NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

May 11, 2009

POWERPLANT GROUP CHAIRMAN'S FACTUAL REPORT

NTSB No: DCA-09-MA-021

A. ACCIDENT

Location:	Denver International Airport, Denver Colorado
Date:	December 21, 2008
Time:	18:18 local Mountain Standard Time
Aircraft:	Continental Airlines Boeing 737-524, flight number 1404, registration number N18611

B. POWERPLANTS GROUP

Safety Board Group Chairman:	Jean-Pierre Scarfo - Powerplant Lead Engineer Washington D.C.
Federal Aviation Administration Member:	Kevin E Miller Powerplant Program Manager, ASAA CMO Seattle, Washington
Continental Airlines Member:	Roger Cooper Propulsion Engineer Houston, Texas
Airline Pilot's Association Member:	Rod Herrig ALPA – Continental Airlines Safety Houston, Texas
CFM Member:	Ken Wolski Flight Safety Office Cincinnati, Ohio

C. SUMMARY

On December 20, 2008, at 18:18 Mountain Standard Time (MST), Continental Airlines flight 1404, a Boeing 737-524 (registration N18611), equipped with CFM56-3B1 engines, departed the left side of runway 34R during takeoff from Denver International Airport (DEN). The scheduled, domestic passenger flight, operated under the provisions of Title 14 CFR Part 121, was enroute to George Bush Intercontinental Airport (IAH), Houston, Texas. There were 37 injuries between the passengers and crew, and no fatalities. The airplane was substantially damaged and experienced a post-crash fire. The weather observation in effect at the time of the accident was reported to be winds at 290 and 24 knots with gusts to 32 knots, visibility of 10 miles, a few clouds at 4,000 feet and scattered clouds at 10,000 feet. The temperature was reported as -4° C (Celsius).

The No. 1 engine had become detached from the left-hand wing during the crash sequence while the No. 2 engine remained attached to right-hand wing. The airplane came to rest on its belly and on the No. 2 engine. Examination of both engines reveals no indications of any engine case uncontainments, or no pre-accident under cowl fire. All the fan blades on both engines were present and exhibited varying degrees of damage consistent with engine rotation during the crash sequence. The No. 1 engine ingested dirt and earth debris throughout the fan stage. The No. 2 engine did exhibit fire damage and thermal distress to the inboard cowls consistent with the fire that occurred on the right-hand side of the aircraft after the crash. The low pressure turbine (LPT) for the No. 1 engine was not accessible; however, the No. 2 engine was and all the visible stage 4 LPT blades were present, intact, and straight.

According to the Flight Data Recorder, the engine speed spooled up to the desired takeoff (T/O) power and no engines anomalies were noted during the takeoff roll for either engine while the airplane remained on the runway. About two seconds after the airplane departed the runway, the No. 1 engine experienced an uncommanded deceleration (no corresponding recorded throttle movement) while the No. 2 engine remained at the T/O setting. Up until this point, neither throttle had been reduced from their takeoff power setting. About three seconds after the airplane departed the runway both throttles were brought back to idle, and about one second later the thrust reversers were deployed.

D. DETAILS OF THE INVESTIGATION

1.0 ENGINE INFORMATION

1.1 ENGINE HISTORY

The accident airplane, registration number N18611, was equipped with two CFM56-3B1 turbofan engines. The engine serial numbers (SN) were 857882 and 858761 for the No. 1 and No. 2 engines respectively.

The No. 1 engine was installed on the accident airplane on August 6, 2008. The engine had accumulated 20,124 cycles since new (CSN) and 38,292 hours time since new (TSN) when installed on August 2008. The last maintenance action was on August 5, 2008 where the engine was inspected after coming off another airplane for customer convenience prior to installation on N18611. The last engine repair[1] was performed by GE Engine Services Strother facility in Winfield, Kansas in June 2006. The engine had accumulated 17,013 CSN and 32,345 hours TSN at the time of the last repair (**APPENDIX 1**).

The No. 2 engine was installed on the accident airplane December 18, 2006. The engine had accumulated 12,158 CSN and 22,785 hours TSN when installed on December 2006. The last maintenance, which was also the last repair, was performed by GE Engine Services Strother facility on December 9, 2006 (**SEE APPENDIX 1**).

At the time of the accident the engines, had accumulated the cycles and times listed in **TABLE 1**.

Table: 1: Engine Times and Cycles at the Time of the Accident

	No. 1 Engine	No. 2 Engine
cycles since new (CSN)	20,552	14,926
cycles since last installation (CSLI)	428	2,768
cycles since last repair (CSLR)	3,539	2,768
time since new (TSN) hours	39,092	28,081
time since last installation (TSLI) hours	800	5,296
time since last repair (TSLR) hours	6,747	5,296

1.2 ENGINE INFORMATION

The CFM56-3B1 is a high bypass, dual-rotor, axial flow turbofan engine. A single-stage HPT drives the 9-stage HPC. The integrated fan and low pressure compressor (booster) are driven by a 4-stage low pressure turbine (LPT). The annular designed combustion chamber increases the HPC discharge air velocity to drive the high and low pressure turbines. An accessory drive system provides drive requirements for engine mounted aircraft accessories. The CFM56-3 utilizes an electronic Power Management Control (PMC) system to provide an automatic and precise power while retaining the reliable hydromechanical main fuel control system. The system controls fan speed and permits automatic thrust control during takeoff, climb and cruise operations as well as during the emergency go-around and maximum continuous operational modes.

CFM is a partnership between General Electric in the USA and Snecma *(Société Nationale d'Etude et de Construction de Moteurs d'Aviation)* Moteurs of France. CFM is not an acronym; however, the company (CFM) and product line (CFM56) receive their names by a combination of the two parent companies' commercial engine designations: GE's CF6 and Snecma's M56. The division of labor is such that Snecma is

[1] Continental refers to a repair as an engine overhaul or restoration.

responsible for the fan and LPT modules while GE is responsible for the remainder of the engine – HPC, combustion, and HPT.

All directional references to front and rear, right and left, top and bottom, and clockwise and counterclockwise are made aft looking forward (ALF) as is the convention. The direction of rotation of the engine is clockwise. All numbering in the circumferential direction starts with the No. 1 position at the 12:00 o'clock position, or immediately clockwise from the 12:00 o'clock position and progresses sequentially clockwise ALF.

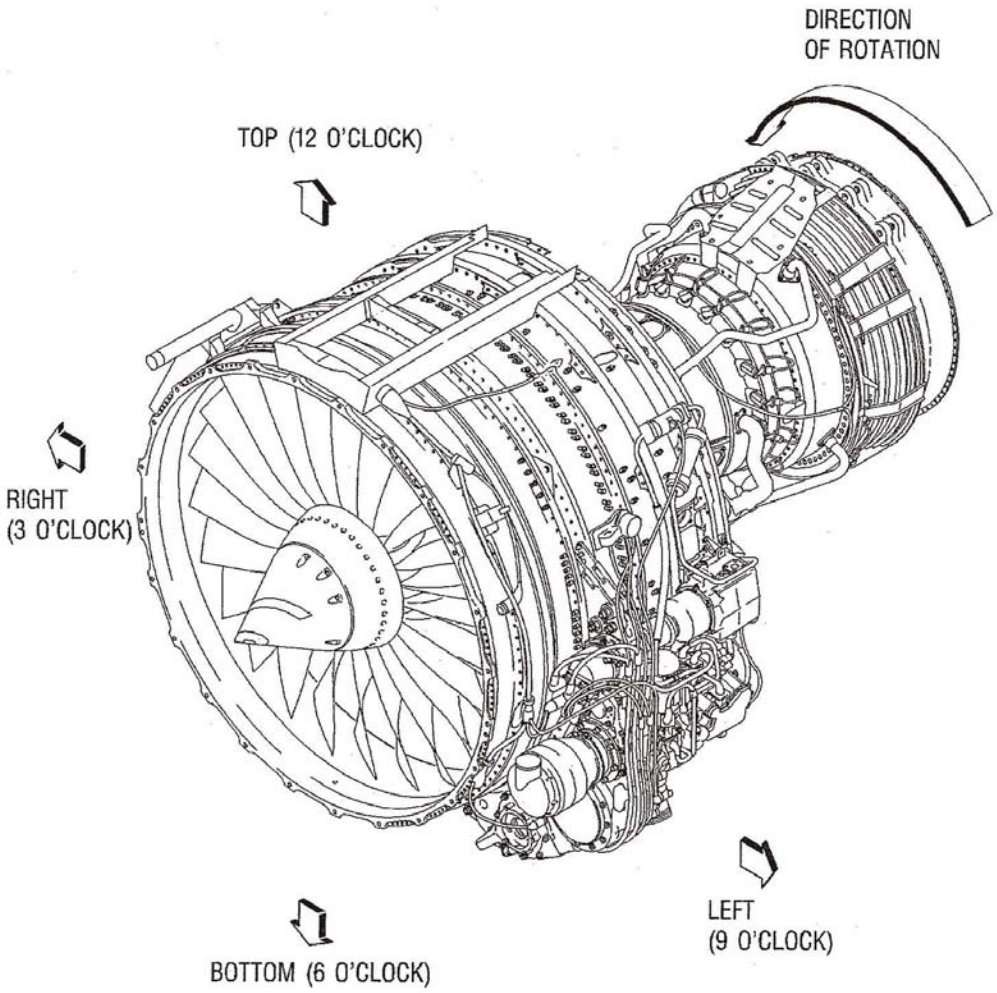

FIGURE 1: CFM56 ENGINE CROSS SECTION

2.0 ON-SITE AND IN-SITU ENGINE EXAMINATION

The following engine, engine cowl, and thrust reverser descriptions are in the 'as-found' condition; these parts had not been moved by recovery or airport rescue and firefighting (ARFF) personnel. Therefore, not all parts of the engine or engine associated hardware were visible for examination. The descriptions in this section only pertain to those areas that were accessible and visible.

2.1 NO. 1 ENGINE CFM56-3B1 SN 857882 (LEFT-HAND SIDE)

2.1.1 General Engine Location and Cowl & Thrust Reverser Condition

The No. 1 engine was found detached from the airplane and was resting on its right-hand side to the left of its installed position on the left wing (**PHOTO 1**). The engine was oriented in the general direction of travel and canted away (left) from the airplane fuselage (**PHOTO 2**). The pylon was detached from the wing but remained attached to the engine (**PHOTO 3**). Much of the thrust reverser structure had separated from the engine. Pieces of the blocker doors, cascades, and thruster reverser fixed structure remained attached to the engine (**PHOTOS 2 & 3**). The forward engine mounts were obscured by the pylon; therefore, their condition was not documented. However, the aft engine mount was exposed allowing visual confirmation that both aft mount attachment points, which are integral to turbine rear frame, were intact. The pylon upper link (dog-bone shaped link) was intact and remained attached to the pylon by its installation pin. The upper link aft eyelet, where the fuse pin would have been located, was intact but the spherical bearing was damaged (**PHOTO 4**).

PHOTO 1: NO. 1 ENGINE DETACHED

PHOTO 2: FORWARD & LEFT OF LEFT WING

PHOTO 3: TOP OF ENGINE – PYLON ATTACHED

PHOTO 4: NO. 1 ENGINE 6:00 O'CLOCK POSITION

Ground scars were located north of taxiway WC between taxiway WC and Kewaunee Street that were consistent in size and shape with the engine cowlings and on the south side of the Kewaunee Street berm, were two large semi-circular impact marks consistent with the size and shape of the lower part of the inlet. Also noted were ground scars consistent with the airplane's nose and main landing gears (**Photo 5**).

Scattered along the airplane's path of travel after it had departed the runway and went over the Kewaunee Street berm were various parts and components from the engine and thrust reverser. The following items were noted along the debris field: parts of the thrust reverser transcowl, thrust reverser blocker doors, thrust reverser cascades, part of the thrust reverser actuation ring (approximately a 180° section), part of the accessory gearbox, constant speed drive generator, engine lubrication and scavenge pump, fan cowl, and engine air turbine starter (**PHOTO 6**).

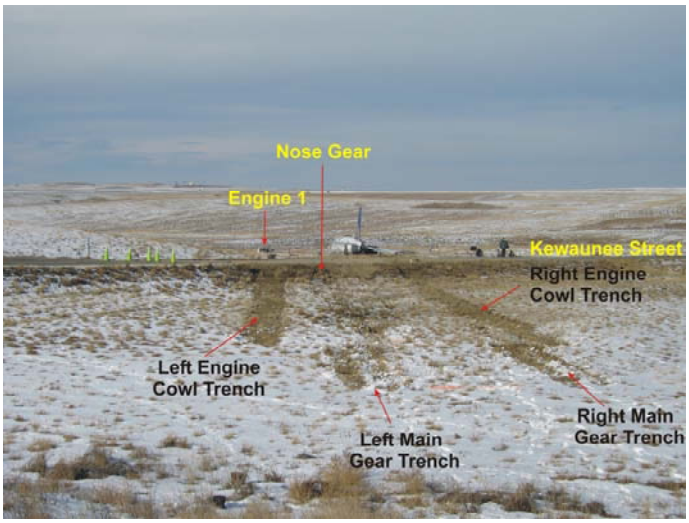

PHOTO 5: AIRPLANE GROUND SCARS

PHOTO 6: DEBRIS FIELD ALONG WRECKAGE PATH

2.1.2 Detailed Engine Documentation

The inlet lip remained attached to the fan cowl inner barrel structure and the inner barrel structure remained attached the engine's fan case "A"-flange. The inlet lip exhibited rearward impact damage from approximately the 3:00 to 9:00 o'clock position. The inlet lip was separated from inner barrel from approximately the 6:00 to 2:00 o'clock position (**PHOTOS 7 AND 8**). The inner barrel did not exhibit any exit holes or impact marks.

PHOTO 7: INLET LIP SEPARATION

PHOTO 8: INLET LIP SEPARATION

The fan and booster assembly is comprised of the spinner cone, fan disk, fan blades, booster rotor, booster vane assemblies, and small associated hardware. The front and rear spinner cones are made of an aluminum alloy. The aft flange of the rear spinner cone is bolted to the fan disk and is part of the fan blade retention system. Thirty-eight (38) titanium fan blades are installed into the fan disk. The fan blades incorporate a mid-span shroud for support.

All the fan blades were present, installed in the fan disk, and relatively straight and intact with minimal if any airfoil leading damage. The majority of the fan blade tips were bent in the direction opposite rotation with five (5) consecutive blades (Nos. 38 – 4 in the direction of rotation)[2] missing leading edge corners. All the fan blade mid-span shrouds were intact and a few mid span shrouds were shingled.[3] The front and rear spinner cones remained in place and did not exhibit any impact damage. Only black paint loss, consistent with normal operational erosion, was noted on the front spinner (**PHOTO 9**).

PHOTO 9: NO. 1 ENGINE FAN BLADE DAMAGE

The fan frame module consists of the fan case and the basic fan frame structure. The fan case is bolted to the fan frame structure in the back and to the fan cowl inner barrel at the front. Within the fan case are installed fan outlet guide vanes, and the inner surface of the case is lined with: 12 fan forward acoustical panels, one abradable liner located radially in-line with the fan blades, 12 fan mid acoustical panels and 12 fan aft acoustical panels. The fan case is designed to contain a failed fan blade and any associated debris. The basic fan frame structure, commonly referred to as the fan frame, consists of an outer casing, radial struts and a center hub that supports the No. 1 and 2 bearing support as well as the No. 3 bearing assembly. Both the fan frame case and the fan case are made of a steel alloy.

[2] The fan blades had been previously number during installation and for convenience that same numbering sequence was used to documents blade damage.
[3] Shingling is the phenomena when the fan blade mid span shrouds overlap each other instead of having their contact surface butted up against each other as intended.

The fan case stage 1 fan blade abradable liner was missing and worn away down to the case base metal from the 3:00 to 1:00 o'clock position but was intact from the 1:00 to 3:00 o'clock position. Dirt and earth debris was noted 360° around on the inner diameter of the fan case along the fan blade path. The accessory gearbox, which is attached to the fan case by two links and is located at the bottom of the engine, was missing about a third of the housing structure on the hydraulic pump side, but remained attached to the engine by the one of its two links (**SEE PHOTO 7**).

Looking through the back of the fan frame, some of the outlet guide vanes (OGV) and variable bleed valves (VBV) were visible. The OGVs were intact and installed with a few located near the 6:00 o'clock position starting to pull out from the fan case. The VBVs were found in the OPEN position and the actuation rig and attaching hardware and in-place and appeared intact.

Looking both through the fan blades in the front and through the fan frame in the rear, dirt and earth debris were noted on and between the OGVs (**PHOTO 10**). The booster inlet guide vanes (IGV) were all present and exhibited no visible leading edge damage. Dirt and earth debris was also noted between most of the IGVs (**PHOTO 10**).

PHOTO 10: DIRT AND EARTH DEBRIS IN THE FAN AND BOOSTER SECTION

Part of the inner fan bypass duct was missing exposing the high pressure compressor, combustion, and turbine areas from about the 5:00 to 7:00 o'clock position. No signs of under cowl fire, case breaches, or uncontainments were noted. All the fire detector loop rubber grommets and the fuel line "C"-clamp cushions were intact and exhibited no heat distress. No signs of hot gas blow by from the fuel nozzle attachment pads were noted. All the visible fuel nozzle manifolds and fuel lines were intact and no evidence of fuel leaks was noted. All the borescope plugs (13) remained installed. The left-hand variable stator vane (VSV) actuator rod was extended 3.0-inches, which is near its full stroke, and corresponds to VSVs near full closed. The fuel nozzles were all present and intact.

The exhaust nozzle remained attached to the aft flange of the turbine rear frame but was crushed inwards. The exhaust plug remained attached to the turbine rear frame center hub and was buckled and pushed forward.

2.2 NO. 2 ENGINE CFM56-3B1 SN 858761 (RIGHT-HAND SIDE)

2.2.1 General Engine Location and Cowl & Thrust Reverser Condition

The No. 2 engine and its pylon remained attached to right-hand wing, and engine was resting on the ground (**PHOTO 11**). The outboard (right) fan cowl door was present, attached, and found in the OPEN position. The only damage to the outboard fan cowl was noted at the bottom where cowl material was torn and missing. No fire damage was noted under the fan outboard cowl and the oil tank, power management unit (PMU), and igniter boxes, along with the fan fire loops, were all intact, undamaged, and exhibited no signs of heat distress **(PHOTO 12)**. The forward engine mount appeared visually intact and undamaged.

PHOTO 11: NO. 2 ATTACHED TO RIGHT WING

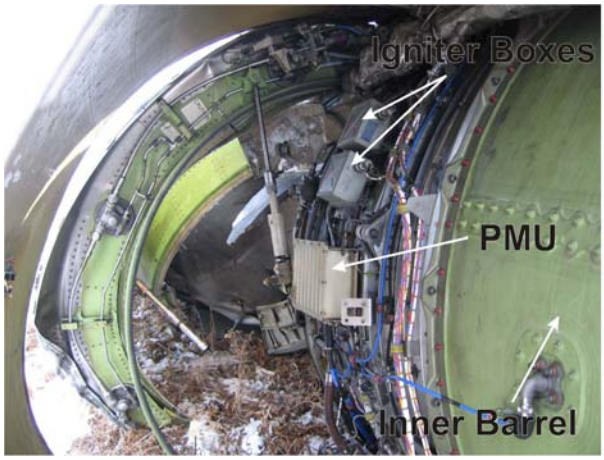

PHOTO 12: NO FIRE DAMAGE - OUTBOARD COWL

The inboard fan cowl was heavily burnt and fire damaged with much of the resin missing leaving only the carbon weave (**PHOTO 13**). The inboard fan cowl was held open by hand exposing the inner barrel and fan case area. Heat distress and fire damage was noted on the outer skin of the inner barrel from the 6:00 to 9:00 o'clock position but was not burned through. Aft of the accessory gearbox, the left-hand side of the engine exhibited widespread thermal distress and fire damage. The electric wires to the constant speed drive & generator exhibited thermal distress and were slightly melted. The accessory gearbox, all of the engine accessories, and the transfer gearbox, were intact and remained attached. The main fuel line remained intact with no signs of a fuel leak, its fire sleeve remained intact but was thermally damaged (**PHOTO 14**).

PHOTO 13: COWL FIRE DAMAGE INBOARD SIDE

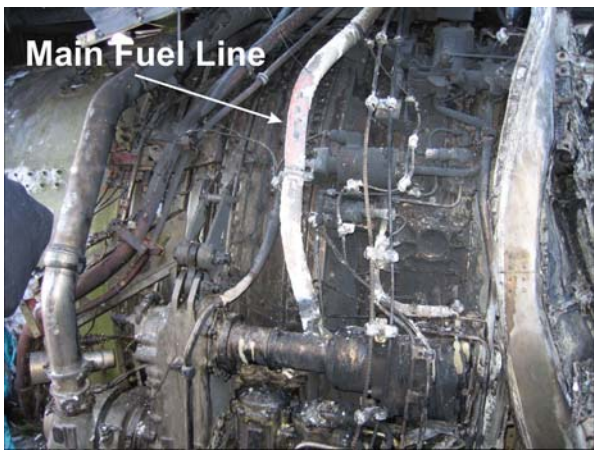

PHOTO 14: UNDERCOWL FIRE DAMAGE

An exit hole was noted in the inner barrel[4] at the 12:00 o'clock position but no impact damage was noted to the underside of the pylon in that area (**PHOTO 15**). An exit hole through the inner barrel was also noted at the 10:00 o'clock position and no visible impact damage was noted to the inboard fan cowl.

The thrust reverser outboard transcowl remained attached but was dislodged from the outboard half of the thrust reverser actuation ring. The outboard transcowl was damaged and had been pushed aft. The majority of the thrust reverser inboard transcowl was either missing or heavily fire damaged. Several of the inboard blocker doors were visible and they were found in the deployed position (**PHOTO 16**).

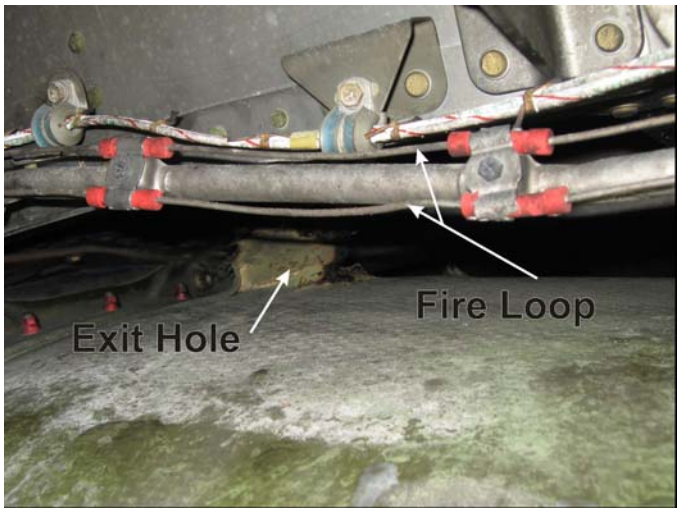

PHOTO 15: INNER BARREL EXIT HOLE

PHOTO 16: BLOCKER DOORS DEPLOYED

2.2.2 Detailed Engine Documentation

The inlet lip remained attached to the fan cowl inner barrel structure and the inner barrel structure remained attached to the engine's fan case "A"-flange. The inlet lip exhibited an inward impact from the 6:00 to 8:00 o'clock position pushing the inner barrel into the air flow path. The inner barrel exhibited impact marks 360° localized just forward of the fan blade position. The forward acoustic liners exhibited gouges and were rubbed down to the backing strip with some pieces of the liners missing (**PHOTO 17**).

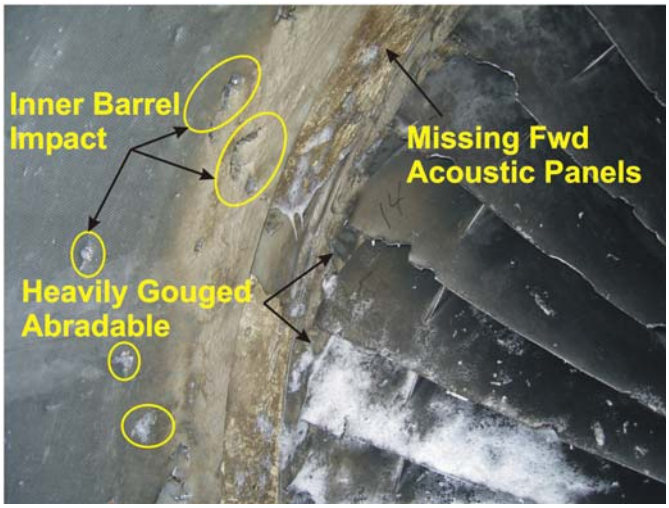

PHOTO 17: INNER BARREL IMPACT DAMAGE AND FORWARD ACOUSTIC PANELING LOSS

[4] The inner barrel is defined as the inner skin of the inlet cowl.

All the fan blade platforms and lower airfoil sections were present with blades numbered 5 and 18[5] fractured below the mid span shroud (**PHOTO 18**). All the fan blade leading edges exhibited various amounts of hard body impact damage with the No. 24 blade missing about 50% of its leading edge (**Photos 18 and 19**). The majority of the fan blade leading edge tips were bent aft with four (4) consecutive blades (Nos. 6 – 9 in the direction of rotation) bent in the direction opposite rotation and blades numbered 3 and 4 bent forward. A large piece of fan blade was observed at the 12:00 o'clock position resting between the fan blades and the OGVs (**Photo 19**). The mid span shrouds were intact for all the blades at full length. The front and rear spinner cones remained in place and did not exhibit any impact damage. Only paint loss was noted, consistent with what was observed on the No. 1 engine.

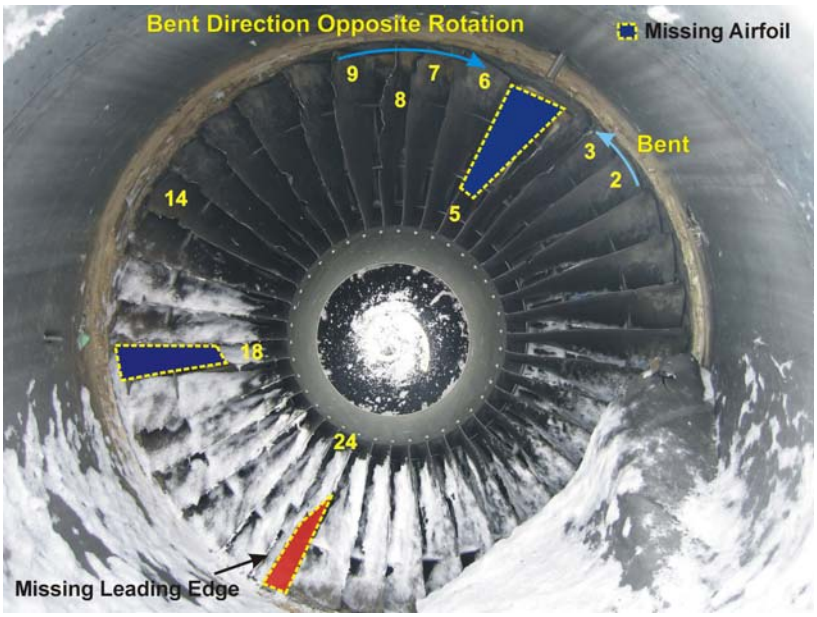

PHOTO 18: ALL FAN BLADES REMAINED INSTALLED

PHOTO 19: HARD BODY DAMAGE AND FAN BLADE FRAGMENT RESTING IN FRONT OF THE OGVS

[5] The fan blades had been previously numbered during installation and for convenience that same numbering sequence was used to documents blade damage.

The fan case stage 1 blade abradable liner was heavily gouged 360° through the circumference down to the case base metal (**SEE PHOTO 17**). Looking through the fan blades, all the OGVs were present and appeared undamaged. Looking through the back of the fan frame, some of the VBVs were visible and they were found in the OPEN position with the actuation ring and attaching hardware appeared intact and installed. All the booster IGVs were present and appeared undamaged. As a general observation, no dirt or earth debris was noted either on or between the fan blades, the OGVs, or the IGVs (**PHOTO 20**). The white substance is the remenants of the fire retarget agent used by ARFF personnel. The VSVs were found in the CLOSED position.

PHOTO 20: NO DIRT OR EARTH DEBRIS INGESTED

On the outboard side of the engine, starting at the LPT forward flange and moving aft, signs of heat distress and fire damage were visible. This included blackening of the LPT case cooling air manifolds and blistering of the core fire loop grommets. No signs of heat distress were noted forward of the LPT forward flange. What remained of the thrust reverser inboard translating cowl was moved out of the way exposing the left side of the combustion and turbine areas. The fuel manifold and fuel lines appeared intact from about the 2:00 to 5:00 o'clock positions. No fire damage or thermal distress was noted in this area, nor was there any evidence of fuel leaks.

The exhaust nozzle remained installed to the rear flange of turbine rear frame and was crushed inwards. The exhaust plug remained attached to the turbine rear frame center hub and was buckled and pushed forwards. The stage 4 LPT blades from the 6:00 to 8:00 o'clock position were visible through the aft end of the turbine rear frame and the blades appeared straight and intact (**Photo 21**).

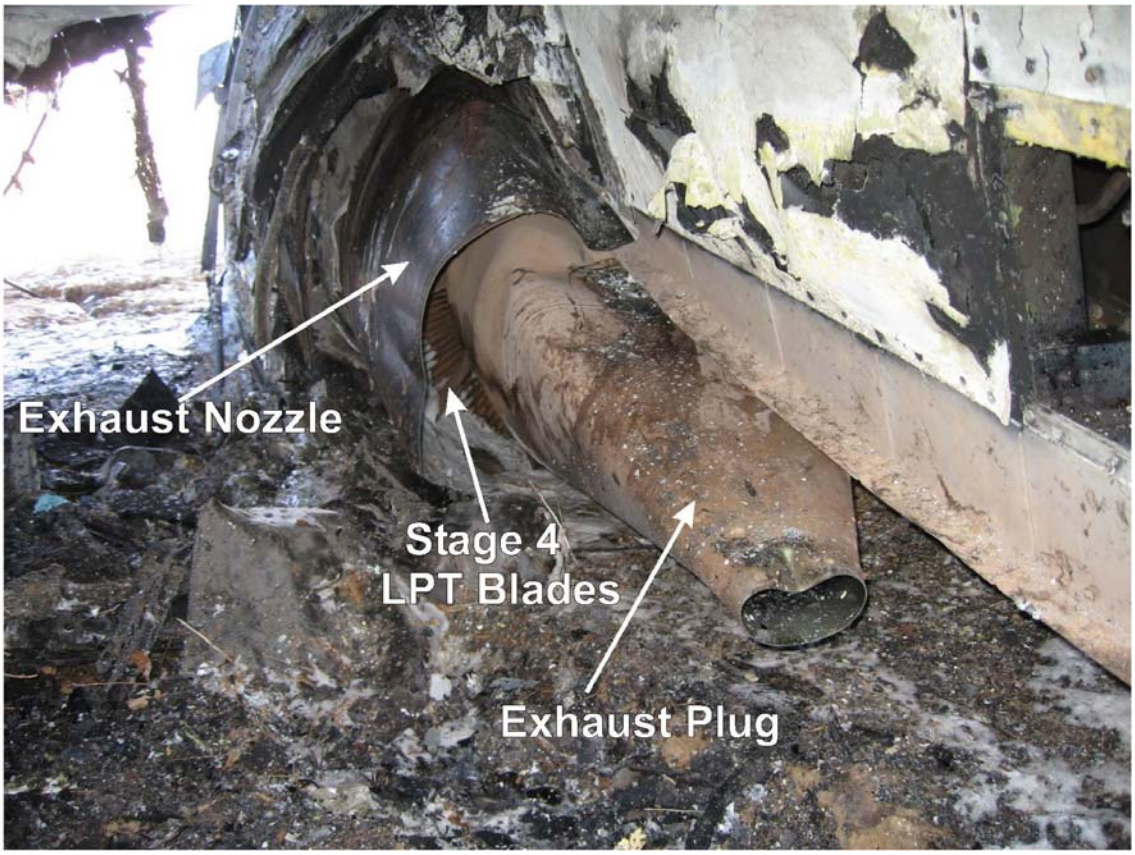

PHOTO 21: STAGE 4 LOW PRESSURE TURBINE BLADES APPEAR INTACT

3.0 ON-SITE COCKPIT INDICATIONS

The No. 1 engine throttle was in the full forward position at the mechanical stop while the No. 2 engine throttle was at the idle stop and the thrust reverser lever pulled fully aft (**PHOTO 22**). Both fuel start valve levers were in the idle position (**PHOTO 23**). All the fire handles were found in the stowed position.

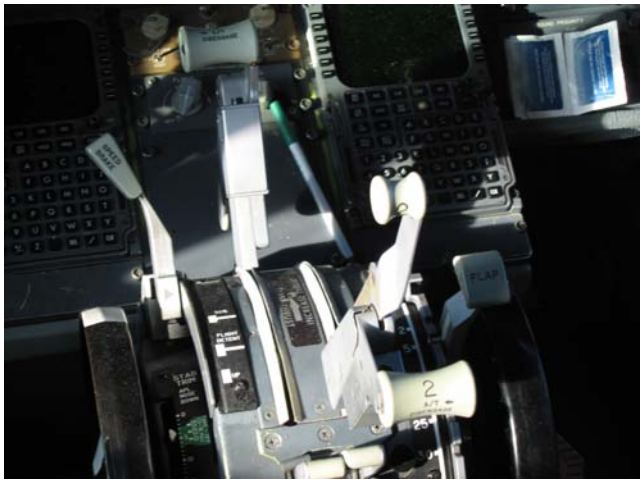

PHOTO 22: THROTTLE POSITIONS

PHOTO 23: FUEL START LEVER POSITION

4.0 ENGINE MAINTENANCE DISCREPANICES

Continental Airlines provided list of discrepancies for Air Transport Association (ATA) codes related to the powerplants (**APPENDIX 2**) for the 90-days prior to the accident date. **TABLE 2** shows those discrepancies and corrective actions taken.

Table 2: 90-Day Engine History

ATA Code	ATA Description	Discrepancy	Reported Date	Corrective Action	Correction Date
7000 7100 7400 7500 7600 7700 7800	 Powerplant Ignition Air Engine Controls Engine Indicating Engine Exhaust	None			
7200	Turbine/Turboprop Engine	Six fan blades nicked or curled on No.1 engine Fan case abradable material missing on No.1 engine	12/11/08 12/11/08	Blended Repaired	12/11/08 at station IAH[6] 12/11/08 at station IAH
7300	Engine Fuel and Control	None		Normal fuel filter check/replacement	
7900	Engine Oil	None		Normal servicing	
8000	Starting	No. 2 engine start valve will not close	10/03/08	Replace start switch	10/04/08 at station IAH

5.0 FLIGHT DATA RECORDER INFORMATION

The engine sequence of events is based on data from the flight data recorder (FDR) for the accident flight. The FDR was sent to the Safety Board Headquarters in Washington DC and was read out by the Vehicle Recorder Specialist. **FIGURE 2** is a FDR plot for the accident flight and **TABLE 3** provides a quick reference for the engine sequence. For reference purposes, time = zero seconds (T=0s) corresponds to the FDR MST (HH:MM:SS) of 18:17:39 and is designated as the time when the airplane is holding at the arrival end of Runway 34R before the engines are advanced from idle speed for takeoff (T/O). A reference times have been rounded to the nearest second. At T=0s, the throttles are at idle (0.7° and -1.4° throttle lever angle (TLA) respectively) resulting in fan speeds (designated as percent N1) for both engines of about 22% and 23% N1, respectively.

At about T=+1s (MST 18:17:40), both throttles were advanced and the engine fan speeds started to increase. According to the Continental 737 Flight Manual takeoff thrust is set as follows:

> As the aircraft is aligned with the runway, the Pilot Flying (PF) will smoothly advance both throttles, ensuring symmetrical engine acceleration, to approximately 40% N1 and allow the engines to stabilize….After the engines are stabilized, the PF will manually advance the throttles toward the takeoff power setting and engage TOGA when satisfied that engine acceleration is normal. Normally TOGA will be engaged as the throttles reach the vertical position (70% N1) position. (**APPENDIX 3**)

[6] IAH is Continental's facility located at the George Bush International Airport in Houston TX.

About three (3) seconds (MST 18:17:43) after both throttles were advanced (T=+4s) the airplane starts on its T/O roll. The acceleration of the engines was mismatched as they passed through 40% N1, even though the TLA for both were within about a percent of each other. According to the interview statement of the Captain (Flying Pilot), he commented that it [engines] was a little squirrelly getting to 40% N1 and as they were going to 70% N1 there was still a split in the motors but when pushed through to around 90% N1 he made sure the engines were pretty well matched [N1 speed]. The First Officer (Non-Flying Pilot) stated in his interview that the captain pushed the throttles to 40% N1 to make sure there were two good spools and that when the throttles were pushed to 70% N1, the captain engaged the auto-throttles but commented that the throttles were mismatched but that they spooled up to the takeoff power without any problems (See Operations/Human Performance Group Chairman's Factual report for complete details of the interview of the Captain and First Officer). At about T=+17s (MST 18:17:56), both fan speeds of both engines came together at about 70% N1 and from that point, continued to accelerate and were closely matched while they accelerated to T/O power.

Both engines reached T/O power, about 90% N1 speed, at about T=+25s (MST 18:18:04) and remained at that level until about T=+40s (MST 18:18:19). According to the First Officer statement, the T/O power setting was to be 90.9% N1 based on their accuload program. At about T=+39s (MST 18:18:18), the airplane departed off the left side of the runway while both engines remained at about 90% N1. About two (2) seconds later (T=+41s/MST 18:18:20), the No. 1 engine experienced an uncommanded deceleration (no corresponding recorded TLA movement) to 58% N1 speed while the No. 2 engine fan speed remained at about 90%. At about T=+42s (MST 18:18:21) both throttles were brought back to idle and about one (1) second later (T=+43s/MST 18:18:22) the thrust reversers were deployed. The commanded reduction in power occurred about three (3) seconds after the airplane had departed the runway. According to the FDR data, the thrust reverser remained deployed to the end of the recording. The fan speed for the No. 1 engine continued to decrease after it reached 42% N1 at T=+42s but at a much slower rate than before until it reached its lowest recorded value of about 30% N1 at the end of the recording. The fan speed for the No. 2 engine continued to steadily decrease after the throttle lever was brought back to idle at T=+42s. Neither the No. 1 or 2 engine fan speed increased in value when the thrust reversers were deployed.

TABLE 3: ACCIDENT SEQUENCE RELATIVE TO ENGINE PARAMETERS

MST (HH:MM:SS)	Time	Pertinent Engine Parameters
18:17:39	T=0s	TLAL = 0.7° and Engine 1 N1 speed 22% TLAR = -1.4° and Engine 2 N1 speed 23%
18:17:40	T=+1s	Throttles advance and N1 speeds increase
18:17:43	T=+4s	Airplane starts takeoff roll
18:17:56	T=+17s	Engine N1 speeds match
18:18:04	T=+25s	Engine 1 and 2 N1 speeds are about 90%
18:18:18	**T=+39s**	**Airplane departure left side of runway**
18:18:20	T=+41s	Engine 1 experienced an uncommanded deceleration Engine 1 fan speed drops to 58%
18:18:21	T=+42s	Engine 1 N1 speed drops to 42% Both throttles retarded to idle Engine 2 N1 speeds starts to drop
18:18:22	T=+43s	Thrust reversers on both engines deployed

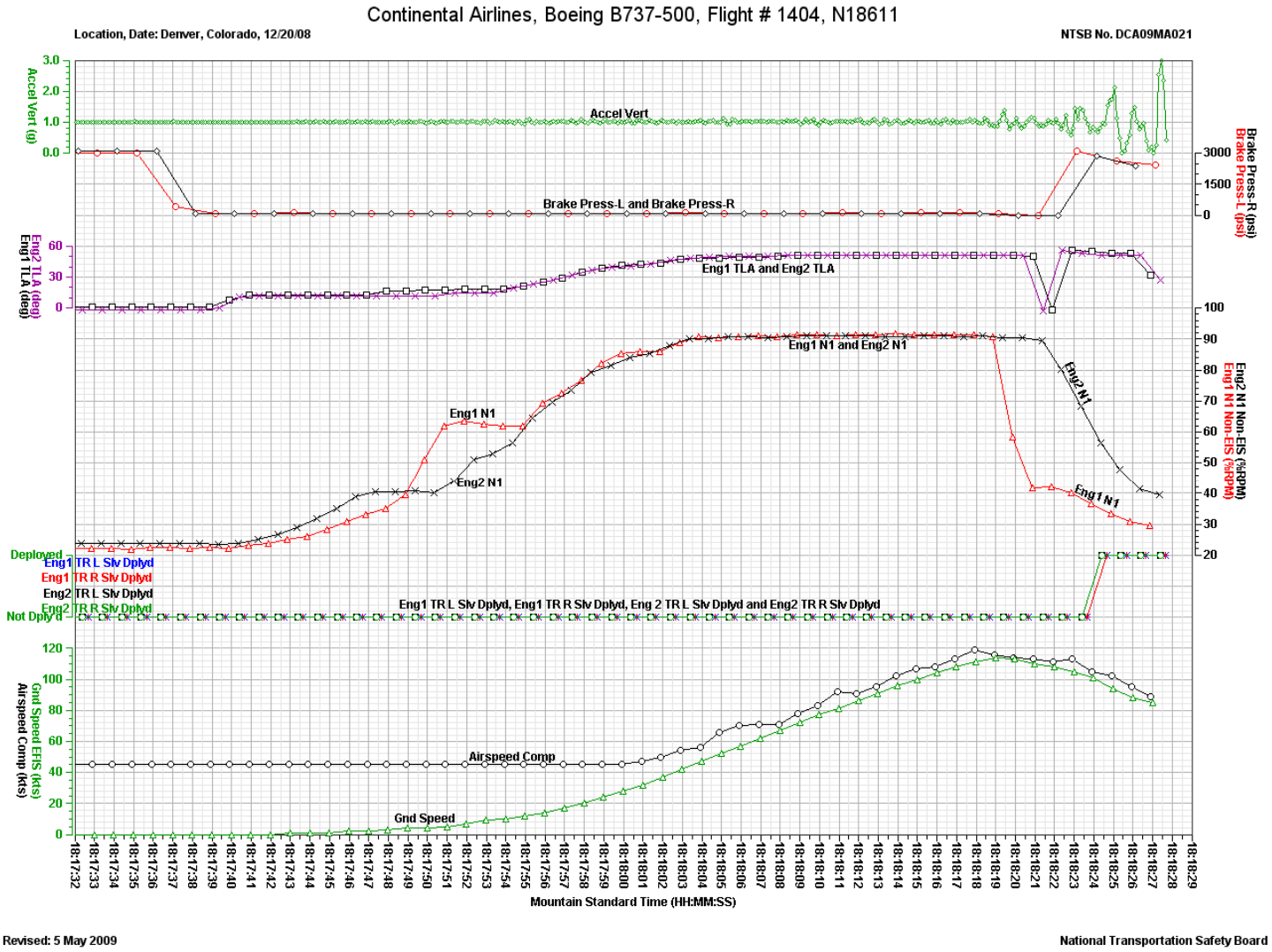

FIGURE 2: DIGITAL FLIGHT DATA RECORDER DATA

Jean-Pierre Scarfo
Aerospace Engineer
Powerplant Lead Engineer

APPENDIX 1: CONTINENTAL AIRLINES MAINTENANCE TIME AND CYCLE ENGINES TRACKING

M&E PART/SERIAL #: 03-7200-9-0001 7882 TRCKNG #: 0000000
MFG PART/SERIAL #: CFM56-3B1 857882 NHA POS E1 1 ENG
KEYWORD/DESCRIPTION ENGINE, BASIC, CFM56-3B 737-3/5

LOCATION/STATUS: INSTALLED ON A/C 0611 SERVICEABLE
PREVIOUS LOCATION: IAH ENGINE SHOP/ALL CREWS ON A/C 0611 E1

TYPE OF MAINTENANCE INSPECT CNTL PROGRAM: 237 OC-AD
DATE OF LAST MAINTENANCE 05 AUG 08

NEXT HIGHER ASSEMBLY KEYWORD	MFG SERIAL NO	INSTALL-NHA	ON NHA
24-2000-9-0001 0611 A/C	27324	06 AUG 08	06 AUG 08

TIME-STANDARD	TOTAL-TIME	TS-INST	TSREPAIR
CYCLES	020552.00	000428.00	003539.00
FLYING TIME	039092.19	000800.28	006747.13

M&E PART/SERIAL #: 03-7200-9-0001 8761 TRCKNG #: 0000000
MFG PART/SERIAL #: CFM56-3B1 858761 NHA POS E2 2 ENG
KEYWORD/DESCRIPTION ENGINE, BASIC, CFM56-3B 737-3/5

LOCATION/STATUS: INSTALLED ON A/C 0611 SERVICEABLE
PREVIOUS LOCATION: IAH ENGINE SHOP/ALL CREWS ON A/C 0611 E2

TYPE OF MAINTENANCE REPAIR CNTL PROGRAM: 237 OC-AD
DATE OF LAST MAINTENANCE 09 DEC 06

NEXT HIGHER ASSEMBLY KEYWORD	MFG SERIAL NO	INSTALL-NHA	ON NHA
24-2000-9-0001 0611 A/C	27324	18 DEC 06	18 DEC 06

TIME-STANDARD	TOTAL-TIME	TS-INST	TSREPAIR
CYCLES	014926.00	002768.00	002768.00
FLYING TIME	028081.12	005296.32	005296.32

TS-Inst- Time installed on AC TS Repair –Time since engine repair, egt restoration

ESN857882

LP8076832	12/11/2008	ON WALK AROUND FOUND #1 ENG. FOD #31 FAN BLADE NICKED. BLENDED #31 BLADE IAW AMM 72-31-02, #31 BLADE WITHIN LIMITS.
LP8076830	12/11/2008	ON WALKAROUND FOUND #1 ENG. FOD #19 FAN BLADE TIP CURLED. BLENDED #19 BLADE IAW AMM 72-31-02, #19 BLADE WITHIN LIMITS
LP8076829	12/11/2008	ON WALKAROUND FOUND #1 ENG. FOD #15 FAN BLADE NICKED. BLENDED #15 BLADE IAW AMM 72-31-02, #15 BLADE WITHIN LIMITS.
LP8076834	12/11/2008	ON WALKAROUND FOUND #1 ENG. FOD ABRADABLE MATERIAL MISSING AT 1 0 O'CLOCK POSITION IN THE FAN SHROUD. PERFORMED PLUG REPAIR IAW AMM 72-33-00.

ESN858761 has no engine maintenance issues for the last 90 days

APPENDIX 2: DISCREPANCIES HISTORY FOR THE 90-DAYS PRIOR TO THE ACCIDENT DATE

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SC1WRALC 22 DEC 08 10:54   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7000           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY                      <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ---------------      ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS          DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA    DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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SC1WRALC 22 DEC 08 10:55   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7100           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY                      <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ----------------     ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS           DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA     DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE  DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  -------------------  ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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7200

A/C 0611 CLOSED LOG 8076830 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY LEE 02156 STA IAH 11 DEC 08 ATA 07200
ON WALKAROUND FOUND #1 ENG. FOD #19 FAN BLADE TIP CURLED.
CORRECTED BY RICH 32114 STA IAH 11 DEC 08 ATA 07200
BLENDED #19 BLADE IAW AMM 72-31-02, #19 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 8076829 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALKAROUND FOUND #1 ENG. FOD #15 FAN BLADE NICKED.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
BLENDED #15 BLADE IAW AMM 72-31-02, #15 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 8076828 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALKAROUND FOUND #1 ENG. FOD #4 BLADE TIP CURLED.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
BLENDED #4 BLADE IAW AMM 72-31-02, #4 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 8076835 FLT/CHK SCHK NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
REMOVED FAN BLADES #30 AND #31 TO FACILITATE REPAIR ON L/P 8076
834.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
INSTALLED FAN BLADES #30 AND #31 IAW AMM 72-31-02.
****
A/C 0611 CLOSED LOG 8076834 FLT/CHK 1607 NON ROUTINE LINE
DELAYED 00:30 DI 10/DEC/08
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALKAROUND FOUND #1 ENG. FOD ABRADABLE MATERIAL MISSING AT 1
0 O'CLOCK POSITION IN THE FAN SHROUD.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
PERFORMED PLUG REPAIR IAW AMM 72-33-00.
****
A/C 0611 CLOSED LOG 8076831 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALK AROUND FOUND #1 ENG. FOD #27 FAN BLADE NICKED.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
BLENDED #27 BLADE IAW AMM 72-31-02, #27 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 8076832 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALK AROUND FOUND #1 ENG. FOD #31 FAN BLADE NICKED.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
BLENDED #31 BLADE IAW AMM 72-31-02, #31 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 8076833 FLT/CHK 1607 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
ON WALK AROUND FOUND #1 ENG. FOD.#38 FAN BLADE NICKED.
CORRECTED BY [redacted] STA IAH 11 DEC 08 ATA 07200
BLENDED #38 BLADE IAW AMM 72-31-02, #38 BLADE WITHIN LIMITS.
****
A/C 0611 CLOSED LOG 4249858 FLT/CHK 1868 NON ROUTINE LINE
MIS
REPORTED BY [redacted] STA IAH 10 DEC 08 ATA 07230
TDR ONLY REF #1 ENG FOD
ALTERED BY [redacted] STA HQJ 11 DEC 08
CHANGED ATA 7200 TO 7230.
CORRECTED BY [redacted] STA IAH 10 DEC 08 ATA 07200
TDR
****
GCS100I *** END OF PROGRAM ***

7300

A/C 0611 CLOSED LOG 8076813 FLT/CHK SCHK NON ROUTINE LINE
REPORTED BY [redacted] STA MIA 26 NOV 08 ATA 07300
DIP REQUESTED FOR THE RIGHT ENG. TO REMOVE,INSPECT AND REPLACE
THE LPENG. FUEL FILTER PER AMM 73-11-02 AFTER 10 BUT WITHIN 45
FLT HOURS
DEFERRED BY [redacted] STA MIA 26 NOV 08 DIP
INITIATED A DIP FOR FUEL FILTER REPLACEMENT, REF CONTROL # 9143
9
CORRECTED BY [redacted] STA IAH 02 DEC 08 ATA 07300
REMOVED AND REPLACED FUEL FILTER PER M.M. 73-11-02 LEAK CK'D GOO
D ON RT ENG DIP CLOSED
******A/C QUALITY CONTROL LAST UPDATE BY 07257 STA IAH 26NOV08
CONTROL #: 91439 SOURCE DOCUMENT: EA573002222F
REPETITIVE LABOR HOURS: 0002 GROUND TIME: 0004
TERMINATING LABOR HOURS: 0002 GROUND TIME: 0004
ENGINE #2 ESN 858761, REMOVE AND REPLACE THE #2 ENGINE LOW
PRESSURE FUEL FILTER AFTER 10 FLIGHT HOURS BUT WITHIN 45
FLIGHT HOURS. REFERENCE EA 5730-02222 REV F, OP 62, TASK 9
FOR FILTER INSPECTION CRITERIA.
******A/C RECORDS LAST UPDATE BY 45782 STA HQJ 01DEC08
TA M&E: 24-9973-8-0189 S/N: 0611 LIMIT: *** SEE BELOW ***
NHA: 24-2000-9-0001 NHA S/N: 0611
LIMIT: 1) T/A: AFTER 10 BUT BEFORE 45 F/H~ODEE
DIP 57-DIP ADD DATE:26NOV08 TIME:1307 STA:MIA
MATERIAL/LABOR LAST UPDATED BY: [redacted] ON 02DEC08
MAN HOURS REQUIRED WERE INDICATED 00002 M/H
GROUND TIME: 0004
00001 EA B737-73-3-0019 KIT, TASK, FUEL 73-00-00
99-7300-3-0001
AVL SYS 11/27 SM
****
A/C 0611 CLOSED LOG 8076812 FLT/CHK SCHK NON ROUTINE LINE
REPORTED BY [redacted] STA MIA 26 NOV 08 ATA 07300
DIP REQUESTED FOR THE LEFT ENG. TO REMOVE,INSPECT AND REPLACE T
HE LP ENG. FUEL FILTER PER AMM 73-11-02 AFTER 10 BUT WITHIN 45
FLT HOURS.
DEFERRED BY [redacted] STA MIA 26 NOV 08 DIP
INITIATED A DIP FOR FILTER CHANGE REF CONTROL #91441
CORRECTED BY [redacted] STA IAH 02 DEC 08 ATA 07300
REMOVED AND REPLACED FUEL FILTER ON #1 ENG PER M.M 73-11-02 LEAK
CK'D GOOD DIP CLOSED
******A/C QUALITY CONTROL LAST UPDATE BY 07257 STA IAH 26NOV08
CONTROL #: 91441 SOURCE DOCUMENT: EA573002222F
REPETITIVE LABOR HOURS: 0001 GROUND TIME: 0004
TERMINATING LABOR HOURS: 0002 GROUND TIME: 0004
ENGINE #1 ESN 857882, REMOVE AND REPLACE THE #1 ENGINE LOW
PRESSURE FUEL FILTER AFTER 10 FLIGHT HOURS BUT WITHIN 45
FLIGHT HOURS. REFERENCE EA 5730-02222 REV F, OP 62, TASK 8
FOR FILTER INSPECTION CRITERIA.
******A/C RECORDS LAST UPDATE BY 45782 STA HQJ 01DEC08
TA M&E: 24-9973-8-0190 S/N: 0611 LIMIT: *** SEE BELOW ***
NHA: 24-2000-9-0001 NHA S/N: 0611
LIMIT: 1) T/A: AFTER 10 BUT BEFORE 45 F/H~ODEE
DIP 57-DIP ADD DATE:26NOV08 TIME:1311 STA:MIA
MATERIAL/LABOR LAST UPDATED BY: [redacted] ON 02DEC08
MAN HOURS REQUIRED WERE INDICATED 00001 M/H
GROUND TIME: 0004
00001 EA B737-73-3-0019 KIT, TASK, FUEL 73-00-00
99-7300-3-0001
AVL SYS 11/27 SM
****
GCS100I *** END OF PROGRAM ***

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SC1WRALC 22 DEC 08 11:10   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7400           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY              Y       <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ----------------     ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS           DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA     DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE  DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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SC1WRALC 22 DEC 08 11:11   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7500           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY              Y       <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ---------------      ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS          DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA     DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE  DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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SC1WRALC 22 DEC 08 11:12   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7600           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY              Y       <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ----------------     ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS           DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA     DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE  DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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SC1WRALC 22 DEC 08 11:13   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7700           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY              Y       <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ---------------      -------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS          DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA    DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
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```
SC1WRALC 22 DEC 08 11:13   DISPLAY DISCREPANCY HISTORIES


AIRCRAFT NUMBER        0611
TOTAL NUMBER OF DAYS   090     <----- CLOSED DISC OLDER THAN 60-90 DAYS WILL
ATA SYSTEM             7800           NOT BE DISPLAYED (AVAIL. ON MICROFILM)
DEFERRAL CODE
FLEET NUMBER
LOG PAGE NUMBER                <----- FOR SINGLE ITEM DISPLAY ONLY
HARD COPY              Y       <----- ENTER Y FOR HARD COPY, NO DISPLAY
FLEET SERVICE LOGS             <----- ENTER N FOR NO DISPLAY
   OPTIONS AVAILABLE  ------->     AIRCRAFT ENTRIES -OR- FLEET ENTRIES
   -----------------               ---------------      ------------
1 OPEN AND DEFERRED ITEMS . . . .  A/C                  FLEET (TIME DEFERRED)
2 ALL ITEMS . . . . . . . . . . .  A/C + DAYS          DAYS + FLEET
3 ALL ITEMS BY ATA  . . . . . . .  A/C + DAYS + ATA    DAYS + ATA + FLEET
4 OPEN ITEMS BY DEFERRAL CODE . .  A/C + DEFERRAL CODE DEF CODE + FLEET
5 ALL OPEN AND DEFERRED BY ATA  .  ------------------   ATA + FLEET
OPTION 2 BY FLEET OR HARD COPY BY FLEET WILL DEFAULT TO
5 DAYS IF TOTAL NUMBER OF DAYS IS GREATER THAN 5 DAYS
 RETURN-TO-IUV                                                NEXT COMMAND
GCS087E NO ITEMS FOUND IN THIS CATEGORY
GCS008I *** END OF TRANSACTION ***
```

7900

A/C 0611 CLOSED LOG 8094142 FLT/CHK 0290 NON ROUTINE LINE
REPORTED BY [redacted] STA IAH 09 NOV 08 ATA 07900
A/C NEEDS ENGINE OIL SERVICE.
CORRECTED BY [redacted] STA IAH 09 NOV 08 ATA 07900
SERVICED ENGINE OILS TO FULL.O.K.FOR SERVICE.
****

GCS100I *** END OF PROGRAM ***

8000

A/C 0611 CLOSED LOG 4265905 FLT/CHK 1189 PILOT REPORT
REPORTED BY [redacted] STA EWR 03 OCT 08 ATA 08000
#2 ENGINE START VALVE WILL NOT CLOSE AUTOMATICALLY,MUST SELECT
START SWITCH TO OFF.2 START IN BOS.(REFERANCE TO LOG#8059998
DEFERRED BY [redacted] STA EWR 03 OCT 08 MEL
MEL#2 ENGINE START SWITCH AUTO CUT OFF.MUST TURN IT OFF MANUALL
Y.A/C OK TO CONT.
CORRECTED BY [redacted] STA IAH 04 OCT 08 ATA 08000
REPLACED #2 ENG START SWITCH IAW WM 80-11-11. OPS CHECK GOOD.
MEL 80-02-1R CNTL#:447152 ADD DATE:03OCT08 TIME:1239 STA:EWR
REPETITIVE LABOR HOURS: 0003 GROUND TIME: 0003
MATERIAL/LABOR LAST UPDATED BY: [redacted] ON 03OCT08
MAN HOURS REQUIRED WERE INDICATED 00003 M/H
GROUND TIME: 0003
00001 EA 00-0363-3-0181 RELAY,
AVL IAH IN STK/MX TO ORDER 10/03 IAH
00001 EA 03-7712-9-0001 INDICATOR, N2 T
AVL IAH IN STK/MX TO ORDER 10/03 IAH
****
GCS100I *** END OF PROGRAM ***

APPENDIX 3: CONTINENTAL AIRLINES 737 FLIGHT MANUAL TAKEOFF PROCEDURES

Position verification in-flight is required. Select the FIX page, type in the identifier for the VOR that is manually being tuned by the VHF navigation panel and crosscheck the radial and DME from raw data vs. the computed data. Selecting and executing FMC UPD should ensure RNP/ANP requirements if needed. If LNAV is required at 400 feet AGL, the monitoring pilot should display raw data.

When FMC position is confirmed, both Nav radios should be selected to AUTO. This gives the FMC maximum capability to use navaids for position updating.

VHF Nav tuning is automatically selected when the HSI switch is positioned to NAV.

Note: Aircraft not utilizing the FMC POS UPD feature may require several minutes of airborne time to acquire an accurate FMC position (dependent on navaid update availability).

Caution: Failure to ensure the correct runway and correct SID/TRAN is programmed in the FMC will lead to subsequent vertical/lateral navigation errors, compromising both ATC separation and/or noise abatement requirements.

Setting Takeoff Thrust

A rolling takeoff is recommended. As the aircraft is aligned with the runway, the Pilot Flying will smoothly advance both throttles, ensuring symmetrical engine acceleration, to approximately 40% N_1 and allow the engines to stabilize. The throttle position will be about ¾" forward of idle. Unrestricted advancement of the throttles can cause asymmetric thrust with directional control problems, especially on slippery runways.

Caution: The nose wheel steering (tiller) should not be used above normal taxi speeds (20 knots).

After the engines are stabilized, the PF will manually advance the throttles toward the takeoff power setting, and engage TOGA when satisfied that engine acceleration is normal. Normally TOGA will be engaged as the throttles reach the vertical (70% N_1) position. As the throttles reach the end of their forward movement, the PF calls "CHECK POWER," and the PM ensures that the throttles stabilize at takeoff N_1 (referencing the TAKEOFF PAGE of the FMC) and replies "POWER SET _____%."

Note: Both F/D switches must be on to engage the F/D Takeoff mode (TOGA). The F/D switches are not required to engage autothrottle only.

A/T annunciates N_1 and AFDS annunciates TOGA. The thrust levers drive forward and flight director bars command 10 degrees nose down. The F/D does not provide runway steering guidance or rotation commands. At approximately 60 knots, the F/D will command 15 degrees nose up.

③ At 64 knots (84 knots - 5 7 8 9), A/T annunciates THR HOLD.

A/T annunciates N_1 and AFDS annunciates TOGA. The thrust levers drive forward and flight director bars command 10 degrees nose down. The F/D does not provide runway steering guidance or rotation commands. At approximately 60 knots, the F/D will command 15 degrees nose up.

③ At 64 knots (84 knots - 5 7 8 9), A/T annunciates THR HOLD.

Takeoff Roll

Keep the airplane on the centerline with rudder pedal steering and rudder. The rudder becomes effective between 40 and 60 knots. Use of the nose wheel steering tiller during takeoff is not recommended.

The Captain will guard and retain exclusive control of the throttles from the time initial takeoff power is set until V_1, and will be prepared to perform the rejected takeoff maneuver if required. When the First Officer is making the takeoff, the First Officer will place both hands on the yoke after initially setting takeoff power.

The PM monitors essential instruments including both primary and standby airspeed indications, engine instruments, verifies proper oil pressure, and verifies A/T N_1 indication changes to THR HOLD. If the THR HOLD mode annunciation does not appear, no crew action is required unless a subsequent system fault caused unwanted thrust lever movement. Lack of the THR HOLD annunciation means the protective feature may not be active.

The PM will crosscheck the standby airspeed indicator against their own airspeed indicator, and then at 100 knots call "100 KNOTS." The PF will visually confirm that his/her airspeed indicator is in agreement.

The PM will call "V_1" at approximately 5 knots prior to the actual V_1 speed (depending upon acceleration rate) so as to complete the call by the time the airspeed indicator has reached actual V_1.

The PM will call "ROTATE" at V_R, and will then monitor the flight instruments throughout the remainder of the takeoff procedure.

After liftoff, THR HOLD mode remains engaged until:

③ 5 a radio altitude of 400 feet RA is reached and 18 seconds have elapsed since liftoff.

7 8 9 a radio altitude of 800 feet RA.

The A/T mode cannot be changed during this time because power is taken away from the throttle drives to ensure no A/T movement occurs during the takeoff phase. The A/T will automatically annunciate ARM and thrust will remain at TO setting. A/T mode can be changed only after the ARM annunciation appears. If full thrust is desired during a reduced thrust takeoff, manually position the thrust levers to the thrust limit as indicated by the cursors on the N_1 gauges.