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CITATION CJ2 525A
PILOT TRAINING MANUAL

Record of Revision No. 1

This is a complete reprint of the *Citation CJ2 525A Pilot Training Manual*, Volume 1.

The portion of the text or figure affected by the current revision is indicated by a solid vertical line in the margin. A vertical line adjacent to blank space means that material has been deleted. In addition, each revised page is marked "Revision 1" in the lower left or right corner.

The changes made in this revision will be further explained at the appropriate time in the training course.

the best safety device in any aircraft is a well-trained crew . . .

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CITATION CJ2 525A PILOT TRAINING MANUAL

VOLUME 1
OPERATIONAL INFORMATION

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NOTICE

The material contained in this training manual is based on information obtained from the aircraft manufacturer's Pilot Manuals and Maintenance Manuals. It is to be used for familiarization and training purposes only.

At the time of printing it contained then-current information. In the event of conflict between data provided herein and that in publications issued by the manufacturer or the FAA, that of the manufacturer or the FAA shall take precedence.

We at FlightSafety want you to have the best training possible. We welcome any suggestions you might have for improving this manual or any other aspect of our training program.

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NORMAL PROCEDURES

This chapter presents the abbreviated cockpit checklist provided with each Citation CJ2 in expanded form. Should any conflict exist between this information and the checklist in the FAA-approved *Airplane Flight Manual*, the *Flight Manual* shall take precedence. Any implied technique presented assumes that proper pilot skill and judgment are exercised.

PREFLIGHT

PREFLIGHT INSPECTION

1. Battery .... CONNECTED
2. Engine and Pitot Covers .... REMOVED (TWO EACH)

PRELIMINARY COCKPIT INSPECTION

A preliminary cockpit inspection should be made on the first flight of the day. Ensure that the airworthiness and registration certificates and radio license are displayed in the airplane and that the FAA-approved *Airplane Flight Manual*, the *Rockwell Collins FCS-3000 IFCS Pilot's Manual*, and other manuals that may be required because of installation of various types of equipment, are on board. FAA regulations also require a flashlight to be carried. Check that oxygen masks, headsets, microphones, and the pilots' abbreviated checklist are on board.

NOTE

Prior to cockpit inspection, check tail cone to ensure battery is connected and verify that both of the engine and pitot covers are removed.

1. Documents.. CHECK ABOARD
   a. To be displayed in airplane at all times:
      1. Airworthiness and registration certificates
      2. Transmitter license(s)
   b. To be carried in the airplane at all times:
      1. FAA-approved *Airplane Flight Manual*
      2. *Rockwell Collins Pro Line 21 Avionics System Pilot's Guide*
      3. Applicable *FMS Pilot's Guide*
2. Flashlight .... ABOARD

3. Portable Fire Extinguisher.............................. SERVICED AND SECURE

Located in a quick-release holder on the floor inboard of the copilot's seat; pressure gage should read in the white arc indicating a 150-psi charge.

4. Microphones, Headsets, and Oxygen Masks.............................. ABOARD

5. Oxygen Quantity.. CHECK

Check quantity gage at 1,600 to 1,800 psi and crew masks connected to side console outlets. Pilot's-side console oxygen control valve properly positioned to NORMAL. Caution should be exercised, because inadvertently placing the oxygen control valve to MANUAL DROP will result in deployment of the cabin masks. The standard crew masks must be stowed in the quick-donning holder and set on 100% for flight above FL 250.

The crewmember can verify oxygen flow by donning the mask and breathing with the regulator in the 100% position and ensuring that no restrictions to breathing are present, and by checking the flow indicator.

6. Battery Disconnect Switch .... BATT DISC

7. Battery Switch............................... BATT (NO VOLTAGE INDICATION)

8. Battery Disconnect Switch .... NORM

   Check for a minimum of 24 volts.

9. All Circuit Breakers .... CHECK

10. Generators... GEN or OFF

    Generators OFF is external power is to be used for start.

11. Pitot and Static Heat.. ON 30 SEC—OFF

    Annunciator light will go out. Allow 30 seconds for pitot tubes and static ports to heat, then OFF.

12. Landing Lights... ON

    Check illumination on ground .... OFF, IF SEEN FROM COCKPIT

13. Other External Lights and Passenger Advisory Lights.......................... ON

    Check Illumination .... OFF (IF SEEN FROM COCKPIT)

14. Control Lock.. UNLOCKED

    Control surfaces should be free for exterior inspection.

15. Gear Handle .... DOWN

16. Fuel Quantity .... CHECK

17. Elevator Trim.................................. POSITION TRIM TAB INDICATOR WITHIN TAKEOFF TRIM RANGE

18. Flap Handle.. CHECK POSITION (AGREES WITH FLAP POSITION)

19. Throttles .... OFF

20. All Other Switches.. OFF OR NORM

NOTE

Expedite all checks with electrical power on and ensure that the air-conditioner switch is off, if an external power unit is not used.

Landing and NAV lights may be omitted if night flight is not anticipated.

External power must be disconnected to complete items 6, 7, and 8. Voltmeter will indicate external power unit (EPU) voltage, if used, when the battery switch is placed in BATT position, item 7.

EXTERIOR INSPECTION

Make a general check for security, condition, and cleanliness of the airplane and components. Check particularly for damage; fuel, oil, and hydraulic fluid leakage; security of access panels, and removal of keys from locks (Figure NP-1).

Hot Items and Lights

1. Left and Right Static Ports .... CLEAR AND WARM

   At high outside temperatures, it is difficult to feel heat from the static port. Running the back of a finger from the airplane skin over the static port and onto the skin again is the easiest way to feel the higher temperature of the port.

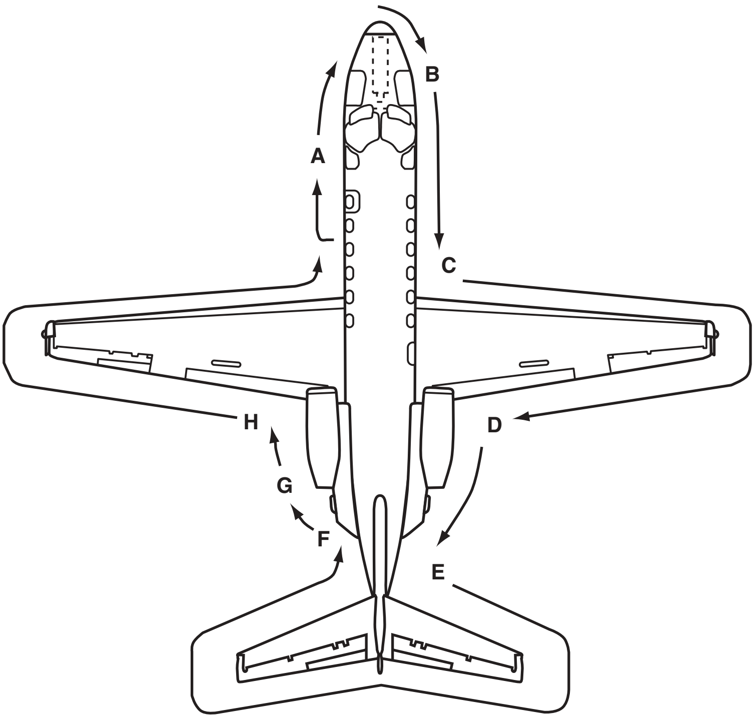

Figure NP-1. Exterior Inspection

2. Left and Right Pitot Tubes .... CLEAR AND HOT

   Do not grasp pitot tube firmly, because severe burns could result.

3. Landing Lights .... BOTH ON (IF NOT OBSERVED FROM COCKPIT)

4. Angle-of-Attack Vane .... FREE AND HOT

   Use caution in checking the vane when hot; check that it is free.

5. Flashing Beacon .... ON AND FLASHING (IF NOT OBSERVED FROM COCKPIT)

6. Emergency Exit Light .... ON (IF NOT OBSERVED FROM COCKPIT)

7. Right Navigation and Strobe Lights.................. ON (IF NOT OBSERVED FROM COCKPIT)

8. Tail Navigation Light.. ON

9. Left Wing Inspection, Navigation, and Strobe Lights .... ON (IF NOT OBSERVED FROM COCKPIT)

10. Lights and Battery Switches.. OFF

Left Nose

1. Baggage Door.. SECURE AND LOCKED

   Check latches firmly closed. The baggage and avionics bay doors must be key-locked to actuate door-locked microswitches. The DOOR NOT LOCKED annunciator will not extinguish if the baggage doors are not locked.

2. Nose Gear, Doors, Wheel, and Tire............. CONDITION AND SECURE

   Chine and tread of nose tire must be in good condition to meet the water/slush runway operating limitations. Nose tire inflation pressure is 120 ±5 psi. On the ground, the two forward gear doors are closed but the rear door is open, allowing a visual inspection of the nose gear assembly, shimmy damper, and nose gear steering bellcrank. Proper nose oleo strut extension of a fully fueled airplane is approximately 2.5".

3. Nosewheel Centering Lock Assembly .... DISCONNECT LOCKING MECHANISM AND VERIFY FLY PLACARD IS VISIBLE

   (Do not tow airplane with nosewheel centering lock assembly in FLY position.)

Right Nose and Fuselage Right Side

1. Windshield Alcohol Reservoir Sight Gage .... FLUID VISIBLE

   Ball should be at top of sight gage.

2. Brake and Gear Pneumatic Pressure Gage............................ GREEN ARC

   Pressure should read between 1,800 and 2,050 psi.

3. Power Brake Accumulator Charge (Table NP-1) .... LIGHT GREEN ARC (PRECHARGE PRESSURE) OR DARK GREEN ARC (OPERATING PRESSURE)

   If BATT switch was turned on and BRAKE SYSTEM circuit breaker was in during cockpit inspection.

Table NP-1. ACCUMULATOR INDICATIONS

ACCUMULATOR DISCHARGED	ACCUMULATOR CHARGED	STATUS
Fluid visible at top of upper gage	Fluid visible at bottom of upper gage	Normal minimum full
Fluid visible in upper gage	Fluid above top of bottom gage	Refill when practical
Fluid level not visible in upper gage	Fluid at or below top of bottom gage	Refill before operation

4. Brake Fluid Reservoir Sight Gages .... FLUID VISIBLE

   The metal "star" in the upper sight gage will have a red tint when reservoir is full. The ball should be at the top of the upper sight gage if the accumulator charge is in the light green arc (discharged).

5. Baggage Door.. SECURE AND LOCKED

   Check latches firmly closed. The baggage doors must be key-locked to actuate door-locked microswitch. The DOOR NOT LOCKED annunciator will not extinguish if the baggage doors are not locked.

6. Oxygen Blowout Disc .... GREEN

   Green disc should be in place. If it is missing, oxygen bottle may be empty.

7. Overboard Vent Lines... CLEAR

   Check vacuum vent, brake reservoir vent, alcohol bottle vent and gear, and brake air bottle vent.

8. Rosemont Temperature Probe.. CHECK

9. Landing Light.. CONDITION

10. Top and Bottom Antennas .... CONDITION AND SECURE

Right Wing

1. Wing Leading-Edge Vent .... CLEAR

2. Fuel Quick Drains .... DRAIN AND CHECK FOR CONTAMINATION

   Push straight up on the drains when taking fuel samples. The drain may lock open if it is turned. There are a total of six drains, three per side.

3. Main Gear, Door, Wheel, and Tire .... CONDITION AND SECURE

   Check tire for wear and inflation to 114 ±5 psi, and the door for security. Check wheel hubcap for condition and security of fastening. Check gear for general security, fluid leakage, and an approximate oleo strut extension of 2.5" if airplane is fully fueled.

4. Engine Air Inlet .... CLEAR

5. Engine Fan Duct and Fan .... CHECK FOR BENT BLADES, NICKS, AND BLOCKAGE OF STATORS

   If the fan is windmilling, place hand on bullet nose or install engine cover to stop the rotation. If damage is observed, refer to the *FJ44-2C Engine Maintenance Manual*.

6. Pylon Inlet .... CLEAR

7. Generator Cooling Air Inlet .... CLEAR

8. Cabin Escape Hatch .... SECURE

9. Stall Strip .... CONDITION (NO NICKS OR DENTS), SECURE

10. Heated Leading Edge .... CONDITION, EXHAUST CLEAR

11. Fuel Tank Vent .... CLEAR

    If vent is blocked, a negative pressure may build up in the wing, causing the tank to collapse.

12. Fuel Filler Cap .... SECURE

    Check locking latch closed and directed aft.

13. Static Wicks .... CHECK

    There should be one static wick on the wing trailing edge outboard of the aileron and two on the trailing edge of the aileron. One aileron static wick may be missing, no more than two total missing on the entire airplane.

14. Aileron, Flap, and Speedbrakes.................. CONDITION AND SECURE

    Ensure flap position matches indicator. Check ailerons for freedom and hinge points for security. Check flaps and speedbrakes for security.

15. Hydraulic Reservoir .... CHECK

16. Air-Conditioning Exhaust,
    Lower Antennas, and Drains .... CONDITION AND CLEAR

Right Nacelle

1. Engine Fluid Drain and T_{T2} Inlet .... CLEAR

   It is normal to find some residual fluid on the drain lines.

2. Generator Cooling Air Exhaust.. CLEAR

3. Oil Filter Differential Pressure Indicator .... NOT EXTENDED

4. Oil Level .... CHECK

   Filler Cap and Access Doors.. SECURE

5. Engine Exhaust and Bypass Ducts .... CONDITION AND CLEAR

   Check for fuel leakage, damage to turbine blades, cracks, and general security.

6. Thrust Attenuator .... CONDITION AND SECURE

   The paddle should be firmly hydraulically stowed.

Empennage

1. Right Horizontal Stabilizer Deice Boot .... CONDITION

   Check boots for cuts that might prevent inflation and for signs of delamination.

2. Right Horizontal Stabilizer, Elevator, and Trim Tab .... CONDITION

   Ensure trim tab position matches elevator trim tab position indicator.

3. Rudder and Trim Tab .... SECURE AND CORRECT SERVO TAB ACTION

4. Static Wicks (Rudder, Both Elevators, and Tail Cone) .... CHECK

   There should be three static wicks on the trailing edge of each elevator: two on the trailing edge of the rudder and one on the tail cone. One rudder or elevator static wick may be missing, no more than two total missing on the entire airplane.

5. Vortex Generators.. CHECK (FIVE EACH SIDE OF VERTICAL STABILIZER)

6. Left Horizontal Stabilizer, Elevator, and Trim Tab .... CONDITION

   Ensure trim tab position matches elevator trim tab position indicator.

7. Left Horizontal Stabilizer Deice Boot.................................. CONDITION

   Check boots for cuts that might prevent inflation and for any indication of delamination.

Aft Compartment

1. Fire Bottle Pressure Gages.............................. CHECK TEMPERATURE-PRESSURE RELATIONSHIP

   Check that the pressure in the bottles is within limits for the ambient temperature. A pressure/temperature chart is located between the bottles in the tail cone compartment. Checking for correct bottle pressure is the only way to determine the bottles are full. The BOTTLE ARMED light on the glareshield will illuminate when the ENG FIRE switch is pushed, regardless of bottle condition.

2. Junction Box Circuit Breakers .... IN

   Check all visible circuit breakers.

3. Equipment and Junction Box Access Doors .... SECURE

   Check inner tail cone access door closed, latches firmly closed.

4. Aft Compartment Baggage .... SECURE

5. Aft Compartment Light .... OFF

6. Aft Compartment Access Door .... SECURE AND LOCKED

7. External Power Service Door .... SECURE

8. Battery Cooling Intake and Vent Lines .... CLEAR

Left Nacelle

1. Engine Exhaust and Bypass Ducts .... CONDITION AND CLEAR

   Check for fuel leakage, damage to turbine blades, cracks, and general security.

2. Thrust Attenuator .... CONDITION AND SECURE

   The paddle should be firmly hydraulically stowed.

3. Engine Fluid Drains and T_{T2} Inlet... CLEAR

4. Generator Cooling Air Exhaust.. CLEAR

5. Oil Level .... CHECK

   Filler Cap and Access Doors... SECURE

6. Oil Filter Differential Pressure Indicator .... NOT EXTENDED

Left Wing

1. Flap, Speedbrakes,
   Aileron, and Trim Tab .... CONDITION AND SECURE

   Assure flap position matches indicator.

2. Static Wicks .... CHECK

   There is one static wick on the wing trailing edge, outboard of the aileron, and two on the trailing edge of the aileron. One aileron static wick may be missing, no more than two total static wicks may be missing on the entire airplane.

3. Fuel Tank Vent.. CLEAR

   If the vent is blocked, a negative pressure may build up in the wing, causing the tank to collapse.

4. Fuel Filler Cap.. SECURE

   Check locking latch closed and directed aft.

5. Heated Leading Edge.......................... CONDITION, EXHAUST CLEAR

6. Stall Strip... CONDITION (NO NICKS OR DENTS), SECURE

7. Engine Air Inlet .... CLEAR

8. Pylon Inlet .... CLEAR

9. Generator Cooling Air Inlet .... CLEAR

10. Engine Fan Duct and Fan .... CHECK FOR BENT BLADES, NICKS, AND BLOCKAGE OF FAN STATORS

    If the fan is windmilling, place hand on bullet nose or install engine cover to stop the rotation. If damage is observed, refer to the *FJ44-2C Engine Maintenance Manual*.

11. Main Gear Door Wheel and Tire................. CONDITION AND SECURE

    Check tire for wear and inflation to 114 ±5 psi, and the door for security. Check wheel hubcap for condition and security of fastening. Check gear for general security and fluid leakage.

12. Fuel Quick Drains.. DRAIN AND CHECK FOR CONTAMINATION

    Push straight up on the drains when taking fuel samples. The drain may lock open if it is turned. There are two drains at the centerline and one outboard of the main landing gear.

13. Wing Leading Edge Vent... CLEAR

Fuselage Left Side

1. Wing Inspection Light... CONDITION

2. Landing Light... CONDITION

3. Cabin Door Seals
   (Primary and Secondary)...................... CHECK FOR RIPS AND TEARS

CABIN INSPECTION

1. Emergency Exit .... SECURE

   Handle Locking Pin .... REMOVE

   Check fit of door, handle stowed, guard in place, and locking pin removed.

2. Passenger Seats .... UPRIGHT AND OUTBOARD
3. Door Entry Lights .... OFF

   Switch located on entry door post.

4. Exit Placards .... SECURE

COCKPIT INSPECTION

1. Oxygen Control Valve .... CHECK IN NORMAL
2. Oxygen Masks .... CHECKED AND PROPERLY STOWED

   (Check mask at 100% and in EMER; check mic.)

3. All Circuit Breakers .... CHECK

   Circuit breakers on both panels checked in.

4. Standby Gyro Switch .... TEST (MOMENTARILY); GREEN LIGHT ON
5. Standby Gyro .... ON

   Check Amber Light .... ON

6. Battery Switch .... BATT 24 VOLTS MIN STBY GYRO LIGHT OUT

   Voltmeter checked at 24 volts for battery start, 29 volts maximum with external power applied.

7. Avionics Power .... ON—AHRS INITIALIZED
8. ATIS/Clearance (if required) .... EMER (CHECK POWER TO EMERGENCY BUS ITEMS)

NOTE

With the battery switch in emergency position, power should be supplied to the following:

- COMM 1
- NAV 1
- Overhead floodlights
- Pilot's and copilot's audio panels
- Standby engine N_1 indicator
- Flap control
- Voltmeter
- Right pitot static heater
- Standby altimeter/airspeed (vibrator)
- Standby HSI (copilot's AHRS)
- Landing gear control
- Landing gear monitor

COMM 1/NAV 1 can be used on emergency bus for clearance/ATIS without operating other airplane equipment, if needed, prior to start.

9. Battery Switch .... BATT

10. External Power.................. CONNECTED (IF APPLICABLE)

CAUTION

ITT may approach 1,000°C during battery starts at higher elevation airports. External power unit with at least 800-amperes capacity is required for the first engine start at airports with elevation above 10,000 feet. If external power unit with variable shutoff current capability is used, it should be set to 1,100 amperes.

11. ATIS/Clearance.......................... CHECK (IF REQUIRED)

12. Rotary Test Switch............... WARNING SYSTEMS CHECKED

    Perform warning test with rotary selector. Check in the OFF position with the red light extinguished.

13. Radar.. OFF OR STBY

14. Avionics Power .... OFF

15. Generators .... GEN

    (OFF if external power is to be used for start.)

16. Fuel Boost .... NORM

    In the NORM position, the boost pumps will be automatically activated and deactivated during the engine start sequence.

17. Fuel Transfer .... OFF

18. L AHRS Slave .... AUTO

19. Parking Brake .... SET

    Depressing the brake pedals and pulling the parking brake handle out traps applied pressure to the wheel brakes. If the brake accumulator charge did not indicate in the dark green or light green arc on the walkaround check, the accumulator must be charged by turning the battery switch to BATT shortly before setting the brakes.

20. Windshield Bleed-Air Valves .... OFF

21. Control Lock .... OFF

    Ensure that the handle is fully in and controls and throttles are free.

22. Pilot AHRS REV .... NORM (COPILOT NORM IF INSTALLED)

23. Landing Gear Control .... DOWN

24. Landing Gear Lights .... CHECK GREEN LIGHTS ILLUMINATED AND UNLOCK LIGHT OUT

25. Antiskid .... ON

26. Standby Gyro Cabin Knob .... UNCAGED AND NO FLAG

27. Engine Instrument Warning Indicators .... NO FLAGS

28. Air Conditioner .... OFF

29. Air Source Select .... AS REQUIRED

    Position the TEMPERATURE SELECT control to AUTO position in midrange.

30. R AHRS Slave .... AUTO

31. Cockpit Voice Recorder
(If Installed) TEST Button.. PUSH AND HOLD FOR 5 SECONDS

Verify illumination of green test light.

32. Throttles... CHECK OFF

Both throttles latched in the OFF position.

33. Thrust Attenuator Switch.. AUTO

34. Engine Synchronizer .... OFF

35. All Other Switches.. OFF OR NORM

Switches OFF or NORM; generators GEN for battery start. All radios and avionics off to preclude the possibility of equipment damage due to voltage variances during start. Because the engine bleed ports do not open until positive pressure is evident, it is not necessary to turn off the AIR SOURCE selector, and it may be left in BOTH, for starting and all normal operation.

36. Battery and Standby Gyro... OFF

(If there is a delay before engine start) or ON (with external power unit [EPU].)

QUICK TURNAROUND

When a complete preflight has already been accomplished and the condition of the airplane has previously been thoroughly checked, it may be desirable to use the Quick Turnaround checklist in circumstances, such as prior to succeeding flights on the same day.

1. Standby Gyro .... ON/CHECK AMBER LIGHT ILLUMINATED

2. Battery Switch .... BATT

3. Battery Voltage .... CHECK (24-VOLT MINIMUM)

4. External Power................................... CONNECTED (IF APPLICABLE)

5. Avionics Power .... ON

6. Rotary Test Switch............................... AOA (VERIFY SATISFACTORY PREFLIGHT TEST), THEN OFF

7. Avionics Power .... OFF
8. Generators .... GEN (OFF IF EXTERNAL POWER)
9. Boost Pumps .... NORM
10. All Other Switches .... OFF OR NORM
11. Parking Brake .... SET
12. Control Lock .... OFF
13. Landing Gear Control .... DOWN
14. Landing Gear Lights .... CHECK
15. Standby Gyro Caging Knob .... UNCAGED AND NO FLAG
16. Engine Display Warning Indicators .... NO FLAGS
17. Throttles .... CHECK OFF

BEFORE STARTING ENGINES

1. Preflight Inspection .... COMPLETE
2. Wheel Chocks .... REMOVED
3. Cabin Door .... CLOSE AND LOCK

   Check green indicators for proper door pin position, handle vertical and in the detent.

4. Passenger Briefing .... COMPLETE

   (Include seat/seat belt adjustment, emergency exits, smoking, and oxygen.)

5. Seats, Seat Belts, Shoulder Harnesses, and Rudder Pedals .... ADJUST AND SECURE

   Check seats locked in the desired position. Check seat belts snug and shoulder harnesses latched to the buckle. Rudder pedals adjust individually by depressing the tab on the inboard side and moving fore or aft.

6. Fuel Quantity .... CHECKED
7. Flashing Beacon Light .... ON

8. Air Conditioner .... OFF

STARTING ENGINES (DOWNWIND ENGINE FIRST)

Clear the area behind the airplane and check for foreign objects in front of the engine inlet.

NOTE

In crosswind conditions, starting the downwind engine first (for battery start) will produce a lower start ITT. Otherwise, either engine can be started first.

Due to the hazards of foreign object ingestion and noise, the left engine should not be running during boarding or deplaning. If last minute boarding is anticipated, the right engine should be started first.

1. Flood and Center Panel Lights .... FULL BRIGHT (FOR NIGHT OPERATION)

2. Start Button.. PRESS MOMENTARILY

   Button .... LIGHTS

3. Throttle .... IDLE AT 8% TURBINE (N_2) RPM (MINIMUM) AND INDICATION OF FAN (N_1) ROTATION

NOTE

Lower start ITT can be achieved by allowing N_2 to peak (but need not exceed 12% N_2) prior to advancing the throttle lever to idle.

For tailwind engine starts, ensure proper direction of fan rotation (N_1 increasing) prior to bringing throttle to idle.

4. ITT .... CHECK FOR RISE

   Abort start if ITT rapidly approaches 1,000°C or showing no rise within 10 seconds. Do not exceed 900°C for more than 15 seconds.

CAUTION

If engine maintenance has been performed, air in the fuel lines may cause a hot start. Ensure that proper purging procedures have been accomplished prior to attempting a start. Be prepared to abort the start.

5. Engine Indications .... CHECK NORMAL

   Check engine indications within limits. Check that starter has disengaged and that all annunciator lights are out except AOA HTR FAIL, P/S HTR OFF, ATTEN UNLOCK, and other engine OIL PRESSURE WARN, FUEL LOW PRESS, and GEN OFF.

6. Fuel, Oil, Generator, and Hydraulic System Annunciators .... EXTINGUISHED

   Check the FUEL LOW PRESS, FUEL BOOST ON, and OIL PRESS WARN lights extinguished. After light-off occurs, at approximately 45% turbine rpm, the starter relay opens, terminates ignition and fuel boost and turns off the start button and the instrument floodlights. During a battery start with the GEN switch on, the generator will come on line, extinguishing the GEN OFF light, at approximately 45% turbine rpm. With external power in use, the GEN switches can be off until starting is complete.

   An overvoltage protection system is provided during use of an external power unit (EPU). The control unit monitors the external power unit voltage and will deenergize the external power relay if the voltage is above 32.5 volts. External power cannot be reapplied to the airplane until the electrical power has been interrupted after the start termination for the voltage protection, or until the voltage is reduced below 32.5 volts.

   Should automatic start sequencing not terminate, the boost pump, ignition, and associated lights will remain on. The starter, however, will discontinue cranking due to speed sensing, which governs at approximately 45% N_2. Depressing the STARTER DISENGAGE button will terminate the automatic start sequence. This button is illuminated anytime the PANEL LIGHT CONTROL NIGHT DIM switch is on.

7. Other Engine .... START; REPEAT STEPS 2 THROUGH 6

   If a generator cross-start is to be accomplished, leave the throttle at idle N_2 (turbine) rpm on the operating engine. The engine should idle at approximately 53.4% N_2 rpm (±2.5% rpm). For generator cross-starts, both start buttons will illuminate, indicating that both start relays are closed.

8. External Power .... CHECK CLEAR (IF APPLICABLE)

9. Generators... GEN (IF EXTERNAL POWER WAS USED FOR START)

   It may not be possible to bring the generators on line until the external power is removed.

10. DC Amperes and Volts.. CHECK

a. Left Generator .... OFF

Check L AMP drop, (R AMP INCR, voltage 29 ±.25)

b. Right Generator .... OFF

Check voltage drops to battery (24-volt minimum)

c. Left Generator .... GEN

Check on line (AMPS INCR, voltage 29 ±.25)

d. Right Generator .... GEN

Check generators parallel and voltage 29 ±.25

e. Battery Switch .... OFF

Check L AMP and R AMP drop

f. Battery Switch .... BATT

Check voltage 29 ±.25

While a generator is off line, the MASTER CAUTION and the applicable GEN OFF light will illuminate. If both generators are off line at the same time, the MASTER WARNING and both GEN OFF lights will flash.

BEFORE TAXI

1. Air Conditioner, Fans, and Temperature Control .... AS REQUIRED

   Select both left and right positions, pausing long enough between selections to verify airflow from each position. Selector should be positioned to BOTH after checking pressure sources, unless conditions are such that FRESH AIR may be desired before takeoff.

   NOTE

   The air-conditioner switch must be in AUTO or FAN and the aft fan must be operating for the automatic cabin temperature control system to function.

2. Lights .... AS REQUIRED

   Turn on interior and exterior lights as required and adjust interior and instrument light intensity as desired.

NOTE

Bulb life is extended considerably by using the recognition/taxi light position for taxi.

3. Avionics Power Switch/FMS .... ON

4. Passenger Advisory Lights .... PASS SAFETY

5. Pressurization .... AUTO/SET DESTINATION ELEVATION

6. Electric Elevator Trim .... CHECK AND SET

   (Operate electric elevator trim nose up and push AP/TRIM DISC switch. Verify elevator trim wheel stops rotating. Trim should not operate while pressing only one side of the split switch. Repeat check for nose down trim. Repeat trim check for copilot's AP/TRIM DISC switch.) Set the trim as required for the center of gravity.

7. Flaps .... CHECK AND SET

   a. Set flaps to ground flaps and verify both speedbrakes deploy.

   b. Advance both throttles above 85% N_2; verify speedbrakes retract and flaps >35° annunciator illuminated.

   c. Retard throttles to idle; verify lights extinguish and speedbrakes redeploy.

   d. Set flaps to TAKEOFF; verify speedbrakes retract.

8. Flight Controls .... FREE AND CORRECT

   Check for full travel of all controls. Observe aileron and elevator for correct movement. The elevator and ailerons can be seen from the cockpit.

9. Rudder Bias System .... CHECK

   a. Advance left throttle to approximately 70% N_1.

   b. Verify left rudder pedal moves forward.

   c. Return left throttle to idle.

   d. Advance right throttle to approximately 70% N_1.

   e. Verify right rudder pedal moves forward.

   f. Return right throttle to idle.

10. Thrust Attenuators .... CHECK/AUTO

    Place the thrust attenuator switch in STOW; the white ATT STOW SELECTED advisory light will illuminate. Advance either throttle beyond 85% N_2 with the thrust attenuator switch in STOW; the MASTER CAUTION will illuminate. Bring the throttles to idle and select the thrust attenuators switch to TEST; the MASTER CAUTION will illuminate. Place the thrust attenuator switch in AUTO with the throttles at idle; the thrust attenuators will be deployed. Advance either throttle above idle; the thrust attenuators will stow and then redeploy when the throttle is returned to idle.

11. ATIS, Clearance, Flight
    Management System, and Charts.. CHECK

    Check navigation radios tuned to desired frequencies and courses set. Check transponder on proper code and in standby; turn to ALT just before takeoff.

12. Takeoff Data (V_1, V_R, V_2, V_{ENR}, [V_T],
    N_1 Speed Setting, and Takeoff Field Length
    and Weight Limits) .... CONFIRM FOR APPROPRIATE TAKEOFF FLAP SETTING

    Check field length required at takeoff gross weight against runway available using actual temperature, runway slope, pressure altitude, and wind information. Check gross weight against maximum allowable takeoff weight using actual temperature and pressure altitude information. Refer to performance tables for takeoff N_1, V_1, V_R, V_2, and best single-engine climb speed (V_{ENR}).

13. Avionics/FMS .... CHECK AND SET

14. Cross-check VOR on standby HSI and copilot's HSI with VOR on pilot's PFD. (If the HSI differs from the PFD by more than 4°, do not use that HSI for VOR navigation.)

TAXI

Gradually apply just enough thrust to break inertia. Reduce power to the amount necessary to achieve desired taxi speed. Avoid riding the brakes and always place the throttles to idle before commencing braking. Caution should be exercised in congested areas to reduce the possibility of blast damage to equipment and personnel.

Taxiing on one engine may be advisable at light weights to reduce brake wear, particularly in very cold weather when idle thrust is relatively high.

Turning capability into the live engine is reduced, however, and consideration should be given to the direction of anticipated turns in deciding which engine to operate. Peak exhaust velocity to generate the necessary thrust will be higher on one engine. Maneuvering in close quarters may dictate the use of both engines. If additional thrust should be needed for taxiing, place the thrust attenuator switch to STOW position.

Ground operations in visible moisture with an outside ambient air temperature from +10°C or below require that ENGINE ANTI-ICE be ENG ON or WING/ENG.

1. Brakes .... CHECK

CAUTION

If, during taxiing a hard brake pedal or no braking condition is encountered, operate the emergency brake system. Maintenance is required before flight.

NOTE

If the antiskid is turned off prior to or during taxiing, it must be turned on prior to takeoff. The antiskid must be turned on and the self-testing sequence completed (antiskid annunciator light out) while the airplane is stationary. If the airplane is taxiing when the antiskid system is turned on, the antiskid test sequence will not be completed successfully and the antiskid will not be operational during takeoff.

2. Flight Instruments .... CHECK

   Check the pilot's ADI and HSI on the PFD have desired functions selected and displayed. Check copilot's ADI erect and no flag showing. Observe heading indicators and magnetic compass are in agreement. Check the pilot's and copilot's AHRS SLAVE is in AUTO, and the vertical speed indicators (VSIs) are at zero.

3. Crew Briefing .... COMPLETE

   It is suggested that the pilot brief the copilot and crew on takeoff procedures at this point. This briefing may consist of discussion concerning crew coordination with respect to: flap setting, use of anti-ice, review of takeoff power setting, V-speeds and other airspeed callouts desired, and normal and emergency procedures.

   A review of the planned departure and climbout procedures, as well as NAV aids to be used, may also be conducted at this time.

BEFORE TAKEOFF

1. Anti-ice and Deice Systems................................ CHECK (WHEN ICING CONDITIONS ARE ANTICIPATED)

   Clearing the area behind the airplane, set power at or above 75% N_2 rpm, and turn on the engine and wing anti-ice and tail deice. Check for annunciators to illuminate and extinguish (approximately 1 minute). Turn wing and engine anti-ice off until ready for takeoff. Open the windshield bleed manual valves; turn on the windshield anti-ice; check flow and turn the anti-ice switches off and close the manual valves. Check for proper sequencing of the TAIL DEICE annunciators.

   CAUTION

   Do not operate windshield anti-ice on the ground at high engine rpm.

   Limit ground operation of pitot and static heat to 2 minutes to preclude damage to the pitot and static system and the angle-of-attack probe.

   Do not continue operating ENG/WING ANTI-ICE on the ground at high engine rpm after anti-ice annunciators have extinguished.

   Do not operate deice boots when ambient temperature is below –35°C (–31°F).

2. Passenger Seats.. CHECK FULL UPRIGHT AND OUTBOARD

3. Anticollision Lights .... ON

   NOTE

   Do not operate the anticollision lights in conditions of fog, clouds or haze, as the reflection of the light-beam can cause disorientation or vertigo.

4. Landing or Recognition Lights.. AS DESIRED

5. Transponder.. ALT

   Set transponder to assigned mode and code.

6. Cockpit Air Distribution.. AS REQUIRED

7. Air Source Select .... BOTH

8. Flaps .... SET FOR TAKEOFF

9. Trim .... SET FOR TAKEOFF

10. Thrust Attenuator Switch.. AUTO

11. Radar.. AS REQUIRED

12. Anti-ice and Deice Systems .... ON, IF REQUIRED

13. Ignition.. ON

    Turning the ignition to ON will help to prevent a flameout if the engine should ingest water spray or a foreign object on takeoff.

14. Pitot and Static Heat .... ON

    Limit ground operation of pitot and static heat to 2 minutes to preclude damage to the angle-of-attack system.

15. Annunciator Panel .... CHECKED

    All annunciator lights should be extinguished with the possible exception of ENG or WING ANTI-ICE if either or both of those systems is selected at a low power setting.

NOTE

The L or R ATTEN UNLOCK advisory lights will be illuminated with throttles at idle, but will extinguish when throttles are advanced for takeoff.

The GROUND IDLE advisory light will be illuminated with GROUND IDLE switch in NORMAL.

TAKEOFF

1. Throttles .... SET TAKEOFF THRUST

   Slowly and smoothly apply power while referencing the engine instruments. A rolling takeoff may be used with sufficient runway available, but it should be remembered that the *Airplane Flight Manual* takeoff field length data and takeoff N_1 settings assume a static runup.

2. Engine Instruments .... CHECK

3. Brakes .... RELEASE

Directional control is normally maintained with nose gear steering and rudder; and upwind (wing down) aileron in crosswind conditions. For two crewmember operations, it is suggested that the copilot perform the engine instrument monitoring function and set the throttles enabling the pilot to direct his full attention to airplane control. N_1 should be closely observed, and throttle corrections made as necessary to maintain takeoff thrust and ensure symmetrical thrust application. Large differential power changes, particularly at the higher thrust settings, can induce yaw.

It is recommended that the copilot (for two crewmember operations) verbally state when takeoff thrust is set, a crosscheck of airspeed indicators at 70 knots is made, and when reaching V_1 and V_R. Positive back pressure is required to rotate and it should be accomplished precisely at V_R. Early or late rotation may degrade takeoff performance. It should be done smoothly, however, so that a decrease in airspeed does not occur. Normal rotation angle is 10° noseup.

Should a serious irregularity become evident before reaching V_1, the takeoff should be aborted. With a problem after V_1, the takeoff should normally be continued. Procedures for abort and single-engine takeoff are outlined in the “Emergency Procedures” chapter.

AFTER TAKEOFF—CLIMB

1. Landing Gear .... UP

   When a positive rate of climb is indicated, pulling the gear handle out and moving UP initiates the retraction cycle, illuminating the GEAR UNLOCKED and HYD PRESS ON lights. Check both lights are extinguished, indicating the gear are up and locked.

2. Flaps .... UP

   At a comfortable altitude with wings level and a minimum airspeed of V_2 + 10 KIAS, push the flap handle in (to clear the TO and APPR detent) and full forward. Observe the position indicator to the left of the handle move to FLAP UP. A small pitch change will occur. Minor trimming will be required as the airplane accelerates to climb airspeed.

3. Ignition .... NORM

   When clear of any bird hazard and cockpit workload permits, return the IGNITION switches to NORM.

4. Throttles .... SET MAXIMUM CONTINUOUS THRUST (MULTIENGINE)

5. Engine Synchronizer .... AS REQUIRED

When N_1 is set, within 2%, or N_2 within 1% (left to right), turn engine synchronizer selector switch to FAN or TURB as desired. Crosscheck the remaining engine instruments within limits.

6. Yaw Damper.. AS REQUIRED

   With the yaw damper engaged, airplane control is improved and passenger comfort is enhanced.

7. Passenger Advisory Lights.. AS REQUIRED

   Placing the switch to SEAT BELT leaves that cabin advisory light illuminated and extinguishes the NO SMOKING and emergency exit lights. If no turbulence is anticipated, placing the switch to OFF extinguishes both the advisory and emergency exit lights.

8. Anti-ice and Deice Systems .... AS REQUIRED

   Use of engine anti-ice reduces allowable fan speed and dictates close monitoring of interturbine temperature (ITT) and rpm limits.

9. Landing or Recognition Lights .... OFF

10. Pressurization... CHECK

11. Altimeters .... SET TO 29.92 (1,013 MB) AT TRANSITION ALTITUDE AND CROSSCHECK

CRUISE

1. Throttles.. SET AS DESIRED

   Climb thrust is normally maintained upon level-off until acceleration to the desired cruise mode takes place. As the airplane accelerates and the ram-air temperature (RAT) increases, N_1 rpm may have to be adjusted to the appropriate setting. If the optional engine synchronizer is installed and engine rpm does not automatically synchronize at desired cruise setting, turn the engine synchronizer switch to OFF, allowing the synchronizer actuator to center; roughly synchronize the engines with the throttles and turn the synchronizer switch to FAN or TURB. When operating at maximum range cruise, thrust necessary to maintain optimum angle of attack diminishes with fuel burnoff.

   Although the airplane is not operationally restricted in rough air, flight in severe turbulence should be avoided. If severe turbulence is encountered, it is recommended that the igniters be turned on and airspeed maintained at approximately 180 KIAS. Maintain a constant attitude, avoid abrupt or large control inputs, and do not chase airspeed and altitude indications.

A comfortable cabin temperature is normally maintained with the AUTO TEMPERATURE SELECT in the 12 to 2 o'clock position. During daylight, the crew environment may not be an accurate reference to the cabin comfort level due to solar heating taking place through the wide expanse of cockpit windows.

2. Anti-ice and Deice Systems .... AS REQUIRED

   The engine bleed air anti-ice must be activated when operating in visible moisture at temperatures from +10°C or below RAT and anytime icing is occurring. The pitot and static anti-ice is normally operated during flight.

   Detailed instructions for operation of the engine anti-ice and surface deice systems are found in Section II of this manual and in the FAA-approved *Airplane Flight Manual*.

3. Cockpit Air Distribution.. AS REQUIRED

   Cockpit air distribution and windshield air defogging is regulated by a diverter valve that has a control knob on the tilt panel.

CAUTION

Do not operate deice boots when indicated RAT is below –35°C (–31°F).

DESCENT

1. Defog Systems .... AS REQUIRED

   Warming the windshield with W/S BLEED air will assist in defrosting.

   a. DEFOG FAN.................................... HI (AT START OF DESCENT)

   b. Cockpit Air Distribution .... MAX

   c. Windshield Bleed-Air Valves.. MAX

      Windshield Bleed-Air Switch .... LOW

      (Below 18,000 feet if landing temperature/dew point spread is less than 5°C [10°F].)

2. Pressurization.................................... SET DESTINATION ELEVATION

   After beginning descent, verify destination field elevation is set in the SET ALT field of the controller.

   Ensure depressurization prior to touchdown.

Monitor the differential pressure/cabin altitude in order to ensure that the cabin altitude descends at the correct rate to the lower altitude.

3. Anti-ice and Deice Systems .... AS REQUIRED

   PITOT & STATIC and ENGINE ANTI-ICE should be on and operating and W/S BLEED as required when operating in visible moisture at a ram-air temperature from +10°C or below.

4. Throttles .... AS REQUIRED

   Maintain sufficient power for wing anti-icing (ENG ANTI-ICE lights remain OFF) above 75% N_2 (minimum).

5. Altimeters .... SET AT TRANSITION ALTITUDE AND CROSSCHECK (18,000 FEET IN USA)

   Set landing field barometric pressure in both altimeters when cleared below, or when passing, transition altitude. Crosscheck altimeters for agreement.

6. Landing Data (V_{APP}, V_{REF}, V_{ENR} for V_T, N_1, and Landing Distance and Factors) .... CONFIRM

   Refer to performance tables for V_{REF} based on arrival gross weight. Check runway requirements based on gross weight and destination field information. Ascertain N_1 and V_{APP} for use in the event of a missed approach.

7. Landing or Recognition Lights .... AS REQUIRED

NOTE

Bulb life is considerably extended by using the recognition/taxi light position.

APPROACH

1. Seats, Seat Belts, and Shoulder Harnesses.................................. SECURE

   Check seats locked in the desired position. Check seat belts snug and shoulder harnesses latched to the buckle.

2. Crew Briefing .... COMPLETE

3. Avionics and Flight Instruments .... CHECK

   Check NAV receivers on proper frequency and required heading and course information set. Crosscheck flight instruments for correct indications.

4. Minimums .... SET

   Set decision height or minimum descent altitude on REFS page 2. For VFR operation, other desired altitude may be set to provide terrain proximity warning. Baro setting minimums is recommended.

5. Passenger Advisory Lights.. PASS SAFETY

   Turns on SEAT BELT/NO SMOKING signs and emergency exit lights.

6. Passenger Seats .... CHECK FULL UPRIGHT AND OUTBOARD

   Position in accordance with associated placard.

7. Fuel Transfer .... OFF

   Check TRANSFER knob OFF and FUEL TRANSFER and FUEL BOOST ON annunciator lights extinguished.

8. Flaps .... APPROACH SETTING

   Flaps may be extended to T.O. & APPR below 200 KIAS. Check indicator to verify position.

9. Engine Synchronizer .... OFF

   Engine synchronizer should be off to prevent excessive wear with large or frequent throttle movement.

10. Thrust Attenuator Switch... AUTO

11. Antiskid Switch .... ON

12. Landing Lights.. ON

13. Annunciator Panel... CHECK

14. Pressurization .... CHECK DESTINATION ELEVATION SET

    Passing approximately 500 feet above ground level (AGL), check that the cabin pressurization indicator indicates zero differential before landing. If the differential is in excess of approximately one-half psi, select a higher landing field elevation to ascend the cabin. Any pressure existing at touchdown will be dumped by the outflow valves (actuated by the left main gear squat switch) and may cause discomfort.

BEFORE LANDING

1. Ignition.. ON

   May preclude flameout should an engine problem arise or a bird strike occur during approach and landing phase.

2. Landing Gear.. DOWN AND LOCKED

   Pulling gear handle out and moving it DOWN illuminates the HYD PRESS ON and GEAR UNLOCKED lights while gear is extending. Check three green lights (nose, left, and right) on and GEAR UNLOCKED and HYD PRESS ON lights extinguished. Maximum landing gear operating speed to extend is 250 KIAS.

3. Flaps.. LANDING SETTING

   Flaps may be extended to LAND below 161 KIAS. Flaps should be in the LAND position for all normal landings. Check indicator to verify position. Handle must be pushed in to clear T.O. & APPR detent when LAND flaps are desired.

4. Autopilot and Yaw Damper.. OFF

   Yaw damper OFF to ensure complete rudder authority to the pilot for landing. Utilize the AP/TRIM DISC button on either control wheel or the YD ENGAGE paddle on the autopilot control panel.

5. Airspeed.. V_{REF}

   Consistently comfortable and safe landings are best achieved from a stabilized approach. The point at which the airplane should be stabilized with airspeed at V_{REF} to V_{REF} +10, full flaps, and the desired descent rate, is normally coincident with commencing the final descent to landing. Under instrument conditions, this usually occurs at the final approach fix inbound.

   After passing the instrument approach fix outbound, or nearing the airport traffic area, airspeed should be reduced below 200 KIAS and the flaps extended to the T.O. & APPR (15°) position. Approaching the final instrument fix inbound (one dot from glideslope intercept on an instrument landing system [ILS] approach), or a downwind abeam position, extend the landing gear. At the point where final descent to landing is begun, extend flaps to LAND, establish the desired vertical rate, and adjust power to maintain V_{REF} to V_{REF} + 10 indicated airspeed.

   Power management during the approach/landing phase is relatively easy because an N_1 setting in the 65% to 68% range will normally result in desired indicated airspeeds for the various configurations. Depending on air traffic control requirements, thrust necessary for the entire approach can often be set during descent, keeping in mind that fan (N_1) rpm will decrease slightly for a fixed throttle setting with a decrease in altitude or indicated airspeed. Using a sea level airport with zero wind at a typical landing weight (8,500 pounds), a throttle setting that results in about 65% N_1 in close will give approximate level flight indicated airspeeds of 150 knots clean and 130 with flaps T.O. & APPR. Gear extended, flaps LAND, and commencing an average descent (500 feet per minute) will result in approximately V_{REF} airspeed. Higher field elevations, landing gross weights, and/or headwind component will require a greater power setting.

Speed control on final should be precise for optimum landing performance. This is best accomplished by establishing V_{REF} airspeed well before crossing the threshold. In gusty wind conditions, it is recommended that one-half the gust factor in excess of 5 knots be added to V_{REF}.

If landing above 12,000 feet pressure altitude, turn the OXYGEN CONTROL VALVE to CREW ONLY and turn pressurization bleed air OFF to preclude passenger mask deployment.

6. Speedbrakes .... RETRACTED PRIOR TO 50 FEET

Landing with speedbrakes extended is not approved.

NOTE

Do not allow turbine (N_2) rpm to be less than approximately 65%.

When approaching within approximately 50 feet of airport elevation, power should be gradually reduced to idle. Wind velocity and direction will dictate the rate at which the throttles are retarded. For example, in very high surface headwind conditions, it may be necessary to maintain at or near approach power until close to touchdown.

LANDING

1. Throttles .... IDLE

(Extends thrust attenuators automatically after touchdown with the thrust attenuator switch in AUTO.)

Touchdown, preceded by a slight flare, should occur on the main wheels. Check thrust at idle and lower the nosewheel.

Suggested crosswind technique involves flying a crab down final approach and aligning the longitudinal axis of the airplane to runway centerline with the rudder just before touchdown. The wide expanse of cockpit visibility makes small crab angles difficult to detect, and particular attention should be devoted to this area to achieve smooth crosswind landings.

2. Brakes .... APPLY (AFTER TOUCHDOWN)

Braking should be commenced according to runway length available to reduce brake wear. Normally with excess runway, braking is begun after aerodynamic deceleration to below 80 KIAS takes place. Apply smooth, gradually increasing pressure, until a comfortable turn-off speed is reached. For maximum braking performance, immediately after touchdown and wheel spinup, apply continuous maximum effort to the brake pedals and hold to approximately 20 knots (do not modulate brake pedals). As ground speed decays to approximately 20 knots, ease off the brake pedals). As ground speed decays to approximately 20 knots, ease off the brake pedal pressure in order to avoid tire skidding when the antiskid drops out.

CAUTION

If during landing, a hard brake pedal or no braking condition is encountered, operate the emergency brake system. Maintenance is required before next flight.

NOTE

To obtain maximum braking performance from the antiskid system, the pilot must apply continuous maximum effort (no modulation) to the brake pedals.

Dropout of the antiskid system occurs at approximately 12 knots, where braking reverts to power brake mode.

3. Flaps.. GROUND

Select GROUND by lifting the flap handle and moving it to the extreme down position; the speedbrakes will be automatically selected when the flap handle is placed in the GROUND position.

NOTE

The FLAPS >35° annunciator may illuminate and thrust attenuators may not deploy if the nose is held up for aerodynamic braking.

ALL ENGINES GO-AROUND

1. Throttles .... SET GO-AROUND THRUST

2. Airplane Pitch Attitude .... +10° (USE FLIGHT DIRECTOR GO-AROUND MODE)

3. Flaps .... APPROACH SETTING

4. Climb Speed .... V_{APP}

5. Landing Gear .... UP (WHEN POSITIVE RATE OF CLIMB IS ESTABLISHED

6. Flaps .... UP

7. Throttles .... SET MAXIMUM CONTINUOUS THRUST (MULTIENGINE)

AFTER LANDING

It is recommended that use of the checklist be delayed until the airplane is clear of the runway.

1. Flaps .... UP

   Check that the HYD PRESS ON light extinguishes after the flaps are up. Taxiing with flaps in any position, except up on a snow or slush covered taxiway, may result in obstruction of the flaps.

2. Ignition .... NORMAL

   Both IGNITION switches to NORM

3. Pitot and Static Heat .... OFF

4. Landing and Anticollision Lights...................................... AS REQUIRED

   NOTE

   Bulb life is considerably extended by using the RECOG/TAXI light position for taxi.

5. Anti-ice and Defog Systems.. AS REQUIRED

   NOTE

   High humidity conditions may require the defog and windshield bleed systems to remain on.

6. Transponder .... GRD (IF DESIRED)

7. Radar.. OFF OR STANDBY

SHUTDOWN

1. Parking Brake .... SET OR

   Wheels .... CHOCK

NOTE

If brakes are very hot, do not set parking brake.

Always check cabin differential pressure at zero before opening the door. Any pressure existing due to malfunction of the left main gear squat switch or outflow valves could cause the door to open rapidly, presenting a hazard to personnel in the vicinity.

2. Defog Fan .... OFF

   DEFOG FAN switch to the center (OFF) position.

3. Air Conditioner .... OFF

4. Flaps .... TAKEOFF AND APPROACH

   Set flaps to TAKEOFF & APPROACH to facilitate the next preflight inspection. If the airplane is to be unattended for a lengthy period or severe weather is expected, leave flaps up.

5. Standby Gyro Switch .... OFF

6. Standby Gyro .... CAGE

7. Passenger Advisory Lights .... OFF

8. Exterior Lights .... OFF

9. Avionics Power .... OFF

10. Throttles .... OFF

    (After allowing interturbine temperature (ITT) to stabilize at minimum value for 2 minutes.)

11. Flashing Beacon Light .... OFF

12. Control Lock .... ENGAGE (UNLESS AIRPLANE WILL BE TOWED)

CAUTION

Towing the airplane with the control lock engaged will damage the nosewheel steering mechanism.

13. Battery Switch .... OFF

    BATT switch to the center OFF position. Care should be exercised that it is not placed in EMER. Emergency bus items could drain the battery over a period of time.

    For deplaning at night, the battery switch may be left in BATT to make available all cabin lighting until passengers and cabin baggage are deplaned. Turning the EXTERIOR WING INSP LIGHT switch ON provides additional illumination in front of the cabin door. An illuminated courtesy light switch, located near the forward door post on the refreshment center, is wired to the hot battery bus and turns on the emergency exit lights and one forward passenger compartment light. When securing the airplane, install the engine and pitot tube covers. Check that the BATT, passenger advisory, and courtesy light switches are off.

14. Nosewheel Centering Lock Assembly....................... ENGINE LOCKING MECHANISM AND VERIFY (RED) TOW PLACARD VISIBLE (DO NOT TOW IN (GREEN) FLY POSITION)

15. Engine Oil Level .... CHECK (10 MINUTES AFTER SHUTDOWN)

16. Engine Covers.............. INSTALL (AFTER ENGINES HAVE COOLED)

    In conditions of blowing or drifting snow, install engine covers after shutdown as soon as engines cool sufficiently.

TURBULENT AIR PENETRATION

Flight through severe turbulence should be avoided if possible. The following procedures are recommended for flight in severe turbulence:

1. Ignition.. ON

2. Airspeed... APPROXIMATELY 180 KIAS DO NOT CHASE AIRSPEED

3. Maintain a constant attitude without chasing the altitude. Avoid sudden large control movements.

4. Operation of the autopilot is recommended in basic modes only (ROL and PIT only)

EXPANDED CHECKS

ROTARY TEST—WARNING SYSTEMS CHECK

See MASTER WARNING section.

DC AMPS/VOLTS—CHECK

1. L GEN OFF—L AMPS **ZERO**, R AMPS **DOUBLED**, R GEN **29V**
2. R GEN OFF—AMPS BOTH **ZERO**, BATT **25V**
3. L GEN TO GEN—L APS **DOUBLED**, R AMPS **ZERO**, L GEN **29V**
4. R GEN TO GEN—AMPS **EQUAL, 29V**
5. BATT Switch OFF— L & R AMPS **DROP SLIGHTLY** (BATT relay open), **ZERO V**
6. BATT Switch—BATT **29V**

FLAPS—CHECK and SET

1. FLAPS GROUND, 60%—SPEED BRAKES **EXTENDED**
2. BOTH THROTTLES ABOVE 85% N_2—SPEEDBRAKES **RETRACT** AND 35° **LIGHT ON**
3. THROTTLES IDLE—SPEED BRAKES **EXTENDED** AND 35° **LIGHT OFF**
4. **SET and VERIFY** FLAP POSITION for TAKEOFF and SPEED BRAKE **RETRACTED**

RUDDER BIAS SYSTEM—CHECK

1. ADVANCE LEFT THROTTLE TO **APPROXIMATELY 70% N_1**
2. VERIFY LEFT RUDDER PEDAL **MOVES FORWARD**
3. LEFT THROTTLE TO **IDLE**
4. ADVANCE RIGHT THROTTLE TO **APPROXIMATELY 70% N_1**
5. VERIFY RIGHT RUDDER PEDAL **MOVES FORWARD**
6. RIGHT THROTTLE TO **IDLE**

THRUST ATTENTUATORS—CHECK and AUTO

1. SELECT **STOW**—See White “ATTEN STOW SELECTED” light **ON**
2. ADVANCE **RH Throttle Above 85% N_2** (in stow)—See **MASTER CAUTION ON**
3. ADVANCE **LH Throttle Above 85% N_2** (in stow)—See **MASTER CAUTION ON**
4. Throttle **IDLE** and select **TEST—MASTER CAUTION ON**
5. Select **AUTO** (at idle)—See T/A Deploy, White “ATTEN UNLOCK” Light **ON**
6. ADVANCE **RH Throttle Above Idle**—T/A Stow, White “ATTEN UNLOCK” Light OFF
7. **RH Throttle Idle**—T/A Deploy, White “ATTEN UNLOCK” Light **ON**
8. ADVANCE **LH Throttle Above Idle**—T/A Stow, White “ATTEN UNLOCK” Light **OFF**
9. **LH Throttle Idle**—T/A Deploy, White “ATTEN UNLOCK” Light **ON**

ABNORMAL PROCEDURES

CONTENTS

TABLE

ABNORMAL PROCEDURES

ENGINE/FUEL

FALSE ENGINE START (ENGINE DOES NOT LIGHT)

1. Throttle .... OFF
2. Starter Disengage .... PRESS 15 SECONDS AFTER THROTTLE OFF

ENGINE STARTER WILL NOT DISENGAGE

1. Starter Disengage Button .... PRESS

If starter does not disengage and start button light remains illuminated (start relay stuck):

2. Generator Switches .... OFF
3. Battery Disconnect Switch .... BATT DISC
4. Throttle(s) .... OFF
5. Battery (Located In Tail Cone) .... DISCONNECT

HIGH SUSTAINED ITT DURING GROUND SHUTDOWN

1. Throttle .... CHECK OFF
2. Start Button .... PRESS MOMENTARILY
3. Starter Disengage .... PRESS AFTER 15 SECONDS

LOW FUEL PRESSURE (L OR R FUEL LOW PRESS CAUTION LIGHT ON AND MASTER CAUTION)

1. Fuel Boost .... ON

   Check that the fuel boost pump circuit breakers are in. Low fuel pressure should activate the boost pump automatically with the boost pump switches in NORM, but the switch should be positioned ON to ensure the pump is being powered.

2. L or R Boost Circuit Breaker (Left Panel) .... CHECK

3. Fuel Quantity .... CHECK

4. Fuel Transfer .... AS REQUIRED

   Selecting transfer will allow the use of a boost pump to pressurize the entire fuel system and should extinguish the light, as well as balancing the fuel.

LOW FUEL QUANTITY (L OR R FUEL LOW LEVEL CAUTION LIGHT ON AND MASTER CAUTION)

The illumination of this light indicates that the remaining fuel in the respective tank is 220 ±10 pounds or less.

1. Fuel Boost .... ON

   Check that the fuel boost pump circuit breakers are in and that the FUEL BOOST ON advisory lights are illuminated. To ensure uninterrupted fuel flow to the engines, the boost pump switches must be positioned to ON when the low fuel lights illuminate.

2. Land as soon as practical.

FUEL BOOST PUMP ON (L OR R FUEL BOOST ON ADVISORY LIGHT ON)

This light indicates that the respective fuel boost pump was either automatically or manually turned on.

If the fuel boost pump was not manually selected to on:

1. Fuel Boost .... ON, THEN NORM

   (Check for the FUEL LOW PRESS CAUTION light to illuminate and extinguish. The MASTER CAUTION light may flash.)

CAUTION

If the FUEL BOOST PUMP ON light remains illuminated and/or the FUEL LOW PRESS light and MASTER CAUTION flash, leave the fuel boost switch in NORM with the pump running. If low fuel pressure has caused the boost pump to trip on, turning the boost pump off could possibly result in engine flameout.

FUEL FILTER BYPASS (L OR R FUEL FLTR BYPASS CAUTION LIGHT ON AND MASTER CAUTION)

This light indicates fuel filter bypass or impending bypass.

1. Land as soon as practical.

   Consider the possibility of partial or total loss of both engines. If the FUEL FLTR BYPASS light illuminates during high altitude flight, suspect ice formation across the filter. If one FUEL FLTR BYPASS light is on, and the cause is contaminated fuel, it may be possible that the other wing fuel is also contaminated.

2. Inspect filter after landing.

   Check the tank sump and filter quick drains for water accumulation after landing and refer to the *Maintenance Manual* for additional information.

FUEL GAUGING SYSTEM FAULT (L OR R FUEL GAUGE CAUTION LIGHT ON AND MASTER CAUTION)

The illumination of this light indicates that a fault has been detected in the respective fuel gauging system. Monitor the respective fuel gauge for proper indication. This fault may also be the result of improper fuel capacitance. Check fuel after landing.

NOTE

The fuel gauging BITE control box indications should be checked prior to battery switch OFF. Record the fuel quantity in each tank at time of the fault to assist in maintenance troubleshooting.

FUEL TEMP (AMBER INDICATION)

Indicates the fuel temperature is close to, or has exceeded, fuel temperature limits. Refer to FUEL LIMITATIONS in the *Airplane Flight Manual*.

On the Ground

1. Determine if the actual fuel temperature limit is exceeded for the fuel currently in use (refer to FUEL LIMITATIONS in the *Airplane Flight Manual*).

2. If fuel temperature is outside published limits, correct situation prior to flight.

In Flight

If fuel temperature is below minimum limit

1. Engine Instruments....................................... CONTINUE TO MONITOR fuel and oil temperatures

2. Land as soon as practical.

NOTE

- May indicate a failure of the fuel-oil heat exchanger (engine oil is not being cooled by the fuel).
- Higher than normal oil temperatures on affected side may occur.

If fuel temperature is above maximum limit

1. Throttle (affected engine) .... REDUCE

2. Engine Instruments....................................... CONTINUE TO MONITOR fuel and oil temperatures

NOTE

Hot fuel may be the result of abnormally-high engine temperatures on affected side.

3. Land as soon as practical.

NOTE

- If fuel temperature is high, consider possible engine flameout due to vaporization.
- Expect fuel temperatures to increase as fuel quantity decreases.

FUEL TRANSFER (FUEL TRANSFER ADVISORY LIGHT ON)

This light indicates that the fuel transfer is operational. This is normal during transfer operation. The supply tank FUEL BOOST ON annunciator will also be illuminated.

If the fuel transfer illuminates when transfer is not selected:

1. Fuel Boost .... BOTH ON OR BOTH OFF

2. Fuel Balance .... MONITOR

GROUND IDLE (GROUND IDLE ADVISORY LIGHT ON)

On the Ground

1. Normal indication with the GND IDLE switch in the NORMAL position.

In Flight

Illumination of this light in flight indicates that the engines may reduce to ground idle speed if the throttle is retarded to the IDLE stop. Engine acceleration time to go-around thrust may be increased in this condition.

1. GND IDLE .... HIGH
2. ENGINE SYNC .... OFF

After Landing

1. GND IDLE .... NORMAL

ENGINE INDICATING SYSTEM

N_1, N_2, AND FLAG (YELLOW DASHES IN DIGITAL READOUT)

1. DCU PRI, DCU SEC, and
   EDC Circuit Breakers (Affected Side Panel) .... CHECK
2. Refer to standby N_1 indicator as required.

ITT FAILURE (NO POINTER AND FAIL DISPLAYED ON ITT TAPE)

1. DCU PRI, DCU SEC, and
   EDC Circuit Breakers (Affected Side Panel) .... CHECK

LOSS OF OIL PRESSURE INDICATION (NO POINTERS DISPLAYED)

1. DCU PRI and DCU SEC
   Circuit Breakers (Affected Side Panel) .... CHECK
2. Throttle (Affected Engine) .... REDUCE POWER AS DESIRED

If OIL PRESS WARN L or R light on and MASTER WARNING:

3. Throttle (Affected Engine) .... OFF

4. Accomplish Engine Failure/Precautionary Shutdown checklist.

LOSS OF OIL TEMPERATURE INDICATION (NO POINTERS DISPLAYED)

1. DCU PRI and DCU SEC
   Circuit Breakers (Affected Side Panel).. CHECK

LOSS OF FUEL QUANTITY INDICATION (NO POINTER AND YELLOW DASHES IN DIGITAL READOUT)

1. DCU PRI, DCU SEC and FUEL QTY
   Circuit Breakers (Affected Side Panel).. CHECK

LOSS OF FUEL FLOW INDICATION (YELLOW DASHES IN DIGITAL READOUT)

1. DCU PRI, DCU SEC, and FUEL FLOW
   Circuit Breakers (Affected Side Panel).. CHECK

ENGINE COMPARATOR MONITOR (YELLOW ITT, N_1 OR N_2 DISPLAYED ON INDICATOR)

1. Engine Instruments .... MONITOR

2. Standby N_1 Indicator .... UTILIZE AS REQUIRED

NOTE

The arrow indicates the side causing the miscompare.

The standby N_1 indicator utilizes the direct output from the N_1 monopole.

LOSS OF ENGINE COMPARATOR MONITOR (WHITE ENG1, ENG2 DISPLAYED ON PFD)

This light indicates that all sources of engine information may not be available and that the comparator monitor is inoperative.

1. Engine Instruments .... MONITOR

ELECTRICAL

SINGLE GENERATOR FAILURE (L OR R GEN OFF CAUTION LIGHT ON AND MASTER CAUTION)

1. Electrical Load .... REDUCE AS REQUIRED (300 AMPS MAX THROUGH 41,000 FEET) (250 AMPS MAX GND AND ABOVE 41,000 FEET)

2. Air Conditioner .... OFF OR FAN

3. Failed Generator .... CHECK SWITCHES AND CIRCUIT BREAKERS; RESET AS REQUIRED

   Rotating the voltage selector knob to the appropriate position may aid in isolating the problem. If the voltage is normal, it indicates that the generator power relay has tripped due to reverse current or undervoltage, and generator reset is unlikely. A reading of zero indicates that the generator field relay has tripped due to an overvoltage. In this case, a reset may be possible.

If unable to reset:

4. Failed Generator .... OFF

AFT J-BOX CIRCUIT BREAKER NOT ENGAGED (AFT J-BOX CB CAUTION LIGHT ON AND MASTER CAUTION)

This indicates that the left or right start control aft J-box circuit breaker(s) is(are) disengaged.

On the Ground

1. Correct prior to flight. Respective engine cannot be started.

In Flight

1. Respective engine can be started only using a windmilling airstart.

225-AMP CURRENT LIMITER BLOWN (AFT J-BOX LMT CAUTION LIGHT ON AND MASTER CAUTION)

The aft J-box left or right current limiter circuit breaker is disengaged, indicating a probable blown current limiter. Normal generator power is available to the respective buses, but the crossfeed bus will not supply power to the respective bus from the battery or from the opposite generator in the event of a generator failure.

On the Ground

1. Correct prior to flight.

In Flight

1. Be prepared for loss of left or right extension and associated buses in the event of a generator failure.

ENVIRONMENTAL/PRESSURIZATION

BLEED AIR OVERHEAT (L OR R BLD AIR O'HEAT CAUTION LIGHT ON AND MASTER CAUTION)

Illumination of this light indicates that a malfunction has caused the bleed air, leaving the respective precooler, to exceed allowable temperature. This would likely occur if engine, wing and/or windshield anti-ice is on and/or, the precooler door actuator is failed closed and engine power is high.

1. Throttle, Affected Engine .... REDUCE

   (Maintain rpm greater than 75% N_2 if WING/ENG anti-ice is selected on.)

NOTE

When the overheat occurs, the wing anti-ice valve on the side of the overheat, if on, will automatically shutoff and cycle.

If overheat occurs during single-engine operation when throttle reduction is not practical, and all anti-ice systems are on, the copilot's windshield bleed-air manual valve should be closed to reduce the amount of bleed air required.

If the annunciator will not extinguish when engine rpm is reduced, the problem is likely to be a faulty temperature sensor. Bleed temperature at lower rpm is not hot enough to trip the sensor.

FRESH AIR SELECTED (FRESH AIR CAUTION LIGHT ON AND MASTER CAUTION)

Indicates that the air source selector is set to the FRESH AIR position.

CAUTION

The airplane will not pressurize in the fresh air mode.

ENVIRONMENTAL SYSTEM AIR DUCT OVERHEAT (AIR DUCT O'HEAT CAUTION LIGHT ON AND MASTER CAUTION)

1. TEMP Circuit Breaker (Left Panel) .... RESET

   The TEMP control circuit breaker on the left circuit-breaker panel must be in for automatic temperature control.

If auto temperature select in hot position

2. Auto Temperature Select .... SELECT lower temperature

If light does not go out (30 seconds maximum)

3. Auto Temperature Select... MANUAL
4. Manual Hot/Manual Cold Switch .... MANUAL COLD

   Hold in this position until overheat light goes out (30 seconds maximum).

If light goes out

5. Auto Temperature Select .... AUTO

   (Select a cooler temperature.)

NOTE

If the AIR DUCT O'HEAT light illuminates again, select MANUAL on auto temperature selector and control temperature with the MANUAL HOT/MANUAL COLD switch.

If light does not go out

5. Air Source Select .... L or R

   Reduce power on selected engine, if necessary.

CABIN PRESSURIZATION CONTROLLER FAILURE

If the cabin does not pressurize after takeoff:

1. Thrust Attenuator Switch .... STOW

NOTE

Failure of the cabin to pressurize after takeoff indicates possible failure of a squat switch in the ground mode, which could result in thrust attenuators being deployed in flight.

If the cabin altitude is not being maintained:

1. Pressurization Control .... MANUAL

   Control cabin altitude with the MANUAL toggle valve.

If cabin pressure is maintained, but amber FAIL annunciator in pressure controller is illuminated (probable loss of air data computer input, autoschedule inoperative):

1. Pressurization Controller .... SELECT CA (CABIN ALTITUDE) OR FL (FLIGHT LEVEL)

2. Pressurization SET ALT Knob........................ AS DESIRED (FL OR CA)

3. Prior to Descent .... SET ALT KNOB (CA, DESTINATION PRESSURE ALTITUDE + 200 FEET)

CABIN DOOR PRESSURE SEAL FAILURE (DOOR SEAL LIGHT ON AND MASTER CAUTION)

Illumination indicates that the cabin door primary seal pressure is too low to maintain the door seal integrity. A secondary seal should maintain pressurization.

1. Descend to 31,000 feet (or lower).

2. Oxygen Masks .... DON AND NORMAL (IF ABOVE 24,000 FEET)

3. Passenger Advisory Light .... PASS SAFETY

4. Descend below 15,000 feet as soon as practical.

EMERGENCY PRESSURIZATION ON (EMERG PRESS ON CAUTION LIGHT ON AND MASTER CAUTION)

Illumination indicates that the emergency pressurization system has been turned on at the air source select switch.

ENVIRONMENTAL SYSTEM CABIN OVERHEAT

1. TEMP Circuit Breaker (Left Panel) .... RESET
2. Auto Temperature Select.. MANUAL
3. Manual Hot/Manual Cold .... MANUAL COLD (HOLD FOR AT LEAST 30 SECONDS FOR MAXIMUM COLD)

If no change in temperature occurs:

4. Windshield Bleed Valves .... CLOSED
5. Air Source Select.. EMER

NOTE

Pressurization air will enter the cabin through the cockpit air distribution system (footwarmers, side panels, and defog). EMER pressurization air will be controlled at approximately 120°F.

If still no change in temperature:

6. Altitude.. DESCEND AS SOON AS PRACTICAL
7. Air Source Select....................................... FRESH AIR IF NECESSARY (CABIN WILL DEPRESSURIZE)

USE OF SUPPLEMENTAL OXYGEN (UNPRESSURIZED)

1. Oxygen Masks.. NORMAL BELOW 25,000 CABIN ALTITUDE

   100% AT OR ABOVE 25,000 FEET

   ENSURE CREW AND PASSENGERS ARE RECEIVING OXYGEN

2. Cabin Altitude.. MAX 25,000 FEET WITH PASSENGERS

   MAX 40,000 FEET CREW ONLY

3. Oxygen .... CHECK ENDURANCE (REFER TO FIGURE 3-4)
4. Range .... COMPUTE

   (Based on oxygen endurance and revised fuel flow and groundspeed.)

FLIGHT CONTROLS

ELECTRIC ELEVATOR TRIM RUNAWAY

1. Autopilot/Trim Disengage Switch .... PRESS
2. PITCH TRIM Circuit Breaker (Left Panel)....................................... PULL
3. Manual Elevator Trim .... AS REQUIRED

ELECTRIC ELEVATOR TRIM INOPERATIVE

1. PITCH TRIM Circuit Breaker (Left Panel) .... CHECK

If still inoperative:

2. Manual Elevator Trim .... AS REQUIRED

NOTE

Do not attempt to use the autopilot if the electric trim is inoperative. The autopilot will not be able to trim out servo torque, and disengaging the autopilot could result in a significant pitch upset.

JAMMED ELEVATOR TRIM TAB

Cruise

NOTE

The procedure required will vary with the airspeed at the time the jammed condition occurs. It is best to maintain the trimmed speed as long as possible without exceeding 275 KIAS or approximately 10 pounds of elevator force. When nearing the airport or when more than 10 pounds of force is required, regardless of altitude, initiate the following procedures:

1. Throttles.. IDLE
2. Speedbrakes .... DEPLOY
3. Landing Gear... DOWN (BELOW 250 KIAS)
4. Airspeed.. REDUCE

   (Elevator force will reduce as airspeed is reduced.)

5. Wing Flaps .... TAKEOFF AND APPROACH (BELOW 200 KIAS)

6. Speedbrakes .... RETRACT

   (Below 140 KIAS speedbrakes may be used as desired. Elevator force will increase slightly.)

7. Airspeed .... 140 KIAS

8. Wing Flaps .... Landing Setting

   (Elevator force will increase slightly if flaps LAND is selected.)

NOTE

Do not attempt to use the autopilot if the electric trim is inoperative. The autopilot will not be able to trim out servo torque, and disengaging the autopilot could result in a significant pitch upset.

Takeoff or Go-Around

1. Reduce power as necessary to maintain 140 KIAS or less. Do not change flap position. Minimum speed is V_{REF} for selected landing flap setting or $V_{REF(35)}$ + 18 KIAS for flaps 0° or unknown. Do not retract landing gear. Land as soon as practical.

RUDDER BIAS SYSTEM VALVE CLOSED (RUDDER BIAS CAUTION LIGHT ON AND MASTER CAUTION)

On Ground

1. RUDDER BIAS Circuit Breaker (Left Panel).................................. PULL

2. Correct condition prior to flight.

In Flight

1. RUDDER BIAS Circuit Breaker (Left Panel).................................. PULL

2. Flight may be continued in a normal manner.

NOTE

With the rudder bias system inoperative, rudder pedal force and/or directional trim required for single-engine operation will be significantly increased.

RUDDER BIAS UNCOMMANDED MOTION (LEFT OR RIGHT RUDDER PEDAL MOVED FORWARD)

Uncommanded Motion during Ground Operation

1. Rudder Pedal Deflection .... OVERPOWER AS REQUIRED TO MAINTAIN DIRECTIONAL CONTROL
2. RUDDER BIAS Circuit Breaker (Left Panel) .... PULL
3. Correct condition prior to flight.

Uncommanded Motion during Takeoff or In Flight

1. Rudder Pedal Deflection .... OVERPOWER AS REQUIRED TO MAINTAIN DIRECTIONAL CONTROL
2. Climb to and/or maintain a safe altitude.
3. RUDDER BIAS Circuit Breaker (Left Panel) .... PULL
4. Flight may be continued in a normal manner.

NOTE

With the rudder bias system inoperative, rudder pedal force and/or directional trim required for single-engine operation will be significantly increased.

ICE AND RAIN PROTECTION

ENGINE OR WING ANTI-ICE FAILURE (L OR R ENG AND/OR L OR R WING ANTI-ICE CAUTION LIGHT ON AND MASTER CAUTION)

Illumination of this light indicates that the engine inlet or wing leading edge temperature is below safe level for satisfactory ice protection. This is normal when engine/wing anti-ice is first actuated until normal temperature is achieved, and if engine speed is reduced below approximately 75% N_2. Once the engine inlet and/or wing leading edge has obtained normal temperature, subsequent illumination of the annunciator will illuminate the MASTER CAUTION. Illumination of the WING ANTI-ICE L or R light may also indicate wing overtemperature. In this case, the wing anti-ice will automatically shut off and cycle back on when the overtemperature condition has cleared. This condition should not occur except on the ground at high power settings with ENGINE and WING ANTI-ICE on.

In Flight (Steady Illumination)

1. Throttle.. INCREASE POWER (ABOVE 75% N_2)

2. Wing/Engine Anti-ice Controls....................... CHECK SWITCHES AND ENGINE ANTI-ICE CIRCUIT BREAKERS (LEFT PANEL)

If ENGINE ANTI-ICE light remains on (after two minutes):

3. ENGINE Anti-ice Circuit Breaker (Left Panel) .... PULL

NOTE

The respective WING and ENGINE ANTI-ICE annunciators will be inoperative and the wing/engine anti-ice valves will open. The wing/engine anti-ice switch should remain in WING/ENG to operate the pylon inlet heater.

4. Monitor engine inlet or leave the icing environment as soon as possible.

If only WING ANTI-ICE remains on:

3. Affected Wing/Engine Anti-ice Switch.................................. WING/ENG

4. Wing Crossflow Switch... WING XFLOW

5. Leave icing environment as soon as possible.

If light(s) do not extinguish or reilluminate:

5. Leave icing environment as soon as possible.

6. After leaving the icing environment, reset the circuit breaker (if applicable) and select anti-ice switches to OFF.

NOTE

If landing in icing environment, use Anti-ice On procedures.

If only the WING ANTI-ICE light is on and WING/ENG ANTI-ICE switch is selected to OFF:

This indicates an overheat condition for respective wing leading edge.

1. Wing Crossflow Switch... WING XFLOW

2. Respective Engine .... REDUCE POWER AS MUCH AS FEASIBLE

3. Land as soon as practical.

NOTE

If landing in icing environment, use Anti-ice On procedures.

WINDSHIELD BLEED-AIR FAILURE

If loss of hot air supply (valve will not open or possible line failure):

1. Windshield Bleed-Air Switch and Valves .... OFF

2. Windshield Alcohol Anti-ice .... AS REQUIRED

3. Leave icing environment as soon as possible.

NOTE

Ten minutes of alcohol available to pilot's windshield only.

WINDSHIELD AIR OVERHEAT (W/S AIR O'HEAT CAUTION LIGHT ON AND MASTER CAUTION)

The windshield bleed-air system will be inoperative while the W/S AIR O'HEAT light is illuminated.

If windshield bleed switch on LOW or HI (air flow cycles off and on):

1. If Windshield Bleed-Air Switch is HI .... SELECT LOW

NOTE

If the controller has detected an overtemp and shut off the windshield bleed air, the system will cycle back on when the air temperature cools. Increased airspeed and selecting warmer cabin may improve controller efficiency and eliminate the overtemp condition. Satisfactory anti-ice will be provided under most icing conditions while the system cycles.

If satisfactory anti-ice is not maintained:

2. W/S BLEED AIR Circuit Breaker (Left Panel) .... PULL

3. Windshield Bleed Manual Valves .... ADJUST TO MINIMUM FLOW

NOTE

Use of emergency pressurization will reduce effectiveness of windshield anti-ice.

CAUTION

If continuing airflow air will still be too hot, but flow will be reduced. Monitor windshield for evidence of heat damage and close windshield manual valves if evidence occurs.

4. Windshield Alcohol Anti-ice .... AS REQUIRED

5. Leave icing environment as soon as possible.

NOTE

Ten minutes of alcohol available to the pilot's windshield only.

If continued illumination (not cycling, probable controller failure):

1. Windshield Bleed-Air Manual Valves .... OFF OR REDUCE TO MINIMUM FLOW TO MAINTAIN ADEQUATE VISIBILITY

CAUTION

If continuing airflow air will still be too hot, but flow will be reduced. Monitor windshield for evidence of heat damage and close windshield manual valves if evidence occurs.

2. Windshield Alcohol Anti-ice .... AS REQUIRED

3. Leave icing environment as soon as possible.

NOTE

Ten minutes of alcohol available to the pilot's windshield only.

If the windshield bleed switch is off:

This will indicate that there is a probable solenoid valve failure or leak. Windshield air temperature is not regulated. Windshield heat damage is possible. Maintenance is required.

1. Windshield Bleed-Air Manual Valves.. OFF

PITOT-STATIC HEATER FAILURE (L OR R P/S HTR OFF, CAUTION LIGHT ON AND MASTER CAUTION)

1. Pitot-Static Switch .... CHECK

   Check that the PITOT & STATIC ANTI-ICE switch is on and that the L and R PITOT STATIC circuit breakers are in.

2. PITOT-STATIC Circuit Breaker (Left Panel) .... CHECK

3. AP XFR... PUSH (IF REQUIRED)

   Select side with operative pitot-static heat.

NOTE

The altitude hold, altitude select, vertical speed hold, and indicated airspeed hold functions may be inoperative if the pilot's or copilot's pitot-static system fails. The autopilot can reference the pilot's or copilot's pitot static system. Therefore, use the operative side for the autopilot reference.

ANGLE-OF-ATTACK HEATER FAILURE (AOA HTR FAIL CAUTION LIGHT ON AND MASTER CAUTION)

Indicates that the angle-of-attack heating element, located in the AOA sensor, has failed.

1. Pitot-Static Switch .... CHECK

2. AOA HEATER Circuit Breaker (Left Panel)............................ CHECK IN

3. Leave icing environment as soon as practical.

WARNING

Do not reduce airspeed below V_{REF} (for selected landing flap setting) or $V_{REF(35)}$ + 18 (flaps up). If the AOA probe becomes iced, the stick shaker may not function.

TAIL DEICE TIMER FAILURE (L OR R TAIL DEICE ADVISORY ANNUNCIATOR FAILS TO ILLUMINATE OR CONTINUES TO CYCLE)

If the annunciator(s) fails to illuminate:

1. Tail Deice Switch.. CHECK POSITION
2. Tail Deice Circuit Breaker .... CHECK IN
3. Tail Deice Switch .... MANUAL

   (Repeat at 3 to 5 minute intervals or as required if the stabilizer can be seen.)

If the tail deice boots fail to inflate:

4. Accomplish TAIL DEICE Failure procedure.

   If the tail deice boots continue to cycle with the tail deice switch in the off position (tail deice advisory light cycles):

1. TAIL DEICE Circuit Breaker (Left Panel)....................................... PULL
2. Reset the TAIL DEICE circuit breaker as needed to actuate the system.

   Reset and pull periodically (3 to 5 minutes).

3. Leave icing environment as soon as practical.

TAIL DEICE FAILURE (TAIL DEICE FAIL CAUTION LIGHT ON AND MASTER CAUTION)

1. Throttles .... INCREASE POWER (AS REQUIRED ABOVE 75% N_2)
2. Tail Deice Switch .... OFF, THEN AUTO OR MANUAL

If tail deice fail light remains on:

3. Leave icing environment as soon as possible.

If it cannot be verified that there is no ice on the horizontal stabilizer:

4. Do not exceed 15° flaps.

INADVERTENT ICING ENCOUNTER

1. Wing/Engine Anti-ice .... ENG ON OR WING/ENG

2. Windshield Anti-ice and Tail Deice .... AS REQUIRED

SEVERE ICING ENCOUNTER

Severe icing may be encountered at temperatures as cold as –18°C. Increased vigilance is required at temperatures around 0°C ambient air temperature with visible moisture present.

NOTE

The following weather conditions may be conducive to severe inflight icing:

- Visible rain at temperatures colder than 0°C ambient air temperature.
- Droplets that splash or splatter at temperatures colder than 0°C ambient air temperature.

If severe icing is present:

Severe icing conditions are indicated by one or more of the following visual cues:

- Unusually extensive ice accumulations on the airframe and windshield in areas not normally observed to collect ice.
- An accumulation of ice on the upper surface of the wing aft of the protected area.

1. Immediately request priority handling from Air Traffic Control to facilitate exiting the severe icing conditions.

2. Flaps .... LEAVE IN CURRENT POSITION (DO NOT EXTEND OR RETRACT)

3. Autopilot .... DISENGAGE

CAUTION

Be prepared for control wheel force required to maintain desired flightpath.

4. Avoid abrupt and excessive maneuvering that may aggravate control problems.

5. If Unusual Or Uncommanded Roll Is Encountered .... REDUCE ANGLE OF ATTACK

FLIGHT GUIDANCE—SINGLE PFD

PILOT PFD FAILURE (BLANK DISPLAY)

1. Display Reversion .... SELECT REV TO MFD

COPILOT EADI FAILURE (RED ATT DISPLAYED OR BLANK DISPLAY)

1. Continue flight referring to standby instruments and pilot PFD.

NOTE

If RED ATT is displayed, the autopilot will not engage.

COPILOT EHSI FAILURE (RED HDG DISPLAYED OR BLANK DISPLAY)

1. Continue flight referring to pilot PFD.

NOTE

If RED HDG is displayed, autopilot will not engage and standby HSI will be inoperative.

MFD FAILURE (BLANK DISPLAY)

1. Display Reversion .... SELECT REV TO PFD

2. Engine Instruments .... MONITOR PFD OR STANDBY N_1 INDICATOR

PFD AND MFD FAILURE (BLANK DISPLAY)

1. Continue flight referring to standby instruments.

2. Engine Instruments..MONITOR STANDBY N_1 INDICATOR

3. Land as soon as practical.

PFD ATTITUDE/AHRS FAILURE (YELLOW AP, RED ATT, AND WHITE XAHS DISPLAYED)

1. AHRS Reversion.. AHRS REV

NOTE

Autopilot will not engage. Flight director will not be displayed.

2. Land as soon as practical.

DUAL ATTITUDE/AHRS FAILURE (YELLOW AP, RED ATT, AND WHITE XAHS DISPLAYED ON PFD; RED ATT ON EADI)

1. Airplane Attitude.. CONTROL BY REFERENCE TO STANDBY ATTITUDE GYRO

2. Heading .... REFERENCE MAGNETIC COMPASS IF STANDBY HSI FLAGGED

3. Land as soon as practical.

PFD HEADING/AHRS FAILURE (YELLOW AP, RED HDG, AND WHITE XAHS DISPLAYED)

1. AHRS Reversion.. AHRS REV

NOTE

Autopilot will not engage. Flight director will not be displayed.

2. Land as soon as practical.

DUAL HEADING/AHRS FAILURE (YELLOW AP, RED HDG, AND WHITE XAHS DISPLAYED ON PFD; RED HDG ON EHSI)

1. Heading .... REFERENCE MAGNETIC COMPASS

2. Land as soon as practical.

IN FLIGHT AHRS ALIGNING (WHITE ATT/HDG ALIGNING ON PFD)

1. Maintain straight and level attitude and constant airspeed.

2. Valid attitude and heading information should be available within 45 seconds.

STANDBY HSI HEADING FAILURE (RED HDG DISPLAYED)

1. STDBY HSI Circuit Breaker (Right Panel) .... CHECK

2. AHRS 2 and AHRS 2 STBY PWR Circuit Breakers (Right Panel) .... CHECK

3. Heading .... REFERENCE MAGNETIC COMPASS, IF REQUIRED

AIR DATA COMPUTER FAILURE (RED IAS/ALT/VS DISPLAYED ON PFD)

1. Airspeed and Altitude... REFER TO STANDBY AND COPILOT INSTRUMENTS

2. Transponder Select Switch .... SELECT XPNDR #2

3. Land as soon as practical.

CAUTION

Depending on the cause of the failure, the pressurization controller may be in barometric mode.

NOTE

The flight director will not display. The autopilot will engage in basic pitch and roll mode.

COPILOT ALTIMETER FAILURE

1. Altitude .... REFER TO STANDBY AND PILOT INSTRUMENTS

2. Transponder Select Switch .... SELECT XPNDR #1

3. Land as soon as practical.

CAUTION

Depending on the cause of the failure, the pressurization controller may be in barometric mode.

ADC AND COPILOT ALTIMETER FAILURE

1. Airspeed and Altitude .... REFER TO STANDBY AIRSPEED/ALTIMETER AND COPILOT AIRSPEED

2. Land as soon as practical.

CAUTION

Depending on the cause of the failure, the pressurization controller may be in barometric mode.

NOTE

The flight director will not display. The autopilot will engage in basic pitch and roll mode. Transponder altitude reporting will be inoperative.

COMPARATOR MONITOR ALERT (YELLOW ROL, PIT, ATT, AND HDG)

Indicates that the data between the appropriate systems does not agree within comparator limits.

1. Pilot and Copilot Attitude, Altitude, and Airspeed .... MONITOR

2. Autopilot/Trim Disengage Switch .... PRESS

LOSS OF COMPARATOR MONITOR ALERTS (WHITE XAHS)

Indicates a lack of comparator monitor capability.

1. Pilot and Copilot Attitude, Altitude, and Airspeed .... MONITOR

FLIGHT GUIDANCE COMPUTER FAILURE (RED-BOXED FD DISPLAYED)

NOTE

Only on-side references may be used for flight guidance operation. Selection of AHRS or DADC reversion on the coupled side during normal operation will result in flight guidance computer failure (FD).

FD will annunciate with APPR captured and the loss of glide-slope information.

Vertical and lateral modes with a yellow strike-through line indicate the autopilot is in basic pitch and roll.

1. Selected Autopilot Modes .... RESELECT TO ACHIEVE ANNUNCIATION OF PITCH AND ROLL

2. L and R FGC Circuit Breakers (Right Panel) .... CHECK

AFD CROSSTALK FAILURE (YELLOW XTLK DISPLAYED)

Indicates that the data displayed on the PFD and MFD may not be synchronized.

1. PFD/MFD .... VERIFY INFORMATION IS SET AS DESIRED

LOW SPEED CUE (LSC) AOA FAILURE (RED AOA1 OR AOA2 DISPLAYED)

Indicates that the AOA information is not valid.

1. Airspeed.. V_{REF} DURING APPROACH

CAUTION

V_{REF} must be based on the aircraft weight and flap setting. LSC may not be used as a primary source of V_{REF}.

NOTE

The default LSC indication is a default yellow vertical line displayed on top of the impending stall speed (ISS) checkerboard. The yellow vertical line represents the minimum and maximum stall speeds: 71 knots to 102 knots.

DISPLAY CONTROL PANEL FAILURE (RED DCP 1 DISPLAYED)

All functions controlled by the DCP and by the course heading panel (CHP) will be inoperative.

PANEL AVIONICS FAN FAILURE (FAN 1 AND/OR FAN 2 AMBER LIGHT ON)

FAN 1 Light Illuminated (Below COMM 1 Control Knob)

Indicates that one or both of the internal cooling fans in the panel radio stack has failed. No limit applies, however, and radio service life may be extended by turning off unused radios, particularly during ground operations.

FAN 2 Light Illuminated (Below COMM 2 Control Knob)

Indicates that the primary cooling fan for the panel radios has failed.

1. Unnecessary Radios .... OFF

FLIGHT GUIDANCE—DUAL PFD

PILOT PFD FAILURE (BLANK DISPLAY)

1. Display Reversion .... SELECT REV TO MFD

COPILOT PFD FAILURE (BLANK DISPLAY)

1. Continue flight referring to standby instruments and pilot PFD.

2. PFD PRIM, HTR Circuit Breakers (Right Panel) .... CHECK

3. Pressurization Controller .... CHECK/SET

CAUTION

Depending on the cause of the failure, the ADC may be inoperative and the pressurization controller may be in barometric mode.

MFD FAILURE (BLANK DISPLAY)

1. Display Reversion ....SELECT REV TO PFD
2. Engine Instruments .... MONITOR PFDS OR STANDBY N_1 INDICATOR

DUAL PFD AND MFD FAILURE (BLANK DISPLAY)

1. Continue flight referring to standby instruments.
2. Engine Instruments.. MONITOR STANDBY N_1 INDICATOR
3. Land as soon as practical.

AUTOPILOT OUT OF TRIM (YELLOW-BOXED "E↑,↓" OR "A←,→" DISPLAYED ON PFDS)

CAUTION

Do not manually overpower the autopilot. Overpowering the autopilot does not cancel the autotrim. The autotrim will trim against flightcrew inputs to the column/wheel. This could lead to a severe out-of-trim condition. If manual control of the aircraft is required, disengage the autopilot with the autopilot/trim disengage button.

If momentary illumination occurs:

Indication of an elevator (yellow-boxed "E") or aileron (yellow-boxed "A") mistrim condition.

1. Autopilot/Trim Disengage Switch .... PRESS (IF ELEVATOR TRIM NOT IN MOTION)

CAUTION

Be prepared for control wheel force required to maintain desired flightpath.

2. Elevator or Aileron Trim .... ADJUST AS REQUIRED
3. Autopilot .... ENGAGE AS DESIRED

If continuous illumination occurs:

1. Control Wheel .... GRIP WITH BOTH HANDS

CAUTION

Be prepared for high control forces to maintain desired flightpath.

2. Autopilot/Trim Disengage Switch .... PRESS
3. Elevator or Aileron Trim .... ADJUST AS REQUIRED
4. Autopilot .... ENGAGE AS DESIRED

AUTOPILOT OVERSPEED RECOVERY (YELLOW FLC OVRSPD MODE)

1. Throttles.. IDLE
2. Speedbrakes .... EXTEND (AS DESIRED)
3. Autopilot.. RESELECT VERTICAL MODE AFTER FLC OVRSPD EXTINGUISHES

NOTE

IAS or Mach reference cannot be adjusted by the pitch wheel in FLC OVRSPD.

The selection of any vertical mode except altitude hold is inhibited in FLC OVRSPD.

FLC OVRSPD provides a pitch up command to decelerate the airplane and maintain V_{MO}/M_{MO}.

SINGLE ATTITUDE/AHRS FAILURE (YELLOW AP, RED ATT, AND WHITE XAHS DISPLAYED)

1. AHRS Reversion (Affected Side) .... AHRS REV
2. AP XFR .... PUSH (SELECT SIDE WITH OPERATING AHRS)
3. Autopilot Mode Selectors...................................... Select modes as desired
4. Land as soon as practical.

NOTE

Autopilot will not engage. Flight director will not be displayed unless the side with the operating AHRS is selected.

DUAL ATTITUDE/AHRS FAILURE (YELLOW AP, RED ATT, AND WHITE XAHS DISPLAYED)

1. Airplane Attitude.. CONTROL BY REFERENCE TO STANDBY ATTITUDE GYRO
2. Heading .... REFERENCE MAGNETIC COMPASS
3. Land as soon as practical.

SINGLE HEADING/AHRS FAILURE (YELLOW AP, RED HDG, AND WHITE XAHS DISPLAYED)

1. AHRS Reversion (Affected Side) ....AHRS REV
2. AP XFR .... PUSH (SELECT SIDE WITH OPERATING AHRS)
3. Autopilot Mode Selectors .... SELECT MODES AS DESIRED
4. Land as soon as practical.

NOTE

Autopilot will not engage. Flight director will not be displayed unless the side with the operating AHRS is selected.

DUAL HEADING/AHRS FAILURE (YELLOW AP, RED HDG, AND WHITE XAHS DISPLAYED)

1. Heading .... REFERENCE MAGNETIC COMPASS
2. Land as soon as practical.

IN FLIGHT AHRS ALIGNING (WHITE ATT/HDG ALIGNING)

1. Maintain straight and level attitude and constant airspeed.
2. Valid attitude and heading information should be available within 45 seconds.

STANDBY HSI HEADING FAILURE (RED HDG DISPLAYED)

1. STDBY HSI Circuit Breaker (Right Panel).................................. CHECK
2. AHRS 2 and AHRS 2 STBY PWR Circuit Breakers (Right Panel)... CHECK
3. Heading.. REFERENCE MAGNETIC COMPASS, IF REQUIRED

SINGLE AIR DATA COMPUTER FAILURE (RED IAS/ALT/VS DISPLAYED)

1. ADC Reversion (Affected Side)... DADC REV
2. AP XFR .... PUSH (SELECT SIDE WITH OPERATING ADC)
3. Autopilot Mode Selector........................ SELECT MODES AS DESIRED
4. Transponder Select Switch .... SELECT XPNDR ON SIDE WITH OPERATING ADC
5. Land as soon as practical.

CAUTION

Depending on the cause of the failure, the pressurization controller may be in barometric mode.

NOTE

The flight director will not display and the autopilot will engage in basic pitch and roll mode, unless the side with the operating ADC is selected with AP XFR.

DUAL AIR DATA COMPUTER FAILURE (RED IAS/ALT/VS DISPLAYED)

1. Airspeed and Altitude... REFER TO STANDBY AIRSPEED/ALTIMETER
2. Land as soon as practical.

CAUTION

Depending on the cause of the failure, the pressurization controller may be in barometric mode.

NOTE

The flight director will not display and the autopilot will engage in basic pitch and roll mode. Transponder altitude reporting will be inoperative.

COMPARATOR MONITOR ALERT (YELLOW ROL, PIT, ATT, HDG, ALT, AND IAS)

Indicates that the data between the appropriate systems does not agree within comparator limits.

1. Pilot and Copilot Attitude, Altitude, and Airspeed .... MONITOR

2. Autopilot/Trim Disengage Switch .... PRESS

LOSS OF COMPARATOR MONITOR ALERTS (WHITE XAHS OR XADC)

Indicates lack of comparator monitor capability.

1. Pilot and Copilot Attitude, Altitude, and Airspeed .... MONITOR

FLIGHT GUIDANCE COMPUTER FAILURE (RED-BOXED FD DISPLAYED)

NOTE

Only on-side references may be used for flight guidance operation. Selection of AHRS or DADC reversion on the coupled side during normal operation will result in flight guidance computer failure (FD).

FD will annunciate with APPR captured and the loss of glide-slope information.

Vertical and lateral modes with a yellow strike through the line indicate that the autopilot is in basic pitch and roll.

1. Selected Autopilot Modes .... RESELECT TO ACHIEVE ANNUNCIATION OF PITCH AND ROLL

2. L and R FGC Circuit Breakers (Right Panel) .... CHECK

3. AP XFR .... SELECT SIDE WITH OPERATIONAL ADC OR AHRS

4. Autopilot Modes .... RESELECT AS DESIRED

FLIGHT DIRECTOR ALERT (YELLOW FD1 OR FD2 DISPLAYED)

Indicates a lack of independent flight guidance during an ILS approach or go-around.

ILS Approach

1. NAV Radios .... SELECT ILS FREQUENCY ON OFF-SIDE NAV

Go-Around

1. Flight Directors .... UTILIZE FLIGHT DIRECTOR WITH GA MODE ANNUNCIATED

AFD CROSSTALK FAILURE (YELLOW XTLK DISPLAYED)

Indicates that the data displayed on the PFD and MFD may not be synchronized.

1. PFDs/MFD .... VERIFY INFORMATION IS SET AS DESIRED

LOW SPEED CUE (LSC) AOA FAILURE (RED AOA1 OR AOA2 DISPLAYED)

Indicates that the AOA information is not valid.

1. Airspeed .... V_{REF} (DURING APPROACH)

CAUTION

V_{REF} must be based on aircraft weight and flap setting. LSC may not be used as a primary source of V_{REF}.

NOTE

The default LSC indication is a default yellow vertical line displayed on top of the impending stall speed (ISS) checkerboard. The yellow vertical line represents the minimum and maximum stall speeds: 71 knots to 102 knots.

DISPLAY CONTROL PANEL FAILURE (RED DCP 1 OR DCP 2 DISPLAYED)

If DCP1 is displayed:

1. AP XFR .... PUSH, IF REQUIRED (SELECT COPILOT SIDE)

2. Copilot DCP .... UTILIZE TO CONTROL DCP FUNCTIONS DISPLAYED ON THE COPILOT PFD AND REFERENCE SPEEDS/N_1 ON BOTH PFDs

NOTE

The course heading panel (CHP) will be inoperative.

If DCP 2 is displayed:

1. AP XFR .... PUSH, IF REQUIRED (SELECT PILOT SIDE)

2. Pilot DCP and CHP .... UTILIZE TO CONTROL DCP FUNCTIONS DISPLAYED ON THE PILOT PFD AND REFERENCE SPEEDS/N_1 ON BOTH PFDs

NOTE

The copilot course knob panel (CKP) will be inoperative.

PANEL AVIONICS FAN FAILURE (FAN 1 AND/OR FAN 2 AMBER LIGHT ON)

FAN 1 Light Illuminated (Below COMM 1 Control Knob)

Indicates that one or both of the internal cooling fans in the panel radio stack has failed. No limit applies, however, and radio service life may be extended by turning off unused radios, particularly during ground operations.

FAN 2 Light Illuminated (Below COMM 2 Control Knob)

Indicates that the primary cooling fan for the panel radios has failed.

1. Unnecessary Radios .... OFF

HYDRAULICS/BRAKES

LANDING GEAR WILL NOT EXTEND

1. Airspeed.. BELOW V_{LO} (250 KIAS)
2. GEAR CONTROL Circuit Breaker (Left Panel) .... CHECK
3. Landing Gear Handle.. CHECK DOWN

If handle fails to move from the up position or gear will not extend:

4. GEAR CONTROL Circuit Breaker (Left Panel).......................... PULL
5. Auxiliary Gear Control .... PULL T-HANDLE AND ROTATE TO LOCK

NOTE

Landing gear free-fall may take up to 20 seconds to achieve all three downlock lights.

6. Rudder.......................... YAW AIRPLANE, IF NECESSARY, TO ACHIEVE DOWNLOCK LIGHT
7. Auxiliary Gear Control .... PULL KNOB TO BLOWDOWN (FOR POSITIVE LOCK)

NOTE

Pneumatic pressure should be used to assure positive locking of all three gear actuators.

CAUTION

Prior to using the emergency extension, the landing gear handle must be down and/or the gear control circuit breaker pulled to prevent possible energizing of the gear hydraulic system to the retract position.

Once the emergency gear extension system has been used, do not attempt to raise the gear.

If the gear handle remains up, power brakes and antiskid are inoperative.

LANDING GEAR WILL NOT RETRACT (GEAR UNLOCK LIGHT REMAINS ON)

1. Airspeed.. BELOW V_{LO} (200 KIAS)
2. GEAR CONTROL Circuit Breaker (Left Panel)........................... CHECK
3. Landing Gear Handle.. CHECK UP

If the gear retracts:

4. Continue flight.

If the gear does not retract:

4. Thrust Attenuator Switch .... STOW

NOTE

Failure of the gear to retract after takeoff indicates a possible failure of a squat switch in the ground mode. This could result in the thrust attenuators being deployed in flight.

5. Landing Gear Handle.. POSITION DOWN
6. Downlock Lights .... VERIFY ALL ILLUMINATED
7. Land as soon as practical.

LOW HYDRAULIC FLOW (L AND/OR R HYD FLOW LOW CAUTION LIGHT ON AND MASTER CAUTION)

Indicates an inoperative pump or cavitated pump(s).

NOTE

One or both pumps may cavitate for a short time following maneuvering at near zero or less than zero G. Cavitated pumps should be inspected for damage prior to next flight.

Single Failed Pump

1. Land as soon as practical (to preclude further pump damage).

Both Pumps Failed (Total Hydraulic Failure)

NOTE

Landing gear, flaps, and speedbrakes will be inoperative.

1. Land as soon as practical (to preclude further pump damage).

2. Accomplish Landing Gear Will Not Extend and Flaps Inoperative Approach and Landing procedures.

WARNING

If the thrust attenuators(s) unlock(s), it (they) will not automatically restow and cannot be stowed using the thrust attenuator stow switch. Do not reduce airspeed below stick shaker speed. (Engine thrust above idle is not affected by deployed attenuator(s) as the attenuator is blown stowed by the engine thrust.)

HYDRAULIC SYSTEM REMAINS PRESSURIZED (HYD PRESS ON ADVISORY LIGHT REMAINS ON AFTER SYSTEM CYCLE IS COMPLETED)

Indicates that the hydraulic system is pressurized. The white HYD PRESS ON advisory light will illuminate normally when the speedbrakes, landing gear or flaps are in transit, or the thrust attenuators are being stowed. If the HYD PRESS ON light remains on after a cycle of one of these systems is complete or illuminates at any other time, action must be taken to preclude damage to the hydraulic system.

NOTE

During normal operation, thrust attenuators may creep out slightly from the stowed position, resulting in a brief pressurization of the hydraulic system. No action should be taken unless the MASTER CAUTION is illuminated.

If not due to system normal operational:

1. Last System Used.. RECYCLE (SPEEDBRAKES, LANDING GEAR, FLAPS OR THRUST ATTENUATORS)

2. SPEEDBRAKE Control Circuit Breaker (Left Panel) .... PULL

3. GEAR CONTROL Circuit Breaker (Left Panel)............................... PULL

4. FLAP CONTROL Circuit Breaker (Left Panel)................................ PULL

5. L and/or R THRUST ATTEN Circuit Breaker (Left Panel).............. PULL

If the system is depressurized:

6. Circuit Breakers .... RESET (ONE AT A TIME)

Leave pulled circuit breaker that caused the system to depressurize.

7. Land as soon as practical. Reset pulled circuit breaker prior to landing.

WARNING

If the thrust attenuator circuit breaker(s) is (are) pulled, the thrust attenuator(s) may unlock. Handling characteristics near stall are degraded. Do not slow airspeed below stick shaker speed.

If the system remains pressurized (indicating that the bypass valve has failed):

6. Circuit Breakers .... RESET (ONE AT A TIME)

7. Land as soon as possible. If the system bypass valve fails, the hydraulic system may overheat.

ANTISKID SYSTEM FAILURE (ANTISKID INOP CAUTION LIGHT ON, MASTER CAUTION, AND POWER BRAKE LOW PRESS CAUTION LIGHT OUT)

1. Antiskid Switch .... ON

2. SKID CONTROL and BRAKE
   SYSTEM Circuit Breakers (Left Panel).. RESET

If the light remains on:

3. Antiskid Switch.. OFF

4. Multiply normal FLAPS LAND landing distance by 1.4.

CAUTION

Differential power braking is available. However, since the antiskid is inoperative, excessive pressure on the brake pedal may cause wheelbrakes to lock, resulting in a tire blowout.

5. Be prepared to use the emergency brake system.

NOTE

If the antiskid hydraulic pump fails after the accumulator pressure exceeds 900 psi, the POWER BRAKE LOW PRESS light may not illuminate until normal brakes are used.

DISPATCH WITH ANTISKID SYSTEM INOPERATIVE (ANTISKID INOP CAUTION LIGHT ON, MASTER CAUTION, AND POWER BRAKE LOW PRESSURE CAUTION LIGHT OUT)

CAUTION

Differential power braking is available. However, since the antiskid is inoperative, excessive pressure on the brake pedals may cause wheel brakes to lock, resulting in tire blowout.

Takeoff

1. Multiply the Flaps 15° takeoff field lengths obtained from *AFM* Takeoff Distance Charts, ANTI-ICE ON/OFF by 1.6.

NOTE

Flaps 0° takeoff with inoperative antiskid system is prohibited.

2. Antiskid Switch .... OFF
3. Throttles .... SET for takeoff
4. Engine Instruments .... CHECK
5. Annunciator Panel .... VERIFY only ANTISKID INOP advisory light on
6. Brakes .... RELEASE

Landing

1. Multiply the landing distance obtained from *AFM* Landing Distance Charts by 1.4.
2. Prior to Landing ....Accomplish Normal Procedures, APPROACH, BEFORE LANDING and LANDING checklist

POWER BRAKE SYSTEM FAILURE (PWR BRK LOW PRESS AND ANTISKID INOP CAUTION LIGHTS ON AND MASTER CAUTION)

1. SKID CONTROL and BRAKE SYSTEM Circuit Breakers (Left Panel).. RESET

If the lights remain on:

2. Plan to use the emergency brake system for landing.

3. Multiply normal FLAPS LAND landing distance by 1.3.

4. Brake Pedals... REMOVE FEET FROM BRAKE PEDALS

   If the brakes are depressed while the emergency airbrakes are actuated, high pressure air will bypass the shuttle valve and possibly rupture the brake fluid reservoir.

5. Emergency Brake Handle...................................... PULL AS REQUIRED

CAUTION

The antiskid system does not function during emergency braking. Excessive pressure on the emergency brake handle can cause both wheelbrakes to lock, resulting in the blowout of both tires.

After landing, clear the runway and stop. Do not attempt to taxi onto the ramp using the emergency brakes.

NOTE

Best performance can be obtained by using a smooth, steady, continuous pull of the handle to obtain the desired deceleration rate. Multiple pulls and releases of the handle will deplete the nitrogen charge.

WHEELBRAKE FAILURE

1. Brake Pedals... REMOVE FEET FROM BRAKE PEDALS

   If the brakes are depressed while the emergency airbrakes are actuated, high pressure air will bypass the shuttle valve and possibly rupture the brake fluid reservoir.

2. Emergency Brake Handle...................................... PULL AS REQUIRED

Pulling the emergency brake handle will apply equal pressure to both brakes. A fully serviced (1,800 to 2,050 psi) emergency air bottle holds enough air for approximately 18 full brake applications if the landing gear has not been blown down, since each brake application takes approximately 100 psi. Lowering the landing gear by the emergency air method requires approximately 1,000 psi, leaving approximately 800 psi (approximately eight brake applications) available for emergency braking. Excessive modulation should be avoided. Best results are obtained using slow, steady pressure until the airplane is stopped. Although differential braking is not available, directional control can be easily maintained utilizing nose gear steering, rudder and aileron. Do not attempt to taxi into tight spaces or on a crowded ramp with only emergency brakes, due to the possibility of depleting the air bottle while moving.

CAUTION

The antiskid system does not function during emergency braking. Excessive pressure on the emergency brake handle can cause both wheelbrakes to lock, resulting in the blowout of both tires.

After landing, clear the runway and stop. Do not attempt to taxi onto the ramp using the emergency brakes.

- Landing distance will increase by a factor of 1.3.

NOTE

Best performance can be obtained using a smooth, steady, continuous pull of the handle to obtain the desired deceleration rate. Multiple pulls and releases of the handle will deplete the nitrogen charge.

ATTENUATOR UNLOCKED (L AND/OR R ATTEN UNLOCK ADVISORY LIGHT ON)

Indicates that the respective thrust attenuator is not in the stowed (locked) position. Position is normal, if on the ground, if the attenuator switch is in AUTO and the throttles are at idle.

On the Ground—Throttle Not at Idle

1. Correct condition prior to flight.

In Flight

1. Thrust Attenuator Switch .... STOW

If attenuator does not stow:

2. Use caution during approach. The thrust attenuator will deploy at low thrust settings and blow back at higher thrust.

3. Accomplish normal Approach and Before Landing procedures, except the thrust attenuator switch remains in STOW.

WARNING

Handling characteristics near stall are degraded. Do not reduce airspeed below stick shaker speed if the thrust attenuator(s) is (are) deployed.

DISPATCH WITH ATTENUATOR STOWED (ATT STOW SELECTED ADVISORY LIGHT ON)

Takeoff

1. Multiply the takeoff field lengths obtained from the AFM 0°/15° FLAP, ANTI-ICE ON/OFF by 1.05.

2. Throttles.. IDLE

3. Thrust Attenuator Switch .... STOW

4. ATTEN UNLOCK Advisory Lights .... EXTINGUISHED

5. ATTEN STOW SELECTED Advisory Light .... ON

6. Throttles.. SET for takeoff

7. Master Caution .... PUSH to cancel

8. Engine Instruments .... CHECK

9. Annunciator Panel...................................... VERIFY only ATTEN STOW SELECTED advisory light ON

10. Brakes .... RELEASE

Landing

1. Use the landing distance obtained from AFM Landing Distance Charts.

2. Accomplish Normal APPROACH and BEFORE LANDING procedures except thrust attenuator switch remains in STOW. ATTEN STOW SELECT advisory light will be on.

ATT STOW SELECTED ADVISORY LIGHT ON AND MASTER CAUTION

1. Thrust Attenuator Switch.. AUTO

   Unless STOW was selected due to an attenuator malfunction (refer to Attenuator Unlocked procedure).

SPEEDBRAKES EXTENDED (SPD BRK EXTEND ADVISORY LIGHT ON)

Indicates that both L and R wing speedbrakes are in the fully extended position.

ABNORMAL APPROACH AND LANDING

FLAPS INOPERATIVE APPROACH AND LANDING (NOT IN LANDING POSITION)

1. FLAP CONTROL Circuit Breaker (Left Panel) .... CHECK

If the flaps remain inoperative:

2. Landing Data and N_1 (Table AP-1).. CONFIRM

   Reduce the maximum landing weight and multiply normal FLAPS LAND landing distance by applicable factor from Figure 3-3 in the FAA-approved *Flight Manual*.

3. Airspeed........................ FLAPS 0° OR UNKNOWN, $V_{REF(35)}$ + 18 KIAS

   FLAPS 0° OR UNKNOWN, $V_{REF(35)}$ + 25 KIAS (IF RESIDUAL ICE IS ON THE AIRPLANE)

   FLAPS 15°, $V_{REF(35)}$ +8 KIAS

   FLAPS 60° (GROUND FLAPS), $V_{REF(35)}$

4. Seats, Seat Belts, and Shoulder Harnesses.................................. SECURE

CAUTION

If a flap system failure causes the flaps to extend to the ground flap (60°) position in flight and the flaps will not retract, execute a normal landing. Use caution not to reduce power early, as a high sink rate may result. Do not exceed 140 KIAS with flaps at 60°.

Table AP-1. LANDING DISTANCE FACTORS—FLAPS INOPERATIVE

FLAPS DEGREES	ALTITUDE—FEET: SL THROUGH 3000		3001 THROUGH 6000		6001 THROUGH 8000		ABOVE 8000	
	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by
0° *	0 lbs.	1.45	500 lbs.	1.45	740 lbs.	1.45	970 lbs.	1.45
15° *	330 lbs.	1.25	830 lbs.	1.25	1,130 lbs.	1.25	1,100 lbs.	1.25
60°	0 lbs.	1.0	0 lbs.	1.0	0 lbs.	1.0	0 lbs.	1.0
0° with residual ice *	520 lbs.	1.5	990 lbs.	1.5	Prohibited	Prohibited	Prohibited	Prohibited

* Downhill and/or tailwind landings prohibited.

If an angle-of-attack indexer is installed, fly "on speed" indication, crosschecking with the airspeed indicator. Due to the increased airspeed and low drag configuration, the airplane will have an increased tendency to "float" in ground effect. To counter this, the airplane should be flown onto the runway, using only a slight flare to break the rate of descent. Touchdown attitude will be flatter than normal and speed should not be in excess of V_{APP}, V_{REF} or V_{REF} + 15 KIAS, as required. Landing field length increases approximately 100% for a no-flap landing.

5. Avionics and Flight Instruments .... CHECK
6. Minimums .... SET
7. Passenger Advisory Lights.. PASS SAFETY
8. Passenger Seats... CHECK FULL UPRIGHT AND OUTBOARD
9. Fuel Transfer .... OFF
10. Engine Synchronizer .... OFF
11. Thrust Attenuator Switch.. AUTO
12. Antiskid Switch.. ON

13. Landing Lights .... ON

14. Annunciator Panel .... CHECK

15. Pressurization .... CHECK (DESTINATION ELEVATION SET

16. Crew Briefing .... COMPLETE

17. Ignition .... ON

18. Landing Gear .... DOWN AND LOCKED

NOTE

Refer to Landing Gear Will Not Extend procedure if both hydraulic pumps have failed.

19. Autopilot and Yaw Damper .... OFF

20. Speedbrakes .... RETRACTED PRIOR TO 50 FEET

FLAPS GREATER THAN 35° (FLAPS > 35° CAUTION LIGHT ON AND MASTER CAUTION)

On Ground

The FLAPS > 35° light will illuminate and activate the MASTER CAUTION if the flaps are extended beyond 35° (e.g., to ground flap) and both throttles are advanced beyond approximately 85% N_2. There is an 8-second delay in flight in order to prevent nuisance illuminations during landing, such as when GROUND FLAPS is selected before the squat switch becomes made.

1. DO NOT ATTEMPT TO TAKE OFF.

2. Flaps .... SET AS APPROPRIATE

NOTE

The FLAPS > 35° annunciator is disabled on the ground with throttles below approximately 85% N_2.

In Flight

1. Flap Selector Position .... VERIFY

If flaps have gone beyond 35°:

2. Flaps .... SELECT LESS THAN 35°

3. Airspeed... 140 KNOTS OR LESS

4. If flaps remain beyond 35°, accomplish Flaps Inoperative Approach and Landing procedures.

LANDING WITH A FAILED PRIMARY FLIGHT CONTROL CABLE

Rudder

1. Utilize rudder trim.

2. After touchdown, lower the nose and deploy ground flaps as soon as possible.

Lower the nose in order to provide nosewheel steering to override trim.

Aileron

1. Use the rudder for directional control, limiting bank angle to 15° maximum. Do not use aileron trim, except for gross adjustments.

2. If possible, choose a runway with the least possible crosswind.

3. After touchdown, lower the nose and deploy ground flaps as soon as possible.

Elevator

1. Use the manual elevator trim wheel for primary pitch control. Do not use electric trim.

2. Make small pitch and power changes and set up landing configuration early.

3. After landing, select ground flaps and brake as soon as possible.

SINGLE-ENGINE APPROACH AND LANDING

Crew Briefing—Complete

1. Seats, Seat Belts, and Shoulder Harnesses .... SECURE
2. Landing Data and N_1 Settings .... CONFIRM
3. Avionics and Flight Instruments .... CHECK
4. Minimums .... SET
5. Passenger Advisory Lights .... PASS SAFETY
6. Passenger Seats .... CHECK FULL UPRIGHT AND OUTBOARD
7. Fuel Transfer .... CHECK
8. Flaps .... Approach Setting
9. Engine Synchronizer .... OFF
10. Thrust Attenuator Switch .... AUTO
11. Antiskid .... CHECK ON
12. Landing Lights .... ON
13. Annunciator Panel .... CHECK
14. Pressurization .... CHECK (DESTINATION ELEVATION SET)
15. Ignition (Operating Engine) .... ON
16. Landing Gear .... DOWN AND LOCKED
17. Autopilot and Yaw Damper .... OFF
18. Airspeed .... V_{APP} MINIMUM
19. Speedbrakes .... RETRACTED
20. Flaps .... LANDING SETTING (WHEN LANDING ASSURED)
21. Airspeed .... V_{REF}

SINGLE-ENGINE GO-AROUND

1. Throttle (Operating Engine) .... TAKEOFF THRUST
2. Airplane Pitch Attitude .... 10° (GO-AROUND MODE ON FLIGHT DIRECTOR FOR REFERENCE)
3. Flaps .... APPROACH SETTING

NOTE

The landing gear warning horn cannot be silenced if the landing gear is retracted prior to the flaps reaching the approach position.

4. Climb Speed .... V_{APP} MINIMUM
5. Landing Gear....................................... UP (WHEN POSITIVE RATE OF CLIMB IS ESTABLISHED)
6. Flaps (When Clear of Obstacles)................ RETRACT ACCELERATING TO V_{ENR} (V_T)
7. Climb Speed.. V_{ENR} (V_T)
8. Thrust ....MAXIMUM CONTINUOUS SINGLE ENGINE

DOOR NOT LOCKED (DOOR NOT LOCKED CAUTION LIGHT ON AND MASTER CAUTION)

Indicates unlocked (key) nose or tail cone doors, failure or improper position of one or more door switches, and/or possible disengagement of the lower forward cabin door pin.

On the Ground

1. Correct condition prior to flight.

In Flight

1. Airspeed... REDUCE
2. Passenger Advisory Light .... PASS SAFETY
3. Cabin Door .... KEEP CLEAR

4. Descend to a lower altitude.

5. Land as soon as practical.

MASTER WARNING LIGHT ON STEADY OR FLASHING, NO WARNING LIGHTS ILLUMINATED

1. Master Warning .... PRESS TO RESET

2. WARNING LTS I and II Circuit Breakers (Left Panel)................. CHECK

3. Instruments (Electrical and Engine) .... MONITOR

MASTER CAUTION LIGHT ON STEADY, NO CAUTION LIGHTS ILLUMINATED

1. Thrust Attenuator Switch.. CHECK

NOTE

In flight, if the thrust attenuators are selected stowed, the ATTN STOW SELECT advisory light is illuminated, the flaps are extended beyond 15°, and the MASTER CAUTION light will illuminate.

2. MASTER CAUTION... PRESS TO RESET

3. WARNING LTS I and II Circuit Breakers (Left Panel)................. CHECK

4. Instruments (Electrical and Engine) .... MONITOR

FIREWALL SHUTOFF VALVE CLOSED (F/W SHUTOFF CAUTION LIGHT ON AND MASTER CAUTION)

Indicates that the applicable engine fire switch has been pushed. All electrical, fuel, and hydraulic systems are closed at the applicable firewall.

ANNUNCIATOR VIDEO FAILURE (VIDEO FAIL LIGHT ON AND MASTER CAUTION AND WARNING LIGHTS REMAIN ON)

Indicates failure of the visual annunciator test. Pressing either of the MASTER WARNING RESET switches for 2 to 3 seconds will cause the annunciator to leave the test mode and resume operation, until the cause of the test failure can be determined.

ANNUNCIATOR AUDIO FAILURE (AUDIO FAIL LIGHT ON)

Indicates failure of the audio annunciator test.

1. Rotary Test Switch .... CHECK OVERSPEED AND LANDING GEAR WARNING

CAUTION

One or more audio/tone warnings may be inoperative.

EMERGENCY PROCEDURES

CONTENTS

ILLUSTRATIONS

EMERGENCY PROCEDURES

ENGINE

Numbered steps enclosed in boxes in this section are immediate action items and should be committed to memory.

ENGINE FAILURE OR FIRE OR MASTER WARNING DURING TAKEOFF

Speed Below V_1—Takeoff Should Be Aborted

1. Brakes .... AS REQUIRED
2. Throttles .... IDLE
3. Speedbrakes .... EXTEND

If engine fire:

4. Accomplish Engine Fire procedure.

If engine failure:

4. Accomplish Engine Failure/Precautionary Shutdown procedure.

NOTE

To obtain maximum braking performance from the antiskid system, the pilot must apply continuous maximum effort (no modulation) to the brake pedals.

The takeoff field lengths assume that the pilot has maximum effort applied to the brakes at the scheduled V_1 speed during the aborted takeoff.

Speed above V_1:

1. Maintain directional control.
2. Accelerate to V_R.
3. Rotate at V_R; climb at V_2.
4. Gear .... UP (AFTER POSITIVE RATE OF CLIMB)
5. At 1,500 feet AGL or minimum safe altitude, retract flaps at V_2 + 10 and accelerate to V_{ENR} (V_T).

If engine fire:

6. Accomplish Engine Fire procedure.

If engine failure:

6. Accomplish Emergency Restart One Engine or Engine Failure/Precautionary Shutdown procedure.

ENGINE FAILURE/PRECAUTIONARY SHUTDOWN

1. Throttle (Affected Engine) .... OFF

   Any one or more of the following indications might suggest a precautionary shutdown: abnormal or rising interturbine temperature (ITT), engine vibration, fan/turbine rpm fluctuating or abnormally high or low, abnormal oil pressure, abnormal oil temperature or erratic fuel flow. Circumstances will normally dictate whether to continue to operate the engine with possible further damage or shut it down. If the throttle is reduced when airspeed is below 130 KIAS (copilot's indicator) and the landing gear is set up, the gear warning will sound and can be silenced with the horn silence switch. Cabin pressure altitude may rise at the single-engine flow rate of 4 ppm. Selecting the affected engine throttle OFF, selects the operating FCV to 8 ppm, normal flow rate for normal pressurization.

2. Ignition (Affected Engine) .... NORM
3. Engine Synchronizer .... OFF
4. Generator (Affected Engine) .... OFF
5. Electrical Load .... REDUCE AS REQUIRED (300 AMPERES MAXIMUM)

6. Fuel Transfer .... AS REQUIRED

   Do not exceed 200 pounds asymmetric fuel load. If no fire hazard exists, leave the firewall shutoff OPEN and turn the boost pump on to prevent damage to the engine-driven fuel pump. If the engine windmills with the firewall shutoff CLOSED or with no indication of oil pressure, after landing, refer to the *Engine Maintenance Manual*.

7. Engine Fire Switch
   (Affected Engine) .... LIFT COVER AND PUSH (IF SEVERE ENGINE FAILURE OR FIRE OCCURRED)

NOTE

If no fire hazard or engine damage exists, leave firewall shutoff OPEN and turn boost pump on to prevent damage to the engine fuel pump. If the engine windmills with the firewall shutoff CLOSED or with no indication of oil pressure, after landing, refer to the *Engine Maintenance Manual*.

8. Fuel Boost (Affected Engine) .... ON (IF FIREWALL SHUTOFF NOT CLOSED)

9. Land as soon as possible. Refer to Single Engine Approach and Landing procedure.

If icing conditions exist:

10. Affected Engine Anti-ice... WING/ENG

11. Wing Crossflow Switch... WING XFLOW

NOTE

The ENG ANTI-ICE annunciator on the affected engine side will be on continuously after the engine inlet temperature sensor cools to 10°C (50°F) or below. L and R WING ANTI-ICE annunciators will function normally.

12. Operating Engine Anti-ice Switch... ENG ON OR WING/ENG, AS REQUIRED

13. Windshield Anti-ice and Tail Deice .... AS REQUIRED

14. Leave icing environment as soon as possible.

ENGINE FAILURE DURING COUPLED APPROACH

1. Power (Operating Engine) .... INCREASE, AS REQUIRED
2. Airspeed .... V_{APP}
3. Flaps .... APPROACH SETTING

4. Rudder Trim .... TRIM TOWARD OPERATING ENGINE, AS DESIRED

   The yaw change will be relatively small since the operating engine is at an approach power setting.

5. Throttle (Affected Engine) .... OFF
6. If engine fire, accomplish Engine Fire procedure.
7. Crew Briefing .... COMPLETE
8. Fuel Transfer .... CHECK
9. Ignition (Operating Engine)... ON
10. Landing Gear... DOWN AND LOCKED
11. Annunciator Panel... CHECK

    With one engine shut down by the throttle, the appropriate OIL PRESS WARN, GEN OFF, FUEL BOOST ON (if the FUEL BOOST pump switch is ON), and HYD FLOW LOW lights will be on. If the engine is shut down by the firewall shutoff switch, the appropriate F/W SHUTOFF, OIL PRESS WARN, FUEL LOW PRESS, GEN OFF, and HYD PRESS WARN lights will be on. The low fuel pressure will turn on the fuel boost pump, but in this case, it should be manually placed to OFF. When the throttle is placed to CUTOFF, the FUEL LOW PRESS light will extinguish. In either case, if the MASTER WARNING light is flashing, it should be extinguished to reduce distraction.

12. Autopilot and Yaw Damper... OFF (AT OR ABOVE MINIMUMS)
13. Flaps .... LANDING SETTING (WHEN LANDING ASSURED)

    At the pilot's discretion, flaps may be left at TO & APPR or lowered to LAND. If TO & APPR flaps are used, maintain V_{REF} + 10 KIAS (or "on speed" angle of attack). LAND flaps are used under most conditions, since little pitch change is encountered when they are selected and touchdown speed can be reduced.

14. Airspeed .... V_{REF}

15. Speedbrakes .... RETRACTED PRIOR TO 50 FEET

    Landing with speedbrakes extended is not authorized.

ENGINE FIRE (L OR R ENGINE FIRE WARNING LIGHT/SWITCH ILLUMINATED)

1. Throttle (Affected Engine) .... IDLE

   Check for the fire light to extinguish. A bleed-air leak at high power can cause the fire light to illuminate. If the throttle is reduced when airspeed is below 130 KIAS (copilot's airspeed indicator) and the landing gear is up, the landing gear warning will sound and can be silenced by pressing the horn silence button.

If the light remains on:

2. Engine Fire Switch .... LIFT COVER AND PUSH

   Pushing this switch cuts off fuel to the engine, hydraulic fluid supply to the engine-driven pump, trips the generator field, positions a valve to allow both bottles to be fired into the affected engine, and illuminates the bottle armed lights.

3. Either Illuminated Bottle Armed Light .... PUSH

4. Ignition (Affected Engine) .... NORM

If ignition is in the ON position, return the switch to NORM.

5. Throttle (Affected Engine) .... OFF

6. Reduce Electrical Load .... AS REQUIRED (300 AMPERES MAXIMUM) THROUGH 41,000 FEET
250 AMPS ABOVE 41,000 FEET

7. Fuel Boost (Affected Engine) .... OFF, THEN NORM

   If the pump is in the ON position, return the switch to OFF and then to NORM.

8. Land as soon as possible.

If the FIRE warning light is on after 30 seconds:

9. Remaining Illuminated Bottle Armed Light .... PUSH

10. Land as soon as possible.

If icing conditions exist:

11. Engine Anti-ice (Affected Engine) .... ENG ON OR WING/ENG

12. Wing Crossflow Switch .... WING XFLOW

NOTE

The ENG ANTI-ICE annunciator on the affected engine side will be on continuously after the engine inlet temperature sensor cools to 10°C (50°F) or below. L and R WING ANTI-ICE annunciators will function normally.

13. Operating Engine Anti-ice Switch .... ENG ON OR WING/ENG, AS REQUIRED

14. Windshield Anti-ice and Tail Deice .... AS REQUIRED

15. Leave icing environment as soon as possible.

If the light goes out and secondary indications are not present:

2. Land as soon as practical.

EMERGENCY RESTART—ONE ENGINE

Refer to Figure 3-1 in the FAA-approved *Airplane Flight Manual* or Figure EP-1 for airstart envelope.

Following Shutdown with Starter Assist

NOTE

If the engine is to be shut down for intentional airstarts, it should be allowed to cool at idle for 3 minutes prior to shutdown, and then allowed to cool for 5 minutes while shut down, prior to restarting.

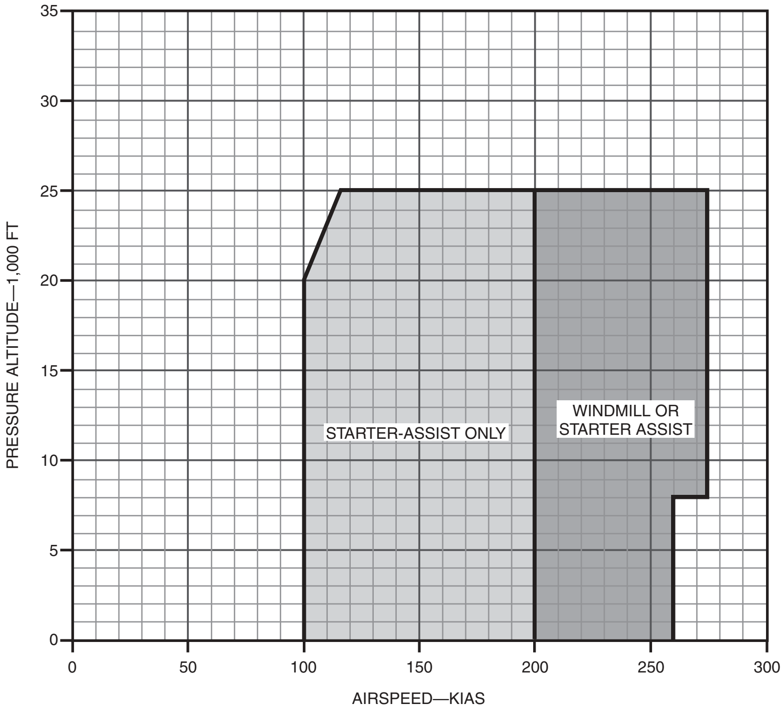

Figure EP-1. Airstart Envelope

1. Throttle (Affected Engine) .... OFF
2. Generator (Affected Engine) .... GEN
3. Anti-ice (Affected Engine) and Air Conditioning .... OFF
4. Firewall Shutoff (Affected Engine) .... CHECK OPEN
5. Ignition (Affected Engine) .... ON
6. Start Button (Affected Engine) .... PRESS MOMENTARILY

   Generator cross-start is disabled with weight off the left main gear squat switch to preclude generator damage from excessive N_2 rpm on the operating engine.

7. Throttle (Affected Engine) .... IDLE AT 8% N_2 (TURBINE) RPM (MINIMUM) AND INDICATION OF N_1 ROTATION

8. Engine Instruments .... MONITOR

NOTE

At low airspeeds, ITT may reach 1,000°C. The ITT must be monitored so as not to exceed the limits of Figure EP-1. Intentional (training) started-assisted airstarts should be conducted above 150 KIAS to ensure a cooler start temperature and prolong engine life.

If start occurs:

9. After Engine Stabilizes, Fuel Boost and Ignition (Affected Engine)... NORM

10. Anti-ice and Air Conditioning... AS DESIRED

It may be necessary to select the associated generator RESET position momentarily to reinstate the generator following a windmilling airstart. Maximum start interturbine temperature is 1,000°C for 5 seconds (Figure LIM-4).

NOTE

At low airspeeds, ITT may approach 1,000°C. The ITT must be monitored so as not to exceed the limits of Figure LIM-4. Intentional starter-assisted airstarts should be conducted above 150 KIAS to ensure cooler start temperature and prolong engine life.

If the engine is to be shut down for intentional airstarts, it should be allowed to cool at idle for 3 minutes prior to shutdown, and then allowed to cool 5 minutes while shut down, prior to restarting.

If start does not occur:

9. Starter Disengage Switch... PRESS

10. Accomplish Engine Failure/Precautionary Shutdown procedure.

Following shutdown—windmilling with airspeed above 200 KIAS.

NOTE

If the engine is to be shutdown for intentional airstarts, it should be allowed to cool at idle for three minutes prior to shutdown and then allowed to cool for five minutes while shutdown prior to restarting.

1. Throttle (Affected Engine) .... OFF

2. Firewall Shutoff (Affected Engine) .... CHECK OPEN

3. Anti-Ice (Affected Engine) and Air Conditioning .... OFF

4. Ignition (Affected Engine) .... ON

5. Fuel Boost (Affected Engine) .... ON

   Associated engine ignition and boost pump switches must be selected ON since automatic sequencing and selection of these functions does not occur when the start button is not utilized.

6. Throttle (Affected Engine) .... IDLE at 8% N_2 (Minimum) and indication of N_1 rotation

   Maintaining above 240 KIAS, place throttle to IDLE.

7. Engine Instruments .... MONITOR

If start occurs

8. After engine stabilizes—Fuel Boost and Ignition (Affected Engine) .... NORM

9. Generator (Affected Engine) .... GEN

10. Anti-Ice and Air Conditioning.. AS DESIRED

If start does not occur

8. Accomplish ENGINE FAILURE/PRECAUTIONARY SHUTDOWN procedure.

EMERGENCY RESTART—TWO ENGINES

Refer to Figure 3-1 in the FAA-approved *Airplane Flight Manual* for airstart envelope.

1. Ignition .... BOTH ON
2. Fuel Boost .... BOTH ON

   Engine ignition and boost pump switches must be selected to the ON position, since automatic sequencing and selection of these functions does not occur when the start button is not utilized.

3. Throttles .... IDLE

   Throttles to IDLE for attempted immediate light-off.

4. If Altitude Allows.......... INCREASE AIRSPEED TO 200 KIAS

   Possibilities of immediate start are increased if airspeed is over 240 KIAS.

5. Firewall Shutoff .... CHECK BOTH OPEN
6. All Anti-ice Switches and Air Conditioner .... OFF

   They are turned OFF to minimize engine bleed-air losses.

If N_2 speed is less than 8%:

7. Either Start Button .... PRESS MOMENTARILY

If start occurs:

8. Opposite Engine Start Button .... PRESS MOMENTARILY

If start does not occur:

8. Starter Disengage Switch .... PRESS
9. Opposite Engine Start Button .... PRESS MOMENTARILY

If either or both engines start:

10. After Engine(s) Stabilize; Fuel Boost and Ignition .... NORM
11. Generator(s) .... GEN

12. Anti-ice and Air Conditioning .... AS DESIRED

13. Accomplish Engine Failure/Precautionary Shutdown procedure if one engine did not start.

If neither engine starts:

10. Accomplish Maximum Glide—Emergency Landing procedure.

MAXIMUM GLIDE—EMERGENCY LANDING

1. Airspeed .... 150 KIAS

NOTE

Maximum glide airspeed is 130 KIAS at 12,000 pounds, decreasing approximately 4 KIAS per 500-pound decrease in weight. However, the turbines may not windmill, to provide hydraulic pressure, below 150 KIAS. Maintain 150 KIAS or above, if possible, until landing gear and flaps are extended and speedbrakes are retracted.

2. Flaps .... UP

3. Speedbrakes .... RETRACT

4. Landing Gear .... UP

5. Transponder .... EMERGENCY, 7700

6. ATC .... ADVISE

7. Crew Briefing .... COMPLETE

8. Passenger Advisory Switch .... PASS SAFETY

9. Seats, Seat Belts, and Shoulder Harnesses .... SECURE

10. Landing Gear,
    Speedbrakes, and Flaps .... AS REQUIRED (ABOVE 150 KIAS) FOR LANDING ANTICIPATED

CAUTION

Landing gear, flaps, and speedbrakes will operate slowly above 150 KIAS and may not operate below 150 KIAS. Do not attempt to extend speedbrakes below 150 KIAS. Plan on the possibility of flaps inoperative landing and use of emergency gear extension procedures.

LOW OIL PRESSURE INDICATION (RED POINTER AND DIGITS, L OR R OIL PRESSURE WARN LIGHT OFF)

1. Throttle (Affected Engine) .... REDUCE POWER (BELOW 80% N_2)

If the pointer and digits change to amber or green:

2. Throttle (Affected Engine).......................... MAINTAIN BELOW 80% N_2
3. Land as soon as practical.

NOTE

Engine operation with oil pressure in the amber range is permitted for up to 5 minutes, with N_2 less than 80%. The engine indicating system (EIS) monitors elapsed time and will turn the pointer and digits red if 5 minutes in the amber range is exceeded.

If the pointer and digits remain, or return to, red:

2. Throttle (Affected Engine) .... OFF
3. Accomplish Engine Failure/Precautionary Shutdown procedure.

LOW OIL PRESSURE WARNING (L OR R OIL PRESS WARN LIGHT ON AND MASTER WARNING)

1. Throttle (Affected Engine) .... REDUCE

If the oil pressure indication responds to throttle movement and the pointer remains green:

2. Throttle (Affected Engine) .... IDLE OR AS REQUIRED
3. Monitor EIS oil pressure indication.
4. Land as soon as practical.

If the oil pressure indication does not respond to the throttle movement or the pointer turns red:

2. Throttle (Affected Engine) .... OFF
3. Accomplish Engine Failure/Precautionary Shutdown procedure.

ENVIRONMENTAL/PRESSURIZATION

ELECTRICAL FIRE OR SMOKE

1. Oxygen Masks .... DON AND EMER
2. Oxygen Microphone Switches.................................. MIC OXY MASK

   Ensure selector is on 100% oxygen when masks are used.

3. Smoke Goggles (If Installed)................................. DON (IF REQUIRED)
4. Air Source Select .... BOTH

Unknown Source

5. Flood Lights.. FULL BRIGHT
6. Battery Switch .... EMER
7. Generators .... OFF

With the battery switch in the emergency position (EMER) and the generators off, power is supplied for at least 30 minutes to the following:

- COMM 1
- NAV 1
- Overhead floodlights
- Pilot's and copilot's audio panels
- Standby engine N_1 indicator
- Flap control
- Landing gear monitor (lights)
- Voltmeter
- Right pitot-static heater
- Standby altimeter/airspeed (vibrator)
- Standby HSI (copilot's AHRS)

- Standby gyro (internal battery)
- Landing gear control

CAUTION

The flight guidance system, including EFIS displays and autopilot, is inoperative.

The antiskid/powerbrake system is inoperative.

The engine, wing, and windshield anti-ice valves will be open. Refer to anti-ice on thrust charts. Engines will revert to anti-ice on idle speed.

RAT is inoperative due to loss of display. Use caution when applying power, (except for go-around where ground temperatures can be used).

All engine indicating displays, except the standby N_1, will be inoperative.

Automatic pressurization control, cabin dump, and source selection are inoperative. Cabin altitude must be manually controlled using the manual toggle switch.

Fuel quantity displays will be inoperative. Be aware of fuel duration.

All external and internal lights, (except overhead flood and emergency lights), will be inoperative.

All warning, caution, and annunciator lights will be inoperative.

Rudder bias is inoperative. Rudder pedal force and/or directional trim required for single-engine operation will be significantly increased.

9. Land as soon as possible (within 30 minutes).

If severity of smoke warrants:

10. Oxygen Control Valve .... MANUAL DROP
11. Passenger Oxygen .... ENSURE PASSENGERS ARE RECEIVING OXYGEN
12. Passenger Advisory Light .... PASS SAFETY
13. Battery Switch .... BATT

14. Air Source Select .... FRESH AIR (CABIN WILL DEPRESSURIZE)

15. Emergency Dump Switch .... DUMP

16. Battery Switch .... EMER

17. Emergency Descent .... AS REQUIRED

18. Land as soon as possible.

When landing is assured:

19. Landing Gear .... DOWN

20. Flaps .... LANDING SETTING

21. Airspeed .... V_{REF}

22. Landing .... USE EMERGENCY BRAKE SYSTEM

    Multiply the landing distance by 1.33 (Flaps 35°).

ENVIRONMENTAL SYSTEM SMOKE OR ODOR

1. Oxygen Masks	DON AND EMER
2. Oxygen Microphone Switches	MIC OXY MASK

3. Smoke Goggles (if installed) .... DON (if required)

4. Air Conditioner Switch .... OFF

5. Defog Fan .... OFF

6. Air Source Select L

   Allow time for smoke to dissipate.

If smoke continues

7. Air Source Select .... R

   Allow time for smoke to dissipate.

8. Altitude.. DESCEND

   Accomplish EMERGENCY DESCENT procedure if required.

9. Air Source Select .... FRESH AIR (Cabin will depressurize)

10. If necessary, accomplish SMOKE REMOVAL procedure.

SMOKE REMOVAL

NOTE

No action is normally required; however, if smoke is intense:

1. Oxygen Masks .... DON AND EMER

2. Oxygen Microphone Switches.................................. MIC OXY MASK

3. Smoke Goggles (If Installed)................................ DON (IF REQUIRED)

4. Oxygen Control Valve .... MANUAL DROP

5. Passenger Oxygen .... ENSURE PASSENGERS ARE RECEIVING OXYGEN

6. Passenger Advisory Light .... PASS SAFETY

7. Air Conditioner Switch .... OFF

8. Cabin Dump Switch.......................... DUMP (CABIN ALTITUDE WILL NOT EXCEED APPROXIMATELY 15,000 FEET WITH AIR SOURCE SELECT IN L, R OR BOTH)

9. Emergency Descent... AS REQUIRED

If smoke persists or it cannot be verified that there is no fire:

10. Land as soon as possible.

OVERPRESSURIZATION

1. Pressurization System Select .... MANUAL

   Control pressurization with the manual (UP/DOWN) toggle switch.

If still overpressurized:

2. Air Source Select.. L OR R (CONTROL CABIN PRESSURE WITH THROTTLE)

   Attempt to control cabin pressure with the appropriate throttle by reducing power, letting a smaller amount of air into the airplane to pressurize the cabin.

If unable to control:

3. Oxygen Masks .... DON

   Check oxygen selector on 100%.

4. Oxygen Microphone Switches....................................... MIC OXY MASK

   Switch to MIC OXY MASK in order to use microphone in oxygen mask.

5. Oxygen Control Valve .... MANUAL DROP

6. Passenger Oxygen .... ENSURE PASSENGERS ARE RECEIVING OXYGEN

7. Passenger Advisory Light .... PASS SAFETY

8. Air Source Select.. OFF

9. Emergency Descent... AS REQUIRED

If still overpressurized:

10. Emergency Dump Switch (CABIN DUMP).................................... DUMP

This switch manually opens the normal dump valve to rapidly depressurize the airplane. All smoking material should be extinguished.

CABIN DECOMPRESSION (CABIN ALT WARNING LIGHT ON AND MASTER WARNING)

1. Oxygen Masks .... DON AND 100%
2. Oxygen Microphone Switches.................................. MIC OXY MASK
3. Emergency Descent.. AS REQUIRED

   Initiate Emergency Descent procedures, if required.
4. Passenger Oxygen .... ENSURE PASSENGERS ARE RECEIVING OXYGEN
5. Transponder .... EMERGENCY

If not arrested by 14,000 feet cabin altitude

6. Air Source Selector .... EMER
7. Windshield Bleed Manual Valves.. Close

   (AS REQUIRED in icing conditions.)
8. Refer to Abnormal Procedures, USE OF SUPPLEMENTAL OXYGEN.

NOTE

Use of EMER pressurization will reduce effectiveness of windshield anti-ice system.

EMERGENCY DESCENT

1. Ignition.. ON
2. Autopilot/Trim Disengage Switch .... PRESS
3. Throttles .... IDLE
4. Speedbrakes .... EXTEND
5. Airplane Pitch Attitude.. APPROXIMATELY 20° NOSEDOWN

NOTE

Disregard the flight director commands and maintain V_{MO}/M_{MO} schedule. The PFD may go into declutter mode.

6. Maximum Airspeed .... V_{MO}/M_{MO}

   (Use reduced speed if structural damage has occurred.)

7. Passenger Advisory Light .... PASS SAFETY

8. Transponder .... EMERGENCY

9. Descend to 15,000 MSL or minimum safe altitude, whichever is higher.

If descent into icing conditions is required:

10. Anti-ice/Deice .... AS REQUIRED

    Maintain sufficient power, above 70% N_2, to keep the ANTI-ICE annunciators extinguished.

ELECTRICAL

BATTERY OVERHEAT (BATT O'TEMP WARNING LIGHT ON AND MASTER WARNING)

1. Amp/Volt.. NOTE

   Note the indication of voltage and/or ampere before performing step 2.

2. Battery Switch .... EMER

   In the EMER position, the battery will not be charged by the generators. All electrical equipment will continue to receive power. The direct current (DC) bus is powered by the generators. Battery voltage may now be read with the voltage selector in EMER and the generator bus voltage with the voltage selector in L GEN or R GEN. Individual generator voltages can be read by selecting L GEN or R GEN and turning the other generator off.

3. Amp/Volt .... NOTE DECREASE

   If current decreases and battery voltage is one volt less than generator voltage in 30 seconds to 2 minutes, monitor battery overheat annunciator for possible change. In 30 seconds to 2 minutes after disconnect, battery voltage should read at least one volt less than the generators.

If amperage/voltage decreases:

4. Battery Switch .... OFF (VOLTMETER WILL BE INOPERATIVE)

   Proceed to applicable step 7 of this procedure.

If the BATTERY O'TEMP light goes out:

5. Battery Switch .... BATT

If no amperage/voltage decreases (battery relay stuck):

4. Battery Switch .... BATT

5. Battery Disconnect Switch .... BATT DISC

6. Amperage .... NOTE DECREASE

   If battery voltage is one volt less than generator voltage in 30 seconds to 2 minutes, monitor battery overheat annunciator for possible change.

If BATTERY O'TEMP light does not go out or >160 warning light illuminates:

7. Land as soon as possible.

   Since the battery has continued to overheat, it may be because the battery is still being charged through a failed battery relay. Placing the battery disconnect switch to BATT DISC removes the battery's ground and should isolate it from the rest of the system, causing it to no longer be charged. The generators are still supplying power to the rest of the airplane systems. If the BATT O'TEMP light does not go out, a multiple failure situation has probably occurred that is allowing the battery to continue to be charged.

If the BATTERY O'TEMP light goes out:

7. Battery Disconnect Switch .... NORM

8. Battery Switch .... BATT

9. Land as soon as practical.

CAUTION

Prolonged operation with the battery disconnect switch in BATT DISC and the battery switch off, or both generators off, will deplete the battery through the battery disconnect relay until the relay closes.

After landing, refer to the *Airplane Maintenance Manual* for proper maintenance procedures, as damage to the battery may have occurred.

LOSS OF BOTH GENERATORS (L AND R GEN OFF CAUTION LIGHTS AND MASTER WARNING)

1. Air Conditioner .... OFF OR FAN

2. Generators .... RESET, THEN GEN

   Attempt to reset both generators.

If only one generator comes on:

3. Electrical Load .... REDUCE AS REQUIRED
   (300 AMPS MAX—THROUGH 41,000 FEET)
   (250 AMPS MAX GND AND ABOVE 41,000 FEET)

If neither generator comes on:

3. Floodlights .... FULL BRIGHT

4. Battery Switch .... EMER

   With the battery switch in emergency position and the generators off, power is supplied for at least 30 minutes to the following:

- COMM 1
- NAV 1
- Overhead floodlights
- Pilot's and copilot's audio panels
- Standby engine N_1 indicator
- Flap control
- Landing gear monitor (lights)
- Voltmeter
- Right pitot-static heater
- Standby altimeter/airspeed (vibrator)
- Standby HSI (copilot's AHRS)

- Standby gyro (internal battery)
- Landing gear control

CAUTION

The flight guidance system, including EFIS displays and autopilot, is inoperative.

The antiskid/powerbrake system is inoperative.

The engine, wing, and windshield anti-ice valves will be open. Refer to anti-ice on thrust charts. Engines will revert to anti-ice on idle speed.

RAT is inoperative due to loss of display. Use caution when applying power, (except for go-around where ground temperatures can be used).

All engine indicating displays, except the standby N_1 indicator, will be inoperative.

Automatic pressurization control, cabin dump, and source selection are inoperative. Cabin altitude must be manually controlled using the manual toggle switch.

Fuel quantity displays will be inoperative. Be aware of fuel duration.

All warning, caution, and annunciator lights will be inoperative.

All external and internal lights, (except overhead flood and emergency lights), will be inoperative.

Rudder bias is inoperative. Rudder pedal force and/or directional trim required for single-engine operation will be significantly increased.

5. Windshield Bleed-Air Manual Valves .... OFF OR MINIMUM FOR CLEAR VISION THROUGH WINDSHIELD

6. Land as soon as practical.

When landing is assured:

7. Landing Gear .... DOWN

8. Flaps .... LANDING SETTING

9. Airspeed .... V_{REF}

10. Landing .... USE EMERGENCY BRAKE SYSTEM

Multiply landing distance by 1.33 (Flaps 35°).

FLIGHT GUIDANCE

AUTOPILOT MALFUNCTION

1. Autopilot/Trim Disengage Switch .... PRESS

NOTE

The autopilot monitors will normally detect failures and automatically disengage the autopilot.

Autopilot minimum use height:

ILS Approach .... 70 feet AGL

Nonprecision Approach .... 240 feet AGL

Engage AP After Takeoff .... 240 feet AGL

Use Height During Cruise .... 1,000 feet AGL

EVACUATION

EMERGENCY EVACUATION

1. Throttles .... BOTH OFF
2. L/R Engine Fire Switches .... BOTH PRESS
3. L/R Fire Bottle Armed Switches .... BOTH PRESS (IF FIRE SUSPECTED
4. Battery Switch.. OFF
5. Airplane Outside .... CHECK FOR BEST ESCAPE ROUTE

If evacuation through cabin door:

6. Cabin Door.. OPEN
7. Move away from airplane.

If evacuation through escape hatch:

6. Escape Hatch .... REMOVE AND THROW HATCH OUT OF AIRPLANE
7. Move away from airplane.

DITCHING

Ditching is not approved and was not conducted during certification testing of the airplane. Should ditching be required, the following procedure is recommended:

Preliminary

1. Bleed-Air Selector.. OFF
2. Radio .... MAYDAY
3. Transponder .... EMERGENCY
4. Locator Beacon (If Installed) .... EMER

5. ATC .... ADVISE

6. Passenger Advisory Lights .... PASS SAFETY

7. Prepare passengers for ditching.

8. Rate of Descent .... 200 TO 300 FEET PER MINUTE

9. Ditching Heading .... PARALLEL TO MAJOR SWELL SYSTEM

Approach

1. Landing Gear .... UP

2. Flaps .... APPR

3. Approach Speed .... V_{REF}

NOTE

Plan approach to parallel any uniform swell pattern and attempt to touch down along a wave crest or just behind it. If the surface wind is very strong or the water surface rough and irregular, ditch into the wind on the back side of a wave.

Water Contact

1. Aircraft Pitch Attitude .... SLIGHTLY HIGHER THAN NORMAL LANDING ATTITUDE

2. Reduce airspeed and rate of descent to a minimum, but do not stall the airplane.

3. Throttles .... OFF

   (Just prior to water contact and contact water on a crest of a swell, parallel to the major swell.)

After Water Contact

Under reasonable ditching conditions, the aircraft should remain afloat an adequate time to launch and board life rafts in an orderly manner.

WARNING

The main cabin door should remain closed and evacuation made through the emergency exit.

FORCED LANDING

All the considerations for a successful forced landing are similar to those for ditching. Attempt to establish radio contact, squawk the emergency code, and brief the passengers. For one engine operative, the approach should be made with the gear down, flaps in land position, speed V_{REF} + 10 KIAS, and a 200 to 300 feet-per-minute rate of descent. If possible, establish an abeam position with the gear extended and altitude sufficient to enable a safe landing to be made in the event of a power loss. Just before touchdown, place the throttles in cutoff and turn off the battery. Touchdown should be made in a normal landing attitude and emergency braking employed if necessary. For two engines inoperative, refer also to the Maximum Glide—Emergency Landing procedure in this section.

1. Radio .... MAYDAY

   Identify airplane position, heading, altitude, and IAS.

2. Transponder 7700
3. Locator Beacon (If Installed) .... EMER
4. Passenger Advisory Switch .... PASS SAFETY

   Brief passengers as thoroughly as possible.

5. Gear .... DOWN
6. Flaps .... 35° (LAND)
7. Speed .... V_{REF} + 10 KIAS
8. Rate of Descent .... AS REQUIRED TO EFFECT TOUCHDOWN IN SELECTED LANDING AREA
9. Throttles .... OFF (JUST PRIOR TO CONTACT)

SPINS

Intentional spins are prohibited and were not conducted during flight tests of the airplane. Should a spin occur, the following recovery procedures are recommended:

1. Power to idle on both engines.

2. Neutralize yoke and apply full rudder opposite the direction of rotation.

3. Approximately one-half turn of spin after applying rudder, push yoke forward.

4. Remove rudder input as rotation slows so that rudder is centered when rotation stops.

5. Pull out of the dive with a smooth, steady control pressure.

6. Indicated airspeed and/or angle of attack should be closely monitored during the pullout to avoid a secondary stall.

LIMITATIONS AND SPECIFICATIONS

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LIMITATIONS AND SPECIFICATIONS

OPERATING LIMITATIONS

GENERAL

NOTICE

Certification and operational limitations are conditions of the type and airworthiness certificates and must be complied with at all times as required by law.

CERTIFICATION STATUS

This airplane is certified in accordance with FAR 23 Normal Category and FAR 36 (noise). Takeoff and landing performance special condition certification requirements are equivalent to FAR 25.

Specifications

Length .... 47.34 feet (14.4 m)

Height .... 14.45 feet (4.4 m)

Wing span .... 49.79 feet (15.2 m)

Horizontal .... 20.77 feet (6.3 m)

Stance (distance between main gear) .... 15.95 feet (4.9 m)

Wheelbase (main to nose gear) .... 18.26 feet (5.6 m)

Curb-to-curb turning distance .... 32.88 feet (10.02 m)

Wall-to-wall turning distance .... 66.71 feet (20.33 m)

WEIGHT

Maximum design ramp weight .... 12,500 pounds, 5,670 kg

Maximum design takeoff weight .... 12,375 pounds, 5,613 kg

Maximum design landing weight .... 11,500 pounds, 5,216 kg

Maximum design zero fuel weight .... 9,300 pounds, 4,218 kg

Takeoff weight is limited by the most restrictive of the following requirements:

Maximum certified takeoff weight .... 12,375 pounds

Maximum takeoff weight permitted by climb requirements .... Refer to procedures for use of Takeoff Performance tables in *AFM,* Section IV

Takeoff field length .... Refer to procedures for use of Takeoff Performance tables in *AFM,* Section IV

Landing weight is limited by the most restrictive of the following requirements:

Maximum certified landing weight.................................... 11,500 pounds

Maximum landing weight permitted by climb requirements or brake energy limit .... Refer to procedures for use of Approach and Landing Performance tables in *AFM,* Section IV

Landing distance .... Refer to procedures for use of Approach and Landing Performance tables in *AFM,* Section IV

Maximum takeoff and landing weights may be additionally restricted due to altitude, temperature, and runway available.

AIRSPEED

The maximum operating limit speeds (Table LIM-1) may not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training.

Maximum maneuvering speeds (V_A).......................... Refer to Figure LIM-1

Full application of rudder and aileron controls as well as maneuvers that involve angle of attack near the stall should be confined to speeds below maximum maneuvering speed. Refer to load factor limitations for pitch maneuvering limitations.

NOTE

For minimum control speeds (V_{MCA} and V_{MCG}) refer to the respective definition in Section IV, Performance.

CENTER OF GRAVITY

Refer to center-of-gravity moment envelope in *AFM*, Section II.

Forward limit:

At 7,500 pounds or less .... 21.0% MAC (277.99)

At 8,500 pounds .... 14.5% MAC (273.33)

At 9,200 pounds .... 14.5% MAC (273.33)

At 12,500 pounds .... 19.66% MAC (277.03)

(Straight-line variation)

Aft limit .... 29.00% MAC (283.72)

Table LIM-1. AIRSPEED LIMITATIONS

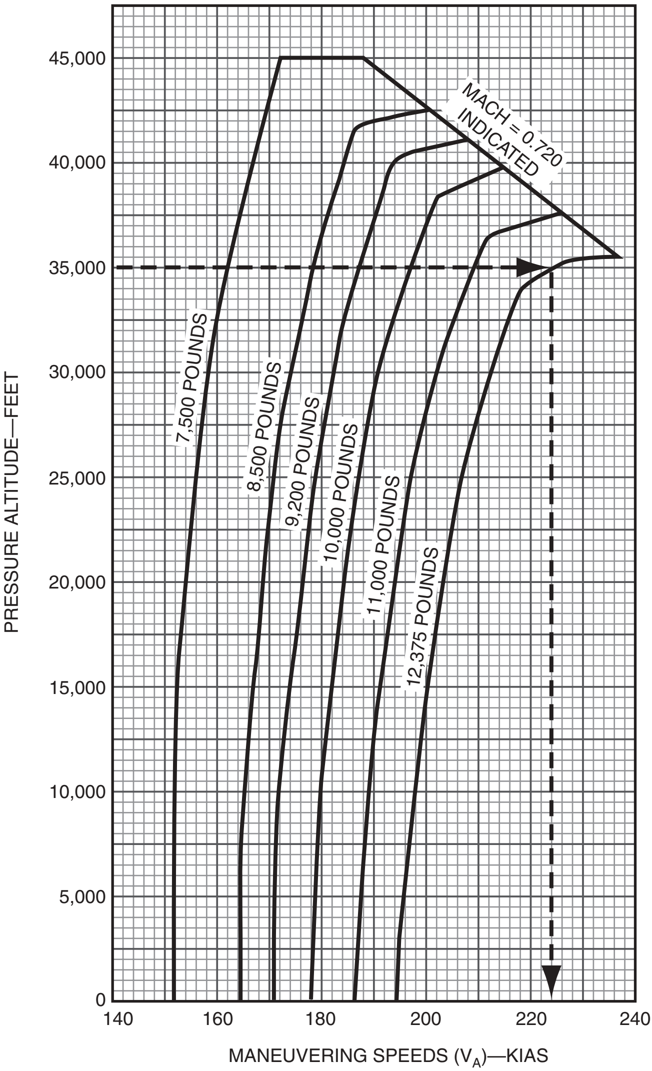
CONDITION	SPEED
M_{MO} (above 29,300 ft)	0.720 Mach
V_{MO} (between 8,000 and 29,300 ft)	275 KIAS
V_{MO} (below 8,000 ft)	260 KIAS
V_A	Refer to Figure LIM-1
Turbulent air penetration	180 KIAS
V_{FE} TAKEOFF and APPROACH FLAP 15°	200 KIAS
V_{FE} FLAP LAND 35°	161 KIAS
V_{FE} GROUND FLAP 60°	Prohibited In Flight
MAX SPEED WITH FLAPS FAILED TO GROUND 60°	140 KIAS
MAX gear extended V_{LE}	275 KIAS
MAX gear operating—V_{LO} (extending)	250 KIAS
MAX gear operating—V_{LO} (retracting)	200 KIAS
V_{SB} maximum speedbrake operating speed	NO LIMIT
V_X 2 ENG FLAP 15° (Not a limit)	124 KIAS
V_Y 2 ENG FLAP 15° (Not a limit)	191 KIAS
V_{MCA} (Not a limit) FLAPS 0°	89 KIAS
V_{MCA} (Not a limit) FLAPS 15°	81 KIAS
V_{MCG} (Not a limit)	89 KIAS
Maximum tire ground speed	165 KIAS
Minimum speed for sustained flight in icing (except approach and landing) (NOT A LIMIT)	160 KIAS
Maximum autopilot operating speed	275 KIAS or .720 Mach

GROUND FLAP LIMITATIONS

Intentional selection of ground flaps in flight is prohibited.

WARNING

The ground flaps position is not locked out in flight. Selection of ground flaps will significantly increase drag and sink rate.



EXAMPLE:
Pressure altitude—35,000 feet
Weight—12,375 pounds
Maximum maneuvering speed—224 knots

Figure LIM-1. Maximum Maneuvering Speeds

TAKEOFF AND LANDING OPERATIONAL LIMITS

Maximum altitude limit .... 14,000 feet
Maximum tailwind component .... 10 knots
Maximum crosswind component................................... 26 knots (not a limit)
Maximum ambient temperature.................................. (Refer to Figure LIM-2 and *AFM* Figure 4-7, ISA Chart)
Minimum ambient temperature .... –33°C

The maximum asymmetric fuel differential is 200 pounds; however, controllability for safe return and landing has been demonstrated with an emergency asymmetrical difference of 600 pounds.

The autopilot and yaw damper must be OFF for takeoff and landing.

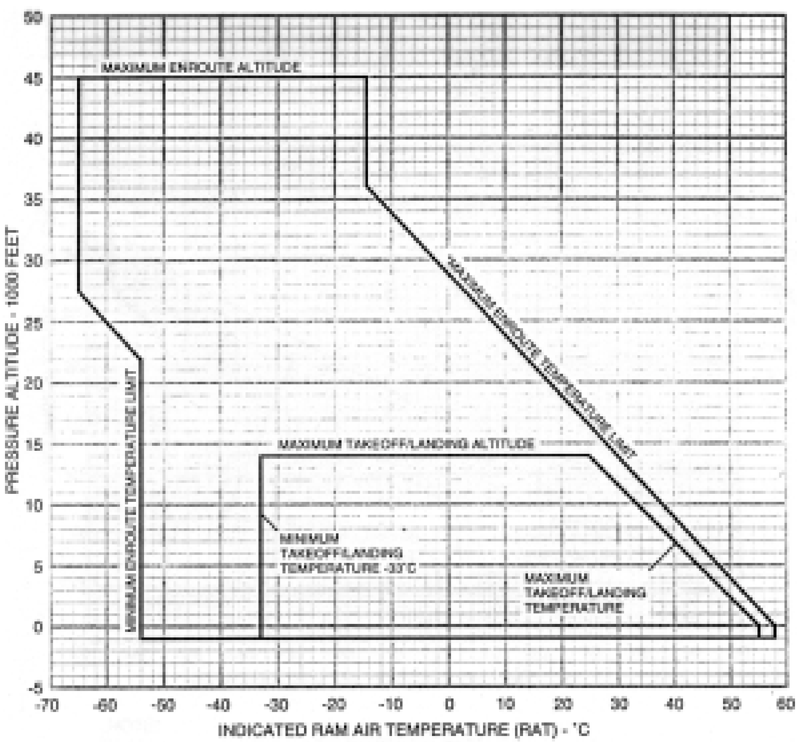


Figure LIM-2. Takeoff/Landing/Enroute Temperature Limitations

Rudder bias must be operational for takeoff and a satisfactory preflight test must be performed in accordance with Section III, Normal Procedures.

The angle of attack and stall warning system must be operational for takeoff and a satisfactory preflight test must be performed in accordance with Section III, Normal Procedures.

Prior to takeoff, the elevator trim check in Section III, Normal Procedures must be satisfactorily completed.

Takeoffs and landings are limited to paved runway surfaces. Refer to Section VII, *AFM* Advisory Information, for landing distance corrections applicable to runway surfaces other than dry.

Extending ground flaps during touch-and-go landings is prohibited. The ground idle switch must be in the HIGH position when conducting touch-and-go landings.

Engine synchronizer must be OFF for takeoff and landing.

Flaps 0° takeoff with inoperative antiskid is prohibited.

Takeoff is prohibited if both antiskid and thrust attenuators are inoperative.

Cabin must be depressurized for takeoff and landing.

Speedbrakes must be retracted prior to 50 feet on landing.

Goodyear tire part number 184F68-1 and tire part number 030-611-0 (manufactured by BF Goodrich/Michelin) are the only nose tires approved. The nose tire must be inflated to 120 ± 5 psi.

Maximum tire ground speed is 165 knots.

ENROUTE OPERATIONAL LIMITS

Maximum operating altitude .... 45,000 feet

Maximum ambient temperature .... Refer to Figure LIM-2

Minimum ambient temperature .... Refer to Figure LIM-2

Generator load .... 300 amperes up to 41,000 feet/ 250 amperes above 41,000 feet

OPERATIONS AUTHORIZED

This airplane is approved for day and night VFR or IFR flight and flight into known icing conditions when the required equipment is installed as defined within the Kinds of Operations Equipment List section later in this chapter.

Acrobatic maneuvers, including spins, are prohibited. Intentional stalls are prohibited above 18,000 feet.

MINIMUM CREW

Except where otherwise prescribed by applicable operating limitations, minimum crew for all operations are as follows:

1. Pilot, provided:

   a. The pilot holds a CE525(S), single pilot type rating.

   b. The airplane is equipped for single pilot operation as specified in the Kinds of Operations Equipment List section later in this chapter.

   c. The pilot must occupy the left pilot's seat.

or

1. Pilot and one copilot, provided:

   a. The pilot-in-command holds a CE525(S) or CE525 (second-in-command required) type rating.

LOAD FACTOR

In flight:

Flaps UP position (0°)........................... –1.52 to +3.6G at 12,375 pounds
Flaps Takeoff and Approach to
Land position (15° to 35°) .... 0.0 to +2.0G at 12,375 pounds

These accelerations limit the angle-of-bank in turns and limit the severity of pullup and pushover maneuvers.

WEIGHT AND BALANCE DATA

The airplane must be operated in accordance with the approved loading schedule. Refer to weight and balance data in *AFM*, Section VI.

PASSENGER SEATING

For all takeoffs and landings, adjustable seats must be fully upright and outboard.

Maximum passenger seating, not including two crew seats, is seven. (Eight with optional belted toilet installed.)

ELECTRICAL

GENERAL

Minimum ambient temperature for battery start (if airplane is cold soaked).. –33°C

NOTE

If the airplane is cold soaked below –33°C, it must be preheated or hangared prior to engine start.

If the battery is cold soaked below –18°C, it must be preheated above –18°C prior to start.

EIS may take 1 to 6 minutes to become usable after power is applied when cold soaked below –10°C.

Maximum temperature for engine start...................... Refer to Figure LIM-2

Maximum airport elevation for ground battery start/EPU start .... 14,000 feet

Minimum battery voltage for battery start... 24 VDC

Minimum/maximum external power current capacity for start.. 800/1,100 amps

NOTE

Normal starter current draw is approximately 1,000 amperes peak. External power units with variable maximum current shutoff should be set to 1,100 amperes. Use of an EPU with voltage in excess of 29 VDC, or current in excess of 1,100 amps, may damage the starter.

BATTERY AND STARTER CYCLE LIMITATIONS

Starter cycle limitation........................... Three engine starts per 30 minutes.

Three cycles of operation with a 60-second rest period between cycles is permitted.

The battery temperature warning system must be operational for all ground and flight operations.

The battery temperature warning system preflight test in *AFM*, Section III, Normal Procedures, must be satisfactorily completed (rotary test).

NOTE

This limitation is independent of starter power source: i.e., battery, generator-assisted cross start or external power unit.

Use of an external power source with voltage in excess of 29 VDC, or current in excess of 1,100 amps, may damage the starter.

Battery cycle limitations .... Three engine starts per hour

NOTE

If battery limitation is exceeded, ground maintenance procedures are required. Refer to Chapter 24 of the *Maintenance Manual* for procedures.

Three generator-assisted cross starts are equal to one battery start.

If an external power unit is used for start, no battery cycle is counted.

If the BATT O'TEMP light illuminates during ground operation, do not take off until the proper maintenance procedures have been accomplished.

ENGINE

GENERAL

The limitations outlined in the *AFM* must be complied with regardless of the type of operation. The following are extracts from the *AFM*.

APPROVED OILS

APPROVED BRAND	SPECIFICATION
Mobil Jet II	MIL-L-23699
Mobil 254	MIL-L-23699
Exxon 2380 (Emergency only)	MIL-L-23699

NOTE

Mixing of approved oils is permissible.

Exxon 2380 oil may be used pure or mixed with approved oil only for a maximum of 25 hours run time between major periodic inspections. Record in the engine log book the total amount of run time with Exxon 2380 oil. Following any usage of Exxon 2380 oil, the oil tank must be drained, flushed with approved oil, and serviced with pure approved oil. (Definition of oil flush is removal of chip collector screens and pouring one quart of approved oil through the oil fill port.)

ENGINE OPERATING LIMITS

Engine type .... Williams International FJ44-2C turbofan

Engine operating limits .... Refer to Table LIM-2

Engine overspeed limits .... Refer to Figures LIM-5 and LIM-6

Takeoff/go-around thrust setting .... Refer to *AFM* Figure 4-8

Maximum continuous thrust, single engine .... Refer to *AFM* Figures 4-9 and 4-10

Maximum continuous thrust, multiengine .... Refer to *AFM* Figure 4-11

ENGINE START LIMITATIONS (GROUND)

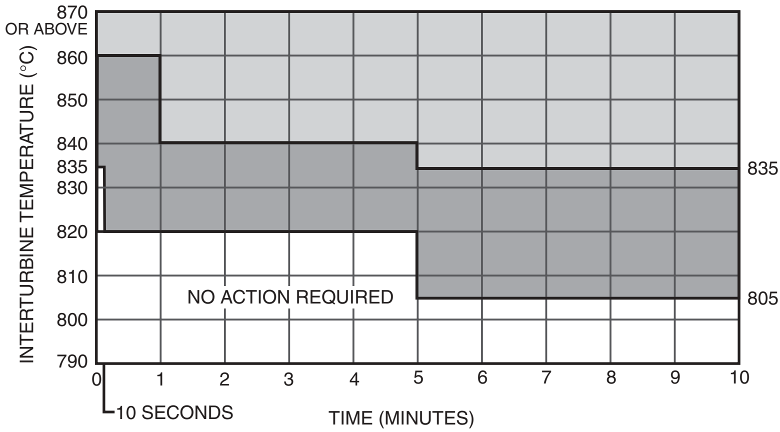
Temperature (ITT) limits .... Refer to Figure LIM-4

Table LIM-2. Engine Operating Limits

OPERATING CONDITIONS	OPERATING LIMITS					
THRUST SETTING	TIME LIMIT (MINUTES)	ITT TEMP °C	N_2 % TURBINE RPM	N_1 % FAN RPM	OIL PRESSURE PSIG	OIL TEMP °C
START		REFER TO FIG. LIM-4				–40 TO 135 (NOTE 7)
GND IDLE	CONTINUOUS		53.4 ±2.5		35 MIN 100 MAX (NOTE 6)	–40 TO 135 (NOTE 7)
FLT IDLE	CONTINUOUS		64.3 ±2.5		35 MIN 100 MAX (NOTE 6)	–40 TO 135 (NOTE 7)
TAKEOFF	5 (NOTE 1)	820 MAX	98.8	105.2 (NOTE 1)	45 TO 90 (NOTE 3)	10 TO 135
MAXIMUM CONTINUOUS	CONTINUOUS	805 MAX	98.8	105.2 (NOTE 2)	45 TO 90 (NOTE 3)	10 TO 135
GND IDLE	—	REFER TO FIG. LIM-3	REFER TO FIG. LIM-5	REFER TO FIG. LIM-6	23 MIN (NOTE 4) 100 MAX (NOTE 5)	149 (NOTE 8)

NOTES:

1. Takeoff ratings that are nominally limited to 5 minutes duration may be used for up to 10 minutes for one engine inoperative operations. Time limit begins when throttle lever is advanced for takeoff thrust. The takeoff thrust (N_1) for the airplane is defined in Figure 4-8, and is more limiting than engine rotational limits, and must be observed. Performance data, including V_{MCA} and V_{MCG} in Section IV, is based on the use of the takeoff thrust setting.
2. Maximum continuous thrust (MCT) for the airplane is defined by Figures 4-9 and 4-10 (single engine) and Figure 4-11 (multiengine). These thrust limits (N_1) are more limiting than engine rotational limits and must be observed. Performance data in Section IV is based on the use of the appropriate MCT setting.
3. Minimum oil pressure is 45 psig when operating at or above 80% N_2; 35 psig when operating below 80% N_2.
4. Minimum allowable oil pressure is 23 psig for up to 5 minutes when operating below 80% N_2.
5. Maximum allowable oil pressure is 100 psig for up to 5 minutes when operating at or above 80% N_2.
6. Maximum allowable oil pressure is 100 psig for up to 5 minutes with oil pressure returning to normal range.
7. The engine should not be operated above 80% N_2 until oil temperature is above 10°C.
8. Maximum oil temperature is 149°C for up to 5 minutes when operating below 80% N_2.

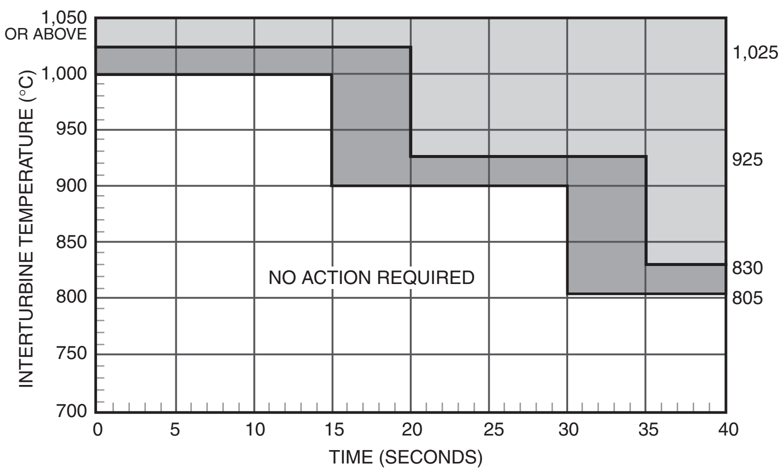


LEGEND

1. RECORD INCIDENT IN LOG BOOK
2. DETERMINE AND CORRECT CAUSE OF OVERTEMPERATURE

PERFORM MAJOR PERIODIC INSPECTION

Figure LIM-3. Temperature Limits (Except Starting)



LEGEND

1. RECORD INCIDENT IN LOG BOOK
2. DETERMINE AND CORRECT CAUSE OF OVERTEMPERATURE PRIOR TO NEXT START

PERFORM HOT SECTION INSPECTION

Figure LIM-4. Temperature Limits (Starting)

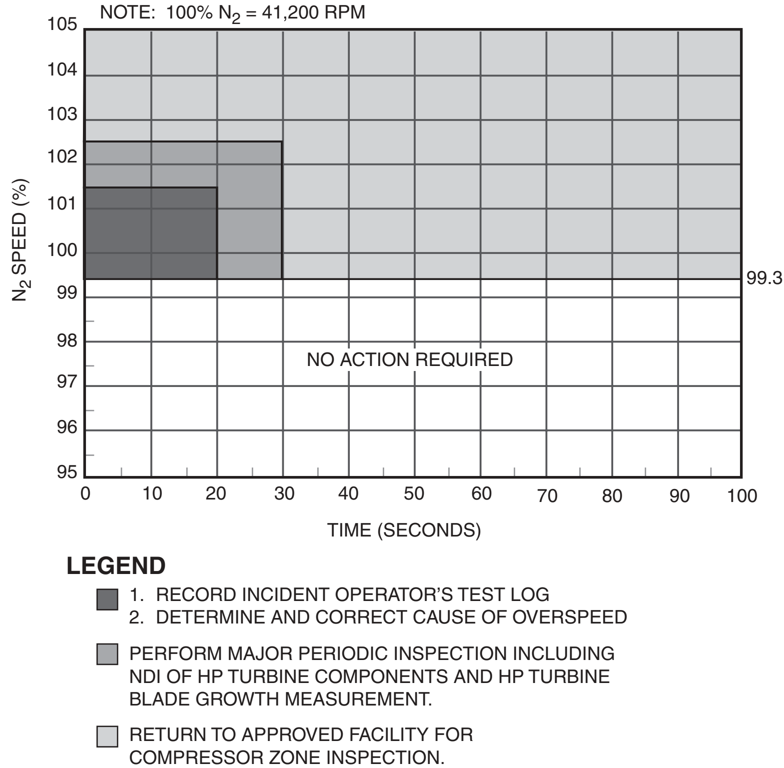


Figure LIM-5. N_2 Engine Overspeed Limits

Maximum tailwind component (above 10,000 feet to 14,000 feet) .... 0 knots

Maximum tailwind component (10,000 feet or below) .... 16 knots

Maximum crosswind component .... 16 knots

NOTE

The thrust attenuator switch must be in AUTO for tailwind within ±30° of the tail.

Maximum time to light-off .... 10 seconds

NOTE

Time to light-off is defined as the time after the throttle lever is moved from off to idle position until light-off is indicated.

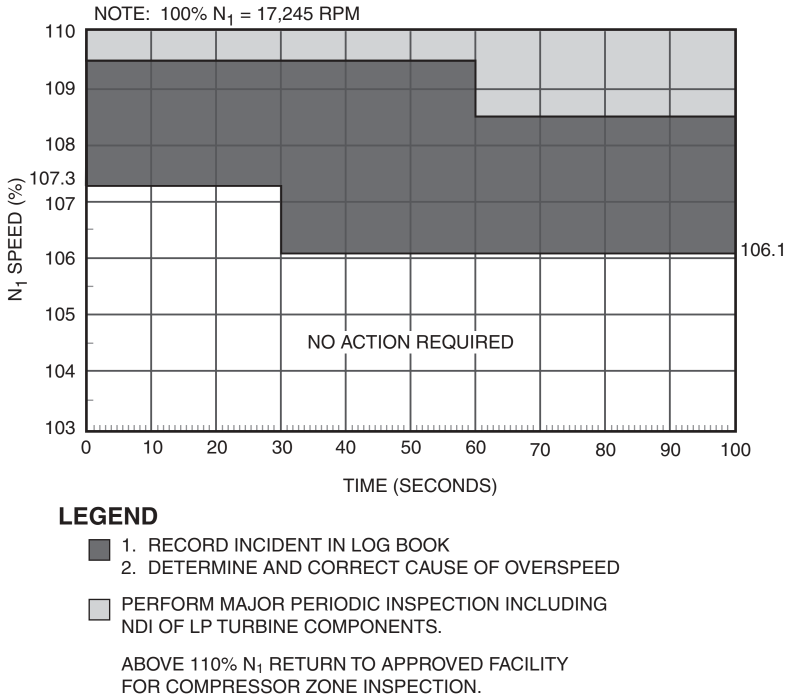


Figure LIM-6. N_1 Engine Overspeed Limits

GROUND OPERATION

Continuous engine ground static operation up to and including 5 minutes at takeoff thrust is limited to ambient temperatures defined in Figure LIM-2.

Generator current (maximum) .... 250 amperes

Limit ground operation of pitot-static heat to 2 minutes to preclude damage to the pitot tubes and angle-of-attack vane.

Prolonged ground operation at high engine rpm with engine, wing, and/or windshield anti-ice on is prohibited. Do not operate with the wing anti-ice on more than 1 minute after the L or R WING ANTI-ICE annunciators have extinguished.

ENGINE FAN INSPECTION

To assure accurate fan speed thrust indication, inspect the fan for damage prior to each flight.

NOTE

Prior to engine start, *AFM*, Section III, Normal Procedures, "Exterior Inspection" for engine fan duct and fan inspection must be satisfactorily completed.

ENGINE START LIMITATIONS (GROUND)

Minimum ambient temperature for engine start (if airplane is cold soaked) .... –33°C

NOTE

If the airplane is cold soaked below –33°C, it must be preheated prior to engine start.

If the battery is cold soaked below –18°C, it must be preheated to above –18°C prior to start.

The engine indicating system (EIS) may take 1 to 6 minutes to become usable after power is applied when cold soaked below –10°C.

Maximum temperature for engine start...................... Refer to Figure LIM-2

Maximum airport elevation for ground battery start.. 14,000 feet

Maximum airport elevation for ground external power start .... 14,000 feet

Minimum battery voltage for battery start.. 24 VDC

Minimum/maximum external power current capacity for start... 800/1,100 amps

NOTE

Normal starter current draw is approximately 1,000 amperes peak. External power units with variable maximum current shutoff should be set to 1,100 amperes. Use of an external power source with voltage in excess of 29 VDC, or current in excess of 1,100 amps, may damage the starter.

ENGINE OPERATION IN HAIL OR HEAVY RAIN

Engine parameters may fluctuate during flight through areas of hail and/or heavy rain, but will return to normal after exiting these conditions. If hail and/or heavy rain is encountered, the following conditions must be met:

- Ignition must be on
- Flight at or below 15,500 feet—Turbine speed must be maintained at 70% N_2 or greater.
- Flight above 15,500 feet—Turbine speed must be maintained at 76.5% N_2 or greater.

ENGINE START LIMITATIONS (AIR)

Overtemperature limits... Refer to Figure LIM-4

Airspeed/altitude limit .... Refer to *AFM* Figure 3-1, (air start envelope)

Maximum time to light-off.. 10 seconds

NOTE

Time to light-off is defined as the time after the throttle lever is moved from cutoff to idle position until light-off is indicated.

FUEL

Boost Pumps—ON; when L and/or R FUEL LOW LEVEL caution lights illuminate or at 220 pounds or less indicated fuel.

NOTE

If fuel transfer is required, ***verify*** the fuel boost pump OFF on the side to which the fuel is being transferred. (For example, transfer from left tank to right tank, verify right boost pump is OFF.)

The maximum asymmetric fuel differential is 200 pounds, however, controllability for safe return and landing has been demonstrated with an emergency asymmetrical differential of 600 pounds.

Approved fuels for use are listed in Table LIM-3.

Table LIM-3. Fuel Limitations

GRADE (REFER TO CAUTION AND NOTE BELOW)	SPECIFICATION	MINIMUM FUEL TEMPERATURE °C/°F	MAXIMUM FUEL TEMPERATURE °C/°F
JET A JET A1	ASTM-D1655	–40/–40 –40/–40	57.2/135 57.2/135
JP-8	MIL-T-83133	–40/–40	57.2/135
JET B*	ASTM-D1655	–45/–49	56/132.8
JP-4*	MIL-T-5624	–45/–49	56/132.8

*REFER TO FIGURE LIM-7 FOR ALTITUDE OPERATING LIMITATIONS WITH JET B OR JP-4 FUEL.

NOTE

Dupont Stadis 450 anti-ice additive or equivalent is permitted to bring fuel up to 300 conductive units, but not to exceed 1 ppm (parts per million).

SOHIO Biobor JF biocide additive is approved at a concentration not to exceed 20 ppm (270 ppm total additive) of elemental boron.

EGME/DIEGME additive is approved at a concentration not to exceed 0.15% by volume.

UNUSABLE FUEL

Fuel remaining in the fuel tanks when the fuel quantity indicator reads zero is not usable in flight (Figure LIM-7).

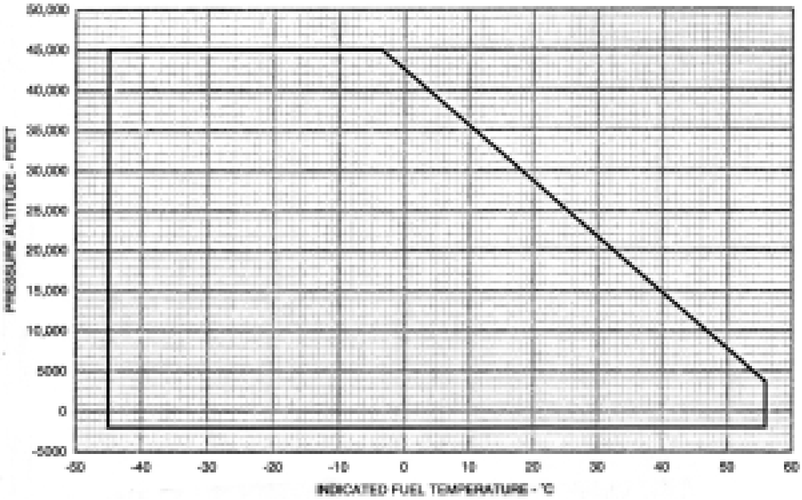


Figure LIM-7. JET B/JP-4 Fuel Operating Limitations

ANTI-ICE

GENERAL

Limit ground operation of pitot-static heat to 2 minutes to preclude damage to the pitot-static tubes and angle-of-attack probe.

Prolonged ground operation at high engine rpm with engine, wing, and/or windshield anti-ice on is prohibited. Do not operate with the wing anti-ice on more than 1 minute after the L or R WING ANTI–ICE annunciators have extinguished.

WINDSHIELD ICE PROTECTION FLUID

Use TT-I-735 isopropyl alcohol for windshield anti-ice.

ICING

NOTE

In flight—Icing conditions exist when the indicated RAT in flight is +10°C or below and visible moisture in any form is present.

Icing conditions on the ground exist when the OAT or indicated RAT is +10 C or below, and where surface snow, slush, ice or standing water may be ingested by the engines or freeze on engine nacelles, or engine sensor probes.

1. Minimum engine N_2 speed for effective anti-icing .... 75% N_2

2. Minimum temperature for operation of tail deicing boots (indicated RAT) .... –35°C

3. Engine anti-ice must be ENG on, (or WING/ENG) for operations with indicated RAT of +10°C or below when flight free of visible moisture cannot be assured.

4. After an icing encounter with inoperative tail deice boots, maximum flap deflection is 15°. Refer to the Flaps Inoperative Approach and Landing, Abnormal Procedure chapter, for landing with flaps 15°.

OPERATIONS IN SEVERE ICING CONDITIONS

WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certified. Flight in freezing rain, freezing drizzle or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice buildup on protected surfaces, exceeding the capability of the ice protection system or resulting in ice forming aft of the protected surfaces. This ice may not shed when the ice protection systems are used and may seriously degrade the performance and controllability of the airplane.

All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night.

NOTE

This supercedes relief provided by the master minimum equipment list.

Severe icing conditions that exceed those for which the airplane is certified shall be determined by the following visual cues:

- Unusually extensive ice accumulation on the airframe and windshield in areas not normally observed to collect ice

- Accumulation of ice on the upper surface of the wing aft of the protected area

If one or more of these visual cues exist:

- Use of the autopilot is prohibited.

- Immediately request priority handling from the air traffic control to facilitate a route or altitude change to exit the icing conditions.
- Leave flaps in current position; do not extend or retract.
- Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- If unusual or uncommanded roll control movement is observed, reduce angle of attack.

Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when the following conditions exist:

- Unusual lateral trim is required while the airplane is in icing conditions.
- Autopilot trim warnings are encountered while the airplane is in icing conditions.

HYDRAULIC FLUID

Use RED MIL-H-83282 type fluids only.

Thrust Attenuators

The thrust attenuators switch must be in AUTO for staring, with a tailwind within ±30° of the tail.

Takeoff is prohibited if both thrust attenuators and antiskid are inoperative.

ENVIRONMENTAL

CABIN PRESSURIZATION LIMITATIONS

Normal cabin pressurization limitations .... 0.0 to 9.0 psi differential

Cabin must be depressurized for takeoff and landing.

OXYGEN MASK

1. Prior to flight, the EROS oxygen mask must be checked and stowed properly in its receptacle to qualify as a quick-donning mask.

NOTE

Headsets, eyeglasses or hats worn by the crew may interfere with the quick-donning capabilities of the oxygen masks.

Unless carefully trimmed, mustaches and/or beards worn by crewmembers may interfere with proper sealing of the oxygen mask. Mask fit and seal should be checked on the ground prior to flight.

2. Continuous use of the supplemental oxygen system above 25,000 feet cabin altitude (with passengers) or above 40,000 feet cabin altitude (crew only) is prohibited.

3. For single pilot operations, a crew oxygen mask must be available for a passenger occupying the right crew seat. The mask must be checked during preflight and passengers briefed on its use.

ROCKWELL COLLINS FCS–3000 INTEGRATED FLIGHT CONTROL SYSTEM

1. The *Rockwell Collins Pro Line 21 Avionics System for the Cessna Citation CJ1/CJ2 Pilot's Guide*, Publication Number 523-0780351-00X117 (X is a variable and changes with revision number), dated 02/07/00 or later version, must be immediately available to the flightcrew.

2. One pilot must remain in his/her seat with the seat belt fastened during all autopilot operations.

3. Operating in the composite mode is limited to training and display failure conditions.

4. The pilot's PFD (and copilot's if installed) and MFD must be installed and operational in the normal mode for takeoff.

5. The FCS-3000 system must be verified to be operational by a satisfactory automatic preflight test (no messages on powerup) prior to each flight in which the autopilot is to be used.

6. The autopilot minimum engage height after takeoff is 240 feet AGL.

7. The autopilot use height during cruise is 1,000 feet AGL.

8. The autopilot minimum-use height is as follows:

   - ILS approach—70 feet AGL
   - Nonprecision approaches—240 feet AGL

9. During VOR approaches, the HDG mode must be selected until established on the final approach segment after crossing the VOR. The APPR mode may be reselected once the aircraft is reestablished on the approach course. VOR approaches must be conducted in the APPR mode.

10. Category II approaches are not approved.

11. The TURB mode of the flight control system must be off when conducting either VOR or LNV (FMS) approaches.

STANDBY GYRO HORIZON

A satisfactory preflight test must be accomplished on the standby gyro system in accordance with *AFM*, Section III, Normal Procedures.

KINDS OF OPERATIONS EQUIPMENT LIST

This airplane may be operated in day or night VFR or IFR and flight into known icing conditions when the appropriate equipment is installed.

The equipment list in Table LIM-4 identifies the systems and equipment upon which type certification for each kind of operation was predicated. The systems and items of equipment listed must be installed and operable unless either of the following conditions is met:

1. The airplane is approved to be operated in accordance with a current minimum equipment list (MEL) issued by the FAA or:
2. An alternate procedure is provided in the FAA-approved *Airplane Flight Manual* for the inoperative state of the listed equipment and all limitations are complied with.

NOTE

The following systems and equipment list does not include all equipment required by the Parts 91 and 135 Operating Requirements. It also does not include components obviously required for the airplane to be airworthy such as wings, primary flight controls, empennage, engine, etc.

Table LIM-4. KINDS OF OPERATIONS EQUIPMENT LIST

SYSTEM AND/OR COMPONENT	KIND OF OPERATION: VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING	COMMENTS
AVIONICS						
1) VHF transceiver	*	*	1*	1*	1*	* Or as required by operating regulation
2) Static wicks	13*	13*	13*	13*	13*	* Fifteen total installed; one may be missing from any control surface, no more than two total may be missing
3) Transponder	*	*	1*	1*	1*	* Or as required by operating regulation
4) VHF NAV receiver	*	*	1*	1*	1*	* Or as required by operating regulation
5) Cockpit voice recorder	*	*	*	*	*	* Required for two pilot operations with six passenger seats installed
ELECTRICAL						
1) Battery	1	1	1	1	1	
2) Battery overheat annunciator	1	1	1	1	1	
3) DC generator	2	2	2	2	2	
4) DC generator annunciator	2	2	2	2	2	
5) DC loadmeter	2	2	2	2	2	
6) DC voltmeter and select switch	1	1	1	1	1	
ENVIRONMENTAL/ PRESSURIZATION						
1) Bleed-air shutoff valve	2	2	2	2	2	
2) Cabin bleed-air flow control valve	1	1	1	1	1	
3) Outflow valve/safety valve	2	2	2	2	2	
4) Primary door seal	1	1	1	1	1	
5) Secondary door seal	1	1	1	1	1	Required above FL310
6) Pressurization controller	1	1	1	1	1	
7) Emergency press dump valve	1	1	1	1	1	
8) Fresh air fan	1	1	1	1	1	
9) Defog fan	1	1	1	1	1	
10) Differential press/cabin altitude gage	1	1	1	1	1	
11) Cabin temperature control system (except air conditioner)	1	1	1	1	1	
12) Duct overtemperature annunciator	1	1	1	1	1	
13) Cabin altitude warning system	1	1	1	1	1	Required above FL240
EQUIPMENT AND FURNISHINGS						
1) Exit sign (lighted)	2	2	2	2	2	
2) Seat belt	*	*	*	*	*	* One per occupied seat
3) Shoulder harness	*	*	*	*	*	* Crew seats and all occupied passenger seats

Table LIM-4. KINDS OF OPERATIONS EQUIPMENT LIST (Cont)

SYSTEM AND/OR COMPONENT	KIND OF OPERATION: VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING	COMMENTS
FIRE PROTECTION						
1) Engine fire-detection system	2	2	2	2	2	
2) Engine fire-extinguisher system	2	2	2	2	2	
3) Portable fire extinguisher	1	1	1	1	1	
FLIGHT CONTROLS						
1) Flap position indicator	1	1	1	1	1	
2) Flap system (including annunciators)	1	1	1	1	1	
3) Trim tab position indicator (rudder, aileron, and elevator)	3	3	3	3	3	
4) Trim systems (rudder, aileron, and elevator)	3	3	3	3	3	
5) Stick shaker system	1	1	1	1	1	
6) Speedbrake System (both sides)	1	1	1	1	1	
7) Rudder bias system	1	1	1	1	1	
FLIGHT/NAVIGATION INSTRUMENTS						
1) Airspeed indicator	2	2	2	2	2	Dual PFD or single PFD and copilot airspeed
2) Sensitive altimeter	2	2	2	2	2	Dual PFD or single PFD copilot airspeed
3) Single PFD (primary flight display)	1*	1*	1*	1*	1*	* Includes AHRS 1 and 2, ADC 1
4) Dual PFD (primary flight display)	2*	2*	2*	2*	2*	* Includes AHRS 1 and 2, ADC 1 and 2
5) MFD (multifunction display)	1	1	1	1	1	
6) Vertical speed indicator	0	0	2	2	2	
7) Standby altimeter/airspeed	1	1	1	1	1	
8) Standby NAV 1 HSI	1	1	1	1	1	
9) Standby attitude indicator	1	1	1	1	1	
10) Copilot's attitude indicator	1	1	1	1	1	Applicable to single-PFD installation
11) Copilot's HSI indicator	1	1	1	1	1	Applicable to single-PFD installation
12) Clock	0	0	1	1	1	
13) Magnetic compass	1	1	1	1	1	

Table LIM-4. KINDS OF OPERATIONS EQUIPMENT LIST (Cont)

SYSTEM AND/OR COMPONENT	KIND OF OPERATION: VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING	COMMENTS
FUEL/ENGINE						
1) Fuel boost pumps (including annunciators)	2	2	2	2	2	
2) Fuel flow indicator system**	2	2	2	2	2	
3) Fuel quantity system**	2	2	2	2	2	
4) Fuel transfer system (including annunciator)	1	1	1	1	1	
5) Firewall shutoff system	2	2	2	2	2	
6) Fuel low level annunciators	2	2	2	2	2	
7) Fuel low pressure annunciators	2	2	2	2	2	
8) Engine-driven fuel pump	2	2	2	2	2	
9) Duel ignitor system, each engine (including indicator lights)	2	2	2	2	2	
10) Engine indicators, N1, ITT, N2, oil pressure, and oil temperature**	2	2	2	2	2	
11) Engine oil pressure annunciators	2	2	2	2	2	
12) Hydraulic pressure on annunciator	1	1	1	1	1	
13) Hydraulic flow low annunciators	2	2	2	2	2	
14) Thrust attenuators	2*	2*	2*	2*	2*	* For thrust attenuators stowed, refer to Abnormal Procedures Dispatch with thrust attenuators stowed
15) Standby N_1 indicators	1	1	1	1	1	
** These items are part of the engine indicating system (EIS) displayed on the MFD.						
ICE AND RAIN PROTECTION						
1) Engine anti-ice system (including annunciators)	2	2	2	2	2	
2) Wing anti-ice system (including annunciators)	0	0	0	0	2	
3) Windshield anti-ice system (including annunciators and rain removal doors	1*	1*	1*	1*	2*	* Pilot's required for ground defog and rain removal
4) Pitot-static and AOA heat (including annunciators)	2*	2*	2*	2*	2*	* Single AOA system
5) Tail deice system (including annunciators)	0	0	0	0	1	
6) Glareshield ice detect lights	0	0	0	2*	2*	* Required for night ice detection

Table LIM-4. KINDS OF OPERATIONS EQUIPMENT LIST (Cont)

SYSTEM AND/OR COMPONENT	KIND OF OPERATION: VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING	COMMENTS
LANDING GEAR/BRAKES						
1) Landing gear position indicator	3	3	3	3	3	
2) Unsafe indicator	1	1	1	1	1	
3) Landing gear aural warning system	1	1	1	1	1	
4) Emergency extension system	1	1	1	1	1	
5) Powerbrake system	1	1	1	1	1	
6) Antiskid system (including annunciator)	1*	1*	1*	1*	1*	* For inoperative antiskid, refer to Abnormal Procedures Dispatch with Antiskid Inoperative.
7) Emergency brake system	1	1	1	1	1	
LIGHTING						
1) Cockpit and instrument light system	0	1	0	1	0	
2) Landing lights	0	2	0	2	0	
3) Navigation light	0	3	0	3	0	
4) Anticollision light (wing tip strobe)	0	2	0	2	0	
5) Wing inspection light	0	0	0	1*	1*	* Required for night ice detection
6) Passenger safety system	1	1	1	1	1	
OXYGEN						
1) Oxygen system including pressure gage	1	1	1	1	1	Required if unpressurized or if flight is above FL240
2) Passenger masks	*	*	*	*	*	* If any passenger seat is occupied, the number of installed masks must equal the number of installed passenger seats plus one.
3) Crew oxygen mask	2*	2*	2*	2*	2*	* One for each occupied crew seat

Table LIM-4. KINDS OF OPERATIONS EQUIPMENT LIST (Cont)

SYSTEM AND/OR COMPONENT	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING	COMMENTS
WARNING/CAUTION						
1) Annunciator panel	1	1	1	1	1	
2) Master caution	1	1	1	1	1	Pilot is required for single-pilot operations; both required for two crew
3) Master warning	1	1	1	1	1	Pilot is required for single-pilot operations; both required for two crew
4) Audio warnings (red annunciators, engine fire, dual generator fail, autopilot, minimums, altitude, and landing gear)	*	*	*	*	*	* All audio warnings are required (verbal warning system)
or						
4) Tone warnings (autopilot, minimums, altitude, and landing gear)	*	*	*	*	*	* All audio warnings are required (tone warning system)
5) Overspeed warning system	1	1	1	1	1	
6) Miscellaneous annunciators (DME and thrust attentuator stow)	*	*	*	*	*	* All are required
MISCELLANEOUS EQUIPMENT						
1) FAA-approved *Airplane Flight Manual*	1	1	1	1	1	
2) *Collin's Proline 21 Pilot's Guide*	1	1	1	1	1	
3) Approved *FMS Pilot's Manual*	1	1	1	1	1	
4) Hand Microphones	2	2	2	2	2	
5) Passenger Briefing Cards	*	*	*	*	*	* One required for each occupied seat

SINGLE PILOT

The following are required when the airplane is operated with a crew of one pilot; per applicable operating rules:

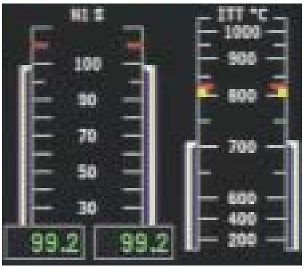
1) Operable FCS-3000 autopilot
2) Headset with microphone (must be worn)
3) FAA-approved pilots' abbreviated checklist, Cessna PN 525ACL-00 or later approved revision
4) Provisions for storage and retention of navigation charts, accessible to the pilot from the pilot station

INSTRUMENT MARKINGS AND ENGINE INDICATING SYSTEM (EIS)

Copilot's Airspeed Indicator (Standard)

Red line .... 275 KIAS (0.72 Mach)
260 KIAS (below 8,000 ft)

Fan (N1) RPM Indicators



Scale markings:
Red line .... 105.3% rpm

Tape/pointer/digital readout:
Red .... ≥106.5% rpm
105.3 to 106.4% rpm for ≥30 sec
Yellow .... ≥105.3% ≤106.4% <30 sec

Tape/pointer:
White .... ≤105.2% rpm

Digital readout:
Green .... ≤105.2% rpm

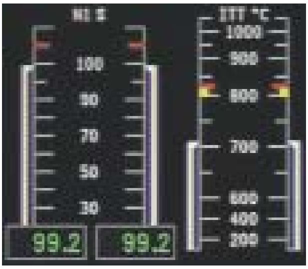
NOTE

Tape, pointer, and digital readout will turn red or yellow if outside normal operating limits.

Pointer and digital readout will flash for 5 seconds, then remain steady if outside normal operating limits.

White tape pointer represents green band.

Interturbine Temperature Indicators



Engine Start

Scale markings:

Red triangle .... 1,002°C
Red line .... 822°C
Yellow band .... 806°C to 820°C

Tape/pointer:

Red .... ≥1,002°C
White .... ≤1,000°C

NOTE

Tape will turn red and pointer will flash red for 5 seconds, then remain steady red if outside normal starting operating limits.

Engine running red line and yellow band do not apply while ITT start limit (red triangle) is in view.

White tape pointer represents green band.

Engine Running

Scale markings:

Red line .... 822°C
Yellow band .... 806°C to 820°C

Tape/pointer:

Red .... ≥822°C
806°C to 820°C for ≥5 min
Yellow .... 806°C to 820°C for <5 min
White .... ≤804°C

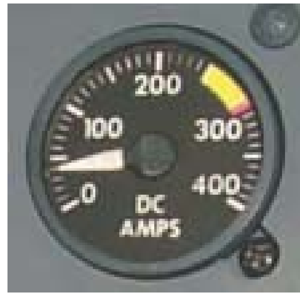
NOTE

Tape will turn red or yellow, the pointer will flash red or yellow for 5 seconds, then remain steady if outside normal operating limits.

White tape pointer represents green band.

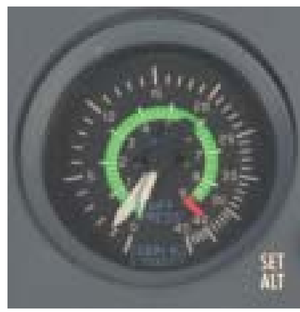
Left and Right Ammeter Indicators

Red line .... 300 amps
Yellow arc .... 250 to 300 amps



Cabin Differential Pressure Indicator

Red line .... 9.0 psi
Green arc .... 0.0 to 9.0 psi



Oxygen Pressure Indicator

Red line.. 2,000 psi
Yellow arc .... 0.0 to 400 psi
Green arc .... 1,600 to 1,800 psi

Turbine (N2) RPM Indicators

Digital readout:
- Red .... ≥98.9% rpm
- Green .... ≤98.8% rpm

NOTE

Digital readout will flash red for 5 seconds, then remain steady if outside normal operating limits.

Oil Temperature Indicators

Scale markings:
- Red band .... ≥136°C
- Yellow band................................ ≤9°C
- Green band .... 10°C to 135°C

Pointer:
- Red .... ≥136°C
- Yellow .... ≤9°C
- Green .... 10°C to 135°C

Digital readout:
- Red .... ≥136°C
- Yellow .... ≤9°C

NOTE

Pointer and digital readout will flash red or yellow for 5 seconds, then remain steady if outside normal operating limits.

Digital readout is displayed only when temperature is outside normal operating limits.

Oil Pressure Indicators

Scale markings:

Red band .... ≤22 psi
≥101 psi
Yellow band .... 23 to 34 psi
91 to 100 psi
Green band .... 35 to 90 psi

NOTE

Oil pressure indicator scale markings do not change with varying N_2.

N_2 <80%

Pointer:

Red .... ≤22 psi
23 to 34 psi ≥5 min
91 to 100 psi ≥5 min
≥101 psi
Yellow .... 23 to 34 psi <5 min
91 to 100 psi <5 min
Green................................. 35 to 90 psi

Digital readout:

Red .... ≤22 psi
23 to 34 psi ≥5 min
91 to 100 psi ≥5 min
≥101 psi

Yellow .... 23 to 34 psi <5 min
91 to 100 psi <5 min

N_2 ≥80%

Pointer:

Red .... ≤44 psi
91 to 100 psi ≥5 min
≥101 psi

Yellow .... 91 to 100 psi <5 min

Green................................. 45 to 90 psi

Digital readout:

Red .... ≤44 psi
91 to 100 psi ≥5 min
≥101 psi

Yellow .... 91 to 100 psi <5 min

NOTE

Pointer and digital readout will flash red or yellow for 5 seconds, then remain steady if outside normal operating limits with the following exception:

- For oil pressure 91 to 100 psi the pointer will change to yellow, but digits will not be displayed until 4 minutes have elapsed, at which time both yellow digits and pointer will flash for 5 seconds, then remain steady.

Digital readout is displayed only when pressure is outside normal operating limits.

Brake and Gear Pneumatic Pressure Indicator (In Nose Compartment)

Wide red arc .... Above 2,050 psi
Narrow red arc.................... 0.0 to 1,600 psi
Yellow arc....................... 1,600 to 1,800 psi
Wide green arc .... 1,800 to 2,050 psi

Brake Hydraulic Accumulator Pressure Indicator (In Nose Compartment)

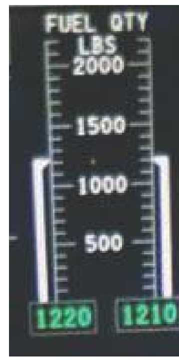
Narrow red arc .... Underpressure
Light green arc .... Precharge pressure
Yellow arc .... Caution
Wide green arc .... Normal operating range
Wide red arc .... Overpressure

Wing Tank Fuel Temperature (°C)

The motive flow is heated. Fuel flow includes 9pph to start nozzles.

Fuel Quantity

The scale is from 0 to 2,200 pounds with tick marks at 500, 1,000, 1,500, and 2,000 pounds. There are 100-pound tick marks to maximum range. The tape pointer is white.



Windshield Alcohol

Full.. 10 minutes

L and R STANDBY N1%

If MFD and PFD displays fail.

Standby Altimeter/Airspeed Indicator

Angle-of-Attack Indicator

White .... .57 to .63 1.3 V_{S1} or max L/D
Yellow .... .63 to .85 approaching critical AOA
Red .... .85 to 1.0 warning zone beginning of low speed buffet
Red .... 1.0 full stall
Stick shaker .... .80 to .95
Power loss .... Needle stows at 1.0

MANEUVERS AND PROCEDURES

CONTENTS

ILLUSTRATIONS

TABLES

OPERATING TECHNIQUES

GENERAL

This section contains a description of the maneuvers that are likely to be encountered in training and in most line-flying operations. There is always more than one way to fly any airplane; however, these procedures have evolved from many Citation flying hours. They have been proven safe, expedient, and readily manageable and are recommended by the manufacturer. The following flight profiles show some normal and emergency operating procedures. They are designed as a general guide for ground training purposes. Actual inflight procedures may differ due to aircraft configuration, weight, weather, traffic, ATC instructions, etc. Procedures outlined are consistent with the *Airplane Flight Manual* (*AFM*). If a conflict should develop between these procedures and the *AFM*, then *AFM* procedures must be followed.

PREFLIGHT AND TAXI PROCEDURES

After completing the initial flight planning and preflight checks, the takeoff data should be computed to give the correct takeoff thrust setting and distance, V_1, V_R, V_2, V_{ENR}, and the emergency return V_{REF} speed. Prior to takeoff, the pilot-in-command should review with the copilot the departure procedures and also the emergency procedures to be followed for a rejected takeoff prior to V_1 or a continued takeoff after V_1.

CAUTION

Do not tow with the control lock engaged, to prevent damage to the nosewheel steering mechanism.

During ground operation, do not ride the brakes, as sufficient heat to melt the fusible plugs may be generated.

NOTE

With the gust lock on, the flight controls are locked in neutral and the throttles are locked in the off position.

TAKEOFF PROCEDURES

General

The pilot will advance the throttles, slowly at first, to allow the engines to accelerate, then more rapidly to the computed takeoff power setting. The copilot will back up the pilot on the throttles and make the final setting and adjustments as necessary. In addition, the copilot will make the following airspeed calls:

1. Initial airspeed indications on both instruments (airspeed alive)

2. 70 knots (check both instruments)

3. V_1

4. V_R (call "rotate")

5. V_2

Takeoff Rejected

If an abnormal situation, annunciator light, system failure, etc., occurs during the takeoff roll, the copilot notifies the pilot-in-command, who makes the final decision to take off or abort.

NOTE

If the decision is made to abort the takeoff prior to reaching V_1, the following procedure from the checklist should be used:

1. Brakes .... AS REQUIRED
2. Throttles .... IDLE
3. Speedbrakes .... EXTEND

The computed takeoff field lengths assume that the pilot has maximum effort applied to the brakes at the scheduled V_1 speed during the aborted takeoff.

Normal Takeoff

At V_R, the pilot will rotate the airplane to a 10° noseup attitude on the ADI and, when a positive rate of climb is indicated, retract the gear. As the airspeed increases through a minimum of V_2 +10 knots (V_{FS}), retract the flaps. Continue to accelerate to normal climb speed, and complete the After Takeoff-Climb checklist.

Engine Failure at or after V_1

If an engine fails at or after V_1, the takeoff will normally be continued. At V_R, rotate the nose of the airplane to 10° and raise the landing gear when a positive rate of climb has been established. Maintain V_2 until reaching 1,500 feet above airport elevation, clear of obstacles, whichever is higher; then lower the nose to level flight and accelerate to V_{ENR}. As the airspeed reaches V_2 +10 knots (V_{FS}), retract the flaps. When V_{ENR} is obtained, reduce power to maximum continuous. When time and cockpit duties permit, complete the appropriate Emergency Procedures checklist and the After Takeoff-Climb checklist. Part 25 is a visual (VFR) concept. When IFR under TERPS, fly second segment to a safe altitude. The pilot will determine what safe altitude and safe climb gradient are.

NOTE

Do not let the emergency distract you from flying the airplane. Wait until you are safely airborne and above 1,500 feet before taking care of the emergency and the After Takeoff-Climb checklist.

If the 10-minute engine time limit at takeoff power is reached prior to reaching V_{ENR}, maintain the attained airspeed, reduce power to maximum continuous N_1, and climb to the enroute altitude.

If it becomes necessary to maneuver the airplane during the normal departure climb, limit the bank angle to 30°, and maintain no less than minimum maneuvering speed (1.3 V_{S1} +10 knots).

If it becomes necessary to maneuver the airplane during the single-engine departure climb before attaining minimum maneuvering speed, limit the bank angle to 15°.

Use the same procedures if a 0° flap takeoff is made.

PERFORMANCE

The Citation CJ2 is certified under Part 23. The following discussion on speeds will be of use in understanding the capabilities of the airplane.

Speeds

Holding Speeds

Manufacturer's published holding speeds are 180 KIAS at 12,000 pounds down to 160 KIAS at 8,000 pounds. If fuel is critical, flying .6 (3-o'clock position) on the angle-of-attack indicator will provide best endurance or maximum flight time per gallon of fuel. This data is based on gear and flaps up and speedbrakes retracted.

Hydroplaning Speeds

The formula used to determine the speed at which a tire is likely to hydroplane on a wet runway is stated as follows:

$$\text{Hydroplane Speed} = 7.7\sqrt{\text{Tire Pressure}}$$

From the above formula, the nose gear hydroplane speed is about 84 knots and the main gear is about 82 knots.

OBJECTIVES AND REQUIREMENTS OF PERFORMANCE

Takeoff Limitations (Flaps "TAKEOFF and APPROACH" and Flaps "UP")

The takeoff weight is limited by the most restrictive of the following requirements:

- Maximum certified takeoff weight (structural)
- Maximum takeoff weight permitted by takeoff climb requirements
- Maximum takeoff weight permitted by takeoff field length, which meets two requirements in the event of an engine failure at V_1. It ensures that the rejected takeoff can be completed within the existing runway and it allows for the takeoff to be continued, ensuring that the airplane reaches a height of 35 feet (reference zero) by the time it reaches the end of the takeoff distance. When the accelerate-stop and takeoff distances are the same, the takeoff field length is referred to as the balanced field length.

These requirements are operating limitations and must be complied with. Additionally, obstacle clearance capability may be an actual physical necessity, if not a legal requirement, and may further limit the takeoff weight.

The pilot should also consider the landing weight restrictions at the destination airport. The limited landing weight plus the expected fuel to be burned enroute may be more limiting than any restrictions at the departure airport, especially if the trip is of short duration.

Finally, the pilot may choose to limit the takeoff weight to ensure single-engine safety when flying over mountainous terrain.

Table MAP-1. TAKEOFF FLIGHTPATH PROFILE

	FIRST SEGMENT CONFIGURATION	SECOND SEGMENT CONFIGURATION	THIRD SEGMENT CONFIGURATION
SPEED	V_2	V_2 (1.10 V_{MC} air or 1.20 V_S) whichever is greater	V_2 accelerating V_{ENR}
THRUST SETTING	Takeoff (one engine) (anti-ice systems off/on)	Takeoff (one engine) (anti-ice systems off/on)	Max cont (anti-ice systems off/on) after 10 minutes
FLAP POSITION	Takeoff or up (as applicable)	Takeoff or up (as applicable)	Up at V_2 +10
GEAR POSITION	Down	Up	Up
REQUIRED GRADIENT OF CLIMB	Positive (greater than zero)	2.4% gross –0.8 1.6% net	

NOTE

When using charts to determine the V_1 speeds, remember that V_1 is a function of configuration, weight, and all of the field conditions, while V_R and V_2 are functions solely of configuration and weight. Remember, too, that V_1 must be equal to or less than V_R.

NOTE

The second segment is generally the most limiting segment, and the third segment is a level flight segment (at 1,500 feet) with the gear up and the airplane accelerating to single engine climb speed (V_{ENR}).

Obstacle Clearance (Loss of Engine at V_1)

Part 25 requires that the airplane manufacturer display a takeoff path profile beginning at reference zero and ending at 1,500 feet AGL. Part 121 requires that the net takeoff flightpath clear all obstacles by 35 feet, or avoid them horizontally (by banking not to exceed 15° bank) by 200 feet within the airport boundary and 300 feet outside the airport boundary. To achieve this capability, all obstacles clearance takeoff flightpath charts show net takeoff climb gradients (actual or gross gradient of climb reduced by .8%).

Enroute Limitations

The *AFM* chart, "Single-Engine Enroute Net Climb Gradient," is not an operating limitation of the airplane under Part 91. It does, however, allow the pilot to calculate the maximum enroute altitude that the airplane will maintain on one engine. The chart depicts the actual or gross gradient of climb reduced by 1.1%.

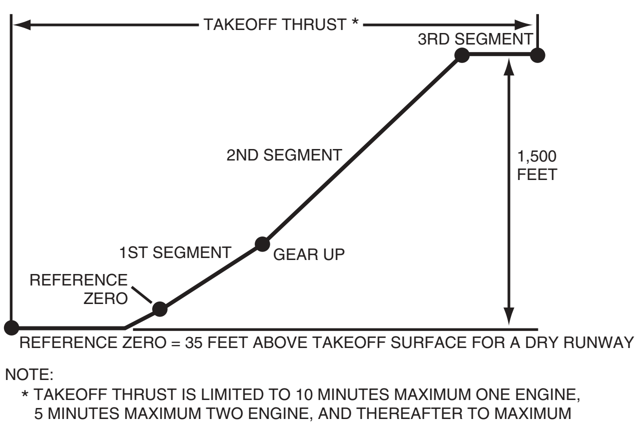


Figure MAP-1. Part 25 Climb Profile

Landing Limitations

The maximum landing weight is restricted by:

1. Maximum certified landing weight (structural)
2. Maximum landing weight permitted by climb requirements
3. Maximum landing weight permitted by landing field length
4. Maximum landing weight permitted by brake energy limits

For high pressure altitudes and temperatures, the approach climb configuration may be more restrictive and require a lower landing weight than the landing climb configuration. The "Maximum Landing Weight Permitted by Climb Requirement or Brake Energy Limits" chart, found in the *AFM*, depicts the landing weight as limited by the approach climb or brake energy.

An *AFM* chart, "Landing Distance, Actual Distance," provides the horizontal distance necessary to land and come to a complete stop from a point 50 feet over the runway threshold at V_{REF} (130% of the stall speed in the landing configuration). At that point, thrust is reduced to idle.

NOTE

For a no-flap landing, the final approach speed is based on the normal V_{REF} +18 KIAS. This will result in an increase of approximately 45% in the landing distance below 8,000 feet.

Table MAP-2. CLIMB CONFIGURATIONS

	APPROACH CLIMB CONFIGURATION	LANDING CLIMB CONFIGURATION
SPEED	V_{APP} (1.3 V_{S1}) (Approach climb speed)	V_{LC} (1.3 V_{S0}) (Landing climb speed)
THRUST SETTING	Takeoff (one engine)	Takeoff (two engine)
FLAP POSITION	Takeoff	Land
GEAR POSITION	Up	Down
REQUIRED GRADIENT OF CLIMB	2.1% gross	3.2% gross

V-SPEED DEFINITIONS

V_1 Decision Speed

This speed is obtained from the performance charts in the *AFM* and varies with airplane weight, flap setting, engine bleeds, altitude, and temperature. It must always be less than or equal to V_R.

V_R Rotation Speed

This speed is a function of weight and airplane configuration. It must always be equal to or greater than V_1. If V_1 is greater than V_R for a particular set of takeoff conditions, V_1 must be lowered to equal V_R.

V_2 Safety Climb Speed

V_2 is also a function of weight and airplane configuration. It is obtained from the performance charts in the *AFM* or from the condensed checklist.

Flap Ret—Flap retracting speed (V_2 +10 knots). Also used as minimum final segment climb speed.

V_2 gives the best angle of climb (altitude vs. distance).

V_{YSE}/V_{ENR}/V_{SE} Single-Engine Enroute Climb Speed

This speed can be used for a variety of purposes and is obtained from the *AFM*:

- Best rate of climb (altitude vs. time)
- Single-engine drift-down speed
- Single-engine climb speed

V_{REF} Minimum Final Approach Speed

This speed is 1.3 V_{SO} and is the minimum speed to be used on final approach. It is the airspeed that is equal to landing 50-foot point speed with full flaps and landing gear extended.

V_{APP}	The landing approach climb airspeed (1.3 V_{S1}) with 15° flap position, landing gear UP.

TOLD CARD

Figures MAP-2 and MAP-3 show takeoff and landing data (TOLD) cards.

ARPT	Name of airport or ICAO identifier
ELEV	Airport elevation or runway elevation if significantly different than airport elevation
TEMP	Temperature of airport as reported by ATIS
PRES ALT	Pressure altitude—Set 29.92 in the altimeter and read the pressure altitude directly from altimeter.
RWY AVAIL	Runway available—The actual runway length available at a given field. If the runway required is greater than runway available, reduce gross weight.

FlightSafety Int'l CITATION

TAKEOFF DATA

ATIS - CLEARANCE

ARPT ________ ELEV ________

TEMP ________ C PRES ALT ________

GW: MAX ________ ACT ________

RWY: AVAIL ________ REQ'D ________

FLAPS ________ TRIM ________

N1% SPEEDS

T/O ________ V1 ________

CLB ________ VR ________

V2 ________

VENR ________

EMERGENCY RETURN

FLAPS	VREF - VAPP	RWY REQ'D
________	________	________
________	________	________

Figure MAP-2. Takeoff Data Card

RWY REQ'D	Actual length of runway to be used for takeoff
FLAPS	The actual takeoff flap setting for the takeoff data
GW MAX	Maximum gross weight allowable—This is the maximum weight permitted for takeoff considering maximum takeoff weight permitted by climb requirements or maximum takeoff weight for field length. Maximum landing weight and fuel burnoff must also be considered.
Trim	Elevator trim at zero or white ARC range—Other trim at neutral
GW: ACT	The actual weight of the airplane at the beginning of the takeoff roll (does not include taxi fuel)

FlightSafety Int'l CITATION

LANDING DATA

ATIS - CLEARANCE

ARPT ____________ ELEV ____________

TEMP __________ C PRES ALT ________

GW: MAX ___________ ACT __________

RWY: AVAIL ________ REQ'D ________

GO-AROUND N1% ____________

FLAPS	VREF - VAPP	RWY REQ'D
________	____________	________
________	____________	________

Figure MAP-3. Landing Data Card

ATIS-Clearance	Space provided for copying pertinent information and clearance
T/O N_1%	Maximum fan setting for existing temperature and pressure altitude taken from the *AFM* or checklist and must be adjusted for anti-ice
CLB N_1%	Maximum climb fan setting depending on ram-air temperature and altitude from *AFM* or checklist and must be adjusted for anti-ice
Emer. Return/ RWY REQ'D	Required field length for an emergency landing immediately after takeoff
ARPT	Name of airport or ICAO identifier
ELEV	Destination airport elevation
TEMP	Temperature of airport in celsius
PRES ALT	Pressure altitude—During flight, obtain destination altimeter setting. Subtract 29.92 from reported altimeter setting. If reported pressure is less than 29.92, add the sum to destination elevation. Subtract if higher.
RWY: REQ'D	Landing distance adjusted for airplane configuration (flaps—antiskid); landing gross weight, runway conditions
RWY: AVAIL	Actual length of the runway available for landing
GW: MAX	Maximum gross weight allowed considering maximum certified landing weight, maximum weight permitted by climb requirement, maximum weight permitted by landing field length, and maximum weight permitted by brake limits
GW: Actual	Actual weight for landing at the destination airport
ATIS-Clearance	Space provided for copying pertinent information and clearance
Maneuvering Spd	Minimum maneuvering speed—V_{REF} corrected for flap setting. Clean V_{REF} +30, approach flap V_{REF} +20, and land flaps V_{REF} +10 knots
V_{REF}	Threshold speed for full flaps—Correct for no flaps if necessary. Taken from *AFM* or checklist and based on weight
V_{APP}	Engine out go-around landing approach climb airspeed (1.3 V_{S1}) with flap 15° and gear UP
RWY REQ'D	Fifty-foot driftdown and maximum braking rollout distance with two engines at idle power and thrust attenuators deployed at touchdown

Go-Around N_1	Go-around fan setting—This is the takeoff thrust setting from the *AFM* or checklist (10-minute limit). Must be corrected for anti-ice ON/OFF

MINIMUM MANEUVERING SPEED

This speed is the minimum speed that will provide an adequate margin above stall while maneuvering the airplane. Table MAP-3 lists the factor to be added to the full flap V_{REF} for the Citation CJ2 minimum maneuvering speed.

FINAL APPROACH PROCEDURES

NOTE

The following are suggested procedures for those who have no standard policy.

Flight Deck Discipline

Good operating practices are essential for precise execution of approach procedures, whether on instruments or visual. By constantly maintaining an awareness of the progress along the approach profile, the crew provides for an orderly transition to the landing runway; cross-checking must be thorough and continuous.

Approach planning begins sufficiently in advance of the approach, with a review of the approach charts and attention given to alternative courses of action, takeoff missed approach procedure, and approach briefing completed.

Flight information redundancy improves the ability to cross-check, which in turn provides for a continuous validation of one information source against another. It also decreases the effect of over-concentration on a single-instrument display.

The cross-check on final approach is, therefore, enhanced by tuning both pilots' navigation aids to the same frequencies.

Table MAP-3. MINIMUM MANEUVERING SPEEDS

FLAP CONFIGURATION	CITATION CJ2	RESIDUAL ICE
Clean	$V_{REF(35)}$ +30	$V_{REF(35)}$ +35
Flaps T.O. and APPR	$V_{REF(35)}$ +20	$V_{REF(35)}$ +25
Flaps full	$V_{REF(35)}$ +10	———

Scan Transfer

The transfer from instruments to visual flight differs with the approach being made.

Noncoupled approaches:

- The pilot flying remains on instruments. When reaching decision height (DH) or minimum descent altitude (MDA) and being advised of continuous visual reference, the pilot progressively adjusts his or her scan to visual flight, announces, "I am visual," and lands.

- The pilot not flying, when approaching DH or MDA, adjusts his scan pattern to include outside visual cues. When the pilot flying announces that he is "visual," the pilot not flying assumes the responsibility for monitoring the instruments and provides continuous advice of warning flags and deviations from approach tolerances (sink rate, airspeed, glide slope, and localizer) to touchdown.

Coupled approaches:

- The pilot flying adjusts his scan pattern to include outside visual cues. When reaching DH and having assured himself of continuous visual reference, he announces "I am visual," and lands.

- The pilot not flying concentrates on instruments to touchdown, advising of warning flags and deviation from approach tolerances.

UNUSUAL ATTITUDES

General

An unusual attitude is an airplane attitude occurring inadvertently. It may result from one factor or a combination of several factors, such as turbulence, distraction from cockpit duties, instrument failure, inattention, spatial disorientation, etc. In most instances, these attitudes are mild enough for the pilot to recover by reestablishing the proper attitude for the desired flight condition and resuming a normal cross-check.

Techniques of recovery should be compatible with the severity of the unusual attitude, the characteristics of the airplane, and the altitude available for recovery.

The following aerodynamic principles and considerations are applicable to the recovery from unusual attitudes:

- The elimination of a bank in a dive aids in pitch control

- The use of bank in a climb aids in pitch control

- Power and speedbrakes, used properly, aid in airspeed control

Unusual attitudes, as demonstrated in a simulator, are only accurate to the degree that real aircraft data is loaded in the simulator computers, i.e. steep turns, stalls, and emergency descent. Pilots may be asked to demonstrate their skill in recovery from unusual attitudes outside the pitch and bank maneuvering attitudes for which real aircraft data is not available in the simulator. This determines only that a pilot remains oriented and uses safe practices in the recovery and that the actual tactile feel and aircraft response might be different.

RECOVERY PROCEDURES

Attitude Indicator(s) Operative

Normally, an unusual attitude is recognized in one of two ways: an unusual attitude "picture" on the attitude indicator or unusual performance on the performance instruments. Regardless of how the attitude is recognized, verify that an unusual attitude exists by comparing control and performance instrument indications prior to initiating recovery on the attitude indicator. This precludes entering an unusual attitude as a result of making control movements to correct for erroneous instrument indications. If there is any doubt as to proper attitude indicator operation, then recovery should be made using the following attitude indicator inoperative procedures:

- If diving, adjust power and/or speedbrakes as appropriate while rolling to a wings-level, upright attitude, and correct to level flight on the attitude indicator.

- If climbing, use power as required, and bank toward the nearest horizon as necessary to assist in pitch control and to avoid negative G-forces. As the airplane symbol approaches the horizon bar, adjust pitch, bank, and power to complete the recovery and establish the desired airplane attitude.

Attitude Indicator(s) Inoperative

With an inoperative attitude indicator, successful recovery from unusual attitudes depends greatly on early recognition of attitude indicator failure. For example, attitude indicator failure should be immediately suspected if control pressures are applied for a turn without corresponding attitude indicator changes. Another example is satisfactory performance instrument indications that contradict the "picture" on the attitude indicator.

If an unusual attitude is encountered with an inoperative attitude indicator, the following procedure is recommended:

- Check other attitude indicators for proper operation, and recover on the operative attitude indicator.

Table MAP-4. STANDARD CALLOUTS (IFR AND VFR)

LOCATION	CONDITION	CALLOUT
Takeoff	• Computed N_1 set • Engine instruments normal • Annunciator panel lights normal	
	Both airspeed indicators moving off the peg	"Airspeed alive"
	Both airspeed indicators indicating 70 KIAS	"70 knots"
	Airspeed indicators at computed V_1	"V_1"
	Airspeed indicators at computed V_R	"Rotate"
	Airspeed indicators at computed V_2	"V_2"
Departure/ enroute/ approach	Prior to intercepting an assigned course	"Course alive"
	1,000 feet prior to level off	State altitude leaving and assigned level-off altitude
Climb and descent	Approaching transition altitude (IFR AND VFR)	"Transition altitude altimeters reset"
	1,000 feet above/below assigned altitude (IFR)	State altitude leaving and assigned level-off altitude
Final (IFR)	At final approach fix	(Fix) altimeters and instruments check *1
	500 feet above minimums	"500 above minimums"
	100 feet above minimums	"100 above minimums"
	Visual reference required by PART 91.175(c) is continuously established *2	"Runway at (clock position)" or "Approach lights at (clock position)"

Table MAP-4. STANDARD CALLOUTS (IFR AND VFR) (Cont)

LOCATION	CONDITION	CALLOUT
	After pilot flying reports "visual," pilot not flying reverts to instruments and callouts	"V_{REF} + airspeeds"
		"Sink (rate of descent)"
		"On," "Above," or "Below glide slope," if available
	At DH (decision height)	"Minimums, runway not in sight" or "Minimums, runway at (clock position)" or "Minimums, approach lights, at (clock position)"
	At MDA (minimum descent altitude)	"Minimums"
	At MAP (missed-approach point)	"Missed-approach point, runway not in sight" or "Missed-approach point, runway at (clock position)" or "missed-approach point, approach lights, at (clock position)"
Final (VFR)*3	500 feet above field elevation	"500 above field"
	100 feet above field elevation	"100 above field"

*1. CHECK FOR APPEARANCE OF WARNING FLAGS AND GROSS INSTRUMENT DISCREPANCIES. CAPTAIN'S JUDGMENT ON EXCESSIVE ALTIMETER ERROR.

*2. CARE MUST BE EXERCISED TO PRECLUDE CALLOUTS THAT CAN INFLUENCE THE PILOT FLYING AND RESULT IN PREMATURE ABANDONMENT OF INSTRUMENT PROCEDURES.

*3. IT IS RECOMMENDED THAT ALL PILOTS USE AVAILABLE ELECTRONIC/VISUAL SYSTEMS AS AN AID IN MAINTAINING GLIDE SLOPE.

TAKEOFF PROCEDURES AND FLIGHT PROFILES

Figures MAP-4 and MAP-5 show accepted Citation CJ2 takeoff profiles.

Sample Pretakeoff Briefing

Accomplish the following briefing prior to requesting takeoff clearance:

1. "This will be a ________ takeoff with flags set at ________."
   (static or rolling) (state flap position)

   (Mention anti-ice if required.)

2. "I will advance the throttles, and you set takeoff power."

3. "Call: 'Airspeed alive,' '70 knots,' 'V_1,' 'Rotate,' 'V_2,' and 'Positive rate.'"

4. "Monitor all engine instruments and the annunciator panel during takeoff. At the '70 knots' call, cross-check both airspeed indicators."

5. "In the event of a serious malfunction prior to V_1, call 'Abort.'" (Captain may reserve authority to call abort.)

6. "If a malfunction occurs at or after V_1, we will continue the takeoff. Advise me of the malfunction, and we will handle it as an in-flight emergency. Plan to fly ________."
   (state intentions)

7. "Departure instructions are ________. The navaids are set to ________."
   (state intentions) (state intentions)

8. "Any questions?"

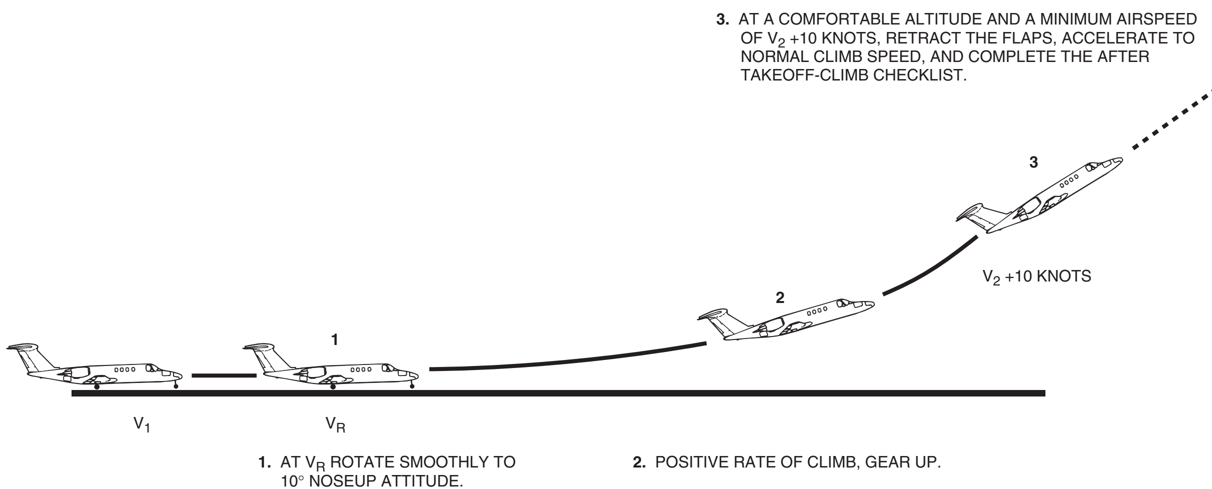


Figure MAP-4. Takeoff—Normal

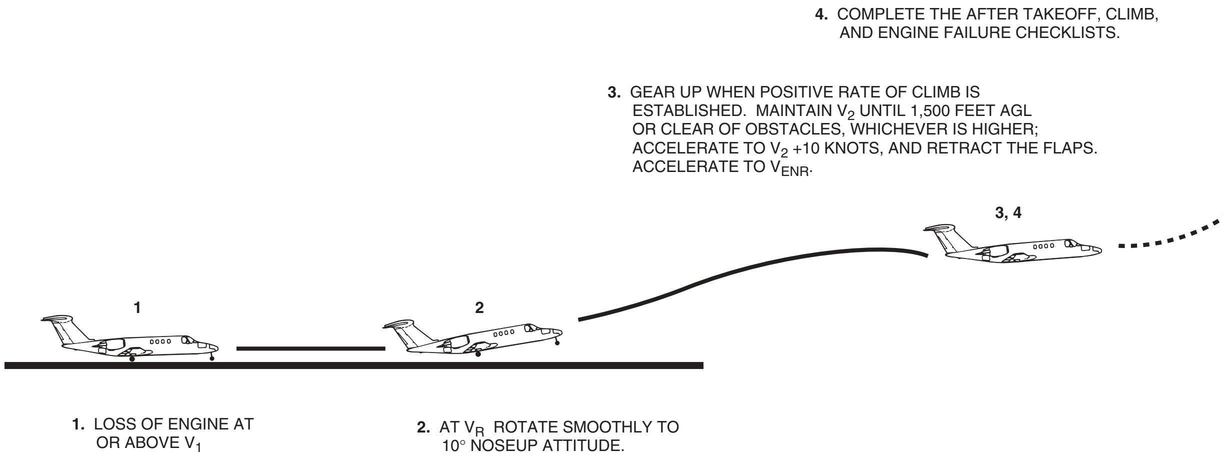


Figure MAP-5. Takeoff—Engine Failure at or above V_1

APPROACHES, LANDING PROCEDURES, AND FLIGHT PROFILES

Approach Briefing (Prior to Before Landing Checklist)

The briefing should accomplish the following:

1. Identify the approach to be flown and the transition (Figure MAP-6).

2. Assign the copilot to identify all intersections and the FAF, tune and ID all frequencies.

3. Assign the NAV frequency and course SEL changes for the entire approach.

4. Assign the timing responsibility upon request.

5. Assign the copilot the standard callouts:

   a. 1,000 feet before assigned altitudes

   b. Localizer or course alive

   c. 500 feet and 100 feet above published minimums

   d. "Minimums, runway not in sight" OR "Minimums, runway in sight, cleared to land"

Sample Approach Briefing

"We'll fly the localizer back-course approach to runway 19L at Wichita. I want you to set 110.3 in NAV 1 with 013° in the course selector window. Also set 113.8 in NAV 2 with 081° course selected to identify KECHI. Set 332 on the ADF for PICHE. Identify all navigation aids. Start timing at KECHI, using 2 minutes 30 seconds for 120 knots groundspeed. After crossing KECHI, set the ILS frequency in NAV 2, and set your HSI to match mine. If we execute a missed approach, I'll start a climb to 3,000 feet direct to IC LOM. We will observe all standard callouts."

Stabilized Approach

This training program uses the stabilized approach concept. The approach profiles are based upon achieving a stabilized approach. Configuration changes at low altitude are limited to those changes that can be easily accommodated without adversely affecting pilot workload. A stabilized approach must be established before descending below the following minimum stabilized approach heights:

- 500 feet above the airport elevation during VFR or visual approaches and during straight-in instrument approaches in VFR weather conditions

- MDA or 500 feet above airport elevation, whichever is lower, if a circling maneuver is to be conducted after completing an instrument approach

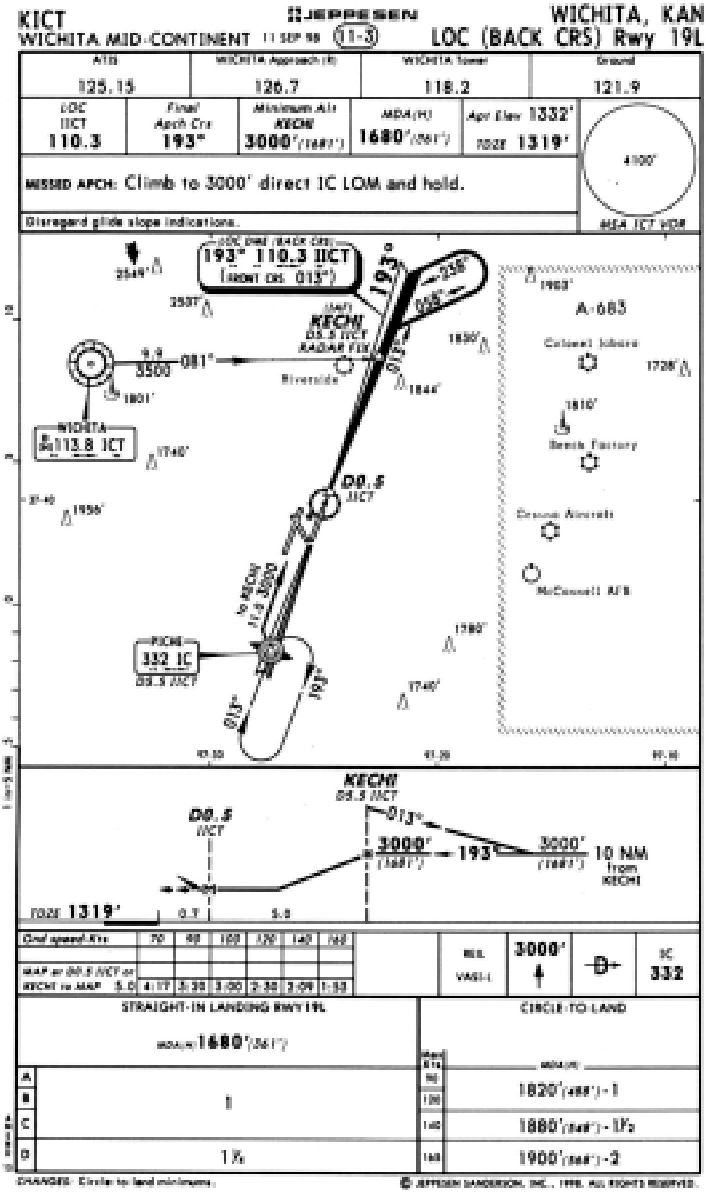


Figure MAP-6. Approach Plate (Typical)

- 1,000 feet above the airport or TDZ elevation during any straight-in instrument approach in instrument flight conditions

- 1,000 feet above the airport during contact approaches

If a stabilized approach cannot be achieved before descending below the above minimum stabilized approach heights, immediate action will be taken to execute a missed approach or go-around.

Landing Procedures and Flight Profiles

Figures MAP-7 through MAP-11 provide guidelines for several types of approaches.

The actual touchdown is on the main gear with a slightly nose-high attitude. After the nose gear is lowered to the runway, extend the flaps to 60° ground flaps and apply the wheelbrakes as necessary.

NOTE

On single-engine approaches, do not lower the flaps to LAND until the landing is assured.

Adjustments to Landing Distance

- Antiskid inoperative .... +40%
- Powerbrake and antiskid inoperative .... +30%
- Wet runway .... Refer to advisory information in the AFM
- Icy runway .... Refer to advisory information in the AFM

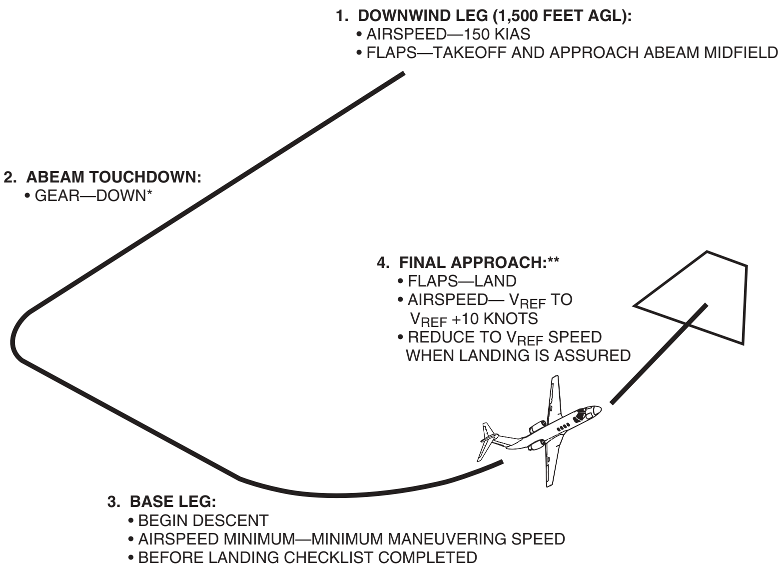
Table MAP-5. FLAPS INOPERATIVE LANDING DISTANCE FACTORS

FLAPS DEGREES	ALTITUDE—FEET							
	SL THROUGH 3000		3001 THROUGH 6000		6001 THROUGH 8000		ABOVE 8000	
	Reduce Max Lndg Weight by	Multiply Flaps 35° Landing Dist.	Reduce Max Lndg Weight by	Multiply Flaps 35° Landing Dist.	Reduce Max Lndg Weight by	Multiply Flaps 35° Landing Dist.	Reduce Max Lndg Weight by	Multiply Flaps 35° Landing Dist.
0° *	0 lbs.	1.45	500 lbs.	1.45	740 lbs.	1.45	970 lbs.	1.45
15° *	330 lbs.	1.25	830 lbs.	1.25	1,130 lbs.	1.25	1,100 lbs.	1.25
60°	0 lbs.	1.0	0 lbs.	1.0	0 lbs.	1.0	0 lbs.	1.0
0° with residual ice *	520 lbs.	1.5	990 lbs.	1.5	Prohibited	Prohibited	Prohibited	Prohibited

* Downhill and/or tailwind landings prohibited

Note:

See Table AP-1.

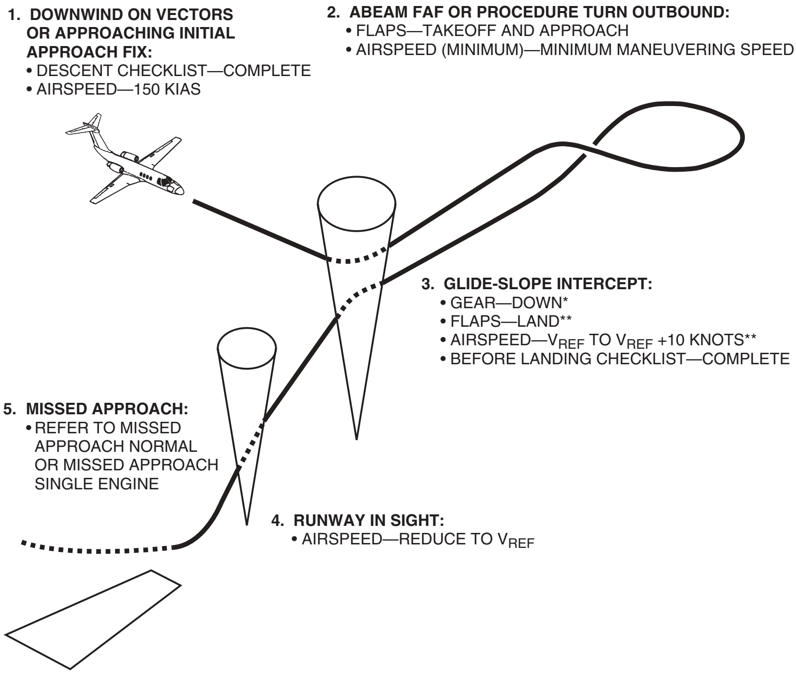


NOTE:
IN GUSTY WIND CONDITIONS, INCREASE V_{REF} BY HALF OF THE GUST FACTOR IN EXCESS OF 5 KNOTS

* IF BEING RADAR-VECTORED TO A VISUAL APPROACH, LOWER THE GEAR ON BASE LEG OR NO LATER THAN THREE MILES FROM THE THRESHOLD ON A STRAIGHT-IN APPROACH.

** SINGLE ENGINE—V_{REF} +10 KNOTS MINIMUM AND MAINTAIN FLAPS APPROACH UNTIL LANDING IS ASSURED.

Figure MAP-7. VFR Approach—Normal/Single Engine



NOTE:
IN GUSTY WIND CONDITIONS INCREASE V_{REF} BY HALF OF THE GUST FACTOR IN EXCESS OF 5 KNOTS.

* ONE DOT PRIOR TO GLIDE-SLOPE INTERCEPT WITH TWO ENGINES; AT GLIDE SLOPE INTERCEPT WITH ONE ENGINE.

** SINGLE ENGINE — V_{REF} +10 KNOTS (MINIMUM) WITH FLAPS AT APPROACH UNTIL LANDING IS ASSURED, THEN FLAPS TO LAND AND AIRSPEED V_{REF} CROSSING THRESHOLD.

Figure MAP-8. ILS Approach—Normal/Single Engine

Crosswind Landing

Method No. 1:

The Citation CJ2 will be flown down final approach with runway centerline alignment maintained with normal drift correction. Approaching the threshold, lower the upwind wing to maintain no drift, and apply opposite rudder to maintain alignment with runway centerline. Fly the airplane onto the runway—do not allow drift to develop.

Method No. 2:

The “crab” or wings-level method may be continued until just before touchdown. Then, with wings level, apply rudder pressure to align the airplane with the runway centerline at the moment of touchdown. Fly the airplane onto the runway—do not allow drift to develop.

Circling Approaches

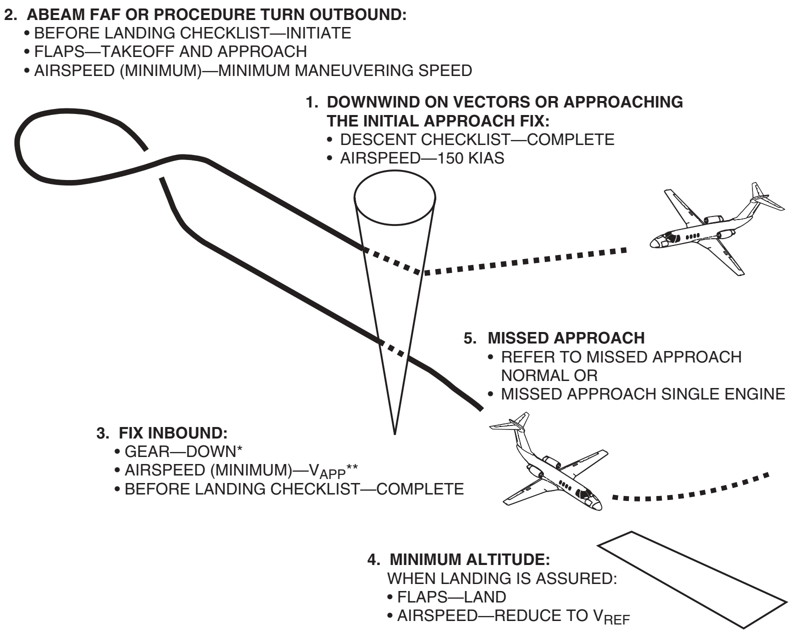
A circling approach may follow any authorized instrument approach. Although the Citation CJ2 aircraft is in approach category B, category C minimums are used during the circling approach due to the higher maneuvering airspeeds. A normal instrument approach is flown until visual contact with the airport is made at the MDA published for the particular circling approach. With the airport in sight, the approach becomes a visual reference approach with a continued cross-check of the flight instruments. At this point, configuration and speeds will be the same as for a normal visual approach.

Leaving the final approach fix, maintain minimum maneuvering speed with the flaps at takeoff and approach and the landing gear down. Reduce the power to provide a 1,000-foot-per-minute rate of descent. When approaching MDA, power should be added to maintain airspeed while leveling off, thereby reducing the rate of descent and ensuring that the airplane does not go below MDA. There are many recommended circling procedures once the airport is in sight. Any procedure is acceptable, provided the following criteria are met:

- An identifiable part of the airport is always in sight.
- A safe and controllable airspeed is maintained.
- MDA is maintained until the aircraft is in position to perform a normal descent to a landing on the landing runway without excessive maneuvering.

FLAPS-UP LANDING AND FLIGHT PROFILE

When planning a no-flap approach and landing (Figure MAP-12), the landing weight of the airplane must be considered. An attempt should be made to reduce this weight if possible, especially if runway length is marginal, due to the higher approach and landing speeds required for a no-flap configuration. Compute the normal V_{REF}, and add 18 knots. Set the PFD airspeed on the new no-flap V_{REF} speed. Fly the final approach at the adjusted V_{REF} +10 knots maximum, and reduce to the adjusted V_{REF} prior to crossing the threshold.



NOTE:

IN GUSTY WIND CONDITIONS, INCREASE V_{REF} BY HALF OF THE GUST FACTOR IN EXCESS OF 5 KNOTS.

FOR CIRCLING APPROACHES, MAINTAIN MINIMUM MANEUVERING SPEED CONSISTENT WITH FLAP POSITION. TURN FINAL, SELECT FLAPS TO LAND, AND REDUCE TO V_{REF} SPEED WHEN LANDING IS ASSURED.

*ENSURE GEAR IS DOWN AND LOCKED BY FAF.

**SINGLE ENGINE—V_{REF} +10 KNOTS (MINIMUM) WITH FLAPS AT APPROACH UNTIL LANDING IS ASSURED, THEN FLAPS TO LAND AND AIRSPEED V_{REF} CROSSING THRESHOLD.

Figure MAP-9. Nonprecision Approach—Normal/Single Engine

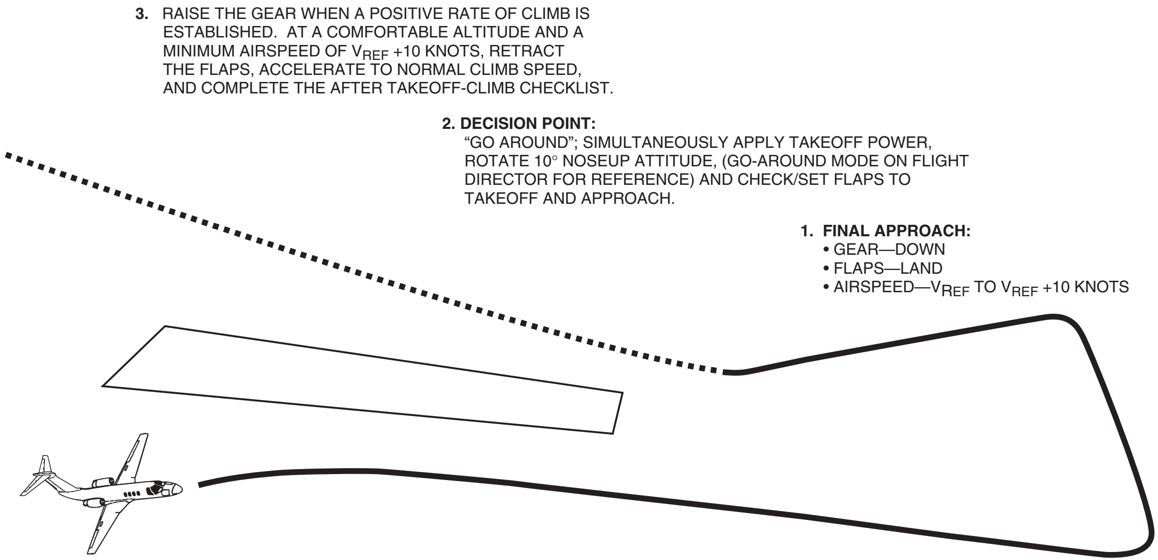


Figure MAP-10. Missed Approach—Normal

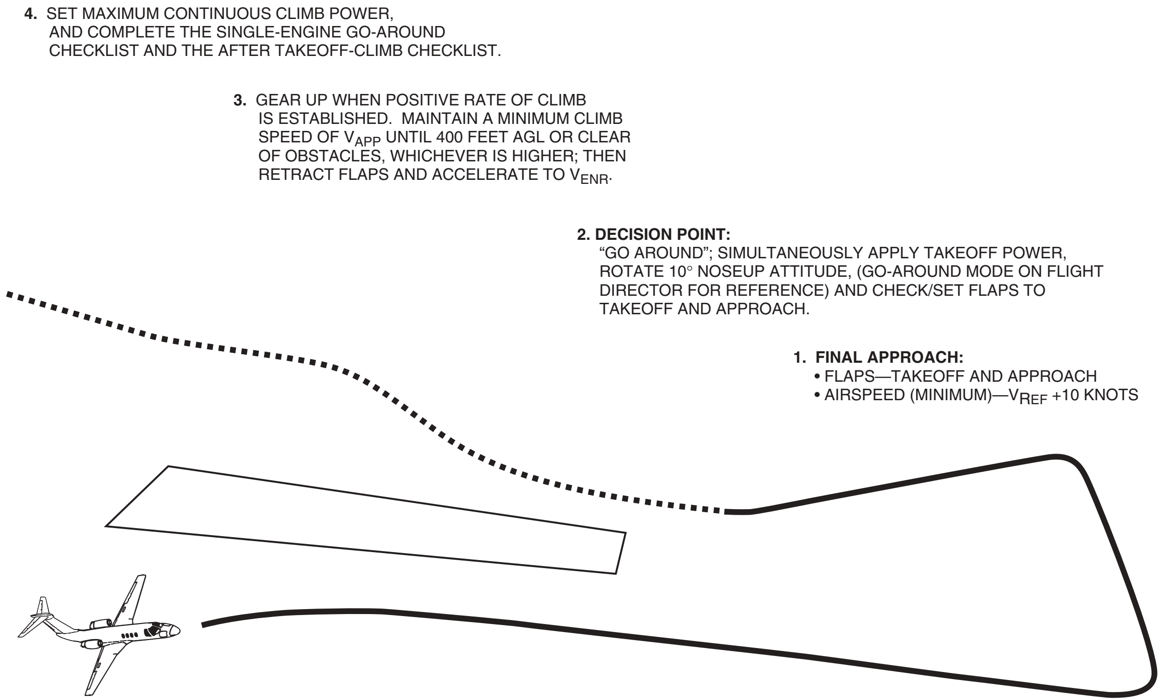


Figure MAP-11. Missed Approach—Single Engine

FLAPS-UP LANDING AND FLIGHT PROFILE (Cont)

NOTE

To preclude excessive float during landing, allow the airplane to touch down in a slightly flatter attitude than on a normal landing.

Table MAP-6. ZERO FLAPS INOPERATIVE LANDING DISTANCE FACTORS

FLAPS DEGREES	ALTITUDE—FEET							
	SL THROUGH 3000		3001 THROUGH 6000		6001 THROUGH 8000		ABOVE 8000	
	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by	Reduce Figure 4-46 by	Multiply Figure 4-47 by
0° *	0 lbs.	1.45	500 lbs.	1.45	740 lbs.	1.45	970 lbs.	1.45
0° with residual ice *	520 lbs.	1.5	990 lbs.	1.5	Prohibited	Prohibited	Prohibited	Prohibited

* Downhill and/or tailwind landings prohibited

APPROACH TO STALL AND FLIGHT PROFILES

Prior to any planned approaches to stall (Figures MAP-13 through MAP-15), clear area visually. All recoveries will be made with power and a minimum loss of altitude.

At least one approach to a stall shall be made in other than straight flight not to exceed 30° bank. The usual condition is 20° bank and approach flaps.

The stall warning is achieved aerodynamically, aided by stall strips on the inboard section of each wing. These strips disrupt the airflow over the horizontal stabilizer, resulting in a prestall buffet. The stall warning also is provided by a stick shaker attached to the control columns. It is activated at an angle-of-attack indication of approximately .82 (gear down, full flaps). Stall recovery should be initiated at the onset of either indication.

Prior to stalls (ICCEY check):

1. Ignition.. ON
2. Compute climb power setting for altitude and temperature.
3. Compute V_{REF} for gross weight.
4. Engine synchronizer.. OFF
5. Yaw damper.. OFF

Limitations (stalls).......... Intentional stalls are prohibited above 18,000 feet

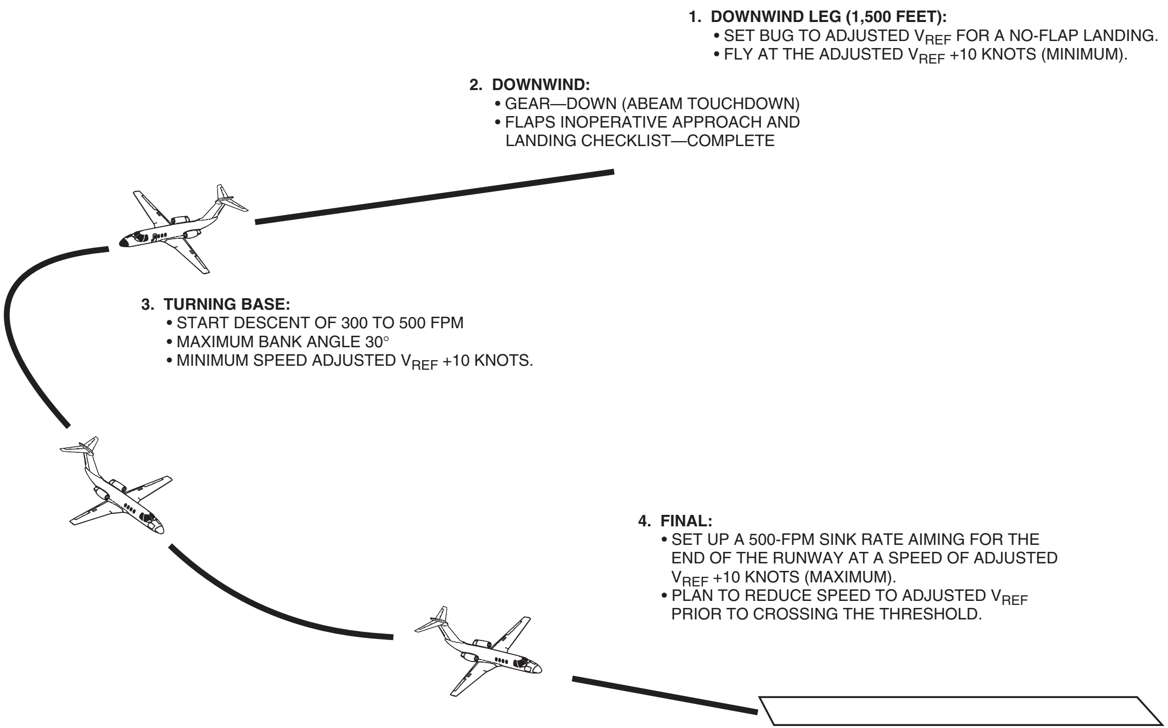


Figure MAP-12. Visual Approach and Landing with Flaps Inoperative

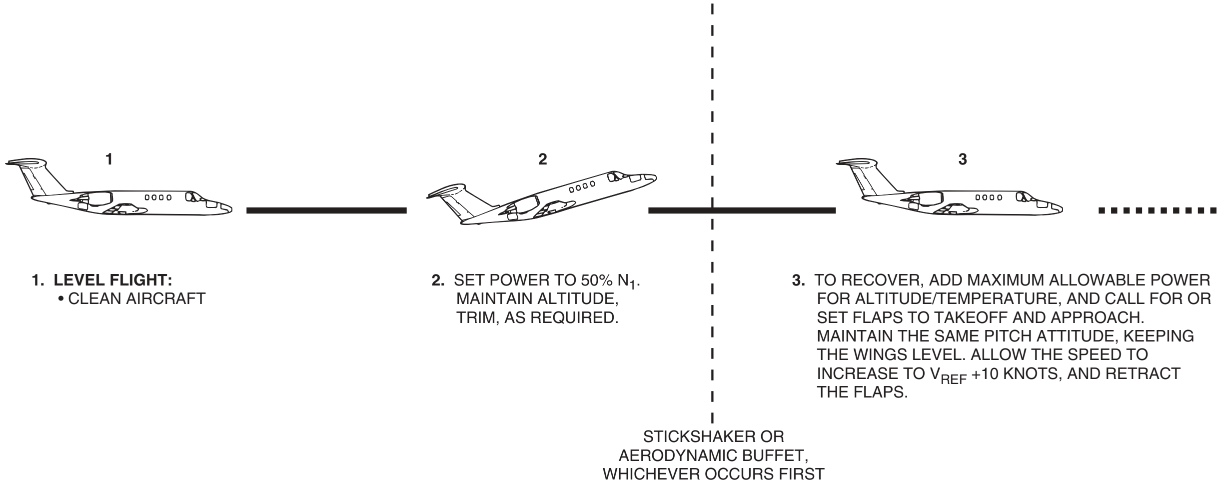
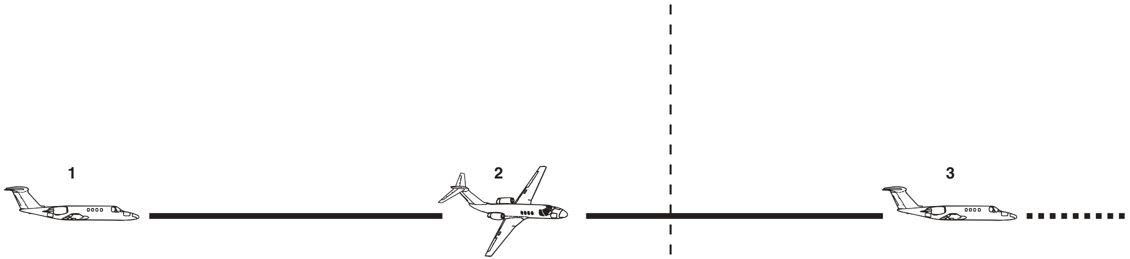


Figure MAP-13. Approach to Stall—Enroute Configuration



1. **LEVEL FLIGHT:**
   - FLAPS—TAKEOFF AND APPROACH

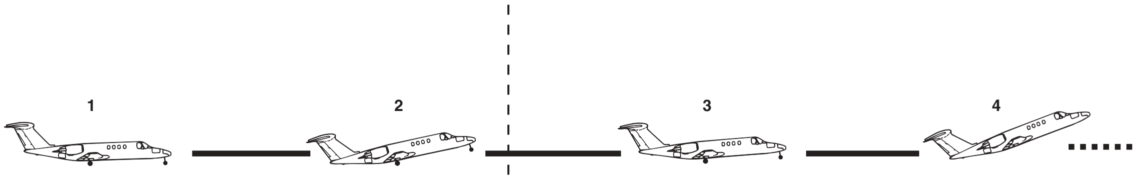
2. ROLL INTO A 20° BANK. SET POWER TO 50% N_1. MAINTAIN ALTITUDE, TRIM AS REQUIRED.

3. TO RECOVER, ADD MAXIMUM ALLOWABLE POWER FOR ALTITUDE AND TEMPERATURE. CHECK THAT THE FLAPS ARE AT THE TAKEOFF AND APPROACH POSITION. MAINTAIN THE SAME PITCH ATTITUDE, AND ROLL THE WINGS LEVEL. * ALLOW THE SPEED TO INCREASE TO V_{REF} +10 KNOTS AND RETRACT THE FLAPS.

STICKSHAKER OR AERODYNAMIC BUFFET, WHICHEVER OCCURS FIRST

* NOTE:
USE THE RUDDER TO AID IN LEVELING THE WINGS. THIS WILL MINIMIZE THE ADVERSE YAW PRODUCED BY DOWN AILERON.

Figure MAP-14. Approach to Stall—Takeoff Configuration



1. **LEVEL FLIGHT:**
   - GEAR—DOWN
   - FLAPS—LAND

2. SET POWER TO 50% N_1. MAINTAIN LEVEL FLIGHT UNTIL THE STALL INDICATION OCCURS. TRIM, AS REQUIRED.

STICKSHAKER OR AERODYNAMIC BUFFET, WHICHEVER OCCURS FIRST

3. TO RECOVER, SIMULTANEOUSLY ADD MAXIMUM ALLOWABLE POWER, LOWER PITCH ATTITUDE SLIGHTLY, KEEPING WINGS LEVEL. WHEN THE STICK SHAKER STOPS SHAKING, CALL FOR/SET FLAPS TO TAKEOFF AND APPROACH.

4. AS AIRSPEED REACHES V_{REF}, ROTATE SLOWLY AND SMOOTHLY TO 10° NOSEUP AND HOLD THIS SPEED UNTIL A POSITIVE RATE OF CLIMB IS ATTAINED. RETRACT THE GEAR. CLIMB TO YOUR MDA AT V_{REF}, THEN ALLOW THE AIRSPEED TO INCREASE TO V_{REF} +10 KNOTS AND RETRACT THE FLAPS.

Figure MAP-15. Approach to Stall—Landing Configuration

PROCEDURE

- AIRSPEED—200 KIAS
- BANK ANGLE—45°
- MAINTAIN ALTITUDE
- INCREASE THRUST, PASSING THROUGH 30° BANK (APPROXIMATELY 50 POUNDS FUEL FLOW OR 3% N_1).
- INITIATE ROLLOUT 10° PRIOR TO DESIRED HEADING.

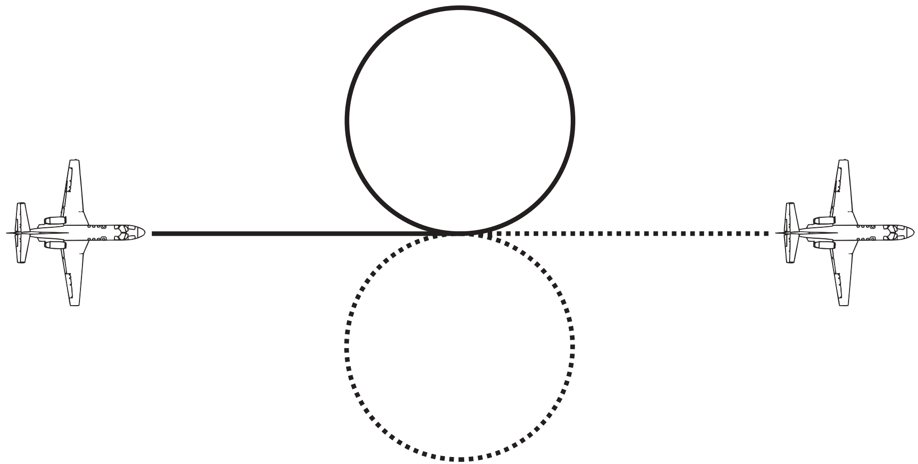


Figure MAP-16. Steep Turns

EMERGENCY DESCENT AND FLIGHT PROFILE

1. Start maneuver at an altitude of 35,000 to 45,000 feet.

2. The initial entry into the descent is accomplished by rolling the airplane into a moderate bank allowing the nose to drop to about 15° nosedown pitch with the power in idle and the speedbrakes extended. This will avoid negative G-forces on the airplane. Roll the wings level after reaching desired pitch angle. As the speed approaches M_{MO}/V_{MO}, adjust nosedown pitch to maintain this speed and trim.

3. Call out periodic altitude checks during descent.

4. Copilot calls 2,000 feet above level-off altitude; start level-off 1,000 feet above altitude and retract speedbrakes.

WINDSHEAR

The best windshear procedure is avoidance. Recognize the indications of potential windshear and ***avoid*** them.

The key to recovery from windshear is to fly the aircraft so that it is capable of a climb gradient greater than the windshear-induced loss of performance. Normally, the standard wind/gust correction factor 1/2 gust will provide a sufficient margin of climb performance. If a shear is encountered that jeopardizes safety, initiate a rejected landing procedure. If the sink rate is arrested, continue with the procedure for microbursts.

Microbursts

If a microburst is encountered, the first indication will be a rapid increase in the rate of descent accompanied by a rapid drop below glide path (visual or electronic).

1. Initiate normal rejected landing procedures (10° pitch).

2. Do not change the aircraft configuration until a climb is established.

3. If the aircraft is not climbing, smoothly increase pitch until a climb is established or stall warning is encountered. If stall warning is encountered, decrease pitch sufficiently to depart the stall warning regime.

4. When positively climbing at a safe altitude, complete the rejected landing maneuver.

NOTE

The positive rate-of-climb should be verified on at least two instruments. Leave the gear down until you have this climb indication, as it will absorb some energy on impact should the microburst exceed your capability to climb.

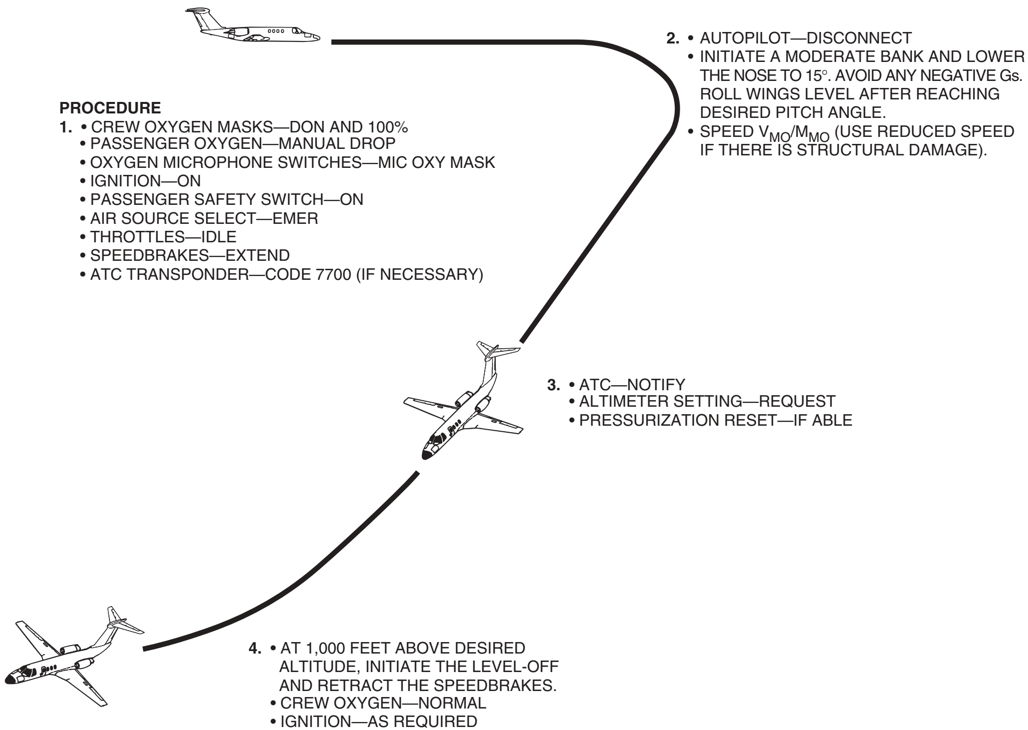


Figure MAP-17. Emergency Descent and Flight Profile

WARNING

If a decision is made to rotate to the stall warning, extreme care should be exercised not to overrotate beyond that point, because the aircraft is only a small percentage above the stall when the aural warning activates.

Acceptable Performance Guidelines

- Understand that avoidance is primary
- Ability to recognize potential windshear situations
- Ability to fly the aircraft to obtain optimum performance

FLIGHT INTO ICING

Flight into known icing is the intentional flight into icing conditions that are known to exist by either visual observation or pilot weather report information. Icing conditions exist anytime the indicated RAT is +10°C or below and visible moisture in any form is present. Cessna Citations, equipped with properly operating anti-ice and deice equipment, are approved to operate in maximum intermittent and maximum continuous icing conditions, as defined by Part 25, Appendix C, when that equipment is in operation. The equipment has not been designed to provide protection against freezing rain or severe conditions of mixed or clear ice. During all operations, the pilot is expected to exercise good judgment and be prepared to alter the flight plan, i.e., exit icing, if conditions exceed the capability of the airplane and equipment.

Ice accumulations significantly alter the shape of airfoils and increase the weight of the airplane. Flight with ice accumulated on the airplane will increase stall speeds and alter the speeds for optimum performance. Flight at high angle of attack (low airspeed) can result in ice buildup on the underside of the wings and the horizontal stabilizer aft of areas protected by boots or leading edge anti-ice systems. Minimum airspeed for sustained flight in icing conditions (except approach and landing) is 160 KIAS. Prolonged flight with the flaps and/or landing gear extended is not recommended. Trace or light amounts of icing on the horizontal stabilizer can significantly alter airfoil characteristics that will affect stability and control of the airplane.

NOTE

With residual ice on the airplane, stall characteristics are degraded and stall speeds are increased. For flaps 35°, the increase in stall speed is small and does not warrant an increase in the landing speed. For flaps 15°, the approach speed should be increased by 6 KIAS.

Freezing rain and clear ice will be deposited in layers over the entire surface of the airplane and can "run back" over control surfaces before freezing. Rime ice is an opaque, granular, and rough deposit of ice that usually forms on the leading edges of wings, tail surfaces, pylons, engine inlets, antennas, etc.

SPECIAL PROCEDURES

SHORT-FIELD OPERATION

For takeoff, taxi into position as close to the approach end as possible, and apply takeoff thrust while holding the brakes. *AFM* takeoff field length data assumes a static runup and use of all available runway. When specified thrust is set, release the brakes. Retrim power at approximately 60 knots. Rotate smoothly precisely at V_R, as a delay will result in degradation of takeoff performance. Retract the gear when positively climbing, and climb at V_2 (V_2 +15 KIAS multiengine) with T.O. & APPR (15°) flaps until clear of any obstacles.

Landing distance data in the *AFM* assumes a steady 3° approach angle and a threshold crossing speed of V_{REF} at an altitude of 50 feet, with thrust reduced to idle at that point. In practice, it is suggested that for minimum field operations the threshold be crossed at a comfortable obstacle clearance altitude, allowing some deceleration to take place when approaching the runway. Touchdown should occur with maximum available runway remaining at minimum safe speed.

The energy to be dissipated during rollout is directly related to airplane weight and velocity at touchdown. Although weight normally is dictated by cabin loading and reserves required, flight planning into short fields should include avoiding carrying excessive weight in stored fuel. This consideration offers the side benefit of improved enroute performance. Velocity is something that can be controlled in nearly every case. Precise speed control is important in the short-field environment. A 1% increase in speed will require approximately 2% more rollout distance. Excessive speed and late throttle reduction also will increase "float" prior to touchdown.

In general, short-field landings are accomplished the same as normal landings except for maximum braking and closer attention to touchdown point and speed. A stabilized approach at V_{REF} provides the best possible starting point because any corrections necessary will be small. Establish a glide angle that will safely clear any obstacles and result in touchdown as comfortably close to the approach end as feasible. A very flat approach generally requires excessive power in close, and for that reason should be avoided. It also results in a reduction of the vertical gust margin. At approximately 50 feet AGL, power reduction is normally begun to cross the threshold at a speed not in excess of V_{REF}. Check the throttles at idle and avoid an excessive flare that may cause the airplane to float. Deceleration will take place much more rapidly on the runway than it will airborne.

After touchdown on the main gear, lower the nose and apply the wheel brakes. When the squat switches compress, the thrust attenuators will extend automatically and the white L or R ATTEN UNLOCK annunciators will illuminate. While they are extending, the white HYD PRESS ON annunciator also will illuminate; when they reach the extended position the HYD PRESS ON will extinguish. Pull the flap lever out to clear the detent and place the handle all the way down into GROUND FLAPS/60° position. Selecting GROUND FLAPS/60° will lower the flaps to the extreme down position and also will extend the speedbrakes. Once braking has begun, back pressure on the yoke will provide additional weight on the main gear, providing the nose is not raised.

ADVERSE FIELD CONDITIONS

All *AFM* field length data assumes a dry, hard-surface runway except where otherwise noted. Precipitation-covered runway conditions degrade braking effectiveness and require significantly greater actual takeoff and landing field lengths.

Considerations for landing on a precipitation-covered runway are similar to those for short field operations where speed is minimized and maximum roll out distance is made available. Landing performance has been demonstrated in standing water or slush depths up to 0.75 inch. Igniters must be on. Takeoff and landing distances will be significantly influenced by standing water, slush, snow or ice on the runway. Refer to Section VII of the FAA-approved *Airplane Flight Manual* for corrections to takeoff and landing data.

Automatic operation of the thrust attenuators in adverse runway conditions will not cause any noticeable difference in operation of the airplane, as compared to operation on a dry, hard-surface runway. Rain or snow will not be blown forward and throttle technique is not affected.

Precipitation-covered and icy runways present particular hazards which must be understood in order to achieve effective braking. Under normal braking conditions, the antiskid system is very effective in preventing skids and in producing minimum stopping distances, with the pilot applying and maintaining steady maximum pressure. However, on a precipitation- or ice-covered runway, the phenomenon of dynamic hydroplaning may greatly reduce the antiskid effectiveness, because the wheels either do not spin up equally or do not spin up to the antiskid threshold speed.

With 114 ±5 psi tires, hydroplaning in the Citation CJ2 may occur above approximately 80 knots ground speed. It is important to maintain properly inflated tires with good tread depth. Because ground speed is critical, avoid tailwinds when operating in these conditions. When braking on precipitation-covered runways, ensure that the wheels are down and tracking prior to applying brakes. This will give the wheels time to spin up. Ensure that maximum weight is on the wheels, i.e., select GROUND FLAPS/60° to fully extend the flaps and cancel as much lift as possible, as well as to extend the speedbrakes.

If runway permits, use maximum aerodynamic braking to slow the airplane prior to braking. When braking is commenced, gradually apply steady pressure until antiskid cycling begins. As long as the antiskid is cycling, maintain that pressure. If long antiskid pressure dumps occur due to hydroplaning, release the brakes to allow the wheels to spin up again and then gradually reapply pressure until antiskid cycling resumes.

After landing on ice or slush, a complete check of the airplane, including overboard vents and control surfaces, should be conducted.

WATER/SLUSH OPERATION

The airplane has been demonstrated to safely operate in standing water/slush depths up to 0.75 inch. Igniters must be on.

WARNING

Takeoff and landing distances will be significantly influenced by standing water, slush, snow or ice on the runway.

NOTE

Refer to Section VII in the FAA-approved *Airplane Flight Manual* for corrections to takeoff and landing data.

NOTE

The following procedure may be followed to help remove slush and/or frozen water from the landing gear. If able, do not immediately retract the gear to allow centrifugal force and airflow to remove excess fluid and slush. After initial gear retraction, extend and retract the gear one additional time.

ANTI-ICE AND DEICE SYSTEMS

The anti-ice system consists of bleed-air-heated engine inlets, wing leading edge, windshield, and pylon inlet ducts. The pitot tubes, static ports, and angle-of-attack probe are electrically heated. Windshield alcohol anti-ice is also provided as a backup system for the left windshield. The horizontal stabilizer is deiced by pneumatic boots.

All anti-ice systems and tail deice systems should be turned on when operating in visible moisture and the indicated RAT is +10°C or below. The wing/engine anti-ice systems may be operated in the ENG ON position and the windshield anti-ice and tail deice may be OFF, provided it can be visually verified that no ice is accumulating. The wing anti-ice system is automatically shut off when the respective engine N_2 falls below 75% to allow for faster engine acceleration from idle.

CAUTION

Do not operate tail deice boots when indicated RAT is below –35°C (–31°F).

When the wing/engine anti-ice switches are placed to either the ENG ON or WING/ENG position, hot bleed air flows through the respective engine inlet providing anti-ice protection to the engine inlet and generator cooling air inlet. The engine fan, stators, and spinner are aerodynamically deiced. Ice will build on the spinner, engine fan, and stators, and shed due to centrifugal and aerodynamic forces. Minor acoustical vibrations may be evident at some power settings as this ice builds and sheds. The engine anti-ice system is monitored by temperature sensors that will illuminate the ENG ANTI-ICE L/R annunciator should the engine inlet temperature fall below 10°C (50°F). The MASTER CAUTION will illuminate approximately 50 seconds after illumination of the ENG ANTI-ICE L/R annunciator. The MASTER CAUTION is disabled when the system is initially turned on, until the ENG ANTI-ICE annunciators extinguish.

When the wing/engine anti-ice switches are placed to the WING/ENG position, (engine N_2 above 75% rpm in flight), precooled bleed air flows to the respective wing leading edge, exiting through louvers on the lower surface of the wingtip. The wing anti-ice system is monitored by temperature switches in each wing root. When bleed-air temperature entering the wing leading edge is less than 110°C (230°F), the respective L/R WING ANTI-ICE annunciator will illuminate.

A 104°C (220°F) switch monitors wing skin temperature and will shut the respective wing anti-ice system off and illuminate the respective L/R WING ANTI-ICE annunciator should an overheat condition occur. This condition will occur during sustained round operation at high engine thrust, but should not occur in flight. The L/R WING ANTI-ICE annunciators will also illuminate approximately 1 minute after the respective engine N_2 is reduced below 75% rpm, unless the 110°C (230°F) switch causes earlier illumination. In any case, the MASTER CAUTION will illuminate approximately 1 minute after illumination of the L/R WING ANTI-ICE annunciator. The MASTER CAUTION is disabled when the system is initially turned on, until the L/R WING ANTI-ICE annunciators extinguish.

When the wing/engine anti-ice switches are placed to the WING/ENG position, engine bleed air is supplied to the pylon air inlet duct to prevent ice from blocking cooling air supply to the cabin and windshield heat exchangers. Blockage of these ducts will result in loss of cabin and windshield bleed temperature control.

The horizontal tail is deiced by pneumatic boots controlled by the tail deice AUTO–OFF–MANUAL switch. Selecting the switch to AUTO will activate a controller that will inflate the boots one side at a time, then repeat this cycle continuously after 3 minutes, providing automatic deice of the stabilizer. Selecting the momentary MANUAL position will inflate both boots as long as the pilot holds the switch in the MANUAL position. Manual mode will cause a slight pitch bump at boot inflation that will vary in intensity with the amount of ice accumulated prior to boot activation. Vacuum is supplied to deflate the boots after each cycle and keep them deflated between cycles and when OFF.

Proper activation of the deice boots is annunciated by a white L/R TAIL DEICE advisory light on the annunciator panel that illuminates when proper inflation pressure is reached in each deice boot.

CAUTION

The tail deice boots should not be activated at indicated RAT below –35°C (–31°F). Boot cracking may result.

The windshield bleed-air system provides windshield anti-ice under all normal operating conditions. This system also provides external windshield defog and rain removal. The system supplies engine bleed air through an electrically actuated pressure regulating shutoff valve in the tail cone and manually positioned regulating valves to each windshield. The manual valves are located at each bleed-air nozzle and are in the OFF position for all normal operations. A check should be made to ensure that the rain removal handle is pushed down for windshield anti-icing. When windshield anti-icing is required. the W/S bleed valves are turned on and the W/S bleed switch is turned to LO, if the indicated RAT is above –18°C, or to HI if the indicated RAT is –18°C or below. Normal system operation is indicated by an increase in air noise.

Electric heating elements are provided in the pilot's and copilot's pitot tubes, pilot's and copilot's static ports, and the angle-of-attack probe. The pitot-static anti-ice switch actuates all of these elements. Operation may be checked on preflight by turning the switch ON for approximately 30 seconds, then OFF; then feeling each element during the external inspection. Ground operation of the pitot-static heat should be limited to less than 2 minutes to avoid damage.

PASSENGER COMFORT

When parked during daylight in hot weather, it is suggested that the cabin window shades be closed to reduce solar-heat transfer. An optional exterior windshield cover performs the same function for the cockpit and is very effective. To circulate cool air in the interior, increased air circulation in the cockpit is available by turning the forward and aft fans to HI.

The air-conditioning system discharges conditioned air from floor-mounted evaporator/blowers in the forward and aft ends of the cabin, to provide rapid cabin cooling. The air conditioner is controlled by switches on the environmental control (tilt) panel, and can be used on the ground or in flight. The three-position AIR COND switch (AUTO–OFF–FAN) controls primary power to the system. In the OFF position, power to the compressor is removed and the cabin temperature control system will be ineffective. In the AUTO position, the aft blower and the cabin temperature control system are energized, and the forward blower is automatically controlled. In the FAN position, the cabin temperature control system is energized, and the aft evaporator fan and the forward fan will run at the speed selected on the fan switches. The forward fan may be turned off by selecting AUTO, but it has a default function that will cause the fan to run at low speed whenever the freon compressor engages.

On the ground, the following rules-of-thumb apply:

- With the TEMPERATURE SELECT in MANUAL, and the AIR SOURCE SELECT in L, R or BOTH, heated bleed air is always available.

- With the TEMPERATURE SELECT in AUTO and the AIR SOURCE in L, R or BOTH, heated bleed air is available if cabin air is below approximately 65°F, and no heated bleed air is available if cabin air is above approximately 65°F.

- If the AIR SOURCE SELECT is OFF, no bleed air will be available with the TEMPERATURE SELECT in either AUTO or MANUAL.

Temperature control in the heat mode is not operative on the ground, because the required crossflow of cooling air through the air-to-air heat exchangers is not available.

On the ground or in flight, optimum cabin heating and cooling system operation is achieved by making small changes and waiting for the results, rather than by making large temperature control changes that may result in overshooting the desired temperature.

The flood cooling system provides an air outlet grill at the upper aft end of the cabin to initially supply a high-volume flow of conditioned bleed air to provide the cabin with faster and more efficient cooling. The system is controlled by a position (FLOOD) on the AFT FAN switch (FLOOD–HI–LO) on the environmental control panel. When the FLOOD position is selected, air is diverted from the overhead distribution system directly into the cabin through the outlet grill. The flood cooling door is actuated by service bleed air, and therefore, its position cannot be changed if the engines are not operating.

Increasing or decreasing engine bleed-air extraction can cause a slight momentary bump in cabin pressure. Always check power stabilized at idle when changing the AIR SOURCE SELECT on the ground. The abbreviated checklist is designed to enable the crew to perform all prestart functions in advance. This permits items, such as the warning test, to be complete before passenger boarding and accelerates the ramp departure without compromising safety or thoroughness. Leaving the chocks, brake checks can be done lightly and smoothly. If heavy braking is required on landing roll, using up elevator to create drag also counters the nosedown pitching moment so that deceleration feel in the cabin is less abrupt.

COLD WEATHER OPERATION

Operation of the airplane has been demonstrated after prolonged exposure to ground ambient temperature of –34°C (–29°F). Ground operations after prolonged cold soak greater than two hours may not be conducted at temperatures colder than –40°C. If prolonged cold soak is anticipated, refer to *Maintenance Manual* procedures to prepare the airplane for cold soak. If the airplane has been cold soaked on the ground for more than 1.5 hours at temperatures colder than –18°C, refer to *Maintenance Manual* procedures to prepare the airplane for flight. The following operational procedures are recommended if the airplane is anticipated to be exposed to cold soak.

Remove EROS crew oxygen masks (if installed) if temperature will be less than 0°C, and drain all cabin fluids.

When the airplane is parked in any conditions of falling or blowing snow, regardless of temperature, the engine and pitot covers should be installed. The airplane should be parked with flaps retracted. Prior to flight, the airplane must be cleared of snow, and if wing, empennage or control surfaces are frosted, they must be deiced. Refer to the *AFM*, "Deicing Procedures," in Section VII of the *AFM*.

If the airplane is to be parked outside for more than a few hours at temperatures below –15°C, the following special considerations are advised:

- The airplane batteries should be moved to a warm environment or battery heaters installed and connected. Below –20°C, batteries may be inert and will not charge or discharge.

The following operational procedures are recommended after cold soak:

- Hydraulic accumulators, pneumatic storage bottles, and oxygen cylinders will indicate a lower pressure because of the temperature drop. Refer to the appropriate temperature charge placards. It should be noted that hydraulic and pneumatic systems are more prone to leaks in extreme cold. A significantly lower charge may indicate a leak. Prior to preflight, the flaps should be extended to allow inspection of the wing trailing edge for hydraulic leaks.

Some electrical systems and avionics computers and displays may be slow to warm up. Cabin fluorescent lighting will also be slow to illuminate and should be turned on if its use is anticipated. LCD displays may require several minutes to reach full brightness. FMS computers may require several minutes to give accurate initial position. Typically, warmup may take 20 minutes or more.

NOTE

Dispatch is prohibited until all required avionics systems are verified to be functioning properly.

Use EPU after extended cold soak. If a start is attempted using an external power unit and/or preheated battery and the starter will not motor to 8% N_2 minimum, terminate the starting sequence. Advancing the throttle to idle below 8% N_2 can be damaging to the engine and the battery. Battery voltage below 11 volts after the start button is pressed indicates a potential for an unsuccessful start.

Apply preheat to engines, tail cone, cabin, and cockpit. Engine preheating is best accomplished by installing the engine covers and directing hot air through the oil filter access door. A warm battery provides significant benefit and the heater hose can be placed in the tail cone with the door propped, as far closed as possible, to minimize heat loss. If the airplane has been cold soaked below –18°C, and the battery has been removed and kept warm, a battery start may be made if the engines are preheated.

NOTE

If the airplane has been cold soaked below –18°C, and the battery has been removed and kept warm, a battery start may be made if the engines have not been cold soaked below –33°C. If the airplane is cold soaked below –33°C, it must be preheated or warmed in a heated hangar prior to engine start. If a start is attempted and the starter will not motor to 8% N_2 minimum, terminate the start sequence.

NOTE

If the airplane has been cold soaked and the brake system hydraulic pump continues to run for more than 30 seconds after turning the battery switch to BATT, it is permissible to pull the BRAKE SYSTEM circuit breaker and chock the main landing gear wheels to save battery power for engine start. The recommended procedure is to turn the battery switch to OFF. Pull the BRAKE SYSTEM circuit breaker located on the left circuit-breaker panel. Chock the main landing gear wheels. Follow cold weather operations for starting the engines. Once either generator is on line, reset the BRAKE SYSTEM circuit breaker and set the parking brake. Remove wheel chocks when desired.

Engine starts using ground power or battery should be normal, except that the exhaust will initially smoke and engine oil pressure will be high. Engine oil pressure up to 100 psi for 5 minutes is normal during cold starts. Once engine oil temperature is above 10°C, the engine may be operated above 80% N_2.

Following engine start, all flight controls and speedbrakes should be cycled through full travel several times to verify that all controls reach full travel and operate normally.

NOTE

If the airplane has been cold soaked, the landing gear may take up to 20 seconds to fully retract.

Maximum heat is obtained with the right/left or both engine(s) operating and the PRESS SOURCE SELECT in BOTH. Switching the TEMPERATURE CONTROL SELECTOR to MANUAL and selecting MANUAL HOT for 10 seconds ensures that the temperature mixing valve is in the hot position. Turning the COCKPIT AIR DIST valve to MAX will increase air circulation in the cockpit. Operating the engine(s) above idle rpm increases temperature and airflow.

The engine should not be operated above 80% N_2 until the engine oil temperature is above 10°C. It is not recommended to operate air conditioning in AUTO, and defog should be off to prevent the freon air-conditioning system from operating.

Most effective overall cabin heating is achieved by selecting the COCKPIT AIR DISTR bias valve to MAX, and the FAN to LOW or HI, until the cockpit is comfortable. Then move the bias valve toward WARM. Warming the cabin first may tend to cause the temperature controller to stabilize before the cockpit warms. This is due to the temperature sensor being located in the cabin.

Operating in extremely cold temperature super cools and reduces the solubility of any water particles in the fuel, increasing the possibility of fuel system icing. The tank and fuel filter drains under each wing should be drained frequently and thoroughly. It is possible for water to settle in the sump and freeze, which would block the drain. Heat should be applied until fuel flows freely. Maintain heat after flow begins to ensure that all particles have melted. Collect the drainage in a clear, clean container to inspect for water globules.

TURBULENT AIR PENETRATION

Flight through severe turbulence should be avoided if possible. The following procedure is recommended for flight in severe turbulence:

1. Ignition .... On
2. Airspeed .... Approximately 180 KIAS (Do not chase airspeed)
3. Maintain a constant attitude without chasing altitude. Avoid sudden, large control movements.
4. Operation of the autopilot is recommended in basic modes only (ROL and PIT only).

ENGINE COMPRESSOR STALLS

When the airplane is in an attitude of high angle of attack, or in a steep turn which effectively amounts to a high angle-of-attack, and the throttles are moved rapidly, it is possible to induce engine surges (compressor stalls). On occasion, they can occur during normal flight at normal angles of attack. These surges are not harmful unless they occur repeatedly and are of unusual intensity. Engine damage does not result; however, it is not advisable to purposely induce engine compressor stalls. When the airplane is in an attitude during which compressor stalls can reasonably be expected to occur, such as during the practice of approaches to a stall, the pilot should use reasonable care in handling the throttles. Intentional stalls should be avoided at high altitudes and in attitudes which may reasonably be expected to induce engine compressor stalls.

UNINTENTIONAL STALLS WITH AUTOPILOT ENGAGED

Stall warning is effected on the Citation CJ2 by the stick shaker, which induces a mechanical vibration into the control column by means of an electric vibrator, at a speed slightly higher than normal stall buffet. Since this method of stall warning depends upon tactile sensation, if the airplane is being flown on autopilot, it is possible to approach the stall warning envelope without the pilot being aware of it. Therefore, it is advisable to use caution when operating the airplane on autopilot at slow airspeeds or under conditions in which the airplane could be expected to approach stalling speeds.

If the airplane should stall while flying on autopilot, the autopilot will automatically disconnect and all the normal autopilot off annunciations will be in evidence. The flight director will remain engaged.

SERVICING

FUEL

General

A variety of fuels can be used in the airplane. Commercial kerosene Jet A, Jet A-1, JP-8, JET B, and JP-4 are approved fuels. When using JET B or JP-4, observe the JET B/JP-4 altitude operating limits (Figure LIM-7). Refer to the *AFM* for limitations. No AV gas is allowed.

Any additive meeting the specifications of MIL-I-27686 or MIL-I-85470 can be used with fuel that does not contain an anti-icing additive.

WARNING

Anti-icing additives containing ethylene glycol monomethyl ether (EGME) or Diethylene Glycol Monomethyl ether (DIEGME) are harmful if inhaled, swallowed, or absorbed through the skin, and will cause eye irritation. Also, they are combustible. Before using this material, refer to all safety information on the container. Do not exceed 0.15% volume.

CAUTION

If additive is used, ensure that the additive is directed into the flowing fuel stream and that the additive flow is started after the fuel flow starts and is stopped before fuel flow stops. Do not allow concentrated additive to contact the coated interior of the fuel tank or airplane painted surface. Use not less than 20 fluid ounces of additive per 156 gallons of fuel or more than 20 fluid ounces of additive per 104 gallons of fuel.

Prolonged storage of the airplane will result in a water buildup in the fuel that leaches out the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration of additive can be checked using a CJMD 128-002 anti-icing additive concentration test kit, available from Cessna Aircraft Company, Citation Marketing Division, Wichita, KS 67277. It is imperative that the instructions for the test kit be followed explicitly when checking the additive concentration.

Excessive additive may cause fuel tank damage or erroneous fuel quantity indications.

When refueling, do not operate radios, radar, or other electronic equipment, and ensure that the fuel truck is grounded and a ground is connected to the airplane. A fuel ground plug attachment point is located under each wingtip.

It is not necessary to maintain fuel balance during refueling; however, maximum asymmetric fuel differential for flight is 200 pounds. In an emergency, 600 pounds of fuel unbalance may be tolerated.

OIL

Each engine oil tank has an oil filler neck with a dipstick and cap assembly. Oil is added to each engine directly through the filler neck, and quantity is measured on the dipstick in U.S. quarts. Engines have a sight glass to facilitate the checking of oil quantity. Oil should be checked 10 minutes after shutdown.

CAUTION

> Persons who handle engine oil are advised to minimize skin contact with used oil and promptly remove any used oil from their skin. A laboratory study, while not conclusive, found substances which may cause cancer in humans. Thoroughly wash used oil off skin as soon as possible with soap and water. Do not use kerosene, thinners, or solvents to remove used engine oil. If waterless hand cleaner is used, always apply skin cream after using.

Mobile Jet Oil II, Exxon 2380, BP 2380 and Mobil 254 are the only approved oils. Mixing of approved oils is permissible (Exxon 2380 and BP 2380 have limits).

HYDRAULICS

Servicing the main hydraulic reservoir is normally performed by maintenance personnel. The reservoir should be serviced with fluid conforming to red MIL-H-83282 only. Phosphate ester-type hydraulic fluids must not be used; system deterioration will occur. Servicing of the hydraulic system does not require equipment capable of delivering hydraulic fluid under pressure.

The hydraulic brake reservoir can be serviced by removing the right baggage compartment aft liner to allow access to the reservoir. The filler plug can then be removed and the reservoir filled to within one-half inch of the opening. The brake reservoir should be serviced with only MIL-H-83282 fluid; any other type of fluid will cause system deterioration.

OXYGEN

The oxygen filler valve is located on the bulkhead just inside the door in the right nose compartment. Oxygen servicing should be done by maintenance personnel using breathing oxygen conforming to MIL-O-27210, Type 1. Refer to the cockpit gage while servicing to prevent overfill.

Oxygen pressure will vary with ambient temperature. In very cold ambient temperatures, the oxygen pressure indication may appear low, but may in actuality be appropriate for the temperature condition.

NOTE

Refer to Chapter 12 of the *Airplane Maintenance Manual*, Oxygen Cylinder Fill Pressure, for various fahrenheit temperatures table.

WHEEL FUSIBLE PLUG LIMITS

Brake application reduces the speed of an airplane by means of friction between the brake stack components. The friction generates heat, which increases the temperature of the brake and wheel assembly, resulting in an increased tire pressure. Each main wheel incorporates fuse plugs, that melt at a predetermined temperature, to prevent a possible tire explosion due to excessively high tire pressure. Flightcrews must take precautions when conducting repetitive traffic circuits, including multiple landings and/or multiple rejected takeoffs, to prevent overheating the brakes, which could melt the fuse plugs and cause loss of all tire pressure and possible tire and wheel damage. During such operations, minimize brake usage (runway permitting), and consider the brakes in flight with the landing gear extended.

ALCOHOL

An alcohol reservoir is located next to the brake reservoir behind the right baggage compartment aft liner. The liner must be removed for servicing. The filler plug on the reservoir should be removed and alcohol added to bring the fluid level up to the neck of the filler plug. Filling to above the sight gage provides a reserve supply of isopropyl alcohol (TT-I-735) to perform preflight or operational checks without replenishing the reservoir.

FIRE BOTTLES

Underserviced fire bottles must be exchanged by authorized maintenance facilities.

GEAR AND BRAKE PNEUMATIC SYSTEM

The emergency gear and brake bottle should be serviced when the pressure gage reads below 1,800 psi. Maintenance personnel should perform the servicing with high-pressure nitrogen and refill the bottle to 2,050 psi. Servicing is accomplished through a charging valve on the bottle, which is located behind the right baggage compartment aft liner.

TIRES

Main gear tire pressures should be maintained at 114 ±5 psi, and the nose tire at 120 ±5 psi. Since tire pressure will decrease as the temperature drops, a slight overinflation can be used to compensate for cold weather. Main tires inflated at temperatures of 21°C and lower should be overinflated 1.5 psi for each 6°C drop in temperature anticipated at the coldest airport of operation. Nose tires at temperatures of 21°C and lower should be overinflated only 0.5 psi for each 6°C anticipated drop in temperature.

Worn tires and underinflation both contribute to lowering the speed at which hydroplaning occurs on precipitation-covered runways. Refer to Adverse Field Conditions in this section for a discussion of hydroplaning.

TOILET

The standard toilet is serviced by removing the waste container and the plastic bag. The flush toilet reservoir should be serviced after every flight; however, it must be serviced when the liquid level becomes too low or when liquid appears to have incorrect chemical balance. To properly service the reservoir, it must be removed from the toilet by disconnecting it and pulling it through the door in the front of the cabinet. Instructions for removing and servicing the reservoir are found in Chapter 12 of the *Maintenance Manual*. Servicing the reservoir requires the addition of the proper mixture of water and chemical (1.5 ounces of chemical per quart of water) to the reservoir. It takes approximately 2 quarts of liquid if the reservoir is empty. If outside temperatures are below freezing and the airplane is kept in an unheated hangar, add antifreeze to both the reservoir and the waste container.

AIRPLANE CLEANING AND CARE

PAINTED SURFACES

The exterior of a new airplane is painted with a polyurethane two-component top coat which, unlike early coatings, does not require exposure to air for complete cure to occur. The care required by the finish will not change as the paint ages.

The finish should be cleaned only by washing with clean water and mild soap, followed by rinse water and drying with a soft cloth or chamois.

Minimize flying through rain, hail or sleet.

To help prevent development of corrosion, particularly filiform corrosion, the airplane should be spray-washed at least every two or three weeks (especially in warm, damp, salty environments) and waxed with products recommended in Chapter 12 of the *Airplane Maintenance Manual* to help keep water from accumulating in skin joints and around countersinks. Products containing silicones should be avoided, as they contribute to P-static buildup.

Polyurethane topcoats are designed with UV inhibitors to slow the degradation caused by exposure. The inhibitors concentrate near the surface of the coating during the initial stages of cure. Care must be taken during any buffing, polishing, or power waxing so that this surface layer is disturbed only to the smallest extent necessary. With special care, however, buffing, polishing or power waxing is acceptable.

DEICE BOOTS

The deice boots on the horizontal stabilizer leading edges have a special electrically conductive coating to bleed off static charges that cause radio interference and may perforate the boots. Maintenance operations should be done carefully to avoid damaging this conductive coating or tearing the boots.

To prolong the life of surface deice boots, they should be washed and serviced on a regular basis. Keep the boots clean and free from oil, grease, and other solvents that cause rubber to swell and deteriorate. Outlined below are the recommended cleaning and servicing procedures.

CAUTION

Use only the following instructions when cleaning boots. Disregard instructions which recommend petroleum-based liquids (Methyl-Ethyl-Ketone, unleaded gasoline, etc.), which can harm the boot material.

Clean the boots with mild soap and water, then rinse thoroughly with clean water.

NOTE

Isopropyl alcohol can be used to remove grime that cannot be removed using soap. If the alcohol is used for cleaning, wash the area with mild soap and water, then rinse thoroughly with clean water.

To possibly improve the service life of the deice boots and to reduce the adhesion of ice, it is recommended that the deice boots be treated with Age Master Number 1 and Icex.

Age Master Number 1 used to protect the rubber against deterioration from the ozone, sunlight, weathering, oxidation, and pollution, and Icex, used to help retard ice adhesion and keep the deice boots looking new longer, are both products of, and are recommended by, BFGoodrich.

The application of both Age Master Number 1 and Icex should be in accordance with the manufacturer's recommended directions as outlined on the containers.

CAUTION

Protect adjacent areas and clothing, and use plastic or rubber gloves during applications; Age Master Number 1 stains and Icex contains silicone that makes paint touchup almost impossible.

Ensure that the manufacturer's warnings and cautions are adhered to when using Age Master Number 1 and Icex.

If a high-gloss finish is desired on the deice boots, Acroseal coating (available from Huber Janitorial Supplies, 114 North St. Francis Street, Wichita, KS 67202) may be used in lieu of Age Master Number 1 and/or Icex. Preparation for application of Acroseal is the same as required for Age Master Number 1 and Icex. Apply a thin layer of Acroseal on the clean, dry surface of the deice boot with a cloth swab. Let dry thoroughly and hand buff with a soft cloth.

Small tears and abrasions can be repaired temporarily without removing the boots, and the conductive coating can be renewed.

ENGINES

The engine compartments should be cleaned using a suitable solvent. Most efficient cleaning is done using a spray-type cleaner. Before spray cleaning, ensure that protection is afforded for other components that might be adversely affected by the solvent. Refer to the *Maintenance Manual* for proper lubrication of components after engine cleaning.

INTERIOR CARE

To remove dust and loose dirt from the upholstery, headliner, and carpet, clean the interior regularly with a vacuum cleaner.

Blot any spilled liquid with cleansing tissue or rags. Don't pat the spot; press the blotting material firmly, and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot clean the area.

Oily spots may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place on the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

WARNING

Use all cleaning agents in accordance with the manufacturer's recommendations.

WARNING

The use of toxic or flammable cleaning agents is discouraged. If these cleaning agents are used, ensure that adequate ventilation is provided to prevent harm to the user and/or damage to the airplane.

Soiled upholstery and carpet may be cleaned with foam detergent, used according to the manufacturer's instructions. To minimize wetting of the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

The plastic trim, instrument panel, and control knobs need only be wiped with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with kerosene. Volatile solvents, such as those mentioned in the paragraphs on care of the windshield, must never be used, since they soften and craze the plastic.

WINDOWS AND WINDSHIELDS

The acrylic windshields and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge that attracts dust particles in the air. Wiping with a moist chamois removes both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzene, acetone, carbon tetrachloride, fire extinguisher fluid, lacquer thinner or glass cleaner. These materials soften the acrylic and may cause it to craze.

After removing dirt and grease, if the surface is not badly scratched, it should be waxed with a good grade of commercial wax. The wax fills in minor scratches and helps prevent further scratching. Apply a thin, even coat of wax, and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the acrylic. If the surface is badly scratched, refer to the *Maintenance Manual* for approved repairs.

Do not use a canvas cover on the windshield, unless freezing rain or sleet is anticipated. Canvas covers may scratch the acrylic surface.

OXYGEN MASKS

The crew masks are permanent masks that contain a microphone for radio transmissions. The passenger masks are oro-nasal, that form around the mouth and nose area. All masks can be cleaned with alcohol. Do not allow the solution to enter the microphone or electrical connections. Apply talcum powder to the external surfaces of the passenger mask rubber face piece.

WEIGHT AND BALANCE

CONTENTS

ILLUSTRATIONS

WEIGHT AND BALANCE

GENERAL

Weight

Airplane maximum weights are predicated on structural strength. It is necessary to ensure that the airplane is loaded within the various weight restrictions to maintain structural integrity.

Balance

Balance, or the location of the center of gravity (CG), deals with airplane stability. The horizontal stabilizer must be capable of providing an equalizing moment to that which is produced by the remainder of the airplane. Since the amount of lift produced by the horizontal stabilizer is limited, the range of movement of the CG is restricted so that proper airplane stability and control is maintained.

Stability increases as the CG moves forward. If the CG is located out of limits too far forward, the airplane may become so stable that it cannot be rotated at the proper speed or flared for landing.

The aft of limits CG situation is considerably worse because the stability decreases. Here the horizontal stabilizer may not have enough nosedown elevator travel to counteract a nose up pitching movement, resulting in a possible loss of control.

Basic Formula

$$\text{Weight} \times \text{Arm} = \text{Moment}$$

This is the basic formula upon which all weight and balance calculations are based. Remember that the arm or CG location can be found by adapting the formula as follows:

$$\text{Arm} = \frac{\text{Moment}}{\text{Weight}}$$

Weight Shift Formula

$$\frac{\text{Weight Shifted}}{\text{Total weight}} = \frac{\text{Distance CG is shifted}}{\text{Distance weight is shifted}}$$

The above formula can be utilized to shift weight if the CG is found to be out of limits. Use of this formula avoids working the entire problem over again by trial and error.

Example: Baggage weighing 100 pounds is moved from the nose compartment to the tailcone compartment. Weight and balance previously calculated is as follows:

Weight of Aircraft .... 12,375 pounds

Current CGT Location .... 277.8 inches

Weight of Baggage .... 100 pounds

Arm of Nose Compartment .... 74.00 inches

Arm of Tailcone Compartment .... 384.59 inches

Inserting the values in the weight shift formula:

$$\frac{100}{12{,}375} = \frac{\text{Distance CG moved}}{384.59 - 74.00}$$

Cross-multiplying gives the following result:

$$(384.59 - 74.00) \text{ X } 100 \div 12{,}375 = \text{Distance CG moved}$$

$$2.51 = \text{Distance CG moved}$$

Since the weight was brought from the nose compartment to the tailcone compartment (weight moved rearward, CG moved rearward), the new CG would be:

$$\text{New CG location} = 277.8 + 2.51 = 280.3$$

Weight Addition or Removal

If weight is to be added or removed after a weight and balance has been computed, a simple formula can be used to figure the shift in the center of gravity.

$$\frac{\text{Weight added (or removed)}}{\text{New total weight}} = \frac{\text{Distance the CG is shifted}}{\text{Distance between the weight arm and the old CG arm}}$$

If it is desired to find the weight change needed to accomplish a particular CG change, the formula can be adapted as follows:

$$\frac{\text{Weight to be added (or removed)}}{\text{Old total weight}} = \frac{\text{Distance the CG is shifted}}{\text{Distance between the weight arm and the new CG arm}}$$

DEFINITIONS

Manufacturer's Empty Weight
Weight of structure, powerplants, furnishings, systems, and other items of equipment that are an integral part of a particular configuration.

Standard Empty Weight
Manufacturer's empty weight plus standard items.

Standard Items Equipment and fluids not an integral part of a particular airplane and not a variation for the same type of airplane. These items may include, but are not limited to, the following:
a. Unusable fuel
b. Engine oil
c. Toilet fluid
d. Serviced fire extinguisher
e. All hydraulic fluid
f. Trapped fuel

Basic Empty Weight
Standard empty weight plus installed optional equipment.

Operational Takeoff Weight
Maximum authorized weight for takeoff. It is subject to airport, operational, and related restrictions. This is the weight at the start of the takeoff run and must not exceed maximum design takeoff weight.

Operational Landing Weight
Maximum authorized weight for landing. It is subject to airport, operational, and related restrictions. It must not exceed maximum design landing weight.

Useful Load Difference between maximum design taxi weight and basic empty weight. It includes payload, usable fuel, and other usable fluids not included as operational items.

Usable Fuel Fuel available for airplane propulsion.

Unusable Fuel Fuel remaining after a fuel runout test has been completed in accordance with government regulations. It includes drainable unusable fuel plus unusable portion of trapped fuel.

Trapped Fuel Fuel remaining when the airplane is defueled by normal means using the procedures and attitudes specified for draining the tanks.

Actual Zero Fuel Weight	Basic empty weight plus payload. It must not exceed maximum design zero fuel weight.
Payload	Maximum design zero fuel weight minus basic empty weight. This is the weight available for crew, passengers, baggage, and cargo.
MAC	Mean Aerodynamic Chord. The chord of an imaginary air-foil which, throughout the flight range, will have the same force vectors as those of the wing.

FORMS

The weight-and-balance forms are discussed below, and examples of the forms are included in Figures WB-1 through WB-12 at the end of this section. If the airplane has a different seating configuration from the one depicted in the example, the form appropriate to that configuration will be found in the *AFM*.

AIRPLANE WEIGHING FORM

(Form 2088)

The airplane weight, CG arm, and moment (divided by 100) are all listed at the bottom of this form as the airplane is delivered from the factory. Ensure that the basic empty weight figures listed are current and have not been amended.

WEIGHT-AND-BALANCE RECORD

(Form 2088)

The weight-and-balance record amends the airplane weighing form. After delivery, if a service bulletin is applied to the airplane or if equipment is removed or added that would affect the CG or basic empty weight, it must be recorded on this form in the *AFM*. The crew must always have access to the current airplane basic weight and moment in order to be able to perform weight and balance computations.

(Form 2084 or 2085)

The tables already have computed moments/100 for weights in various seating locations in the airplane.

BAGGAGE/CABINET WEIGHT-AND-MOMENT TABLE (Form 2086)

Notice in the cabinet and cargo compartments tables the last weight that a moment/100 is listed for under the nose compartment column is 400 pounds. This corresponds to the placard limit in that compartment. Remember that this limit is structural in nature. It is based on the maximum weight the flooring in that area can support. This same point applies to the aft cabin and tail cone compartments as well.

FUEL LOADING WEIGHT-AND-MOMENT TABLE

All of the tables have arms listed for the various locations except the fuel table. Notice that the arm varies depending on the quantity of usable fuel.

WEIGHT-AND-BALANCE COMPUTATION FORM (Form 2087)

A step-by-step process is outlined for determining weight and CG limits by this form. The payload computations are made in the left column, while the rest of the computations are done in the right column.

CENTER-OF-GRAVITY LIMITS ENVELOPE GRAPH

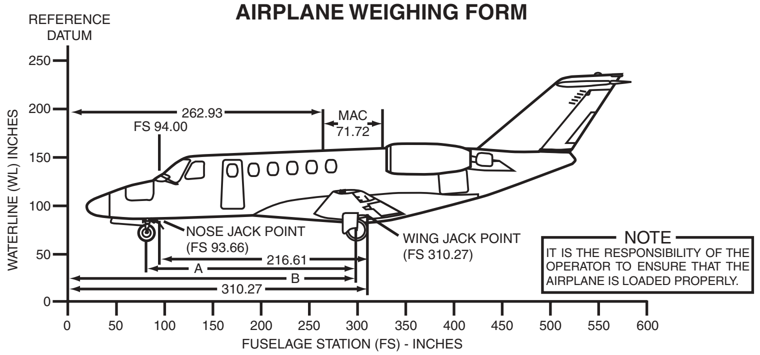
After summing all the weights and moments, it is necessary to determine whether the CG is within allowable limits.

This graph represents the allowable CG envelope.

The way to plot the location of the CG on the graph is to determine the CG location in inches aft of datum, then plot it against the weight. To determine the CG arm, the total moment (moment x 100) is divided by the total airplane weight.

A27168

AIRPLANE WEIGHING FORM



LOCATING CG WITH AIRPLANE ON LANDING GEAR

LEGEND

DIMENSION A = Horizontal distance from center of main landing gear axle to center of nose landing gear axle (determined by measurement after airplane is level on scales *or by using Figure 6-1 sheet 3 and the accompanying instructions).*

DIMENSION B = Horizontal distance from reference datum to center of main landing gear axle. obtain this distance by measuring from nose jack point FS 93.66 to center of nose landing gear axle and subtracting this value from dimension A and adding to FS 93.66. (Must be measured after airplane is level on scales *or by using Figure 6-1 sheet 3 and the accompanying instructions).*

FORMULA for Longitudinal CG

CG Arm of Airplane = (Dimension B) $-$ [(Dimension A) X (Nose Landing Gear Net Weight) (   )] / [Nose and Main Landing Gear Weight Totaled (   )] = (   ) Inches Aft of Datum

LOCATING CG WITH AIRPLANE ON JACK PADS

FORMULA for Longitudinal CG

CG Arm of Airplane = 310.27 $-$ [216.61 X (Nose Jack Point Net Weight) (   )] / [Nose and Wing Jack Point Weight Totaled (   )] = (   ) Inches Aft of Datum

LEVELING PROVISIONS

LATERAL AND LONGITUDINAL-
USE LEVELING TOOL ACROSS
INBOARD SEAT TRACKS AT
APPROXIMATELY FS 148.00

LOCATING PERCENT MAC

FORMULA for Percent MAC

$$\text{CG Percent MAC} = \frac{(\text{CG Arm of Airplane}) - 262.93}{0.7172}$$

AIRPLANE AS WEIGHED TABLE

POSITION	SCALE READING	SCALE DRIFT	TARE	NET WEIGHT
LEFT WING				
RIGHT WING				
NOSE				
AIRPLANE TOTAL AS WEIGHED				

BASIC EMPTY WEIGHT AND CENTER-OF-GRAVITY TABLE

ITEM	WEIGHT (POUNDS)	CG ARM (INCHES)	MOMENT (INCH-POUNDS/100)
AIRPLANE (CALCULATED OR AS WEIGHED) (INCLUDES ALL UNDRAINABLE FLUIDS AND FULL OIL)			
DRAINABLE UNUSABLE FUEL AT 6.75 POUNDS PER GALLON	**67.00**	**299.61**	**200.74**
BASIC EMPTY WEIGHT			

FORM NUMBER 2088, 17 April 2000

Figure WB-1. Airplane Weighing Form—Form 2088

WING TANK FUEL	
WEIGHT (POUNDS)	**MOMENT/100 ARM VARIES (INCH–POUNDS)**
100	295.82
200	589.83
300	882.51
400	1,173.95
500	1,464.57
600	1,754.31
700	2,043.24
800	2,331.69
900	2,619.66
1,000	2,907.02
1,100	3,194.61
1,200	3,481.85
1,300	3,769.19
1,400	4,056.38
1,500	4,343.48
1,600	4,630.51
1,700	4,917.43
1,800	5,204.14
1,900	5,490.64
2,000	5,776.99
2,100	6,063.22
2,200	6,349.57
2,300	6,636.05
2,400	6,923.07
2,500	7,210.15
2,600	7,498.48
2,700	7,786.75
2,800	8,075.63
2,900	8,364.53
3,000	8,653.61
3,100	8,942.67
3,200	9,231.63
3,300	9,520.49
3,400	9,809.23
3,500	10,097.73
3,600	10,386.20
3,700	10,674.61
3,800	10,962.96
3,900	11,250.92
3,960	11,424.77

CAUTION

The certified maximum usable fuel quantity is 3,960 pounds, with each wing filled to the “FULL” indicating tab on the filler standpipe. Do not fill above the tab on the standpipe, as adequate fuel expansion volume may not be available. Check weight and balance.

Figure WB-2. Fuel Loading Weight-and-Moment Table

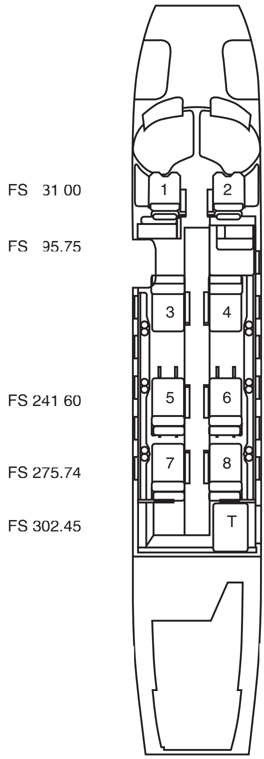
CREW AND PASSENGER

WEIGHT (POUNDS)	MOMENT/100				
	SEAT 1 OR SEAT 2 Arm = F.S. 131.00	SEAT 3 OR SEAT 4 Arm = F.S. 195.75	SEAT 5 OR SEAT 6 Arm = F.S. 241.60	SEAT 7 OR SEAT 8 Arm = F.S. 275.74	LH Belted Toilet Arm = F.S. 302.45
50	65.50	97.88	120.80	137.87	151.23
60	78.60	117.45	144.96	165.44	181.47
70	91.70	137.03	169.12	193.02	211.72
80	104.80	156.60	193.28	220.59	241.96
90	117.90	176.18	217.44	248.17	272.21
100	131.00	195.75	241.60	275.74	302.45
110	144.10	215.33	265.76	303.31	332.70
120	157.20	234.90	289.92	330.89	362.94
130	170.30	254.48	314.08	358.46	393.19
140	183.40	274.05	338.24	386.04	423.43
150	196.50	293.63	362.40	413.61	453.68
160	209.60	313.20	386.56	441.18	483.92
170	222.70	332.78	410.72	468.76	514.17
180	235.80	352.35	434.88	496.33	544.41
190	248.90	371.93	459.04	523.91	574.66
200	262.00	391.50	483.20	551.48	604.90
210	275.10	411.08	507.36	579.05	635.15
220	288.20	430.65	531.52	606.63	665.39
230	301.30	450.23	555.68	634.20	695.64
240	314.40	469.80	579.84	661.78	725.88
250	327.50	489.38	604.00	689.35	756.13
260	340.60	508.95	628.16	716.92	786.37
270	353.70	528.53	652.32	744.50	816.62
280	366.80	548.10	676.48	772.07	846.86
290	379.90	567.68	700.64	799.65	877.11
300	393.00	587.25	724.80	827.22	907.35
310	406.10	606.83	748.96	854.79	937.60
320	419.20	626.40	773.12	882.37	967.84
330	432.30	645.98	797.28	909.94	998.09
340	445.40	665.55	821.44	937.52	1,028.33

NOTE:

Unbelted toilet may be installed on left or right side. Belted toilet is on left side only.

CREW AND PASSENGER MOMENT ARMS



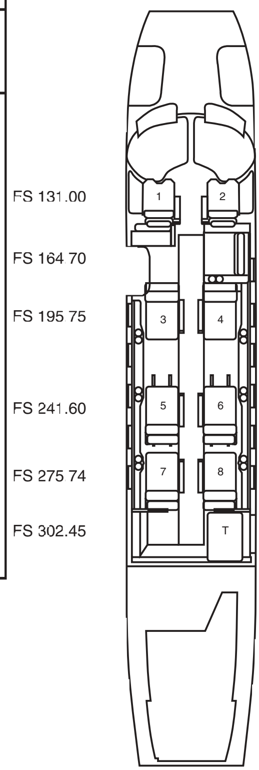
FORM NUMBER 2084, 18 April 2000

Figure WB-3. Crew and Passengers Weight-and-Moment Table/Standard—Form 2084, 18 April 2000

CREW AND PASSENGER

WEIGHT (POUNDS)	MOMENT/100					
	SEAT 1 OR SEAT 2 Arm = F.S. 131.00	SIDE FACING SEAT Arm-F.S. 164.70	SEAT 3 OR SEAT 4 Arm = F.S. 195.75	SEAT 5 OR SEAT 6 Arm = F.S. 241.60	SEAT 7 OR SEAT 8 Arm = F.S. 275.74	LH Belted Toilet Arm = F.S. 302.45
50	65.50	82.35	97.88	120.80	137.87	151.23
60	78.60	98.82	117.45	144.96	165.44	181.47
70	91.70	115.29	137.03	169.12	193.02	211.72
80	104.80	131.76	156.60	193.28	220.59	241.96
90	117.90	148.23	176.18	217.44	248.17	272.21
100	131.00	164.70	195.75	241.60	275.74	302.45
110	144.10	181.17	215.33	265.76	303.31	332.70
120	157.20	197.64	234.90	289.92	330.89	362.94
130	170.30	214.11	254.48	314.08	358.46	393.19
140	183.40	230.58	274.05	338.24	386.04	423.43
150	196.50	247.05	293.63	362.40	413.61	453.68
160	209.60	263.52	313.20	386.56	441.18	483.92
170	222.70	279.99	332.78	410.72	468.76	514.17
180	235.80	296.46	352.35	434.88	496.33	544.41
190	248.90	312.93	371.93	459.04	523.91	574.66
200	262.00	329.40	391.50	483.20	551.48	604.90
210	275.10	345.87	411.08	507.36	579.05	635.15
220	288.20	362.34	430.65	531.52	606.63	665.39
230	301.30	378.81	450.23	555.68	634.20	695.64
240	314.40	395.28	469.80	579.84	661.78	725.88
250	327.50	411.75	489.38	604.00	689.35	756.13
260	340.60	428.22	508.95	628.16	716.92	786.37
270	353.70	444.69	528.53	652.32	744.50	816.62
280	366.80	461.16	548.10	676.48	772.07	846.86
290	379.90	477.63	567.68	700.64	799.65	877.11
300	393.00	494.10	587.25	724.80	827.22	907.35
310	406.10	510.57	606.83	748.96	854.79	937.60
320	419.20	527.04	626.40	773.12	882.37	967.84
330	432.30	543.51	645.98	797.28	909.94	998.09
340	445.40	559.98	665.55	821.44	937.52	1,028.33

CREW AND PASSENGER MOMENT ARMS



NOTE:
Unbelted toilet may be installed on left or right side. Belted toilet is on left side only.

FORM NUMBER 2085, 18 April 2000

Figure WB-4. Crew and Passenger's Compartments Weight-and-Moment Table/Option 1—Form 2085, 18 April 2000

BAGGAGE AND STORAGE COMPARTMENTS CONTENTS

WEIGHT (POUNDS)	MOMENT/100 NOSE COMP ARM = FS 74.00 in.	CABIN COMP ARM = FS 301.70 in.	TAILCONE COMP ARM = FS 384.59 in.
20	14.80	60.34	76.92
40	29.60	120.68	153.84
60	44.40	181.02	230.75
80	59.20	241.36	307.67
100	74.00	301.70	384.59
120	88.80		461.51
140	103.60		538.43
160	118.40		615.34
180	133.20		692.26
200	148.00		769.18
220	162.80		846.10
240	177.60		923.02
260	192.40		999.93
280	207.20		1,076.85
300	222.00		1,153.77
320	236.80		1,230.69
340	251.60		1,307.61
360	259.00		1,384.52
380	281.20		1,461.44
400	296.00		1,538.36
420			1,615.28
440			1,692.20
460			1,769.11
480			1,846.03
500			1,922.95
520			1,999.87
540			2,076.79
560			2,153.70
580			2,230.62
600			2,307.54

CABINET CONTENTS

WEIGHT (POUNDS)	MOMENT/100 LH STORAGE CABINET ARM = FS 155.88 in.	REFRESH CENTER ARM = FS 163.00 in.	SFS ARM REST ARM = FS 179.13 in.
5	7.79	8.96	8.96
10	15.59	16.30	17.91
13	20.26	21.19	23.29
15	23.38	24.45	
20		32.60	
25		40.75	
30		48.90	
35		57.05	
40		65.20	
45		73.35	
50		81.50	
55		89.65	
60		97.80	
65		105.95	
70		114.1	
72		117.36	
75		122.25	

LH CHART CASE

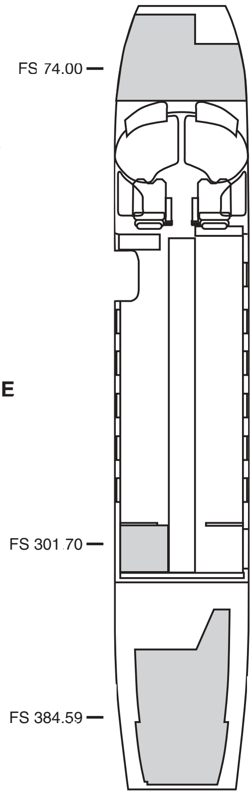
WEIGHT (POUNDS)	MOMENT/100 NAVIGATION CHART CASE ARM = FS 151.00 in.
5	7.55
10	15.10

RH CHART CASE

WEIGHT (POUNDS)	MOMENT/100 NAVIGATION CHART CASE ARM = FS 152.25 in.
5	7.61
10	15.23

LH TOILET DRAWER STORAGE

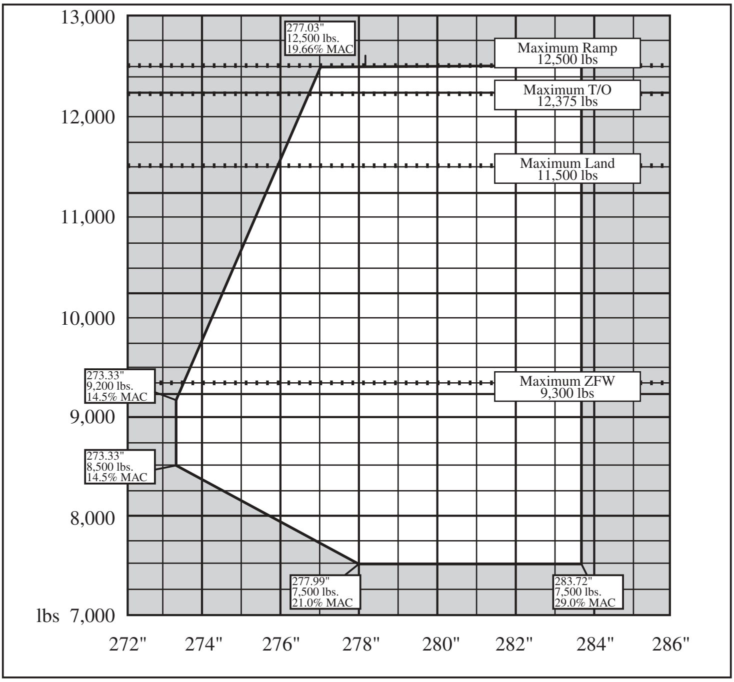
WEIGHT (POUNDS)	MOMENT/100 TOILET DRAWER ARM = FS 314.58 in.
5	15.73



FORM NUMBER 2086, 18 April 2000

Figure WB-5. Baggage and Cabin Compartments Weight-and-Moment Table—Form 2086, 18 April 2000

Citation CJ2 (Model 525A)



Weight Adjustment:

$$\frac{\textbf{Wt. Shifted}}{\textbf{Total Weight}} = \frac{\textbf{CG Moved Inches}}{\textbf{Wt. Shifted Inches}}$$

ZFGWT Shift:

_______ = _______

TAKEOFF GROSS WEIGHT Shift:

__________ = __________

Original CG	+/– Correction	= Adjusted CG

Other Weight Shift:

_______ = _______

Figure WB-6. Form

WEIGHT-AND-BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE MODIFICATION OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

DATE	ITEM		DESCRIPTION OF STRUCTURE MODIFICATION OR EQUIPMENT	WEIGHT CHANGE						BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (–)				
	IN	OUT		WEIGHT (POUNDS)	ARM (INCHES)	MOMENT /100	WEIGHT (POUNDS)	ARM (INCHES)	MOMENT /100	WEIGHT (POUNDS)	MOMENT /100

Figure WB-7. Weight-and-Balance Record—Form 2091, 27 March 2000

Citation CJ2

Weight and Balance

Sample Loading Problem

FlightSafety International
Citation Learning Center
Wichita, Kansas

Figure WB-8. Weight-and-Balance Sample Loading Problem Cover

Citation CJ2 (Model 525A)

1

Item	Arm	Weight	MOM/100
Pilot	131.00	180	
Copilot	131.00	160	
Seat 3	195.75	180	
Seat 4	195.75	200	
Seat 5	241.60	140	
Seat 6	241.60	150	
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70	30	
Tailcone Comp.	384.59	100	
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)		1,140	

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight		
+ Payload		
Zero Fuel Weight *		

ZFW MOM / Zero Fuel Weight = ______ ZFW CG

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	
+ Flight Fuel	
+ Reserve Fuel	
Ramp Weight	

4 Calculate Takeoff Fuel

Total Fuel
–Taxi Fuel
Takeoff Fuel

5 Calculate Takeoff Weight, Moment and CG

Item	Weight	MOM/100
Zero Fuel Weight *		
+ Takeoff Fuel		
Takeoff Weight		

Takeoff MOM / Takeoff Weight = ______ Takeoff CG

6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	
+ Reserves	
Landing Weight	

7

* See limitations on reverse.

Loading Information:	
Total Fuel	3,700 lb
Pilot	180 lb
Copilot	160 lb
Passenger	180 lb
Passenger	200 lb
Passenger	140 lb
Passenger	150 lb
Passenger Baggage	100 lb
Cargo Package	30 lb

Figure WB-9. FSI Form

(1) The first step in completing weight-and-balance computation is to determine the total weight and moment of the payload. This is accomplished using the left portion of the worksheet.

The pilot and copilot always occupy seats 1 and 2. Other passengers are seated according to the seating chart provided by Cessna or based upon personal preference.

The arms for each passenger and cargo location are determined by referring to the loading charts provided by Cessna.

Passenger weights are entered based on the actual weights. Average weights may also be used for each passenger.

The moment for each passenger can be determined by reference to the loading charts provided by Cessna or by multiplying the weight times the arm for each passenger and item of cargo.

(1) Calculate Payload Weight and Moment

Item	Arm	Weight	MOM/100
Pilot	131.00	180	235.8
Copilot	131.00	160	209.6
Seat 3	195.75	180	352.35
Seat 4	195.75	200	391.50
Seat 5	241.60	140	338.24
Seat 6	241.60	150	362.40
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70	30	90.51
Tailcone Comp.	384.59	100	384.59
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)		1,140	2,364.99

By convention, the moment is divided by 100. This provides "shorter" numbers that fit in small spaces. For example, the actual moment for Seat 4 is 39,150 inch-pounds (195.75 in. x 200 lb).

Items of cargo may be located in the nose compartment, cabin or tailcone. There are specific weight restrictions for each location. The loading charts indicate the maximum weight that is allowed in each location.

Placement of cargo should not be done haphazardly. Cargo should be secured and located to provide the most favorable center-of-gravity location.

The weights and moments of the pilots, passengers, and cargo are added to determine the total payload weight and moment. The totals are then copied to the weight-and-balance worksheet.

Figure WB-10. Weight-and-Balance Worksheet— Sample Loading Problem (Sheet 1 of 5)

2 THE SECOND STEP IS TO DETERMINE THE ZERO FUEL WEIGHT, MOMENT

BASIC EMPTY WEIGHT
From the aircraft records, copy the basic empty weight (BEW) and moment in the space provided on the worksheet.

PAYLOAD
From the payload worksheet, copy the total payload weight and moment onto the payload line in the spaces provided.

ZERO FUEL WEIGHT
Add the basic empty weight and the payload weight. This is the zero fuel weight (ZFW). Enter the number in the space provided.

Add the moment of the empty aircraft to the payload moment. Enter the total in the space provided.

Divide the ZFW moment by the zero fuel weight. The ZFW arm must be within the aft boundary of the envelope.

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight	7,660	22.003.42
+ *Payload*	1,140	2,364.99
Zero Fuel Weight *	8,800	24,368.41

$$\frac{\text{ZFW MOM}}{\text{Zero Fuel Weight}} = \boxed{276.9} \quad \text{ZFW CG}$$

3 THE THIRD STEP IS TO ADD THE TOTAL FUEL LOAD AND FIND THE RAMP WEIGHT.

TOTAL FUEL LOAD
Enter the total fuel load in the space provided.

RAMP WEIGHT
Add the zero fuel weight and the total fuel load. The result is the ramp weight.

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	8,800
+ *Flight Fuel*	2,700
+ *Reserve Fuel*	1,000
Ramp Weight	12,500

Note:

The zero fuel weight (ZFW) and the ramp weight may not exceed the certified limits.

If the zero fuel weight exceeds the certified limit, passengers or cargo must be removed to reduce the weight.

If the ramp weight exceeds the certified limit, either the fuel load or the payload must be reduced.

Figure WB-10. Weight-and-Balance Worksheet— Sample Loading Problem (Sheet 2 of 5)

4 THE FOURTH STEP IS TO DETERMINE THE TAKEOFF WEIGHT, MOMENT

TAKEOFF FUEL
Enter the takeoff fuel weight. (Total fuel load minus 125 lb)

Using the fuel loading chart provided by Cessna, determine the moment for the takeoff fuel weight.

TAKEOFF WEIGHT
Add the takeoff fuel weight and the zero fuel weight. The takeoff weight must be less than the certified limit.

Add the takeoff fuel moment and the zero fuel weight moment.

Divide the takeoff moment by the takeoff weight. The result is the takeoff arm. The takeoff arm must be within the envelope limits.

5 THE FIFTH STEP IS TO DETERMINE THE LANDING WEIGHT.

LANDING FUEL
Enter the projected landing fuel in the space provided.

LANDING WEIGHT
Add the landing fuel and the zero fuel weight. The landing weight must not exceed certified limits.

4 Calculate Takeoff Fuel

Total Fuel 3,700
–Taxi Fuel 125
Takeoff Fuel 3,575

5 Calculate Takeoff Weight, Moment and CG

Item		MOM/100
Zero Fuel Weight *	**8,800**	**24,368.41**
+ *Takeoff Fuel*	**3,575**	**10,314.08**
Takeoff Weight	**12,375**	**34,682.49**

$\dfrac{\text{Takeoff MOM}}{\text{Takeoff Weight}} =$ **280.3** **Takeoff CG**

6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	**8,800**
+ *Reserves*	**1,000**
Landing Weight	**9,800**

7 *** See limitations on reverse.**

Figure WB-10. Weight-and-Balance Worksheet— Sample Loading Problem (Sheet 3 of 5)

Citation CJ2 (Model 525A)

1 Calculate Payload Weight and Moment

Item	Arm	Weight	MOM/100
Pilot	131.00	180	235.8
Copilot	131.00	160	209.6
Seat 3	195.75	180	352.35
Seat 4	195.75	200	391.50
Seat 5	241.60	140	338.24
Seat 6	241.60	150	362.40
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70	30	90.51
Tailcone Comp.	384.59	100	384.59
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)		1,140	2,364.99

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight	7,660	22.003.42
+ Payload	1,140	2,364.99
Zero Fuel Weight *	8,800	24,368.41

$\frac{\text{ZFW MOM}}{\text{Zero Fuel Weight}}$ = 276.9 ZFW CG

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	8,800
+ Flight Fuel	2,700
+ Reserve Fuel	1,000
Ramp Weight	12,500

4 Calculate Takeoff Fuel

Total Fuel	3,700
–Taxi Fuel	125
Takeoff Fuel	3,575

5 Calculate Takeoff Weight, Moment and CG

Item		MOM/100
Zero Fuel Weight *	8,800	24,368.41
+ Takeoff Fuel	3,575	10,314.08
Takeoff Weight	12,375	34,682.49

$\frac{\text{Takeoff MOM}}{\text{Takeoff Weight}}$ = 280.3 Takeoff CG

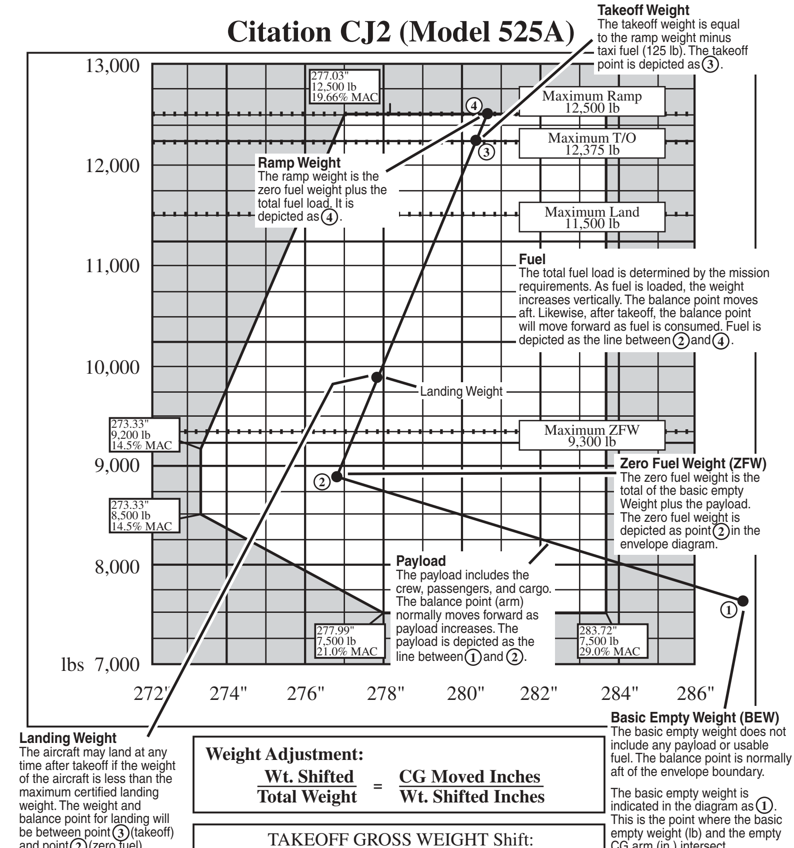
6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	8,800
+ Reserves	1,000
Landing Weight	9,800

7 * See limitations on reverse.

Loading Information:	
Total Fuel	3,700 lb
Pilot	180 lb
Copilot	160 lb
Passenger	180 lb
Passenger	200 lb
Passenger	140 lb
Passenger	150 lb
Passenger Baggage	100 lb
Cargo Package	30 lb

Figure WB-10. Weight-and-Balance Worksheet— Sample Loading Problem (Sheet 4 of 5)



Weight Adjustment:

$$\frac{\text{Wt. Shifted}}{\text{Total Weight}} = \frac{\text{CG Moved Inches}}{\text{Wt. Shifted Inches}}$$

ZFGWT Shift:

______ = ______

TAKEOFF GROSS WEIGHT Shift:

______ = ______

Original CG	+/– Correction	= Adjusted CG

Other Weight Shift:

______ = ______

Takeoff Weight Limitations

1. TFL ≤ Runway Available
2. SE climb capability ≥1.6% Net in 2nd Segment
3. SE climb capability to clear any obstacle in takeoff flight path
4. Takeoff weight ≤ maximum certified takeoff weight.
5. Landing weight ≤ maximum certified landing weight at destination

Landing Weight Limitations

1. Landing Distance ≤ Runway Available
2. Climb capability ≥ 2.1% gross SE
   ≥ 3.2% gross ME
3. Brake energy limits
4. Landing weight ≤ maximum landing weight
5. Destination Takeoff Field Length to depart

Figure WB-10. Weight-and-Balance Worksheet— Sample Loading Problem (Sheet 5 of 5)

Citation CJ2 (Model 525A)

For Standard and Option 1 Seating Configurations

Standard—Refreshment Center Behind Copilot's Chair
Option 1—Side Facing Seat Behind Copilot's Chair
The RH Unbelted toilet Has 100 Lbs Baggage Storage on the LH Side
With LH Belted Troilet, Lose 100 lbs Bags

1 Calculate Payload Weight and Moment

Item	Arm	Weight	MOM/100
Pilot	131.00		
Copilot	131.00		
Seat 3	195.75		
Seat 4	195.75		
Seat 5	241.60		
Seat 6	241.60		
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70		
Tailcone Comp.	384.59		
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)			

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight		
+ Payload		
Zero Fuel Weight *		

$\frac{\text{ZFW MOM}}{\text{Zero Fuel Weight}} = \boxed{\quad}$ ZFW CG

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	
+ Flight Fuel	
+ Reserve Fuel	
Ramp Weight	

4 Calculate Takeoff Fuel

Total Fuel
–Taxi Fuel
Takeoff Fuel

5 Calculate Takeoff Weight, Moment and CG

Item	Weight	MOM/100
Zero Fuel Weight *		
+ Takeoff Fuel		
Takeoff Weight		

$\frac{\text{Takeoff MOM}}{\text{Takeoff Weight}} = \boxed{\quad}$ Takeoff CG

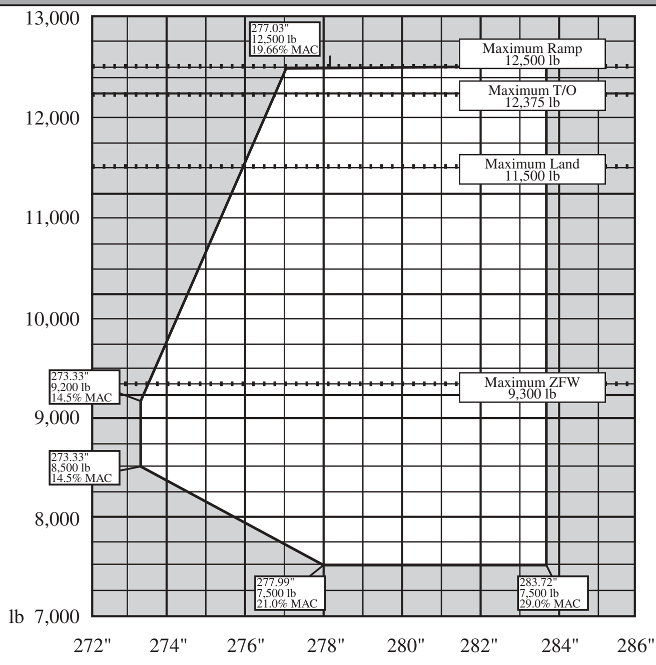
6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	
+ Reserves	
Landing Weight	

7 * See limitations on reverse.

Figure WB-11. Weight-and-Balance Worksheet

Citation CJ2 (Model 525A)



Weight Adjustment:

$$\frac{\textbf{Wt. Shifted}}{\textbf{Total Weight}} = \frac{\textbf{CG Moved Inches}}{\textbf{Wt. Shifted Inches}}$$

ZFGWT Shift:

_______ = _______

TAKEOFF GROSS WEIGHT Shift:

__________ = __________

Original CG	+/– Correction	= Adjusted CG

Other Weight Shift:

_______ = _______

Takeoff Weight Limitations

1. TFL ≤ Runway Available
2. SE climb capability ≥1.6% Net in 2nd Segment
3. SE climb capability to clear any obstacle in takeoff flight path
4. Takeoff weight ≤ maximum certified takeoff weight.
5. Landing weight ≤ maximum certified landing weight at destination

Landing Weight Limitations

1. Landing Distance ≤ Runway Available
2. Climb capability ≥ 2.1% gross SE
   ≥ 3.2% gross ME
3. Brake energy limits
4. Landing weight ≤ maximum landing weight
5. Destination Takeoff Field Length to depart

Figure WB-12. Citation CJ2 Center-of-Gravity Envelope

PERFORMANCE

CONTENTS

ILLUSTRATIONS

TABLES

PERFORMANCE

GENERAL

CERTIFICATION

The Model 525A Citation CJ2 is certified under Part 23 Normal Category and Part 36 Amendment 18 (noise). Takeoff and landing performance are under special condition certification requirements and are equivalent to Part 25 which governs the certification of transport category airplanes. This ensures Part 25 performance requirements, which basically ensures specific single-engine climb capability throughout flight.

APPROVED *AIRPLANE FLIGHT MANUAL*

In accordance with Part 25, the *AFM* "Performance" section contains only single-engine take-off and climb data. All takeoff data, for example, is based upon losing thrust on one engine at the worst possible moment—right at V_1. The *AFM* contains no enroute cruise information but does, of course, contain landing data. This data is based upon the conditions, factors, and assumptions discussed below.

STANDARD PERFORMANCE CONDITIONS

All performance data in the *AFM* is based on flight test data and the following conditions:

1. Thrust ratings include the installation, bleed air, and accessory losses.

2. Full temperature accountability within the operational limits for which the airplane is certified.

NOTE

Should ambient air temperature or altitude be below the lowest temperature or altitude shown on the performance charts, use the performance at the lowest value shown.

3. Wing flap positions are as follows:

Takeoff	UP AND TO/APPR	0° and 15°
Enroute	UP	0°
Approach	TO/APPR	15°
Landing	LAND	35°
	GROUND FLAPS	60°

4. All takeoff and landing performance is based on a paved, dry runway.

5. The takeoff performance data was obtained using the following procedures and conditions.

SINGLE-ENGINE TAKEOFF—ACCELERATE-GO

a. The power was set static to takeoff power; then the brakes were released. Power was retrimmed at approximately 60 KIAS.

b. The pilot recognized engine failure at V_1.

c. The airplane continued to accelerate to V_R, at which time the pilot made positive rotation to +10° noseup. Pitch attitude was adjusted, as required, to achieve V_2 upon reaching 35 feet AGL.

d. The landing gear was retracted when a positive climb rate was established.

e. V_2 was maintained from the 35-foot point above the runway to 1,500 feet AGL.

SINGLE-ENGINE TAKEOFF—ACCELERATE-STOP

a. The power was set static, then the brakes were released. Power was retrimmed at approximately 60 KIAS.

b. The pilot recognized the necessity to stop because of engine failure or other reasons just prior to V_1.

c. Maximum pilot braking effort was started at V_1 and continued until the airplane came to a stop.

d. Both throttles were brought to idle.

e. Thrust attenuators were automatically deployed at idle throttles.

f. Directional control was maintained through the rudder pedals and differential braking as required.

g. Antiskid was on during all tests.

h. Speedbrakes and ground flaps were not used.

MULTI-ENGINE TAKEOFF

a. The power was set static, and then the brakes were released. Power was retrimmed at approximately 60 KIAS.

b. Positive rotation to +10° was made at V_R accelerating to V_2 +12 and pitch adjusted as required to maintain V_2 + 12 (V_{35}).

c. The landing gear was retracted when a positive climb rate was established.

d. V_2 +12 KIAS was maintained from the 35-foot point above the runway until the obstacle was cleared, at which time, the airplane was accelerated and the flaps were retracted.

6. The landing performance was obtained using the following procedures and conditions.

LANDING

a. Landing preceded by a steady 3°-approach angle down to the 50-foot height point with airspeed at V_{REF} in the landing configuration.

b. Two-engine thrust setting during approach was selected to maintain the 3°-approach angle at V_{REF}.

c. Idle thrust was established at the 50-foot height point and throttles remained in that setting until the airplane had stopped.

d. Rotation to a landing attitude was accomplished at a normal rate.

e. Thrust attenuators were automatically deployed on main wheel contact.

f. Maximum wheel braking was initiated immediately on nosewheel contact and continued throughout the landing roll. Ground flaps were selected immediately after brake application.

g. The antiskid system was on during all tests.

h. Speedbrakes were disabled (i.e., no performance credit).

CONDITIONS

Wing Flaps.. LAND

Engines... TWO ENGINES OPERATING

Landing Gear.. EXTENDED

Antiskid.. OPERATIVE

VARIABLE FACTORS AFFECTING PERFORMANCE

Details of variables affecting performance are given with tables in the *AFM* to which they apply. Assumptions which relate to all performance calculations, unless otherwise stated, are as follows:

- Cabin pressurization
- Anti-ice off
- Humidity corrections on thrust have been applied according to the applicable regulations.
- Winds, for which correction information is presented on the charts, are to be taken as the tower winds 32.8 feet (10 meters) above runway surface. Factors have been applied as prescribed in the applicable regulations. In the tables, negative represents tailwind and positive represents headwind.
- Gradient correction factors can be applied to gradients less than or equal to 2% downhill or 2% uphill. In the tables, negative represents downhill gradients and positive represents uphill gradients.

DEFINITIONS

Accelerate-Stop Distance—The distance required to accelerate to V_1, and abort the takeoff and come to a complete stop with maximum braking applied at V_1.

Altitude (All)—Altitudes used in this chapter and the *AFM* are pressure altitudes unless otherwise stated.

Anti-ice Systems—The following systems comprise the anti-ice systems that affect performance of the following:

- Windshield bleed-air anti-ice
- Engine anti-ice
- Wing anti-ice
- Pylon inlet anti-ice

Performance, when referred to ANTI-ICE ON, is based on all the above systems being operated at the same time.

Additionally, the pitot-static and angle-of-attack anti-ice systems are anti-ice systems that do not affect performance.

Calibrated Airspeed (KCAS)—Indicated airspeed (knots) corrected for position error and assumes zero instrument error

Climb Gradient—The ratio of the change in height during a portion of a climb, to the horizontal distance transversed in the same time interval

Deice Systems—The horizontal stabilizer, tail deice system is the only deice system.

Demonstrated Crosswind—The ***demonstrated*** crosswind velocity of 26 knots (measured at 6 feet above the runway surface) is the velocity of the wind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. ***This is not limiting.***

Engine Cycle—Engine operating life limits are determined by mechanical and thermal stresses which occur during engine operation. It is therefore necessary to record flight cycles (both partial and full) in addition to operating hours. The total true cycles will be the sum of the number of full and partial cycles accrued during each flight and must be recorded in the airplane log book for each individual engine at the completion of each flight. Cycles will be computed as follows:

1. Full Cycle:

   a. Engine start, takeoff power setting, followed by engine shutdown, regardless of duration

   b. In-flight start

2. Partial Cycle:

   a. A touch-and-go landing shall be recorded as 0.50 cycle.

   b. A full stop landing without engine shutdown shall be recorded as 0.50 cycle.

   c. Ground running—Idle to max continuous thrust shall be recorded as 0.50 cycle.

Engine Out Accelerate-Go Distance—The horizontal distance from brake release to the point at which the airplane attains a height of 35 feet above the runway surface, on a takeoff during which an engine is recognized to have failed at V_1 and the takeoff is continued.

Gross Climb Gradient—The climb gradient that the airplane can actually achieve with ideal ambient conditions (smooth air).

Indicated Airspeed (KIAS)—Airspeed indicator readings (knots). Zero instrument error is assumed.

ISA—International Standard Atmosphere.

Landing Distance—The distance from a point 50 feet above the runway surface to the point at which the airplane would come to a full stop on the runway.

Mach Number—The ratio of true airspeed to the speed of sound.

Net Climb Gradient—The gross climb gradient reduced by 0.8% during takeoff phase and 1.1% during enroute. This conservatism is required by special condition for terrain clearance determination to account for variables encountered in service.

OAT or TEMP—Outside air temperature or ambient air temperature. The free air static temperature, obtained either from ground meteorological sources or from inflight temperature indications adjusted for instrument error and compressibility effects.

Position Correction—A correction applied to indicated airspeed or altitude to eliminate the effect of the location of the static pressure source on the instrument reading. No position corrections are required when using performance section charts in Section IV of the *AFM* since all airspeeds and altitudes in the *AFM* are presented as indicated values except for stall speeds, which are presented as calibrated values.

RAT—Ram-air temperature. The indicated outside air temperature as read from the RAT display. This must be corrected from ram-air temperature rise to obtain true outside air temperature.

Reference Zero—The point in the takeoff flightpath at which the airplane is 35 feet above the takeoff surface and at the end of the takeoff distance required.

Takeoff Field Length—The takeoff field length given for each combination of gross weight, ambient temperature, altitude, wind, and runway gradients is the greatest of the following:

- 115% of the two-engine horizontal takeoff distance from start to a height of 35 feet above runway surface
- Accelerate-stop distance
- The engine-out accelerate-go distance

No specific identification is made on the charts (see *AFM*) as to which of these distances governs a specific case.

True Airspeed (KTAS)—The airspeed (knots) of an airplane relative to undisturbed air.

V_1 Takeoff decision speed—The distance to continue the takeoff to 35 feet will not exceed the scheduled takeoff field length if recognition occurred at V_1 (accelerate-go). The distance to bring the airplane to full stop (accelerate-stop) will not exceed the scheduled takeoff field length provided that the brakes are applied at V_1.

V_2 Takeoff safety speed—This climb speed is the actual speed at 35 feet above the runway surface as demonstrated in flight during takeoff with one engine inoperative.

V_{35} This climb speed is the actual speed at 35 feet above the runway surface as demonstrated in flight during takeoff with both engines operating.

V_A The maneuvering speed is the maximum speed at which application of full available aerodynamic control will not over stress the airplane.

V_{APP} The landing approach climb airspeed (1.3 V_{S1}) with 15 flap position, landing gear UP

V_{ENR} Single-engine enroute climb speed—Utilize the speedbug V_T for display of V_{ENR} on the PFD

V_{FE} Maximum flap extended speed—The highest speed permissible with wing flaps in a prescribed extended position

V_{LE} Maximum landing gear extended speed—The maximum speed at which an aircraft can be safely flown with the landing gear extended

V_{LO} Maximum landing gear operating speed. The maximum speed at which the landing gear can be safely extended or retracted.

V_{MCA} Minimum airspeed in the air at which directional control can be maintained, when one engine is suddenly made inoperative—V_{MCA} is a function of engine thrust which varies with altitude and temperature. The V_{MCA} presented in the *AFM* was determined for maximum takeoff thrust. V_{MCA} = Flaps 0°—89 KIAS; Flaps 15°—81 KIAS.

V_{MCG} Minimum speed on the ground at which directional control can be maintained, when one engine is suddenly made inoperative, using only aerodynamic controls—V_{MCG} is a function of both airplane weight and engine thrust, which varies with altitude and temperature. The V_{MGC} presented was determined for maximum takeoff thrust. V_{MCG} = 89 KIAS.

V_{MO}/M_{MO} Maximum operating limit speed

V_R The rotation speed is the speed at which rotation is initiated during takeoff to attain V_2 climb speed at or before a height of 35 feet above runway surface has been reached.

V_{REF} The airspeed equal to the landing 50-foot point speed (1.3 V_{SO}) with landing flaps and landing gear extended

V_{SO} The stalling speed or the minimum steady flight speed in the landing configuration (Table PER-1)

V_{S1} The stalling speed or the minimum steady flight speed obtained in a specified configuration

V_X Best angle-of-climb speed (multiengine, flaps 15°) 124 KIAS

V_Y Best rate-of-climb speed (multiengine, flaps 15°) 191 KIAS

Visible Moisture—Visible moisture includes, is not limited to, the following conditions: fog with visibility less than one mile, wet snow, and rain.

Wind—The wind velocities recorded as variables on the charts in the *AFM* are to be understood as the headwind or tailwind components of the actual winds at 32.8 feet (10 meters) above the runway surface (tower winds).

Table PER-1. CONFIGURATIONS

	NUMBER OF OPERATING ENGINES	THRUST	FLAP SETTING (DEGREE)	GEAR
1ST SEGMENT TAKEOFF CLIMB	1	TAKEOFF	UP, 0° OR 15°	DOWN
2ND SEGMENT TAKEOFF CLIMB	1	TAKEOFF	UP, 0° OR 15°	UP
3RD SEGMENT HORIZONTAL ACCELERATION	1	TAKEOFF (10 MINUTES MAXIMUM), THEN MAXIMUM CONTINUOUS SINGLE-ENGINE THRUST	15° UP	UP
ENROUTE CLIMB	1	MAXIMUM CONTINUOUS SINGLE-ENGINE THRUST	UP	UP
APPROACH CLIMB	1	TAKEOFF	15°	UP
LANDING CLIMB	2	TAKEOFF	35° OR LAND	DOWN

NOISE CHARACTERISTICS

CERTIFIED NOISE LEVELS

The following noise levels (Table PER-2) were established using test data obtained and analyzed under procedures of Part 36, Amendment 18. The Citation CJ2 complies with Part 36, Stage 3 requirements.

Takeoff and sideline noise levels were obtained at a takeoff weight of 12,375 pounds with 15° flaps and climb speed of 126 KIAS. For takeoff, thrust was cut back from takeoff N_1 to 86.9% N_1 at 3,133 feet AGL. Approach data was obtained at 11,500 pounds, landing gear down, flaps 35°, and 120 KIAS.

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into or out of any airport.

Table PER-2. NOISE LEVELS

NOISE REFERENCE	EPNdB
TAKEOFF	74.5
SIDELINE	88.8
APPROACH	91.4

SUPPLEMENTAL ICAO ANNEX 16, CHAPTER 3 NOISE LEVEL INFORMATION

The ICAO Annex 16, Chapter 3, noise values are the same as those for Part 36, Amendment 18, and were obtained with the procedures used to establish compliance with Part 36, Amendment 18. The ICAO Annex 16, Chapter 3, noise levels were obtained by analysis of approved data used to demonstrate compliance with Part 36, Amendment 18, Noise Standards. This data is applicable only after approval of the Civil Aviation Approving Authority of the country of airplane registration, including approval of the equivalent procedures used to establish compliance with Part 36, Amendment 18.

SUPPLEMENTAL A-WEIGHTED NOISE LEVELS

The following A-weighted noise levels (Table PER-3) were established for Part 36 reference conditions used in Certificated Noise Levels.

Table PER-3. A-WEIGHTED NOISE LEVELS

NOISE REFERENCE	dBA
TAKEOFF	62.7
SIDELINE	80.4
APPROACH	80.3

Takeoff and sideline noise levels were obtained at a takeoff weight of 12,375 pounds with 15° flaps and climb speed of 126 KIAS. For takeoff, thrust was cut back from takeoff N_1 to 86.9% N_1 at 3,133 feet AGL. Approach data was obtained at 11,500 pounds, landing gear down, flaps 35°, and 120 KIAS.

ASSUMPTIONS

The data obtained from the tables in the *AFM* is based upon the previously discussed conditions and factors. In addition, each chart or table lists the specific conditions that apply to it. The following discussions expand or clarify these areas.

TAKEOFF FIELD LENGTH

The takeoff field length is based on the longer of three distances—accelerate-stop or accelerate-go or two engine distance to 35 feet times 115%. Accelerate-stop is the distance required to accelerate to V_1, lose thrust on one engine, and abort the takeoff. Accelerate-go is the distance to accelerate to V_1, lose thrust on one engine, continue the takeoff, and arrive at a point 35 feet above the runway. It is normally not stated in the takeoff tables which distance is the limiting factor because if the runway available meets or exceeds the runway required, the airplane can abort or continue the takeoff within the allowable distance.

The takeoff field length is also based on holding the brakes while setting the N_1 rpm to the value computed for the pressure altitude and temperature conditions. Once the N_1 is set and stabilizes, the brakes are released. No data or corrections to date are published for "running" takeoffs.

LANDING DISTANCE

The landing distance tables are based upon the airplane arriving at a point 50 feet above the landing runway threshold with the airspeed at V_{REF}, preceded by a 3°-approach angle. The power is reduced to idle at 50 feet, and maximum wheel braking is initiated upon nosewheel contact and continues throughout the landing roll. The landing distance obtained from the tables is the total distance from the threshold to the point where the airplane comes to a complete stop.

ANTISKID

The power brake system with antiskid is standard equipment; therefore, all of the takeoff and landing distances obtained from the *AFM* are predicated on an operative antiskid system. If the antiskid is inoperable, then the Flap 15° (Flap 0° Prohib) takeoff field length obtained from the *AFM* must be increased by 60% and the landing distance by 40%.

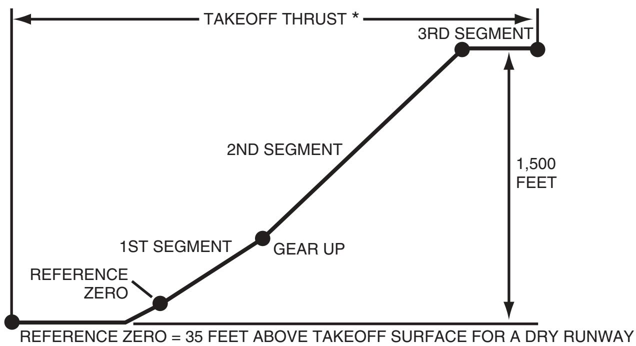
TAKEOFF SPEEDS

V_1 is defined in the *AFM* as the takeoff decision speed. If the engine fails below V_1, the takeoff must be aborted since the accelerate-go distance is based on twin-engine acceleration to that point. Engine failure past V_1 dictates continuing the takeoff since the accelerate-stop distance is based on applying the brakes at V_1.

V_R is rotation speed. It is the optimum speed at which to rotate the airplane. The accelerate-go distance is based on rotating the airplane at V_R. Rotation prior to and rotation after V_R will both result in extending the accelerate-go distance to reference zero (35 feet in the air). This, of course, would invalidate the takeoff field length.

V_2 is defined as the takeoff safety speed. The airplane must accelerate to this speed in the takeoff configuration at a point 35 feet above the runway. This speed is maintained through gear retraction to 1,500 feet AGL. V_2 is the speed the manufacturer determines in order to assure the minimum specified climb gradient in the second segment of the climb, which is 2.4% gross climb gradient (Part 25). For all practical purposes, V_2 could be equated to V_{XSE}, or best angle-of-climb speed, single engine.

The Part 25 climb profile (Figure PER-1) is the standard to which all transport category airplanes are certificated. The airplane must be flown in accordance with this profile during single-engine takeoffs to ensure the specified climb performance and, most importantly, obstacle clearance.



NOTE:
* TAKEOFF THRUST IS LIMITED TO 10 MINUTES MAXIMUM, AND THEREAFTER TO MAXIMUM CONTINUOUS THRUST

Figure PER-1. Part 25 Climb Profile

Reference zero is the point at the end of the takeoff field length where the airplane is at least 35 feet in the air. It is at this point that gear retraction is assumed to begin. The airplane speed is V_2. Obstructions are measured in Part 25 from reference zero.

The first segment of the climb profile begins at reference zero and ends when the landing gear is up and locked. There is no minimum specified climb gradient other than a positive climb. The airplane cannot level out or descend with the speed at V_2.

The second segment of the profile begins when the gear is up and locked. The pitch attitude must be increased slightly in order to maintain V_2 since the drag of the extended landing gear has been eliminated. The airplane now must demonstrate a minimum gross climb gradient of 2.4%. This particular segment is usually the limiting segment when weight reductions for climb requirements are required. This segment ends at 1,500 feet AGL.

The airplane now enters the third segment of the profile. This segment has no climb requirement since it is an acceleration segment. The airplane is accelerated through V_2, the flaps are retracted, and the acceleration is continued to VENR, or V_2 plus 10, whichever is lower. During this segment, the power is reduced to maximum continuous if the 10-minute limitation on takeoff power has expired.

Remember that the Part 25 climb profile only applies during single-engine takeoff situations. During a normal two-engine takeoff, the airplane will exceed all of the required gradients.

WEIGHT

Weight is the performance variable that is most easily controlled by the crew. The discussion of performance boils down to the single fact that the airplane must be at or below a given weight in order to obtain a specific performance parameter, whether it is a climb gradient, field length, etc.

Weight limiting conditions for takeoff are as follows:

1. Design takeoff weight—always limiting
2. Climb requirements
3. Runway length
4. Obstacle clearance
5. Landing requirements at the destination

Weight limiting conditions for landing are as follows:

1. Design landing weight—again, always limiting
2. Climb requirements or brake energy limits
3. Landing distance—not usually limiting
4. Takeoff field length requirements to depart again

ADVISORY PERFORMANCE INFORMATION

Citation CJ2 *AFM* not only contains dry takeoff and landing runway data in *AFM* Section IV for normal flap settings, but also contains 0°- and 15°-flap takeoffs on wet runways to 15-foot screen heights in Advisory Information Section VII. This data is not FAA approved.

WARNING

These distances and corrections factors for wet and adverse runway conditions are approximate and are to be considered minimums, as actual runway conditions may require distances greater than those determined.

DEFINITIONS

Runway Contaminated by Compacted Snow—A runway is considered contaminated by compacted snow when covered by snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up.

Runway Contaminated by Standing Water, Slush, or Loose Snow—A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used, is covered by surface water, more than 3 millimeters (0.125 inch) deep, or by slush, or loose snow, equivalent to more than 3 millimeters (0.125 inch) of water.

Runway Contaminated by Wet Ice—A runway surface condition where braking action is expected to be very low, due to the presence of wet ice.

Wet Runway—A runway is considered wet when there is sufficient moisture on the surface to appear reflective, but without significant areas of standing water.

WET RUNWAY TAKEOFF PERFORMANCE

Determine the takeoff field length using Figure 7-2 (flaps 0°) or Figure 7-4 (flaps 15°) from the following pages (*AFM)* for a wet runway, anti-ice systems off. For anti-ice on or for runway gradients, make adjustments according to Figure 7-1 (flaps 0°) or Figure 7-3 (flaps 15°) of the *AFM*. Then determine the takeoff field length for a dry runway for the same conditions using Section IV (*AFM*) and any appropriate correction factors. The takeoff field length is the longer of the wet or dry takeoff field lengths. Use the V_1 determined from the wet runway performance.

ADVERSE RUNWAY TAKEOFF PERFORMANCE

Determine the takeoff field length using Figure 4-19 (flaps 0°) or Figure 4-21 (flaps 15°) in Section IV of the basic *Airplane Flight Manual* for a dry runway, anti-ice systems off. For anti-ice on or for runway gradients, make adjustments using the following notes. From Figure 7-5 (flaps 0°) or Figure 7-6 (flaps 15°) determine the takeoff field length for the precipitation type and depth.

NOTE

- If the runway has a gradient, the dry takeoff field length must be adjusted in accordance with the takeoff correction factors in Section IV before applying Figure 7-5 or Figure 7-6.

- If the anti-ice systems are on, the dry takeoff field length must be adjusted in accordance with the takeoff correction factors in Section IV before applying Figure 7-5 or Figure 7-6.

WET AND CONTAMINATED RUNWAY LANDING PERFORMANCE

Determine the landing distance using Figure 4-47 (flaps full) in Section IV of the basic *Airplane Flight Manual* for a dry runway. From Figure 7-7 (V_{REF}) and Figure 7-8 (V_{REF} +10 knots) determine the landing distance for the precipitation type and depth. The difference between Figure 7-7 (V_{REF}) and Figure 7-8 (V_{REF} +10 knots) presents the comparison in distances of an overspeed at V_{REF}.

NOTE

- If the runway has a downhill gradient, the dry landing distance must be adjusted in accordance with the landing distance correction factors in Section IV before applying Figure 7-7 or Figure 7-8.

- The published limiting maximum tailwind component for this airplane is 10 knots. However, landings on precipitation covered runways with any tailwind component are not recommended.

PERFORMANCE PROBLEMS

The following performance problem is offered for your practice and review (Figures PER-2 through PER-9).

To complete this performance problem you will need the following references and materials:

- *Weight-and-Balance Worksheet* (Cessna or FlightSafety)
- *Airplane Flight Manual*
- *Airplane Operating Manual*
- *Airman's Information Manual*
- Part 91

There is no single solution to this problem. However, there are recommended and preferred methods of operation. When you finish this problem, compare your solution to the master solution prepared by FlightSafety instructors.

On September 20, you landed at South Lake Tahoe, California, with two passengers. The passengers are company engineers. They are at South Lake Tahoe to do a site survey for a new golf course. On September 22, they are scheduled to depart for a meeting in Denver, Colorado, to report on their findings.

1. **Flight Planning**—The distance from South Lake Tahoe, California, to Denver, Colorado, is approximately 720 nm. Forecast weather for Denver on September 22, is VFR conditions from 0600 MST until 2000 MST. However, your company requires IFR fuel reserves on all flights.

   Forecasts indicate a 50-knot tailwind between South Lake Tahoe and Denver at 37,000 feet. Using the flight planning charts in the *Operations Manual:*

   a. What is the time and fuel required to fly to Denver using MAXIMUM CRUISE THRUST charts at 37,000 feet?

   b. How much additional fuel is required to meet the requirement for IFR fuel reserves?

   c. What is the total fuel load you will need for the flight?

   d. How much oxygen is required, when normally pressurized, to complete this flight under Part 91?

   e. How long will the oxygen last at a cabin altitude (See Table PER-4) of 25,000 feet?

   f. Passenger masks are certified for unpressurized continuous use to what altitude?

2. **Weight and Balance**—When you depart on September 22, you will have the following passengers and cargo:

   Aircraft

Basic Empty Weight	7,577 lb
Moment	21,677.44 (MOM/100)
CG—Arm	________

   Passenger

Pilot	190
Copilot	160
Passenger	175
Passenger	160

Cargo

Hang-up Bags	50
Engineer's Luggage	50
Survey Kit	40

a. What is the zero fuel weight?

b. What is your planned takeoff weight/moment?

c. What is the takeoff CG?

d. What is the maximum amount of cargo you can place in the nose compartment?

NOTE

Use the weight and balance form (Figure PER-6) for calculations and compare your numbers with the weight and balance calculations in Figure PER-5. Use the standard AA seating configuration chart for crew and passengers in the weight and balance pages.

3. **Equipment**—When the landing gear was extended to land at South Lake Tahoe, the antiskid annunciator light came on and stayed on. On landing roll there was no antiskid.

   a. If the antiskid is inoperative and you could not obtain repairs at South Lake Tahoe as a 91 operator, could you dispatch without antiskid?

After parking the aircraft, a lineman informs you that your right navigation light was not working when you taxied to park.

   b. If the navigation light on the right wing tip is burned out and you cannot obtain a new bulb at South Lake Tahoe as a Part 91 operator, could you dispatch with the light inoperative?

During your preflight inspection you discover there are 13 static wicks.

   c. How many static wicks are required for dispatch?

4. **Takeoff**—Forecast weather for South Lake Tahoe on September 22, is listed below. Departure information is attached. The navigation light and antiskid system were repaired.

   Pressure Altitude .... 6,000 FEET

   Temperature .... +15°C

   Ceiling .... 500 FEET OVERCAST

Visibility .... 1/2 SM

Wind.. 330/20

a. Based on forecast weather, can a Part 91 pilot file and take off on an IFR flight plan?

b. What Part 25 climb is guaranteed during first segment climb?

c. What is the minimum second segment net climb gradient guaranteed by Part 25 for takeoff in V_{MC} conditions?

d. What is the TERPS net climb gradient expected when none is published?

e. Takeoff from South Lake Tahoe will be by SID or IFR departure procedure. What climb gradient is required on RWY 36?

f. What takeoff gross weight will guarantee 5.0% net climb gradient through 9,000 feet MSL for both 0°- and 15°-flap settings?

g. What flap setting will you use for takeoff and why?

h. Will the pilot be able to complete the flight as originally planned on the weight and balance sheet?

i. What is the runway gradient?

j. Compute the 0° and 15° takeoff field lengths at the lesser obstruction clearance gross weights.

k. How much more runway is required with 0° flaps over 15° flaps at 6,000 feet pressure altitude?

l. If obstruction clearance is 5.0% net climb gradient and anti-ice is on, what actual airplane climb performance will be used in the charts?

m. Part 25 obstructions must be cleared vertically by _______________.

n. TERP's obstructions must be cleared by ________________________.

o. If the engine fails after V_1 and you are in the clouds at V_2 at 100 feet, will you level off at the Part 25-1,500 foot AGL altitude?

p. During engine failure after V_1 in answer 4.o., what configuration will you fly up to a safe altitude?

5. **Climb**—The ceiling was higher than forecast. You entered the clouds at 1,100 feet AGL and broke out on top at 15,000 feet.

a. How long will it take you to climb to FL370 using a maximum rate climb?

b. How much fuel will be used in the climb?

c. What is your climb capability (fpm) upon arriving at FL370?

d. What is the highest flight level attainable after takeoff without a step climb?

e. If you returned to Tahoe for an emergency landing 15 minutes after takeoff, what is the landing distance?

f. What is your landing distance if the runway is wet, V_{REF} +10? (*AFM* Advisory Information Tab)

6. **Enroute**—Forecast winds at FL370 indicated a 50-knot tailwind. Upon reaching FL370 you find that there is no tailwind component. The winds at altitude are lighter than forecast with a direct crosswind from the south.

   a. With no tailwind, how much additional fuel will be required to reach Denver?

   b. What are two things you can do to arrive at Denver with the same fuel reserves as originally planned?

   c. If you lost an engine 30-minutes after takeoff, what is your maximum single-engine altitude?

7. **Descent**—Denver weather is VFR. Fifty miles from Denver you are advised that due to traffic you will be required to hold at 20,000 feet. The temperature is 15°C and 6,000 feet pressure altitude with calm winds.

   a. If you arrive at the holding fix with 1,200 pounds of fuel, how long can you hold?

   b. What is the recommended holding speed?

8. **Landing**—You are cleared to land with 800 pounds of fuel remaining. Figure PER 8 may be helpful.

   a. What is your V_{APP} and V_{REF} speed and landing distance?

   b. What is your landing distance if the runway is wet?

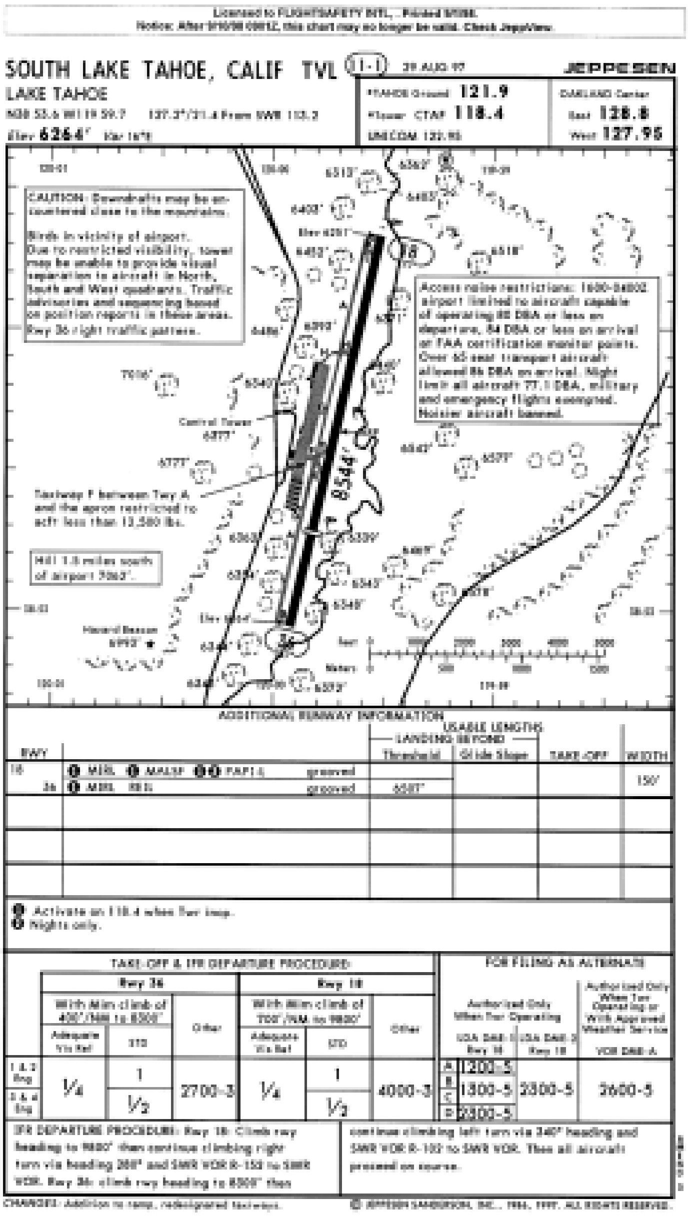


Figure PER-2. South Lake Tahoe, California, Airport 11-1 Jeppesen Chart

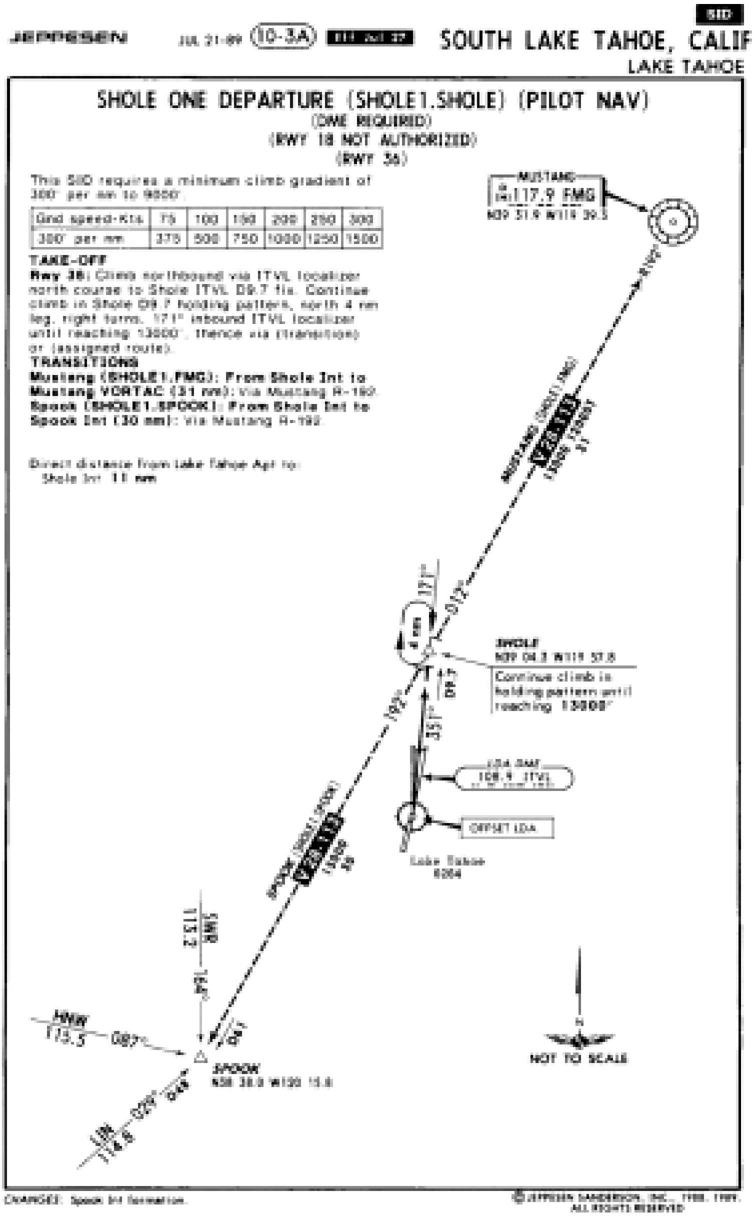


Figure PER-3. South Lake Tahoe, California, 10-3A Shole One Departure (SID)

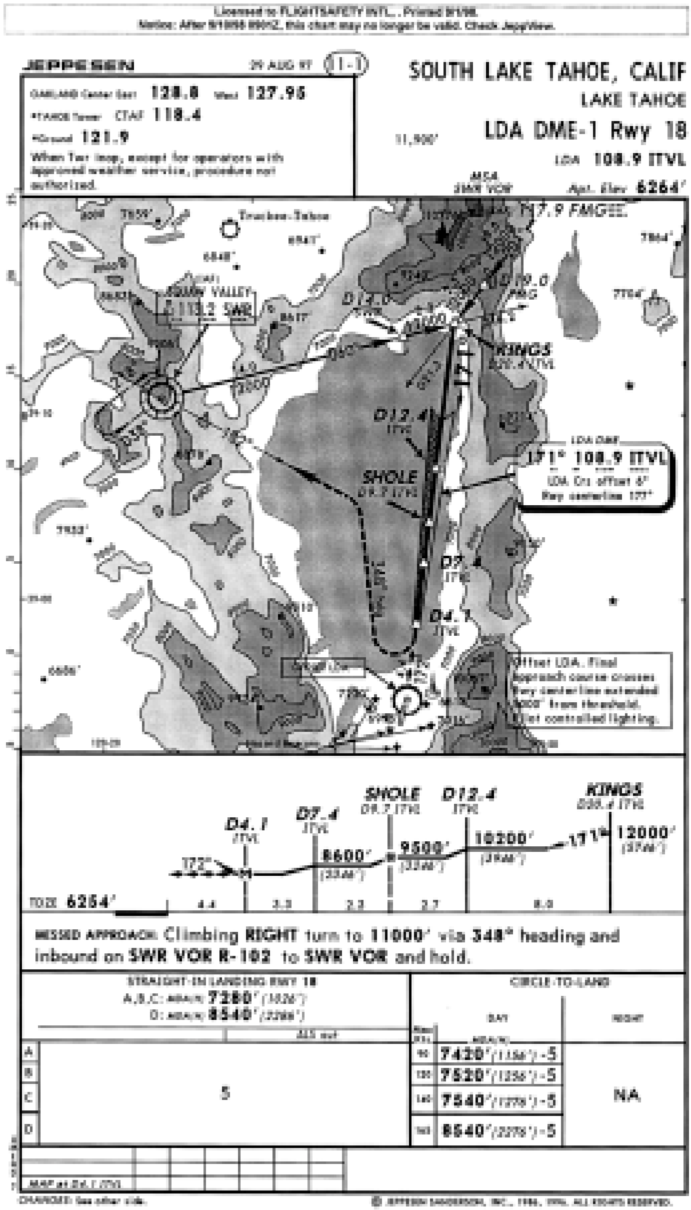


Figure PER-4. South Lake Tahoe, California, 11-1 LDA DME-1 RWY 18 Approach Chart

Citation CJ2 (Model 525A)

For Standard and Option 1 Seating Configurations

Standard—Refreshment Center Behind Copilot's Chair
Option 1—Side Facing Seat Behind Copilot's Chair
The RH Unbelted toilet Has 100 Lbs Baggage Storage on the LH Side
With LH Belted Troilet, Lose 100 lbs Bags

1 Calculate Payload Weight and Moment

Item	Arm	Weight	MOM/100
Pilot	131.00	190	248.90
Copilot	131.00	160	209.60
Seat 3	195.75		
Seat 4	195.75		
Seat 5	241.60	175	422.80
Seat 6	241.60	160	386.56
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70	50	150.85
Tailcone Comp.	384.59	90	345.13
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)		825	1,764.84

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight	7,577	21,677.44
+ *Payload*	825	1,764.84
Zero Fuel Weight *	8,402	23,442.28

$\frac{\text{ZFW MOM}}{\text{Zero Fuel Weight}} = 279.00$ ZFW CG

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	8,402
+ *Flight Fuel*	1,945
+ *Reserve Fuel*	800
Ramp Weight	11,147

4 Calculate Takeoff Fuel

Total Fuel	2,745
–Taxi Fuel	125
Takeoff Fuel	2,620

5 Calculate Takeoff Weight, Moment and CG

Item	Weight	MOM/100
Zero Fuel Weight *	8,402	23,442.28
+ *Takeoff Fuel*	2,620	7,565.42
Takeoff Weight	11,022	31,007.70

$\frac{\text{Takeoff MOM}}{\text{Takeoff Weight}} = 281.3$ Takeoff CG

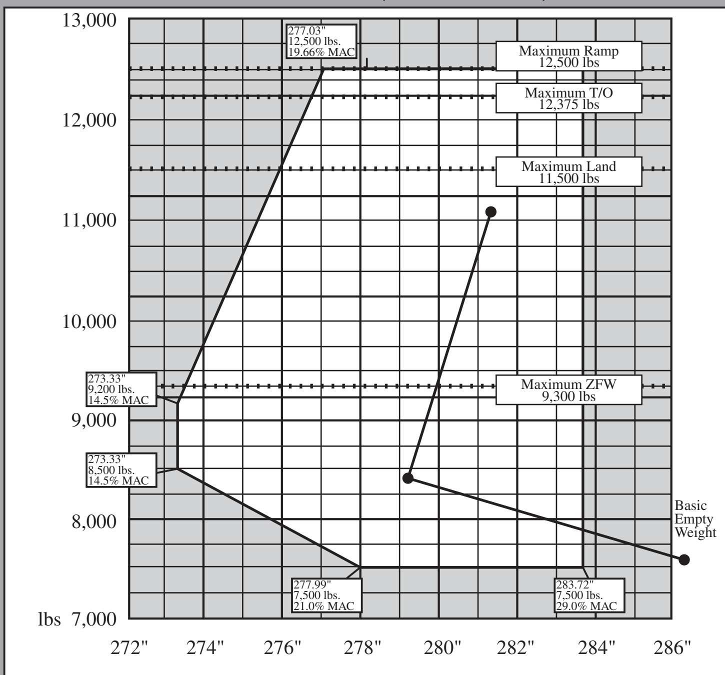
6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	8,402
+ *Reserves*	800
Landing Weight	9,202

7 * See limitations on reverse.

Figure PER-5. Weight and Balance Calculations (Sheet 1 of 2)

Citation CJ2 (Model 525A)



Weight Adjustment:

$$\frac{\textbf{Wt. Shifted}}{\textbf{Total Weight}} = \frac{\textbf{CG Moved Inches}}{\textbf{Wt. Shifted Inches}}$$

ZFGWT Shift:

______ = ______

TAKEOFF GROSS WEIGHT Shift:

________ = ________

Original CG	+/– Correction	= Adjusted CG

Other Weight Shift:

______ = ______

Takeoff Weight Limitations

1. TFL ≤ Runway Available
2. SE climb capability ≥ 1.6 %, 2nd Segment
3. SE climb capability to clear any obstacle in takeoff flightpath
4. Takeoff weight ≤ maximum certified takeoff weight.
5. Landing weight ≤ maximum certified landing weight at destination

Landing Weight Limitations

1. Landing Distance ≤ Runway Available
2. Climb capability ≥ 2.1% gross SE
   ≥ 3.2% gross ME
3. Brake energy limits

Figure PER-5. Weight and Balance Calculations (Sheet 2 of 2)

ANSWERS TO PERFORMANCE PROBLEMS AND REFERENCES

Questions based on 11,022 pounds conservative takeoff gross weight.

1. **Flight Planning**

   a. Trip/flight time: 1+46 (Ref: O.M., Figure 7-13 [Sheet 7])
   Trip/flight fuel: 1,945 pounds
   This includes 125 pounds taxi fuel but does not include 600 pounds reserve fuel.

   LOGIC—We have 720 nm to fly with a 50-knot tailwind component. Refer to O.M., Figure 7-13 (Sheet 7) at 700 and 800 nm, estimating approximately 2,000 pounds plus an estimated 600 pounds reserve fuel, equaling 2,600 pounds total fuel.

   ZFW (zero fuel weight) plus estimated fuel of 2,600 pounds equals approximately 11,000 pounds versus 12,375 or 900 pounds on either side.

   - Stage length 700 nm at 11,000 pounds, 50-knot tailwind equals 1,902 pounds fuel, 1.73 hours.

   - Stage length 800 nm at 11,000 pounds, 50-knot tailwind equals 2,117 pounds fuel, 1.95 hours.

   Total Difference = 215 pounds fuel, 0.22 hours

   For 20 nm divide fuel difference of 215 pounds and 0.22 hours by 100 to get fuel and time/nm.

   215 = 2.15 times 20 = 43 pounds
   100
   0.22 = .0022 times 20 = 0.44
   100

   Add 1,902 pounds + 43 pounds = 1,945 total pounds for 720 nm (fuel)

   Add 1.73 hours + .044 hours = 1.77 hours for 720 nm (time)

   b. IFR reserves of 45 minutes. (Ref: O.M., Figure 7-18 (Sheet 6) equals 800 pounds. This is based on Denver at 6,000 feet pressure altitude and a landing weight of 9,202 pounds, with a conservative approach to an altitude above obstruction clearance. For Denver, we used cruise, 15,000 feet, anti-ice off, two engines, 9,500 pounds, ISA 0°C, normal cruise, fuel flow 1,107 pounds per hour. 1,107 times .75 (3/4 hour) = 830 pounds, or averaged 800 pounds for reserve fuel.

   c. Least fuel required: 1,945 pounds + 800 pounds IFR reserve = 2,745 pounds. (Ref: From 1a to 1b).

d. See Part 91.211 (b)(i): 10 minutes for each occupant for emergency descent plus more if cabin pressure goes above 12,500 feet MSL.

e. Standard: 22 ft^3, 2 crew + 2 passengers = 39 minutes

Optional: 50 ft^3, 2 crew + 2 passengers = 90 minutes

f. Passengers unpressurized 25,000 MSL. (Ref: PTM, Misc. Table 17-1, highest altitude shown and warning PTM 17-6.)

2. **Weight and Balance**

a. ZFGWT 8,402 lb

(Ref: Weight and balance form computations)

b. Planned takeoff GWT/Moment: 11,022 pounds @ 31,007.70 MOM/100

c. = 281.3 inches

d. 400 lb

(Ref: Placard in the nose compartment or see Weight and Moment table in *AFM*, page 6-13, Figure 6-2 (Sheet 4, nose compartment, FS 74.00 400 pounds is the maximum listed.)

3. **Equipment**

a. No. See (KOEL) Kinds of Operating Equipment List in the *AFM* limitations (Authority, page 2-27).

LD x 1.4—Assure adequate runway for landing.

(Ref: *AFM*, page 3-46)

b. Yes. For day VFR, or day IFR, and in icing conditions.
No. For night operations.

(Ref: *PTM* Table LIM-3,
AFM Limitations,
Part 91.205 (c) (3),
Part 91.209 Night,
Part 91.213 (d) (iii)

c. 15 static wicks installed, 13 required.

(Ref: *PTM* Table LIM-4,
AFM Limitations, page 2-24)

Table PER-4. OXYGEN SUPPLY CHART

22 FT^3

AVAILABLE TIME IN MINUTES

CABIN ALTITUDE	1 COCKPIT 0 CABIN	1 COCKPIT 1 CABIN	1 COCKPIT 2 CABIN	1 COCKPIT 3 CABIN	1 COCKPIT 4 CABIN	1 COCKPIT 5 CABIN	1 COCKPIT 6 CABIN	1 COCKPIT 7 CABIN	1 COCKPIT 8 CABIN
8,000	376	95	54	38	29	24	20	17	15
10,000	431	98	56	39	30	24	20	17	15
15,000	431	100	57	40	30	25	21	18	16
20,000	339	96	56	39	30	25	21	18	16
25,000	181	78	50	36	29	24	20	18	16
30,000	248								
34,000	315								
35,000	335								
37,000	381								
39,000	464								
40,000	468								

AVAILABLE TIME IN MINUTES

CABIN ALTITUDE	2 COCKPIT 0 CABIN	2 COCKPIT 1 CABIN	2 COCKPIT 2 CABIN	2 COCKPIT 3 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 5 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 7 CABIN	2 COCKPIT 8 CABIN
8,000	188	76	47	34	27	22	19	16	15
10,000	216	80	49	35	28	23	19	17	15
15,000	216	81	50	36	28	23	20	17	15
20,000	169	75	48	35	28	23	20	17	15
25,000	90	54	39	30	25	21	18	16	14
30,000	124								
34,000	158								
35,000	167								
37,000	190								
39,000	232								
40,000	234								

50 FT^3

AVAILABLE TIME IN MINUTES

CABIN ALTITUDE	1 COCKPIT 0 CABIN	1 COCKPIT 1 CABIN	1 COCKPIT 2 CABIN	1 COCKPIT 3 CABIN	1 COCKPIT 4 CABIN	1 COCKPIT 5 CABIN	1 COCKPIT 6 CABIN	1 COCKPIT 7 CABIN	1 COCKPIT 8 CABIN
8,000	853	215	123	86	66	54	45	39	34
10,000	980	224	126	88	67	55	46	40	35
15,000	980	228	129	90	69	56	47	41	36
20,000	769	217	127	89	69	56	47	41	36
25,000	411	177	112	83	65	54	46	40	35
30,000	562								
34,000	717								
35,000	760								
37,000	865								
39,000	1,054								
40,000	1,063								

AVAILABLE TIME IN MINUTES

CABIN ALTITUDE	2 COCKPIT 0 CABIN	2 COCKPIT 1 CABIN	2 COCKPIT 2 CABIN	2 COCKPIT 3 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 5 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 7 CABIN	2 COCKPIT 8 CABIN
8,000	427	172	107	78	61	51	43	37	33
10,000	490	182	112	81	63	52	44	38	34
15,000	490	185	114	82	64	53	45	39	34
20,000	385	169	109	80	63	52	45	39	34
25,000	206	124	88	69	56	48	41	36	33
30,000	281								
34,000	358								
35,000	380								
37,000	432								
39,000	527								
40,000	531								

NOTE:

COCKPIT MASKS ARE ASSUMED TO BE AT NORMAL SETTING AT 20,000 FEET WITH A RESPIRATORY RATE OF 10 LITERS PER MINUTE—BODY TEMPERATURE PRESSURE SATURATED AND AT 100% SETTING ABOVE 20,000 FEET.

1 Calculate Payload Weight and Moment

Item	Arm	Weight	MOM/100
Pilot	131.00		
Copilot	131.00		
Seat 3	195.75		
Seat 4	195.75		
Seat 5	241.60		
Seat 6	241.60		
Seat 7	275.74		
Seat 8	275.74		
Side Facing Seat	164.70		
LH Belted Toilet	302.45		
Nose Comp.	74.00		
Cabin Comp.	301.70		
Tailcone Comp.	384.59		
LH Chart Case	151.00		
Refreshment Center	163.00		
RH Chart Case	152.25		
LH Fwd Slim Storage Cabinet	155.88		
Side Facing Seat Arm Rest	179.13		
LH Toilet Drawer Storage	314.58		
Payload (Sub Total)			

2 Calculate Zero Fuel Weight, Moment and CG

Item	Weight	MOM/100
Basic Empty Weight *or* Basic Operating Weight		
+ *Payload*		
Zero Fuel Weight *		

ZFW MOM / Zero Fuel Weight = ☐ ZFW CG

3 Calculate Fuel Load and Ramp Weight

Item	Weight
Zero Fuel Weight *	
+ *Flight Fuel*	
+ *Reserve Fuel*	
Ramp Weight	

4 Calculate Takeoff Fuel

Total Fuel
–Taxi Fuel
Takeoff Fuel

5 Calculate Takeoff Weight, Moment and CG

Item		MOM/100
Zero Fuel Weight *		
+ *Takeoff Fuel*		
Takeoff Weight		

Takeoff MOM / Takeoff Weight = ☐ Takeoff CG

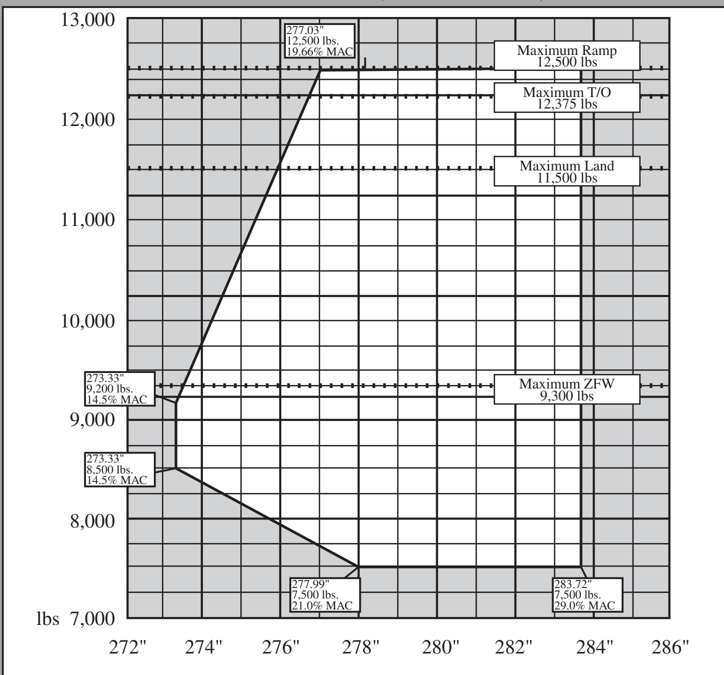
6 Calculate Landing Weight

Item	Weight
Zero Fuel Weight *	
+ *Reserves*	
Landing Weight	

7 * See limitations on reverse.

Figure PER-6. Weight and Balance Form (Sheet 1 of 2)

Citation CJ2 (Model 525A)



Weight Adjustment:

$$\frac{\textbf{Wt. Shifted}}{\textbf{Total Weight}} = \frac{\textbf{CG Moved Inches}}{\textbf{Wt. Shifted Inches}}$$

ZFGWT Shift:

_______ = _______

TAKEOFF GROSS WEIGHT Shift:

__________ = __________

Original CG	+/– Correction	= Adjusted CG

Other Weight Shift:

_______ = _______

Takeoff Weight Limitations

1. TFL ≤ Runway Available
2. SE climb capability ≥1.6% Net in 2nd Segment
3. SE climb capability to clear any obstacle in takeoff flightpath
4. Takeoff weight ≤ maximum certified takeoff weight.
5. Landing weight ≤ maximum certified landing weight at destination

Landing Weight Limitations

1. Landing Distance ≤ Runway Available
2. Climb capability ≥ 2.1% gross SE
   ≥ 3.2% gross ME
3. Brake energy limits
4. Landing weight ≤ maximum landing weight
5. Destination Takeoff Field Length to depart

Figure PER-6. Weight and Balance Form (Sheet 2 of 2)

ANSWERS TO PERFORMANCE PROBLEMS AND REFERENCES (Cont)

4. **Takeoff**

   a. Yes

   (Ref: Part 91 not addressed)

   b. A positive climb (Ref: Figure PER-11)

   c. 2.4% (–) 0.8% = 1.6% Net CL gradient

   (Ref: *AFM*, Performance, Definitions "Net Climb Gradient," page 4-9)

   d. 200 ft/nm $\text{Rise}/_{\text{Run}}$ $200/_{6,000}$ = 3.3% (Ref: AIM 5-2-6b.3)

   (Ref: Figure PER-2)

   e. IFR departure procedure 400 ft/nm to 8,300-ft MSL using runway 36
   $\text{Rise}/_{\text{Run}}$ = $400\text{ ft}/_{\text{nm}}$ = $400\text{ ft}/_{6,000\text{ ft}}$ = 6.6% Net CL Gradient to 8,300 ft MSL.
   OR
   10-3A Shole 1 SID, 5% to 9,000-ft MSL using runway 36

   (Ref: Figure PER-3)

   f. 0° flaps, takeoff GWT:
   11,840 lb @ 6,000 PA/15°C (Ref: Figure 4-38 [Sheet 3])
   10,750 lb @ 9,000 feet PA @ (8,300 ft and 10°C [Sheet 6])
   15° flaps takeoff GWT: 10,750 lb @ 6,000 ft PA/15°C
   (Ref *AFM* Figure 4-40 [Sheet 4])
   9,900 lb @ 9,000 feet PA @ (8,300 feet and 10°C)
   (Ref: *AFM* Figure 4-40 [Sheet 6])
   11,840/10,750 lb Ave 0° flap GWT = 11,295 lb
   10,750/9,900 Ave 15° flaps GWT = 10,325 lb
   Data block for takeoff:

Takeoff GWT 0° flaps	11,295 pounds
Takeoff GWT 15° flaps	10,325 pounds
Pressure altitude	6,000 feet
Temperature	15°C
WX 500 feet overcast	1/2 sm
Wind	330/20
Runway	357° magnetic
Flaps	0°/15°
Engine A/IO	OFF
HWC	17 knots
CL gradient	5.0%

   g. 0° flaps (Ref: 4f above) to carry more fuel to make the trip nonstop.

   h. Yes

i. 6,264 – 6,251 = 13 feet and $^{13}/_{8,544}$ = 0.1% (negligible) NO RWY GRADIENT

(Ref: Figure PER-2)

j. 0° TFL 4,740 feet @ 11,295 lb

(Ref: *AFM* Figure 4-19 [Sheet 13])

15° TFL 3,450 feet @ 10,325 lb

(Ref: *AFM* Figure 4-23 [Sheet 14])

k. 4,740 ft less 3,450 ft = 1,290 ft more TFL

(Ref: See answer k)

l. 5% in anti-ice on charts

m. 35 ft (Ref: Part 25)

n. 48 feet per nautical mile (Ref: AIM 5-2-6 b. 2.)

o. No. Level off at ***safe altitude***, e.g., obstruction clearance altitude MEA, or assigned altitude (not 1,500 ft AGL).

p. Maintain TOP, V_2, takeoff flap setting and do not change, maximum bank 15° to 9,000 at shole intersection.

(Ref: Part 25 1st and 2nd climb gradient criteria)

5. **Climb**

a. SL to 37K anti-ice off: 14
SL to 15K anti-ice on: –5
Total: 9 minutes

(Ref: OM Figure 7-16 [Sheet 2])

b. SL to 37K anti-ice off: 338 pounds
SL to 15K anti-ice on: –146 pounds
Total: 192 pounds

(Ref: Climb data above)

c. 1,242 ft/min anti-ice off (Ref: Climb data above)

d. FL 430 (See asterisk) (Ref: OM Figure 7-15 [1 of 2])

e. Takeoff GWT .... 11,022 pounds
Flaps .... 0°
Pressure altitude .... 6,000 feet
Temperature .... 15°C
Ceiling .... 1,100 feet
Visibility .... 1/2 sm
Wind 330/20
Runway .... 36 (357° magnetic)
Engine anti-ice .... Off below 8,500 feet

HWC...+17 kts

Estimated landing GWT:

11,022
<u>–192</u> climb fuel
10,800 (use 10,800 pounds)

Landing distance 3,170 feet V_{APP} 114/V_{REF} 109

(Ref: Figure 4-47 [13 of 30])

f. 3,170 feet = 5,400 feet

(Ref: *AFM* Advisory Information tab, Figure 7-8)

6. **Enroute**

a. 2,086 pounds (zero wind)
–<u>1,902</u> pounds (50-knot tailwind)
184 pounds based on original conditions at 11,022 pounds

(Ref: O.M Figure 7-12 [Sheet 9])

b. Go 4,000 feet higher (FL 410 if possible) or use F370 NCT in lieu of MCT.

(Ref: O.M. Figure 7-18 [Sheet 32])

(Ref: O.M. Figure 7-18 [Sheet 32])

c. Approximate GWT 10,500 pounds, FL 290

(Ref: O.M. Figure 7-19 [Sheet 10])

7. **Descent**

a. Fuel for hold equals 1,200 – 800 reserves = 400 pounds to hold

Anti-ice off, 9,200 lb GWT, 20K, 167 KIAS, 588 pph

$^{60\text{ min}}/_{588}$ X 400 = 40.8 min

(Ref: O.M. Figure 7-21)

b. 167 pounds

(Ref: O.M. Figure 7-21)

8. **Landing**

a. GWT .... 9,202 pounds
Temperature .... 15°C
Pressure altitude .... 6,000 feet
Winds .... Calm
Landing distance .... 3,070 feet
V_{APP} 108 and V_{REF} 103

(Ref: *AFM* Figure 4-47 [Sheet 14])

b. 3,070 = 3,200 (4,700)

DISTANCE VERSUS CRUISE ALTITUDE

Typical cruise altitudes for various distances are as follows:

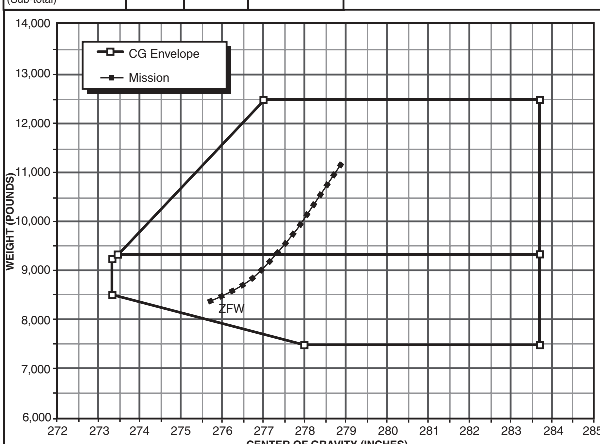
Distance (nm)	Typical Cruise Altitude (ft)
0–100	9,000–18,000
101–200	17,000–29,000
201–300	28,000–35,000
301–500	33,000–39,000
501–900	39,000–41,000
901+	39,000–41,000

WEIGHT AND BALANCE COMPUTATION FORM
MODEL 525A - CITATION CJ2

REGISTRATION NUMBER ____________ **SERIAL NUMBER** ____________ **DATE** Dec 8 00

PAYLOAD COMPUTATIONS			
ITEM	ARM (INCHES)	WEIGHT (POUNDS)	MOMENT/100 (INCH-POUNDS)
OCCUPANTS			
PILOT	131.0	190	248.90
COPILOT	131.0	160	209.60
SEAT 3	195.8	0	0.00
SEAT 4	195.8	0	0.00
SEAT 5	241.6	175	422.80
SEAT 6	241.6	160	386.56
SEAT 7	275.7	0	0.00
SEAT 8	275.7	0	0.00
SIDE FACING SEAT	0.0	0	0.00
TOILET	0.0	0	0.00
LH CHART CASE	151.0	0	0.00
REFR CENTER	163.0	0	0.00
NOSE BAGGAGE	74.0	90	66.60
T/C BAGGAGE	384.6	0	0.00
CABIN COMPARTMENT	301.7	50	150.85
RH CHART CASE	152.3	0	0.00
LH Toilet Storage	314.6	0	0.00
LH Storage Cab	155.9	0	0.00
SFS Armrest	179.1	0	0.00
PAYLOAD (Sub-total)		825	1,485.31

ITEM	WEIGHT (POUNDS)	MOMENT/100 (INCH-POUNDS)
1. BASIC EMPTY WEIGHT Airplane CG = 286.1 inches = 32.3% MAC	7,577	21,677.44
2. PAYLOAD	825	1,485.31
3. ZERO FUEL WEIGHT (sub-total) Do not exceed maximum zero fuel weight of 9,300 pounds. Airplane CG = 275.7 inches = 17.8% MAC	8,402	23,162.75
4. FUEL LOADING	2,745	7,925.87
5. RAMP WEIGHT (sub-total) Do not exceed maximum ramp weight of 12,500 pounds.	11,147	31,088.62
6. LESS FUEL FOR TAXIING	125	360.45
7. TAKEOFF WEIGHT Do not exceed maximum takeoff weight of 12,375 pounds. Airplane CD = 278.8 inches = 22.1% MAC	11,022	30,728.17
8. LESS FUEL TO DESTINATION	1,820	5,224.47
9. LANDING WEIGHT Do not exceed maximum landing weight of 11,500 pounds. Airplane CG = 277.2 inches = 19.8% MAC	9,202	25,503.70



Max Ramp Weight: 12,500 Lb
Max Takeoff Weight: 12,375 Lb
Max Landing Weight: 11,500 Lb
Max Zero Fuel Weight: 9,300 Lb

Notes:

Figure PER-7. Microsoft Excel Weight and Balance Program Example Printout (Sheet 1 of 2)

WEIGHT AND BALANCE COMPUTATION FORM
MODEL 525A - CITATION CJ2

REGISTRATION NUMBER ____________ **SERIAL NUMBER** ____________ **DATE** Dec 8 00

PAYLOAD COMPUTATIONS			
ITEM	ARM (INCHES)	WEIGHT (POUNDS)	MOMENT/100 (INCH-POUNDS)
OCCUPANTS			
PILOT	131.0	190	248.90
COPILOT	131.0	160	209.60
SEAT 3	195.8	0	0.00
SEAT 4	195.8	0	0.00
SEAT 5	241.6	175	422.80
SEAT 6	241.6	160	386.56
SEAT 7	275.7	0	0.00
SEAT 8	275.7	0	0.00
SIDE FACING SEAT	0.0	0	0.00
TOILET	0.0	0	0.00
LH CHART CASE	151.0	0	0.00
REFR CENTER	163.0	0	0.00
NOSE BAGGAGE	74.0	0	0.0
T/C BAGGAGE	384.6	90	346.13
CABIN COMPARTMENT	301.7	50	150.85
RH CHART CASE	152.3	0	0.00
LH Toilet Storage	314.6	0	0.00
LH Storage Cab	155.9	0	0.00
SFS Armrest	179.1	0	0.00
PAYLOAD (Sub-total)		825	1,764.84

ITEM	WEIGHT (POUNDS)	MOMENT/100 (INCH-POUNDS)
1. BASIC EMPTY WEIGHT Airplane CG = 286.1 inches = 32.3% MAC	7,577	21,677.44
2. PAYLOAD	825	1,764.84
3. ZERO FUEL WEIGHT (sub-total) Do not exceed maximum zero fuel weight of 9,300 pounds. Airplane CG = 279 inches = 22.4% MAC	8,402	23,442.28
4. FUEL LOADING	2,745	7,925.87
5. RAMP WEIGHT (sub-total) Do not exceed maximum ramp weight of 12,500 pounds.	11,147	31,368.15
6. LESS FUEL FOR TAXIING	125	360.45
7. TAKEOFF WEIGHT Do not exceed maximum takeoff weight of 12,375 pounds. Airplane CD = 281.3 inches = 25.7% MAC	11,022	31,007.70
8. LESS FUEL TO DESTINATION	1,820	5,224.47
9. LANDING WEIGHT Do not exceed maximum landing weight of 11,500 pounds. Airplane CG = 280.2 inches = 24.1% MAC	9,202	25,783.23

Max Ramp Weight: **12,500 Lb**
Max Takeoff Weight: **12,375 Lb**
Max Landing Weight: **11,500 Lb**
Max Zero Fuel Weight: **9,300 Lb**

Notes:

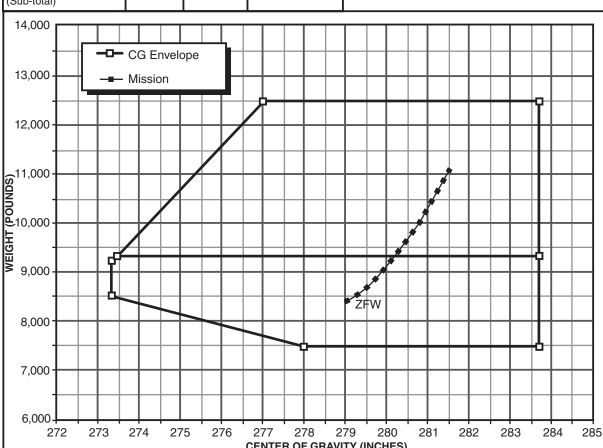


Figure PER-7. Microsoft Excel Weight and Balance Program Example Printout (Sheet 2 of 2)

CREW RESOURCE MANAGEMENT

CONTENTS

ILLUSTRATIONS

CREW RESOURCE MANAGEMENT (CRM)

CREW CONCEPT BRIEFING GUIDE

INTRODUCTION

Experience has shown that adherence to SOPs helps to enhance individual and crew cockpit situational awareness and will allow a higher performance level to be attained. Our objective is for standards to be agreed upon prior to flight and then adhered to, such that maximum crew performance is achieved. These procedures are not intended to supercede any individual company SOP, but rather are examples of good operating practices.

COMMON TERMS

PIC Pilot in Command

Designated by the company for flights requiring more than one pilot. Responsible for conduct and safety of the flight. Designates pilot flying and pilot not flying duties.

F Pilot Flying

Controls the aircraft with respect to assigned airway, course, altitude, airspeed, etc., during normal and emergency conditions. Accomplishes other tasks as directed by the PIC.

N Pilot Not Flying

Maintains ATC communications, copies clearances, accomplishes checklists and other tasks as directed by the PIC.

B Both

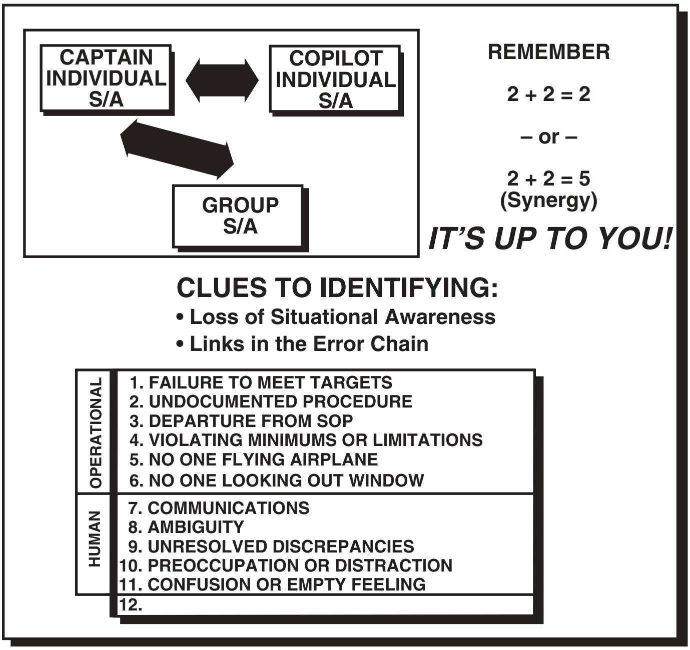


Figure CRM-1. Situational Awareness in the Cockpit

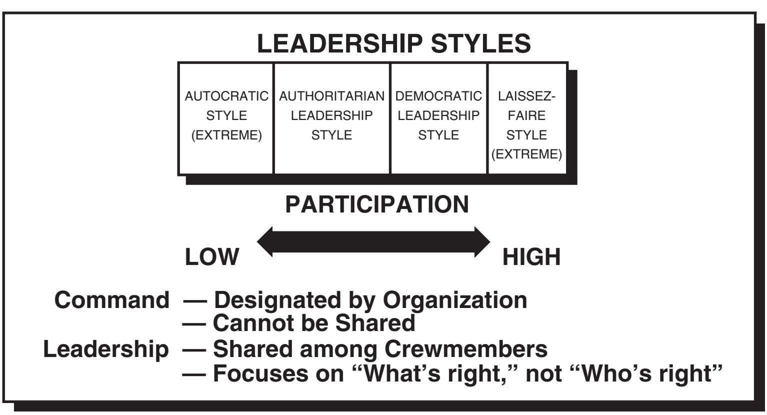


Figure CRM-2. Command and Leadership

PRETAKEOFF BRIEFING (IFR/VFR)

NOTE

The following briefing is to be completed during item one of the "Pretakeoff" checklist. The pilot flying will accomplish the briefing.

1. Review the departure procedure (route and altitude, type of takeoff, significant terrain features, etc.).
2. Review anything out of the ordinary.
3. Review required callouts, unless standard calls have been agreed upon, in which case a request for "Standard Callouts" may be used.
4. Review the procedures to be used in case of an emergency on departure.
5. As a final item, ask if there are any questions.
6. State that the pretakeoff briefing is complete.

CREW COORDINATION APPROACH SEQUENCE

NOTE

The following crew coordination approach sequence should be completed as early as possible, prior to initiating an IFR approach. These items are accomplished during the "Approach (In Range)" checklist.

F—Requests the pilot not flying to obtain destination weather—Transfer of communication duties to the pilot flying may facilitate the accomplishment of this task.

N—Advises the pilot of current destination weather, approach in use, and special information pertinent to the destination.

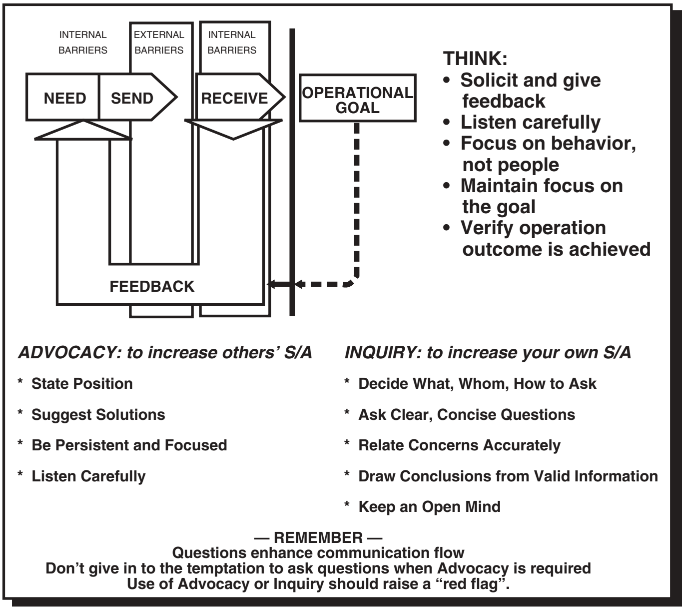


Figure CRM-3. Communication Process

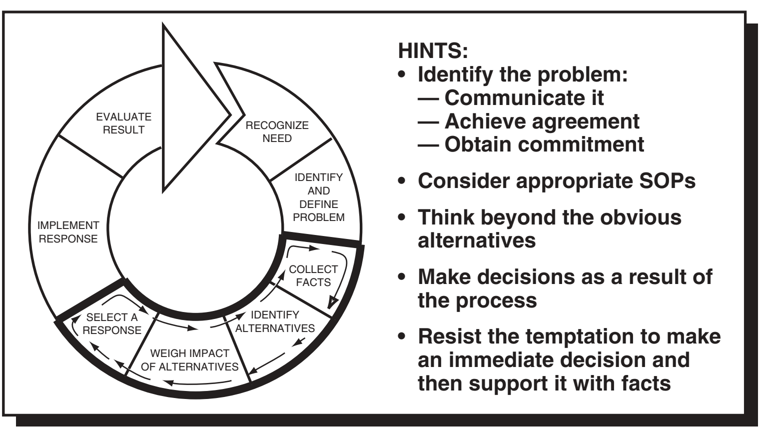


Figure CRM-4. Decision-Making Process

F—Requests the pilot not flying to perform the approach setup.

N—Accomplishes the approach setup and advises of frequency tuned, identified, and course set.

F—Transfers control of the aircraft to the pilot not flying, advising, “You have control, heading __________, altitude __________, ” and special instructions. (Communications duties should be transferred back to the pilot not flying at this point.)

N—Responds, “I have control, heading __________, altitude ________.”

F—Advises, “Approach briefing.”

F—At the completion of the approach briefing, the pilot flying advises, “Approach briefing complete.”

F—Advises, “I have control, heading __________, altitude ________.”

N—Confirms “You have control, heading __________, altitude ________.”

F—“Before Landing checklist.”

N—“Before Landing checklist complete.”

NOTE

The above sequence should be completed prior to the FAF.

NOTE

During the above sequence, the terms F and N have not been reversed during the time that transfer of control occurs.

ALTITUDE CALLOUTS

ENROUTE

1,000 Feet Prior to Level-Off

N	F
State altitude leaving and assigned level-off altitude	“ROGER”
“100 above/below”	“LEVELING”

APPROACH—PRECISION

N	F
At 1,000 feet above minimums	
“1,000 feet above”	“DH __________”
At 500 feet above minimums	
“500 feet above minimums”	“NO FLAGS”
At 100 feet above minimums	
“100 feet above minimums”	“APPROACHING MINIMUMS”
At decision height (DH)	
“Minimums, approach lights at (clock position)”	“CONTINUING”
OR	
“Minimums, runway at (clock position)”	“CONTINUING”
OR	
“Minimums, runway not in sight”	“GO AROUND”

APPROACH—NONPRECISION

N	F
At 1,000 feet above minimums	
"1,000 feet above minimums"	"MDA __________"
At 500 feet above minimums	
"500 feet above minimums"	"NO FLAGS"
At 100 feet above minimums	
"100 feet above minimums"	"APPROACHING MINIMUMS"
At minimum descent altitude (MDA)	
"Minimums"	"LEVEL"
At missed approach point (MAP)	
"Approach lights at (clock position)"	"CONTINUING"
OR	
"Runway at (clock position)"	"CONTINUING"
OR	
"Runway not in sight"	"GO AROUND"

SIGNIFICANT DEVIATION CALLOUTS

N	F

IAS ±10 KIAS

“V_{REF} ± __________”	“CORRECTING TO __________”

Heading ±10° enroute, 5° on approach

“Heading ________ degrees left/right”	“CORRECTING TO __________”

Altitude ±100 feet enroute, +50/–0 feet on final approach

“Altitude __________ high/low”	“CORRECTING TO __________”

CDI left or right one dot

“Left/right of course__________ dot”	“CORRECTING”

RMI course left or right ±5°

“Left/right of course__________ degrees”	“CORRECTING”

Vertical descent speed greater than 1,000 fpm on final approach

“Sink rate__________”	“CORRECTING”

Bank in excess of 30°

“Bank__________ degrees”	“CORRECTING”

RECURRENT SYLLABUS

CONTENTS

ILLUSTRATION

TABLES

RECURRENT SYLLABUS

GENERAL INFORMATION

SPECIALTY CURRICULUM—§61.58

This CFR §142 Training Center approved course satisfies the requirements of PIC Proficiency Check: Operation of aircraft requiring more than one pilot flight crew member. A §142 approved Level C simulator is used with approved school, curriculum, instructors, and course.

TYPE OF AIRCRAFT: CITATION CJ2 (CE-525A)

Completion of this curriculum satisfies the requirements of §61.58 if the proficiency check is completed as a crew.

NOTE

Completion of the §61.63 or §61.157 Core Curriculums satisfies the requirements of the §61.58 curriculum.

CURRICULUM PREREQUISITES

A pilot may enroll in the §61.58 curriculum if that person holds the following:

1. At least a current private pilot certificate with appropriate type rating in the Citation CJ2 and

2. An appropriate instrument rating in the case of flight under IFR

A pilot may enroll in the §135.351 curriculum if that person holds the following:

1. At least a current commercial pilot certificate with appropriate category, class, and type ratings (if type rating is required) in the Citation CJ2 and

2. An appropriate instrument rating in the case of flight under IFR

GROUND TRAINING CURRICULUM SEGMENT

PROGRAMMED TRAINING HOURS

The programmed training hours scheduled for the ground training segment are indicated in Table RS-1.

Table RS-1. PROGRAMMED TRAINING HOURS

TRAINING HOURS	§61.58 AND §135.51
General Operational Subjects	3.9
Aircraft Systems	7.1
Systems Integration (SIT)	1.0
Ground School Hours*	12.0

* Excludes SIM, SIM brief, and debrief hours

Objective of Ground Training

The objective of ground training is to provide pilots with the necessary training to become familiar with all information concerning the aircraft's powerplant, major components and systems, major appliances, performance and limitations, standard and emergency operating procedures, and the contents of the approved aircraft flight manual or approved manual material, placards, and markings.

CURRICULUM SEGMENT OUTLINE

The ground training curriculum segment outline is comprised of the following subject areas: General Operational Subjects, Aircraft Systems, and Systems Integration.

General Operational Subjects

The subject of ground training, referred to as "general operational subjects," includes instruction on certain operational requirements.

A. Weight and Balance Module

B. Performance Module

C. Flight Planning Module

D. *Approved Flight Manual/Aircraft Operating Manual* Module (as appropriate)

E. Windshear Training Module (if required)

F. High Altitude Training Module (if required)*

G. Crew Resource Management (CRM) Module

* This module may be omitted depending on aircraft certification or if proof of high altitude training is provided.

** The §61.58 training curriculum is for part 61 operators. In Chapter 11, the Windshear Training Module is included without the "if required" caveat. The §135.351 training curriculum is recurrent training for Part 135 operators.

Aircraft Systems

The training modules presented in the aircraft systems subject area consist of a breakdown of the various systems of the aircraft. These modules may be taught in any sequence; however, all modules will be covered.

A. Aircraft General

B. Master Warning

C. Lighting

D. Powerplant

E. Fire Protection

F. Electrical

G. Fuel

H. Hydraulics

I. Thrust Attenuators

J. Landing Gear and Brakes

K. Flight Controls

L. Pneumatics/Air Conditioning

M. Pressurization

N. Oxygen (Miscellaneous)

O. Ice and Rain Protection

P. Avionics

Q. Exam and Critique (as required)

Systems Integration

Systems Integration provides the pilot with instruction on aircraft systems interrelationships with respect to normal, abnormal, and emergency procedures. Pilots will be introduced to, and will exercise in, the elements of Crew Resource Management as part of the integration process, including, but not limited to such elements as Situational Awareness and the Error Chain, Synergy and Crew Concept, and Workload Assessment and Time Management. Systems Integration training is conducted during a separate Ground Training session.

Completion Standards

A. Aircraft Systems—The pilot must demonstrate adequate knowledge of the aircraft systems, performance, and flight planning by successfully completing a knowledge test with a minimum score of 80% that is corrected to 100%.

B. Systems Integration—The pilot must be able to describe, locate, and identify aircraft systems; perform normal, abnormal and emergency checklists; program and operate long range navigation systems as required; and demonstrate adequate knowledge of aircraft maneuvers, procedures, and crew resource management during an equipment knowledge test conducted by the Administrator or by a properly designated Training Center Evaluator. In other than 135 the test may be conducted at any point in the course provided that it is accomplished prior to program completion.

TRAINING MODULE OUTLINES

General Operational Subjects Modules

A. Weight and Balance Module

1. General Principles and Methods of Weight and Balance Determination
2. Operations
3. Limitations

B. Performance Module

1. Use of charts, tables, tabulated data, and other related material
2. Performance Problems, Normal, Abnormal, and Emergency Conditions

3. Performance limiting factors such as runway length, ambient temperature, runway contamination, runway slope, etc.

C. Flight Planning Module

1. Flight Planning Charts such as Fuel Consumption Charts
2. Operations
3. Limitations

D. *Approved Flight Manual* (*AFM*)/*Aircraft Operating Manual* Module (as appropriate)

1. Applicability and description of the *AFM*
2. Normal, Abnormal, and Emergency Procedures Sections
3. Limitations Section
4. General Performance Section
5. Systems Description
6. Appendices, Bulletins, and Supplements

E. Windshear Training Module (as required)

1. Windshear Weather
2. High Altitude Meteorology
3. Lessons Learned from Windshear Encounters
4. Model of Flight Crew Actions

F. High Altitude Training Module (if required)

1. High Altitude Aerodynamics and Meteorology
2. Respiration
3. Effects, Symptoms, and Causes of Hypoxia and other High Altitude Sickness
4. Duration of Consciousness without Supplemental Oxygen
5. Effects of Prolonged Use of Oxygen
6. Causes and Effects of Gas Expansion and Gas Bubble Formation and High Altitude Sickness

7. Preventative Measures for Eliminating Gas Expansion, Gas Bubble Formation, and High Altitude Sickness

8. Physical Phenomena and Incidents of Decompression

9. Any other physiological aspects of high altitude flight

G. Crew Resource Management (CRM) Module

Applied CRM is monitored/practiced in each System Integration/Flight Simulator/Aircraft Session. The subjects include the following:

1. Situational Awareness and the Error Chain

2. Communication

3. Synergy and Crew Concept

4. Workload Assessment and Time Management

5. Briefing

6. Reliance on Automation

7. Decision Making and Judgment

8. Stress

Aircraft Systems Modules

A. Aircraft General Module

1. General

    a. Contents of *AFM/Operations Manual* (as appropriate)

    b. Training Manuals

    c. System Description

        (1) Structures

        (2) Airplane Systems

        (3) Publications

        (4) Controls and Components

        (5) Placards and Markings

        (6) Equipment

(7) Emergency Equipment

2. Operations
3. Limitations

B. Master Warning Module

1. General
   a. Rotary Test
   b. Annunciators
2. Operations
3. Abnormal and Emergency Procedures

C. Lighting Module

1. General
   a. Interior Lighting
   b. Exterior Lighting
   c. Annunciators
2. Operations
3. Abnormal and Emergency Procedures

D. Powerplant Module

1. General
   a. System Description
   b. Ignition and Start System
   c. Engine Fuel System
   d. Engine Oil System
   e. Synchronizing
   f. Annunciators
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

E. Fire Protection Module

1. Engine Fire Detection

a. General

(1) System Description

(2) Controls

(3) Annunciators

(4) Servicing

b. Operations

2. Engine Fire Extinguishing

a. General

(1) System Description

(2) Controls

(3) Annunciators

(4) Servicing

b. Operations

3. Portable Fire Extinguishers

a. Location

b. Preflight

F. Electrical Module

1. General

a. System Description

b. DC Power

c. Annunciators

2. Operations

3. Limitations

4. Abnormal and Emergency Procedures

G. Fuel Module

1. General
    a. System Description
    b. Fuel Storage
    c. Controls
    d. Indicators and Indications
    e. Annunciators
    f. Preflight/Servicing/Postflight
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

H. Hydraulics Module

1. General
    a. System Description
    b. Controls and Components
    c. Indicators and Indications
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

I. Thrust Attenuators Module

1. General
    a. System Description
    b. Controls and Components
    c. Annunciators
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

J. Landing Gear and Brakes Module

1. General
    a. System Description
    b. Controls and Components
    c. Indicators and Indications
    d. Annunciators
    e. Nosewheel Steering
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

K. Flight Controls Module

1. General
    a. Primary Flight Controls
    b. Trim Systems Controls and Indicators
    c. Secondary Flight Controls and Indicators
    d. Stall Warning
    e. Annunciators and Indicators
    f. Yaw Damping
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

L. Pneumatics/Air-Conditioning Module

1. General
    a. System Description
    b. Distribution
    c. Controls
    d. Annunciators

2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

M. Pressurization Module

1. General
    a. System Description
    b. Controls and Components
    c. Indicators and Indications
    d. Annunciators
2. Operations
3. Limitations
4. Abnormal and Emergency Procedures

N. Oxygen (Miscellaneous) Module

1. General
    a. System Description
    b. Controls and Components
    c. Indicators and Indications
    d. Preflight and Servicing
2. Operations
3. Limitations

O. Ice and Rain Protection Module

1. General
    a. System Description
    b. Protected Areas
    c. Controls and Indicators

2. Operations
   a. Anti-ice System
   b. Deice System
3. Limitations
4. Abnormal and Emergency Procedures

P. Avionics Module

1. General
   a. Communications
   b. Standard Flight Instruments
   c. Navigation Equipment
   d. Automatic Flight Systems
   e. Controls and Components
   f. Indicators and Indications
   g. Annunciators
2. Operations
   a. Electrical/Mechanical Flight Information System
   b. Electronic Flight Information System
   c. Flight Management System
3. Limitations
4. Abnormal and Emergency Procedures

Q. Exam and Critique Module (as required)

1. Knowledge Test with a passing grade of 80% corrected to 100%

Systems Integration Modules (SIT)

Training Hours:

Systems Integration Module 1.0

NOTE

Systems Integration Training is conducted during a separate Ground Training session.

FLIGHT TRAINING CURRICULUM SEGMENT

The flight training curriculum segment outline is comprised of the following subject areas:

A. Aircraft Orientation and Normal Procedures

B. Abnormal and Emergency Procedures

C. Flight Simulator Segment of the Proficiency Check (if required)

CURRICULUM SEGMENT OUTLINE

Objective of Flight Training

The objective of flight training is to provide an opportunity for a pilot to gain the skills and knowledge necessary to perform the duties of pilot-in-command, and it includes instruction and practice of maneuvers and procedures pertinent to the Citation CJ2. At the end of the flight training curriculum, the pilot will be able to safely and efficiently operate the aircraft and perform the duties and responsibilities of the pilot-in-command. Crew Resource Management is included as part of the flight training process, including, but not limited to, such elements as Situational Awareness and the Error Chain, Synergy and Crew Concept, and Workload Assessment and Time Management.

Aircraft Orientation and Normal Procedures

Training modules will provide instruction to develop the skill to maneuver the aircraft with and without the automatic flight control system. The pilot will become proficient in the use of normal checklists, standard operating procedures, and precision approaches.

Abnormal and Emergency Procedures

This training modules will provide instruction to introduce and practice selected abnormal and emergency procedures. Although there exists no regulatory requirement to do so, in order to accommodate the position taken by the FAA and the aviation community with regard to the inclusion of "unusual attitude" in a pilot training course, and to provide FlightSafety customers with flight simulator exercises which might be useful in some circumstances, FlightSafety will include flight simulator training element in this training program addressing "unusual attitudes" which can be conducted within the defined envelope of flight simulator operation. Unusual attitudes are defined as any maneuver which approaches or reaches the limits of known, validated aircraft flight data, and which data has been transferred to the flight simulators. Unusual attitude include steep turns and approaches to stalls. Excursion outside of this defined envelope cannot be considered as representing the behavior of the actual aircraft. Demonstration of maneuvers outside of the defined flight simulator operating envelope may be conducted at the discretion of the center manager with the caveat that such demonstrations represent our best opinion of aircraft behavior, but cannot be considered accurate. Pilots will become proficient in abnormal and emergency procedures while practicing instrument maneuvers, precision, and nonprecision approaches.

Flight Simulator Segment of the Proficiency Check §91 Pilots (if required)

Normally the §61.58 Pilot Proficiency Evaluation is administered as a progressive check provided the training is conducted by a Training Center Evaluator (TCE) authorized to conduct §61.58 Pilot Proficiency Evaluations. If the Pilot Proficiency Evaluation is not conducted as a progressive evaluation, the pilot would complete the evaluation as Flight Simulator Module No. 3 (Proficiency Check).

Flight Simulator Segment of Instrument Proficiency/Competency Check §135 Pilots

The Instrument Proficiency/Competency Check is conducted by a qualified TCE in accordance with Part 135. Only those maneuvers, procedures, and functions authorized for checking in-flight simulator will be checked.

Aircraft Segment of the Proficiency Check §91 Pilots (if required)

An applicant may choose to take the entire §61.58 Pilot Proficiency Evaluation in the aircraft rather than in the flight simulator.

Aircraft Segment of the Instrument Proficiency/Competency Check §135 Pilots (as required)

An applicant may choose to take the entire Instrument Proficiency/Competency Check in the aircraft rather than in the flight simulator.

Completion Standards §91 Pilots

The pilot must perform all maneuvers and procedures required for a type rating to a FAA Inspector or Training Center Evaluator in accordance with the Airline Transport Pilot and Type Rating Practical Test Standards.

Completion Standards §135 Pilots

The pilot must perform all maneuvers and procedures as the obvious master of the aircraft with the outcome of all maneuvers never in doubt.

PROGRAMMED TRAINING HOURS

Each flight simulator module is scheduled for the hours indicated in the following tables. An additional 0.5 hour for prebriefing and 0.5 hour for debriefing.

Flight training is generally conducted as a crew; however, a pilot training alone may complete the course. The flight training/checking hours are specified in the following tables. The Pilot Flying (PF) and Pilot Not Flying (PNF) are also specified in the following tables. Landings accomplished in a level A simulator cannot be counted for landing credit toward program completion.

Table RS-2. FLIGHT SIMULATOR AS A §91 CREW

FLIGHT SIMULATOR AS A CREW	PF (HOURS)	PNF (HOURS)	TOTAL TIME (HOURS)
Flight Simulator Module No. 1	2.0	2.0	4.0
Flight Simulator Module No. 2	2.0	2.0	4.0
Flight Simulator Module No. 3*	2.0	2.0	4.0

Table RS-3. FLIGHT SIMULATOR FOR §91 SINGLE PILOTS

FLIGHT SIMULATOR SINGLE PILOT	PF (HOURS)	PNF (HOURS)	TOTAL TIME (HOURS)
Flight Simulator Module No. 1	2.0	0.0	2.0
Flight Simulator Module No. 2	2.0	0.0	2.0
Flight Simulator Module No. 3*	2.0	0.0	2.0

* Three options are available to the pilot based on the pilot's personal training needs. Option 1 is a Line-Oriented Flight Training lesson (Progressive Check completed). Option 2 is a Pilot Proficiency Check flown in accordance with §61.58 (Progressive Check not completed). Option 3 is a review of systems, normal and abnormal operations, flight characteristics, or instrument approach procedures, as determined by the trainee and the instructor (Progressive Check completed).

Table RS-4. FLIGHT SIMULATOR AS A §135 CREW

FLIGHT SIMULATOR AS A CREW	PF (HOURS)	PNF (HOURS)	TOTAL TIME (HOURS)
Flight Simulator Module No. 1	2.0	2.0	4.0
Flight Simulator Module No. 2	2.0	2.0	4.0
Instrument Proficiency/Competency Check	2.0	2.0	4.0

Table RS-5. FLIGHT SIMULATOR FOR §135 SINGLE PILOTS

FLIGHT SIMULATOR SINGLE PILOT	PF (HOURS)	PNF (HOURS)	TOTAL TIME (HOURS)
Flight Simulator Module No. 1	2.0	0.0	2.0
Flight Simulator Module No. 2	2.0	0.0	2.0
Instrument Proficiency/Competency Check	2.0	0.0	2.0

FLIGHT TRAINING MODULE OUTLINES

The maneuvers listed in the following modules indicate the training session where the training event is first addressed. If the pilot does not demonstrate proficiency in that session, the event will be carried forward until proficiency is demonstrated. Once proficiency is demonstrated, the event may be considered optional for subsequent training. Based on demonstrated proficiency, events scheduled for a subsequent module may be introduced in an earlier module.

Flight Simulator Training Modules

A. Flight Simulator Module No. 1

1. Flight Training Events

a. Preparation

(1) Prestart Procedures

b. Surface Operation

(1) Starting

(2) Taxi

(3) Pretakeoff Checks

c. Takeoff

(1) Normal/Reduced Flaps Takeoffs

(2) Crosswind Takeoff

(3) Rejected Takeoff

(4) Powerplant Failure at or above V_1

d. Enroute

(1) Unusual Attitudes are defined as any maneuver which approaches or reaches the limits of known, validated aircraft flight data, and in which the data has been transferred to the flight simulator. Excursions outside of this defined envelope cannot be considered as representing the behavior of the actual aircraft. Unusual attitudes include the following:

(a) Steep Turns

(b) Approach to Stall—Enroute Configuration

(c) Approach to Stall—Takeoff Configuration

(d) Approach to Stall—Landing Configuration

(e) In-flight Powerplant Shutdown

f. Approaches

(1) Instrument Departure and Arrival

(2) Navigation Equipment and Assigned Radials

(3) Holding

(4) Precision Approach

(5) Precision Approach with One Engine Inoperative

(6) Nonprecision Approach

(7) Circling Approach

g. Landings

(1) Normal Landing

(2) Maneuver to Landing with a Powerplant Failure

(3) Landing from a Circling Approach

(4) Zero Flap Landing

(5) Landing from a Visual Approach

h. Other Flight Procedures

(1) Windshear/Microburst

(2) ATC Procedures

(3) ATC Phraseology

2. System Procedures (Normal and/or Abnormal)

a. Fuel and Oil

b. Electrical

c. Autopilot

d. Flight Management Guidance Systems/Automatic or Other Approach and Landing Systems

e. Stall Warning Devices

f. Communications Equipment

g. Navigation Systems

h. Anti-icing and Deicing

3. Systems Procedures (Emergency)

a. Powerplant Malfunctions

b. Electrical Systems

c. Flap System Malfunctions

B. Flight Simulator Module No. 2

1. Flight Training Events

a. Takeoff

(1) Normal Takeoff

(2) Instrument Takeoff

(3) Takeoff With Lower than Standard Minimums

b. Enroute

(1) Inflight Powerplant Shutdown

c. Descent

(1) Emergency Descent

d. Approaches

(1) Instrument Departure and Arrival

(2) Navigation Equipment and Assigned Radials

(3) Nonprecision Approach

(4) Missed Approach from a Precision Approach

(5) Missed Approach from a Nonprecision Approach

(6) Missed Approach with a Powerplant Failure

(7) Windshear (Landing)

(8) Navigation Receiver Failure

e. Landings

(1) Normal Landing

(2) Crosswind Landing

(3) Maneuver to Landing to a Missed Approach

(4) Rejected Landing to a Missed Approach

f. Postflight Procedures

(1) After Landing

(2) Parking and Security

(3) Emergency Evacuation (Discussed)

g. Other Flight Procedures

(1) ATC Procedures

(2) ATC Phraseology

2. System Procedures (Normal and/or Abnormal)

a. Pneumatic/Pressurization

b. Air-Conditioning

c. Hydraulic

d. Flight Controls

e. Anti-icing and Deicing

f. Flight Instrument System Malfunction/EFIS Failure

3. Systems Procedures (Emergency)

a. Aircraft Fires

b. Smoke Control

c. Powerplant Malfunctions

d. Hydraulic Systems

e. Flight Control Systems Malfunction

f. Landing Gear Malfunctions

g. EFIS Failure

C. Flight Simulator Module No. 3* §91 Pilots

*Three options are available to the pilot based on the pilot's personal training needs. Option 1 is a Line-Oriented Flight Training lesson (Progressive Check completed). Option 2 is a Pilot Proficiency Check flown in accordance with §61.58 (Progressive Check not completed). Option 3 is a review of systems, normal and abnormal operations, flight characteristics, or instrument approach procedures, as determined by the trainee and the instructor (Progressive Check completed).

Option 2—Instrument Proficiency Check for §91 Pilots/Instrument Proficiency–Competency Check for §135 Pilots

1. Flight Testing Events

a. Preflight Procedures

b. Ground Operations

c. Takeoff and Departure Maneuvers

d. In-flight Maneuvers/Procedures

e. Instrument Procedures

f. Landings and Approaches to Landings

g. Normal and Abnormal Procedures

h. Emergency Procedures

i. Postflight Procedures

GRADING AND EVALUATION

Pilot performance during simulator and flight training shall be graded as Proficient (1), Normal Progress (2), Additional Training Required (3), Unsatisfactory (4), or Discussed (D).

The criteria for evaluation shall be as follows:

- PROFICIENT (1)—The client is able to easily perform the procedure or maneuver; in the language of §61.43 "showing that he is the master of the aircraft, with the successful outcome of a procedure or maneuver never seriously in doubt." Or in the language of FAR 135.293, "...the pilot is the obvious master of the aircraft, with the successful outcome of the maneuver never in doubt."

- NORMAL PROGRESS (2)—The client is making satisfactory progress toward proficiency in the procedure or maneuver but still requires assistance from the instructor. However, the instructor is satisfied that, with additional practice as provided in the FAA-approved curriculum, the client will become fully proficient in the maneuver or procedure.

- ADDITIONAL TRAINING REQUIRED (3)—The client's progress is not satisfactory. However, the Instructor is of the opinion that additional training over and above that specified in the FAA-approved curriculum will enable the client to meet applicable completion standards.

- UNSATISFACTORY (4)—The client shows basic deficiencies, such as lack of knowledge, skill, or ability to perform the required procedures or maneuver. If the present level of performance and progress is maintained, it is doubtful that the client will be able to achieve the applicable completion standards required by the FAA-approved curriculum. Further training shall be taken only after a review by the Center Manager.

- DISCUSSED (D)—This designation indicates that the item was discussed but not performed in the simulator or aircraft. The discussion revealed a satisfactory knowledge of the appropriate procedure, aircraft system, etc.

- TRAINED (T)—This indicates that the client was trained in the maneuver for procedures only, no flight training credit was taken.

- COMPLETED (C)—This indicates that no grade was given. Item is completed (used for Systems Integration/LOFT).

- SIMULATOR TRAINING—The pilot is required to achieve a grade of 1 (proficient) by the completion of simulator training. Additional training will be provided in the portion of the flight in which the pilot experienced difficulty. Decision to terminate training for a pilot who demonstrates substandard performance will be made by the Center Manager.

- FLIGHT TRAINING—The pilot is required to achieve a grade 1 (proficient) by the completion of flight training. Additional training will be provided in the portion of the flight in which the pilot experienced difficulty. Decision to terminate training for a pilot who demonstrates substandard performance will be made by the Center Manager.

COMPLETION STANDARDS

Completion is based on proficiency. Syllabus times are estimates. Pilots must demonstrate satisfactory performance through formal and informal examinations in the classroom and flight simulator, and in flight to ensure they meet the knowledge and skill requirements necessary to meet the course objectives. The Minimum Acceptable Performance Guidelines are as follows:

- Each pilot shall fly the flight simulator and/or aircraft within the appropriate standard. Depending on the type of operation, passenger seating, configuration within the aircraft, and/or pilot's level of certification, the tolerance of the appropriate standard will be specified in one of the following publications:
    - Instrument Rating Practical Test Standards
    - Airline Transport Pilot and Type Rating Practical Test Standards
- The Instructor and/or Training Center Evaluator will determine the applicable standards prior to the start of any training or evaluation session. The required standards will be discussed with the pilot being trained.

The Minimum Acceptable Performance Guidelines are as established in the Airline Transport Pilot and Type Rating Practical Test Standards, FAA-S-8081-5C (as revised). It states in part "showing mastery of the aircraft within the standards outlined in this PTS, with the successful outcome of a task never seriously in doubt."

The standards outline is as follows:

	Practical Test Standards
Prior to final	±5°
	±100 feet
	±10 knots
Departure, Cruise, Holding, Arrival	±10°
	±100 feet
	±10 knots

Steep turns	45 ±5°	
	±100 feet	
	±10 knots	
	±10° rollout	
Circling	Should not exceed 30° bank	
	–0/+100 feet	
	±5 knots	
	±5° heading/track	
	NOTE: 135 OPS 1,000 feet/minute maximum	
Missed Approach	± 100 feet	
	±5 knots	
	±5°	
Approaches to stalls	Recognize perceptible buffet/stall warning device, recover at first indication, striving for minimum loss of altitude, airspeed, and heading deviation	
	In Flight	**After Takeoff**
Powerplant failures	±100 feet	±5 knots
	±10 knots	±5°
	±10° heading	
	Precision	**Nonprecision**
IFR Approaches	1/4 scale deflection*	1/4 scale deflection
		±5° bearing pointer
Final	±5 knots	–0/+50 feet MDA
		±5 knots

*During a precision approach, allow no more than 1/4 scale deflection of either the glide slope or localizer indications to decision height, the missed approach point, or the point over the runway where glide slope must be abandoned to accomplish a normal landing.

"Unsatisfactory Performance" is defined as "Consistently exceeding the tolerances stated in the task objective, or failure to take prompt, corrective action when those tolerances are exceeded." Any action, or lack thereof, by the applicant that requires corrective intervention by the examiner to maintain safe flight shall be disqualifying.

CITATION CJ2 525A SERIES WEEKLY SCHEDULE
§61.58 OR §135.351 RECURRENCY—§61.55 SIC QUALIFICATION
§61.56 REVIEW—§61.57 RECENT FLIGHT EXPERIENCE

MONDAY/THURSDAY (DAY 1) GROUND SCHOOL—4.0 HOURS 0800–1200/1200–1600/1600–2000	TUESDAY/FRIDAY (DAY 2) GROUND SCHOOL—4.0 HOURS 0800–1200/1200–1600/1600–2000	WEDNESDAY/SATURDAY (DAY 3) GROUND SCHOOL—4.0 HOURS 0800–1120/1200–1520/1600–1920
FSI Administration Aircraft General *AFM* and *OM* Lighting Master Warning Electrical Avionics Powerplant Fire Protection Fuel	Hydraulics Thrust Attenuators Landing Gear and Brakes Flight Controls Ice and Rain Protection Pneumatics/Air Conditioning Pressurization Oxygen (Misc) Systems Integration (SIT)	CRM Flight Planning Weight and Balance Performance Exam and Critique Supplemental Instruction If required

SIM TRAINING VS GROUND TRAINING			SIM TRAINING VS GROUND TRAINING			SIM TRAINING VS GROUND TRAINING		
Sim Block	Sim Times	Gnd School	Sim Block	Sim Times	Gnd School	Sim Block	Sim Times	Gnd School
A Brief (0530)	0600–1000	12–16	A Brief (0530)	0600–1000	12–16	A Brief (0530)	0600–1000	12–1520
B Brief (0930)	1000–1400	16–20	B Brief (0930)	1000–1400	16–20	B Brief (1930)	1000–1400	16–1920
C Brief (1330)	1400–1800	8–12	C Brief (1330)	1400–1800	8–12	C Brief (1330)	1400–1800	8–1120
D Brief (1730)	1800–2200	12–16	D Brief (1730)	1800–2200	12–16	D Brief (1730)	1800–2200	1520–16
E Brief (2130)	2200–0200	16–20	E Brief (2130)	2200–0200	16–20	E Brief (2130)	2200–0200	16–1920

Figure RS-1. Typical §91 or §135 Pilot Recurrency Schedule

SYSTEMS REVIEW

CONTENTS

ILLUSTRATIONS

TABLES

SYSTEMS REVIEW

SQUAT SWITCH INPUTS

(Left main squat switch only)

- In flight, it enables:
    - Flight hour meter runs
    - Davtron M877 digital clock flight time runs
    - Opening of emergency pressurization valve
    - Landing gear handle locking solenoid energized unlocked
    - Minimum 75% N_2 rpm limit to activate wing anti-ice in flight
    - Transponder 1 and 2 modes A, C, and S automatically transmit if switched on and turns off the GND light on transponders
    - CVR (optional) cannot erase
    - Automatic load shed for A/C compressor with any generator failure
    - Flaps >35º annunciator light regardless of throttle position if flaps are selected beyond 35º position
    - GNSXLS to navigate
    - Generator-assisted start not possible
    - Collins DCP first push of REFS button displays page 2 of 2 to set landing speeds N_1, and minimums
    - Collins go-around mode when pressed in flight selects left GA (lateral mode) current lubber line Azimuth and GA (vertical mode) 10° pitch up, wings levels.
- On the ground, it enables:
    - Vapor cycle compressor can be run off of EPU or R generator
    - Generator-assisted starts enabled
    - Transponder mode S and automatically turns off mode A and C with transponder on.
    - Master caution lights with either throttle above 85% N_2 and thrust, attenuator switch in STOW.

    - Master caution lights and flaps ≥35 annunciator light with both throttles above 85% N_2 with flaps selected beyond the 35° position.
    - Collins DCP first push of REFS button displays page 1 of 2 to set takeoff speeds and N_1. The left lateral GA mode picks off lift off Azimuth by the squat switch.
    - At touchdown the radar goes to STBY automatically after 60 seconds.
    - Wing Anti-ice "NO" 75% N_2 RPM limit
    - Flight hour meter—OFF on Davtron and Hobb meter
    - Emergency valve cannot open
    - CVR can erase
    - Transponder 1 and 2 GND light on, mode S still available

(Right main squat switch only)

- In flight it enables:
    - Pressurization to normal autoschedule
    - Normal AOA inputs to stick shaker
- On ground, it enables:
    - Pressurization controller to taxi mode (throttles below 85% N_2)
    - Pressure controller to Prepressurization mode (throttle above 85% N_2)
- No AOA to stick shaker except in AOA rotary test

Left and right main squat switches in parallel

- Thrust attenuators
    - Either squat switch to auto deploy at touchdown (USA certification) both squat switches required in UK certification.
- Antiskid protection—Both with antiskid switch ON

Nose gear down and locked

- The optional AOA heads-up display lights up immediately.

EMERGENCY BUS CONDITION

GENERAL

The following components and systems are operative when only the emergency DC bus(es) and hot battery bus are powered (no generators available).

1. COMM 1
2. NAV 1 (and marker beacon panel above copilot's ADI with single PFD configuration)
3. Standby HSI/course/glideslope using NAV 1
4. AHRS-2 heading to standby HSI
5. Audio 2 and Audio 1 when battery switch is in EMER
6. Left and right standby N1 fan
7. Right pitot/static heat
8. Floodlight rheostat
9. Voltmeter
10. ELT (optional)
11. Emergency exits lights
12. Emergency battery pack
13. Baggage compartment lights
14. Standby airspeed/altimeter/vibrator
15. Copilot's pneumatic airspeed altimeter, and vertical speed indicators (single-PFD configuration)
16. Windshield bleed air—No temperature control
17. Rain Doors
18. Gear control and monitoring
19. Flaps
20. Hydraulic PC Board
21. Emergency brakes (pneumatic)
22. Pressurization manual toggle valve (cherry-picker)

23. Cabin altitude/differential pressure indicator
24. Oxygen pressure gage (direct reading)
25. Passenger oxygen valve (manual drop and crew only)
26. Magnetic compass (windshield divider)
27. Standby attitude indicator (30 minute lead acid battery)
28. Standby attitude indicator battery as a secondary power source to AHRS-2 for standby ADI
29. Engine and wing bleed-air anti-ice (no wing crossflow)

Valves that fail closed:

1. Emergency pressurization valve
2. Fuel transfer valve
3. Wing crossflow valve (Anti-ice)
4. Climb and dive solenoid valves (must use cherry-picker)
5. Automatic mask drop (must drop mask manually)

COLLINS PRO LINE 21 REVERSIONARY/FAILURE MODES

SINGLE PFD CONFIGURATION

The single-PFD configuration has dual AHRS but can only revert AHRS 2 to the pilot's side. Only one air data computer is installed on the pilot's side, so no reversion is possible. If the optional copilot's altimeter (Honeywell AM-250 digital altimeter with built-in air data computer ADC) is installed, no copilot altimeter ADC reversion is possible. The standby HSI displays only NAV 1. The copilot's HSI displays only NAV 2. The PFD and MFD will display either NAV 1 or NAV 2. Only heading from AHRS 2 displays on the standby HSI. Only heading from AHRS 2 displays on the copilot's HSI.

- AHRS 1 failure—Use pilot's AHRS REV-NORM switch and bring AHRS 2 into pilot's PFD and MFD.
- AHRS 2 failure—No reversion (one ADC); use AHRS 1 on pilot's PFD and MFD, copilot's HSI (HDG FAIL) standby HSI (HDG FAIL), copilot's ADI (ADI fail)
- ADC 1 failure—No reversion (one ADC); use copilot's instruments backed up by standby instruments. On pilot's PFD, the airspeed, altitude, and vertical speed fail and MFD GS, TAS, RAT, SAT, ISA fail.

- No ADC 2 installed
- PFD goes blank—Use pilot's REV TO MFD switch with EIS/ADI/HSI on the MFD in the compressed mode.
- MFD goes blank—Use pilot's REV TO PFD switch with EIS/ADI/HSI on the PFD in the compressed mode.
- Pilot's PFD and MFD go blank—Use copilot's instruments backed up by standby instruments, no RAT.
- NAV 1 failure—Display cross-side NAV 2 (yellow) on pilot's PFD and MFD, copilot's HSI NAV 2 (normal on-side), standby HSI HDG okay but NAV 1 failed.
- NAV 2 failure—Display NAV 1 on pilot's PFD and MFD backed up by standby HSI (NAV 1), copilots HSI HDG okay but NAV 2 failed.
- Dual generator failure with battery switch in EMER—COMM 1 and NAV 1 are operating, use standby instruments, pilots PFD and MFD blank, copilot's pneumatic airspeed, altitude, VSI operating, copilot's ADI and HSI blank. Prior to landing, leave the battery switch in EMER. Remember, the landing gear and flaps are on the emergency bus and can be extended for landing with the battery switch in EMER. AHRS 2 has been up and functioning the entire time for heading to the standby HSI. Multiply landing distance by 1.4 for inoperative antiskid. Use the emergency brakes to slow and stop. Do not select BATT. This may interupt AHRS for some time.

DUAL PFD CONFIGURATION

The dual-PFD configuration has dual AHRS that can be reverted to pilot's or copilot's displays. There are two air data computers that can be reverted to pilot or copilot's displays. NAV 1 or NAV 2 can be displayed on the pilot's PFD and MFD or the copilot's PFD. Only NAV 1 will display in the standby HSI. Only heading from AHRS 2 will display in the standby HSI.

- AHRS 1 failure—Use pilot's AHRS REV–NORM switch to bring AHRS 2 into pilots PFD and MFD.
- AHRS 2 failure—Use copilot's AHRS REV–NORM switch to bring AHRS 1 into copilot's PFD, the standby HSI HDG fail.
- ADC 1 failure—Use pilot's DADC REV–NORM switch to bring copilot's ADC 2 into pilot's PFD/MFD.
- ADC 2 failure—Use copilot's DADC REV–NORM switch to bring pilot's ADC 1 into copilot's PFD.
- Pilot's PFD goes blank—Use pilot's REV TO MFD–NORM switch to display EIS/ADI/HSI on the MFD in the compressed format.
- Pilot's MFD goes blank—Use pilot's REV TO PFD–NORM switch to display EIS/ADI/HSI on both PFDs in compressed format.

- Both pilot's PFD and MFD go blank—Use copilot's PFD backed up by the standby instruments

- Copilot's PFD goes blank (no reversion available)—Use pilot's PFD and MFD backed up by standby instruments

- NAV 1 failure—Display cross-side NAV 2 (yellow) on pilot's PFD and MFD or use copilot's PFD (NAV 2 is normal on-side) but standby HSI HDG OK but NAV 1 failed.

- NAV 2 failure—Display NAV 1 on pilot's PFD and MFD (normal on-side) or copilot's PFD (cross-side yellow) backed up by standby HSI NAV 1 normal.

- Dual generator failure with battery switch in EMER—COMM 1 and NAV 1 are operating; use standby instruments, pilot's PFD and MFD blank, copilot's PFD is blank. The battery switch remains in EMER. Remember, the landing gear and flaps are on the emergency bus, and can be extended for landing with the battery switch in EMER. AHRS 2 has been up and functioning the entire time for heading on the standby HSI. Multiply landing distance by 1.4 for inoperative anti-skid. Use the emergency brakes to slow and stop. Do not select BATT. This may interupt R AHRS, losing the STBY HSI for some time.

ELECTRICAL SYSTEM

GENERAL

Electrical system schematics (Figures SR-1 through SR-4) are shown behind the electrical system text.

1. Battery switch (really a power distribution switch):

   - OFF—Battery relay and emergency relays are deenergized open; the hot battery bus is powered. (Emergency bus relay default connects to crossfeed bus.)

   - EMER—Emergency relay is energized closed, connecting it to the hot battery bus

   - BATT—Battery relay energized closed; emergency bus powered through crossfeed bus. All DC buses power

2. Generator switches (left and right):

   - GEN—This position gives permission to the GCU, which may close the power relay.

   - OFF—This position removes permission from the GCU, which opens the power relay only; it does not trip the generator field relay.

   - RESET—This position momentarily resets the field relay only.

3. Generator control units (GCU):
   - The GCUs regulate the 30-VDC generator to 29 VDC.
   - The GCUs protect both the generators and the system.
   - The GCUs parallel the generators to share the load; the generators must be within 0.3 volts and 10% of system load.
4. Voltmeter select switch:
   - BATT—Hot battery bus voltage is read when the battery switch is in the BATT or EMER position; the voltage selector switch is spring loaded to the BATT position.
   - L or R GEN—Voltage is read between the respective generator and its power relay. Will read respective generator voltage even with BATT switch off.
5. EMERGENCY BUS (circuit breakers on both circuit-breaker panels):
   - COMM 1
   - NAV 1
   - Standby HSI
   - AHRS 2
   - Standby airspeed/altimeter vibrator
   - Audio 1 when the battery switch is in EMER and audio 2
   - Floodlight rheostat
   - Left and right standby N_1 LCD's (upper center instrument panel) from N_1 monopoles
   - Right pitot/static port heaters
   - Landing Gear Warning Circuit Breaker
   - Gear Control Circuit Breaker
   - Hydraulic Control Circuit Breaker (PC Board)
   - Flap control circuit breaker
   - The crossfeed bus has a circuit with a 20-amp circuit breaker that connects the emergency bus to the crossfeed bus any time the battery switch is in OFF or BATT. Placing the battery switch in EMER energizes the EMER relay to connect the emergency bus to the hot battery bus.

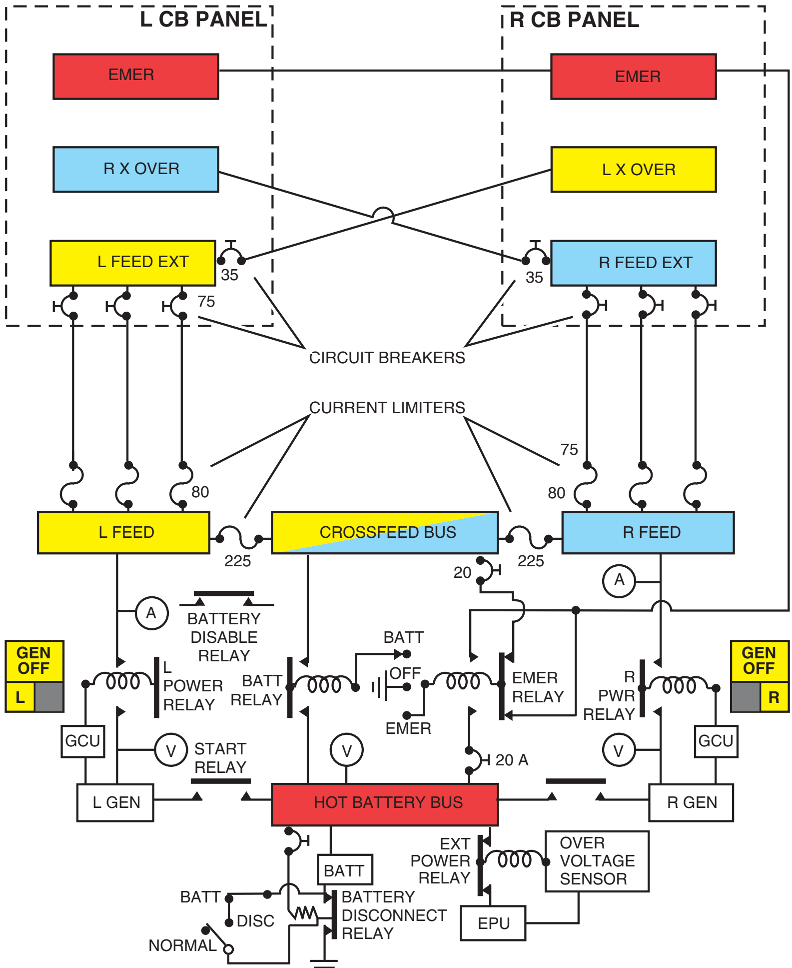


Figure SR-1. Electrical System Schematic—SNs 0001 and Subsequent

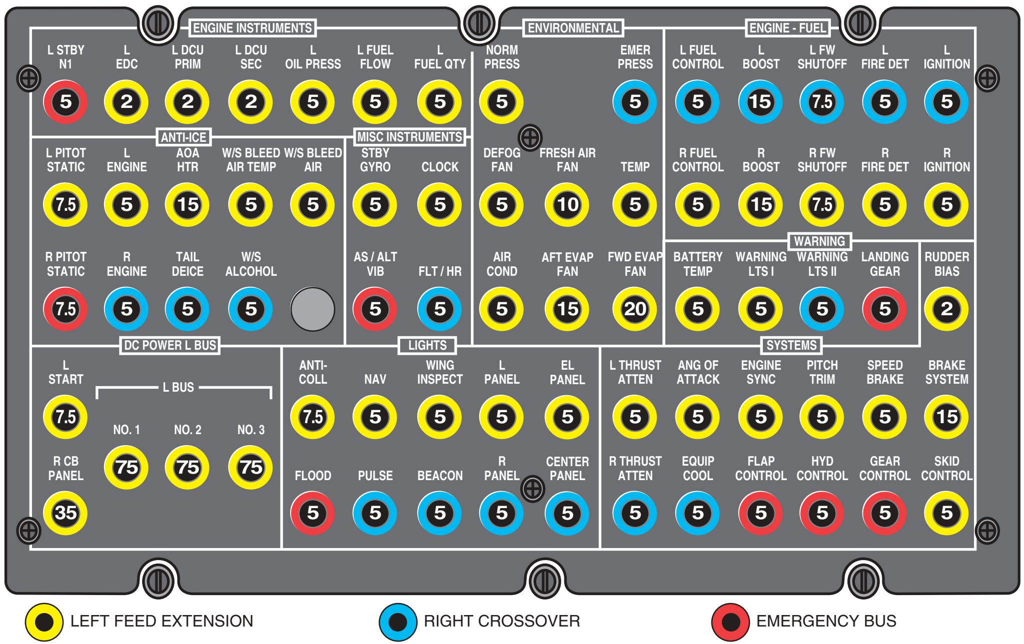


Figure SR-2. Left Circuit-Breaker Panel—Single or Dual PFD

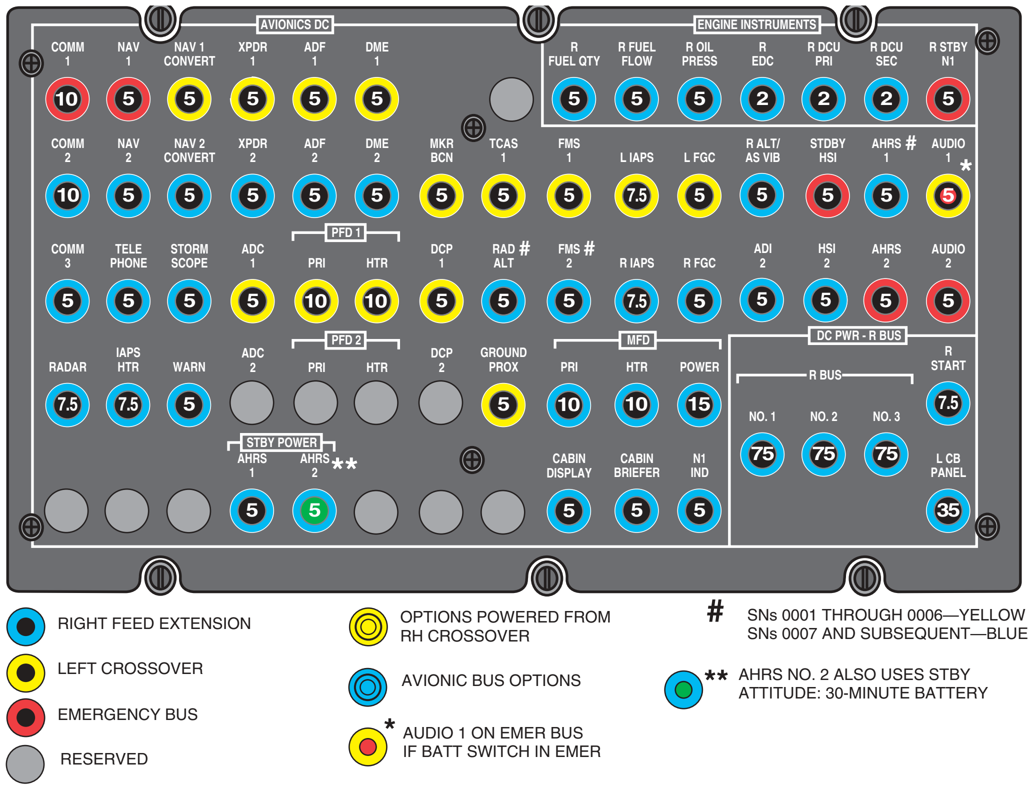


Figure SR-3. Right Circuit-Breaker Panel—Single PFD

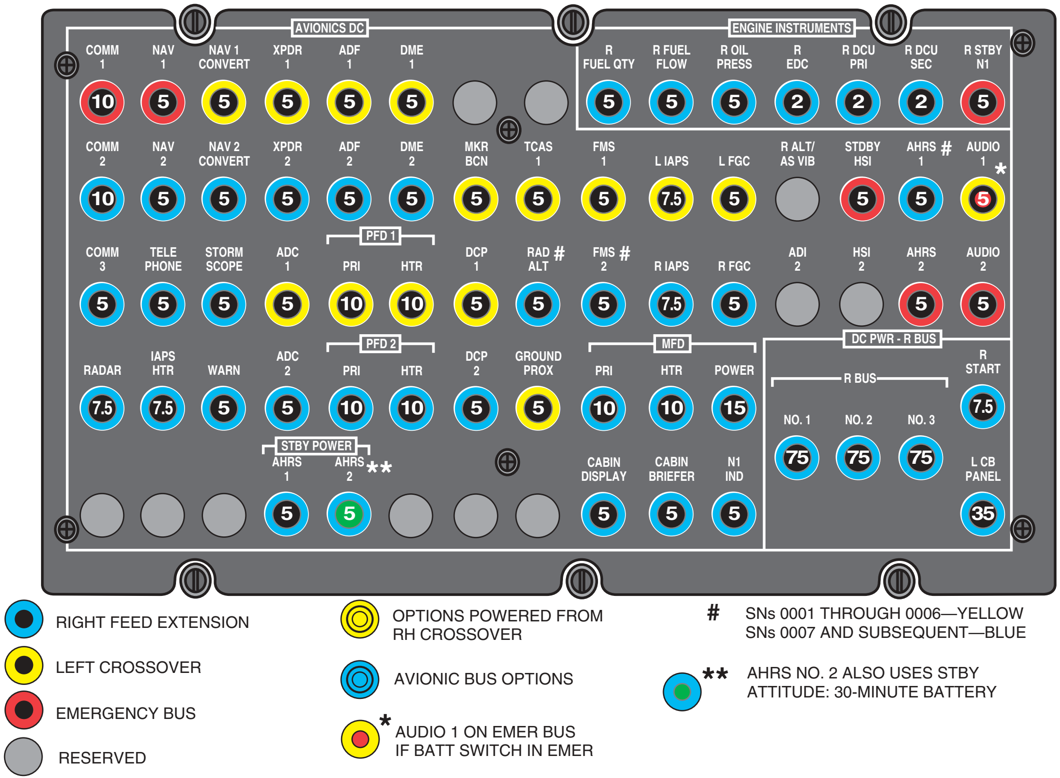


Figure SR-4. Right Circuit-Breaker Panel—Dual PFD

- With one or both generators on line, placing the battery switch to OFF does not cause loss of power to the emergency bus.
- Loss of both generators requires that the battery switch be positioned to EMER to remove power from the normal DC buses and have the hot battery and emergency buses available for emergency power.

6. Hot battery bus:
   - Lights: Nose and tail baggage compartment lights, cabin entry door and emergency “EXIT” white lights, two right wing walkway lights, the optional footwell strip lights (one side).
   - Voltmeter: Reads hot battery bus voltage in BATT or EMER but not in OFF. Reads L/R generator voltage when selected with spring-loaded selected switch.
   - ELT (optional): Turned on by “G” switch, OFF uses hot battery bus power to turn the ELT off.
   - Emergency battery pack: Powers the standby instrument and cockpit floodlights during the start sequence. A 5G force activates an inertia switch to power the cabin entry emergency exit door and emergency “EXIT” white lights, the two right wing walkway lights. The optional footwell strip lights require a second emergency battery pack.
7. L or R GEN OFF LIGHT:
   - Indicates that the power relay is open.
   - If voltage indicates near zero, the field relay is tripped; reset is possible.
   - If voltage indicates normal, the power relay is open and the field relay is not tripped open; reset is not probable.
8. Current limiters (225 amp):
   - Can blow only due to system malfunctions
   - If failed, prevents generators from being parallel
   - If failed prior to ground start, neither engine can be started. If failed in flight the opposite side engine can be started normally.
   - Failure of either limiter will be indicated by AFT J-BOX LMT annunciator light

POWERPLANT

GENERAL

- Williams/Rolls-Royce trademark FJ44-2C (Figure SR-5)
- 2,400-Pounds thrust
- S.L. bypass ration 2.1:1 or 68% of power through the bypass duct.
- Acceleration bleed valve—Mechanically operated off fuel control unit
- Hydraulic operated thrust attenuators reduces idle thrust by 50%—Throttles at idle
- Fuel slinger—Supplies fuel to combustion chamber for normal operation. One nozzle for airstarts at a constant 9 pph is included in MFD fuel flows.
- RPMs @ 100% N_2 41,200, N_1 17,245

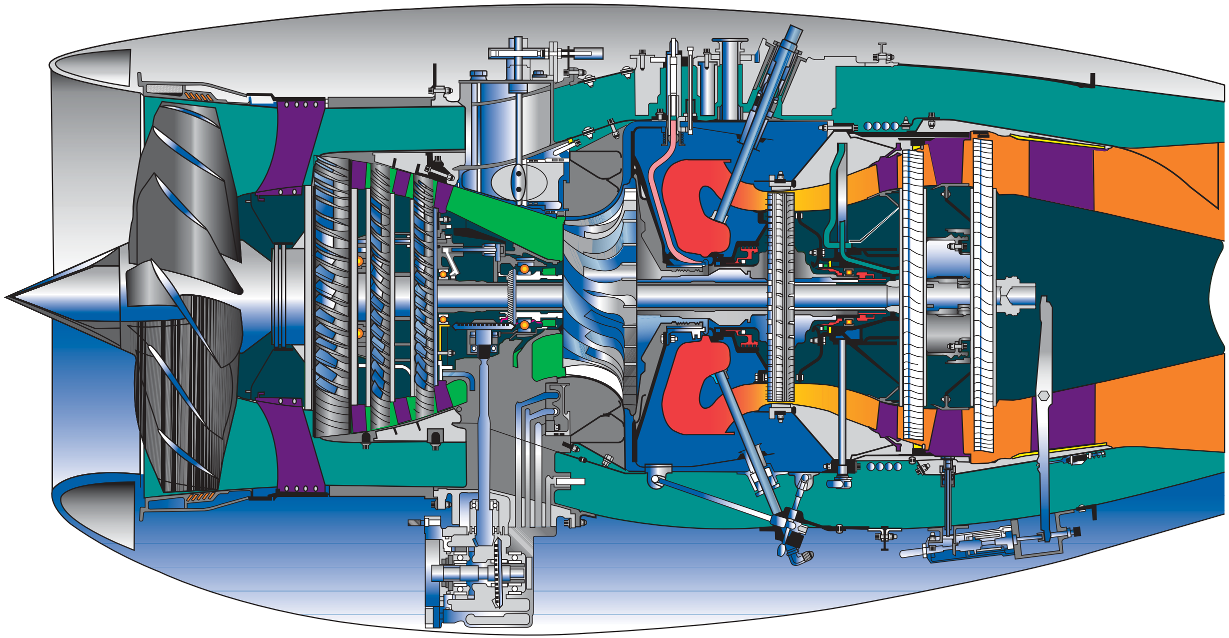


Figure SR-5. FJ44-2C Gas Flow

IGNITION

See Figure SR-6.

- Two exciter boxes and two plugs per engine
- Switch:
  - NORM—Start and engine anti-ice
  - ON—Takeoffs, landings, heavy precipitation, turbulence, practice stalls, and emergency descents.
  - The green ignition light verifies that DC power is available to one or both exciter boxes.

OIL

See Figure SR-7 and Table SR-1.

- Oil capacity is four quarts.
- Maximum permissible oil consumption is .023 gal/hr operating, .20 gal/hr windmilling
- Only Mobil Jet II and Mobil 254 oils are approved for normal oil use in this engine.

Table SR-1. APPROVED OIL

APPROVED BRAND	SPECIFICATION
Mobil Jet II	MIL-L-23699
Mobil 254	MIL-L-23699
Exxon 2380 (Emergency only)	MIL-L-23699

NOTE

Mixing of approved oils is permissible.

Exxon 2380 oil may be used pure or mixed with approved oil only, for a maximum of 25 hours run time between major periodic inspections. Record in the engine log book the total amount of run time with Exxon 2380 oil. Following any usage of Exxon 2380 oil, the oil tank must be drained, flushed with approved oil, and serviced with pure approved oil. (Definition of oil flush is removal of chip collector screens and pouring one quart of approved oil through the oil fill port).

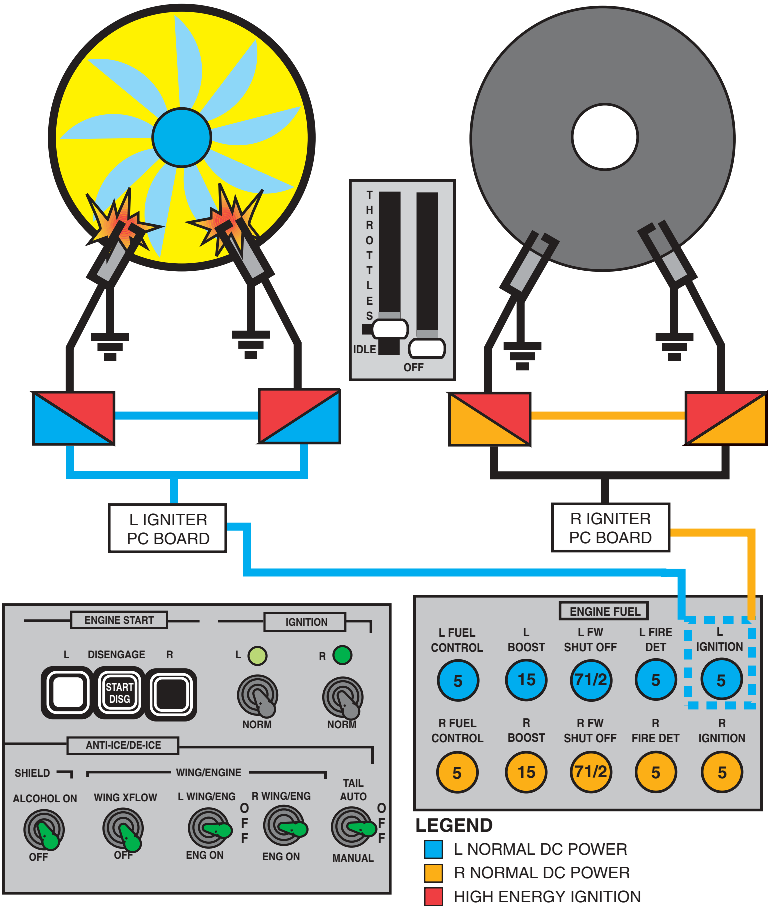


Figure SR-6. Ignition System

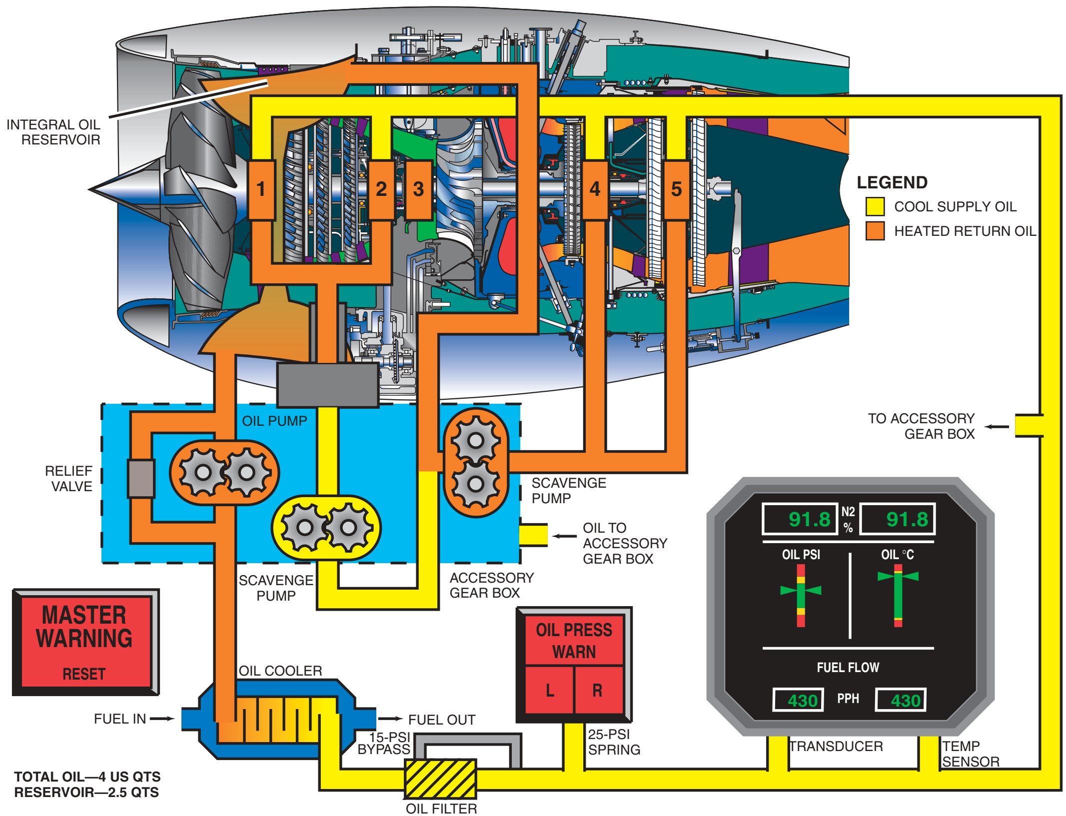


Figure SR-7. Oil System

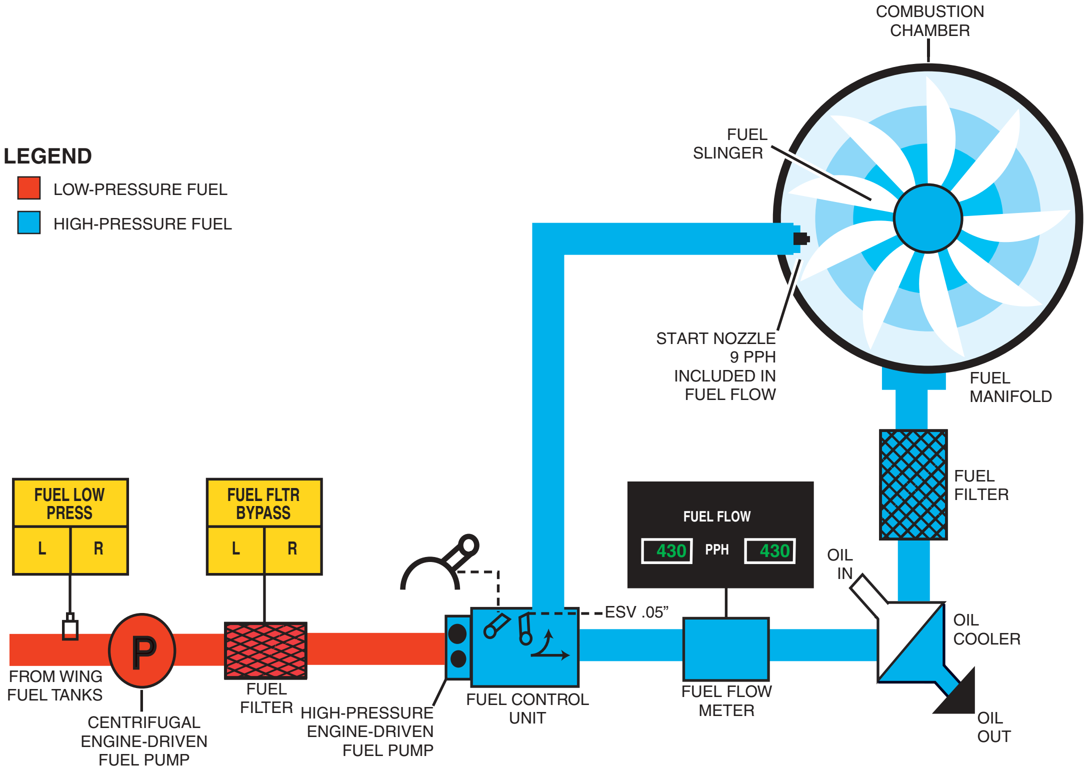


Figure SR-8 Engine Fuel System

FJ44–2C SALTY/SANDY/SMOG ENVIRONMENT WATER WASH POLICY

Operators who routinely fly at low altitudes (4,000 feet or below for more than 30 minutes) over saltwater environments should perform the powerplant desalinization procedure (71-00-03, P.B. 701) at the end of each day's operations.

Operators who fly at higher altitudes or occasionally at lower altitudes (4,000 feet or higher or below 4,000 feet for less than 30 minutes) over saltwater environments should perform the powerplant desalinization procedure (71-00-03, P.B. 701) at least once a week.

Operators who routinely take off or land in sandy or smog environments should perform the powerplant desalinization procedure (71-00-03, P.B. 701) at least once per week.

Perform compressor cleaning to improve compressor efficiency by removing normal accumulations of dirt and grime (71-00-03, P.B. 701). Williams-Rolls recommends that all operators perform this procedure at every routine periodic inspection (check 1 or check 2) as a minimum. Consult *Williams-Rolls FJ44-2C Engine Training Manual* Level II, Ramp and Transit.

FIRE PROTECTION

See Figures SR-9 through SR-11.

- Detection system—Pressure sensor on a helium gas-filled loop
- Requires normal DC power for operation
- Fire warning lights do not illuminate master warning lights.
- Pressing fire warning switchlights activates:
  - Fuel and hydraulic firewall shutoff valves closed
  - HYD FLOW LOW light on
  - Field relay is tripped open (GEN OFF–light on)
  - Fuel low press lights on with Fuel Boost ON light
  - Both fire bottles are armed, white lights illuminated
  - Engine flames out and spools down with oil pressure warning and master warning lights
  - Pressing second time resets all but field relay

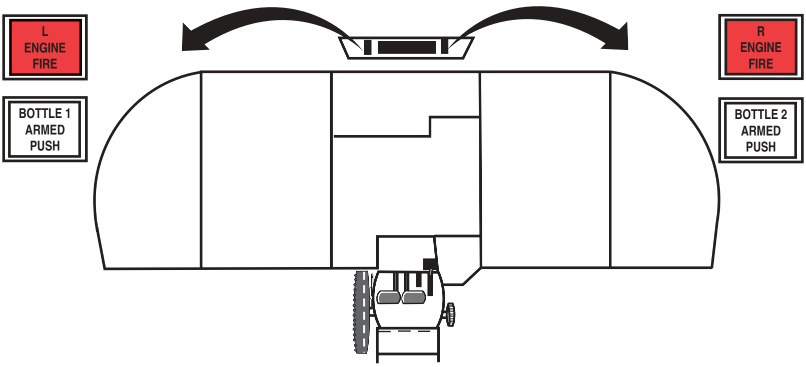


Figure SR-9. ENGINE FIRE Switchlights and Controls

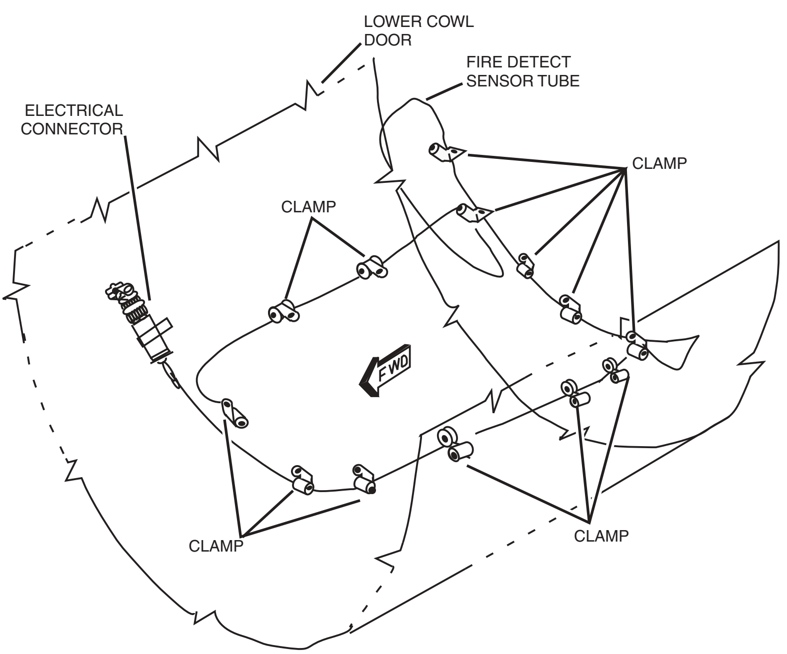


Figure SR-10 . Engine Fire-Detection Sensor

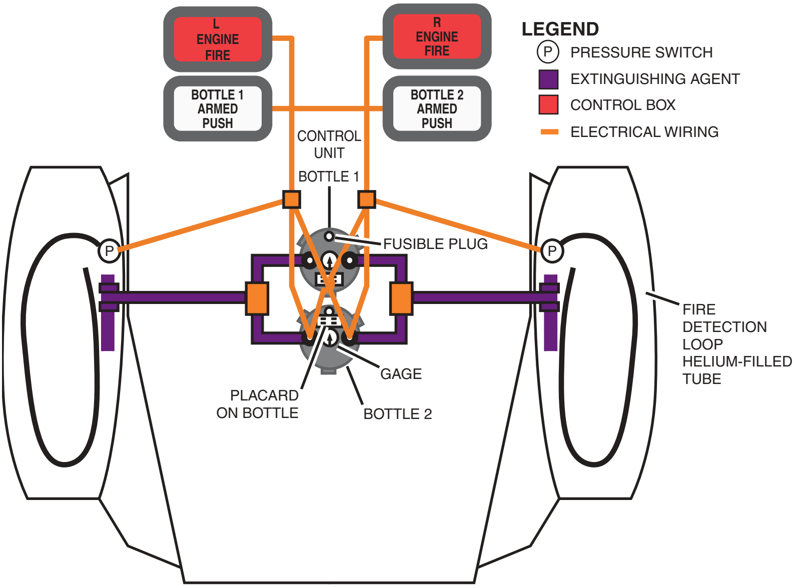


Figure SR-11. Engine Fire-Extinguishing System

FUEL

Total capacity = 586 gallons (3,960 lb, 1,797 kg)

Boost pump switches:

- ON—Boost pump receives power continuously
- OFF—Boost pump off, no power
- NORM—Automatic boost pump activation for start, fuel transfer, and low fuel pressure in engine supply line
- Fuel transfer rate to selected wing is approximately 600 pounds per hour.
- Low fuel pressure light illuminates at a decreasing pressure of 4.4 psi and goes out above 6.4 psi.
- Fuel low level lights illuminate at 220 ±10 pounds in the respective tank with input from float switch.
- Fuel gage light illuminates when a fault has been detected by the signal conditioner in the fuel quantity system.

See Figures SR-12 to SR-13.

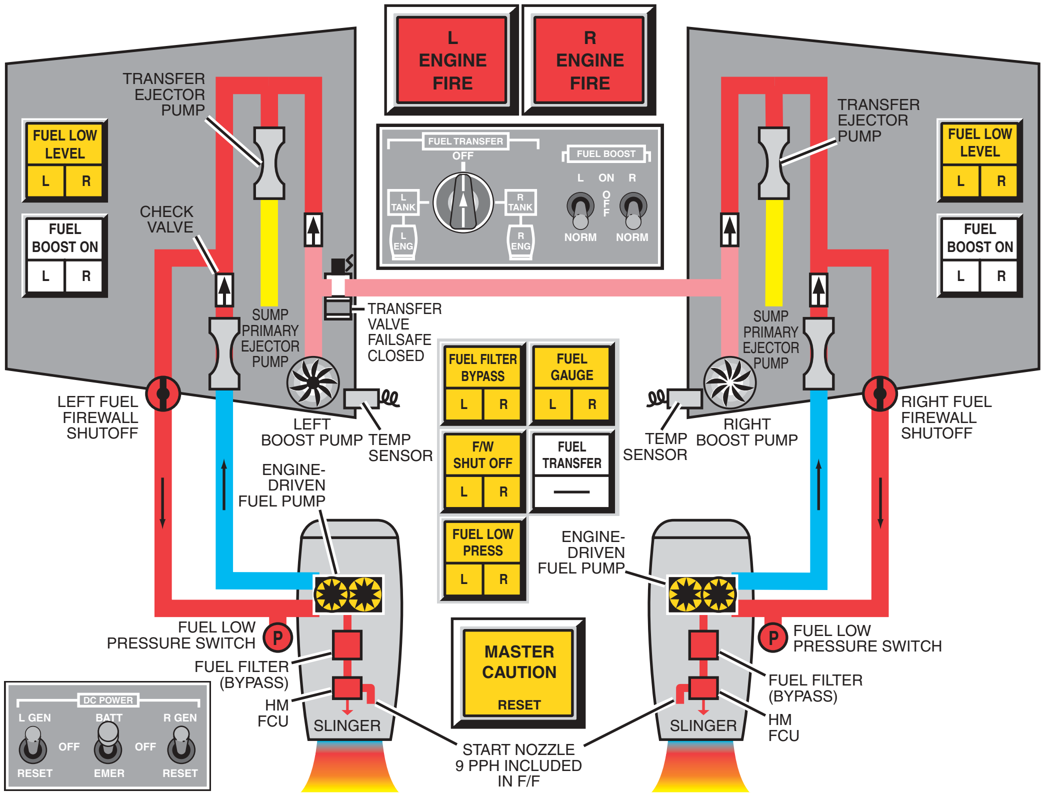


Figure SR-12. Fuel Transfer System—Normal Operation

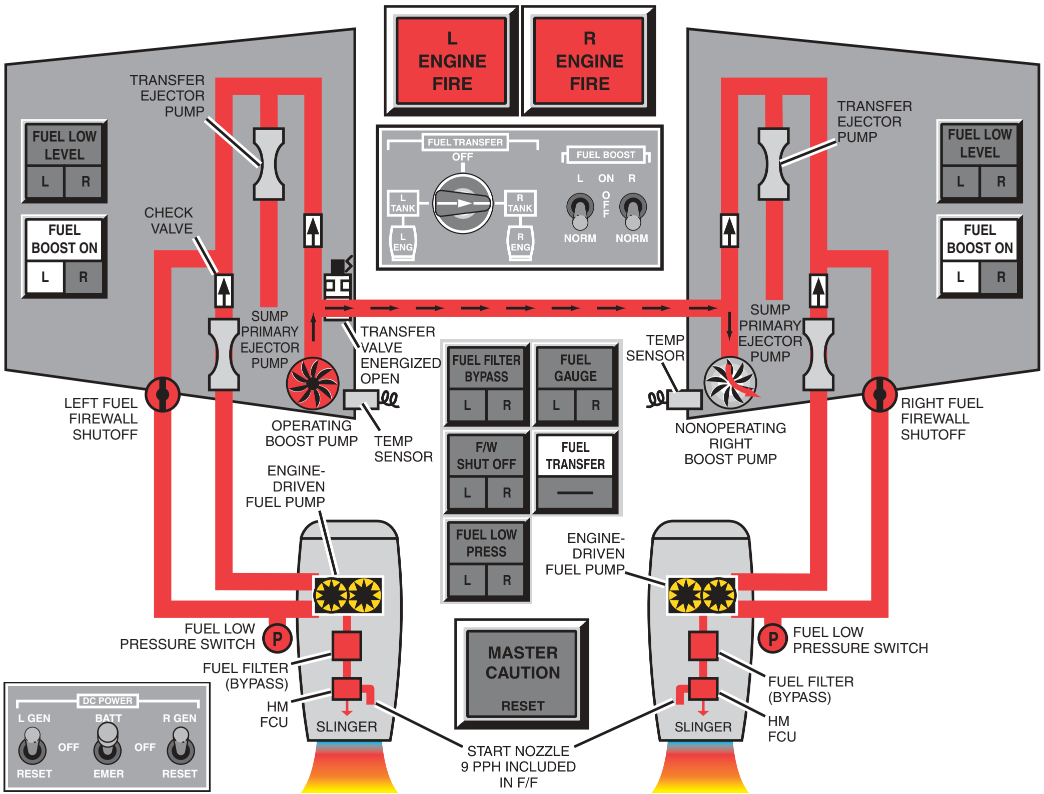


Figure SR-13. Fuel Transfer System— Fuel Transfer Operations

HYDRAULICS

1. Quantities

   - Total system—8.3 liters
   - Reservoir capacity—2 liters

2. Engine-driven pumps—flow rate 3.25 gpm

3. Open center system (Figure SR-14):

   - Bypass valve open (normal—open center)—60 psi
   - Bypass valve closed (closed center system operation)—1,500 psi
   - Fluid can be added without hydraulic mule.

4. Landing gear warning horn sounds:

   - Either throttle less than 85% N_2 and the speed below 130 KIAS; the horn can be silenced.
   - Flaps beyond approach flaps regardless of throttle position; the horn cannot be silenced
   - The rotary test switch is in the LDG GEAR position.

5. Landing gear:

   - Normal or emergency DC power is required for hydraulic retraction and extension (Figure SR-15 and SR-16).
   - Held extended and retracted by mechanical locks.
   - Freefall/pneumatic system is the emergency backup for extension (Figure SR-17).
   - The uplock can be released hydraulically, mechanically, and pneumatically.

6. Speedbrakes (Figure SR-18):

   - Held retracted by actuator mechanical lock and trapped fluid; they are held extended by trapped fluid.
   - Retracted normally with the switch in RETRACT; they are also retracted if either throttle is advanced above 85% N_2 and by flap movement through the 38° flap position switch.

- Extended normally with the switch and on the ground automatically as flaps extend through 38º toward the 60º position. Flap extension of speedbrakes is overrideable by either throttle above 85% N_2 to the retracted position.

- Speedbrake safety valve fail-safes open.

- Require normal DC power to remain extended; they will blow to trail immediately upon DC POWER failure. The speedbrakes safety valve fail-safes open and releases the hydraulic lock (trapped fluid).

- System pressure is required for extension and retraction.

7. Flaps (Figure SR-19):

- Flaps can be extended or retracted on normal or emergency bus power.

- Flaps are electrically controlled and hydraulically actuated.

- Flaps are held retracted by trapped fluid.

- Flaps are held in each selected position by trapped fluid.

- Flap actuators are mechanically interconnected to prevent split flaps.

- Master caution and FLAPS >35° lights illuminate on the ground with both throttles above 85% N_2 with FLAPS in the 60° position. In flight FLAPS >35° will illuminate at any throttle setting with flaps beyond 35°.

8. Thrust attenuators (Figures SR-20 and SR-21):

- Normal DC power required.

- There is one relay controlling both actuators with both engines running.

- On the ground, one squat switch and throttles in idle are required for deployment.

- Master caution lights with either throttle above 85% N_2 and thrust attenuator switch in STOW position.

- When the throttle is advanced to start, only that engine's thrust attenuator bucket deploys.

- When a throttle is moved to OFF, only that engine thrust attenuator bucket stows.

9. Antiskid brakes (Figure SR-22):

   - A digital anti-skid BTU with 5 round mechanical shutters indicate malfunctions and is located behind a door in the right lower aft wall of the forward baggage compartment.
   - Separate from the main airplane hydraulic system with the reservoir located in the nose.
   - Normal DC power is required to operate the pump.
   - Antiskid protection is available only with power brakes.
   - Pneumatic brakes are a backup for the power brakes; no differential braking and no antiskid protection are available.
   - Antiskid protection drops out below 12 knots.
   - Power brake operates through the brake system circuit breaker.
   - Antiskid operates through the skid control circuit-breaker in series with the brake system circuit breaker.
   - Touchdown protection through the skid control circuit breaker requires weight-on-wheels 3 seconds, wheel speed above 61 knots and the squat switches to make power brake and antiskid available.
   - Dispatch with antiskid turned OFF is possible with 15° flap (ONLY).
   - Dispatch with both thrust attenuators and antiskid inoperative is prohibited.

The antiskid system can be dynamically self-tested by:

1. Turning the battery switch on with the antiskid switch ON
2. ROTARY TEST to the antiskid test position, then through annunciator test to the OFF position. Check the antiskid annunciator light went out in 3 seconds on the ground.
3. When the gear is extended the antiskid INOP light comes on 6 seconds and goes out.

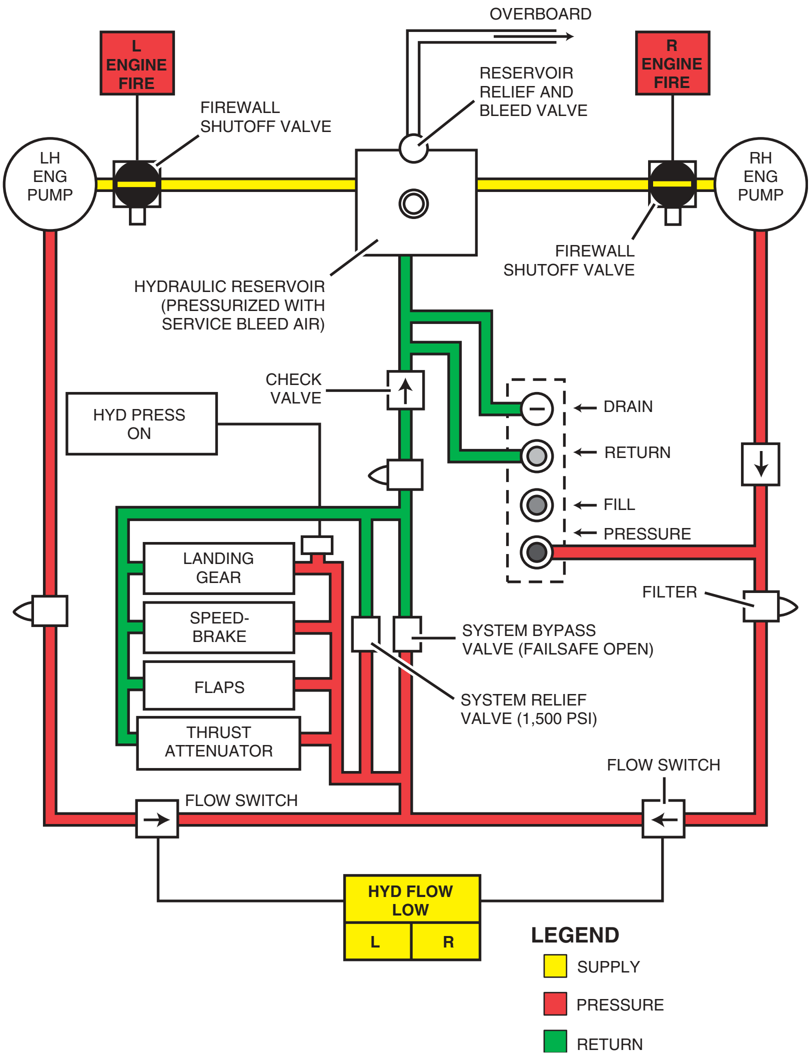


Figure SR-14. Hydraulic System Schematic

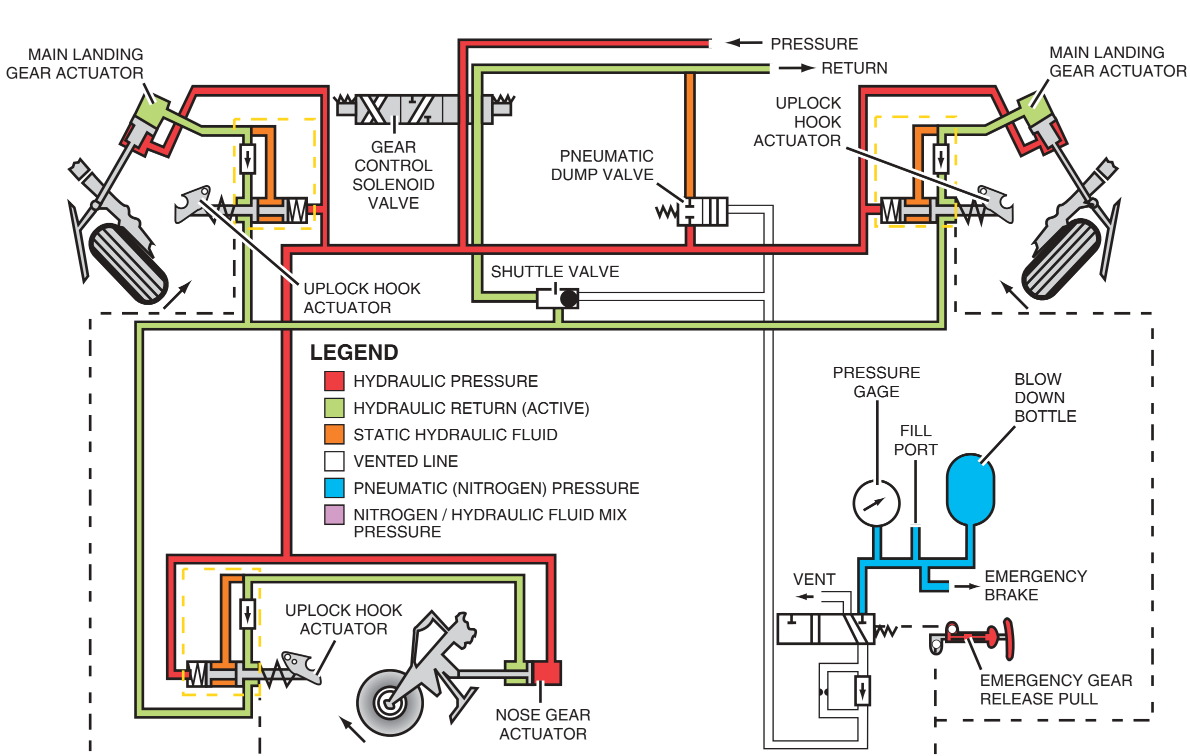


Figure SR-15 Landing Gear Retraction

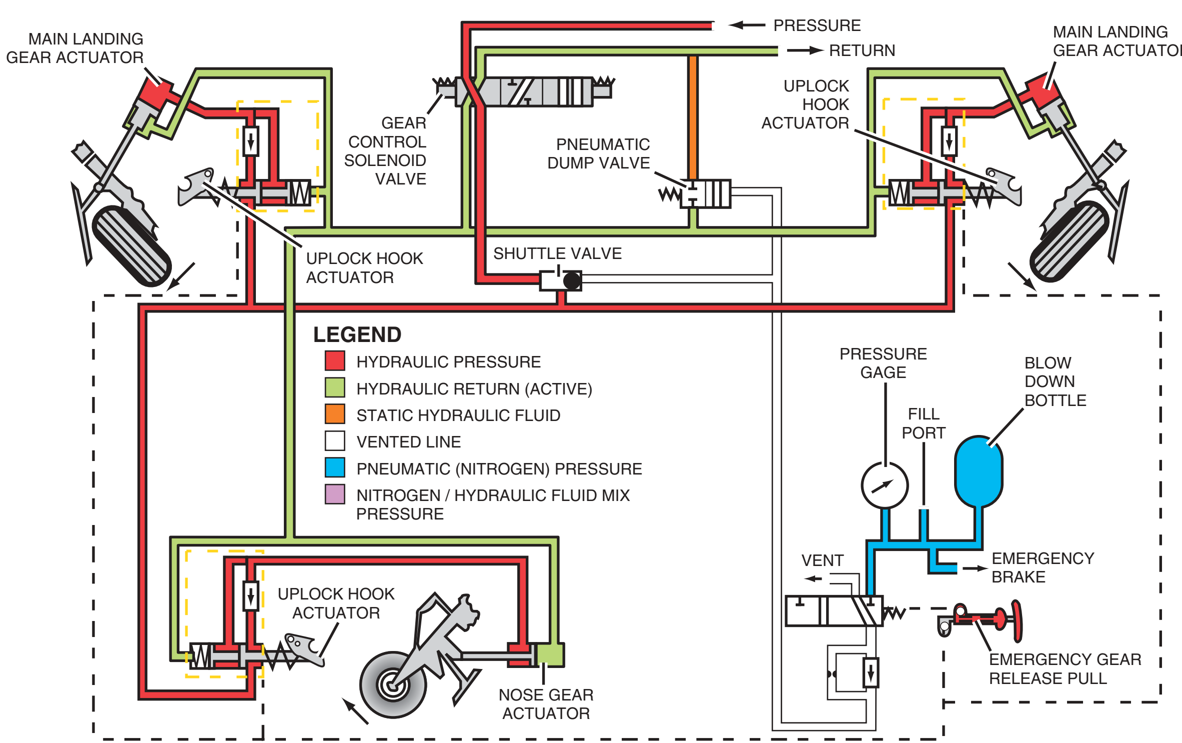


Figure SR-16. Landing Gear Extension

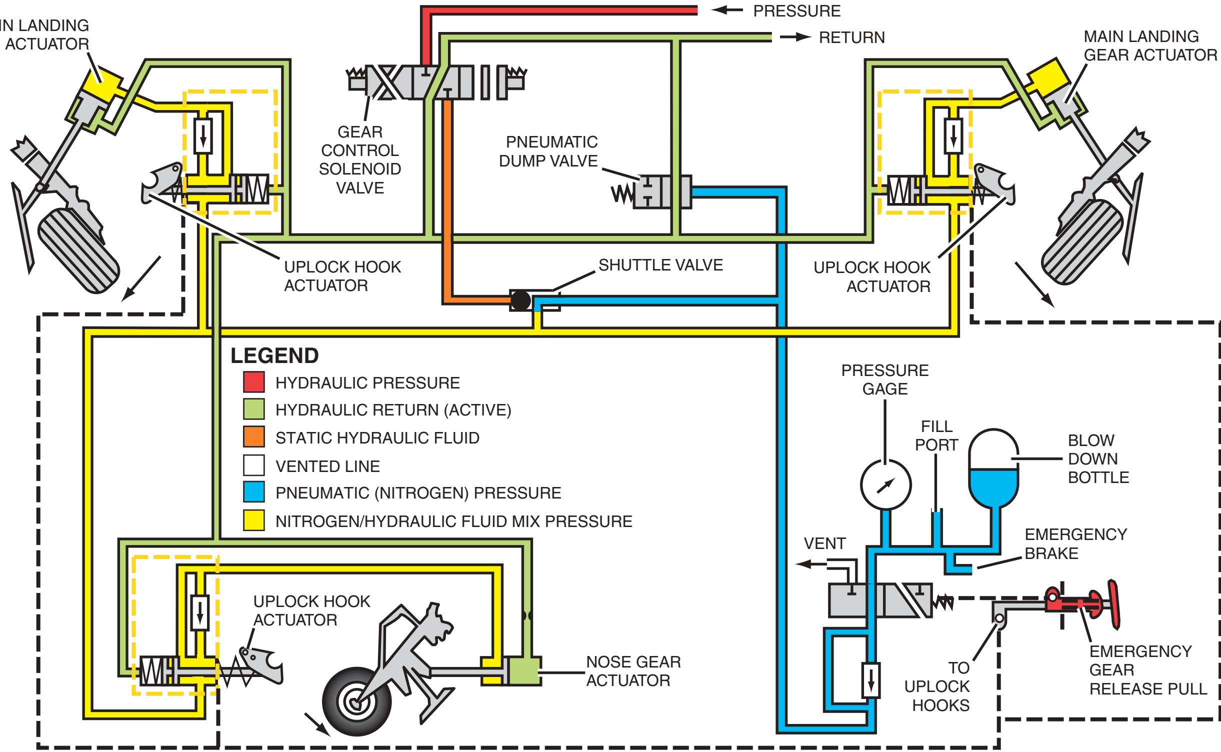


Figure SR-17. Landing Gear Emergency Extension

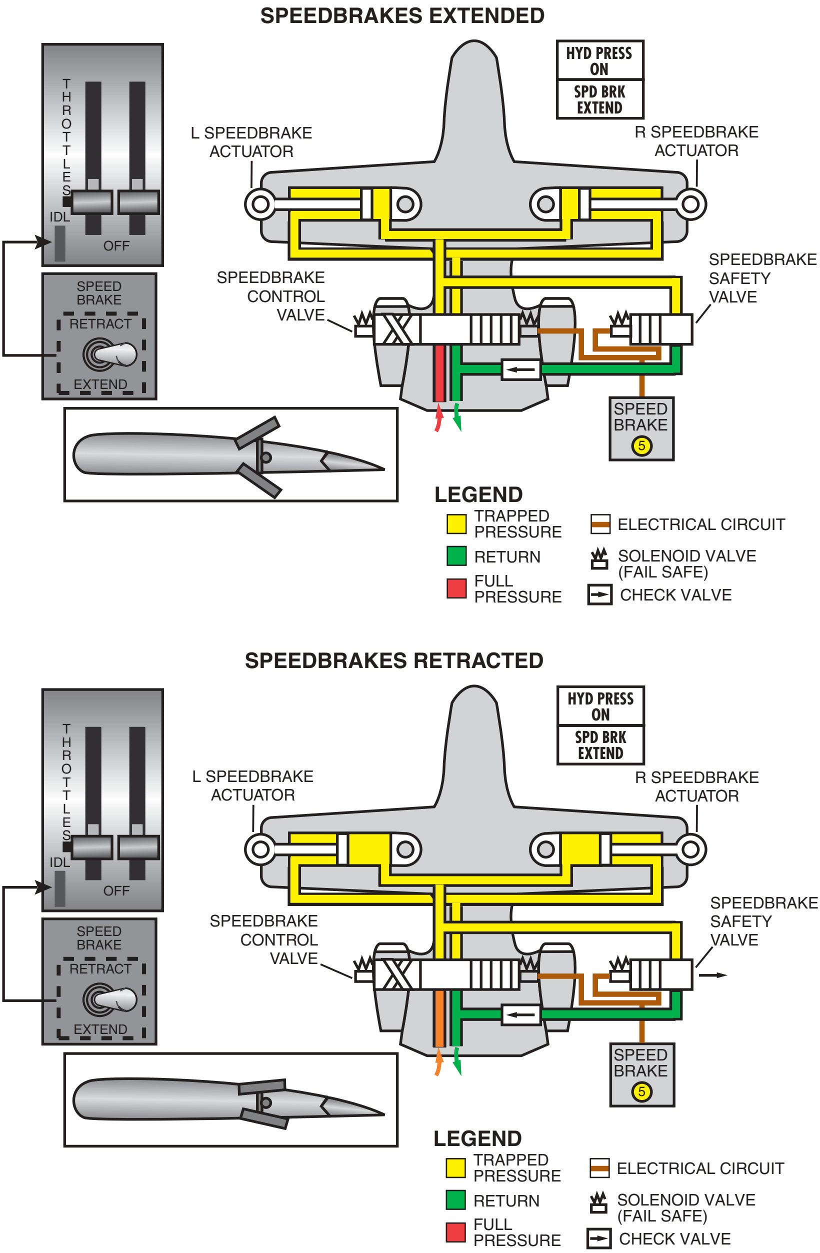


Figure SR-18. Speedbrake Operation

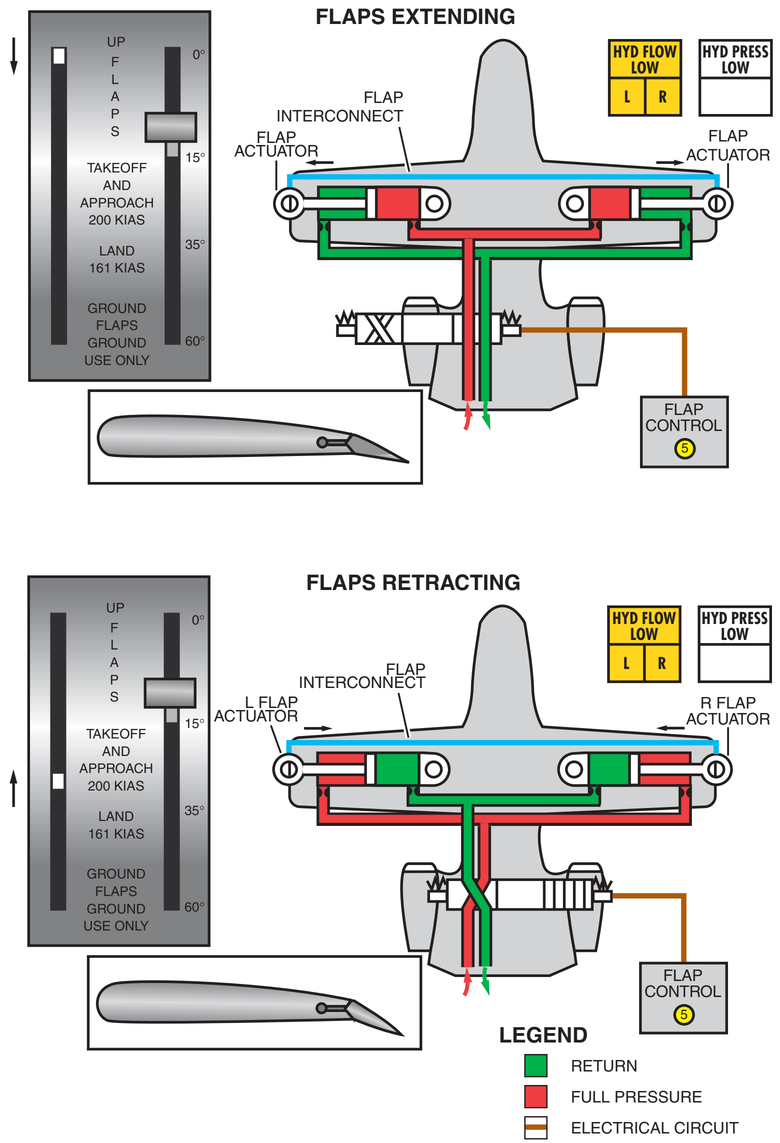
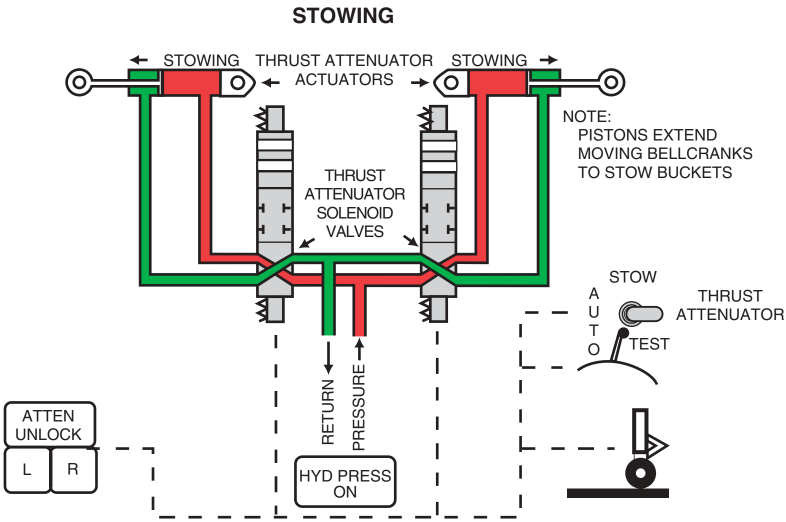


Figure SR-19. Flap Operation



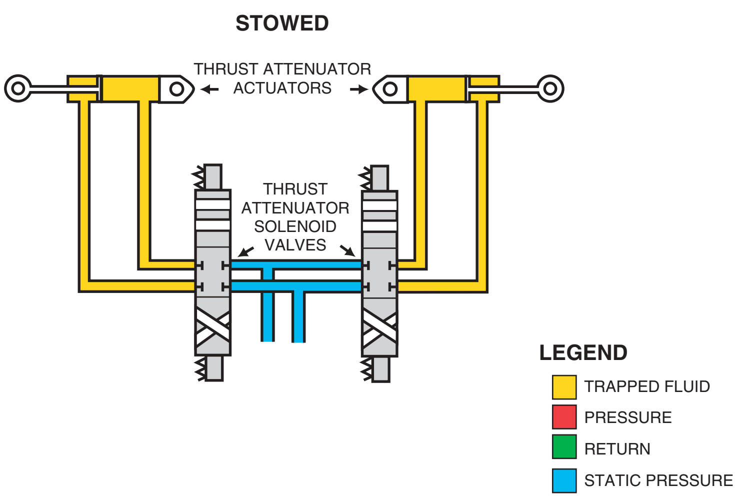


Figure SR-20. Thrust Attenuator System Schematics (Stowing)

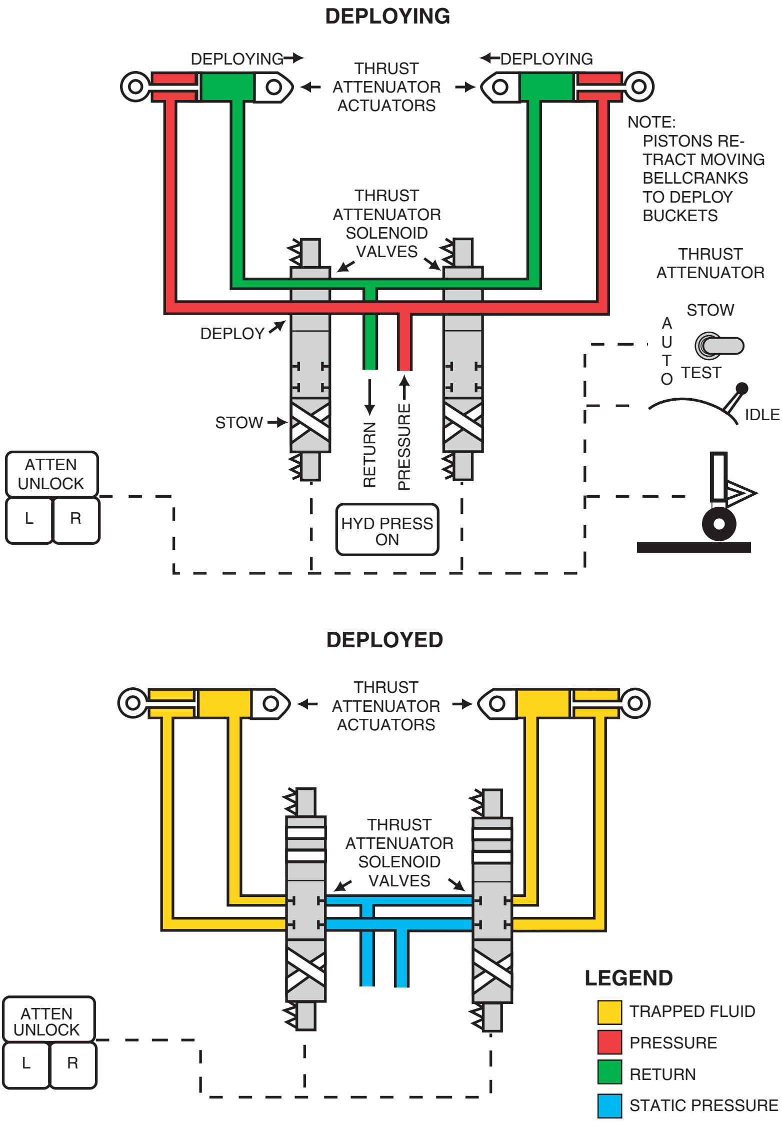


Figure SR-21. Thrust Attenuator System Schematics (Deploying)

FLIGHT CONTROLS

See Figure SR-22.

1. Rudder

   Maximum travel is 30º ±1º either side of center.

   - Trim tab travel is 20º ±1º either side of centerline (servo tab).
   - Nosewheel deflection 20º either side with full rudder pedal. Additional castering of 64º (84º total) with differential braking. Ground handling and towing maximum deflection of nosewheel is 95º either side of center.
   - ***Do not*** attempt flight if nosewheel steering is inoperative.

2. Elevators:

   - Maximum travel is 20º up and 15º down.
   - Trim tab travel is 12º up and 20º down.
   - Can be electrically trimmed.
   - If equipped with optional copilot electric trim, the pilot's has priority.
   - Trim tabs on both elevators.

3. Ailerons:

   - Maximum travel is 23.5º up and 20.5º down.
   - Trim tab on left aileron only: maximum 20º up and 12º down.

4. Control lock secures throttles in cutoff and controls in neutral.

FLAPS AND SPEEDBRAKES

Refer to Hydraulics, this chapter.

ICE AND RAIN PROTECTION

NOTE

The 525A engine anti-ice and tail deice systems should be turned on in flight during indicated RAT of +10°C or below and visible moisture. Wing anti-ice should be on anytime visible accumulations of moisture are

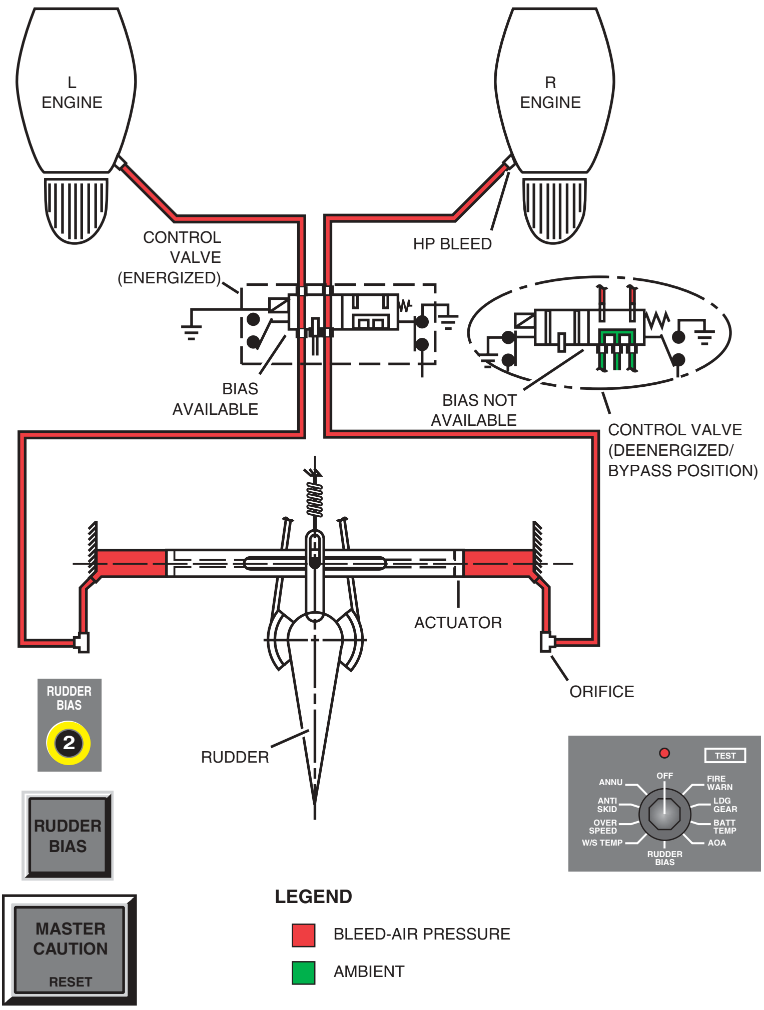


Figure SR-22. Rudder Bias System

observed in this temperature range. Tail deice should be on except when colder than –35ºC RAT. Wing inspection light is mounted on the left side of the fuselage.

Pitot-static heat two-minute limit on ground operation:

- Pitot tubes
- Four flight instruments static ports
- AOA probe—Monitored by AOA HTR FAIL annunciator light
- P/S HTR OFF light does not monitor AOA probe.
- See Figure SR-23

Windshield anti-ice:

- Windshield bleed switch (Figure SR-24) controls the temperature and supply not the volume. HI is used when OAT is –18ºC or colder (138 ±6ºC.280ºF). LOW is used when the OAT is warmer than -18ºC (127º ±6ºC/260ºF).
- Manual valves control volume.
- Wing valves automatically close for respective overheat of L or R WING ANTI-ICE light or L and R BLD AIR O'HEAT lights.
- Windshield air overheat light 149ºC (300ºF)
  - ON for temperature only if the switch is in HI or LO; the solenoid supply valve is energized closed simultaneously.
  - ON for pressure only (5 psi) if the switch is in off.
- Rain doors can be deployed mechanically to assist in deflecting the air and moisture away from the windshield (windshield bleed air must be off to deploy).
- Alcohol anti-icing is the backup for bleed air (ten-minute duration, 1.9 liters); normal DC power is required to operate.
- The bleed-air solenoid fails open with the loss of normal DC power, but automatic temperature control is lost.

ENGINE/WING ANTI-ICE

See Figures SR-25 and SR-26.

- Ground and in-flight icing conditions exist when the indicated RAT is +10°C or below in any kind of visible moisture.

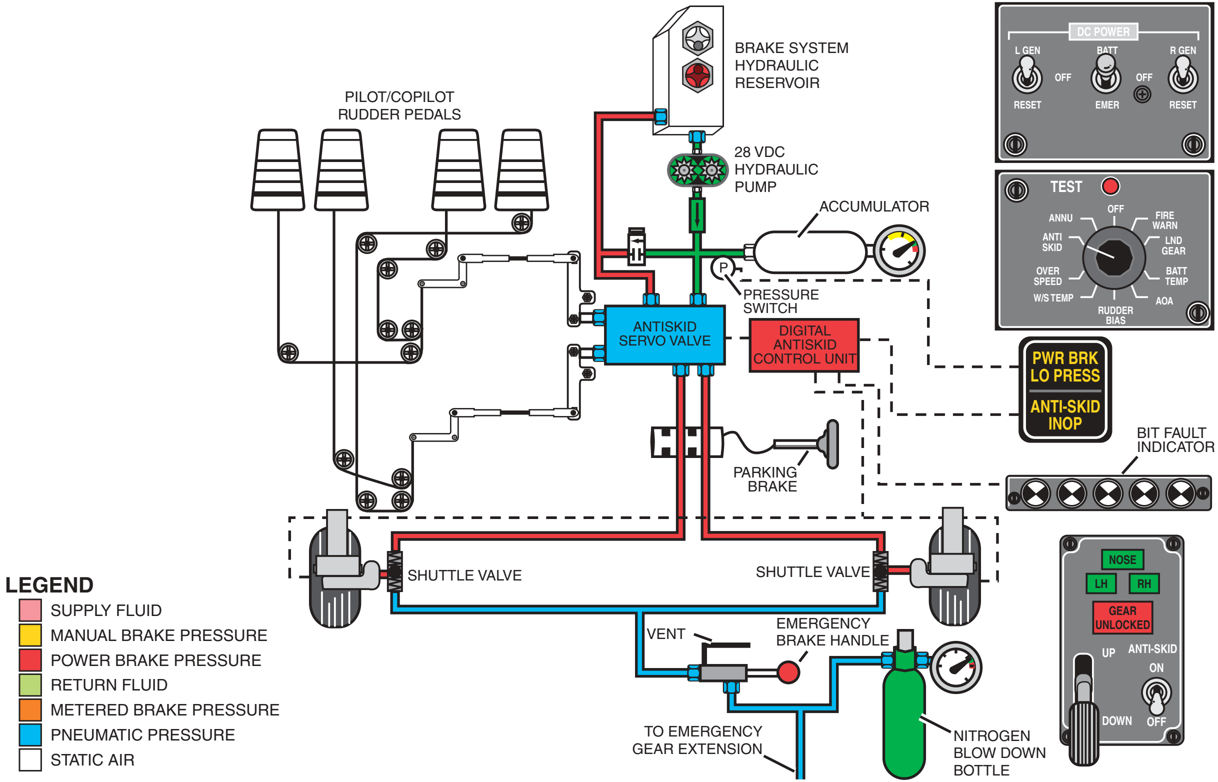


Figure SR-23. Antiskid Brake System Schematic

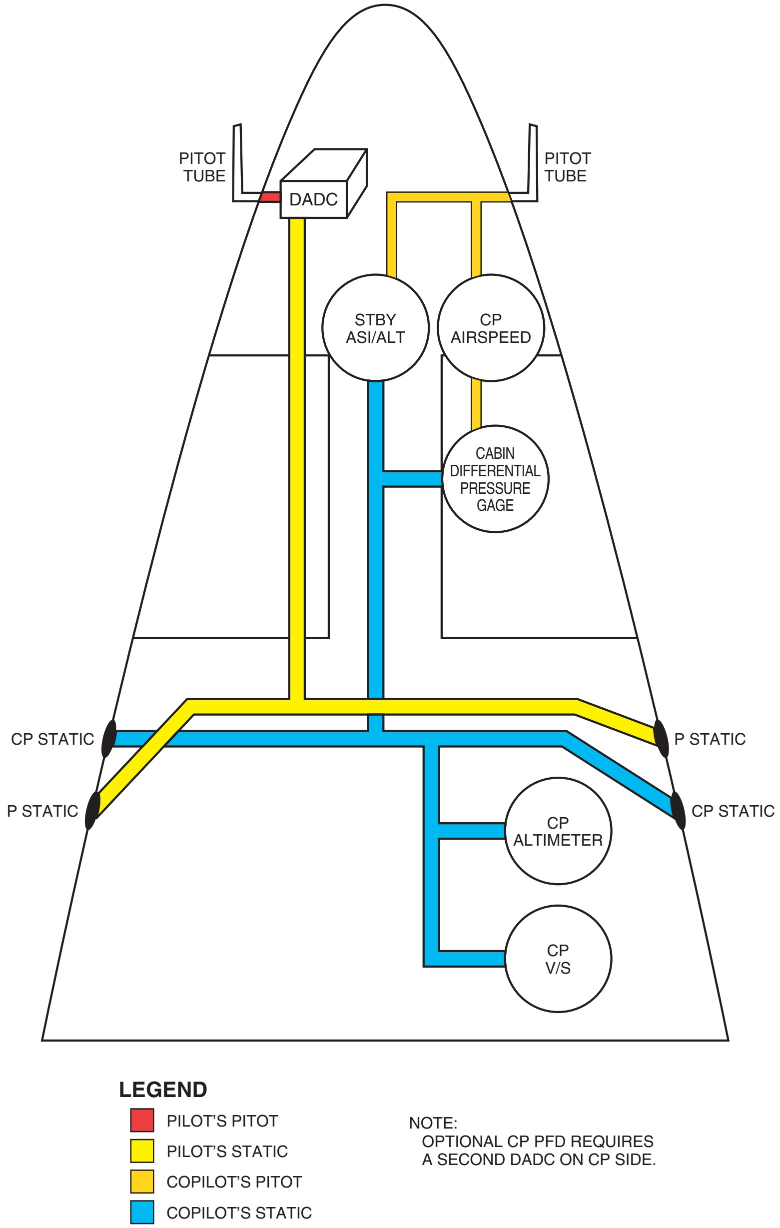


Figure SR-24. Pitot-Static System—Standard

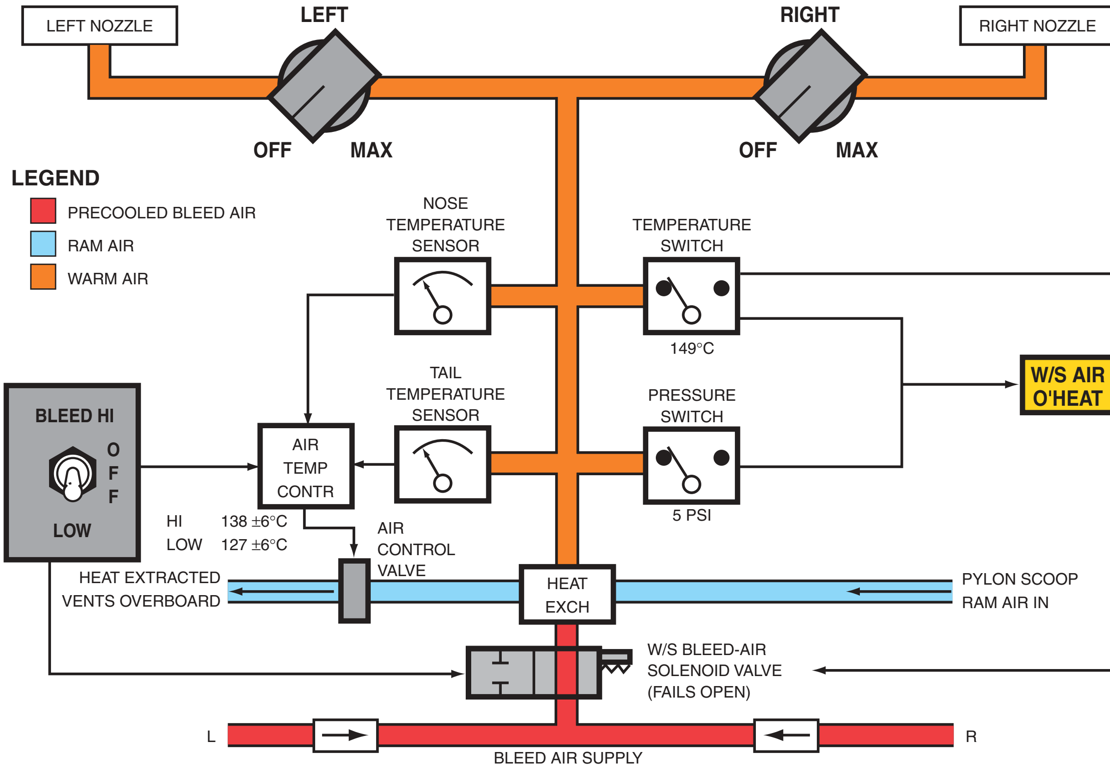


Figure SR-25. Windshield Anti-ice System

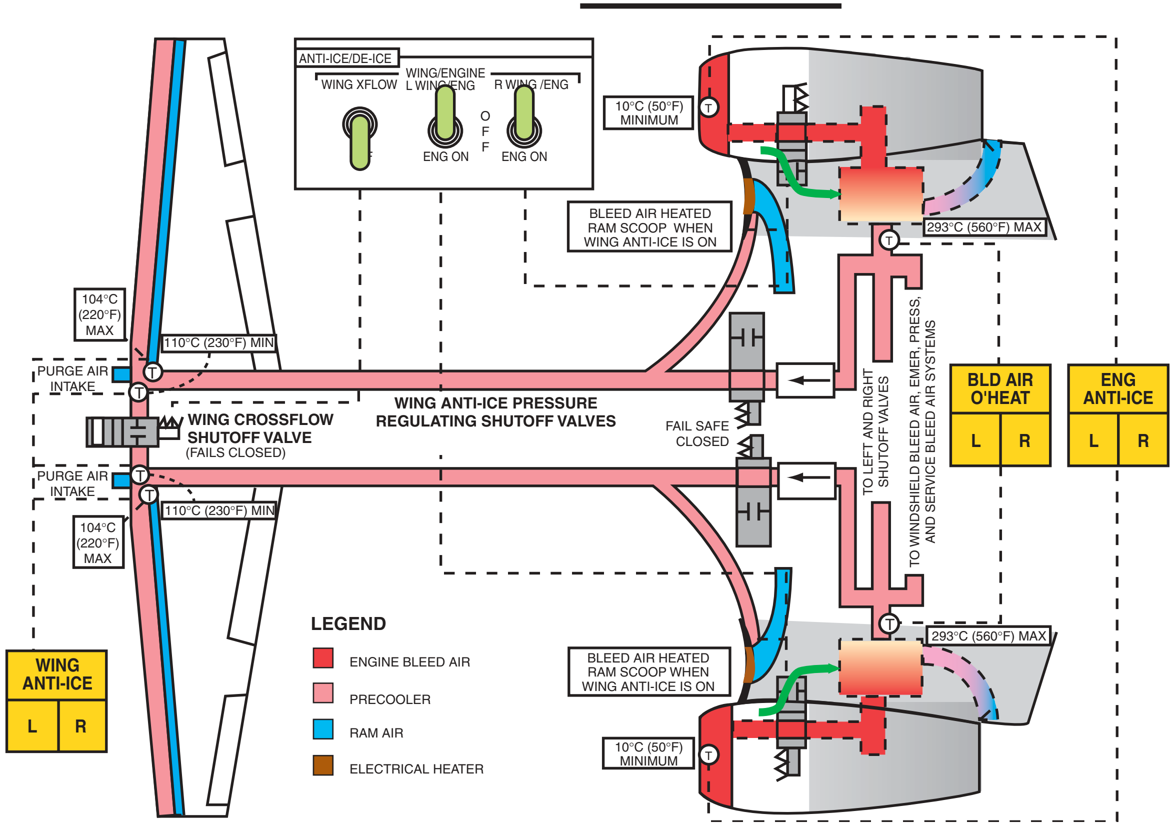


Figure SR-26. Engine /Wing Anti-ice System

- During ground or in-flight icing conditions the engines must be heated continuously.
- The wings must be heated during ground or in-flight icing conditions if the pilot observes visible accumulations of precipitation.
- During prolonged ground operations in icing conditions the wings must not be heated longer than one minute after preheating and the extinguishing of the wing anti-ice lights.
- The wing and engine anti-ice valves fail-safe open and the wing XFLOW valve fail-safes closed.
- Wing XFLOW is used:

  1. To heat the wing and pylon ram air scoop of an inoperative engine,
  2. To heat the wing and pylon ram air scoop when a wing anti-ice valve has failed closed, and,
  3. If the wing ANTI-ICE light illuminates in flight when not in icing conditions and the switches are off. (e.g., a wing anti-ice valve apparently failed open with overheat).

- Selecting engine or wing/engine lets normal DC power operate the ignition and T_{T2}.
- In flight selection deenergizes open the engine anti-ice valve at any N_2 rpm. The wing anti-ice valves immediately open if the throttle is above 75% N_2 and close if below 75% N_2.
- During ground operation, the squat switch removes the 75% speed sensor, and the wing and engine anti-ice valves are continuously open at all throttle positions in engine ON or WING/ENG.
- The wing undertemp sensor is mounted in the bleed-air line at the shank of the wing and the 104°C (220°F) overtemp sensor is also at the shank of the wing to sense a bleed-air line leak.
- Wing anti-ice provides bleed air to heat ram air pylon inlet for its respective side.
- The L or R ENG ANTI-ICE lights:
  - Illuminate during the initial preheating phase and extinguish when properly heated warmer than 10°C (50°F).
  - Go out when preheating is completed activating the undertemp sensor.
  - Do not illuminate for the first minute of undertemp to avoid nuisance trips of the lights. The pilot should detect and correct the condition during the first minute to avoid light activation.

    - Come on steady during the second minute to prompt the pilot to correct the undertemp condition.
    - Come on flashing with steady master caution after 50 seconds to more vigorously prompt the pilot to correct the undertemp condition.

- The wing anti-ice lights:
    - Illuminate during the initial preheating phase and extinguish when properly heated warmer than 110°C (230°F).
    - Illuminate for the same 1-and 2-minute criteria described under ENG ANTI-ICE light operations for undertemp and for underspeed (below 75% N_2).
    - Immediately illuminate flashing with the master caution lights armed to come on in one minute anytime a purge passage overtemp sensor detects 104°C (220°F) in any switch position.
    - Illumination of the BLD AIR O'HEAT light(s) and/or the wing ANTI-ICE light(s); automatically closes the wing anti-ice valves, if open, to prevent a wing overheat.

FRESH AIR light illuminates flashing when FRESH AIR is selected on AIR SOURCE SELECT switch. MASTER CAUTION also illuminates.

EMER PRESS ON illuminates flashing and MASTER CAUTION on steady in flight and ground when EMER is selected on AIR SOURCE SELECT switch. On the ground, the left squat switch prevents the emergency valve from opening.

TAIL DEICE BOOTS

See Figure SR-27

- Engine bleed air (23 psi) is used to inflate and deflate the horizontal boots.
- The boots have an 18-second cycle: 6 seconds for inflation of the left stabilizer boot, 6 seconds for deflation, and 6 seconds for right stabilizer boot and repeat sequence every 3 minutes in AUTO (up position of switch).
- Manual inflates both boots simultaneously.
- Do not activate the boots if indicated RAT is below –35ºC (–31ºF).
- During tail deice boot failure, do not extend flaps beyond 15º in icing conditions.
- TAIL DEICE FAIL light indicates possible voltage failure, timer failure, or a loss of pressure in the pressure cycle.

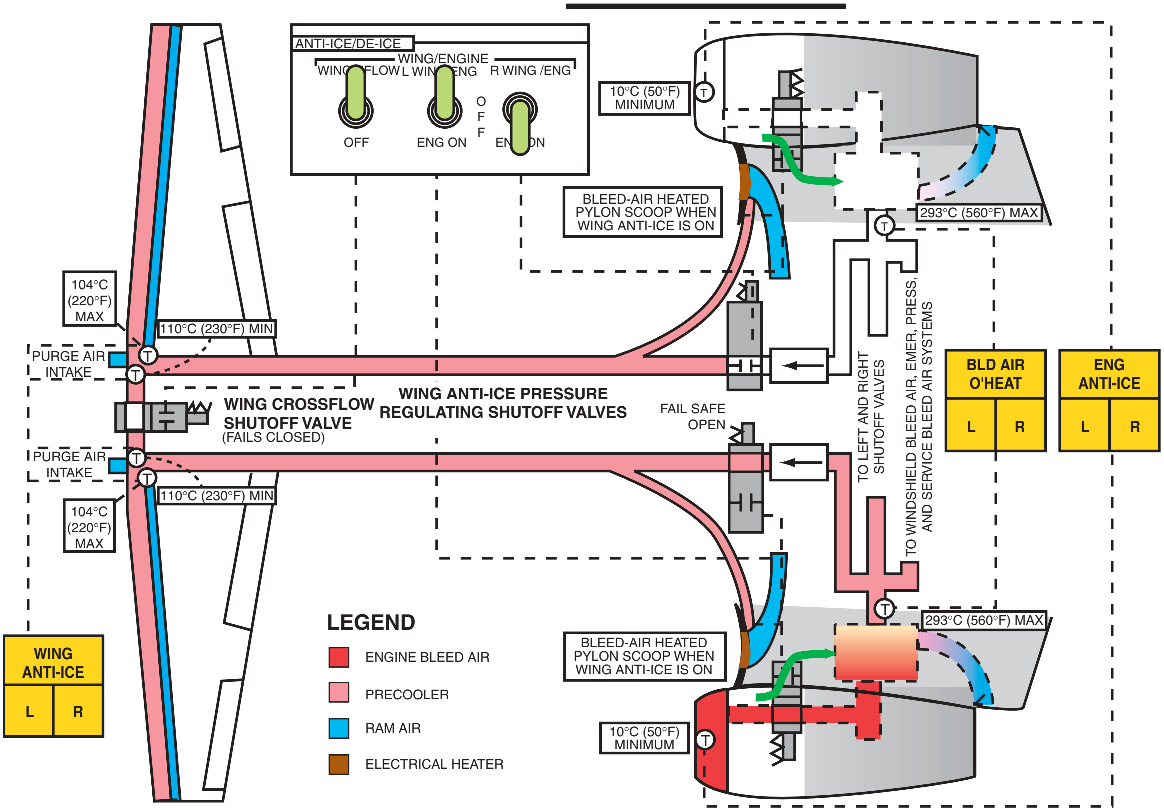


Figure SR-27. Engine/Wing Anti-ice System—Single Engine

ENVIRONMENTAL

The AIR SOURCE SELECT (Figures SR-29 and SR-30) has the following positions:

- OFF—The L and R PRSOV and windshield anti-ice control valves are closed; bleed air is still available for service air and anti-icing/deicing (23 psi). The airplane depressurizes at leak rate.

- FRESH AIR—Ground and unpressurized low-altitude operation only, aircraft will ***not*** pressurize in this position. Turns on axial fan to direct pylon ram air to ventilate the unpressurized pressure vessel. The L and R PRSOV and windshield anti-ice valves are closed.

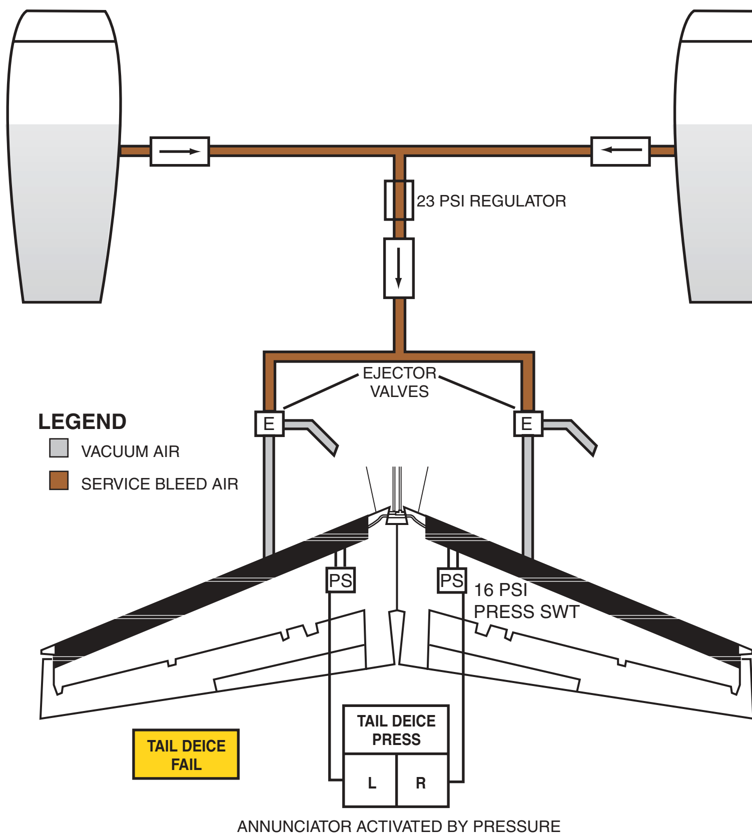


Figure SR-28. Tail Deice System

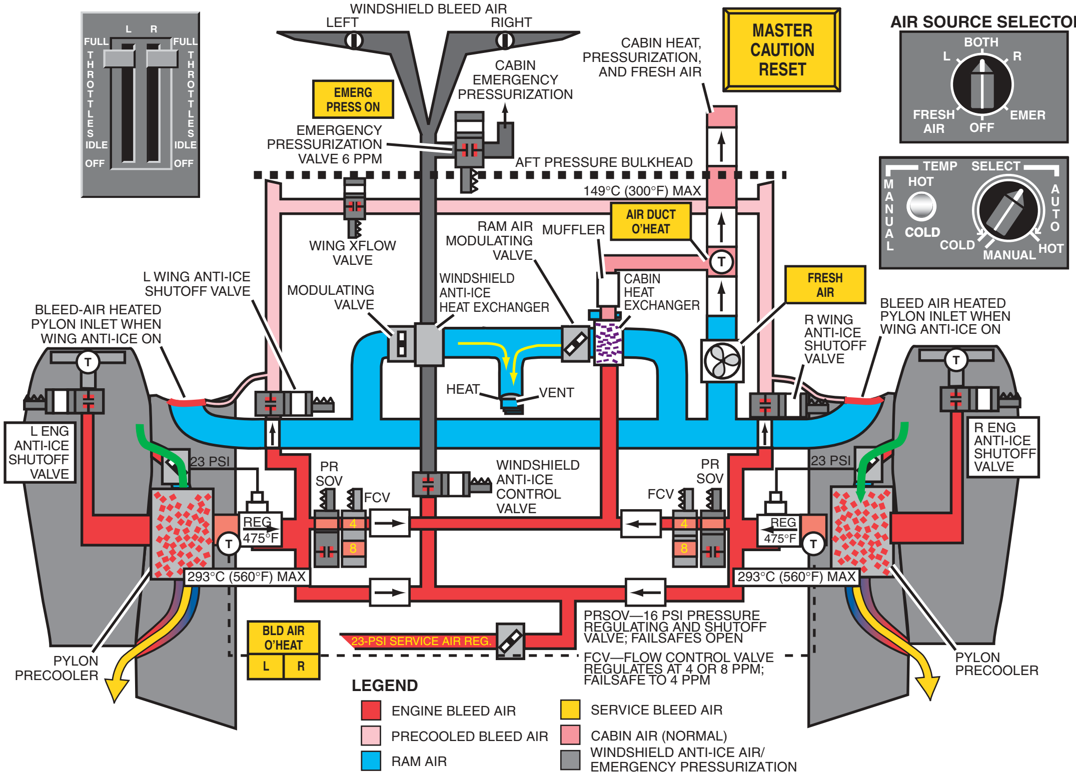


Figure SR-29. Air Supply to Cabin—SNs 0001 and Subsequent

Table SR-2. SOURCE SELECTIONS, VALVE POSITIONS AND FLOW RATES

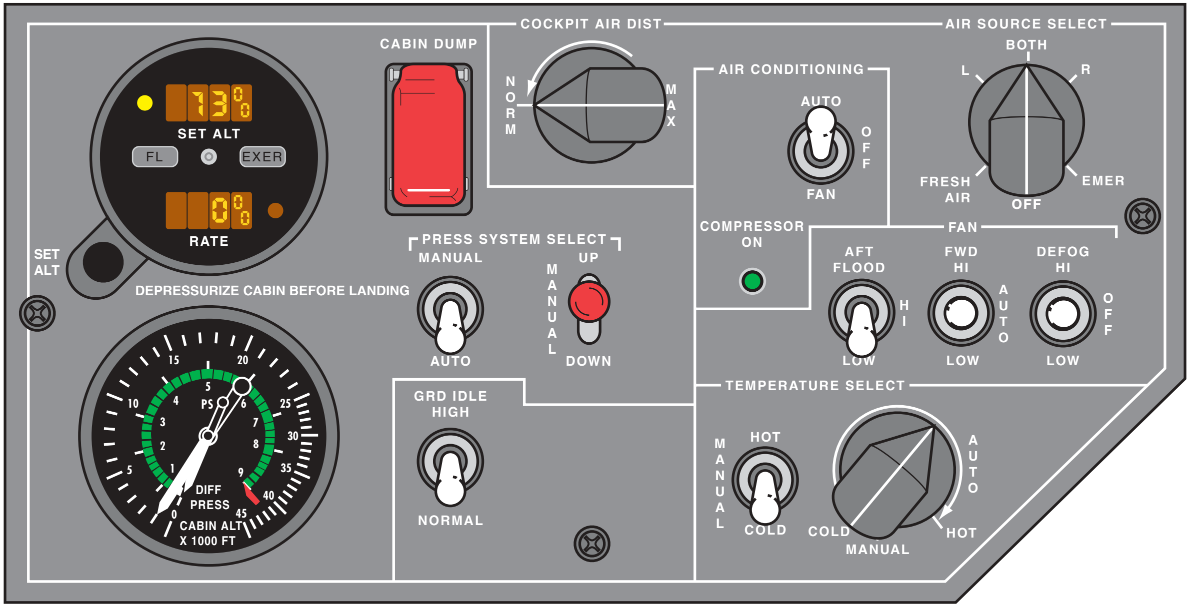
CONDITION	SOURCE SELECTOR POSITION	L PRSOV/ FCV-PPM	R PRSOV/ FCV-PPM	EMER VALVE-PPM	NET FLOW TO CABIN PPF/TEMP/PRESS
2 ENGINES OPERATING	BOTH	OPEN 4	OPEN 4	CLOSED 0	8 PPM 65–85°F
2 ENGINES OPERATING	L	OPEN 8	CLOSED 4/0	CLOSED 0	8 PPM 65–85°F
2 ENGINES OPERATING	R	CLOSED 4/0	OPEN 8	CLOSED 0	8 PPM 65–85°F
2 ENGINES OPERATING	EMER	CLOSED 4/0	CLOSED 4/0	OPEN 6	6 PPM 120°F***
2 ENGINES OPERATING	FRESH AIR	CLOSED 4/0	CLOSED 4/0	CLOSED 0	0 DEPRESSURIZE TO AMBIENT
2 ENGINES OPERATING	OFF	CLOSED 4/0	CLOSED 4/0	CLOSED 0	LEAK RATE TILL DEPRESSURIZED
L THROTTLE OFF, R ENGINE OPERATING	BOTH/R	CLOSED 4/0	OPEN 8	CLOSED 0	8 PPM 65–85°F
L ENGINE OPERATING, R THROTTLE OFF	L/BOTH	OPEN 8	CLOSED 4/0	CLOSED 0	8 PPM 65–85°F
L ENGINE OFF AND LOST DC POWER	ANY POSITION	CLOSED 4/0	OPEN 4	CLOSED 0	4 PPM CABIN MAY RISE
R ENGINE OFF AND LOST DC POWER	ANY POSITION	OPEN 4	CLOSED 4/0	CLOSED 0	4 PPM CABIN MAY RISE
L ENGINE FLAMEOUT, L THROTTLE IDLE, R ENGINE OPERATING	BOTH/R	CLOSED 4/0	OPEN 4	CLOSED 0	4 PPM CABIN MAY RISE
R ENGINE FLAMEOUT, R THROTTLE IDLE, L ENGINE OPERATING	L/BOTH	OPEN 4	CLOSED 4/0	CLOSED 0	4 PPM CABIN MAY RISE

NOTE:

1. THE FCV (4 OF 8 PPM) FLOW CONTROL VALVE FAIL-SAFES TO THE 4-PPM POSITION WITH LOST DC POWER AND THE PRSOV PRESSURE REGULATING AND SHUTOFF VALVE NORMALLY REGULATES 16 PSI IS A FAILSAFE OPEN VALVE.
2. WITH BOTH ENGINES OPERATING IN BOTH AT 4 + 4 = 8 PPM FLOW TO THE CABIN.
3. WITH L OR R SELECTED, THE SELECTED FCV IS ENERGIZED TO A FULL 8 PPM TO CABIN WHILE THE NON-SELECTED FCV IS CLOSED BY LOGIC.
4. ANYTIME A THROTTLE IS SELECTED OFF, THE REMAINING ENGINE FCV IS ENERGIZED TO 8 PPM FLOW TO THE CABIN BY LOGIC.
5. IN THE UNLIKELY EVENT OF ENGINE FAILURE AND THE LOSS OF NORMAL DC POWER, THE OPERATING ENGINE FCV FAILSAFES OPEN TO 4 PPM FLOW TO THE CABIN. AT HALF THE NORMAL FLOW RATE TO THE CABIN, CABIN PRESSURE MAY RISE AND DIFFERENTIAL PRESSURE REDUCE.
6. SHOULD AN ENGINE FLAMEOUT, THE 8 PPM COMMAND WILL NOT SIGNAL THE LIVE ENGINE FCV UNTIL THE DEAD ENGINE THROTTLE IS SELECTED OFF. IN THE MEAN TIME 4 PPM IS AVAILABLE FROM THE LIVE ENGINE FCV AND THE CABIN MAY RISE.

***WINDSHIELD BLEED AIR OFF = 49°C (120°F); WINDSHIELD BLEED AIR HI = 138°C (280°F); WINDSHIELD BLEED AIR LOW = 127°C (260°F)

CLIMB AND CRUISE



IF THE PASSENGERS ARE COLD AT THE 1 O'CLOCK COCKPIT AIR DIST KNOB POSITION (70% CREW AND 30% PASSENGERS), SELECT THE 11 O'CLOCK POSITION SO THEY GET MORE HEAT (60% AND 40% TO PASSENGERS).

Figure SR-30. Environmental Control Panels

- L—The left PRSOV is deenergized open and L FCV is energized to allow air to flow to the cabin at 8 pounds per minute. The R PRSOV is closed.

- BOTH—Deenergized both the L and R, PRSOV valves open at 4 ppm each allowing 8 pounds per minute flow into the cabin.

- R—The right PRSOV is deenergized open and the R FCV is energized to allow air to flow to the cabin at 8 pounds per minute. The L PRSOV is closed.

- EMER—Provide windshield anti-ice heat exchanger bleed air at 49ºC (120ºF) to be regulated by the emergency valve at 6 pounds per minute to the cabin.

- If an engine fails in flight, the good engine now supplies it's normal four pounds per minute. The signal for eight pounds per minute occurs when the failed engine throttle is selected OFF. Cabin pressure loss may be experienced if there is a delay in moving the throttle to OFF on the failed engine.

BLD AIR O'HEAT light illuminates when cooled bleed air exiting the precooler exceeds 560°F. Reducing engine rpm should extinguish light below 540°F.

AIR DUCT O'HEAT illuminates flashing when the temperature of air entering the cabin ducts exceed 149°C (300°F). MASTER CAUTION comes on steady. The system is protected in auto temperature mode.

During ground operations:

- Before first engine start only flood cooling air is available. After first engine start with 23 psi service air available, flood cooling or overhead WEMAC air is selectable.

- Cabin air flowing into the aft evaporator inlet, which is warmer than the 65°F temp sensor, shuts off all engine bleed air to the cabin by closing the 8-ppm flow control and shutoff valve. Existing warm cabin air can be cooled by the vapor cycle compressor using EPU or RH generator power.

- Vapor cycle air-conditioner refrigerant is R134A.

The following table (Table SR-3) shows *AFM* recommended environmental panel comfort settings. Cabin normal settings are listed in left column, and variations from normal are listed for the conditions in the columns to the right. It is recommended that the AUTO-TEMP selector remain at the 1 o'clock position. Recommended settings for descent are also listed.

Table SR-3. ENVIRONMENTAL PANEL COMFORT SETTINGS

	CABIN NORMAL SETTINGS OR IF INITIALLY COOL OR COLD	IF CABIN INITIALLY WARM OR HOT	IF COCKPIT WARM	IF COCKPIT COOL
AIR SOURCE SELECTOR	BOTH			
AIR COND	AUTO			
AFT FAN	LOW	HI OR FLOOD		
FWD FAN	AUTO	HI	LOW/HI	
TEMP SELECT (AVOID CHANGING)	AUTO (1 O'CLOCK)			
DEFOG FAN	OFF			
COCKPIT AIR DIST (4 DETENTS TO PROPORTION AIR)	NORM		NORM & 2nd PSN (11 O'CLOCK) DAY OPS	3rd PSN (1 O'CLOCK) OR MAX NIGHT OPS

FOR DESCENT AFTER COLD SOAK AT ALTITUDE

A. FWD EVAPORATOR FAN SPEED HI
B. SELECT THE DEFOG FAN SWITCH TO HI PRIOR TO DESCENT AND APPROACH.
C. COCKPIT AIR DIST TO MAX ROUTES ADDITIONAL WARM AIR FORWARD FOR CREW COMFORT AND WINDSHIELD WARMUP (MAX = 80% AIR TO CREW AND 20% AIR TO PASSENGERS).
D. SELECT WINDSHIELD ANTI-ICE BLEED AIR TO LOW AND OPEN VALVES.
E. USE CRUISE DESCENT WITH ITS HIGHER N_1S FOR WARMER BLEED AIR TEMPS TO BETTER HEAT.
F. THE CABIN AND COCKPIT

COCKPIT AIR DIST KNOB

SWITCH DETENTS	CREW AIR	PASSENGER AIR
NORM (9 O'CLOCK)	50%	50%
11 O'CLOCK	60%	40%
1 O'CLOCK	70%	30%
MAX (3 O'CLOCK)	80%	20%

MAX IS USED AFTER HIGH ALTITUDE COLD SOAK FOR DESCENT TO INCREASE AIR FOR CREW COMFORT AND WINDSHIELD WARMUP.

PRESSURIZATION

- The pressure controller automatically corrects for non-standard altimeter settings by ARINC bus data from the digital air data computer.
- Normal DC power required and 23-psi air/vacuum for AUTO and ISOBARIC MODE operation (Figure SR-31).
- ISOBARIC MODE—Indicated by amber light and FL displayed in set ALTITUDE scale when the air data computer fails.
- MANUAL MODE—Can be operated without normal DC power and without 23 psi vacuum. Will not override 9.0 psid maximum differential valves.
- HIGH ALTITUDE MODE—If the pressure controller is set bleow 8,000 feet field elevation for landing, the red CABIN ALT light will illuminate at cabin pressures over 10,000 feet. If the pressure controller is set above 8,000 to 14,000 feet field elevation for landing, the red CABIN ALT light will illuminate if cabin pressure is over 14,500 feet. The high altitude mode will increase cabin rates of descent up to 2,500 feet per minute.
- Provides a sea level cabin to 23,586 feet with 9.0 psid differential in manual. Provides an 8,000-foot cabin at 45,000 feet with 9.0 psid in AUTO on digital controller.
- AUTO—The pressure controller uses the auto schedule to control cabin pressure and rate-at-climb.
- Cabin limit valves operate at 14,500 ± 500 feet.
- Normal DC power required for cabin dump to operate and it will not override cabin limit valves.
- Airplane is depressurized on the ground (right squat switch) with throttle below 85% N2.
- Above 85% N2 on the ground airplane goes into prepressurization mode (drives the cabin pressure downward toward 200 feet below field pressure altitude).
- Flight mode—Right squat switch activated, requires air data computer for AUTO operation or manual set CA or FL with SET ALT knob.

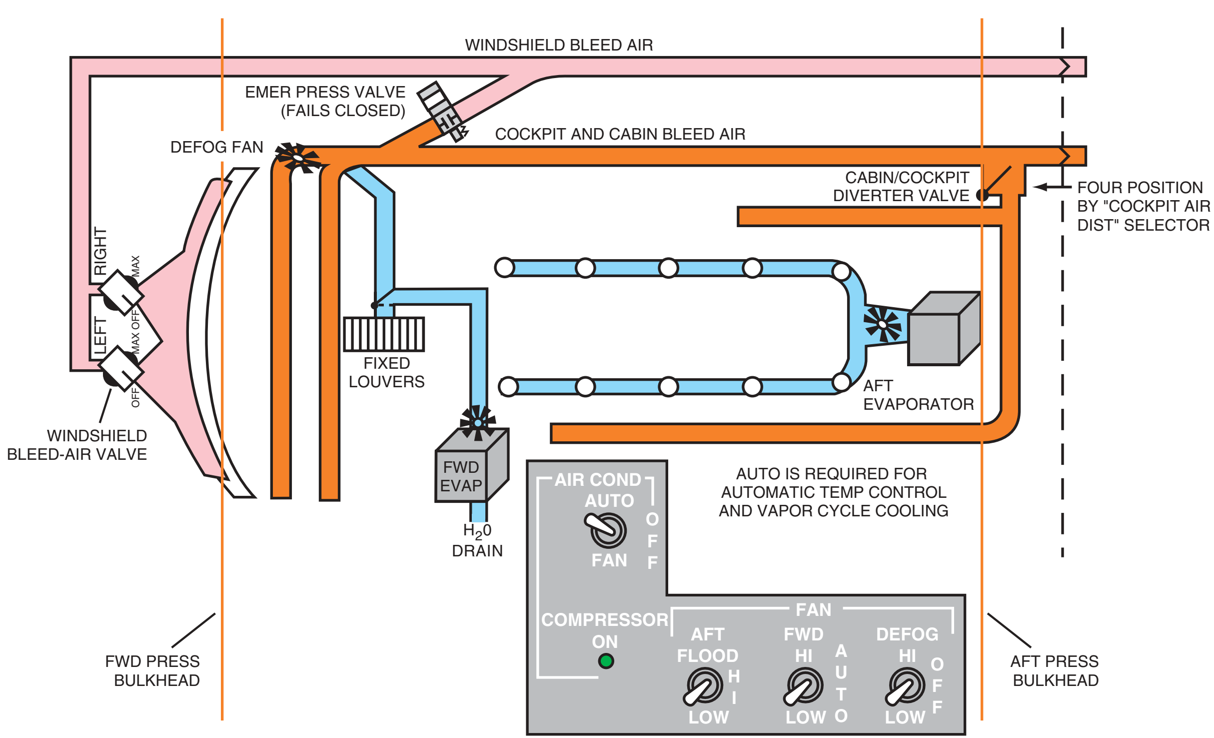


Figure SR-31 Cabin/Cockpit Distribution

OXYGEN

- 22 cubic-foot (619 liter) bottle is standard, 50 cubic-foot (1,407 liter) bottle is optional.
- The bottle pressure green arc is marked from 1,600 to 1,800 psi; this does not ensure oxygen availability to the crew (Figure SR-32).
- Automatic mask drop occurs at 14,500 ±500 feet cabin altitude only if normal DC power is available; the solenoid closes at 8,000 feet cabin altitude.
- EROS mask is standard and must be removed from the airplane and kept warm if the aircraft is subjected to 0°C or below.

VENTS, DRAINS, ANTENNAS

Figure SR-33 shows the 525A vent and drain locations. Figure SR-34 shows the typical locations of communication and navigation antennas.

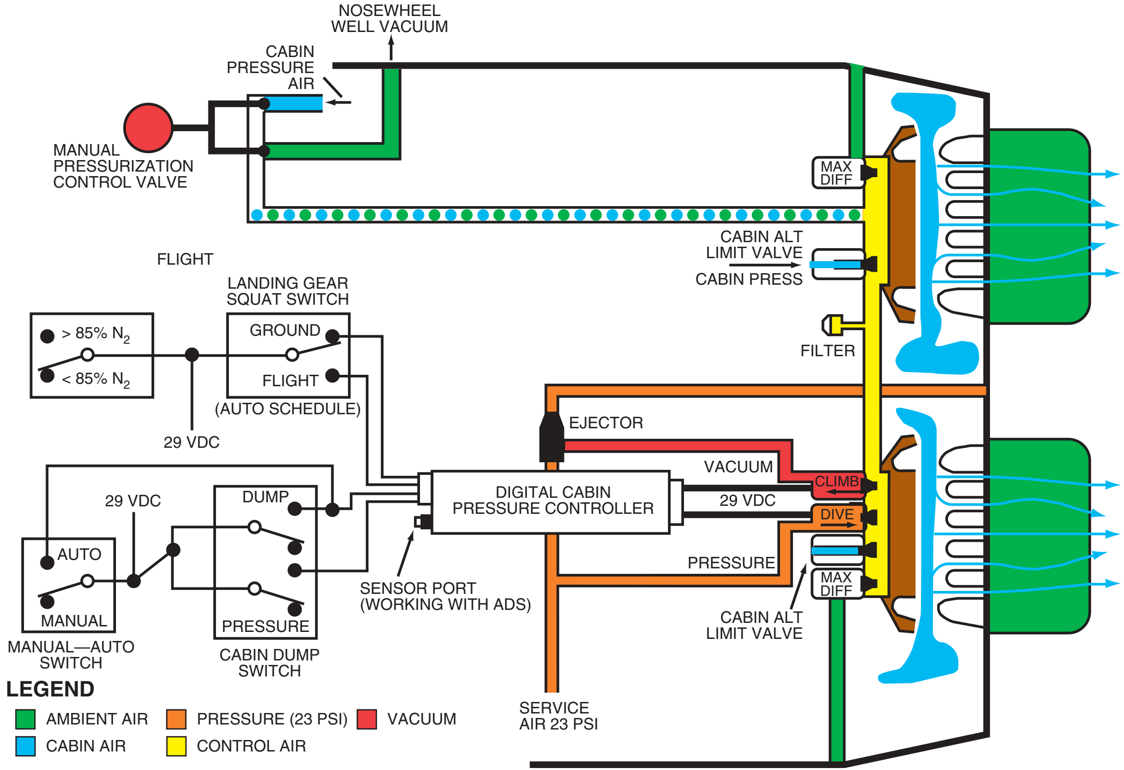


Figure SR-32 Pressurization System Diagram

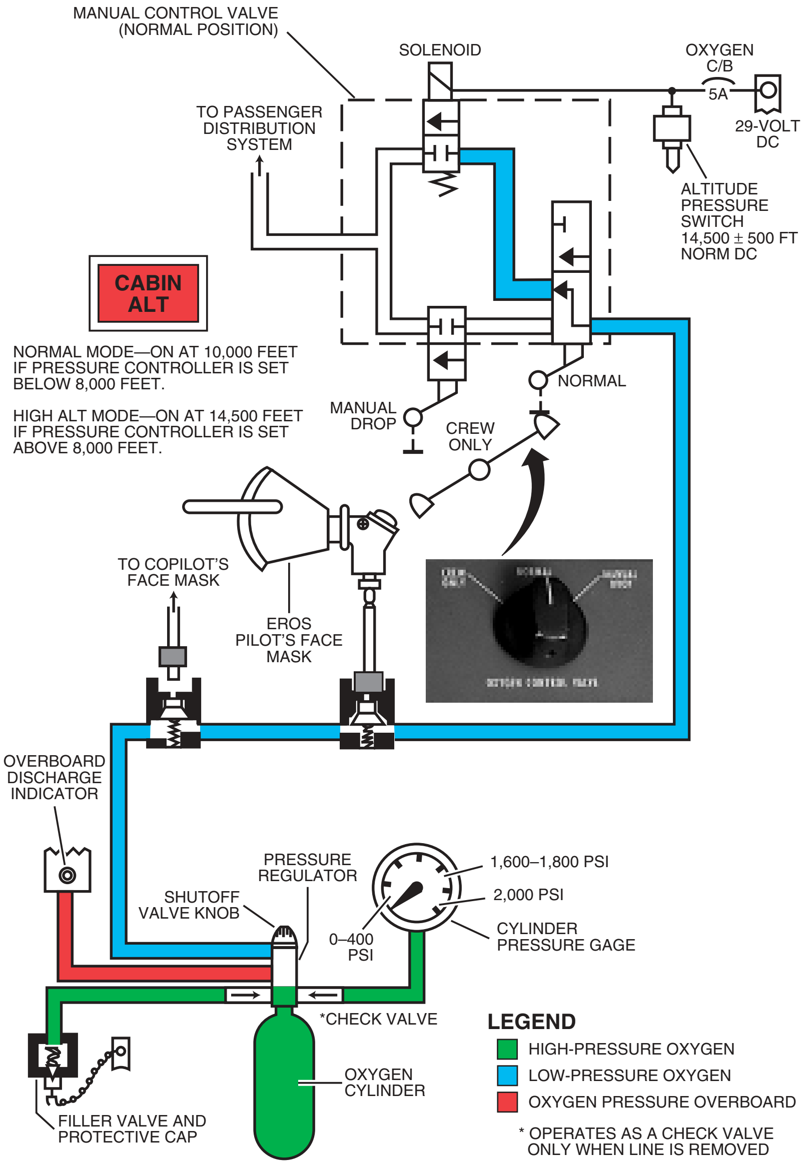


Figure SR-33. Oxygen System

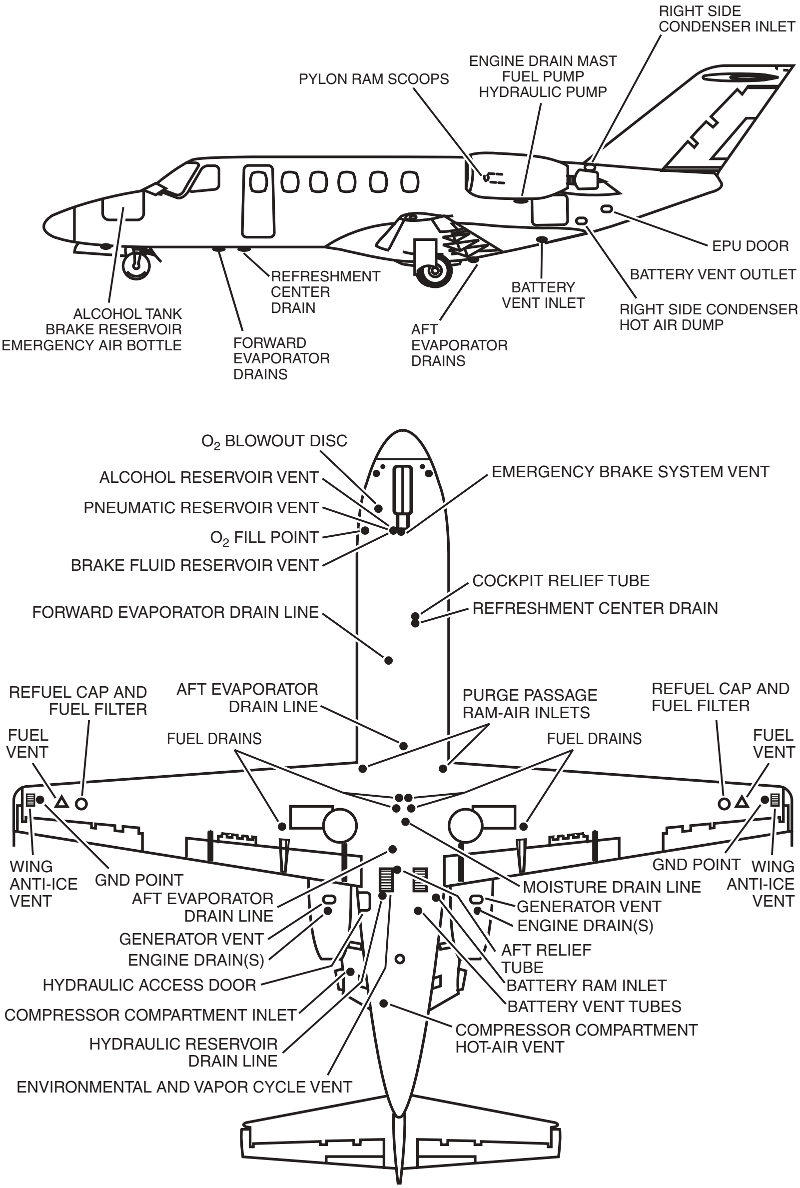


Figure SR-34. Vents and Drains—Typical

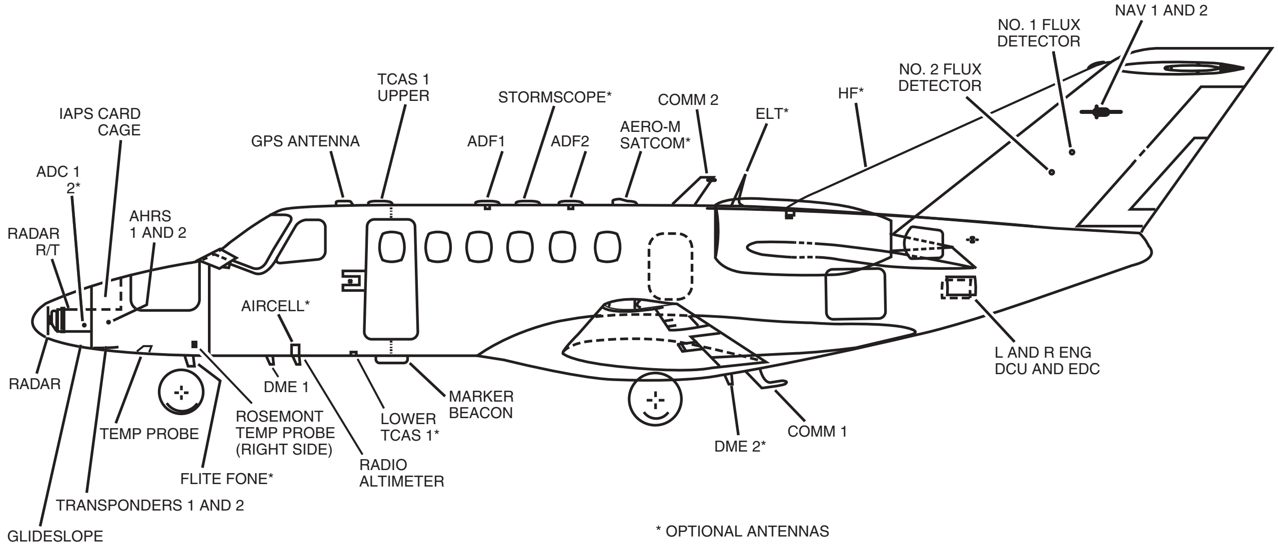


Figure SR-35. Antenna Locations

MASTER WARNING SYSTEM

ILLUSTRATIONS

TABLES

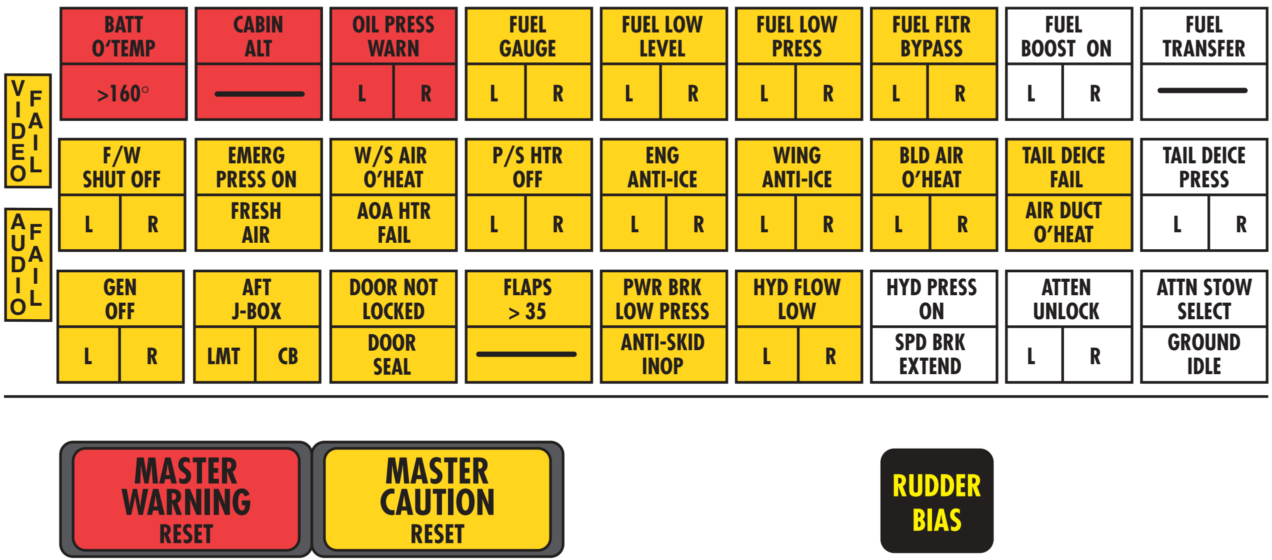


Figure MWS-1. Annunciator Panel—SNs 001 and Subsequent

Table MWS-1. ANNUNCIATOR ILLUMINATION CAUSES

BATT O'TEMP / > 160°	The red battery overtemperature light will flash at temperatures over 145°F; both sections will flash at temperatures over 160°F. Light illumination also triggers the master warning system which will cause the MASTER WARNING to flash. Transition to illumination of >160° will also cause the MASTER WARNING to flash if it has been reset. If a voice system is installed, at 145°F an alert tone will sound followed by "BATTERY OVERTEMP," repeated until reset, and repeated again at 160°F.
CABIN ALT	The red CABIN ALT light advises that the cabin pressure altitude is above 10,000 feet if the pressure controller is set to landing airport elevations under 8,000 feet. If the pressure controller is set above 8,000 feet in the high altitude mode, the cabin altitude light will come on at cabin pressures at 14,500 feet. Illumination of the light also triggers the master warning system, which will flash the MASTER WARNING. If the voice system is installed, the alert tone will sound followed by a "CABIN PRESSURE" voice warning, which will repeat until reset.
OIL PRESS WARN / L R	The red oil pressure warning light advises that the oil pressure is below safe limits. The MASTER WARNING will flash, accompanied by a voice warning "LEFT ENGINE OIL PRESSURE" or "RIGHT ENGINE OIL PRESSURE."
FUEL GAUGE / L R	The amber fuel gage annunciator advises that the fuel gauging system has detected a gauging error. The MASTER CAUTION will illuminate.
FUEL BOOST ON / L R	The white FUEL BOOST ON light indicates that the respective fuel boost pump is either automatically or manually powered.
FUEL LOW LEVEL / L R	The amber FUEL LOW LEVEL light advises that the fuel quantity is below 220 ±10 pounds in either tank. The MASTER CAUTION illuminates with a 4-second delay to avoid nuisance trips in rough air or while taking over rough areas.
FUEL LOW PRESS / L R	The amber FUEL LOW PRESS light advises that the fuel pressure is below normal limits in the left or right engine fuel supply lines. The light is on through 4.4 psi falling and off through 6.4 psi rising. The MASTER CAUTION will illuminate.
FUEL FLTR BYPASS / L R	The amber FUEL FLTR BYPASS light indicates fuel filter bypass is impending at 5 psid and actual bypass at 10 psid. The MASTER CAUTION will illuminate.
FUEL TRANSFER	The white FUEL TRANSFER light indicates that the fuel transfer valve is energized for fuel transfer operation. The nonselected tank fuel boost pump annunciator will also be illuminated.
ATTN STOW SELECTED	The white ATTN STOW SELECTED annunciator indicates that the stow position has been selected on the thrust attenuator switch. If selected in flight with flaps at 85%, it will trigger the MASTER CAUTION. The thrust alternators will not operate.

Table MWS-1. ANNUNCIATOR ILLUMINATION CAUSES (Cont)

GEN OFF L R	The amber GEN OFF light advises that the associated generator power relay is open. Illumination of both lights will trigger the MASTER WARNING lights flashing. For a single-generator failure, the MASTER CAUTION will illuminate with the voice warning “GENERATOR FAILURE.”
AFT J-BOX CB	The amber AFT J-BOX–CB light indicates left or right start control aft J-box circuit breaker(s) is opened. The MASTER CAUTION will illuminate.
AFT J-BOX LMT	The amber AFT J-BOX–LMT light advises that the aft J-box left or right 225A current limiter circuit breaker is opened, indicating a probable blown current limiter. The MASTER CAUTION will illuminate.
F/W SHUTOFF L R	The amber F/W SHUTOFF light indicates the left or right FUEL and HYDRAULIC valves are both fully closed. The valves can be opened by depressing the ENGINE FIRE switchlights a second time. The MASTER CAUTION will illuminate.
EMERG PRESS ON	The amber EMERG PRESS ON light indicates the emergency pressurization system was selected on the air source select switch. The MASTER CAUTION will illuminate.
FRESH AIR	The amber FRESH AIR light indicates the air source selector is set to the fresh air position. The MASTER CAUTION will illuminate.
HYD FLOW LOW L R	The amber HYD FLOW LOW light advises that the left or right hydraulic pump flow rate is below normal and the pump is inoperative below .35 to .55 gpm. The MASTER CAUTION will illuminate.
HYD PRESS ON	The white HYD PRESS ON light advises the hydraulic system is pressurized.
SPD BRK EXTEND	The white SPD BRK EXTEND light advises that the left and right speedbrakes are fully extended.
ATTEN UNLOCK L R	The white ATTEN UNLOCK light indicates that the respective thrust attenuator is not in the stowed (locked) position. The MASTER CAUTION illuminates after a two second delay.
FLAPS >35°	The amber FLAPS >35° light will illuminate if the flaps are extended beyond 35° and both throttles are advanced beyond approximately 85% N_2 on the ground. It is on in flight any time the flaps are extended beyond 35° in flight. In flight, there is an eight-second delay to eliminate nuisance illuminations.

Table MWS-1. ANNUNCIATOR ILLUMINATION CAUSES (Cont)

PWR BRK LOW PRESS	The amber PWR BRK LOW PRESS advises that the power brake hydraulic pressure is low. The ANTI-SKID INOP light will also be on. The MASTER CAUTION will illuminate.
ANTISKID INOP	The amber ANTISKID INOP light advises that the antiskid system is inoperative, the system is in a test mode or the antiskid switch is in the OFF position. The light is active with the gear handle in the UP or DOWN position. The MASTER CAUTION will illuminate.
DOOR NOT LOCKED	The amber DOOR NOT LOCKED light advises that the tail cone compartment or either nose baggage door is not key locked, or the main cabin door is not secured. The MASTER CAUTION will illuminate.
DOOR SEAL	The amber DOOR SEAL light indicates a loss of bleed-air pressure to the primary cabin door seal has fallen below 5.5 psi above cabin pressure. The MASTER CAUTION will illuminate.
TAIL DEICE FAIL L R	The amber TAIL DEICE FAIL flasher and the MASTER CAUTION illuminates steady if, after the system is selected on, the respective tail deice valve loses voltage and/or has a loss of pressure during the 6-second on- cycle time or timer failure. Pressing the MASTER CAUTION will extinguish the MASTER CAUTION and will cause the TAIL DEICE FAIL to go steady on.
TAIL DEICE PRESS L R	The white TAIL DEICE PRESS light indicates proper boot inflation pressure: "L" 6 seconds ON, then 6 seconds OUT; then "R" 6 seconds ON. In manual, both lights are on.
W/S AIR O'HEAT	The amber W/S AIR O'HEAT light advises that bleed air to the windshield exceeds safe temperature limits 149°C (300°F) with the control switch in HI or LOW. With the switch in OFF, it indicates the shutoff valve has failed open or is leaking bleed air, allowing line pressure to exceed 5 psi. The MASTER CAUTION will illuminate.
AOA HTR FAIL	The amber AOA HTR FAIL light advises that the heating element in the probe is inoperative or the pitot heat switch is off. The MASTER CAUTION will illuminate.
P/S HTR OFF L R	The amber P/S HTR OFF light advises that the PITOT HEAT switch is off or, if the switch is on, that power has been lost to any pitot tube heater or any static port heaters. The MASTER CAUTION will illuminate.

Table MWS-1. ANNUNCIATOR ILLUMINATION CAUSES (Cont)

ENG ANTI-ICE L R	The amber ENG ANTI-ICE light indicates that engine inlet temperature is under 10°C (50°F) level for satisfactory ice protection for one minute or more. The MASTER CAUTION has a 50-second delay before it illuminates.
WING ANTI-ICE L R	The amber WING ANTI-ICE light indicates that the wing leading edge is undertemperature below 230°F, overtemperature, or when in flight under 75% N_2 rpm for one minute or more. There is a 50-second delay before MASTER CAUTION illuminates.
GROUND IDLE	Illuminates on the ground with normal selected on GND IDLE switch.
BLD AIR O'HEAT L R	The amber BLD AIR O'HEAT light indicates that a malfunction has caused the bleed air, leaving the respective precooler to exceed allowable temperature. The light comes on above 293°C (560°F) and goes out below 282°C (540°F). The MASTER CAUTION will illuminate.
AIR DUCT O'HEAT	The amber AIR DUCT O'HEAT light advises that the temperature in the duct leading to the cabin exceeds the 149°C (300°F) thermal limit. The MASTER CAUTION will illuminate.
VIDEO FAIL	The amber VIDEO FAIL light indicates failure of the visual annunciator test. Pressing either of the MASTER WARNING RESET switches for 2 to 3 seconds will cause the annunciator to leave the test mode and resume operation, until cause of the test failure can be determined.
AUDIO FAIL	The amber AUDIO FAIL light indicates failure of the audio annunciator test. CAUTION: one or more audio warnings may be inoperative.
RUDDER BIAS	The yellow RUDDER BIAS light illuminates during either of the following conditions: rotary test; or with normal DC power anytime the rudder bias solenoid springloads to the bias not available condition; when bleed air is not available; or tail cone in ambient reference position.

Table MWS-2. TEST INDICATIONS

ROTARY SWITCH POSITION	INDICATION
OFF	The red light is extinguished and the test system is inoperative.
FIRE WARN	Both red L or R ENGINE FIRE lights illuminate and associated aural warning will be heard. The voice annunciation “LEFT ENGINE FIRE/RIGHT ENGINE FIRE” will be heard (voice system only). Avionics power must be on or a headset must be worn to hear the audio warnings.
LDG GEAR	The green NOSE, LH, RH, and the red GEAR UNLOCKED lights, and associated aural warning tone or the voice annunciation “LANDING GEAR” (voice system) will be heard. The voice announcement or tone may be silenced by pressing the horn silence button on the landing gear panel if flap position is 15° or less. Avionics power must be on or a headset must be worn to hear the audio warnings.
BATT TEMP	The BATT O’TEMP and >160° lights will flash showing circuit integrity. The MASTER WARNING RESET lights illuminate. An aural tone will sound three times followed by the “BATTERY OVERTEMP” voice warning (voice system only).
AOA	The stick shaker will operate. The angle-of-attack meter needle will go past the red area and the indexer red chevron light (optional) will flash on and off. Avionics power must be on to test the EADI and indexer functions. The LAA on the PFD will not test. The AOA1 and AOA2 red lights in the AFDs are on.
W/S TEMP	The windshield W/S AIR O’HEAT light will illuminate, and the bleed-air solenoid control valve will close if the WINDSHIELD BLEED switch is selected to LEFT, RIGHT or MAX. The MASTER CAUTION RESET light will illuminate after a 4-second delay.
OVERSPEED	The Mach/Airspeed aural warning tone sounds a series of four tones, eight times. With an optional voice system, a series of ten tones will sound four times.
ANTI-SKID	The ANTI-SKID INOP annunciator illuminates and will remain on for about 5 seconds as the antiskid system completes a full dynamic self-test. Upon completion of the self-test, the annunciators extinguish. If the system does not check operational, the annunciators will remain illuminated.
RUDDER BIAS	The RUDDER BIAS annunciator illuminates indicating that power to the control valve has been interrupted, causing the control valve to move to the bypass not available position. The MASTER CAUTION RESET lights also illuminate.

Table MWS-2. TEST INDICATIONS (Cont)

ROTARY SWITCH POSITION	INDICATION
ANNU	The red rotary test annunciator will illuminate in all test positions other than OFF. The annunciator panel video and audio fail lights illuminate. The annunciator panel lights illuminate by rows. The MASTER WARNING and MASTER CAUTION lights repetitively flash four times and pause as the top row illuminates and goes out. The MASTER WARNING and MASTER CAUTION lights again flash four times and pause as the middle row of lights illuminate and go out, repeating for the lower row, top row, etc., until any other rotary test position is selected. The MASTER WARNING and MASTER CAUTION lights cannot be reset during this test. The standby N_1 LCDs flash 88.8s for 15 seconds, then two zeros. The mode select panel(s) yellow button lights illuminate. The FAN 1 (COMM 1) and FAN 2 (COMM 2) amber lights illuminate. The standard altimeter ALT amber light comes on steady. The optional Honeywell Ametek AM-250 round digital altimeter amber light is on steady. The PFD(s) radar altimeter indicates 50 feet. Extinguished GPWS and DME lights are tested. The tilt panel COMPRESSOR ON green light illuminates. The autopilot panel yellow TURB light is on and the XFR button light if installed. If a voice annunciation is installed, a voice annunciation “TEST” will be heard periodically. The three optional AOA indexer lights illuminate steady. The Davtron and digital cabin pressure controller lights are not tested. The KLN 900 APPROACH/MSG/WPT lights and EFIS lights illuminate. Moving the rotary test switch out of ANNU to any other position, if all tests are successfully completed and the voice system is turned on, “READY” will be heard.