



National Transportation Safety Board Aviation Incident Final Report

| | | | |
|--------------------------------|----------------------|-------------------------|------------|
| Location: | BOSTON, MA | Incident Number: | NYC96IA116 |
| Date & Time: | 05/28/1996, 1421 EDT | Registration: | PHMCH |
| Aircraft: | Boeing 767-31AER | Aircraft Damage: | Minor |
| Defining Event: | | Injuries: | 202 None |
| Flight Conducted Under: | Part 129: Foreign | | |

Analysis

The Boeing 767-300ER had multiple electronic (elec) anomalies, en route, including illuminated warning lights, erroneous display indications, uncommanded autopilot disconnects, & failure of flight (flt) instruments. Flt diverted, & landing (Lndg) was made with zero flaps & slats extended, thrust reversers inop, ground (gnd) spoilers inop & partial anti-skid. During Lndg roll, 4 main tires failed; & 4 tires deflated due to heat/fuse plugs; small main Lndg gear fire erupted, but was extinguished. Flt crew were unaware that thrust reversers & gnd spoilers were inop. They noted ANTI-SKID advisory, but with the workload of responding to the multiple electrical and system failures, did not respond to it. Investigation (inv) revealed systems on several elec buses failed or became intermittently inop, but other systems on same buses remained operative. Detailed gnd & flt tests were made, but anomalies could not be duplicated. Inv revealed negative cable for main battery was not positively secured due to stripped jam nut, & main battery shunt was not built up IAW Boeing specs. Boeing indicated loose battery shunt could cause interruption to gnd. Similar events were reported with 2 other acft of same operator, but query of Boeing data base did not find similar events. Boeing 767-300ER of another operator, same configuration, did not have similar events.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: Numerous electrical anomalies as a result of a loose main battery shunt connection and undetermined electrical system causes.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: CRUISE - NORMAL

Findings

1. (C) ELECTRICAL SYSTEM - MALFUNCTION
2. (C) ELECTRICAL SYSTEM - UNDETERMINED
3. (C) ELECTRICAL SYSTEM,ELECTRIC WIRING - IMPROPER
4. ACFT/EQUIP,INADEQUATE AIRCRAFT MANUALS - MANUFACTURER
5. (C) ELECTRICAL SYSTEM,ELECTRIC WIRING - LOOSE PART/BOLT/NUT/CLAMP/ETC

Occurrence #2: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: LANDING

Findings

6. (F) LANDING GEAR,ANTI-SKID BRAKE SYSTEM - LOSS,PARTIAL
7. (F) FLIGHT CONTROL,SPEED BRAKE - LOSS,PARTIAL
8. (F) THRUST REVERSER - FAILURE,TOTAL

Occurrence #3: FIRE

Phase of Operation: LANDING

Findings

9. LANDING GEAR,NORMAL BRAKE SYSTEM - OVERTEMPERATURE

Factual Information

HISTORY OF FLIGHT

On May 28, 1996, at 1421 eastern daylight time, a Boeing 767-31AER, with Dutch registry PH-MCH, and operated by Martinair Holland as flight 631, received minor damage during an unscheduled landing at Logan Airport, Boston, Massachusetts. There were no injuries to the 3 pilots, 8 flight attendants, or 191 passengers, and visual meteorological conditions prevailed. The flight had departed Schiphol Airport, Amsterdam, The Netherlands, at 0649, destined for Orlando, Florida (MCO), and was operated on an instrument flight rules (IFR) flight plan under 14 CFR 129.

The flight was initiated with three pilots; a captain, a relief captain (F/O 1), and a first officer (F/O 2).

Prior to departure, the flight crew noted anomalies with the airplane clocks. Once corrected, they proceeded with the flight. En route, the airplane experienced numerous electrical anomalies where various warning lights would illuminate, and then extinguish. These occurrences were also accompanied by uncommanded auto-pilot disconnects, changes in airplane zero fuel weight, as displayed on the control display unit (CDU) of the flight management system (FMS), and the blanking of transponder codes.

The flight crew, in radio contact with their dispatch center, discussed the situation and agreed that they could continue with the flight. The Boeing Aircraft Company through the Martinair dispatch center supplied technical assistance. A check of the passenger cabin revealed that numerous personal electronic devices (PEDs) were in use. They were requested to be turned off. At one time while over the North Atlantic, there was a period of time when no anomalies occurred. Nearing the North American continent, and with additional anomalies occurring, the flight crew initially planned to divert to Newark, New Jersey. As the electrical anomalies continued, additional systems were affected, and a decision was made to divert to Boston, Massachusetts. Following the decision to divert, there were failures of the co-pilots electronic attitude director indicators (EADI), and electronic horizontal situation indicators (EHSI). Navigation was lost to the captain's EHSI.

During the initial descent into Boston, the aircraft was flown manually due to autothrottle disengagement and multiple A/P disengagements. When the airplane was configured with flaps 1 (slat extension, no trailing edge flaps), the two needles on a cockpit gauge which represented the respective wing slat positions disagreed. The flight crew checked the runway required for landing with zero flaps, and the runway available at Boston. With sufficient runway available, the captain in concert with the other crew member decided to make no more configuration changes, resulting in a leading edge slat only approach speed of 162 kts. Flap problems had been expected by the crew based on the previous events. The slats were visually inspected to be extended. In the cabin the seatbelts signs switched on and off uncommanded.

During the last portion of flight, the Engine Indicating and Crew Alerting System (EICAS) was filled with caution and advisory messages which were read by F/O 2 from the observers seat on request of the captain.

Although no identification could be received from the Instrument Landing System (ILS), the indication on the left Attitude Director Indicator (ADI) and on the standby ADI seemed

valid.

On final approach to Boston, numerous warning lights illuminated, extinguished, and other warning lights illuminated.

After touch down reverse thrust and autospeedbrakes were not available. Manual braking was anticipated since the autobrake selector did not latch. Braking was done manually by the captain while the wing spoilers were extended by the F/O 1. Just after touch-down the captain initially used full manual braking. The cabin crew's observations were as if they were riding on gravel (pebbles), and the cockpit crew suspected tire failures just after turning off the runway. The last high speed turn off to the left was taken to vacate runway 4R, on which the airplane was brought to a stop. The pilots reported to feel no effect from the manually selected ground spoilers. In the meantime all main landing gear tires were blown or deflated and the airplane was brought to a stop without fully vacating the runway.

A small wheel brake fire developed after landing and was immediately extinguished by the airport fire fighting personnel.

Approximately 25 minutes after landing, the passengers disembarked using mobile stairs.

The incident terminated during the hours of daylight at 42 degrees, 21 minutes North latitude and 71 degrees, 00 minutes West longitude.

PERSONNEL INFORMATION

The flight was conducted using an augmented flight crew, which consisted of two captain rated pilots, and a first officer. All personnel held the appropriate pilot and medical certificates as issued by the government of The Netherlands. Following is a summary of crew flight experience:

Captain The captain had a total time of 6,600 hours, with 3,738 hours in the Boeing 767, including 607 hours as pilot-in-command in the Boeing 767. He had flown 199 hours in the preceding 90 days, including 188 hours in the Boeing 767.

Relief Captain (F/O 1) The relief captain had a total time of 4,000 hours, with 1,590 hours in the Boeing 767. He had flown 195 hours in the preceding 90 days, including 190 hours in the Boeing 767.

First Officer (F/O 2) The first officer had a total time of 5,180 hours, with 388 hours in the Boeing 767. He had flown 150 hours in the preceding 90 days, all in the Boeing 767.

AIRCRAFT INFORMATION

The airplane was a Boeing 767- 31AER. The airplane was delivered new to Martinair in February 1990, in Martinair's specified configuration. The Boeing production line number was 194. It was maintained utilizing a maintenance program furnished by Boeing, and approved by the Directorate of Civil Aviation, The Netherlands. The last inspection was conducted on May 21, 1996, and the airplane had operated 98 hours since the inspection. The total time for the airframe at the time of landing at Boston was 30,802 hours.

AERODROME INFORMATION

The landing was accomplished on runway 4R which was 10,005 feet long, 150 feet wide,

and had a grooved asphalt surface. The airplane turned off the runway at taxiway ROMEO, with about 1,800 feet of runway remaining.

FLIGHT RECORDERS

After the airplane stopped, the cockpit voice recorder operated for over 30 minutes. The cockpit voice recorder was not retained. The digital flight data recorder (DFDR) was retained and forward to the NTSB Laboratory in Washington DC, for readout. According to the Flight Data Recorder (FDR) Specialist's report:

"1. The...[incident] flight, as transcribed was approximately 7:21:19 in duration from liftoff until touchdown. The transition of the...[air/ground] discrete parameter from 'Ground' to 'Air', occurred at 1050:10 Coordinated Universal Time (UTC), or 3:53:42 Elapsed Time, and the aircraft touchdown, as indicated by a spike in vertical acceleration data, occurred at 11:25:45 Elapsed Time., The UTC time of touchdown could not be determined, as the final loss of UTC data occurred at approximately 1813:32 UTC or 11:18:25 Elapsed Time (about 7 minutes prior to touchdown)..."

"3. The first loss of the airplane's Coordinated Universal Time (UTC) occurred at approximately 1110:13 UTC, or 4:13:35 Elapsed Time. UTC time was lost at least ten separate times during the flight..."

"4. The first change of the Master Warning discrete from 'No Warning' to 'Warning' occurred at about 6:06:00 Elapsed Time, while the aircraft was at an altitude of about 33,000 feet and a latitude/longitude position of about 50.52 degrees North and 22.50 degrees West. Repeated changes in the Master Warning discrete were noted between 7:40:00 and 9:20:00 Elapsed time."

"5. At about 10:45:00 Elapsed time, FDR heading data was lost for the remainder of the incident flight. FDR pitch information were also lost for most of the remainder of the flight."

"6. At about 11:17:30 Elapsed Time, several parameters were lost to the FDR until after the incident flight landing. The following parameters were noted to be lost:

| Roll Attitude | Pitch Attitude | UTC Hours |
|----------------|-----------------------------|-----------|
| UTC Minutes | UTC Seconds | Inertial |
| Vertical Speed | Speedbrake Handle Position" | |

"7. Also at about 11:17:30 Elapsed Time, the...[air/ground] discrete changed stated from 'Air' to 'Ground', and the Air Driven Pump discrete changed stated from 'Off' to 'On', and the HF/L/R Keying discrete changed state from 'Not Keyed' to 'Keyed'. These discrettes remained recorded in these states until after aircraft touchdown. Several additional discrettes changed state at about 11:17:30 Elapsed Time, and subsequently changed state after touchdown and during the landing roll-out...."

The Addendum to the Flight Data Recorder Factual Report stated:

"...The anti-skid fault discrete changed from the 'No Fault' to 'Fault' state at about 1101:00 Elapsed Time. The parameter data remained then the 'Fault' state until after airplane touchdown and rollout, when the recorded data returned to the 'No Fault' state...."

"According to the airplane manufacturer, if the 28V reference voltage is removed from the FDR during normal flight recording operation, subsequent readout of the FDR will result in...The Air/Ground discrete will always indicate 'Ground'...."

TESTS AND RESEARCH

The airplane was examined at Boston, from May 29, through June 2, 1996. The four inboard tires had deflated due to melted fuse plugs, and the four outboard tires were deflated due to the casings being worn through. A detailed examination of the airplane was conducted in an attempt to induce the failures that were reported by the flight crew. The testing included the electrical system, shock testing, and engine runs both in the air and ground mode. The testing was unable to duplicate the failures reported by the flight crew.

The investigation revealed that the negative cable for the main battery was not positively secured to the main battery shunt as a result of stripped threads found in the jam nut area on the stud. Additionally, the main battery shunt was not built up in accordance with Boeing specifications. An examination of other Boeing 767s in the Martinair fleet, and on the production line at Boeing revealed similar buildup problems with the battery shunt. Boeing personnel commented that a loose battery shunt may cause interruptions to the ground on the main battery bus of the airplane.

While the airplane was in Boston, several of the static wicks were found to have higher resistance than specified.

On June 3, 1996, the airplane was ferried to the Boeing plant at Everett, Washington, for additional testing. The flight was conducted on a special flight permit issued by the Federal Aviation Administration (FAA).

At Everett, the airplane was subjected to testing equal to or greater than new airplane delivery standards. The wiring system was examined in detail for any anomaly that could have contributed to the problem. An electro magnetic interference (EMI) test was conducted throughout the cockpit and cabin with negative results. Additionally, several components were identified as possible contributors to the event and were removed for separate testing. None of the testing was able to duplicate the events reported by the flight crew.

Further testing of the static wicks at Everett found that the airplane could still dissipate static charges within design specification.

On June 10th, the airplane was given a flight test. The test flight profile included new airplane delivery standards, and additional testing to determine the source of events on May 28, 1996. The test flight was completed without incident.

Following the test flight, as the airplane was prepared for departure to The Netherlands, the right engine integrated drive generator (IDG) failed to come on line. The flight was dispatched with the inoperative IDG, per the airplane minimum equipment list (MEL). The IDG was changed after the airplane arrived in Amsterdam.

The IDG was forwarded to Sunstrand for further examination. According to their report:

"...The gold plating on the IDG connector 'A' pins was lower than the engineering print requirements. Evidence of corrosion on the base material of these pins was observed. This conditions could result in an intermittent signal condition from the IDG input speed sensor which could lead to tripping of the IDG from the AC bus."

ADDITIONAL DATA/INFORMATION

Landing Information Available to Flight Crew

The Martinair quick reference handbook (QRH) contained data for landing with engine

inoperative, single and dual hydraulic failures, anti-skid inoperative, wheel brakes inoperative, speed brakes inoperative, and leading edge and trailing edge slat and flap configuration variations.

Examination of the QRH revealed the basic computed landing distance would be increased by using the following multiplication factors for inoperative components: Speed Brakes - Auto Inoperative 1.43; No Flap, No Slat Landing 1.45; Anti-Skid Inoperative 2.14. The addition factor for landing with Thrust Reversers Inoperative - Good Braking Action was 30 meters (98.43 feet).

During interviews the flight crew acknowledged that they were aware of the ANTI SKID advisory message on the EICAS, but due to high cockpit work load, they did not compute their landing distance with the anti-skid inoperative.

Failure of Spoilers to Auto Deploy, and Thrust Reversers to Be Operative

The flight crew reported that upon touchdown, the spoilers did not automatically deploy, and the thrust reversers were inoperative.

The investigation revealed one common system for the spoilers to automatically deploy, and the thrust reversers to be operative, both air/ground systems must be in the ground mode.

According to Boeing, in the flight mode, there are 5 spoilers per wing, with a maximum extension angle of 45 degrees. In the ground mode, there are 6 spoilers per wing, with a maximum extension angle of 60 degrees. Once deployed manually in the air mode, a transition to the ground mode would automatically increase the maximum spoiler angle, and number of spoilers deployed.

In the air mode, the thrust reversers were inoperative.

According to Boeing, the engines were at flight idle at touchdown, and changed to ground idle about 7 seconds after touchdown.

Use of thrust reversers, ground spoilers, and the shift from flight idle to ground idle all required the ground mode signal. According to the flight data recorder, the ground mode signal was recorded as being in the ground mode prior to touchdown, and remained in the ground mode throughout the landing roll.

The investigation was unable to determine if the ground mode signal was received by the engines, ground spoilers, and thrust reverser systems after touchdown.

National Solar Observatory

A check with the National Solar Observatory on Kitt Peak, Arizona found no bursts of solar radiation to explain the events of May 28, 1996.

Boeing Report

Boeing submitted an event summary based upon the detail summary received from Martinair. The summary of the Boeing report stated:

"Most of the reported events from the flight which diverted to Boston on May 28th, 1996, can be attributed to degraded power on the hot battery bus, left dc and right dc buses. Extensive testing and analysis has been unable to explain the degraded dc bus power as was seen on the Martinair airplane.

The existing design will allow for single bus losses with no loss of primary systems and multiple bus loss will still allow safe operation...."

Additionally, the investigative team noted that while particular items on a bus had failed, the whole bus never failed, and other items on the same bus remained powered. The investigation was unable to explain the selectivity of inoperative components on a bus.

Related Events

The investigation disclosed that similar events had occurred with two other airplanes in the Martinair 767 fleet. The affected airplanes were PH-MCG, line number 279, delivered new to Martinair on September, 1989, and PH-MCL, line number 415, delivered new to Martinair on February, 1992. According to data received from Boeing, events with elements of a similar nature occurred on the following dates in the aircraft listed, with the May 28, 1996, events in PH-MCH being the most extensive.

| | | | |
|-------------------|------------------------------|--------------------|--------|
| February 16, 1996 | PH-MCG | March 24, 1996 | PH-MCH |
| May 13, 1996 | PH-MCL | May 14, 1996 | PH-MCG |
| PH-MCH | Incident Under Investigation | September 17, 1996 | PH-MCH |

A check of modifications completed, engineering changes, and Boeing Service Bulletins and Service Letters was conducted. The only commonality between the three airplanes was a modification to the forward flight attendant jump seat in compliance with a Boeing service bulletin. Examination of the airplane, which included the electrical wiring behind the modification, failed to find anything that would have contributed to the events reported by the flight crew.

At the request of the Safety Board, Boeing conducted a search for similar events within the Boeing 757/767 fleet. The search found nothing similar, other than those events which were observed with PH-MCG and PH-MCL.

Boeing also reported that a 767-300 was delivered to another customer in the Martinair configuration. A check with that customer found no history of events similar to the May 28, 1996 event.

As part of an agreement to return the airplane to line service, a portable airborne digital data system (PADDS) unit was installed in the airplane to monitor the electrical system. No findings have been generated which would explain the events of May 28, 1996.

Summary of Events That Occurred

Following is a summary of the events as reported by the flight crew that occurred during the flight.

- During preflight inspection both the captains and first officer clocks had reset to 00:00.
- L IRS DC FAIL, C IRS DC FAIL, & R IRS DC FAIL lights illuminated and then extinguished - occurred multiple times.
- APU FUEL VALVE light illuminated and extinguished.
- Clocks again display 00:00 several times, EICAS message FLAP/SLAT ELEC appears.
- The ZFW changes to the maximum ZFW 130.8 t (288,000 lbs.), the original ZFW was entered again.
- The VHF ARINC Communications Addressing and Reporting System (ACARS) system produced and printed the same message six times on the on-board printer, although the airplane was out of range.
- When transmitting on the high frequency radio (HF), the EICAS advisory messages FUEL SPAR VAL, R FUEL SPAR VAL, L IRS DC FAIL, C IRS DC FAIL, R

IRS DC FAIL and APU FUEL VAL appeared. The same happened during movement of the electrically powered RH pilot's seat using electrical adjustment control. - HF control during ocean crossing was difficult, for a long time period only Gander, New Foundland, could be contacted. In general when EICAS messages appeared, the related system lights illuminated as well. - The autopilot (A/P) had problems tracking Lateral Navigation (LNAV). The A/P caused the aircraft to start slipping (LH aileron, 8 degree bank, control wheel LH wing down) to track LNAV; the aircraft was trimmed to wings level (with autopilot on, using the rudder trim); later, side slipping to the right occurred, again the aircraft was trimmed. - Electrical current was felt by touching the captain's utility light, while static was experienced from the F/O's electronics flight instruments (EFI) switch. - The auto throttles A/T disconnected once and were reengaged. - In cruise flight many occurrences happened with different aircraft systems. The occurrences seemed to be related with crew actions. An example was the C-A/P disconnected after pushing the ELEC/HYD switch on the maintenance panel ON in order to observe the main battery voltage (28V at that time). - During this time, the A/Ps (C, L and R) disconnected about 50 to 70 times. The frequent A/P disconnects were conformed by the number 2 cabin attendant in the rear cabin who clearly noticed aircraft lateral motion during each A/P disconnect. After each A/P disconnect another A/P was engaged. - The ZFW indication changed to 142.4 t (in excess of the maximum ZFW), the actual ZFW was entered again. - Several times the EICAS messages L IRS DC FAIL, C IRS DC FAIL, R IRS DC FAIL, L FUEL SPAR VAL, R FUEL SPAR VAL and APU FUEL VAL appeared and disappeared. - The A/P caused the aircraft to bank 8 degrees R and L to maintain track (LNAV). After 2 minutes L/R banking, with a maximum track error of 0.1 NM L and R from track, the autoflight mode HDG SEL was selected on chief pilot's request, being a mode without FMS input. The wind was 330 degrees/variable between 20-29 kts, no DME updates were received. - The ACARS DATA/VOICE transfer switch switched from data to voice and back, every now and then. The related ACARS messages were printed at the Martinair Operations Control Center (OCC). - The selected transponder setting 2430 from Gander changed to 0000 several times (not confirmed by ATC) and was reselected. - The DC voltage on the standby/battery bus (DC-V STBY/BAT) on the EICAS ELEC page dropped to 2 V. The DC current (DC-A) showed 0 and the ECIAS messages APU FUEL VAL, L FUEL SPAR VAL, R FUEL SPAR VAL, L IRS DC FAIL, R IRS DC FAIL, CARGO BTL 1 and CARGO BLT 2 appeared while the A/P again disconnected. - The flap/slats indicator moved to a position halfway between 0 and 1 causing the red overspeed band on the speed-tape to come down and no overspeed warning occurred. the EICAS showed the caution message LE SLAT DISAGREE. Shortly thereafter the flaps/slats indicators returned to 0, the red band moved back to normal and the EICAS message disappeared. - The EICAS caution message "R IRS ON DC" appeared (Right Inertial Reference System on DC power). Only 2 minutes later the EICAS caution message R IRS FAULT appeared (Right Inertial Reference System fault). The IRS INSTRUMENT SOURCE switch was selected to ALTN, each FMC was connected now to its selected IRS only, IRS position averaging was not available. - In the cabin, all emergency lights started to illuminate and remained on. - While the captain was still in contact with Martinair on the left HF radio, this radio failed. New York aeronautical radio inc. (ARINC) was contacted on the C VHF radio to continue the phone-patch with Martinair. Control of the aircraft was transferred to the captain due to an electronic flight information system (EFIS) failure on the F/O's side. The captain completed the VHF contact with Martinair on the C VHF radio while flying the aircraft manually. Shortly thereafter the navigation data was lost on the captain's HSI. Due to the rapidly deteriorating technical status of the aircraft a PAN call was given to ATC by the PNF. -

In order to maintain attitude information, the left IRS was selected to ATT. One crew member reported that this action was accomplished after having observed the EICAS caution messages C IRS ON DC followed by C IRS FAULT and L IRS ON DC followed by L IRS FAULT, indicating a failure of the center and left IRSs. - The aircraft was flown manually on radar vectors, using the standby magnetic compass for headings due to the navigation equipment failure, with no IRS/NAV function, no FMCs, no VORs, no RDMI/VOR and compass functions and no EHSIs were available. Due to the failed FMCs no amber band was available on the speed tape. Around this time one of the right fuel pumps indicated a low output pressure. - Although the right wing fuel tank contained about 1000 kg (2200 lbs) more fuel than the left tank, the aircraft had to be flown with right control wheel inputs to keep the wings level. The crew reported to have no aileron trim available at this stage. ATC was frequently informed about the technical status of the aircraft and a 20 NM line-up was requested while descending to 4000 ft. - During flap extension the flap indicator disagree (one needle between 0 and 1, one needle on 1). The EICAS caution message LE SLAT DISAGREE appeared. - There are two light bulbs in each landing gear indicator. After the landing gear was extended, only one bulb illuminated in each landing gear indicator.

Additional Persons

Additional Persons not listed on page 5 of Factual Report
 NTSB Aviation Engineering - Systems Tom Jacky John DeLisi
 Performance - Flight Data Recorder Tamis Kwikkers Directorate General of Civil
 Aviation - The Netherlands Arthur Ricca FAA -
 Airworthiness - Boston, MA

The airplane was released to Martinair on June 12, 1996.

Pilot Information

| | | | |
|----------------------------------|--|-------------------------------|----------------------------|
| Certificate: | Airline Transport | Age: | 37, Male |
| Airplane Rating(s): | Multi-engine Land; Single-engine Land | Seat Occupied: | Left |
| Other Aircraft Rating(s): | Helicopter | Restraint Used: | Seatbelt, Shoulder harness |
| Instrument Rating(s): | Airplane | Second Pilot Present: | Yes |
| Instructor Rating(s): | None | Toxicology Performed: | No |
| Medical Certification: | Class 1 Valid Medical--no waivers/lim. | Last FAA Medical Exam: | 03/12/1996 |
| Occupational Pilot: | Last Flight Review or Equivalent: | | |
| Flight Time: | 6600 hours (Total, all aircraft), 3738 hours (Total, this make and model), 4303 hours (Pilot In Command, all aircraft), 199 hours (Last 90 days, all aircraft), 60 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft) | | |

Aircraft and Owner/Operator Information

| | | | |
|-------------------------------|--------------------------------------|--------------------------------|-------------|
| Aircraft Make: | Boeing | Registration: | PHMCH |
| Model/Series: | 767-31AER 767-31AER | Aircraft Category: | Airplane |
| Year of Manufacture: | | Amateur Built: | No |
| Airworthiness Certificate: | Transport | Serial Number: | 24429 |
| Landing Gear Type: | Retractable - Tricycle | Seats: | 272 |
| Date/Type of Last Inspection: | 05/21/1996, Continuous Airworthiness | Certified Max Gross Wt.: | 407000 lbs |
| Time Since Last Inspection: | 98 Hours | Engines: | 2 Turbo Fan |
| Airframe Total Time: | 30802 Hours | Engine Manufacturer: | P&W |
| ELT: | Not installed | Engine Model/Series: | PW 4060 |
| Registered Owner: | MEGA - FLIGHT KB | Rated Power: | 60000 lbs |
| Operator: | MARTINAIR HOLLAND N.V. | Operating Certificate(s) Held: | None |
| Operator Does Business As: | MARTINAIR | Operator Designator Code: | MHLF |

Meteorological Information and Flight Plan

| | | | |
|----------------------------------|--------------------------|--------------------------------------|------------------|
| Conditions at Accident Site: | Visual Conditions | Condition of Light: | Day |
| Observation Facility, Elevation: | BOS, 20 ft msl | Distance from Accident Site: | 0 Nautical Miles |
| Observation Time: | 1358 EDT | Direction from Accident Site: | 0° |
| Lowest Cloud Condition: | Scattered / 14000 ft agl | Visibility | 10 Miles |
| Lowest Ceiling: | Overcast / 25000 ft agl | Visibility (RVR): | 0 ft |
| Wind Speed/Gusts: | 5 knots / | Turbulence Type Forecast/Actual: | / |
| Wind Direction: | 220° | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | 30 inches Hg | Temperature/Dew Point: | 17° C / 9° C |
| Precipitation and Obscuration: | | | |
| Departure Point: | AMSTERDAM, NL, OF (EHAM) | Type of Flight Plan Filed: | IFR |
| Destination: | ORLANDO, FL (KMCO) | Type of Clearance: | IFR |
| Departure Time: | 0649 EDT | Type of Airspace: | Class B |

Airport Information

| | | | |
|----------------------|-------------------------|---------------------------|-----------------------|
| Airport: | BOSTON/LOGAN INTL (BOS) | Runway Surface Type: | Asphalt |
| Airport Elevation: | 20 ft | Runway Surface Condition: | Dry |
| Runway Used: | 4R | IFR Approach: | ILS |
| Runway Length/Width: | 10081 ft / 150 ft | VFR Approach/Landing: | Precautionary Landing |

Wreckage and Impact Information

| | | | |
|---------------------|----------|----------------------|-----------|
| Crew Injuries: | 11 None | Aircraft Damage: | Minor |
| Passenger Injuries: | 191 None | Aircraft Fire: | On-Ground |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 202 None | Latitude, Longitude: | |

Administrative Information

| | | | |
|-----------------------------------|--|---------------|------------|
| Investigator In Charge (IIC): | ROBERT L HANCOCK | Adopted Date: | 04/28/1998 |
| Additional Participating Persons: | LARRY SMITH; WASHINGTON, DC RICK HOWES; SEATTLE, WA RUDOLPH HIRDES; AMSTERDAM, ND, FRANK ERHART; AMSTERDAM, ND, | | |
| Publish Date: | | | |
| Investigation Docket: | NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ . | | |

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.