Pilot's Operating Handbook
Flight 1 DC 9

POH Contents

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We would also like to thank all of the technical advice and testing from our beta testers. Their help and perseverance is greatly appreciated.

Checklist/Procedures

Philosophy

One of the most important items in good cockpit management is the proper utilization of the checklist. The success attained in the execution of normal and emergency procedures can be attributed to a large extent to the reliability of the challenge and response checklist system. A high degree of standardization will result, which makes possible the repeated interchange of crewmembers without jeopardy to operational safety.

When using the normal checklist all cockpit controls and switches should be checked and properly positioned prior to reading the checklist. The checklist is not an action list, but is used after all controls and switches have been positioned to insure that all items have been checked. The only exception to this is the STARTING checklist where the items will be accomplished in sequence as they are written.

The items are arranged on the checklist in an order that follows, as much as possible, a flow pattern around the cockpit, which leads from one item to the next one adjacent to it.

Receiving Aircraft

If the aircraft is cold, begin with the APU START checklist.

APU START

NOTE: Pressure valve switch should be in the OFF position to prevent pressurization of the cabin while on the ground.

APU Control Panel

1. Battery..... ON

The battery switch must be ON in order to energize the fire warning test circuits, the APU control circuits, and to make power available for the APU start motor circuit. During flight the battery switch must be on to insure proper warning indications and to provide power for the standby horizon and emergency lighting. Battery voltage should be at least 2 Volts prior to starting the APU.

2. APU Fire Control Switch..... NORMAL

The APU fire control switch is wired in series with the APU master switch and must be in the NORM position to affect an APU start.

3. APU Air Cond. Cooler Switch.....OFF

Although the bleed air valve will not open until approximately 95 percent RPM is attained, the APU bleed air switch should be left at OFF until such time as it may be required in order to reduce unnecessary loads on the APU after starting.

4. APU Bus Switches (Bus Control Panel)..... OFF
5. APU Door Switch..... AUTO

The doors switch should be checked at AUTO to achieve automatic doors opening upon starting. The switch must be at AUTO to close the APU inlet doors upon APU shutdown.

Warning – If the doors fail to open, the APU can overheat, even at normal RPM

6. APU Master Switch..... START
    a. Hold APU MASTER to START position until observing a rise in RPM. Then release to RUN position.
    b. Check APU GEN OFF light out at approximately 35%.
    c. Move the APU GEN switch (CSD control panel) to NORM
    d. Observe APU RPM and exhaust temperature limits.
        1. Review the Air Conditioning Control Procedure to insure proper cooling is directed to the APU.
7. APU PWR AVAIL button (APU control)..... ON
8. APU BUS, L and R (APU control)..... ON
    a. Two green indicator lights should illuminate
9. DC BUS TIE (Bus control panel)..... OPEN
10. Voltage and Frequency..... CHECKED
11. Make certain that all procedures on the Air Conditioning Control Procedures have been completed before proceeding to the next checklist.
12. Fuel Boost Pumps (Fuel Pump Control Panel)..... ON
    a. When air conditioning procedures are complete and AC power is available.

APU STARTED

Circuit Breaker Panel

1. Circuit Breakers..... CHECK IN

All circuit breakers should be checked set (in) except those that are collared or associated with inoperative systems. The anti-fog circuit breakers may be opened (pulled) if desired, provided they will not be used.

APU Control Panel

2. APU temperature..... CHECK

Cabin Pressurization Controls

3. Pressure source switch..... STBY
4. Pressure Valve (throttle quadrant)..... CLOSED
5. Radio Rack Coolant Duct Switch..... FAN
    a. This switch normally operates in fan position and provides radio rack cooling and forward belly cargo compartment floor heating. This permits carrying live cargo in this compartment.
6. Air Conditioning Shutoff..... ARM
    a. This action will place the system in the correct configuration for takeoff.
7. Ram Air..... OFF
    a. The ram air switch may be placed in the ram air position to provide ventilation in the airplane if pneumatic pressure is not available for the air conditioning system. Normally, this switch remains at OFF.

Warning – If the radio rack coolant ducts are not providing ventilation to the radios via the fan, the radios could overheat during normal operation, and intermittent failures could occur.

CSD Control Panel

8. CSD Disconnect Switches.....NORM
9. Generator Switches..... OFF
    a. L and R GEN OFF lights on the overhead annunciator panel should be illuminated.

Master Power Controls

10. Avionics Master Switch..... ON
11. Environmental Master Switch..... CHECK ON

Electrical Panel

12. Volt/Ammeter switch..... BATT VOLT
13. Emergency Power Switch..... ON
    a. EMER PWR IN USE light..... CHECK ON
    b. Main panel instruments..... CHECK ON
    c. Battery voltage, check limits..... More than 22 + VOLTS
14. Volt/Ammeter Switch..... BATT AMP
    a. Check Amperage - more than 35 AMPS – DISCHG
15. Emergency Power Switch..... OFF
    a. Check Amperage..... 20 - 65 AMPS – CHRG

Bus Control Panel

19. Galley Power..... ON
20. Recorders
21. Cockpit Voice Recorder..... ON
    a. Check test button..... CHECK OK
22. Data Recorder..... ON
    a. Check test button..... CHECK OK

System Test Panel

23. Anti-Sail..... CHECK OK
24. Stall Warning..... CHECK OK
25. Autopilot Systems..... CHECK OK
    a. For test of the Speed Command systems and the Speed Command (SPD CMD) mode of the Flight Director systems, place the mode selectors to ARM.
    b. Mach trim..... CHECK OK Aileron Trim..... CHECK OK
    c. Rudder Trim.....CHECK OK
26. Master Warning..... CHECK

Cabin Pressurization Controls

27. The barometric scale should be set to the Field barometric setting. The proposed flight altitude plus 1000 feet should be set on the airplane altitude scale. In any case the Cabin Altitude must be at least 1000 feet above takeoff elevation.
28. The climb Rate knob should be set at position for normal operations (approximately 250 FPM).
    a. This rate is applied in addition to whatever climb rate condition the aircraft experiences. For example, setting this control to 250, and when the aircraft is climbing at 1000 FPM, and actual Cabin Climb Rate of 1250 is achieved.

Fuel Pump Controls

29. Left Fuel Pump (FWD)..... ON
30. Right Fuel Pump (FWD)..... ON
31. Left Fuel Pump (AFT)..... ON
32. Right Fuel Pump (AFT)..... ON
33. Boost Pump (FWD)..... ON
34. Boost Pump (AFT)..... ON

Start Controls

35. IGN (Ignition)..... OFF
    a. Ignition should be OFF at all times except when ready to engage the starter switch or when the engine is running.

Cabin Light Controls

36. Emergency light switches..... ARM
    a. The "EMER LIGHT NOT ARMED" annunciator on the overhead panel will go out. The emergency lights in the cockpit, flight compartment, and tail cone will be on unless this switch is in the OFF or AUTO position, or until the batteries become discharged.
    b. In the ARM position, a failure of the DC emergency bus will automatically turn the cabin and cockpit emergency lights on, furnishing illumination for the cabin and exits.

De-Ice Controls

37. Move METER SEL and heat switches to each position to make sure there is a reading on the ammeter.
    a. Ammeter..... CHECK
38. Airfoil Switches..... ON
39. Windshield Anti-Ice ..... ON
40. ENG (Engine) Heat Switches..... ON

Main Instrument Panel

41. RAT/EPR (Center Console) ..... SET
    a. Set the RAT/EPR Indicators to the recommended rating
42. Fuel Quantity (Center Console)..... CHECK
    a. The fuel quantity indicators should be tested by depressing the fuel quantity test button and observing a decrease in fuel quantity indication. The fuel quantity indicators should return to their original indication when the test button is released. Ascertain that sufficient Fuel is available for flight.
43. Oil Quantity (Center Console)..... CHECK
    a. Minimum oil quantity for dispatch is 6 quarts in each oil tank.
44. Gear Lights (Center Console)..... DOWN & LOCKED

Pedestal

45. Stabilizer Trim..... CHECK
    a. While observing stabilizer indicator, hold trim switch to NOSE UP and then to NOSE DOWN momentarily.
    b. Set stabilizer trim to within green takeoff band.
46. Spoilers..... FORWARD/DISARM
    a. To check ground spoilers for manual operation lift lever up, pull aft and up to lock in armed position. Note a slight dip in both hydraulic system pressure indications.
47. Rudder Trim (above radios)..... CHECK
48. Aileron Trim (above radios)..... CHECK
49. Throttles..... CLOSED
50. Fuel X-Feed..... OFF
    a. The fuel crossfeed lever must be OFF or takeoffs and landings. It may be used in flight to equalize tank quantities.
51. Flaps..... FULL UP
52. Fuel Flow Levers..... OFF
    a. The Fuel Control Levers must be in FULL OFF position before starting the engines to prevent premature fuel flow and ignition.

Radio Stack

53. Autopilot..... CHECK
    a. Servos..... DISENGAGE
    b. Nav Selector..... OFF
54. Radios..... CHECK
    a. COM 1 Power Switch..... ON
    b. COM 1 Test..... CHECK OK
    c. COM 2 Power Switch..... ON
    d. COM 2 Test..... CHECK OK
    e. NAV 1 Power Switch..... ON
    f. NAV 1 Test..... CHECK OK
    g. NAV 2 Power Switch..... ON
    h. ADF Power Switch..... ON
    i. ADF Test..... CHECK OK
    j. ADF ANT Switch Test..... CHECK OK
    k. ADF ANT Switch..... ANT
    l. Transponder Test Button..... CHECK OK

Flight Instruments & Magnetic Compass

55. Radio Altimeter..... SET
    a. Press and hold test button. Check that pointer indicates 100 ft. and red warning flog appears. MDA lights should be out.
    b. Rotate MDA set knob until the MDA lights are out for takeoff.
56. Flight Director System..... SET
    a. Select 15° nose up on the pitch command knob
57. Altimeter..... SET
    a. Set altimeter to field barometric setting.
    b. Check Indicated Altitude against known ramp elevation. Allowable tolerances:

Ramp Elevation	Tolerance
Sea level to 1000’	+30’ -20’
1000’ to 3000’	+/- 30’
3000’ to 5000’	+/- 40’
5000’ to 10000’	+/- 60’

58. Compass..... CHECK
    a. Check no warning flags on Compass Indicators and Course Indicators.
    b. Compare headings of Compass Indicators on HIS and RMI.
59. All Other Instruments..... CHECK
    a. Check for proper indications and no Flags.
    b. MKR SENS switch must be ON
    c. Inst. Warning..... TEST
        i. Press the INST WARN button. The INST and GA lights on the main panel annunciator should illuminate. Red indicators signal instrument failure.

Starting Engines

Make certain that all items on the Receiving Aircraft checklist have been performed prior to attempting engine start. Master battery power should be ON, APU power should be available, and bus switches ON, and external power (if available) bus switches should be ON.

1. Parking Brake..... SET ON
2. Minimum Fuel Required (center console)..... CHECK
    a. Check the fuel on board against the minimum fuel required on the flight plan.
3. External Lights (upper panel)..... SET
    a. Taxi Lights..... ON
    b. Recognition Lights (RECOG)..... ON
    c. Beacon (BCN)..... ON
    d. Strobe (STRB)..... ON
    e. Anti-collision (WING) Lights..... ON
    f. Landing (LDG) Lights..... OFF
4. Air Conditioning Supply (overhead panel)..... CHECK
    a. Make sure steps 5 – 10 from the Receiving Aircraft checklist have been fulfilled
5. Fuel Boost Pumps (overhead panel)..... CHECK ON
    a. For Takeoff it is recommended that both pumps in each main tank be utilized to provide a backup pump in the event of failure of a single pump. The forward and aft tank pumps should be ON.
6. Ignition (overhead panel)..... ON
    a. Place ignition switch to BOTH position.
7. Pneumatic Pressure (overhead panel)..... CHECK
    a. Start Pump..... ON
    b. Pneumatic (PNEU) Press indicator..... CHECK
        i. Minimum pneumatic pressure for starting is 36 lbs. minus one lb. per 1,000 feet above sea level.
8. Fuel Heat (overhead panel)..... SET
    a. Left and Right heaters should be ON when atmospheric temperature on the ramp is less than 30 °F.
9. Port Engine (overhead panel)..... START
    a. Open safety shield on port START valve
    b. Press and hold start valve switch
    c. Check to make sure the L START VALVE OPEN light on the overhead annunciator panel is illuminated.
    d. Observe increase in engine RPM indicators.
    e. When combustion occurs and minimum RPM is achieved, the L ENG OUT indicator on the overhead annunciator panel will go dark. When this occurs, release the start valve switch.
10. Starboard Engine (overhead panel)..... START
    a. Open safety shield on starboard START valve
    b. Press and hold start valve switch
    c. Check to make sure the R START VALVE OPEN light on the overhead annunciator panel is illuminated.
    d. Observe increase in engine RPM indicators.
    e. When combustion occurs and minimum RPM is achieved, the R ENG OUT indicator on the overhead annunciator panel will go dark. When this occurs, release the start valve switch.

Before Taxi

1. Electrical Power (overhead electrical panel)..... CHECK
    a. Place meter selector switch to R position and check that AC VOLTAGE, FREQUENCY and DC bus voltage are within limits. Repeat with meter selector switch in L position.
    b. It is recommended that after checking the condition of the AC & DC Electrical Systems, place the selector switch to the BATT AMP position in order to monitor the battery and battery charger.
    c. Check CSD OUTLET temperatures and temperature rise within limits.
        i. Normal temperature is between 100 – 140 oC. Use the "Push For Rise" button if the CSD has just been started to switch the temperature scale, so you can make sure the temperature is increasing.
    d. Check AC and DC LOAD METERS within limits.
    e. L Generator (GEN) switch..... ON
        i. L GEN OFF light on the overhead annunciator panel should go dark
    f. R Generator (GEN) switch..... ON
        i. R GEN OFF light on the overhead annunciator panel should go dark
2. Electrical Bus (overhead panel)..... CHECK
    a. The L AC BUS and DC BUS lights should be ON.
    b. AC BUS X-TIE..... CHECK OPEN
3. CSD Temperature (overhead electrical panel)..... CHECK
    a. CSD temperature indicators should be within limits
4. Ignition switch (start panel)..... OFF
5. Yaw Damper (RUD) switch (autopilot remote)..... ON
6. Air Conditioning Temperature Switches..... CHECK
    a. Make certain that steps 5-7 of the Receiving Aircraft procedures have been accomplished.
7. Emergency Lights (overhead panel)..... CHECK
    a. Check that Receiving Aircraft procedure 36 has been accomplished
    b. No Smoking Lights..... ON
    c. Fasten Seat Belt Lights..... ON
8. Hydraulic Pressure Indicators..... CHECK
    a. Make certain that steps 44 - 45 of the Receiving Aircraft procedures have been accomplished.
    b. Hydraulic boost pumps ON (for flap deployment)

Taxi

1. Fuel Heat (overhead panel)..... AS REQUIRED
    a. Left and Right heaters should be ON when atmospheric temperature on the ramp is less than 30 ^{o}F.
    b. Left and Right heaters should be ON for flight plans with cruise altitude above 21000'
2. Flaps (pedestal)..... SET TAKEOFF
    a. Flaps Control..... SET 15^{o}
    b. Flap setting should be set according to the Flaps Setting Data and verified by observing that flap indicators correspond to the handle setting. The FLAP/RUDDER STOP INOP light will be on momentarily while flaps are in transit.

3. Takeoff EPR..... SET
    a. Determine takeoff EPR by checking the EPR Calculation Table.
    b. NOTE: To insure accurate sensing of the ambient temperature by the RAT probe the aircraft must be moving at least 5K.
    c. Port EPR Limit (center console)..... SET
    d. Starboard EPR Limit (center console)..... SET
4. Stabilizer Trim..... CHECK
    a. Make certain item 46 in Receiving Aircraft procedures has been accomplished
5. Flight Controls..... CHECK

Takeoff

1. Ignition (overhead panel)..... SET TO BOTH
2. Ice Protection..... CHECK
    a. Make certain items 37- 40 of the Receiving Aircraft procedures have been completed
3. APU Air Switch..... CHECK ON
    a. This will allow the APU temperature to decrease and stabilize before the APU is shut down.
4. Hydraulic Booster Pumps (aft overhead panel)..... ON
5. Transponder..... ON (CODE)
    a. Turn transponder ON and insure proper MODE and CODE for departure.
6. After passing 10,000' establish 1000 FPM rate of climb and accelerate to the desired climb speed for the profile being flown. (290 KIAS/0.72 M for Low Speed Climb and 320 KIAS/0.74 M for High Speed Climb).
    a. NOTE: It is important that the desired climb speeds be established as soon as possible consistent with passenger comfort.
7. Radio Altimeter..... SET 2000'
8. Cabin Pressurization (overhead panel)..... SET
    a. Check to make sure items 27 – 28 on the Receiving Aircraft procedures have been performed
    b. Pressure valve switch..... ON
    c. Pressure Valve (throttle pedestal) ..... OPEN/CLIMB

Cruise

1. Determine the desired cruise speed from the planned flight. Obtain the suggested EPR setting from the EGT Limits/Thrust Rating. Your cruise EPR will be the lower of the EPR range if possible.
    a. NOTE: Any reduction in cruise EPR due to use of engine and airfoil ice protection is to be applied to the EPR maximum value range.
2. Flaps..... CHECK FULL UP
3. After level off, using climb power, allow the aircraft to accelerate to the desired cruise KIAS/MACH then set thrust at the computed EPR value. After the aircraft has stabilized in cruise, recheck IAS/ MACH to insure that the target airspeed is being maintained. If the airspeed has fallen below the desired cruise speed, adjust EPR as necessary, within the allowable to hold the planned KIAS/MACH. It is very important that the planned target KIAS/MACH is maintained during cruise flight.

4. When stabilized at cruise altitude and either a heavily loaded aircraft and/or unexpected high enroute temperatures causes a decrease in the Mach number below the desired profile speed, but higher than 0.75 Mach, continue at that altitude using maximum EPR thrust until reaching initial target Mach, or until normal descent. If the Mach number decreases below 0.75 Mach, request the next available lower altitude. This should allow the profile cruise Mach number to be restored and maintained. In either case, fuel consumption should be within flight plan limits.
5. APU Master Switch (Below 400°C)..... OFF
    b. NOTE: It is recommended that the APU be kept running and the APU L and R bus power switches be left ON if a takeoff is to be made in heavy rain or slush. The APU may be shut down when elected by the Captain after takeoff.
6. Gear..... CHECK
    c. All 3 gear lights should be OFF
    d. A red light indicates gear in unsafe position
7. Ignition (overhead panel)..... OFF
8. Boost Pumps (overhead panel)..... AS REQUIRED
9. Air Conditioning Shutoff (overhead panel)..... OVERRIDE
    a. Place switch to override (OVRD) to prevent depressurization in event of engine failure. This must be accomplished prior to 14,000 feet.
10. Hydraulic Boost Pumps (aft overhead panel)..... OFF
11. Radio Altimeter (main panel)..... CHECK 2000'

Descent

1. Cabin Pressure (overhead panel)..... SET
    a. Set Rate Knob to minimum.
    b. Set Cabin altitude to field elevation.
    c. Set field barometric pressure.
    d. Adjust rate knob to desired rate of descent.
2. EPR bug (center console)..... SET
    a. Obtain the suggested EPR setting from the EGT Limits/Thrust Rating.
3. Hydraulic Boost Pumps (aft overhead panel)..... ON
    a. To provide all hydraulic pressure needed for flaps, spoiler and gear extension.

    Follow steps for Cabin Pressurization/Descent Procedures

Approach

1. Hydraulic Boost Pumps (aft overhead panel)..... CHECK ON
2. Fasten Seat Belt Light (overhead panel)..... ON
3. Altimeters..... SET
    a. Check barometric altimeters for proper setting and check radio altimeters set to 2000 feet.
4. Flight Instrument..... CHECK
    a. Check the instrument failure warning system for comparator lights. Check that all radios are tuned and identified, no instrument warning flags are showing and that the altimeters, airspeed, and vertical speeds are in agreement.

Landing

NOTE: If it is known that a landing is going to be made in heavy rain or slush, it is recommended that the APU be started and the L and R APU Bus power switches are ON prior to the landing.

1. Gear..... DOWN/3 GREEN
    a. Place gear handle to down position and in the detent will put the gear down and close the doors. The three green lights will come on indicating that all three gears are in place and locked.
2. Ignition (overhead panel)..... BOTH
3. Spoilers (pedestal)..... AUTO
    a. Do not arm the spoilers until after the landing gear has been extended and indicates down and locked. Check that AUTO SPOILER ARM light is ON. Spoiler lever should be lifted up at the forward end of the quadrant. The lever should remain up and the red marked area at the base of the lever should be visible. If the lever cannot be lifted up high enough to remain up, the auto-extension system will not be operable. This is abnormal and the system will need to be operated manually.
4. Annunciator Panel (overhead panel)..... CHECK
    a. RUDDER TRAVEL UNRESTRICTED light must be ON. All other panel lights should be OFF except those of an advisory nature; such as L & R ENG ANTI-ICE ON, WING ANTI-ICE ON.
5. Hydraulic Indicators (upper panel)..... CHECK
6. Flaps..... AS NEEDED
    a. Set flaps according to required airspeed and descent rate, using the Flaps Setting data as a guideline.
7. Landing Lights (upper panel)..... ON

After Landing

1. Hydraulic Boost Pumps (aft overhead panel)..... OFF
2. Flaps..... 15° or 2O°
    a. Taxiing with the flaps 15° or 2O° helps prevent engine ingestion of foreign objects.
3. Spoilers..... RETRACT
4. Landing Lights..... OFF
5. Ignition (overhead panel)..... OFF
6. Anti-Ice switches (overhead panel)..... OFF
7. APU (overhead panel)..... ON
    a. Start the APU if necessary. Turn the Air Switch to the ON position. Check the voltage and frequency and make sure the APU bus switches are ON. After checking the APU generator, it is recommended that the AC/DC Volt master selector switch be placed in the "BATT AMPS" position to check that the battery is charging.

Parking

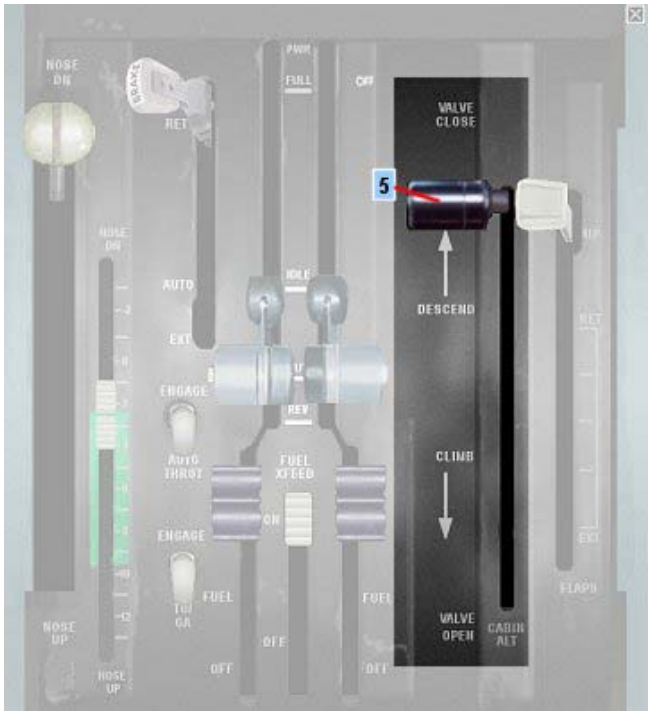
1. Brakes..... RELEASE
    a. It is important to release the brakes as soon as possible to allow rapid brake cooling.
2. Emergency Lights (overhead panel)..... OFF
3. Seat Belt Lights (overhead panel)..... OFF
4. Air Conditioning Supply (overhead panel)..... AS REQUIRED
    a. Normally it is desirable to use only the left air conditioning system while cooling the aircraft and only the right system while heating the aircraft. However, it may be necessary to operate both systems to keep the cabin comfortable. When single air conditioning system operation is satisfactory, place the desired supply switch to HP BLD OFF and the other supply switch to OFF. The APU air switch should be placed to ON for all air conditioning system operation.
5. Exterior Lighting (upper panel)..... OFF
6. Flaps..... FULL UP
7. Parking Brake..... ON
8. Engines (overhead panel)..... SHUT DOWN
    a. L Fwd Fuel Pump..... OFF
    b. L Aft Fuel Pump..... OFF
    c. Fwd and Aft Boost Pumps..... OFF
    d. L ENG OUT annunciator light..... CHECK ON
    e. R Fwd Fuel Pump..... OFF
    f. R Aft Fuel Pump..... OFF
    g. R ENG OUT annunciator light..... CHECK ON
9. Flight Recorders (aft overhead panel)..... OFF

Secure

1. Air Conditioning System..... SHUT DOWN
    a. Follow the Post Flight procedure for shutting down the environmental systems.
    b. Environmental Master Switch..... OFF
2. Radios (radio stack)..... SHUT DOWN
    a. COM 1 Power Switch..... OFF
    b. COM 2 Power Switch..... OFF
    c. NAV 1 Power Switch..... OFF
    d. NAV 2 Power Switch..... OFF
    e. ADF Power Switch..... OFF
    f. ADF ANT Switch..... OFF
    g. Avionics Master Switch..... OFF
3. APU and Electrical..... SHUTDOWN
    a. APU Bus switches..... OFF
    b. APU Master Switch..... OFF
    c. APU AIR COND/COOLER..... OFF
    d. APU Doors/Auto..... OFF
    e. APU RPM..... CHECK ZERO
    f. Generator Switches L and R..... OFF
    g. CSD Disconnect (DISC) L and R..... DISC
    h. CSD Temperature indicators..... CHECK DECREASE
4. Master Battery Switch..... OFF

Cabin/Cockpit Pressurization Procedure

PRIOR TO START



1. Make certain that the Environment Master Switch in ON.
2. Obtain field barometric setting and set the field barometric pressure controller [1], to establish the baseline pressure for the system.

3. Set initial cruise altitude plus 1000 feet, based on your flight plan, on the altitude controller [2].
4. Compute cabin rate of climb.
    a. Cabin altitude change in feet (from the controller) divided by airplane time to climb or descend in minutes, equals rate of climb in feet per minute
    b. See Cabin Climb Example in the appendix
5. Set rate of climb on the controller [4] to the calculated value plus 50 feet per minute.
6. Check that the pressurization outflow control valve [5] (to the right of the throttle) is in the full closed (forward) position.

AFTER TAKEOFF

1. Move the pressurization selector switch [3] to the Primary position. Move the pressurization outflow control valve [5] to the OPEN (down) position. The annunciator light should change from STBY to PRESS. The flow annunciator should also illuminate.

DURING FLIGHT

1. The Cabin Differential pressure and Cabin Altitude [6] should be periodically checked during all phases of flight.
2. The Cabin Pressure alarm will sound, and both the Cabin Pressure Warning Indicator [7] and the Master Warning lights will illuminate if the Cabin Altitude climbs above 8100 feet.

DESCENT

1. Obtain field barometric setting and set the field barometric pressure controller [1], to establish the baseline pressure for the system.
2. Compute rate of descent (as you did with rate of climb) and set this value plus 50 feet per minute on the controller [4].
3. Upon descending below 8000 feet, move the on the altitude controller [2] to the landing field altitude
4. Move the pressurization outflow control valve [5] (to the right of the throttle) to the full closed (forward) position.

Air Conditioning Control Procedure

PRIOR TO START

1. Make certain that the Environment Master Switch in ON.
2. Full bus power must be available to operate the environmental system. If you are parked at the gate, with engines off, you can connect to external power.
3. Make sure you have followed the APU Start procedures, and that APU power is available.
    a. IMPORTANT – make certain that the APU Air Cond. Cooler switch (APU diagram #4) is in the ON position, and that the Coolant Doors (APU diagram #5) is in the AUTO (switch ON) position. Failure to make coolant flow available to the APU will cause overheating and possible APU failure!
4. Move the Coolant Supply Switches [2] to the AUTO position.
5. Move the Cabin and Cockpit Temperature Controls [1] to the AUTO position. Check the temperature indicators for normal (mid-range) readings.
6. Check for positive indication on the Coolant Pressure Indicators [3].
7. Move the RAM Air switch [6] to the ON position so that bleed air is provided to the cooling pressurization system.

8. Move the Radio Rack switch [7] to the FAN position to make sure coolant is pumped to the radio stack ventilation ducts for additional cooling.
    a. Failure to direct coolant to the radio stack will likely cause the stack to overheat, which could lead to intermittent failures.

DURING FLIGHT

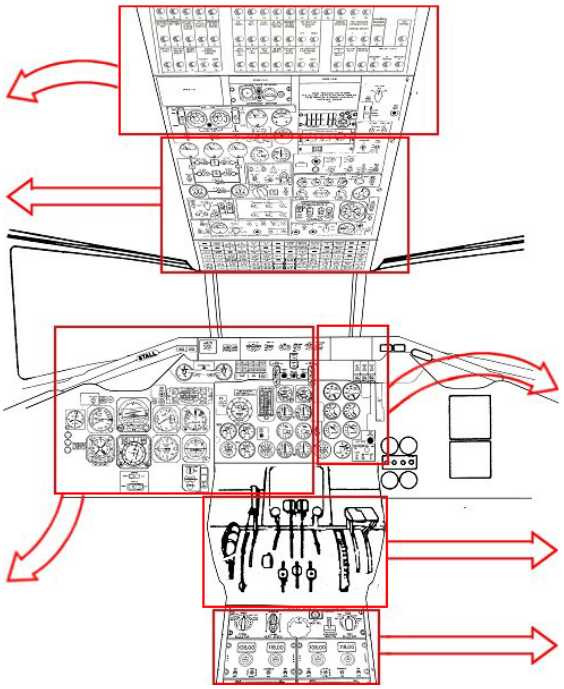
Check the temperature indicators [1] on the Air Conditioning Control Panel, and the temperature indicator or the APU Control Panel to make certain that proper cooling is being provided.

POST FLIGHT

Immediately prior to shutting down the APU:

1. Move the RAM Air switch [6] to the OFF position.
2. Move the Radio Rack switch [7] to the VENTURI position.
3. Shut down the Coolant Supply Switches [2].
4. Move the Cabin and Cockpit Temperature Controls [1] to the STOP position.

Cockpit



Aft Overhead Panel

Overhead Controls

Center Console

Pedestal

Main Instrument Panel

Radio/Autopilot

Main Panel Instruments

Primary Instruments

Other Main Panel Instruments

Upper Panel

Center Console

PRIMARY FLIGHT INSTRUMENTS

1. Airspeed Ind.
2. Horizon
3. Altimeter
4. Radar Altimeter
5. RMI
6. HSI
7. Vertical Speed Ind.
8. Stby. Horizon
9. MDA Ind.

Airspeed indicator

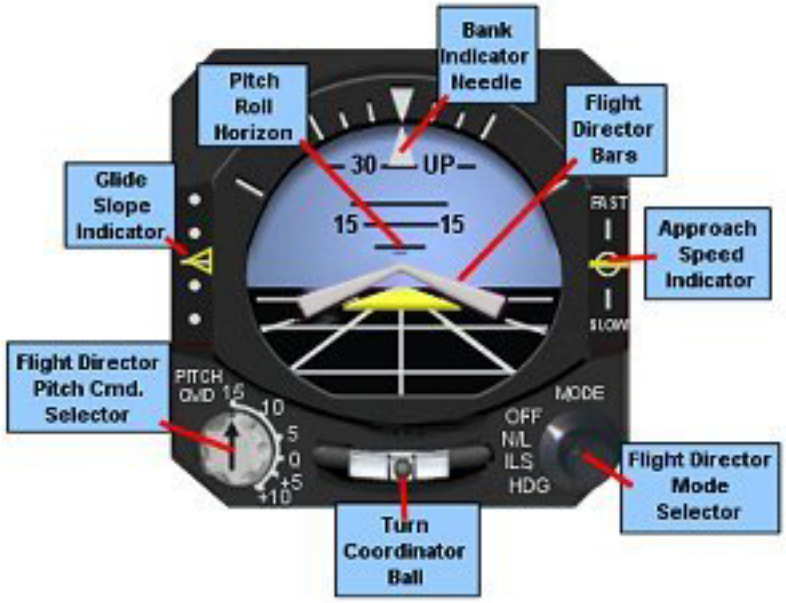
0-400 Knots Indicated Airspeed.

The **Barber Pole** indicates the maximum recommended speed for the aircraft's current altitude.

The **speed bug** controls the autothrottle setting in Mach Airspeed.

Note: See the Airspeed Limitations and Flaps/Stall Speed Data for more detailed information and operating limitations.

Captain's Artificial Horizon



The **Glide Slope** and **Approach Speed** indicators are covered by no-indication flags when a NAV signal is not being received.

See the section on the horizon's Flight Director Functions for a more thorough description of this system.

Altimeter

In hundreds of feet.

Altimeter Kohlsman settings for **Barometric Pressure** in both US and Metric are provided. The **Setting Knob** controls both simultaneously.

The **Indicator Needle** shows increments in hundreds of feet. The **Scrolling Numeric Display** is an accumulator, which displays total altitude, according to the Kohlsman setting, in feet.

The **Failure Indicator** will glow red in case of a failure of the altimeter and/or supporting systems.

Radar Altimeter

Indicates altitude above ground level, 0 – 2,500 ft..

The **Altitude Flag** is visible when the aircraft is above 2,500 ft. AGL.

Minimum Decent Altitude (MDA) is selected using the **Setting Knob**, and is visually represented by the **MDA Bug**. The MDA indicator will illuminate when the aircraft descends to the selected altitude AGL.

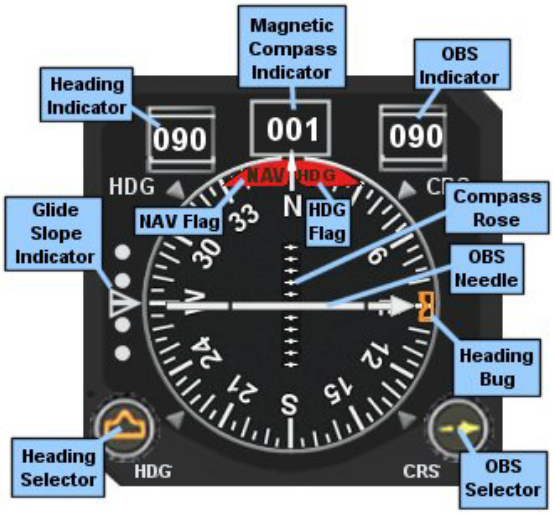
Test Procedure:
Press and hold test button. Check that pointer indicates 100 ft. and that the altitude flag appears. MDA lights should also illuminate.

Radio Magnetic Indicator (RMI)

Combines DI, VOR and/or ADF display and will indicate bearings to stations, together with aircraft heading.

More information on the usage of this instrument is available here.

Horizontal Situation Indicator (HSI)



- **OBS Selector** – controls **OBS Needle** and **OBS Indicator**.
- **Magnetic Compass Ind**. – current magnetic heading
- **Compass Rose** – Displays heading according to position of Compass Select Switch
- **Glide Slope Ind**. – covered when ILS glide slope is not present
- **Heading Selector** – controls **Heading Bug** and **Heading Ind**. Works in conjunction with the Autopilot Heading Control.
- **NAV Flag** - Indicates loss of radio navigational signal.
- **HDG Flag** – Indicates loss of instrument power or directional gyro information is invalid.

Vertical Speed Indicator (VSI)

-6,000 to +6,000 feet per minute indication.

Standby Horizon

Cage-able, vacuum driven standby artificial horizon.

FLIGHT DIRECTOR FUNCTIONS

1. Pitch Select Knob
2. Flight Director Mode Switch
3. Flight Director Bars
4. Glide Slope Needle
5. OBS Needle
6. CDI Needle
7. HDG Adjust Knob
8. OBS Adjust Knob
9. HDG Bug

VOR Capture

1. Tune NAV receiver to the VOR station. Rotate the **OBS Adjust Knob** to coincide with the desired radial. The **CDI Needle** shows the relative position of the radial. Set the **Heading Bug** to the desired intercept heading. Rotate the **Flight Director Mode Switch** to the N/L position. The Autopilot/Flight Director Annunciator N/L light will come on, denoting that steering commands are still referenced to the **Heading Bug** and the computer is armed for VOR Capture. With the Autopilot ALT Hold Switch in the ON position, the **Flight Director Bars** will follow the autopilot/vertical speed settings. Otherwise, the **Flight Director Bars** will respond to the pitch setting selected on the **Pitch Select Knob**. Note that nose up = negative pitch value.

   Airspeed, altitude, distance from station, and prevailing winds combine to influence the amount of overshoot that could be encountered when capturing the omni radial. To optimize the capture performance, a convergence angle should be selected that considers these effects on rate of turn, and the fact that the maneuvering area included in 5 degrees of omni radial deviation is proportional to distance from the station. As distance from the station increases, the convergence angle also may be increased. If capturing at less than 120 miles from the station, a proportionally lesser convergence angle is recommended.

2. As the aircraft approaches the radial, the **CDI Needle** moves toward the center of the scale. At approximately 5 degrees from the radial the **Flight Director Bars** will move to a more shallow intercept angle.

ILS Approach

1. Tune the navigational receiver to the localizer frequency and set the OBS Needle to the published inbound course (runway heading). Rotate the **Flight Director Mode Switch** to the **N/L position**. The Autopilot/Flight Director Annunciator **N/L light** will come on, denoting that steering commands are still referenced to the **Heading Bug** and the computer is armed for ILS Capture.
2. Assuming that the aircraft is above the published minimum approach altitude, engage altitude hold by moving the Autopilot ALT Hold Switch to the ON position, if it is not there already. The Autopilot/Flight Director Annunciator **ALT** light will come on The **Flight Director Bars** will follow the autopilot altitude control. If altitude hold is not desired, the nose down angle that gives the desired rate of descent can be set on the **Pitch Select Knob**. The Autopilot/Flight Director Annunciator will also show the selected pitch value.
3. As the "beam edge" is reached, the **Flight Director Bars** intercept angle shallows to enable more efficient localizer capture.
4. After intercepting the localizer, switch the **Flight Director Mode Switch** to ILS mode. The **Pitch Select Knob** is now inoperative. If automatic glide slop capture does not occur, or if above the glideslope capture is desired, the Flight Director Manual ILS Switch may be moved to the ON position.
5. The **Glideslope Needles** and **CDI Needle** should be monitored as backup during the approach.
    a. Make sure the NAV/HDG selector knob on the autopilot is in the proper mode.

HDG (Heading) Mode

1. Use the **HDG Adjust Knob** to position the **Heading Bug** to the desired course.
2. Select HDG on the **Flight Director Mode Switch.**
3. The **Flight Director Bars** will guide you to the selected heading, regardless of whether the autopilot servos are engaged or not.

Pitch Direction

The **Flight Director Bars** will guide you as follows:

1. When the Autopilot Altitude Hold Switch is engaged, and the Autopilot Servos are engaged, the **Flight Director Bars** will guide you to the selected altitude hold level. This applies to all Flight Director Modes except ILS.
2. When in the ILS mode, the **Flight Director Bars** will direct you along the glideslope, provided the localizer is tuned in.
    a. If capture above or below the glideslope is desired, move the Flight Director Manual ILS Switch to the ON position. The **Pitch Select Knob** will modify the **Flight Director Bars** to reflect the modified glideslope angle.

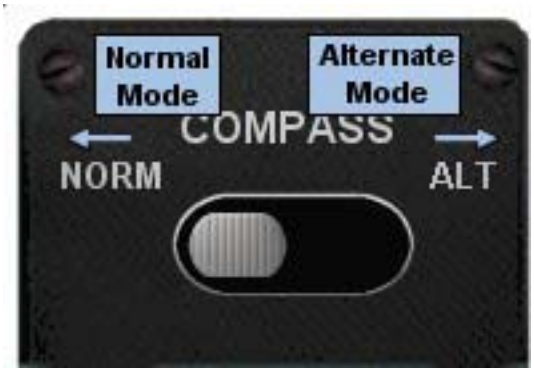
OTHER MAIN PANEL INSTRUMENTS

1. Panel Lights Switch
2. Clock
3. Marker Lights
4. Autopilot Altitude Hold On/OFF
5. Over-speed Warning Light
6. MDA Indicator light
7. Compass Mode Selector
8. Instrument Warning Test Switch
9. Guidance system Annunciators
10. Autopilot Remote

Autopilot Remote Control

Rudder (Yaw Damper) switch and indicator
Aileron (Wing Leveler) switch and indicator
Altitude select

Compass Select Switch



When in **NORM** mode, the HIS compass rose will display magnetic heading.

ALT mode computes magnetic variation and instructs the HSI to display true heading.

Guidance System Annunciators

1 & 3. Instrument Test lights
2. Autothrottle Ind.
4. COM System Failure Ind.
5. HDG/Guidance System Ind.
6. Localizer Lock Ind.
7. Backcourse Lock Ind.
8. Bad Attitude Ind.
9. Horizon Failure Ind.
10. Not Available
11. GPS Drives NAV Ind.

Minimum Descent Altitude (MDA) Indicator

Illuminates when the aircraft descends below the MDA value selected on the Radar Altimeter.

Autopilot ALT Hold Switch

Engage the autopilot ALT Hold function by moving this switch to the ON position.

Altitude will seek the flight level selected on the Autopilot Remote panel.

UPPER PANEL

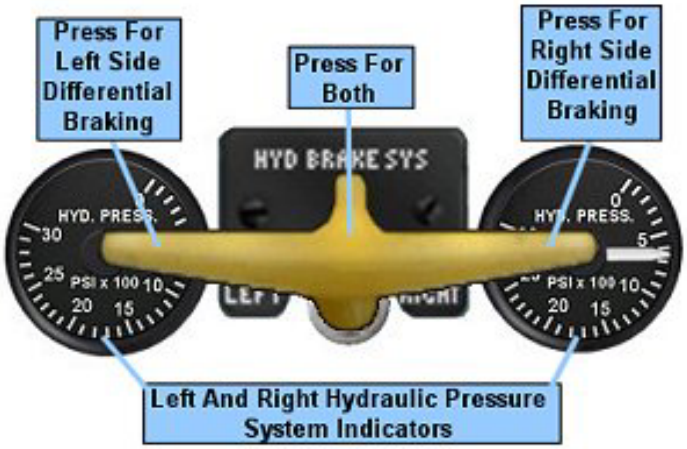
1. Hydraulic Pressure Indicators
2. Hydraulic Brake Handle
3. Autopilot/Flight Director Annunciator
4. Fire Control System

5. Stall Warning Ind.
6. Master Caution/Warning
7. Flt. Dir. Manual ILS Switch
8. Thrust Rev. Ind.
9. Exterior Lighting Control

Annunciator – Autopilot/Flight Director

1. Flight Director Pitch Selector Ind.
2. Flight Director Mode Ind.
3. Autopilot Altitude Hold Mode Ind.
4. Autopilot Wing Leveler Mode Ind.
5. Autopilot Yaw Damper Mode Ind.
6. Autopilot Mode Ind. *
7. Autothrottle Armed Ind.
8. Autothrottle Takeoff/Go Around Ind.

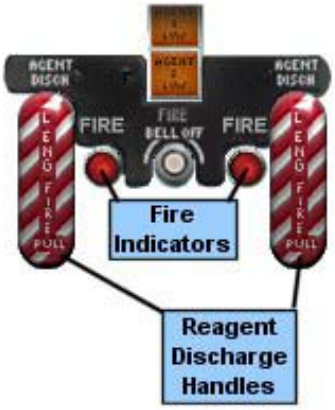
Hydraulics/Brake System



Left and Right Hydraulic Pressure indicators – 0 to 30 PSI

The **Brake Handle** can be employed for both differential braking, or to apply all brakes simultaneously.

Fire Control System



Fire Indicators will illuminate RED when either engine is on fire.

To discharge fire extinguisher reagent, push the **Reagent Discharge Handles** forward.

Stall Warning Indicator

Illuminates red if aircraft enters into a stall condition.

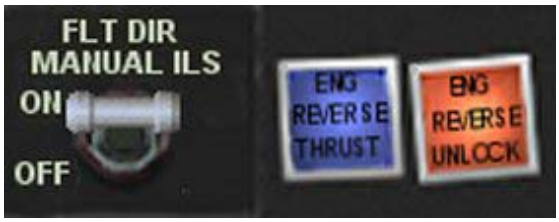
Master Caution and Warning Indicator

A **Master Warning** will illuminate if an engine is lost, or in case of a critical electrical failure.

A **Master Caution** will illuminate in case of a failure in either of the aircraft's electrical generators.

Either indicator may be reset to neutral for a 30-second period by pushing on it.

Flight Director Manual ILS Switch
Thrust Reverse Indicators



The **Flight Director Manual ILS Switch** instructs the Flight Director Bars on the primary horizon instrument to follow an ILS LOC beam. This will **not** function for an ILS backcourse beam.

The amber **ENG Reverse Unlock** indicator will illuminate when the thrust reverser unlock control is engaged on the throttle control. When both engines are in thrust reverse, the blue **ENG Thrust Reverse** indicator will illuminate.

Exterior Lighting Control

1. Landing Lights
2. Wing Floodlights
3. Taxi Lights
4. Rotating Beacon
5. Strobe
6. Recognition Lights

CENTER CONSOLE

Fuel System Instruments

1. Total Fuel Qty. Available
2. Fuel Qty – Left Tank
3. Fuel Qty. – Right Tank
4. Fuel Qty. – Center Tank
5. Fuel Temperature
6. Fuel Flow – Port
7. Fuel Flow- Starboard
8. Fuel Used Reset Button
9. Fuel Qty. Test

TOTAL FUEL QUANTITY INDICATOR

In pounds.

All tanks combined. Strolling numerical display.

FUEL QUANTITY INDICATORS

0 – 10,000 pounds.

Fuel Tank Capacities	
Tank	Capacity in Lbs.
Left	9,300
Center	6,000
Right	9,300

FUEL TEMPERATURE INDICATOR

-20 to 60 °C

Fuel temperature indication at point of engine intake. Indication is for both port and starboard engines.

Operating Limitations		
Condition	Min. °C	Max. °C
Takeoff	5	50
Cruise	-10	50
Landing	-5	50

FUEL FLOW INDICATORS

There are two displays on this instrument:

- **Fuel Flow Needle**– 0 to 12,000 Lbs./hour
- **Fuel used** – Scrolling numeric display in total Lbs. Can be reset to zero using the Fuel Used Reset Button.

Individual indicators for port and starboard engines (6 & 7 above)

FUEL USED RESET BUTTON

Resets the Fuel Used Display to zero.

FUEL QTY. TEST

The fuel quantity indicators should be tested by depressing the fuel quantity test button and observing a decrease in fuel quantity indication. The fuel quantity indicators should return to their original indication when the test button is released. Ascertain that sufficient Fuel is available for flight.

Engine Instruments

1. Digital EPR – RAT Indicator
2. EPR Indicators – Port & Starboard
3. N1 Indicators – Port & Starboard
4. EGT – Port & Starboard
5. N2 Ind. – Port & Starboard
6. Oil Press. – Port & Starboard
7. Oil Temp. – Port & Starboard
8. Oil Quantity – Port & Starboard

DIGITAL EPR – RAT INDICATOR

This instrument displays RAT, EPR, and the recommended EPR limit, selected on each engine's analog EPR indicator.

1. RAT in degrees Celsius
2. Current EPR (average both engines)
3. EPR Limit (average both engines)

EPR INDICATORS

0.8 to 2.4 EPR.

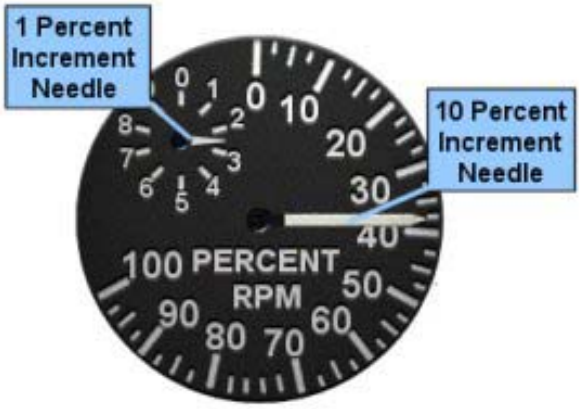
The **EPR Limit Bug**, controlled by the **Setting Knob**, selects the EPR limit.

The Warning Light will illuminate if actual EPR exceeds this limit.

At takeoff thrust, EPR should be around 2.18 at an ambient pressure of 27.2 in Hg and an RAT of 10 deg C.

EPR in the cruise would be just below 2.0 by about an equal amount i.e. - 1.8 to 1.9.

N1 AND N2 INDICATORS



0 – 100 %.

See Normal and Abnormal Power Plant Operation for correct usage of this instrument.

EGT INDICATORS

0 – 800 °C.

See Power Plant Limitations for correct use of this instrument.

The EGT bug setting is set at the factory and cannot be changed by the flight crew.

OIL PRESSURE INDICATORS

0 – 100 PSI.

See Normal and Abnormal Power Plant Operation for correct usage of this instrument.

OIL TEMPERATURE INDICATORS

0 – 110 °C.

See Normal and Abnormal Power Plant Operation for correct usage of this instrument.

OIL QUANTITY INDICATORS

0 – 16 Quarts per engine.

Normal Operating Limits	
Minimum	6 Quarts
Maximum	12 Quarts

Quantities on or near maximum are recommended.

Landing Gear Controls/Indicators

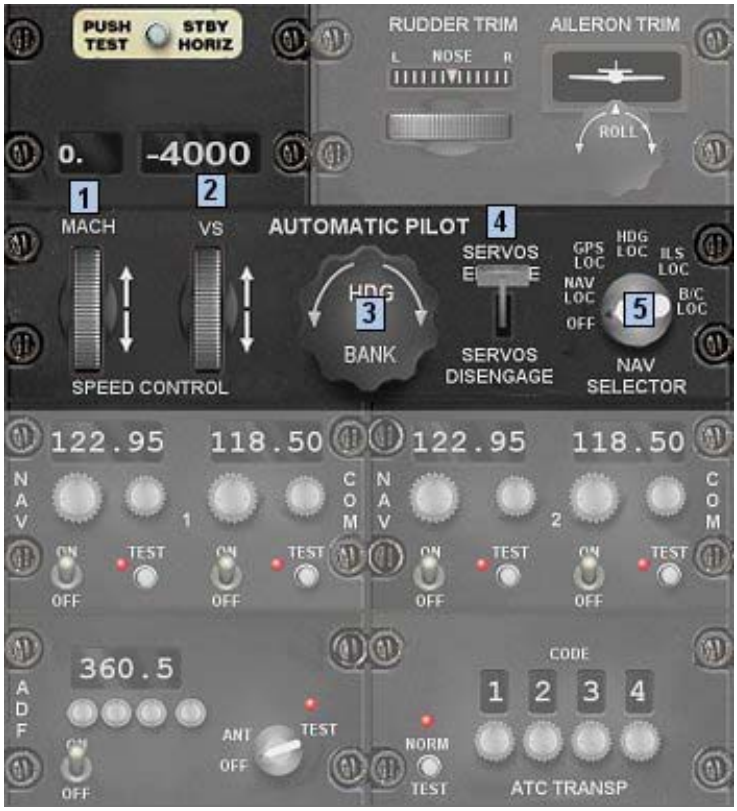
The gear handle and indicator lights are located on the center console.

Green indicator means the gear is down and locked.

Red indicator means the gear is in transition, and is NOT locked.

Radio Stack

AUTOPILOT



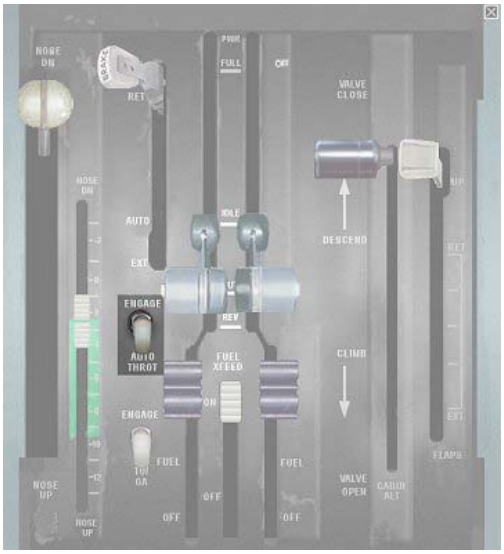
1. MACH SPEED HOLD control and readout
2. VERTICAL SPEED control and readout
3. HEADING/BANK direction knob. Introduces a coordinated turn.
4. Autopilot SERVOS ENGAGE (autopilot master). No autopilot functions will be enabled unless this switch is ON.
5. NAV/HDG SELECTOR. Controls mode of operation for the autopilot bank control – for heading (HDG), NAV/GPS lock, or ILS localizer/backcourse.

Mach Speed Hold

This control sets the actual speed-hold value, in Mach number.

This control works in conjunction with the **Autothrottle Engage Switch** on the throttle quadrant.

Note: If this switch is not engaged, the Mach Speed Hold Control has no function!



Vertical Speed Control

Works in conjunction with the Autopilot Heading Hold switch, on the main panel, and the Altitude Hold Setting Control, also on the main panel.

Note: If this switch is not engaged, and the altitude hold value (below) is not set, the Vertical Speed Control has no function!

Heading/Bank Direction Knob

The Heading Bank Direction knob works in conjunction with the autopilot Heading LOC function. This control will override the Heading Bug Selector Knob on the HSI, and introduce a constant coordinated turn.

The green indicator light directly below this knob will illuminate when this control is active.

Autopilot Servos Engaged Switch

This is the master autopilot control. The altitude hold, heading/Nav/ILS lock controls, or the speed controls will not function unless this switch is in the engaged position.

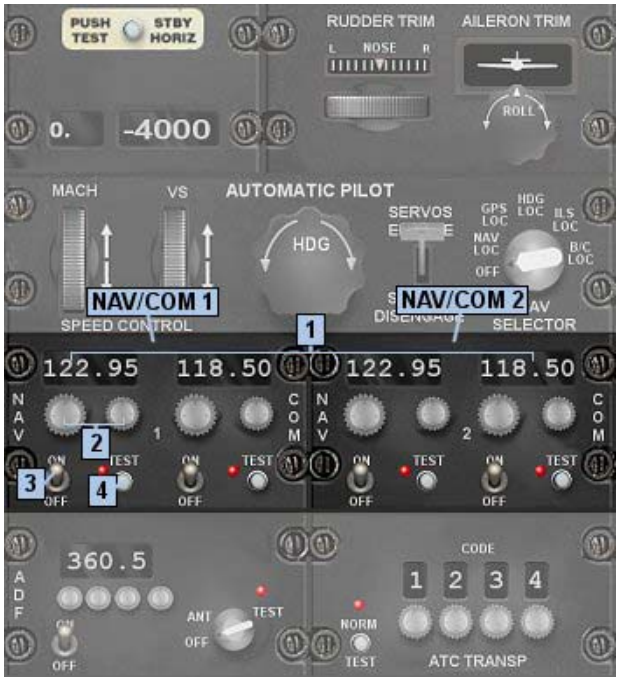
NAV/Heading Selector

This selector controls the LNAV guidance system of the autopilot.

1. Servos Engaged Switch – must be on for this selector to function.
2. Off position – no guidance control
3. NAV lock position feeds guidance instructions according to the OBS/NAV radial selected on the HSI. Note that a NAV frequency must be tuned into the NAV 1 radio for this to function.
4. GPS Lock uses data from the GPS and overrides the guidance instructions from the NAV radio.
5. HDG lock received guidance instructions from the HSI heading bug.
6. ILS lock will follow a localizer beam for LNAV and a glideslope signal for VNAV when it is tuned into the NAV 1 radio.
7. BC (backcourse) lock will follow a reverse localizer course

NAV/COM RADIOS

1. Frequency displays
2. Frequency adjustment knobs. The larger knob controls the whole number, the smaller knob controls the fractional values
3. ON/OFF master switch. This switch must be in the ON position; otherwise there will be no radio reception.
4. Test button. If after pressing this button, the indicator light shows red, a failure in this system has occurred.



ADF RADIO

1. Frequency display.
2. Whole frequency adjustment knobs. Individual controls for 100, 10, and 1 KHz adjustment.
3. Fractional .5 KHz adjustment knob.
4. Power ON/OFF switch. This switch must be in the ON position; otherwise there will be no radio reception.
5. Antenna mode switch. The switch must be in antenna (ANT) position, otherwise no reception will occur. In test position, if the indicator light shows RED, a system failure has occurred.

TRANSPONDER

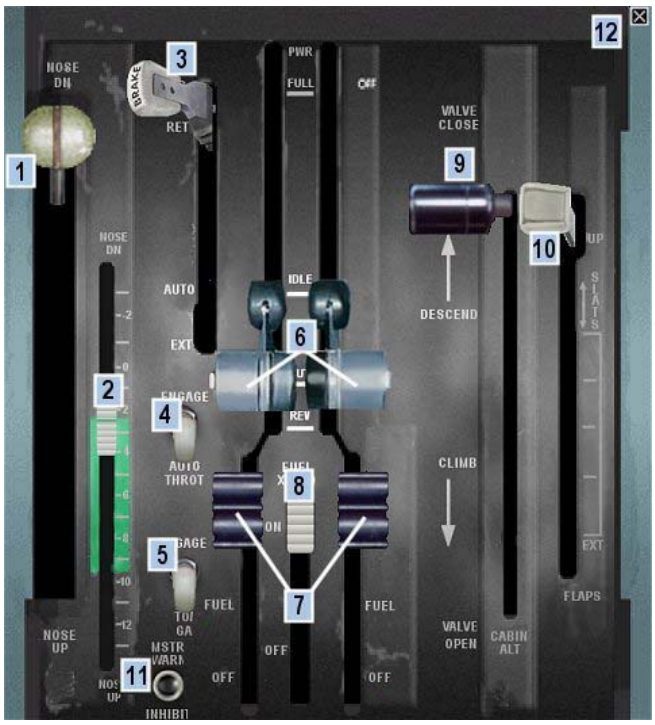
1. Individual adjustment knobs for transponder frequency
2. Test button. If after pressing this button, the indicator light shows red, a failure in this system has occurred.

TRIM CONTROLS

Electronic servo controls

1. Rudder control and trim position indicator
2. Aileron trim and position indicator

Pedestal



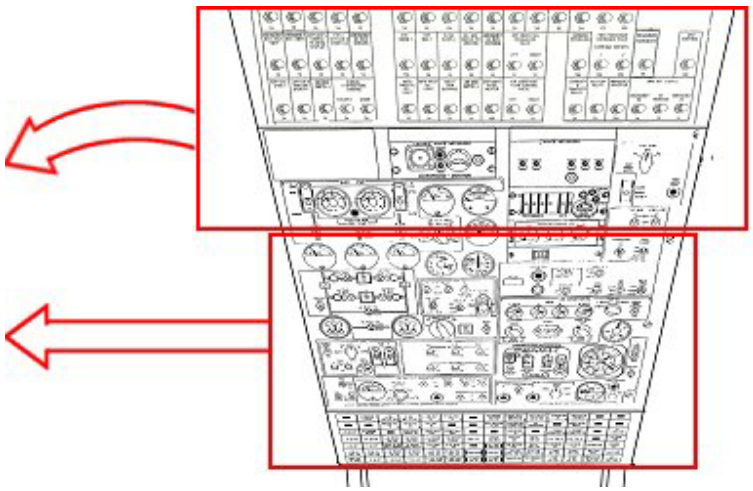
1. Pitch Trim Control
2. Pitch Trim Indicator
3. Speed Brake (spoiler) control. For automatic function on landing, move to AUTO position.
4. Autothrottle ON/OFF toggle (autopilot servos must be engaged).
5. TO/GA ON/OFF toggle (autopilot servos must be engaged).
6. Throttles. Move down past full off position to engage thrust reverse.
7. Fuel control levers, port and starboard.
8. Fuel crossfeed ON/OFF.
9. Cabin pressurization valve control
10. Flaps control.
11. Master Warn Inhibit Switch *
12. Close panel control.

*Master warning inhibit will prevent the master warning from sounding for 5 minutes in case of engine inoperative condition. Intended for use during normal ground operations when engines are not running.

Overhead

Aft Overhead Panel

Overhead/Annunciators



The overhead section of the DC 9 cockpit is quite large, and therefore, is split into two separate sections so that they will be large enough for you to use effectively.

The **Overhead/Annunciator** section contains the main annunciator panel, the APU/bus controls, master power switches, environmental/pressurization controls, deice system controls, fuel system and engine start controls, as well as the cabin lighting controls.

The Aft Overhead section contains the electrical generator/CSD controls, emergency power system, flight recorders and of course, the electrical circuit breakers.

OVERHEAD/ANNUNCIATORS

1. Annunciators
2. De-ice Controls
3. Windscreen Wiper Controls
4. Start Controls
5. Fuel Pump Controls
6. Cabin Pressurization Controls
7. Bus Controls
8. APU Controls
9. Master Power Switches
10. Environment/Air Conditioning Controls
11. Systems Test Circuits
12. Panel View Buttons

Annunciators

Critical system status and warnings are shown here.

De-ice controls

1. Deice system ammeter
2. Mode switch – select between pitot head heat (static or Aux), or Ram Air Temperature (RAT) probe heat.
3. Wing deice switches
4. Tail deice switch
5. Windscreen deice switches
6. Engine deice switches

Cabin Lighting Controls

1. Cabin Emergency Lights
2. Cabin no smoking lights
3. Cabin fasten seat belts lights

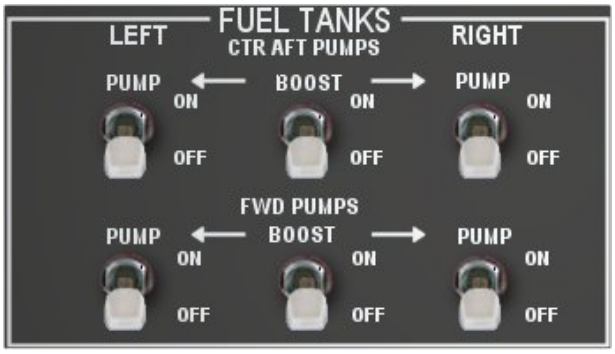
Start controls

1. Pneumatic start pump drive ON/OFF switch
2. Igniter Select switch for port engine (SYS A), starboard engine (SYS B). Normal start procedure is to move this switch to the BOTH position.
3. Fuel heat switches. Recommended for ground start in conditions below freezing.
4. Pneumatic start drive indicator. Indicates pressure in start drive system.
5. Start valves – port & starboard

Important – makes sure you review the Engine Start Procedures thoroughly before attempting to start the engines!

Fuel pump controls

In order for the engines to operate, either the forward fuel pumps or aft fuel pumps must be switched ON.



Cabin pressurization controls

1. Pressure valve status lights. When the pressure valves are open, the light will illuminate PRESS, otherwise STBY.
2. Pressure valve ON/OFF switch
3. Cruising altitude selector – your anticipated cruising altitude MUST be selected here, otherwise full cabin pressurization my not take place.
4. Landing field barometric pressure selector. Use his control to select the current barometric pressure of your destination field prior to descent.
5. Flow indicator. If the system is pressurizing, FLOW will illuminate.
6. Flow/Cabin Climb selector. Select up to 1000 fpm above your present climb rate. This will assist the pressurization system to keep the cabin altitude within desired limits
7. Pressurization alarm light. If cabin altitude rises above 8000' this alarm light will illuminate.
8. Cabin altitude indicator. Current cabin altitude, and differential pressure from the outside.

Important – make certain that you thoroughly review the Cabin Pressurization Procedure prior to operating this system!

Bus control panel

1. APU bus control
2. External power source bus – press ON if external power available
3. AC bus crosstie switch
4. DC bus load meters
5. DC bus crosstie switch
6. Galley power bus ON/OFF
7. AC load meters

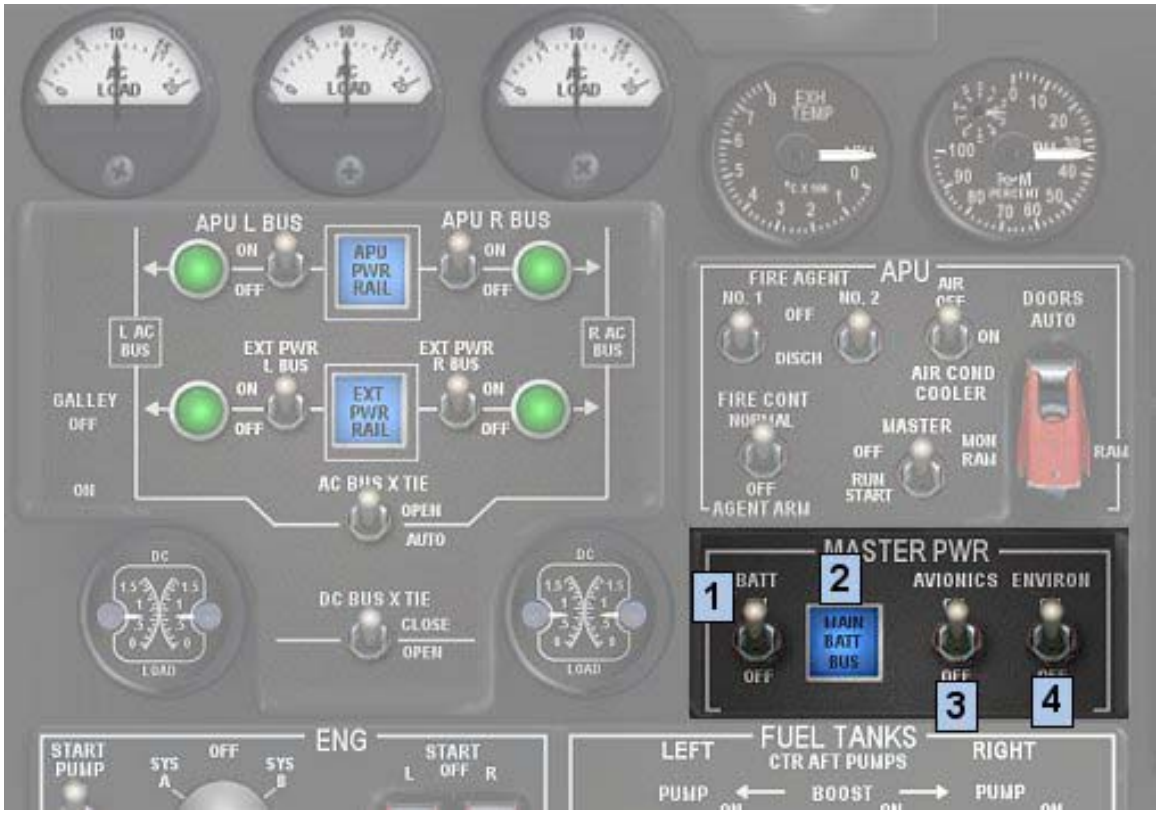
Important – please take time to review the Receiving Aircraft Procedures for Start and Operation of the Electrical System during preflight!

APU Control

1. APU start switch
2. APU fire control mode switch
3. Fire extinguisher switches
4. Air conditioning vent ON/OFF
5. Ventilation ducts OFF/AUTO
6. APU temperature – °C x 100
7. APU RPM indicator

Important – please take time to review the Receiving Aircraft Procedures for Start and Operation of the Electrical System during preflight!

Master Power Switches



1. Master battery ON/OFF
2. Master power indicator light
3. Master avionics ON/OFF
4. Master Environmental system ON/OFF

Important – please take time to review the Receiving Aircraft Procedures for Start and Operation of the Electrical System during preflight!

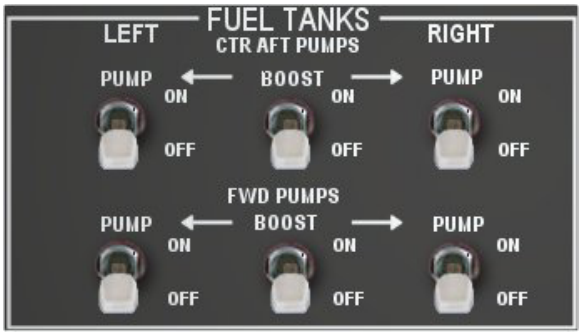
Environment/Air Conditioning Controls

1. Cockpit and cabin temperature controls and indicators. Set to AUTO, the system will provide heating or cooling as needed. Otherwise, the manual modes may be used.
2. Coolant supply switches AUTO/OFF. Coolant is supplied when in the AUTO position.
3. Coolant pressure indicators
4. Temperature indicator and selector. The selector toggles the indicator between cabin, cockpit and radio stack temperature readings.
5. Air conditioning auto shutoff switch. Automatically shuts off the AC system in case of cabin depressurization.
6. Ram air ON/OFF toggle. When on, bleed air is provided to the cooling pressurization system.
7. Radio stack VENTURI/FAN selector. When in FAN mode, coolant is pumped to the radio stack ventilation ducts for additional cooling.

Systems Test Circuits

Vital system tests during preflight and receiving the aircraft are tested here.

Fuel Pump Controls



Either forward or aft fuel pumps must be ON for the engines to operate.

Boost pumps should be in the ON position for engine start.

NOTE: If APU is operating, leave the right main tank pump operating after completing pump check.

AFT OVERHEAD PANEL

1. Circuit Breakers
2. Cockpit Voice Recorder
3. Flight Data Recorder
4. Comm/Antenna Controls
5. CSD/Electrical Controls
6. Data Recorder Controls
7. Emergency Power Controls
8. Data/Voice Recorders Master
9. Hydraulic Boost Pumps
10. Ground Proximity Warning Inhibit

Constant Speed Drive (CSD) And Generator Controls

1. Disconnect switches. Disconnects the drive from the engine (and effectively cutting electrical output).
2. Temperature indicators (left and right). 100 – 140 °C is normal operating range.
3. Generator output switches. Output from the CSD is transferred to the AC electrical bus when the switch is in the ON position.
4. APU throughput switch. AC power from the APU is delivered to the APU bus when this switch is in the ON position.
5. AC voltmeter. Slaved to Electrical System Mode Switch (8).
6. AC power frequency meter, in cycles per second (Hz.). Slaved to Electrical System Mode Switch (8).
7. Volt/Amp meter. Slaved to Electrical System Mode Switch (8).
8. Electrical System Mode Switch. Controls meter display of the various electrical sources.

One may be inoperative provided APU generator is operating and furnishing power to the bus. Disconnect CSD on inoperative generator.

Circuit Breakers

Push the circuit breaker and it will pop out. When the breaker is in the OUT position, the circuit will be open.

Cockpit Voice Recorder

Press the **Test Button** to check for circuit continuity and recorder function.

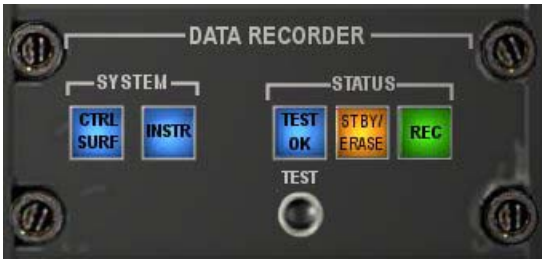
When the Voice Recorder Master **Record Switch** is ON the green light should illuminate, indicating that the recorder is operating.

Press the **Erase Button** to destroy the current record and reset the tape to the beginning (takes about 20 seconds).

Flight Data Recorder

When the Data Recorder Master **Record Switch** is in the ON position, the two **System Lights** (CTRL SURF, INSTR) and the green record (REC) light should illuminate, indicating that recording is in process.

Press the **Test Button** to check for circuit continuity and recorder function



Recorder Control Panel

The trip number advances automatically each time you start the DC 9. The date is also displayed.

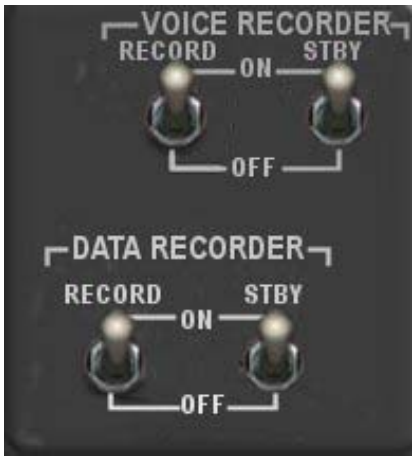
The amount of time left on the data recorder tape (up to 4 hours) is displayed. The **Reset Button** will return recording to the beginning, overwriting present data.

Data/Voice Recorder Master Switches

Master switches for both the voice and data recorders.

Turn the **Record Switches** ON to begin recording.

Turn the **STBY Switches** ON to pause recording.



Emergency Power Control

When the selector switch is in the ON position, the blue EMER PWR IN USE light should illuminate, indicating that power is being delivered.

Hydraulic Booster Pumps

Independent left and right booster pumps. These pumps will provide an additional 10-PSI of hydraulic pressure. For takeoff, landing, and extended gear or control surface operations.

COM Antenna Selector
Master Warning Inhibit Control

Primary and secondary antennae may be selected.

When the Master Warning Inhibit switch is engaged, master alarms will be suppressed for 30 seconds.

Ground Proximity Warning Inhibit

Silences the ground proximity warning system.

WARNING! The ground proximity warning system will not function while this switch is in INHIBIT position.

Alarms And Warnings

The DC 9 Series 30 is equipped with a number of caution, warning and safety alarms.

Ground Proximity Warning

The Ground Proximity Warning System alerts the flight crew when one of the following thresholds is exceeded between 50 and 2450 feet radio altitude.

Mode 1	Excessive Decent Rate.
Mode 2	Unsafe Terrain Clearance During High Speed Flight or While Not in the Landing Configuration.
Mode 3	Altitude Loss After Take - Off or Go Around.
Mode 4	Below Glideslope Deviation Alert.

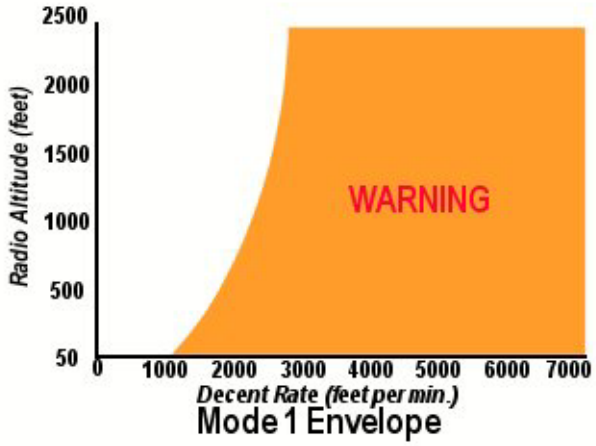
Inputs to the ground proximity computer are; radio altitude from the radio altimeter, barometric altitude rate and mach from an air data computer, glide slope deviation signals from HSI, and landing gear/flap positions.

An aural alert, combined with a Master Warning indication will accompany a deviation of any one of these modes.

Modes Explained (Note that these diagrams are simplified):

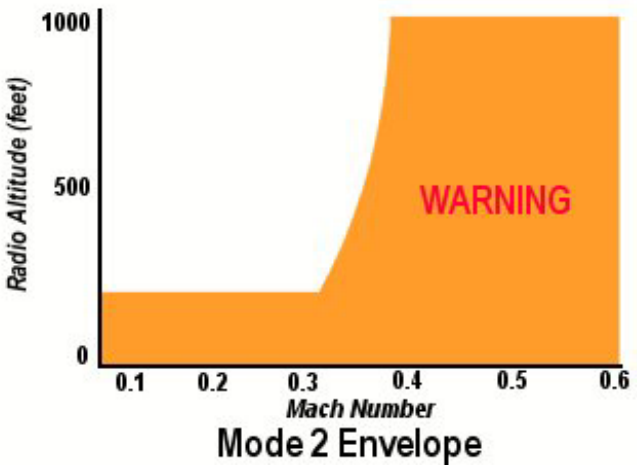
MODE 1 - EXCESSIVE DECENT RATE

Has two boundaries and is independent of airplane configuration. Penetration of the boundary generates a warning, until the rte of decent has been corrected.



MODE 2 - UNSAFE TERRAIN CLEARANCE WITH THE FLAPS NOT IN LANDING POSITION

This mode provides an alert when the gear is down and the flaps are not in landing position. If the envelope is penetrated at less than 0.28 mach with the flaps not in the landing position, the warning is triggered.



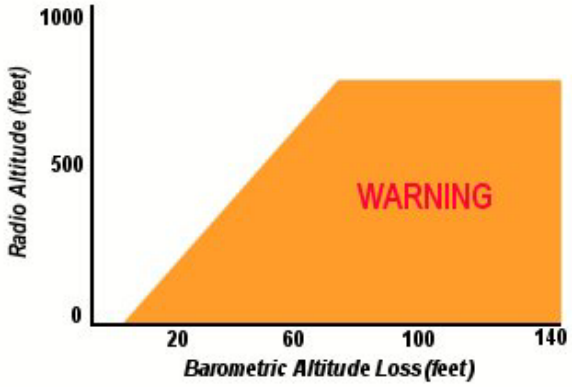
Mode 2 Envelope

MACH -IAS Conversion

MACH	SL	5000'	8000'	10000'
0.34	232	211	200	193
0.45	298	272	258	249

MODE 3 ALTITUDE LOSS AFTER TAKE OFF OR GO AROUND

Provides an alert if a decent is made during initial climb or go around. It is effective between 50 and 700 feet radio altitude and generates the alert when accumulated barometric loss equals approx. 10% of the existing radio altitude. Mode 3 does not arm during decent until below 200 ft radio altitude.



MODE 4 BELOW GLIDESLOPE DEVIATION ALERT
This mode alerts you of a descent of more than 1.3 dots below an ILS glideslope. The mode is armed when a valid signal is being received by the Captain's glideslope receiver and the radio altitude is 1000 feet or less.

Master Caution And Warning Indicators

Either warning can be reset for 30 seconds by depressing the indicator.

Master Caution Indicates failure in the electrical system and/or possible lack of integrity in the cabin pressurization controls. Note that you **must** have output from the CSD, APU, or external power, otherwise you will invoke a Master Caution.

Master Warning Indicates failure of cabin pressurization, engine(s), or signals a ground proximity warning. Either engine out will invoke a Master Warning.

Troubleshooting

Problem	Solution
The avionics master switch is on, but I am still getting **no radio reception**	Makes sure the power switch for the individual radio is on. Check the radio stack.
The **Cabin Press Alarm** and warning light keep coming on during the flight	Check that you have followed all of the Cabin Pressurization Procedures.
The **APU** is **overheating**	1. Make sure the Air Conditioning System is operating normally. In particular, make sure the coolant supply switch is in AUTO position. 2. Check to make sure the APU Air Cond./Cooler switch is in the ON position 3. Make sure the APU ventilation doors are in the AUTO position.
The **APU GEN OFF** light is illuminated, even though I have the APU running	Make sure you have the APU GEN switch on the CSD control panel switched ON.
I am **losing Electrical Power** during the flight.	Make certain the CSD is operating, and that the generator switches are in the ON position.
I am performing near-ground or radical descent procedures and the **Ground Proximity Warning System** keeps sounding	You can silence the GPSW using the inhibit switch on the aft overhead panel.
The **Flight Director Bars** do not seem to be moving.	Make sure the Flight Director Controls are in the proper position during the respective phase of flight.
I have just started climbing out and the **Master Caution alarm** has been triggered, even though the electrical system is functioning properly.	Most likely you have failed to follow the cabin pressurization procedures, and most likely; have not opened the cabin pressurization valve. If this is the case, the red **Cabin Press** annunciator will be illuminated on the overhead annunciator panel.
I have dialed in an **Altitude Hold** number, but it does not seem to be working	Make sure that the Autopilot Servos are engaged, and that the ALT Hold Switch is in the ON position.
The **radios** are **failing intermittently**	Make sure the Air Conditioning radio stack-cooling selector is set to FAN position, providing coolant to the radio stack ducts. Otherwise, the radios may begin to overheat, causing failure.
The **environmental** and **pressure system** controls **will not operate**.	Make sure the master Environmental System switch is in the ON position.
I press the **engine start valves** but nothing happens	1. Make sure you thoroughly review the Engine Start Procedures. 2. Make sure you have turned the pneumatic start pump ON

Appendix

Limitations & Performance

FLAPS SETTING DATA

Stall Speed Flaps Setting						Weight 1000 Lbs	VREF
0°	5 °	15 °	20 °	25 °	50 °		
128	124	118	115	113	105	110	134
125	121	115	113	111	103	105	131
122	118	112	110	108	100	100	128
119	115	109	107	105	98	95	125
116	112	106	104	102	95	90	122
112	109	103	101	99	92	85	118
109	106	100	98	96	90	80	115
106	102	97	95	93	87	75	111
102	99	94	92	90	84	20	107
98	95	90	88	87	81	65	103
280 0.57 M	280	240	240	210	180	← Maximum Speed	

AIRSPEED LIMITATIONS

Condition	KIAS	Mach
Maximum Operating	350	.84
Landing Lights	350	.84
Max for use of Speed Brakes	350	.84
Mm for use of Speed Brakes	220	---
Turbulence penetration	285	.79
Landing Gear	215	.51
Maximum Slat/Flap Speeds		
Slats	280	.57
Flaps 5°/10°	280	.57
Flaps 15°/20°	240	.57
Flaps 25°/30°	210	.57
Flaps 50°	180	.57

POWER PLANT LIMITATIONS

Engine Type…… Pratt & Whitney JT8D-7A

EGT Limits/Thrust Ratings

Operating Conditions	Max. EGT	Time Limit	Thrust/EPR	Notes
Start – below 59 °F RAT	350 °C	Momentary		1
Start – above 59 °F RAT	420 °C			
Idle	480 °C	Continuous		2
Maximum Continuous or Maximum Climb	540 °C 545 °C	Continuous	12,600 Lbs./ 1.8 – 2.0 EPR	3
Takeoff	590 °C	3 Minutes	14,000 Lbs./ 2.0 – 2.2 EPR	4
Acceleration	590 °C	2 minutes	1.8 – 2.2 EPR	

Takeoff, maximum Continuous and Maximum Climb thrust levels are established by appropriate EPR values for the ambient pressure and engine Ram Air Temperature (RAT) conditions.

Notes:

1. If the maximum allowable starting temperature is exceeded, the engine should be shut down and inspected in accordance with the Pratt & Whitney maintenance manual.
2. The idle EGT limit applies at idle speeds, after the air conditioning systems are turned on.
3. The thrust rating is established at sea level under standard day conditions with the engine static.
4. The 14,000 lbs. Takeoff static thrust at sea level is available p to 84 °F ambient temperature.

EPR Calculation

The Engine Pressure Ratio (EPR) is defined to be the total pressure ratio across the engine. EPR is the ratio of nozzle total pressure to compressor face total pressure. EPR is measured on an operating engine and displayed to the pilot on the digital EPR indicator, and on the cockpit dials on the center console. The following table provides guidelines for takeoff acceleration EPR, given a range of atmospheric pressures and temperatures.

Takeoff Thrust – 2 Engine Static Setting - EPR					
	Altitude - Feet				
RAT °C	400 & Below	401-800	801-1300	1300-1700	1701 & Above
9 – 20	2.11	2.12	2.13	2.14	2.15
21 – 22	2.11	2.12	2.13	2.14	2.14
23 - 24	2.11	2.12	2.13	2.13	2.13
25 - 26	2.11	2.12	2.12	2.12	2.12
27 & Up	2.11	2.11	2.11	2.11	2.11

*RAT = Ram Air Temperature

Cabin Climb Calculation

The formula for Cabin Climb Rate (CCR) is: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CCR = (TCA – RA) / (TA / CR)

TCA = Target Cabin Altitude (8000 ft.)
RA = Runway Altitude
TA = Target Altitude
CR = Climb Rate (ft. per minute)
```

Example:
Takeoff RA = 950 ft. (ASL)
TA = 28000 Ft.
CR = 2100 ft. per minute

CCR = 547

Set the Cabin Climb between 500 and 600.

Glossary

Abbreviations

AFL	Above Field Level
AGL	Above Ground Level
A/P	Autopilot
DH	Decision Height
FAF	Final Approach Fix
FD	Flight Director
G/P	Glide Path
HAT	Height Above Touchdown
IAF	Initial Approach Fix
IAS	The indicated airspeed on the airspeed indicator will seldom be the actual speed of the airplane. Airspeed indicators show airspeed at sea level. As the plane rises in altitude, the air becomes thinner and does not offer as much pressure against the airspeed indicator. Therefore, the indicator reads less than the true airspeed. True airspeed can be calculated by adding 2 percent of the indicated airspeed for each thousand feet of altitude. **Example:** What is the true airspeed of a plane that flies at 5,000 feet altitude if the indicated airspeed is 150 miles per hour? **Solution:** The correction is 2 percent per thousand feet of altitude. Since the altitude is 5,000 feet, 2 % x 5 = 10 % Next, multiply the indicated airspeed time 10%: 150 x .10 = 15 miles per hour True air speed is 150 + 15 = 165 miles per hour.
LOC	Localizer
Mach Airspeed	Ratio of true airspeed to the speed of sound. Mach 1 is the speed of sound at sea level, ISA, approximately 1,100 feet per second or 760 mph.
Maneuvering Configuration	Gear Up. Flaps 20° / 15°
MAP	Missed Approach Point
MDA	Minimum Descent Altitude
MGLO	Minimum Gross Level Off is the Minimum Altitude at which the Aircraft should be leveled off in order to complete the S/E transition. This assures clearance of all obstacles in the takeoff flight path.
OBS	Omni Bearing Selector
PT	Procedure Turn
RAT	**Ram Air Temperature**. Temperature of the incoming air being received by the turbine intake. Usually very close to outside air temperature.
S/E	Single Engine

General Airspeed Terminology and Symbols

CAS	Calibrated Airspeed means the indicated speed of an aircraft corrected for position sad instrument error, Calibrated airspeed is equal to true airspeed in standard atmosphere as sea level.
KCAS	Calibrated Airspeed expressed in Knots
GS	Ground Speed - the speed of an airplane relative to the ground.
IAS	Indicated Airspeed- the speed of an aircraft as shown on the airspeed indicator when corrected for instrument error. IAS values assume zero instrument errors.
KIAS	Indicated Airspeed expressed in Knots
TAS	True Airspeed is the airspeed of an airplane relative so undisturbed air, which is the CAS corrected for altitude, temperature and compressibility.
VA	Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not overstress the aircraft
KTAS	True Airspeed expressed in knots
VFE	Maximum flap extended speed – highest permissible with wing flaps in a prescribed extended position
VLE	Maximum Landing Gear Extended Speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
VLO	Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted.
VMCA	Air Minimum Control Speed is the minimum flight speed at which the airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and wind milling; not more than a 5’ bank towards the operative engine; takeoff power on operative engine; landing gear up- flaps in takeoff position; and most rearward CG.
VNE	Never Exceed Speed is the speed limit that may nut be exceeded at any time.
VNO	Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
VS	Stalling Speed or the minimum steady flight speed at which the airplane is controllable.
VSO	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of she airplane during takeoff and landing was actually demonstrated during certification tests.

Internet Links

Boeing Information Page
Information on EPR
Airliners.net Page
Information on RMI Usage
Information on HSI Usage
Aviation Resource Center
Flying The DC 9 Classic
Northwest Airlines DC 9 Configuration
Koop's Aviation DC 9 Page
A lot of very cool photos