-101 tow bar and as many additional men as safety regulations require, the Model 119 can easily be pushed or pulled over a hard surface. Hydraulic pressure for aircraft braking action is available from pressure stored in the brake accumulators or from hand pump operation. By removing a pip pin the scissors are disconnected to provide a minimum turning radius and prevent bending or breaking in nose gear components.

SERVICING

Main and Rudder Systems Hydraulic Reservoir

1. Depress air pressure bleed valve.
2. Remove filler cap.
3. Service with MIL-O-5606 (red) hydraulic fluid until level reaches full mark on reservoir sight gage.
4. Replace and lock filler cap.

Accumulators and Door Air Bottle

1. Remove chest cap.
2. Loosen ¾ inch swivel nut slowly while holding ¾ inch body nut. (Do not allow body nut to turn.)
3. Apply air pressure until gage indicated correct pressure:
   a. Main system accumulator: 1200 ±50 psi
   b. Each brake accumulator: 700 ±50 psi
   c. Door air bottle: 2100 to 3000 psi
   d. Elevator system accumulator: 600 ±25 psi
4. Relieve pressure in hose, disconnect hose and reinstall cap.

Engine Oil Tanks (3¼ Gals. Each Tank)

1. Unlock and remove filler cap.
2. Gage tank: top lug on cable represents full and each succeeding lug represents 1 qt. low with respect to the next highest lug.
3. Fill to top lug with MIL-O-6881 grade 1010 oil.
4. Replace and lock cap.

SERVICING POINTS

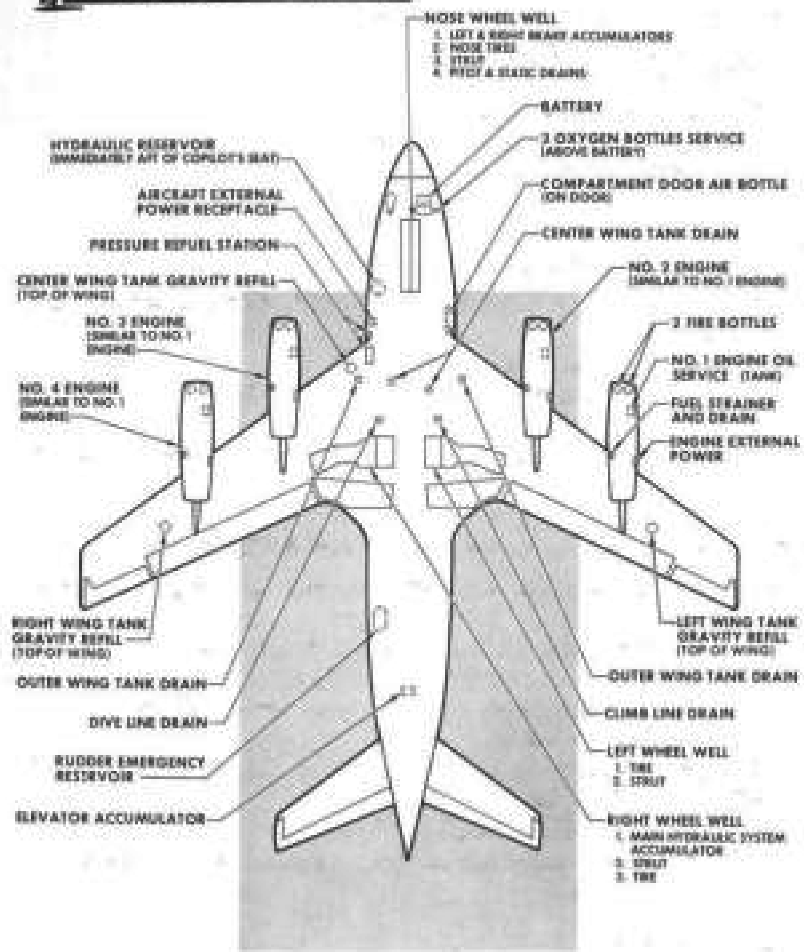


Figure 7-1

Oxygen

1. Connect filler line to the fill manifold.
2. Open each bottle fill valve.
3. Fill bottles to 1800 psi.
4. Close each bottle fill valve.
5. Disconnect filter line from fill manifold.
6. Open each bottle fill valve.

Pressure Refuel, Outer Wing Tanks

1. Connect single point refueling receptacle to the aircraft refuel adapter.
2. Open manual fuel valve.
3. Fill system until flow control valves cut off fuel flow.
4. Close manual fuel valve.
5. Disconnect single point receptacle from aircraft refueling adapter.

Pressure Refuel, Outer Wing and Center Tanks

1. Connect single point refueling receptacle to the aircraft refuel adapter.
2. Connect external power to the aircraft or turn ON battery switch.
3. Place power selector switch in "parked" position.
4. Place fueling station switch in "fuel center tank" position.
5. Open manual fuel valve.
6. Fill system until flow control valves cut off flow of fuel.
7. Close manual fuel valve.
8. Place fueling station switch in OFF position.
9. Disconnect single point receptacle from aircraft fueling adapter.

Gravity Refuel

A filler is located in each tank. The center wing tank filler is installed in the right wing. Because of the size and bends in the connecting line, the center tank will receive fuel slowly.

SEDR-40

Fuel Drains

Six "push type" drains are located in the system as follows: two in the center wing tank, one in each outer wing tank, one in the dive vent and one in the climb vent lines. A moisture drain is provided in each engine fuel feed line and is located near the main fuel strainer.

Pitot-Static Drains

Two moisture drains are provided and are located in the nose wheel well.

BRIEFING NOTES