



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 19, 2022

Group Chairman's Factual Report

SYSTEMS

DCA21FA174

A. ACCIDENT

Location: Honolulu, Hawaii
Date: July 2, 2021
Time: 0145 Hawaii standard time (HST)
1145 coordinated universal time (UTC)
Airplane: Boeing 737-200, N810TA, Rhoades Aviation Inc, dba TransAir Flight 810

B. SYSTEMS GROUP

Group Chairman Scott Warren
National Transportation Safety Board
Washington, D.C.

Group Member Greg Fukaye
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C. DETAILS OF THE INVESTIGATION

The systems group convened on July 3-8 in Hawaii, and again on October 14-26, 2021, at the Barber Point, Hawaii pier to examine and document the recovered wreckage.

D. FACTUAL INFORMATION

1.0 Cockpit Documentation

The cockpit appeared to be intact structurally with both pilots' seats firmly attached to the floor (see Figure 1). The control columns were heavily corroded and both control wheels had detached and were laying on the floor adjacent to the columns with very heavy corrosion on the column gearing. Both left and right sliding windows were fully open. The entire cockpit had a coating of corrosion or salt water organic residue evident on every hard surface. Many of the instruments had glass lens breakage or crazing and were difficult to read. The instrument indications and switch positions were as noted below.



Figure 1. Overall View of Cockpit Main Instrument Panel

Captain's Instrument Panel and Left Sidewall Panel (see Figure 2)

- Airspeed Indicator and speed bugs. 4 movable bugs present and located at:
 - bug 1- 76 kts,
 - bug 2 -128kts,
 - bug 3 -146kts,
 - bug 4 - 225kts
- Radio Magnetic Indicator (RMI)
 - Very High Frequency Omni-Directional Range 1 (VOR 1) pointer parked at 2 o'clock.
 - VOR 2 pointer parked at 5 o'clock.
 - Compass card shown at northerly and actual position obscured by corrosion/sea life contamination
- Instrument (Inst) comparator - intact
- Captain's Attitude Director Indicator (ADI)
 - Not erect and Bendix style (flying Vee) integrated turn ball
- Captain's Horizontal Situation Indicator (HSI)
 - Fail flag in view, selected heading 345, actual heading near zero obscured visibility due to water damage
- Background Light - 11 o'clock position
- Map light - 1130 o'clock position on gusset
- Main Panel Brightness - 2 o'clock position

- Approach Progress Display (APD)–intact and not illuminated
- Marker Beacon lights - intact with all 3 present
- Altimeter - Flagged
 - Baroset - 1017/3004
- Instantaneous Vertical Speed Indicator (IVSI) - Aftermarket unit with Traffic Advisory (TA) switch
- Distance Measuring Equipment (DME) - Present
- Radio altitude - Flagged
- Clock - 01:58
- 2 photo electric cells next to APD panel are intact
- Unknown display below IVSI (approx. 3 inch x 3 inch square)
- Non factory annunciators below HSI "HSI on NAV/HSI on GPS"
- Non factory annunciator "Windshear/Windshear" upper left corner of panel
- Selective Calling System (Selcal) code placard with tail "9M-PML" identified bottom of Panel
- Placard showing "N810TA" on lower center instrument panel



Figure 2. Captain's Instrument Panel

First Officer's (FO) Instrument Panel and Right Sidewall Panel (see Figure 3)

- Total Air Temperature (TAT) Indicator (on Thrust Rating Panel)
- Thrust Panel
 - Climb mode selected and shown
 - Max Engine Pressure Ratio (EPR) 1.76 behind flag (see Figure 4)
- Airspeed Indicator and speed bugs. 4 movable bug present and located at:
 - bug 1 - 80kts,
 - bug 2 - 126kts,
 - bug 3 - 141 kts,
 - bug 4 - 240 kts
- RMI
 - Flagged,
 - VOR pointers parked at 3 o'clock
 - compass card at 5 degrees
- Inst comparator - intact no annunciations
- FO's ADI
 - Not erect and Bendix style (flying Vee) integrated turn ball
- FO's HSI
 - Fail flag in view,
 - selected heading 345 actual heading near zero
- Background Light - 12 o'clock position
- Map light - 2 o'clock position on gusset
- Main Panel Brightness - 12 o'clock position
- APD - intact
- Marker Beacon lights - intact with all 3 present
- Altimeter - not flagged reading 45,800 (see Figure 5)
 - Baroset - 1018/3005
- IVSI - Aftermarket unit with TA switch
- DME - Present
- Radio altitude - Flagged and not legible
- Clock - 01:52
- 2 photo electric cells next to APD panel are intact
- Non factory annunciators below HSI "HSI on NAV/HSI on GPS"
- Non Factory annunciator "Windshear/Windshear" upper left corner of panel right to APD
- Brake Pressure Gauge
 - 3000 Left and Right pointers
 - lens glass "spider-webbed"
- Hydraulic pressure - A 1.2 / B 2.2
- Ground Proximity - Flap Inhibit - Norm/ - Gear Inhibit - Norm
- Non factory "Terrain System" annunciator above and outboard of hydraulic gauges
- Non Factory "Windshear Inop" annunciator outboard of hydraulic gauges
- Selcal code placard with tail "9M-PML" identified bottom of Panel

- Placard showing "N810TA" on lower center instrument panel



Figure 3. First Officer's Instrument Panel



Figure 4. First Officer's Instrument Panel with Thrust Panel Noted by Arrow and Box



Figure 5. First Officer's Altimeter Noted by Arrow and Box

Glareshield/Autoflight Panels (see Figure 6)

- Both Master Caution and Fire Warning annunciators in place
- Six pack lights
 - Captain's - intact-
 - FO's - intact
- Autopilot Control Panel
 - Manual/B/Heading (Man/B/Hdg) OFF (switch centered and is spring loaded)
 - Autopilot (AP) engage OFF/OFF
 - Pitch mode OFF
- Non Factory Navigation/Global Positioning System (NAV/GPS) switch under both six packs
- Captain's Flight Director Mode Panel:
 - Mode select OFF
 - Altitude Hold- OFF
 - Pitch control "0"
- FO's Flight Director Mode Select Panel:
 - Mode select Go-Around (G/A)
 - Altitude Hold- OFF
 - Pitch control "0"



Figure 6. Autoflight Control Panel and Glare Shield

Center Instrument Panel (see Figure 7)

- Standby attitude - Flagged and not erected
- Yaw Indicator - biased to extreme left of center
- Fuel Quantity Totalizer: 11,350/ Zero Fuel 71,100/ Flaps 30 indicated
- Center Tank: Not readable ~200 LBS on small dial
- Left (L) tank 5720 Lbs / Right (R) tank 5600 Lbs
- Engine instruments: (JT8D-9A stickers) (see Figure 8)
 - Engine Pressure Ratio (EPR) 1: 1.04 EPR2: 1.6
 - EPR Set L: 2.0 EPR Set R: 2.0
 - N1 L: 5 N1 R: 4.5
 - Exhaust Gas Temperature (EGT) L: 70 EGT R: <0
 - N2 L: 0 N2 R: 0
 - Fuel Flow (FF): not readable
- Yaw Damper and Engine Vibe Test Switches marked as Deactivated
- Oil Pressure L: ~55 Oil Pressure R: Damaged and unreadable
- Oil temperature L/R: <-40
- Oil Quantity L 2.125 Oil Quantity R: 3
- Flap Indicator - L and R both at 1 deg
- Gear Handle - Off
- Antiskid Inboard (INBD) /Outboard (OUTBD): ON/ON and guarded
- Non factory "A/P on Nav/A/P on GPS" switch light above Standby Attitude Indicator



Figure 7. Center Instrument Panel



Figure 8. Engine Instruments Noted by Arrow and Box

Forward Overhead Panel (see Figure 9)

- Lights - Fixed - L - ON
- Lights - Fixed - R - ON
- Runway Turnoff - L - ON
- Runway Turnoff - R - ON
- Taxi - OFF
- Engine start - 1 - Low Ignition (IGN)
- Engine start - 2 - Low IGN
- Logo light - ON
- Position - ON
- Anti-collision - ON
- Wing - ON
- Wheel well - OFF (INOP Placard)



Figure 9. Overhead panel

Fuel Panel

- Crossfeed - Center position
- Center (Ctr) Fuel Pumps - OFF
- #1 Aft - ON
- #1 Forward (Fwd) - ON
- #2 Aft - ON
- #2 Fwd - ON
- #1 Fuel Heat - OFF
- #2 Fuel Heat - OFF

Navigation Switching Panel

- Very High Frequency Navigation (VHFNAV) - Normal
- Compass - Normal
- Vertical (VERT) Gyro - Normal

Flight (FLT) Controls Panel

- FLT Control A/B - ON
- Alternate (ALT) Flaps - OFF - Guarded/wired
- Spoiler A/B- ON- Guarded/wired
- Yaw Damper - OFF
- Leading Edge Device position panel- Installed
- Thrust Reversers- Eng 1 and 2 switches Normal and guarded

Electrical Panel

- Direct Current (DC) - Rotary switch to Transformer Rectifier 2 (TR2)
- Guard up and Battery (BAT) switch to OFF
- Alternating Current (AC) - Rotary switch between Generator 1 (Gen 1) and Auxiliary Power Unit (APU)
- Standby Power (Pwr) - AUTO - Disconnects guarded and wired shut
- Ground (GRD) PWR - Center position
- Bus Transfer (Trans) - AUTO
- GEN1, APU GEN, GEN 2 - all switches in center position
- Exhaust Gas Temperature (EGT) - 110 C

Center/Miscellaneous Panels

- Wiper - OFF
- Circuit Breaker light rotary switch - OFF
- Panel lights- 5:30 o'clock position
- Equipment cooling - norm
- Emergency (Emer) Exit Lights - Guard up and switch at off position
- No Smoking- ON
- Fasten Belts - AUTO
- Ground (GRD) Interconnect Switch - Close

- Standby compass -operational & shows ~255 (nose relative position after removal from barge)

Window Heat Panel

- L side - ON
- L fwd - ON
- Overheat (OVHT) - selected
- R side - ON
- R fwd - ON
- Pitot Static Probe A - ON
- Pitot Static Probe B - ON
- Wing Anti-ice - OFF
- Engine Anti-ice - 1 - OFF
- Engine Anti-ice - 2 - OFF

Hydraulic Pumps

- A - Eng1- ON
- A - Elec2 - ON
- B - Elec1 - ON
- B - Eng2 - ON

Door lights- all present and not illuminated.

Broken switch lever (APU Bleed) stuck between outboard side of service door light and panel Dzus fastener (see Figure 10)

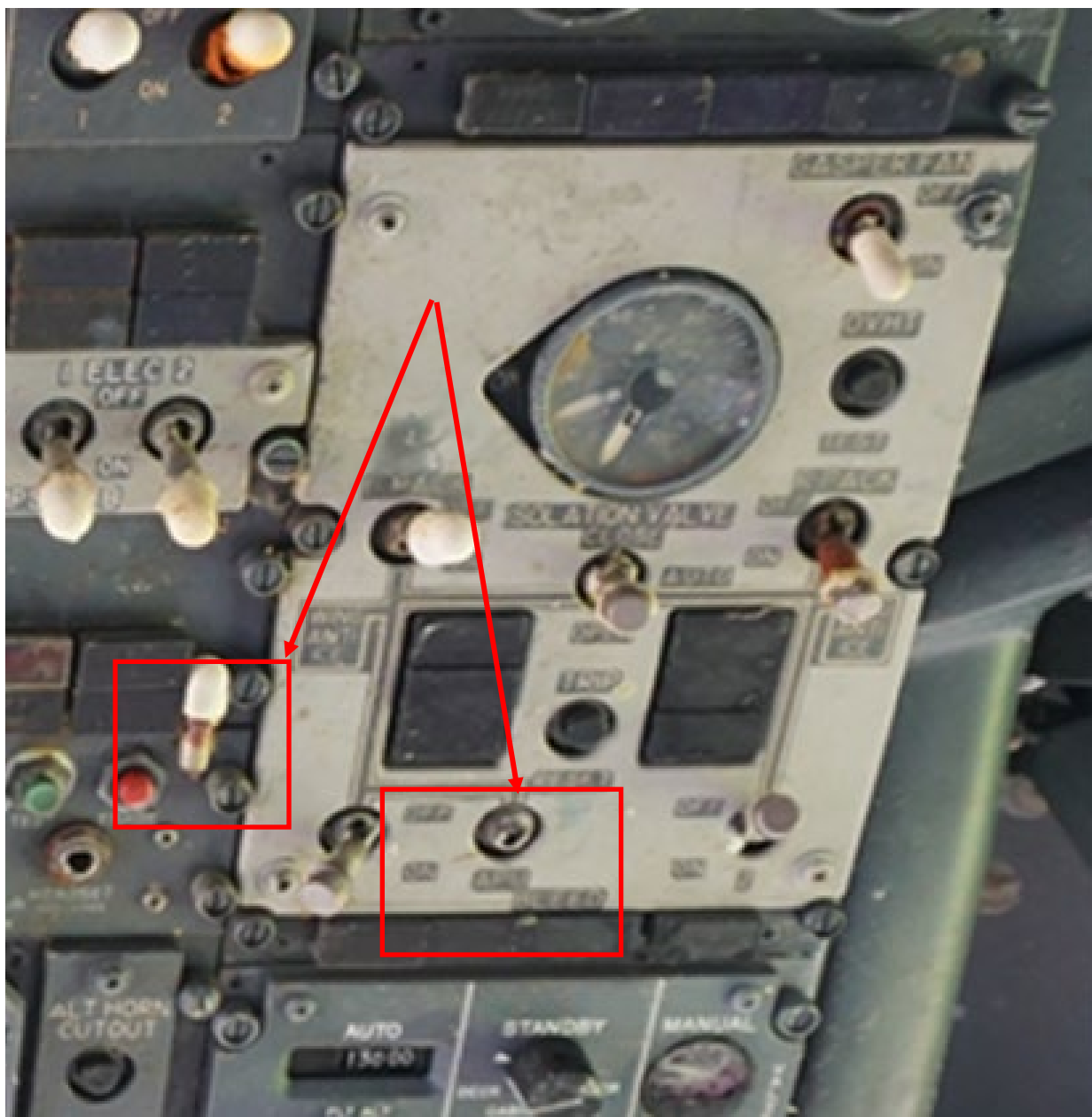


Figure 10. Bleed Panel Switch Damage Noted by Arrows and Boxes

Voice Recorder Panel

- Installed meter unreadable due to seawater damage

Cabin Altitude Panel

- Cabin Pressure Indicator - needle at 12 o'clock
- Cabin Climb Indicator - 4000/feet per minute (fpm) down
- Smoke Clear switch - Normal and guarded

Environmental Panel

- Container (CONT) Cabin air mix valve cool
- Passenger (PASS) CABIN air mix valve off scale Hot
- Air temperature - Supply duct
- Air temperature Indicator - 0C
- CONT Cabin - Auto cool
- PASS CABIN - Auto cool
- Gasper Fan -ON
- L Pack - OFF
- R Pack - ON
- Isolation valve - Auto
- Bleed - 1 - ON and bent inboard
- Bleed -APU - Broken off
- Bleed - 2 - OFF and bent inboard
- Alternate (ALTN) (press) - auto
- Pass Oxygen - normal (guard down and wired)

Cabin Pressurization Panel

- Auto set to 13,000
- Landing Altitude - all zeroes
- Cabin Rate selector - Midway between "DECR" and Index
- Cabin altitude setting - (-)150
- Manual Outflow valve position full counter clock wise (CCW) position
- Ground/Flight switch in Flight
- Manual press switch centered
- Mode switch in Auto

Upper Overhead Panel

- Dome light - OFF
- Wheel (illegible) switch - ON
- Pass Oxygen Normal and guarded/wired
- Pass Oxygen quantity 350 pounds per square inch (PSI)
- Interphone switch - OFF
- Flight recorder switch in Normal and guarded
- Stall Warning Heater (HTR) switch Normal

Aisle Stand (see Figures 11 to 14)

- Left and Right Automatic Direction Finding (ADF) tuning panels Captain's frequency 327 / FO's frequency 121
- Altitude selector panel installed and flagged
- Selcal panel installed
- Weather Radar (Wx RDR) control panel installed and selected OFF
- Wx RDR Cathode Ray Tube (CRT) installed and broken screen
- Non- Factory Air Traffic Control (ATC) control panel installed on FO's side of front electronics panel
- Speedbrake -at flight position
- Stab Trim - 6.5 units nose up
- Stab trim manual wheel missing on Captain's side of the aisle stand. The FO's stab trim wheel was initially in place on the aisle stand, but it became detached during recovery and examination activities. Heavy corrosion was noted on the wheel's former position on the aisle stand.
- Parking Brake - disengaged
- Power Lever 1 - Full Fwd (Max thrust) - piggyback lever was down
- Power Lever 2 - Full Aft (Idle) - piggyback lever was up Go-Around (GA) switch activator missing
- Note: Power lever positions noted "as found" and may not reflect the actual inflight position due to control cables connected to the engine being disturbed when the nose separated from the tail section.
- Flap Lever - 2 deg
- Stab Trim - Main electric - Normal
- Stab Trim - Autopilot - Normal
- Engine Cutoff Lever - 1 - Idle (On/Up)
- Engine Cutoff Lever - 2 - Idle (On/Up)

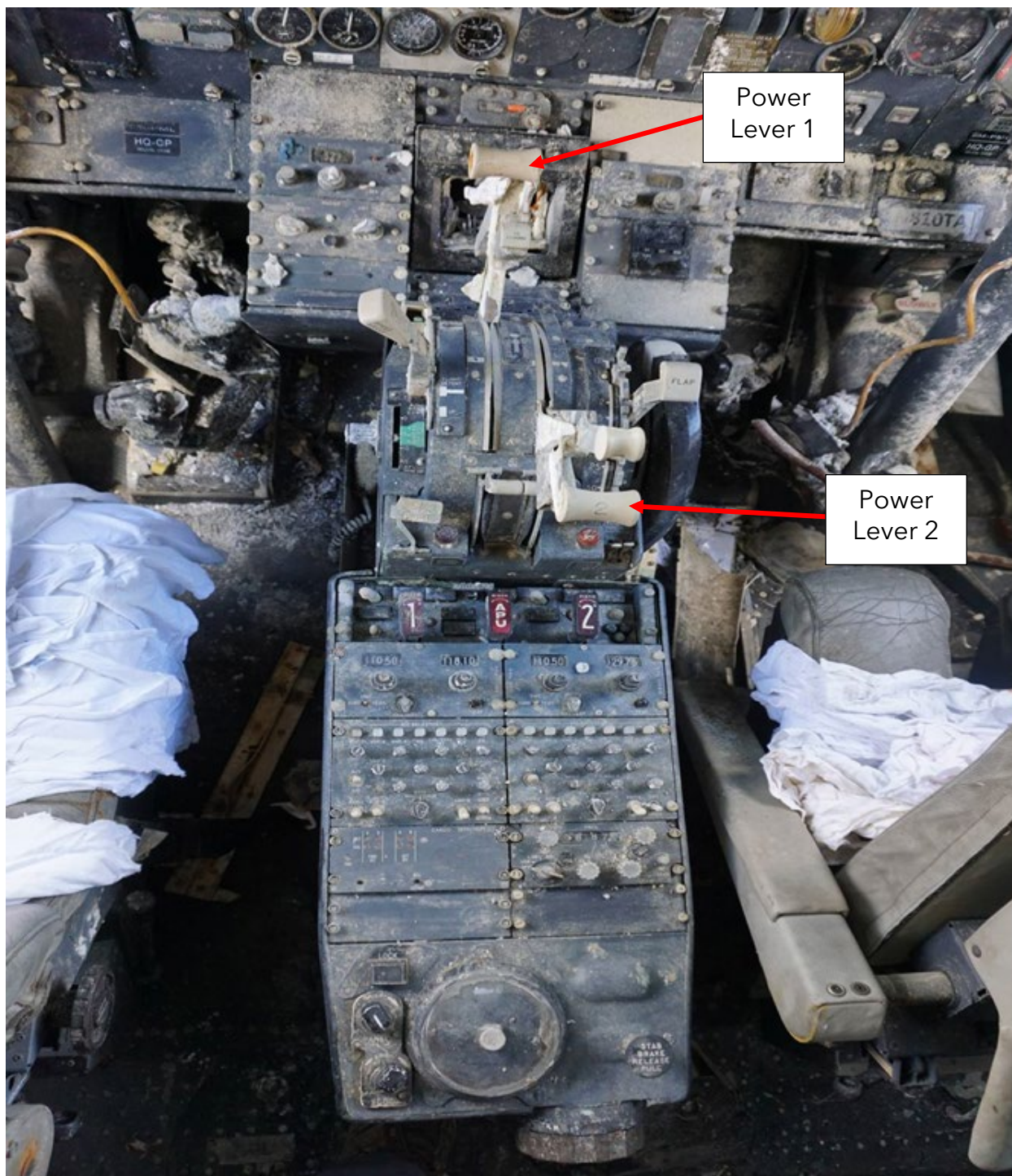


Figure 11. Aisle Stand with Power Levers 1 and 2 Noted

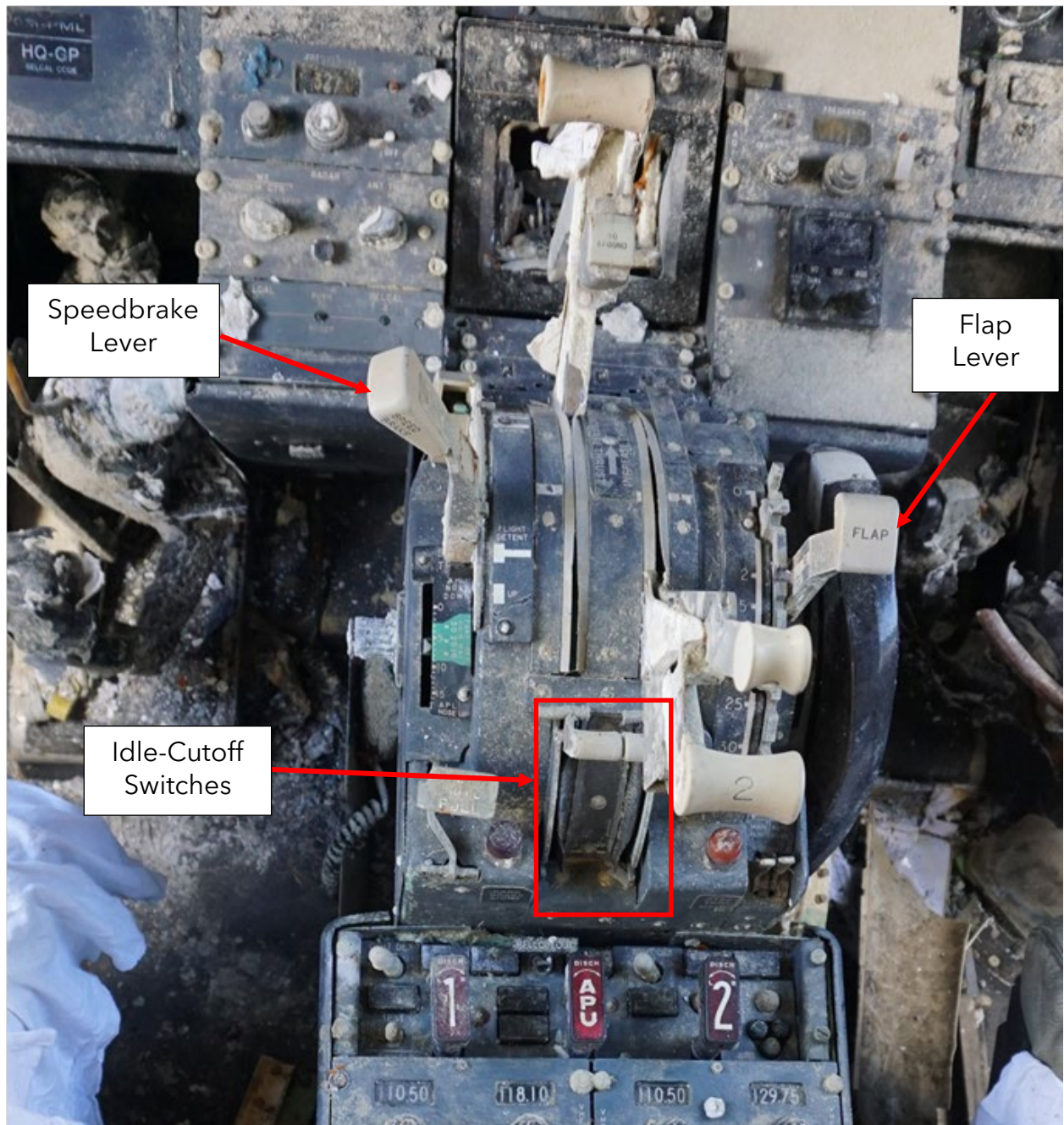


Figure 12. Aisle Stand with Fuel Cutoff, Spoiler, and Flap Lever Positions Noted



Figure 13. Right Stabilizer Trim Wheel Attach Point Location



Figure 14. Left Stabilizer Wheel Attach Point/Stab Trim Position Indicator

- Fire Panel (part of aisle stand)
- Overheat (OVHT) Det - 1 - Normal
 - OVHT Det - 2 - Normal
 - Fire Handle 1 - down
 - Fire Handle APU - down
 - Fire Handle 2 - down

Aft Electronic Panel

- VHF Comm panels set to frequencies 110.50, 118.10, 129.75
- Two radio control panels installed
- Cargo Fire detector panel installed
- High Frequency (HF) tuning panel set to OFF, frequency 8.870 selected
- Rudder trim turn knob is missing and pointer is set to 2.5 Units Aircraft Nose Left (ANL)
- Aileron Trim set to 9.4 Left Wing Down (LWD)
- Stab brake release knob down (normal)
- Panel lighting set to 5 o'clock
- Flood lighting set to OFF

Circuit Breaker Panels

Circuit Breakers (CB) in the out (popped) position:

There are no circuit breakers observed in this condition

Circuit Breakers Collared in the Out Position:

Due to poor condition of the installed nameplate legends, CB position references from cockpit documentation were used.

Note that due to the seawater corrosion, some of the CB had discoloration/corrosion on the nut/hardware that held the CB to the panels; this resulted in some "white" areas exposed that look like the CB had popped but it was just the corrosion around the "button".

Collared Circuit Breakers:

Panel	Row Position	Panel Function
	FO's Side:	
P6-1	A60, B50, B60, B61, B62, B63, D60, D61, D63, D66	FO Nav Inertial Navigation System (INS) and Communication (Comm)
P6-2	F66, F67	Systems
P6-3	K56, K66, M73,	Fuel System and Lighting
P6-4	U58, W56	Air Conditioning and Electric
P6-5	Y-78	Electrics
P6-11	ZA54	No 1 Gen Bus

P6-12	ZA66, ZB64, ZB65, ZB66	No 2 Gen Bus
	Captain's side:	
P18-1	B15, C16	Captain's side NAV
P18-2	H6	Inst and Comm
P18-3	K6, K7, K10, L10, L16, L17, M6, M7, M11, M13, M14	Anti-Ice and Lighting
	N9, N10, N11, N12, N13, N14, P9, P11	
P18-4	S1, S2, S5, T2, U2, U6, U7	Pass Accommodations

2.0 Upper Cargo Door

The upper cargo door (see Figures 15 and 16) was examined and confirmed locked/latched as evidenced by the "pins" shown in the viewing windows. The door external latch handle was noted as faired/latched. There was a window plug missing 4 positions forward from the rear of the door.



Figure 15. Upper Cargo Door



Figure 16. Upper Cargo Door Latch Pin

3.0 Nose Gear

The nose gear was retrieved as part of the nose gear wheel well structure/box and was examined by the structure group member. The nose landing gear strut and mechanism appeared complete including the two tires (see Figure 17).



Figure 17. Nose Gear and Attach Box Structure

4.0 Avionics

The radome was not present on the recovered nose section. The weather radar antenna plate was missing; however, the mount pedestal was still partially intact. The glideslope antenna was still present above the radar unit (see Figure 18).

The avionics bay was missing from the recovered nose section. Line Replaceable Units (LRUs) were recovered from the sea bed. According to Boeing, there was no non-volatile memory (NVM) in any of the LRU's except for the Enhanced Ground Proximity Warning System (EGPWS) unit, which was sent to Honeywell for download.

The EGPWS NVM data was downloaded and reviewed by Honeywell.



Figure 18. Forward Bulkhead/Radar Mounting

5.0 Cabin doors

The cabin doors were examined. Both the left front and right front doors suffered structural damage to the skins and hinge mechanisms. The uppermost and lowermost articulating panels are highly corroded and not entirely in place.

The left forward door (see Figure 19) was unlatched and opened on the recovery vessel after its initial recovery from the sea bed. Upon first access to the nose section during the examination activities at Barbers Point, the left door was noted as unlocked and partially opened.

The right forward door (see Figure 20) was physically stuck in the faired and locked position upon the initial access to the nose section. There was a flat strap stuck in the upper forward latch roller mechanism. TransAir employees opened the right forward door after wreckage recovery on Oct 23, 2021.



Figure 19. Left Forward Cabin Door



Figure 20. Right Forward Cabin Door

6.0 Flight control and engine control cables

The pitch and roll flight control system cables are connected to the control column and control wheel in the cockpit and to the flight control quadrants associated with each control axis in the aft section of the aircraft. The cables are routed through the lower portion of the fuselage (see Figures 21 and 22).

In the wreckage, the cable routing area was damaged, and the cables were broken in the area of the fuselage break.

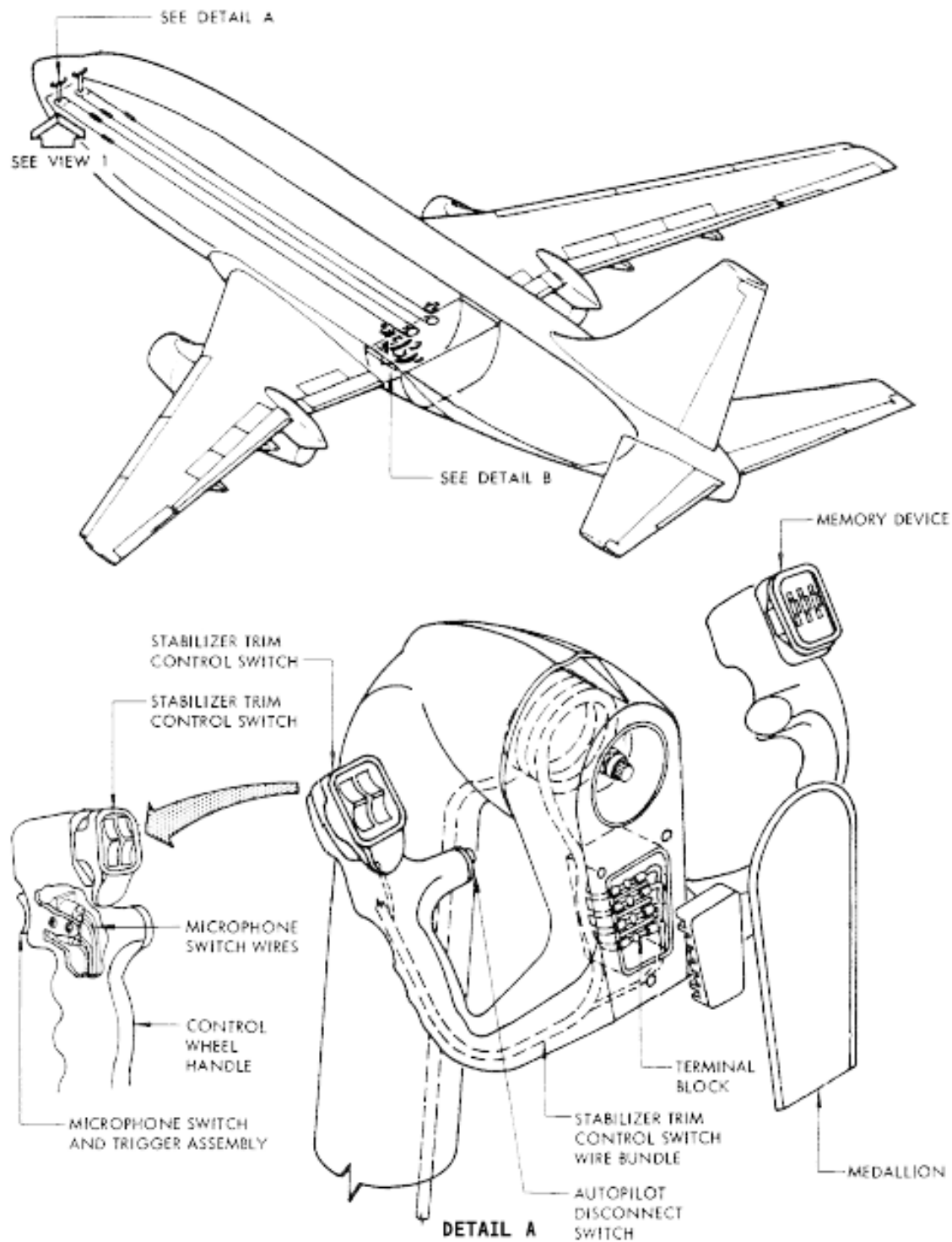


Figure 21. Roll Axis Flight Control Cable Routing (Courtesy of Boeing)

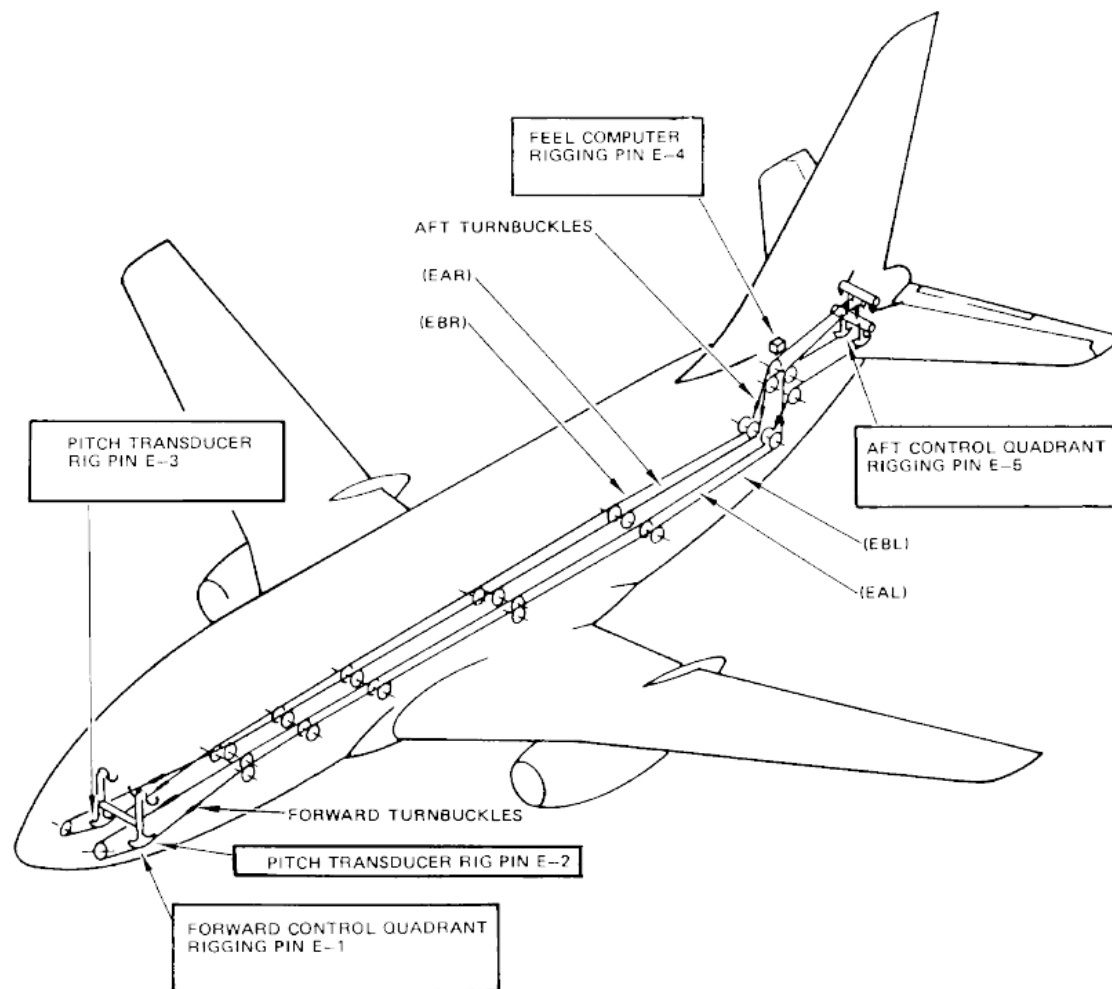


Figure 22. Pitch Axis Flight Control Cable Routing (Courtesy of Boeing)

The forward thrust control system consists of a thrust lever assembly for each engine, connected to each engine fuel control unit by control cables, a push-pull cable, and a rod linkage. The forward thrust control system regulates the engine fuel flow, and hence forward thrust. The cables are routed through the lower portion of the fuselage (see Figure 23). In the wreckage, the cable routing area was damaged, and the cables were broken in the area of the fuselage break.

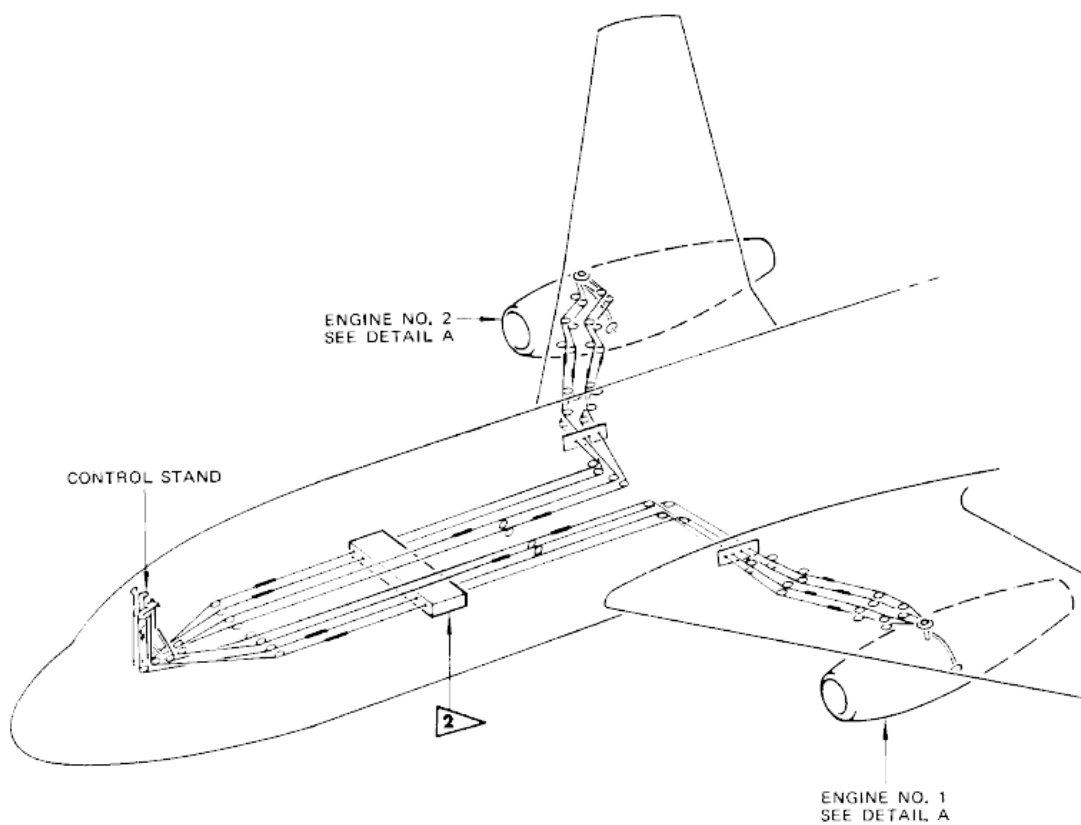


Figure 23. Engine Thrust Control Cable Routing (Courtesy of Boeing)

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