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

October 19, 2011

Group Chairman's Factual Report

OPERATIONAL FACTORS

DCA11FA045A/B

Contents

A. ACCIDENT

Operators:	Air France / Comair Airlines
Location:	John F. Kennedy International Airport (JFK), Jamaica, New York
Date:	April 11, 2011
Time:	2006 Eastern Daylight Time[1]
Airplanes:	Airbus A-380-861, Serial # 49, Registration F-HPJD and CL-600-2C10[2], Registration # N641CA

B. OPERATIONAL FACTORS GROUP

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C. SUMMARY

On April 11, about 2006 EDT, an Airbus A380, F-HPJD, collided with a Bombardier CRJ 701, N641CA, while taxiing for takeoff from John F. Kennedy International Airport (JFK), Jamaica, New York. At the time of the accident, the CRJ was stationary with part of the airplane on the Comair parking ramp and its tail extended onto taxiway "Mike". The CRJ was waiting for ramp clearance to its parking spot. The A380 was carrying 485 passengers and 25 crewmembers, and none were injured. The CRJ was carrying 62 passengers and 4 crewmembers, and none were

[1] All times are Eastern Daylight Time (EDT) based on a 24-hour clock, unless otherwise noted.
[2] When issuing pilot certificates, the FAA uses the designation CL-65 to refer to the CL-600 series airplane. The CL-600-2C10 airplane is commonly called the CRJ-70 when used by airline marketing, with CRJ being an acronym for Canadair Regional Jet and 70 being the number of passengers the airplane can carry.

injured. The Airbus sustained damage to its left wingtip and winglet and the CRJ sustained substantial damage to its left horizontal stabilizer and rudder.

The Airbus was registered to and operated by Air France, and operating under the provisions of 14 Code of Federal Regulations Part 129. The CRJ was registered to and operated by Comair, Inc., and was operating under the provisions of Code of Federal Regulations Part 121. Both airplanes were passenger-carrying flights. The CRJ had departed Logan International Airport (BOS), Massachusetts.

D. DETAILS OF THE INVESTIGATION

The Operations Group gathered written statements and conducted phone interviews with Air France and Comair accident crew members on April 26 - 28, 2011. On April 27, 2011, the Operations Group also interviewed CL-600 Captain Ed Childress of Comair Airlines.

The group gathered written statements from a flight attendant on the Comair accident airplane, a captain on the Pinnacle Airlines airplane that was parked next to the Comair airplane at the time of the accident, and three pilots on a Delta B-767 airplane that altered its taxi path to pass behind the parked Comair airplane shortly before the accident.

NTSB investigators reviewed Air France, Airbus, and Comair Airlines operational manuals.

1.0 HISTORY OF FLIGHT

On April 11, 2011, A Comair Airlines[3] Bombardier CL-600 landed on runway 22L at JFK. After being cleared to cross runway 22R, the Comair airplane was told by air traffic control (ATC) to taxi to their ramp via taxiway Bravo and taxiway Mike. As the Comair airplane was approaching taxiway Mike[4], the first officer contacted the ramp controller[5] who advised the airplane to hold at Diamond 2[6] which was a painted spot on the ramp. The Comair airplane taxied into the ramp area and stopped at the Diamond 2 spot. When inbound to the ramp and stopped at Diamond 2, the Comair airplane's tail extended across a roadway located next to the ramp and onto taxiway Mike. The ramp area and associated taxiway where the Comair airplane was parked at Diamond 2 was not visible from the control tower and the Comair crew did not advise ATC that they had not cleared the taxiway.

While the Comair airplane was taxiing to its ramp, an Air France Airbus A-380 was being pushed back from its gate on the ramp adjacent to where the Comair airplane was to park. The crew of the Air France A-380 started its engines and contacted ATC for a taxi clearance to Runway 22R. ATC advised the Air France crew to turn left on taxiway Alpha and to hold short of taxiway Echo. The A-380 exited its ramp via taxiway Mike Alpha[7] and began a left turn onto

[3] Comair Airlines is a subsidiary of Delta Airlines and was operating as a Delta Connection flight.
[4] See attachment 1 – Crew Interview Summaries and Statements
[5] Ramp Control was provided by a Delta Airlines employee.
[6] See attachment 2 which indicates the location of the Diamond spots as aircraft start-up spots.
[7] See attachment 3, an Air France chart depicting the taxiways and runways at JFK airport.

taxiway Alpha. As they were making the left turn onto taxiway Alpha, Captain Montamat, who was seated on the cockpit jumpseat, said that when they received clearance to taxi, he did not understand the beginning of the clearance because the radio frequency was very busy. The controller had said to taxi on taxiway Alpha to runway 22R and to hold short of taxiway Echo. When Captain Arnoux read back the clearance he said left on taxiway Alpha, taxiway Echo and 22R. Captain Montamat said they often turned right onto taxiway Alpha and went over the bridge, so he was not sure if the clearance was left or right on taxiway Alpha. He also said it had been "many months" since he had been to JFK and he did not recall where taxiway Echo was located. Since he was not sure of the clearance, he said something to Captain Arnoux. Captain Arnoux, who was seated in the right seat providing supervision to Captain Artizzu in the left seat, said he was "sure" of the taxi clearance. However, when Captain Montamat voiced a concern about a left turn being correct, Captain Arnoux said it was best to ask for a confirmation and tried to contact ATC but the frequency was jammed. Captain Montamat said they did not get a response from ATC and there was nobody on the left, so we turned left. Captain Artizzu stated that he heard "left turn" during the clearance to taxi.

At approximately 20:06:25, the A-380 completed its turn and was established on the centerline of taxiway Alpha with a groundspeed of about 8 knots. Captain Arnoux said he checked the nose wheel camera display[8] to be sure the nosewheel was on the centerline of the taxiway. Approximately 2-3 seconds later, ATC advised the Air France A-380 to give way to opposite direction traffic at taxiway Kilo Delta. Captain Arnoux, who was controlling the A-380, stated that he did not look at his taxi map because he knew the Kilo Delta intersection was "at the end of Alpha [taxiway]". Captain Artizzu stated that he knew where the intersection was located but looked momentarily at his taxi chart. Approximately fifteen seconds after being established on taxiway Alpha, the Air France airplane's left wingtip collided with the tail section of the Comair airplane. Both Captain Arnoux and Captain Artizzu stated that they never saw the Comair airplane before the collision. Both pilots indicated they had difficulty seeing clearly outside the A-380 cockpit due to lights from the airport terminal, ground traffic and other airplanes. Captain Arnoux said he only looked forward outside the cockpit, not sideways. He said there were a lot of lights and flashes of light on the roadway to his left so he did not look toward the roadway. He said terminal and vehicle lights bothered him if he looked 20 degrees left.

The pilots of the Comair airplane stated that they noticed the Air France A-380 as it taxied out of its ramp. The captain said that when he noticed the A-380 was on taxiway Alpha, he decided to move his airplane forward a few feet to give the A-380 some more room. After moving forward, he stopped the airplane and reset the parking brake. He said he thought the A-380 would be able to pass behind him. After the A-380 collided with them and turned their airplane, the Comair CRJ crew decided to evacuate the airplane. The airplane was evacuated through the main cabin door. No emergency exits were used. There were no reported passenger injuries. The CRJ F/O reported a muscle strain.

2.0 FLIGHT CREW INFORMATION

The Comair Airlines accident flight crew consisted of a captain and first officer.
Both crewmembers were current and qualified under Comair Airlines and FAA requirements.

[8] See section 4.3 External Taxi Aid Camera System

The Air France Crew consisted of a captain in the left seat who was under supervision, a captain in the right seat who was supervising, and a captain who was occupying the cockpit jumpseat while performing a familiarization ride[9].

2.1 Captain John Patrick Doyle – Comair CRJ Accident Captain

Captain Doyle was 59 years old.

Date of hire with Comair Airlines was October 9, 1989

FAA records of Captain Doyle indicated that:

Private Pilot - Airplane Single Engine Land certificate was issued on October 29, 1973.

Commercial Pilot – Airplane Single and MultiEngine Land, Instrument - Airplane certificate was issued on October 31, 1976.

Airline Transport Pilot Airplane Multi Engine Land certificate was issued on July 29, 2002.

Flight Instructor Airplane Single Engine certificate was issued on February 25, 1977

Ground Instructor Basic Ground Instructor certificate was issued on February 10, 1977

2.1.1 Pilot certificates and ratings held by Captain Doyle at time of the accident:

AIRLINE TRANSPORT PILOT (issued July 29, 2002)
AIRPLANE MULTIENGINE LAND
CL-65, SA 227, EMB-120
COMMERCIAL PILOT PRIVILEGES
AIRPLANE SINGLE ENGINE LAND
GLIDER AERO TOW
SA-227 SECOND IN COMMAND REQUIRED
Limitations:
CL-65 CIRCLING APPROACH - VMC ONLY

MEDICAL CERTIFICATE FIRST CLASS (issued March 17, 2011)
Limitations: Must have available lenses that correct for near vision

2.1.2 Training and Proficiency Checks:

Initial Type Rating CL-65: July 29, 2002

[9] Familiarization rides were undertaken by crewmembers who had received ground school and simulator training on the airplane but had not operated the actual airplane.

Last recurrent ground training: January 29, 2011
Last Proficiency Check in CL-65: November 12, 2010
Last pilot-in-command (PIC) Line Check: November 20, 2009

2.1.3 Flight Times[10]

Total pilot flying time	About 23,000 hours
Total CL-65 flying time	About 3,000 hours
Total CL-65 Pilot-in-command (PIC) time	About 3,000 hours
Total flying time last 24 hours	1.5 hours
Total flying time last 30 days	85 hours
Total flying time last 90 days	240 hours

A review of FAA records found no prior accident, incident or enforcement actions.

Post-accident toxicology tests were negative.

The following pre-accident information was obtained from company records and during a post-accident interview:

The captain and first officer were on the second day of a scheduled three-day flight sequence when the accident occurred. Captain Doyle stated that the on the first day of the sequence, he awoke about 0800. They originated the flight sequence at Cincinnati/Northern Kentucky Airport (CVG) in Covington, Kentucky. They flew from CVG to Detroit Metropolitan Wayne County Airport (DTW), Detroit, Michigan. They then flew from DTW back to CVG and then flew to General Edward Lawrence Logan International Airport (BOS), Boston, Massachusetts. They arrived in BOS at about 2125. Captain Doyle said he went to sleep at about 2200.

On the day of the accident he awoke about 0800 after a good night's sleep. After he woke, he took a five mile walk and then ate lunch. He watched television for a while. He departed the hotel at about 1700. He said the accident flight was scheduled to depart at 1815.

During the flight sequence that included the accident flight, he said he felt rested and had no problems sleeping.

2.2 First Officer Ryan David Piper – Comair CRJ Accident First Officer

F/O Piper was 35 years old.

Date of hire with Comair Airlines: February 13, 2002

[10] Approximate based on interviews and Comair Airlines employment records.

FAA records of F/O Piper indicated that:

Private Pilot - Airplane Single Engine Land – Instrument Airplane certificate was issued on August 14, 1997.

Commercial Pilot – Airplane Single and Multi-Engine Land – Instrument Airplane certificate was issued on November 28, 2005.

Flight Instructor – Airplane and Multi Engine – Instrument Airplane certificate was issued on January 10, 2001.

2.2.1 Pilot certificates and ratings held by F/O Piper at time of accident:

COMMERCIAL PILOT (issued November 28, 2005)
AIRPLANE SINGLE AND MULTIENGINE LAND
INSTRUMENT AIRPLANE
CL-65
Limitations:
CL-65 SIC PRIVILEGES ONLY
CL-65 CIRCLING APPROACH - VMC ONLY

MEDICAL CERTIFICATE FIRST CLASS (issued March 3, 2011)
Limitations: Must wear corrective lenses

2.2.2 Training and Proficiency Checks:

Last Proficiency Check in CRJ 70: March 16, 2011
Last recurrent ground training: March 25, 2010

First Officer Piper had no record of failures during company training.

2.2.3 Flight Times[11]

Total pilot flying time	About7,500 hours
Total CL-65 flying time	About 3,000 hours
Total flying time last 24 hours	1.5 hours
Total flying time last 30 days	65 hours
Total flying time last 90 days	222 hours

A review of FAA records found no prior accident, incident or enforcement actions.

[11] Approximate based on interviews and Comair Airlines employment records.

Post-accident toxicology tests were negative.

The following pre-accident information was obtained from company records and during a post-accident interview:

The captain and first officer were on a scheduled three-day flight sequence. The accident occurred on the second day. The first officer stated that the day before the accident, he did yard work during the day. On the day before the accident, they originated the flight sequence at Cincinnati/Northern Kentucky Airport (CVG) in Covington, Kentucky at about 1435. They flew from CVG to Detroit Metropolitan Wayne County Airport (DTW), Detroit, Michigan. They then flew from DTW back to CVG and then flew to General Edward Lawrence Logan International Airport (BOS), Boston, Massachusetts. They arrived in BOS at about 2125. He said he went to bed about 2300-2330.

On the day of the accident, First Officer Piper said he awoke about 0700 - 0800. He said he had a good sleep. During the day, he called his wife, watched TV, went to the grocery store, ate lunch, showered and shaved. He said he did not take a nap during the day. He said he reported for duty at about 1715 in the hotel lobby in Boston, MA and they had a scheduled departure of 1820. He said he was fully rested when he checked in at the airport. He did not recall what time they got to the airport.

2.3 Captain Philippe Artizzu – Air France Accident Pilot occupying the A-380 Left Seat

Captain Artizzu was seated in the left seat of the Air France A-380 and was the pilot flying (PF). He was receiving initial training on the A-380 from the captain in the right seat. Captain Artizzu was controlling the airplane during taxi for takeoff.

Captain Artizzu was 56 years old.

Date of hire with Air France was October 10, 1983

Captain Artizzu held:

Airline Transport Pilot License ATPL (A) issued by France in accordance with the requirements of the Joint Aviation Regulations (JAR) Flight Crew License (FCL). He was type rated on the A-380, B-737-200, B-737-500, and B-777.

MEDICAL CERTIFICATE CLASS I (issued October 6, 2010)
Limitations: Must have available lenses that correct for near vision.

2.3.1 Training and Proficiency Checks:

Initial Type Rating A-380: February 11, 2011
Last recurrent ground training: April 4, 2011
Last Proficiency Check in A-380: February 11, 2011

Air France reported Captain Artizzu had no record of failures during company training.

2.3.2 Flight Times[12]

Total pilot flying time	About 14,695 hours
Total PIC flying time	About 8,765 hours
Total A-380 flying time	About 24 hours
Total A-380 PIC time	About 24 hours
Total flying time last 24 hours	8 hours
Total flying time last 30 days	24 hours
Total flying time last 90 days	24 hours
Total flying time last 12 months	370 hours

Air France reported their records found no prior accident, incident or enforcement actions.

Post-accident toxicology tests were not administered[13].

2.3.3 Reported Activities

The following pre-accident information was obtained from a post-accident statement and a post-accident interview.

Captain Artizzu described his activities during the 72 hours prior to the accident. He said the times were approximate.

Friday, April 8, 2011

- Awoke at 0730 Central European Summer Time (CEST)
- Performed normal domestic activities
- Went to bed at 2300 CEST

Saturday, April 9, 2011

- Awoke at 0730 CEST
- Performed normal domestic activities with his children
- Went to bed at 2300 CEST

Sunday, April 10, 2011

- Awoke at 0730 CEST
- Arrived at Charles De Gaulle Airport (CDG), Paris France at 1000 CEST

[12] Approximate based on interviews and Air France employment records.
[13] According to the French Bureau d'Enquetes et d'Analyses, in France only the judicial authority had the power to request toxicology tests. Since this accident was not the subject of any criminal investigation, the Air France pilots were not required to undertake any alcohol or drug tests.

- Departed CDG at 1335 CEST
- Arrived JFK at 1600 EDT
- Arrived at hotel in New York, New York at 1730 EDT
- Dinner with crew at 1800 EDT
- Went to bed at 2100 EDT

Monday, April 11, 2011

- Awoke at 0400 EDT – had a normal sleep
- Ate breakfast at 0700 EDT
- Walked around town from 0800 to 1000 EDT
- Returned to hotel for nap – awoke at 1400 EDT
- At about 1615 EDT, "packed up" his belongings
- Arrived at JFK at 1715- felt "well rested"
- Departed gate at 1915 EDT

2.3.4 Medications

Captain Artizzu stated that the only medications he was taking was 75 mg of aspirin every day and 200 mg of statins to diminish the rate of sanguine cholesterol. These medications were prescribed by a doctor.

2.4 Captain Michel Arnoux – Air France Pilot occupying the A-380 Right Seat

Captain Arnoux was seated in the right seat of the Air France A-380 and was the pilot not flying (PNF). He was supervising initial training on the captain in the left seat. He was the pilot-in-command (PIC).

Captain Arnoux was 57 years old.

Date of hire with Air France was December 5, 1982

Captain Arnoux held:

Airline Transport Pilot License ATPL (A) issued by France in accordance with the requirements of the Joint Aviation Regulations (JAR) Flight Crew License (FCL). He was type rated on the A-380, A-340, A-330, and A-320.

MEDICAL CERTIFICATE CLASS I (issued October, 2010)

Limitation: Shall wear corrective lenses and second pilot mandatory qualified.[14]

[14] Air France confirmed that Captain Arnoux was wearing corrective lenses at the time of the accident.

2.4.1 Training and Proficiency Checks:

Initial Type Rating A-380: September 23, 2009
Last Proficiency Check in A-380: February 18, 2011
Last Line Check in A-380: November 3, 2010

Air France reported Captain Arnoux had no record of failures during company training.

2.4.2 Flight Times[15]

Total pilot flying time	About 13,389 hours
Total PIC flying time	About 6,600 hours
Total A-380 flying time	About 450 hours
Total A-380 PIC time	About 450 hours
Total flying time last 24 hours	7.5 hours
Total flying time last 30 days	7.5 hours
Total flying time last 90 days	91 hours
Total flying time last 12 months	320 hours

Air France reported their records found no prior accident or enforcement actions. Captain Arnoux did have an incident in 1992 when, according to Captain Arnoux, his A-320 nose wheel turned 90° during landing. The airplane remained on the runway during the event.

Post-accident toxicology tests were not administered[16].

2.4.3 Reported Activities

The following pre-accident information was obtained from a post-accident statement and a post-accident interview.

Captain Arnoux described his activities during the 72 hours prior to the accident. The times were approximate.

Friday, April 8, 2011

- Awoke at 0700 CEST
- Activities at the office at CDG and return to home at 1800 CEST
- Went to bed at 2300 CEST

Saturday, April 9, 2011

- Awoke at 0900 CEST

[15] Approximate based on interviews and Air France employment records.
[16] See footnote 9

- Rest (relax) at home
- Prepare to fly
- Went to bed at 2300 CEST

Sunday, April 10, 2011

- Awoke at 0800 CEST
- Arrived at CDG at 1100 CEST
- Departed CDG on AF006 at 1335 CEST
- Arrived JFK at 1600 EDT
- Arrived at hotel in New York, New York at 1730 EDT
- Dinner with crew at 1800 EDT
- Went to bed at 2130 EDT

Monday, April 11, 2011

- Awoke at 0600 EDT – had a normal sleep
- Ate breakfast at hotel at 0800 EDT
- Walked around Manhattan from 1000 to 1230 EDT
- Rest before packing up
- At about 1615 EDT, "packed up" his belongings
- Arrived at airport at 1715 EDT
- Departed on AF007 [accident flight] at 1915 EDT

Captain Arnoux certified that he was not tired before the departure of the accident flight

2.4.4 Medications

Captain Arnoux stated that he did not take any medications before the flight.

2.5 Captain Alain Montamat – Air France Pilot occupying the A-380 Cockpit Jumpseat

Captain Montamat was 54 years old.

Date of hire with Air France was October 17, 1985

Captain Montamat held:

Airline Transport Pilot License ATPL (A) issued by France in accordance with the requirements of the Joint Aviation Regulations (JAR) Flight Crew License (FCL. He was type rated on the B747-400, A-380, A-340 and A-330.

MEDICAL CERTIFICATE FIRST CLASS (issued September 23, 2010)

Limitations: Shall wear corrective lenses[17]

2.5.1 Training and Proficiency Checks:

Initial Type Rating A-380: February 11, 2011
Most recent Proficiency Check: November 16, 2010 on the B-747

Air France reported Captain Montamat had no record of failures during company training.

2.5.2 Flight Times[18]

Total pilot flying time	About 16,188 hours
Total flying time last 24 hours	0 hours
Total flying time last 30 days	0 hours
Total flying time last 90 days	22 hours
Total flying time last 12 months	430 hours

Air France reported their records found no prior accident, incident or enforcement actions.

Post-accident toxicology tests were not administered[19].

2.5.3 Reported Activities

The following pre-accident information was obtained from a post-accident statement and a post-accident interview. The times were approximate.

Captain Montamat described his activities during the 72 hours prior to the accident.

Friday, April 8, 2011

- Awoke at 0600 CEST
- Review of final qualification at CDG from 0800 to 1300 CEST
- Went to bed at 2200 CEST

Saturday, April 9, 2011

- Awoke at 0400 CEST
- Simulator training from 0600 to 1100 CEST
- Went to bed at 2200 CEST

[17] Air France reported Captain Montamat was wearing corrective lenses at the time of the accident.
[18] Approximate based on interviews and Air France employment records.
[19] See footnote 9

Sunday, April 10, 2011

- Awoke at 0700 CEST
- Arrived at CDG at 1100 CEST
- Departed CDG as observer on AF006 at 1335 CEST
- Arrived JFK at 1600 EDT
- Arrived at hotel in New York, New York at 1730 EDT
- Dinner with crew at 1800 EDT
- Went to bed at 2100 EDT

Monday, April 11, 2011

- Awoke at 0500 EDT – had a normal sleep
- Ate breakfast at hotel
- Walked around Manhattan from 0900 to 1200 EDT
- Returned to hotel for nap
- At about 1615 EDT, "packed up' his belongings
- Arrived at JFK airport at 1715
- Departed on AF007 [accident flight] at 1915 EDT

Captain Montamat certified that he was not tired before the departure of the accident flight

2.5.4 Medications

Captain Montamat stated that he did not take any medications before the flight.

3.0 WEATHER AT TIME OF ACCIDENT

The METAR[20] weather reported from the automated surface observing system (ASOS) at JFK surrounding the time of the accident was:

- **1951 EDT**: KJFK 112351Z COR VRB03KT 7SM FEW100 BKN250 12/10 A2957 RMK A02 SLP012 T01220100 10156 20117 56010

  Plain language: John F. Kennedy airport at 1951 EDT, wind variable at 3 knots, visibility 7 statute miles, few clouds at 10,000 feet and a broken ceiling at 25,000 feet, temperature of 12° centigrade (C) and a dewpoint of 10° C, altimeter 29.57 inches of mercury. Remarks: automated weather observation system, sea level pressure 1001.2 hectopascals (hpa), temperature 12.2° C, dewpoint 10.0° C, 6-hour maximum temperature 15.6°, 6-hour minimum temperature 11.7° C, 3-hour pressure tendency fallen 1.0 hpa.

[20] METAR is a aviation routine weather report

- 2051 EDT: KJFK 120051Z 19013KT 9SM BKN250 12/10 A2958 RMK A02 SLP015 T01220100 10156 20117 56010

  Plain language: John F. Kennedy airport at 2051 EDT. Wind 190° at 13 knots, visibility 9 statute miles, a broken ceiling at 25,000 feet, temperature of 12° C and a dewpoint of 10° C, altimeter 29.58 inches of mercury. Remarks: automated weather observation system, sea level pressure 1001.5 hpa, temperature 12.2° centigrade (C), dewpoint 10.0° C, 6-hour maximum temperature 15.6°, 6-hour minimum temperature 11.7° C, 3-hour pressure tendency fallen 1.0 hpa.

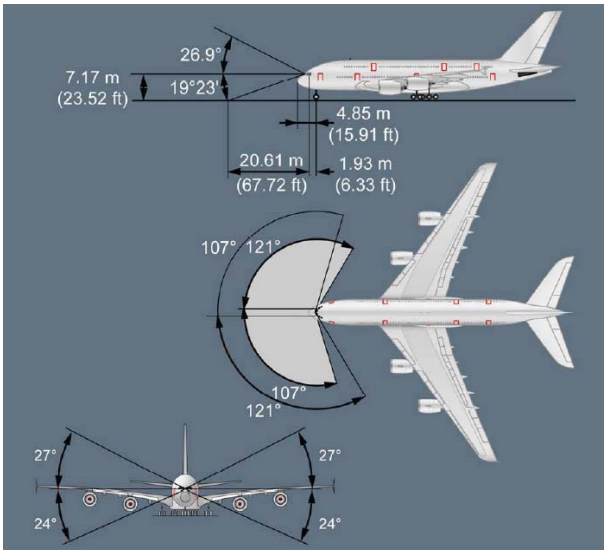
4.0 AIRPLANE INFORMATION

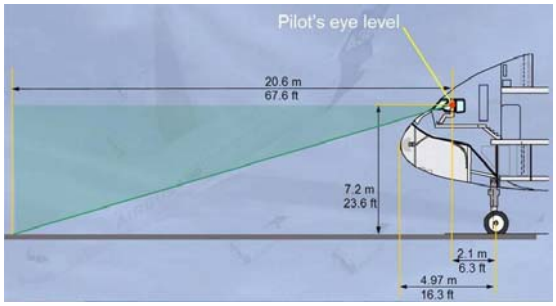
4.1 A-380 wingspan

The A-380 wingspan was 79.750 meters or 261.6 feet

4.2 Visibility from cockpit[21]

Information supplied by Airbus and Air France indicated that when seated in the correct position [about 7.2 meters above ground] the pilot could see the ground from about 20.28 meters in front of the airplane. Anything less than 20.28 meters in front of the airplane would be blocked by the airplane nose. When looking sideways, the pilot could see the ground from about 4.97 meters [16.3 feet] from the airplane and ground closer than 4.97 meters would not be visible. The view looking sideways to the left was limited to about 121 degrees which did not allow the pilot to see the wingtip.

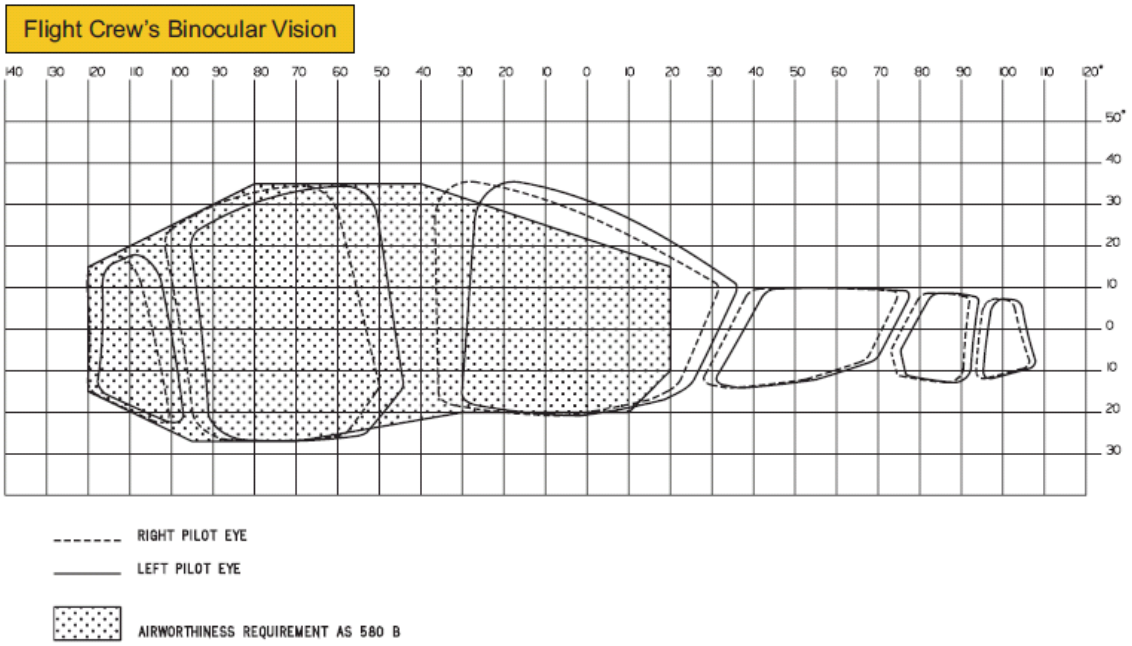




The A-380 Flight Crew binocular vision chart[22] below indicates that as the Air France A-380 airplane was making the turn onto Taxiway Alpha, a 10 degree cone of vision may have blocked

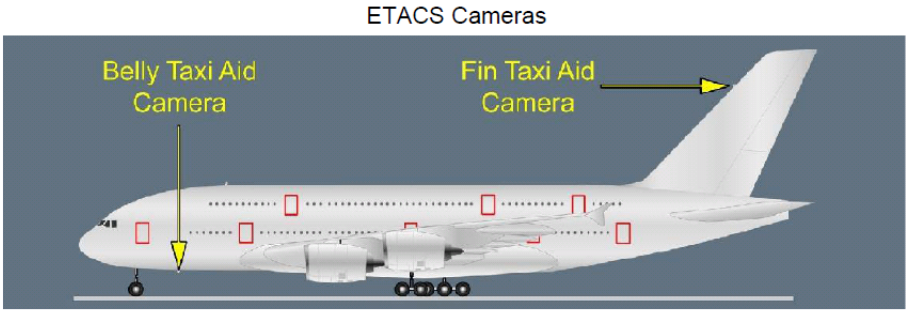
[21] Pictures have been supplied by the Bureau d'Enquetes et d'Analyses

the left seat pilot's vision of the Comair airplane momentarily. However, once the Air France A-380 was established on taxiway Alpha, the view of the Comair airplane and should have been in the binocular vision of both the Air France left seat and right seat pilots.



Interviews with the Air France accident pilots indicated that they did not receive any guidance or training on wingtip clearance in the airplane. The pilots indicated that the simulator projected forward visual lines cuing where the wingtips would pass but there was nothing in the airplane to provide an indication of wingtip clearance. During their training on the A-380, the pilots did receive information about the A-380 wingspan, restrictions on certain taxiways, and were advised to use caution during taxi.

4.3 EXTERNAL TAXI AID CAMERA SYSTEM [23]



[22] Flight Crew's Binocular Vision chart has been supplied by the Bureau d'Enquetes et d'Analyses
[23] ETACS pictures have been supplied by the Bureau d'Enquetes et d'Analyses

The External Taxi Aid Camera System (ETACS) was designed to assist the flight crew by displaying the nose and main gear positions before and during taxi.

The Belly Taxi Aid Camera System (BTACS) was located on the underside of the fuselage just aft of the nosewheel. It displayed a picture of the nosewheel and the taxiway and was used by the pilots to verify that they were on a taxiway centerline or the condition of the nosewheel.

The Fin Taxi Aid Camera (FTAC) was located on the vertical tail and displayed a view of the airplane. The Fin Camera view extended from just outside the number one outboard engine to just outside the number four outboard engine. The Fin Camera did not display the airplane wingtips. The Fin Camera projected a visual indicator to show the location of the outer edge of each of the main landing gears.

The two cameras (BTACS and FTAC) located on the exterior of the A-380 provided external views of the airplane in the cockpit. The live camera views from these cameras could be displayed on either primary flight displays (PFD) or on the System Display (SD) when the airplane was on the ground and below 60 knots. When on the ground, the ETACS is not displayed above 60 kt. When in flight, the camera views could only be displayed on the SD.

The top of the displays, shown below, provides the video from the BTAC. The ground speed is indicated on the top left corner. Two magenta brackets, one on each side of the Nose Landing Gear (NLG), indicate a lateral 5-meter distance from the NLG. The bottom of the display provides the video from the FTAC. A position indicator on each side of the Main Landing Gear (MLG) indicates the outer edge of the MLG and helps the flight crew to determine the landing gear position in relation to the runway or taxiway centerline. The wingtips do not appear on the camera views. There is no wingtip position indicator on the ETACS.

There was no camera display of the wingtips or the wingtip paths.

Neither of the ETACS cameras had the capability of recording.

The Airbus Flight Crew Training Manual, Normal Operations, Taxi, Taxi Camera stated in part:

> *Looking out of the cockpit window remains the primary means of determining when to initiate turns and of verifying the aircraft's position relative to the ground track.*
>
> *To correctly turn and taxi, flight crews must primarily refer to external cues. The ETACS is merely a tool that assists the flight crew……*

4.4 Onboard Airport Navigation System

The Onboard Airport Navigation System dynamically presented a display of the airplane position on an airport moving map display. This display could be seen on either pilot's Navigation Display (ND) located on his instrument panel. Air France standard procedures required that both the Pilot Flying (PF) [Captain Artizzu] and the Pilot Not Flying (PNF) [Captain Arnoux] set the OANS to display on their respective ND during taxi and both pilots stated that this was done. The OANS display did not have the capability to display other airplanes, ground vehicles, or other obstructions.

The Airbus Flight Crew Operating Manual, Aircraft Systems, 34-Navigation, Airport Navigation, System Description, General section stated in part:

> *The Onboard Airport Navigation System (OANS) provides the flight crew with a moving airport map on its onside ND. The OANS is designed to improve the flight crew*

awareness of airport surfaces. However the flight crew's primary reference on ground should always be outside of the aircraft.

The OANS was to be used as an aid during taxi. The Airbus Flight Crew Operating Manual dated 02 February, 2011, Procedures, Normal Procedures, STD Operating Procedures, Taxi, Airport Navigation section stated in part:

Direct visual observation out of the cockpit windows remains the primary means of taxiing.

5.0 A-380 taxi at JFK

Air France had their own JFK taxi chart[24] for the A-380 airplane for JFK that indicated the approved routes for taxi. At the time of the accident, the A-380 accident airplane was using an approved route.

6.0 Comair Taxi Procedures

6.1 Ramp guidance

Comair crews had written guidance for airplanes taxiing inbound to gates on the Jeppesen 20-0[25] plate for JFK. This written guidance did not cover airplanes holding at Diamond spots inbound to gates or airplanes stopping with part of the fuselage still on an active taxiway.

Post-accident interviews indicated that, at JFK, it was a common practice for airplanes to be held temporarily at a Diamond spot when inbound to the Comair ramp via taxiway "Mike".

Comair was asked: what did Comair expect its pilots to do when air traffic control cleared a Comair airplane to the ramp and the airplane was subsequently stopped at a Diamond spot with their tail extended onto the taxiway. Comair responded that there was no "manual guidance for this situation". "In this case, as other ramps, we are going to taxi to, and hold, where we are directed to by the ramp authority". Comair was asked if the crew should advise ATC that they are unable to clear an active taxiway and they responded that "we have no written guidance in our manuals on this". Comair also responded that their crews are expected to follow the general taxi guidance as found in the Aeronautical Information Manual (AIM) and to follow all directions from ATC and ramp control. Comair stated that, in a situation where the crew is aware they are unable to comply with a "movement clearance", the crew should query ATC for a clarification or for alternate instructions.

6.2 Delta Guidance

Delta Airlines personnel were responsible for control of the Comair ramp. Delta Airlines issued a change to the JFK ramp control procedures effective April 13, 2011. The ramp control procedure change stated in part:

[24] See attachment 4 – Air France JFK A-380 Taxi Chart
[25] See attachment 5 – Comair Jeppesen 20-0 plate for JFK

PROCEDURE FOR INBOUND AIRCRAFT ON TAXIWAY "MIKE"

Effective Date: April 13, 2011

Procedure: Inbound Delta Connection aircraft[26] to the "Horse shoe"[27] on Taxiway "Mike" must proceed directly to the gate parking spot. Aircraft cannot be held at "Diamond 1" or "Diamond 2 before proceeding to their gate.

7.0 FAA Regulations and Aeronautical Information Manual Guidance

7.1 FAA Regulations

14 Code of Federal Regulations, Chapter 1 – Federal Aviation Administration, Department of Transportation, Subchapter F - Air Traffic and General Operating Rules, Part 91 – General Operating and Flight Rules, subpart 91-113 – Right-of-way Rules, (b) - General stated in part:

"…..vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft."

7.2 FAA Aeronautical Information Manual

The Aeronautical Information Manual (AIM), dated August 25, 2011, Chapter 2 - Aeronautical Lighting and Other Visual Aids, section 3 – Airport Marking Aids and Signs, sub-section 2-3-4 – Taxiway Centerline, (b.)-Taxiway Centerline, (1.) Normal Centerline stated in part:

"….being centered on the taxiway centerline does not guarantee wingtip clearance with other aircraft or objects."

The Aeronautical Information Manual (AIM), dated August 25, 2011, Chapter 4 – Air Traffic Control, section 3 – Airport Operations, sub-section 4-3-18 Taxiing, b. stated in part:

ATC clearances or instructions pertaining to taxiing are predicated on known traffic and known physical airport conditions. Therefore, it is important that pilots clearly understand the clearance or instruction. Although an ATC clearance is issued for taxiing purposes, when operating in accordance with the CFRs, it is the responsibility of the pilot to avoid collision with other aircraft.

The Aeronautical Information Manual (AIM), dated August 25, 2011, Chapter 5 – Air Traffic Procedures, section 5 – Pilot/Controller Roles and Responsibilities, sub-section 5-5-2 Air Traffic Clearance, a. – Pilot, stated in part:

Promptly complies with an air traffic clearance upon receipt except as necessary to cope with an emergency. Advises ATC as soon as possible and obtains an amended clearance, if deviation is necessary.

[26] See footnote 3
[27] Horse shoe was a description of the Comair ramp.

Submitted by:

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