

**Docket No. SA-520**

**Exhibit No. 2-H**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**Washington, D. C.**

Excerpts from MD-80 *Flight Handbook*

(12 Pages)

BEFORE START EXPANDED PROCEDURES (CONT'D)

• **HYDRAULIC QUANTITY** ..... **CHECKED**

Check HYD FLUID QUANTITY. When hydraulic systems are pressurized, FLUID QUANTITY indications will decrease. Minimum hydraulic quantity (system pressurized) for dispatch is 7 quarts in left system and 8 quarts in right system.

Verify ENG HYD PUMPS switches are in HI and AUX and TRANS pump switches are in OFF.

**BRAKE TEMPERATURE** ..... **CHECK/ALL**

Observe OVHT light is off. Verify brake temperature selector is in ALL. Push brake temperature TEST button and observe BRAKE TEMP gauge indicates between 425 and 475 degrees C and OVHT light comes on. Release brake temperature TEST button and observe BRAKE TEMP gauge indication returns to pre-test value and OVHT light goes off.

ADF ..... **SET**

**RADAR/TCAS/TRANSPONDER** ..... **CHECKED/STANDBY**

WX RADAR SYSTEM.

Activate TEST mode. Adjust DISPLAY and MARKER brightness controls for desired viewing level. Check that the test display is similar to test pattern shown in Section 8.300 of this Handbook (AVIONICS tab). Select 160-mi range for correct test pattern display. Indicators with turbulence detection feature will display a white turbulence band when 40-mi range is selected. The following functions can be tested by activating the associated pushbutton: SEC, AZ, FRZ, RGHT, LEFT. RGHT and LEFT can be activated only when SEC is deactivated. Rotate TILT knob; number at bottom left of display should change. Put system in STBY to maintain system in ready state.

TCAS System

For TCAS Test, press the TEST Switch until hearing the aural message "TCAS Test Pass" or "TCAS Test Fail". Ensure the TA DSPLY Switch is in the AUTO position for normal operation. Refer to AVIONICS (Section 8.400) for operation procedures. Verify the Transponder is set to STANDBY.

**STABILIZER TRIM** ..... **CHECKED & NORMAL**

Move PRIMARY MOTOR BRAKE switch to "STOP". Operate both Captain's control wheel trim switches in NOSE UP and NOSE DN directions. Observe stabilizer does not move and aural warning does not sound. Unless stabilizer is running away, NEVER PLACE THE PRIMARY MOTOR BRAKE SWITCH TO "STOP" WITH THE STABILIZER IN MOTION. Damage will result. Move the PRIMARY MOTOR BRAKE switch to NORM and verify guard is down. The PRIMARY MOTOR BRAKE switch does not affect operation of the alternate stabilizer trim system. While observing the stabilizer indicator, hold Captain's control wheel left trim switch to NOSE UP and then to NOSE DN momentarily.

CAUTION - Do not hold single switch position longer than 3 seconds.

The stabilizer should not move and aural warning should not sound. Repeat this check using Captain's control wheel right trim switch. Observe stabilizer does not move and aural warning does not sound.

Operate both Captain's control wheel trim switches in NOSE UP and then NOSE DN directions and note corresponding direction of stabilizer indicator and aural warning. Operate both First Officer's control wheel trim switches and check stabilizer indicator. Moving Captain's and First Officer's control wheel trim switches in opposite directions will stop stabilizer movement. This is not a required test. If test is used, do not exceed 3-second limit.



BEFORE START EXPANDED PROCEDURES (CONT'D)

Operate both LONG TRIM HANDLES in same direction and check for corresponding indicator movement, release handles to neutral. While observing horizontal trim indicator, momentarily operate each ALT LONG TRIM switch individually to NOSE UP and NOSE DN. Observe stabilizer does not move and aural warning does not sound. Operate both ALT LONG TRIM switches and check for direction of travel at slower rate. To obtain maximum service life, do not maintain switch positions longer than necessary to check response. If there is no response, release switches and determine cause. Should either trim handle or any control switch bind, hesitate or stick when released to neutral, it should be corrected before flight. Any time LONG TRIM handles, control wheel trim switches, or ALT LONG TRIM (secondary) controls are used, they should be moved to their fully deflected switch/lever position to insure both motor and brake circuits are actuated.

SPOILER LEVER..... DISARMED

Verify spoiler lever is in the forward RET (disarmed) position. Normally, 1/4" to 1/3" of red arming band will be visible with spoiler lever in disarmed position. The aileron control wheel will operate flight spoilers in a lateral control function. Observe HYD PRESS gage indicators dip slightly as control wheel is moved in each direction. Flight spoiler surfaces start to extend only after approximately 5 degrees control wheel throw from neutral. During ground operation, when any spoiler panel is extended 10 degrees or more, SPOILER DEPLOYED annunciator light will come on.

RUD HYD CONT LEVER..... PWR

Verify the RUD HYD CONT Lever is in the PWR position. The RUDDER CONTROL MANUAL light will not go out until the right system is pressurized.

• TAKEOFF WARNING, THROTTLES..... CHECKED, IDLE

To test flap and slat function of the takeoff warning system, FLAP/SLAT handle should be in UP/RET, stabilizer in green band, spoilers retracted and parking brakes released. Move both throttles towards full forward position and observe takeoff warning sounds. Move throttles to idle and observe warning is silenced. BOTH throttles must be moved in order to arm the Takeoff Warning System. If takeoff warning does not sound, maintenance action is required prior to takeoff. Confirmation of takeoff warning system operation does not ensure that correct takeoff values for stabilizer trim, center of gravity or flap/slat position have been set.

• FUEL LEVERS, CROSSFEED..... OFF, OFF

Verify FUEL levers are OFF and the FUEL X FEED lever is OFF. The FUEL levers must be at OFF before starting engines to prevent premature fuel flow and ignition. The FUEL X-FEED lever should be in OFF for all normal operations.

FLAP/SLAT HANDLE..... UP/RET

Observe FLAP/SLAT handle is in UP/RET detent, both flap position pointers are UP, and the Slat TAKEOFF, SLAT DISAGREE, AUTO SLAT and SLAT LAND lights are off. If handle is in any other position than UP/RET, contact ground crew for clearance before moving the handle.

CABIN ALTITUDE CONTROL..... AUTO

Verify CABIN ALTITUDE CONTROL LEVER is in the AUTO position and VALVE INDICATOR is OPEN.

COMMUNICATIONS..... CHECK/SET

Number 1 radio will be used for ATC communications and number 2 radio will be used for Company and ATIS.



TAXI EXPANDED PROCEDURES (CONT'D)

When Maximum Thrust must be used, it should be limited to the 24 hour period immediately following the point at which the ART System becomes inoperative.

- a Logbook entry is required anytime Maximum thrust is used.
- a Logbook entry is required anytime the ART System fires for any reason (i.e. engine failure, windshear, etc.), resulting in Maximum thrust.
- a Logbook entry is **not** required as a result of executing a missed approach or go-around.

**FLT GUIDANCE, RADIOS, FMA ..... SET, T.O.-T.O.**

Verify flight guidance system and radios are set as required and that the most restrictive altitude for the departure is displayed in the arm window of the FMA. Push either TO/GA button. Observe roll and pitch FMA's display TAK OFF. Flight director command bars will command wings level and level flight and FAST/SLOW indicators will show full slow. Flight director command bars and FAST/SLOW indicators are not valid until after rotation.

**STABILIZER TRIM ..... °, ..... %, SET ..... °**

Rotate the FLAP thumbwheel, in the LONG TRIM Takeoff Position Display, until the computed T.O. FLAP value appears in the FLAP window.

Rotate the C.G. thumbwheel, in the LONG TRIM Takeoff Position Display, until the computed C.G. value appears in the C.G. window.

- when the FLAP and C.G. values are set for takeoff, the Stabilizer TAKEOFF CONDTN LONG TRIM Readout window will display the proper trim setting.
- using the Primary LONG TRIM Control Wheel Switches, or LONG TRIM Handles, set the LONG TRIM (White) Indicator opposite the Long Trim Takeoff Position (Green) Indicator.
- If the indicators are not within a specified tolerance, after takeoff flaps have been selected, the aural warning will sound when the throttles are advanced for takeoff.

Make a functional check of the Takeoff Warning System. Advance both throttles toward the takeoff position. No warning should sound.

**APU, AIR ..... ON/OFF**

Verify the APU "Air" Switch is OFF. The APU Bleed Air Switch must be OFF for all inflight operations. Unless otherwise required, the APU itself should be shut down. Continued APU operation is recommended when departing very warm terminal areas to assure adequate Aft Accessory Compartment ventilation during takeoff and initial climb. APU operation is also recommended when departing on contaminated runways for electrical system back-up (L & R APU Bus Switches ON).

**PNEUMATIC CROSSFEEDS ..... OPEN/CLOSED**

Position as required. PNEU X-FEED VALVE levers should be closed except if wing anti-ice is to be selected after takeoff. Refer to Ice & Rain Protection - Normal Operation. With the pneumatic crossfeed valves closed, leakage through the valves may cause an indication on the PNEU PRESS gauge. This is a normal condition.

**BRIEFING, BUGS ..... REVIEWED, SET**

**BRAKE TEMPERATURE ..... CHECKED**

Observe brake temperature OVHT Light is off and gauge indicates in normal range.

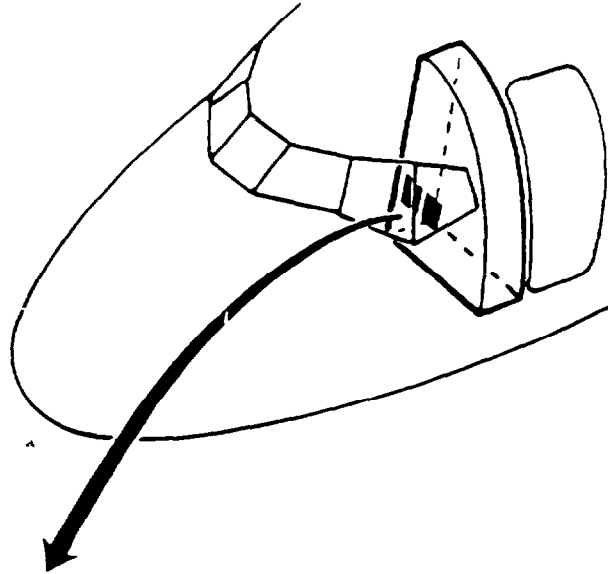
**SHOULDER HARNESSSES ..... ON**

**HYD AND ANTI-SKID**

<p><b>ELEVATOR PWR ON</b> Illuminates to indicate when hydraulic power is being used to drive the elevator halves to pitch the nose down. The system is designed to be activated by forward movement of the elevator control column. BLUE</p>	<p><b>SPOILER/FLAP EXTENDED</b> <b>MASTER CAUTION</b> Indicates speedbrakes extended with the flaps extended beyond 6°. This light is deactivated when on the ground.</p>
<p><b>PARKING BRAKE ON</b> Indicates the parking brake is set. Could also illuminate with a malfunction of the anti-skid system.</p>	<p><b>RUDDER CONTROL MANUAL</b> Indicates hydraulic power is not being supplied to the rudder power cylinder.</p>
<p><b>L REVERSER ACCUMULATOR LOW</b> Indicates pressure in the accumulator has dropped to 1450 psi or below.</p>	<p><b>R REVERSER ACCUMULATOR LOW</b> Indicates pressure in the accumulator has dropped to 1450 psi or below.</p>
<p><b>L HYD TEMP HI</b> <b>MASTER CAUTION</b> Illuminates when the system reservoir fluid temperature reaches approximately 105°C.</p>	<p><b>R HYD TEMP HI</b> <b>MASTER CAUTION</b> Illuminates when the system reservoir fluid temperature reaches approximately 105°C.</p>
<p><b>L HYD PRESS LOW</b> <b>MASTER CAUTION</b> Indicates hydraulic pressure is below normal. This pressure sensing is located in the spoiler sub-system just downstream of the spoiler bypass valve.</p>	<p><b>R HYD PRESS LOW</b> <b>MASTER CAUTION</b> Indicates hydraulic pressure is below normal. This pressure sensing is located in the spoiler sub-system just downstream of the spoiler bypass valve.</p>
<p><b>L OUTBD ANTI-SKID</b> Indicates failure/malfunction of anti-skid protection for the specific wheel. This light will illuminate also when system is tested provided switch is in "ARM" and gear handle is down. The light will be on also if the system switch is "OFF."</p>	<p><b>R OUTBD ANTI-SKID</b> Indicates failure/malfunction of anti-skid protection for the specific wheel. This light will illuminate also when system is tested provided switch is in "ARM" and gear handle is down. The light will be on also if the system switch is "OFF."</p>
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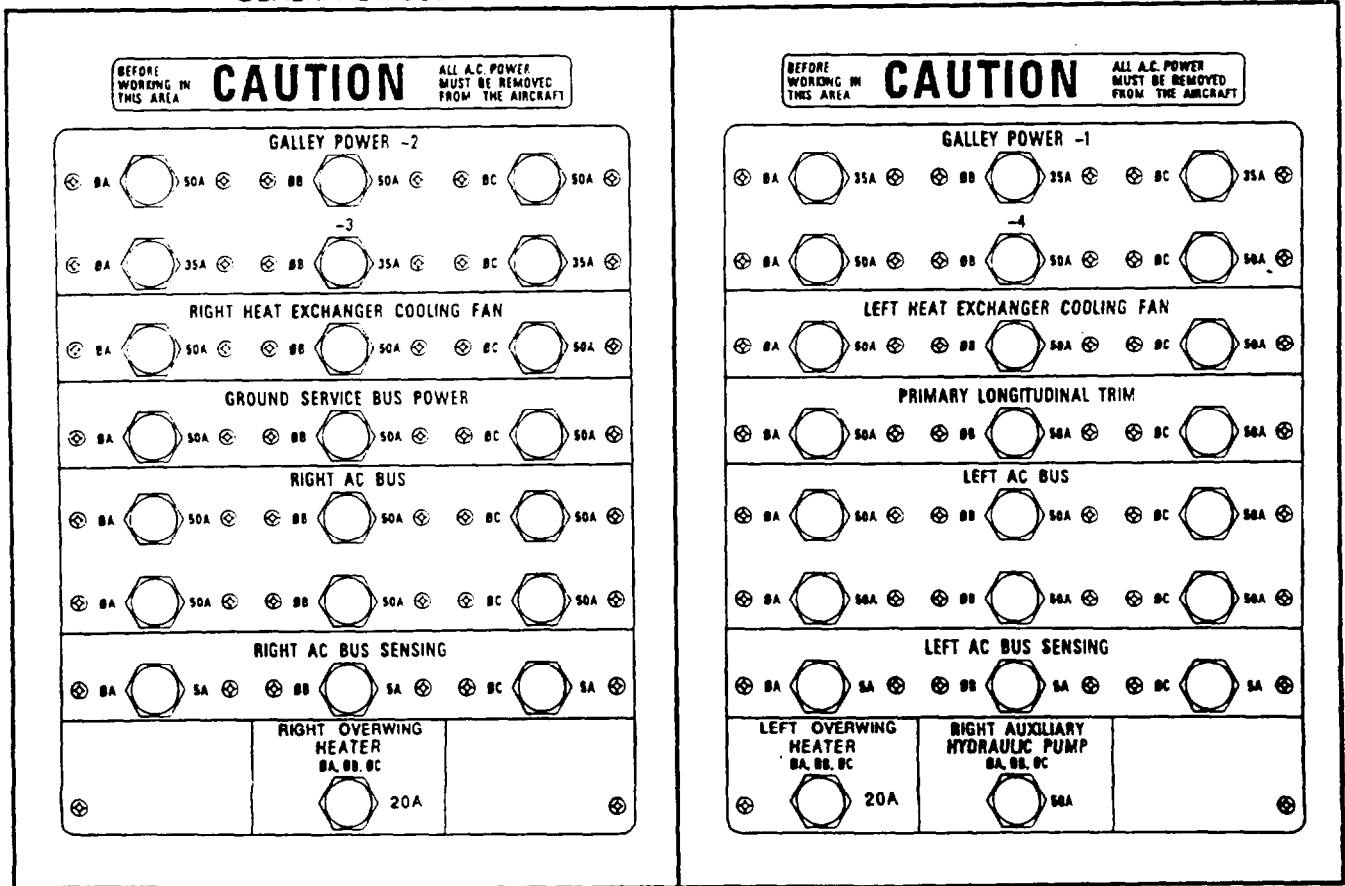
ELECTRICAL POWER CENTER (EPC)

L & R GENERATOR BUS

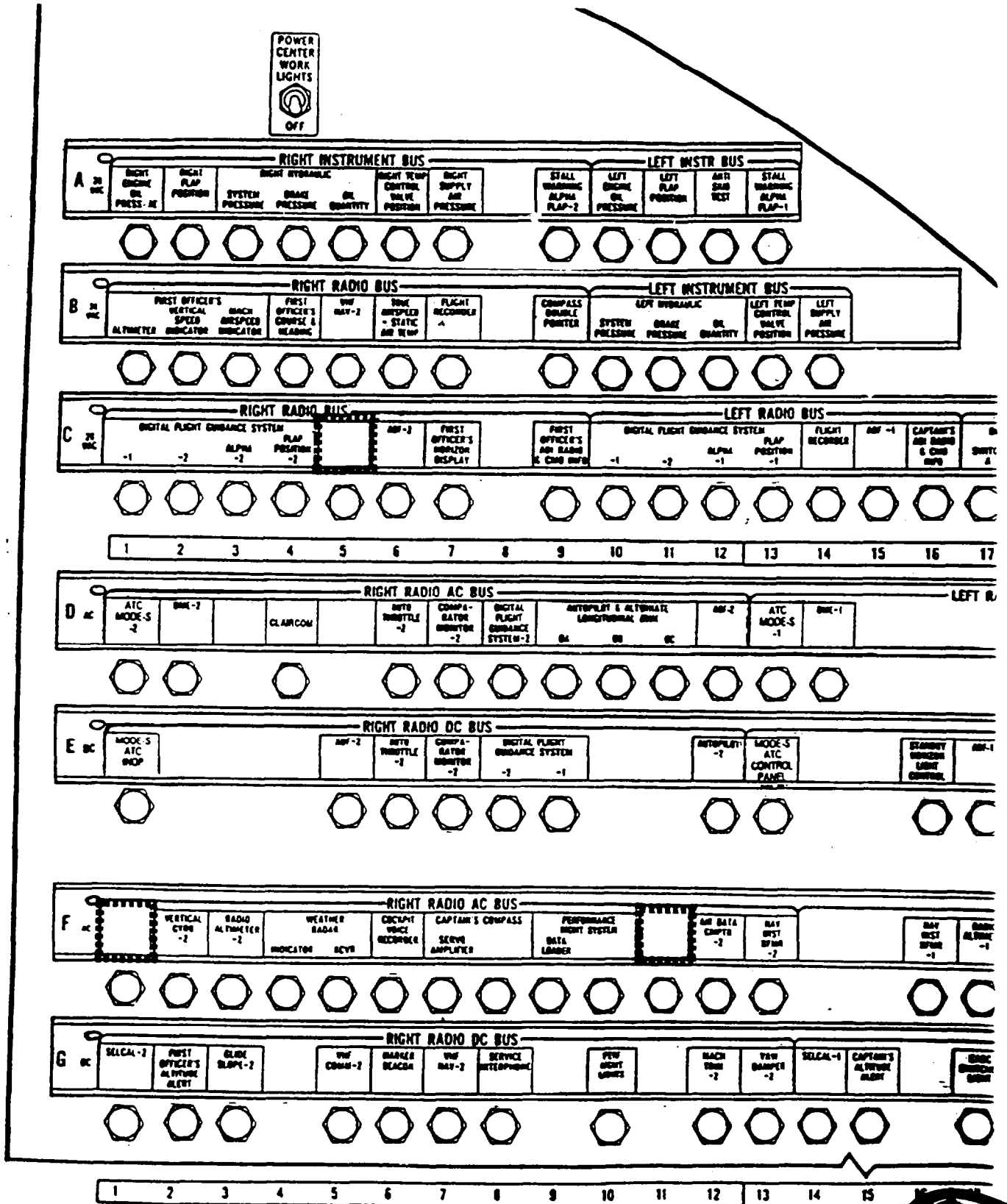


RIGHT  
GENERATOR BUS

LEFT  
GENERATOR BUS



INSTRUMENT AND RADIO BUSES (UPPER EPC)  
Rows A thru G



**AUTOMATIC FLIGHT (Continued)**

**FLIGHT MODE ANNUNCIATOR (FMA)**

The Flight Mode Annunciator (FMA) is an integral part of the Digital Flight Guidance/Flight Director/Autopilot Control System, and is provided to keep the flight crew informed of operating status of the selected computer or any malfunction or failure which could affect the operation of the selected system.

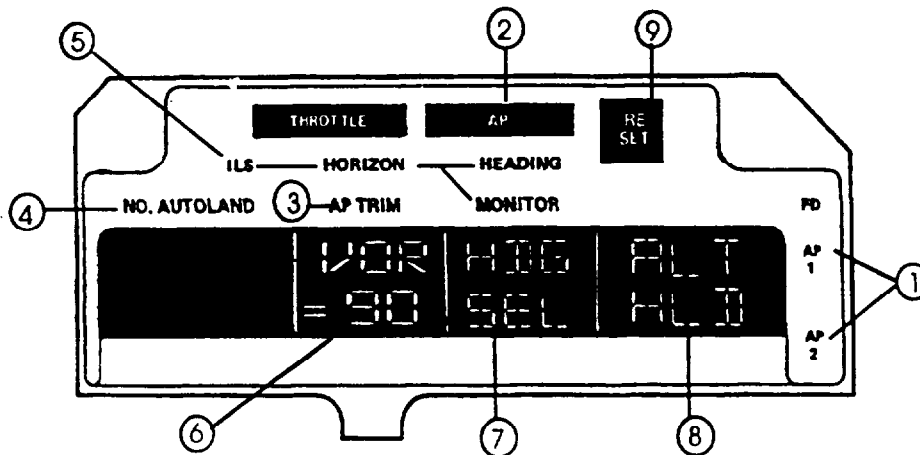


Figure 2

The FMA indications associated with the autopilot operation are the following:

1. AP1 and AP2 Advisory Lights (blue)
  - A. Advises crew as to what information is displayed on the FMA.
  - B. If either AP light is illuminated, display windows annunciate autopilot information. The 1 or 2 indicates which computer system is selected for control and display.
  - C. If no blue AP light is illuminated, display windows can annunciate flight director information.
2. AP Warning Light (red)
  - A. Flashing light illuminates whenever autopilot is disengaged.
  - B. Aural warning tone will accompany light if disengagement occurs during an automatic landing mode.
3. AP Trim Light (amber)
  1. Illuminates when stabilizer out of trim condition exists with autopilot engaged.
4. No Autoland Light (amber)
  1. Illuminated whenever automatic landing capability is not available for the selected Digital Flight Guidance Computer
5. Comparator Light - ILS, HORIZON, HEADING AND MONITOR (amber)
  1. Provides disagreement or failure annunciation of Captains and First Officers flight instruments.
6. ARM Display Window (amber)
  1. Annunciates the Autopilot/Flight Director armed mode(s).
7. ROLL Display Window (green)
  1. Annunciates the Autopilot/Flight Director roll axis operating mode.
8. Pitch Display Window (green)
  1. Annunciates the Autopilot/Flight Director pitch axis operating mode.





**AUTOMATIC FLIGHT (continued)**

9. Reset/Recall Button
  - (A) Used to extinguish ILS-HORIZON-HEADING-MONITOR or NO AUTOLAND legends if problem is not automatically corrected.
  - (B) Can also be used to recall any comparator/failure legend after reset if failure still exists by pressing and holding button in.

**AUTOPILOT/ALTITUDE CONTROL PANEL (Figure 3)**

1. DFGC (Digital Flight Guidance Computer) 1-2 SELECTOR Permits selection of the controlling computer (#1 or #2) for all autopilot functions.
2. AP ON (Autopilot On) Switch
  - A. Permits engagement or disengagement of the autopilot.
  - B. The switch is magnetically held and will not allow engagement unless all protection circuits are satisfied.
3. Altitude Select Knob
  - A. Three position knob which is spring loaded to the normal (center) position. Sets desired altitude in the ALT readout window when rotated. The normal position changes altitude in 1,000 foot increments, when below 1,000 feet it reverts to 100 foot increments.
  - B. When pushed in and held while rotating, altitude is changed in 100 foot increments
  - C. Pushing in will also cancel altitude alert warning.
  - D. Pulling knob full out will arm altitude preselect function so the autopilot, when engaged will automatically capture and hold the selected altitude.

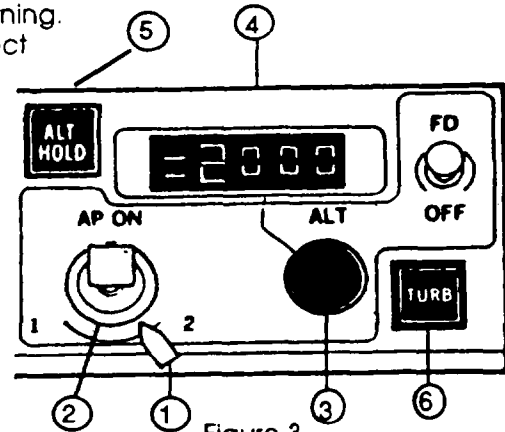


Figure 3

**NOTE:** Altitude preselect should automatically arm a few seconds after selecting the altitude on the new computers.

4. ALTITUDE READOUT  
A digital display of altitude selected with altitude knob.
5. ALTITUDE HOLD Select Button
  - A. When pressed, autopilot will capture and hold the altitude existing at the time of mode engagement..
  - B. "ALT HOLD" will be displayed in the pitch window of both FMAs.
6. TURBULENCE MODE Select Button
  - A. When selected, the autothrottle will disengage.
  - B. The autopilot will provide low gain roll and pitch control for turbulence penetration.
  - C. "WNG LVL" will be displayed in the roll readout window of the FMAs and "TURB" will be displayed in the pitch readout window of the FMAs.

**AUTOMATIC FLIGHT** (continued)

**FLIGHT DIRECTOR**

The Flight Director subsystem provides computed outputs that are displayed to the pilot as maneuvering commands on the ADI/PFD roll and pitch command displays. These steering commands are computed within the respective Digital Flight Guidance Computer; DFGC #1 for the Captain and DFGC #2 for the First Officer. A "FD" command switch on the Flight Guidance Control Panel determines whether the Flight Director is on or off. When the autopilot is engaged the Flight Director single-cue V-Command Bars are simply used to monitor the autopilot performance relative to Flight Director Guidance. When the airplane is manually flown, the pilot must satisfy (center and follow) the roll and pitch commands of the Flight Director V-Command Bars if the airplane is to acquire and maintain a computed flight path.

**MACH TRIM COMPENSATOR**

Speed-attitude-correction is provided by a Mach Trim Compensation System. The Mach Trim Compensation System automatically adjusts the center position of the control column to compensate for nosedown pitching of the airplane caused by high mach number during flight. Mach trim compensation operation is independent of other functions of the Auto Flight System. Elevator control through mach trim compensation is separate from elevator movement control by the autopilot.

**AUTOMATIC LONGITUDINAL PITCH TRIM**

Automatic pitch trim function is provided to transfer steady-state elevator loads to the stabilizer by moving the horizontal stabilizer up or down. If an out-of-trim condition develops in the pitch axis, the horizontal stabilizer will move up or down as commanded by the Automatic Pitch Trim System to correct the out-of-trim condition. AP TRIM lights, located in the Flight Mode and Instrument Warning annunciators may come on during automatic pitch trim compensating action, if the magnitude or time duration of the signal is great enough. The lights will go off when the out-of-trim condition has been corrected.

**AUTOTHROTTLE/SPEED CONTROL**

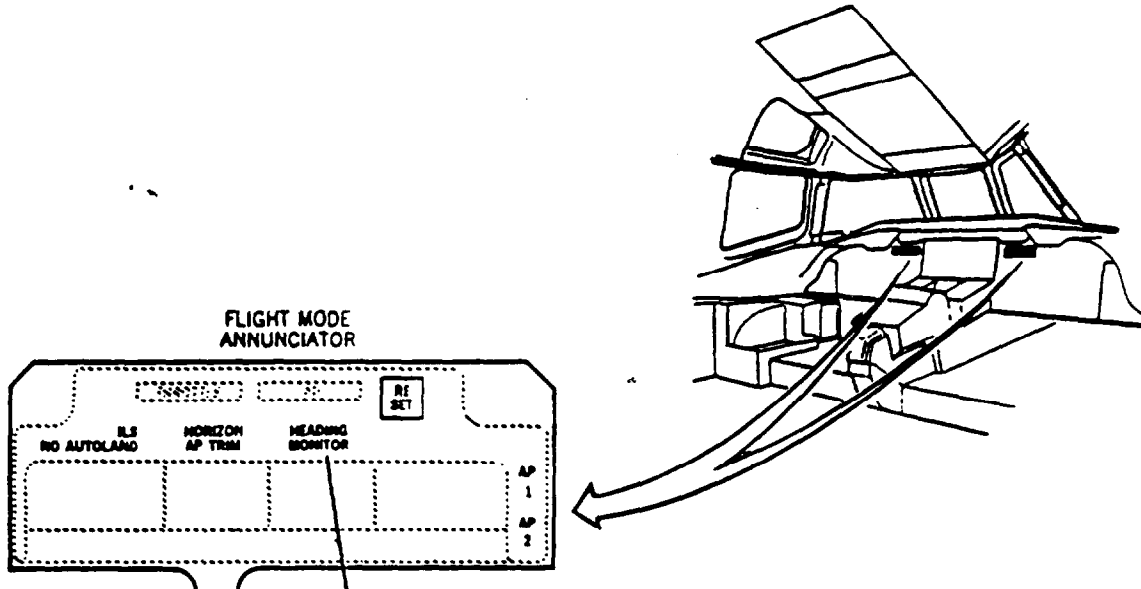
The Digital Flight Guidance System installed on the MD-80 includes a full time automatic throttle that can control airspeed, mach number, and engine thrust from takeoff through landing. The Autothrottle System processes selected airspeed/mach inputs from the the Flight Guidance Control panel, EPR limit from the thrust rating system, throttle position, control surface position, angle of attack, airspeed, mach and altitude from the Air Data System to generate the signal sent to the servo drive actuators for automatic throttle lever displacement and thrust control. The Digital Flight Guidance Computer also provides signals for fast/slow indication, and pitch commands on the Flight Directors for manual throttle control.

Protection circuits designed into the system include EPR limit protection for the thrust mode selected, overspeed protection for VMO/MMO, flap and slat limit speed, as well as stall protection (alpha speed floor) in the speed modes of operation.

Engagement and selection of the operating autothrottle mode is accomplished at the speed mach control panel of the Flight Guidance Control panel on the glareshield.



**AUTOMATIC FLIGHT - Controls and Indicators**  
Flight Mode Annunciator (FMA) Comparator Lights



**Flight Mode Annunciator Legend Lights and RESET Button**

**ILS Light (Amber)** - When comparator detects a deviation difference between LOC/GS 1 and LOC/GS 2 signals, ILS light on both flight mode annunciators will come on (steady). When a failure is detected (flag in view), ILS light on side that has failed will come on flashing, and ILS light on opposite side will come on steady.

**HORIZON Light (Amber)** - When comparator detects a difference in pitch or roll attitude between Capt's and F/O's PFD's, HORIZON light on both flight mode annunciators will come on (steady).

**NOTE**

If comparator error is result of turn error effects on vertical gyro, comparator will reset automatically when error is within tolerance, and the HORIZON light will go off.

When a failure is detected (flag in view), HORIZON light on side that has failed will come on flashing, and HORIZON light on opposite side will come on steady.

**HEADING Light (Amber)** - When comparator detects a difference between Capt's and F/O's ND, HEADING light on both flight mode annunciators will come on (steady).

When a failure is detected (flag in view), HEADING light on side that has failed will come on flashing, and HEADING light on opposite side will come on steady.

**MONITOR Light (Amber)** - MONITOR light on both flight mode annunciators will come on (steady) when a failure affects validity of comparator monitor.

**NO AUTOLAND Light (Amber)** - Comes on steady anytime the selected DFGC detects a condition that does not permit an automatic landing.

**AP TRIM Light (Amber)** - Indicates that the autopilot has a sustained out-of-trim horizontal stabilizer condition. Light will remain on until out-of-trim condition corrects itself or autopilot is disengaged.

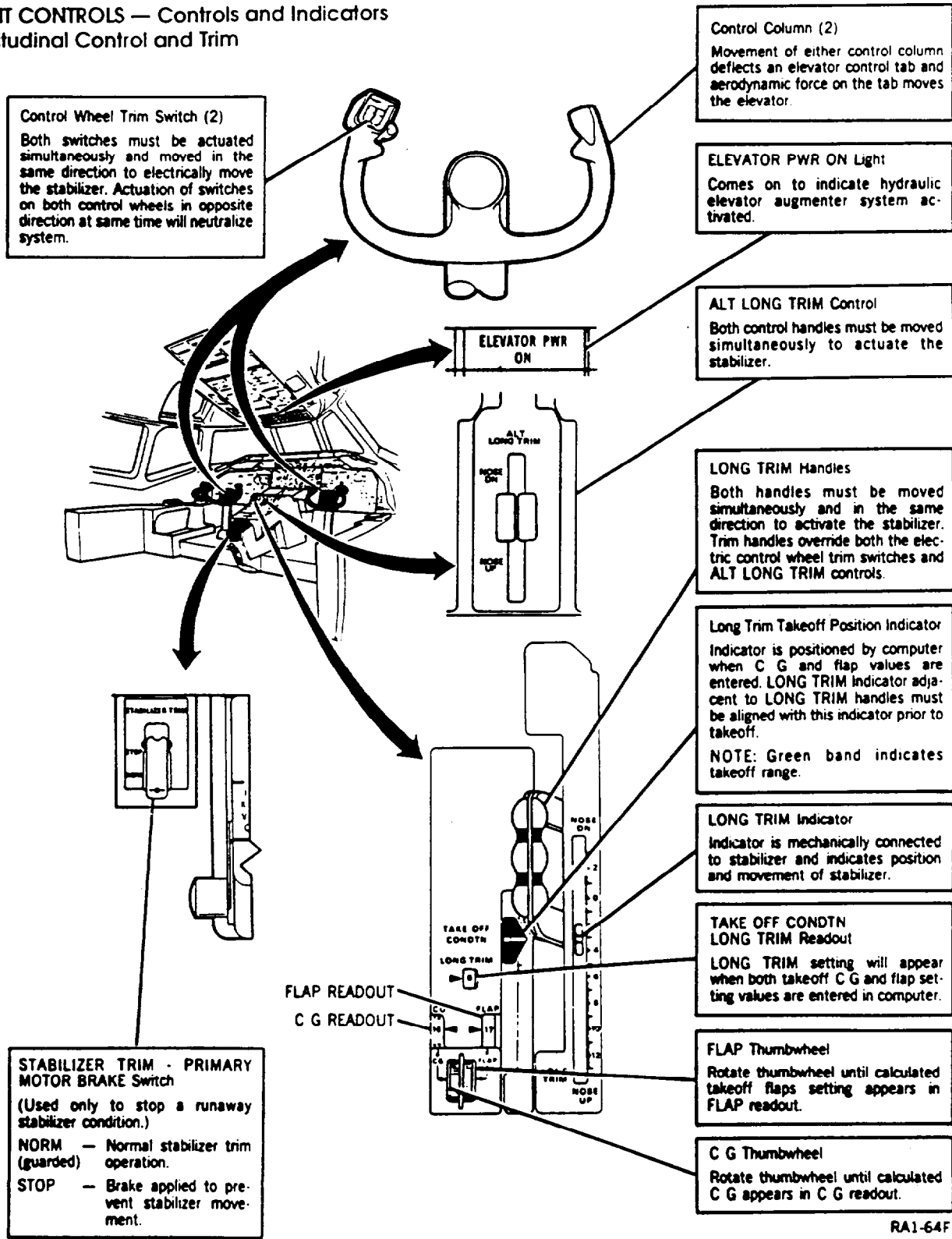
**AP 1/AP 2 Lights (Blue)** - Indicates whether DFGC 1 (AP 1) or DFGC 2 (AP 2) is providing input.

**RESET Button** - Pushing button on either flight mode annunciator will manually reset ILS, HORIZON, HEADING, MONITOR, and NO AUTOLAND legend lights.

Any legend light that has been reset manually can be recalled by pushing the RESET button a second time.



**FLIGHT CONTROLS — Controls and Indicators**  
Longitudinal Control and Trim



RA1-64F



DE-ICING

Be knowledgeable of the ground de-icing and anti-icing procedures being used on your airplane whether the service is being performed by Alaska Airlines personnel or a contracted service. Do not allow de-icing or anti-icing until you are familiar with the de-icing/anti-icing practices and quality control procedures of the service organization. Use only authorized methods, products and support equipment.

By definition, de-icing is the removal of accumulated snow, ice, etc., from the airplane surfaces by application of heated water followed by undiluted glycol-based fluid or the application of a heated water/glycol solution. Anti-icing is the treatment with undiluted glycol-based fluid to prevent snow, ice, or frost from adhering to airplane surfaces. Holdover time is the estimated time anti-icing fluid will prevent the formation or accumulation of rime, ice, or snow on the protected surfaces of an airplane under average weather conditions outlined in the guideline to holdover time in the Company Flight Operations Manual. Complete information can be found in the "Policy" section of the Flight Operations Manual regarding de-icing procedures, responsibilities and duties of all operational groups.

Cold weather protection and servicing of the airplane, including de-icing, must be carried out in accordance with the procedures outlined in the Flight Operations Manual.

MD-80 de-icing is accomplished with both engines shut down if at all possible. If APU electrics and pneumatics are not available, and one engine must be operating at the gate, start the right engine. Advise Maintenance/De-icing Crew that the right engine will be operating during de-icing. Upon completion of de-icing, start engine(s) and complete appropriate checklists.

To make the de-icing procedure more efficient and enhance cooperation with the ground De-icing Crew, the Flight Crew should prepare the aircraft for de-icing by observing the following guidelines:

- 1. Air Conditioning Packs .....OFF
2. APU Bleed Air Switch .....OFF
3. Horizontal Stabilizer ..... Position FULL LEADING EDGE UP (Full Nose Down Trim)
4. Elevators..... Hold FULL NOSE DOWN

The Flight Crew can delay holding the elevators full nose down until the De-icing Crew makes their way back toward the tail area of the aircraft. Holding the elevators full nose down will ensure the wind has not blown one or both elevator halves to the up position, which could cause fluid to pool in the elevator cavity.

De-icing fluid, if allowed to enter the engine inlet ducts or APU inlet duct, will cause white acrid smoke to enter the airplane via the air conditioning system if these pneumatic sources are operating. When de-icing around the engines and APU inlet and exhaust areas, use de-icing fluid sparingly to avoid subsequent ingestion. During de-icing, operational and safety considerations may require leaving the APU running. In this case, the air conditioning packs should be shut down and care should be exercised to avoid fluid spray in the vicinity of the APU inlet and exhaust. Confirmation is required between Flight Crew and De-ice Crew that the packs are off.

Note: If de-ice is solely due to upper wing ice the Air Conditioning packs may be left on if needed.

After de-icing is completed, the airplane should be inspected by qualified ground personnel or the flight crew to ensure the proper results, operate the flight controls, trim tabs, and flaps (where practical) through full travel. If precipitation continues, the de-icing fluid already on the airplane could be diluted, or if takeoff is delayed, consider the possibility of subsequent refreezing on the airplane surfaces which could require additional de-icing. the requirement for further de-icing (holdover time) depends upon the type and concentration of de-icing fluid used, rate and type of precipitation, outside air temperature, temperature of the fuel and airplane surface exposed to the elements and airplane exhaust. Because of the influence of these many variables, it is difficult to accurately determine the time of effectiveness of a de-icing or anti-icing treatment. Be knowledgeable of these variables and their general effects on holdover time. Assure that de-icing or anti-icing treatment is performed at the last possible time prior to taxi to the takeoff position.

