Docket No. SA-532

Exhibit No. 2-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Operations/Human Performance Group Chairmen
Factual Report

(34 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 15, 2009

Group Chairmen's Factual Report

OPERATIONS / HUMAN PEFORMANCE

DCA09MA026

A. ACCIDENT

Operator: US Airways Group, Inc.
Location: Hudson River, New York, New York
Date: January 15, 2009
Time: 1527 eastern standard time[1]
Airplane: Airbus A320-214, Registration Number: N106US, Serial #: 1044

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C. SUMMARY

On January 15, 2009, about 1527 eastern standard time, US Airways flight 1549, an Airbus A320-214, registration N106US, suffered bird ingestion into both engines, lost engine thrust, and landed in the Hudson River following take off from New York City's La Guardia Airport (LGA). The scheduled, domestic passenger flight, operated under the provisions of Title 14 CFR Part

[1] All times are eastern standard time (EST) based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate.
[2] Mr. Boscardin arrived at the NTSB command post in New York City on January 17. Mr. Boscardin took part in the investigative activities with the group until the Operations/Human Performance group completed the field phase of the investigation in Charlotte, North Carolina on January 22, 2009.

121, was en route to Charlotte Douglas International Airport (CLT) in Charlotte, North Carolina. The 150 passengers and 5 crewmembers evacuated the airplane successfully. One flight attendant and four passengers were seriously injured.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board (NTSB) investigators on the Operations/Human Performance Group traveled to New York City on Thursday, January 15, 2009.

The group conducted the initial field phase of the investigation from the NTSB command post located at a hotel in downtown New York City, from January 16 to January 19, 2009.

On January 16, 2009, the group gathered available flight documents for review, conducted an initial review of the Quick Reference Handbook (QRH), coordinated schedule of interviews, and requested company manuals, checklists, weight and balance data for the flight, and flight crew training and personnel records from US Airways. The group also requested flight crew medical and certification records from the Federal Aviation Administration (FAA), conducted interviews with two pilots of other companies who were passengers on the accident flight, and gathered information for the 72-hour history of the accident flight crew.

From January 17 through January 19, 2009, the group conducted interviews with the accident captain, the accident first officer, and a pilot of an airplane that was descending to land at LGA about the time of the accident. The group also interviewed two helicopter pilots who were operating two separate tour helicopters and witnessed the accident airplane's descent toward the Hudson River, as well as portions of the post-ditching evacuation.

On January 19, 2009, the group chairs documented the contents of flight crew bags, inspected the wreckage of the accident airplane, and photo documented the contents of the flight deck and the flight deck controls and switches.

The group traveled to Charlotte, North Carolina, on January 20, 2009, and conducted the remainder of the field phase of the investigation from the US Airways Training Center from January 20 through January 22, 2009.

The group conducted interviews with US Airways Training Department personnel at the training center. The interviews included a ground instructor, and an instructor pilot, each of whom was involved in the accident first officer's recent Airbus training. Additional interviews were conducted with the check pilot who administered the first officer's Airbus qualification event and the check pilot who flew with the first officer during his initial operating experience (OE) on the Airbus. Interviews were also conducted with the US Airways' Manager of AQP (Advanced Qualification Program), the Airbus fleet captain, and the director of Flight Safety.

The group was given a tour of the US Airways Training Center that included a demonstration of the integrated procedures trainer (IPT) used in the training program. In addition, members of the group observed a recreation of the accident in an airplane flight simulator and maneuvered the flight simulator during a recreation with a US Airways check airman.

After completion of the on-scene phase of the investigation, the group conducted numerous interviews via telephone from NTSB headquarters. The investigation included follow up interviews with some interviewees from the field investigation as well as interviews with flight crew members who had flown with the accident crew, a flight crew who had encountered a compressor stall while operating the accident airplane two days prior to the accident, the FAA A320 aircrew program manager (APM) and principle operations inspector (POI) having oversight of US Airways, and the vice president of Flight Operations Support & Services at Airbus.

Members of the group, along with the Aircraft Performance group chairman, traveled to Toulouse, France, to conduct simulator evaluations at the Airbus Training Center. Simulator scenarios were conducted in a Full Flight Simulator and an engineering test simulator. The purpose of the simulations were to (1) identify and evaluate the various options available to the flight crew of US Airways flight 1549 following the bird strike and to determine the implications of each of those options, (2) to expand beyond the context of flight 1549 in order to understand the implications of a dual engine failure in which the airplane is in the ELEC EMER CONFIG[3], (3) to evaluate the checklists and procedures made available to flight crews, and (4) to determine the operational feasibility of achieving minimum vertical speed at touchdown.

E. FACTUAL INFORMATION

1.0 History of Flight

On January 13, 2009, a flight crew reportedly experienced an engine compressor stall while flying the accident airplane on a flight from LGA to CLT. According to the flight crew, the QRH procedure was accomplished and the engine compressor stall did not reoccur. That flight was continued, uneventfully, to CLT where the experience was reported to company maintenance personnel. According to US Airways, maintenance personnel inspected the airplane, performed required maintenance actions, and the airplane was returned to service.

On January 15, 2009, after flying from Pittsburg International Airport (PIT) to CLT on a different airplane, the accident flight crew picked up the accident airplane for a flight to LGA. Except for delays due to snow in the New York area, the flight from CLT to LGA was reported to be uneventful. By the time the flight arrived in LGA, the weather had cleared and the flight crew stated that no deicing of the airplane was necessary prior to the accident flight.

[3] "ELEC EMER CONFIG" refers to the emergency electrical mode in which no electrical power is available from either main generator or from the Auxiliary Power Unit. The Ram Air turbine is deployed either automatically or manually and provides blue hydraulic system pressure (normally provided by the blue electric pump), to power an emergency generator through a hydraulic motor. In this configuration, neither green nor yellow hydraulics are available on the airplane due to a loss of engine power.

The accident flight was scheduled to depart the gate in LGA at 1445 but due to the earlier delays, the flight departed at about 1503. The flight crew stated that they started both engines during the push back from the gate and they contacted the company during the taxi out to complete the final weight and balance. According to the crew, all required pre-departure checklists and procedures were completed during the taxi out to runway 4.

According to the crew of the airplane sequenced for departure immediately behind the accident flight, the accident airplane was held on runway 4 for about 3-4 minutes prior to being cleared for takeoff. The delay was reported to be for a vehicle on the runway that was clearing ice that was deposited on the runway as a result of a previous landing airplane on the crossing runway.

The accident flight was cleared by air traffic control (ATC) for takeoff on runway 4 and instructed to fly heading 360 after departure and climb to 5,000 feet. The accident flight commenced the takeoff roll with the first officer as the pilot flying. After reaching the acceleration altitude, the crew selected flaps up to configure the airplane for climb, completed the after takeoff checklist, and received a radio frequency change to departure control.

According to the flight crew, the climb out was uneventful until reaching an altitude between 3,000 and 5,000 feet. The first officer stated that he saw a line of birds in formation that appeared to be passing beneath the airplane flight path. The captain stated that he looked up and saw birds that filled his field of view. Both flight deck crewmembers reported hearing multiple impacts that they assumed were birds, followed by a burning smell in the airplane.

The crew stated that there was an immediate loss of thrust in both engines. According to the crew, the captain turned on the engine ignition, started the auxiliary power unit (APU), took over control of the airplane[4] and called for the ENG DUAL FAILURE checklist procedure. The first officer began to apply the procedure as the captain maneuvered the airplane and communicated with ATC.

According to the crew, attempts to re-establish thrust from the engines were unsuccessful. The airplane ditched in the Hudson River about 1531. The cabin and flight deck crew initiated evacuation of the airplane. All crewmembers and passengers were evacuated from the airplane and were picked up by ferry boats that were operating in the vicinity.

2.0 Flight Crew Information

The accident flight crew consisted of a captain, first officer, and three cabin crewmembers. The captain and first officer (F/O) had not flown together prior to this pairing. The accident flight was the last flight of a 4-day trip.

[4] See attachment 16 – Captain's Authority

2.1 The Captain

The captain was 57 years old, married, with two children, ages 14 and 16. He lived near San Francisco, California. He learned to fly in 1967 and had a private, commercial, instrument, and certified flight instructor (CFI) certificate prior to completing college. He flew F-4 airplanes in the US Air Force prior to being hired by Pacific Southwest Airlines (PSA) on February 25, 1980, which merged with USAir in 1988. He reported 19,500 hours total flight experience with about 3,800 hours in the Airbus. A US Airways first officer who flew with the captain on a six-leg trip on December 28, 2008, described him as exceptionally intelligent, polite and professional. The captain's proficiency check records were satisfactory.

The captain stated he was in excellent health. His last medical certificate, dated December 1, 2008, contained no restrictions. He had visited a surgeon for blepharoplasty during the previous 6 months, but reported no other changes to his health. He was not taking prescription medications at the time of the accident, and stated that he had not taken any medications in the 72 hours before the accident. He drank alcohol occasionally, but had not had any alcohol in the week and a half before the accident.

The captain had not had any major changes to his health, financial situation or personal life, good or bad, in the last year. When he was not working, the captain typically went to sleep around 2300 and awoke around 0700.

The captain was current and qualified under US Airways and FAA requirements. A review of FAA records found no prior accident, incident or enforcement actions. A search of records at the National Driver Registry (NDR) found no history of driver's license revocation or suspension.

2.1.1 The Captain's Pilot Certification Record

FAA records of the captain indicated that:

<u>Private Pilot - Airplane Single Engine Land</u> certificate was issued on October 28, 1968.
<u>Commercial Pilot – Airplane Single Engine Land</u> certificate was issued on May 24, 1969.
<u>Student Pilot – Passenger Carrying Prohibited: Glider Only</u> certificate was issued on November 10, 1970.
<u>Flight Instructor - Airplanes</u> certificate was originally issued on July 1, 1971.
<u>Commercial Pilot – Airplane Single Engine Land - Glider</u> certificate was issued on July 23, 1971.
<u>Flight Instructor - Airplane and Glider</u> certificate was originally issued on December 16, 1971.
<u>Commercial Pilot – Airplane Single and Multi Engine Land – Glider</u> certificate was issued on August 14, 1972.
<u>Commercial Pilot – Airplane Single and Multi Engine Land – Glider – Instrument</u> certificate was issued on November 17, 1972.
<u>Ground Instructor – Advanced Ground Instructor – Instrument Ground Instructor</u> certificate was issued on June 7, 1973.
<u>Flight Instructor - Airplane Single Engine – Instrument Airplane - Glider</u> certificate was originally issued on September 3, 1975.

Flight Instructor - Airplane Single and Multi Engine – Instrument Airplane - Glider certificate was originally issued on October 31, 1977.
Airline Transport Pilot – Airplane Single and Multiengine Land – Commercial Pilot Privileges – Glider certificate was issued on April 18, 1978. A LR-JET type rating was added on September 15, 1981. A BAE-146 type rating was added on March 25, 1988. A B-737 type rating was added on July 18, 1990. A DC-9 type rating was added on January 18, 1995. An AVR-146 and an A-320 Circling Approach VMC only type rating were added on August 7, 2002.
Flight Engineer – Turbojet Powered certificate was issued on May 13, 1980.

2.1.2 The Captain's Pilot Certificates and Ratings Held at Time of the Accident

AIRLINE TRANSPORT PILOT (issued August 07, 2002)
AIRPLANE SINGLE and MULTIENGINE LAND
AVR-146, B-737, BAE-146, DC-9, LR-JET, A-320 CIRC APCH VMC ONLY
COMMERCIAL PRIVILEGES
GLIDER

FLIGHT ENGINEER (issued May 13, 1980)
TURBOJET POWERED

MEDICAL CERTIFICATE FIRST CLASS (issued December 1, 2008)
Limitations: None

2.1.3 The Captain's Training and Proficiency Checks Completed

Initial Type Rating Airbus A320: August 7, 2002
Last recurrent simulator training: February 20, 2008
Last recurrent ground training: February 19, 2008
Last Line Check in A320: December 27, 2007
Last Proficiency Check: February 21, 2008

2.1.4 The Captain's Flight Times

The captain's flight times, based on US Airways employment records:

Total pilot flying time	19,663 hours
Total Pilot-In-Command (PIC) time	8,930 hours
Total A320 flying time	4,765 hours
Total A320 PIC time	4,765 hours
Total flying time last 24 hours	4 hours, 59 minutes
Total flying time last 7 days	20 hours, 12 minutes
Total flying time last 30 days	39 hours, 26 minutes
Total flying time last 60 days	82 hours, 44 minutes

Total flying time last 90 days	154 hours, 55 minutes
Total flying time last 12 months	782 hours, 30 minutes

2.1.5 The Captain's 72-Hour History

On January 12, 2009, the captain began a 4-day pairing with the accident F/O. He had not been on duty since December 31, 2008. The flight crew began their trip in CLT at 1806 EST and flew to SFO, arriving at 2119 PST. The captain lived in the San Francisco area and he spent the evening at his home. He went to bed around 2300 PST. He said he needed about 8 hours of sleep to feel rested.

On January 13, 2009, the captain awoke at 0700 PST. He had breakfast with his children, after which he got ready for work. He left his house at 1100 PST for a 1220 PST show time at the airport. The flight crew departed SFO at 1315 PST and arrived in PIT at 2103 EST (all times hereafter are EST). The captain went to the hotel from the airport. He said the total layover time was 9 hours and 58 minutes but that did not include check in and check out. He did not recall what time he went to bed.

On January 14, 2009, the captain awoke at 0510 for a 0600 departure from the hotel. He had a 0705 flight departure from PIT to LGA. He ate breakfast at the hotel. He said his quality of sleep on the previous night was good or average. He said it was a short night and he did not get 8 hours of sleep but that that was ok. He said it felt normal. The flight crew flew from PIT to LGA and back to PIT. The captain said they had a long layover and spent the night at a hotel in downtown Pittsburgh. He went for a walk around town, ate dinner and answered some emails. He went to bed fairly early, probably about 2200.

On January 15, 2009, the captain awoke at 0640 for a 0730 van departure from downtown Pittsburgh. The accident crew had a 0900 departure. He said his sleep was good and he was fortunate to be a good sleeper. He was a sound sleeper and said he felt rested. The captain ate breakfast at the airport. The flight crew departed PIT at 0856 after being deiced and arrived in CLT at 1055. The flight crew was excited to fly the newest A321. The flight crew changed airplanes in CLT. The captain did not get anything to eat in CLT. The flight was delayed 75 minutes due to ATC delays. The flight crew departed CLT at 1154 and arrived in LGA at 1423. The captain said they had a quick turn at LGA so he purchased a sandwich to eat on the airplane after departure. The flight crew departed LGA for CLT at 1503.

2.2 The First Officer

The F/O was 49 years old. He lived near Madison, Wisconsin. He learned to fly when he was 15 or 16 years old and flew only in civilian aviation. He was hired by USAir on April 7, 1986. He reported about 20,000 hours total flight experience with about 35 hours in the Airbus. The F/O stated he received a commendation letter from the director of operations years ago for making great PA announcements. A US Airways check airman that flew with the F/O for his OE, a 4-day trip on January 5, 2009, described him as a very good pilot, and stated the F/O came out well trained. The F/O's proficiency check records were satisfactory.

The F/O said that he was in good health. His last medical certificate, dated October 7, 2008, contained a limitation for corrective lenses, and he stated he was wearing corrective contact lenses at the time of the accident. He was not taking prescription medications at the time of the accident, and stated that he had not taken any medications in the 72 hours before the accident. He had not had an alcoholic beverage in 10 years.

The F/O had not had any major changes to his health, financial situation or personal life, good or bad, in the last year. The F/O stated he typically needed 7 hours of sleep to feel rested.

The F/O was current and qualified under US Airways and FAA requirements. A review of FAA records found no prior accident, incident or enforcement actions. A search of records at the NDR found no history of driver's license revocation or suspension.

2.2.1 The F/O's Pilot Certification Record

FAA records of the F/O indicated that:

Private Pilot - Airplane Single Engine Land certificate was issued on November 18, 1976.
Private Pilot - Airplane Single Engine Land – Instrument Airplane certificate was issued on December 17, 1978.
Commercial Pilot – Airplane Single Engine Land and Sea – Instrument Airplane certificate was issued on February 27, 1979.
Flight Instructor - Airplane Single Engine certificate was originally issued on May 10, 1979.
Flight Instructor - Airplane Single Engine – Instrument Airplane certificate was originally issued on August 2, 1979.
Commercial Pilot – Airplane Single and Multi Engine Land – Instrument Airplane certificate was issued on October 20, 1979.
Flight Instructor – Airplane Single and Multi Engine – Instrument Airplane was originally issued on August 25, 1981.
Flight Engineer – Turbojet Powered – (Subject to Provisions Of Exemption No. 2095 As Amended) certificate was issued on May 23, 1986.
Flight Engineer – Turbojet Powered certificate was issued on June 16, 1986.
Airline Transport Pilot – Airplane Multi-Engine Land – Commercial Pilot Privileges – Airplane Single Engine Land certificate was issued on November 19, 1982.
A FK-100 type rating was added on June 12, 2000 and a B-737 type rating was added on March 24, 2002.

2.2.2 The F/O's Pilot Certificates and Ratings Held at Time of the Accident

AIRLINE TRANSPORT PILOT (issued December 31, 2008)
AIRPLANE MULTIENGINE LAND
B-737, FK100, A-320
COMMERCIAL PRIVILEGES
AIRPLANE SINGLE ENGINE LAND

Fk-100, B-737, A-320 Circ. Appr. VMC ONLY

FLIGHT ENGINEER (issued June 16, 1986)
TURBOJET POWERED

MEDICAL CERTIFICATE FIRST CLASS (issued October 7, 2008)
Limitations: Holder shall wear corrective lenses while exercising the privileges of this certificate

2.2.3 The F/O's Training and Proficiency Checks Completed

Initial Type Rating A320: December 31, 2008
Last recurrent simulator training: Not Applicable
Last recurrent ground training: Not Applicable
Last line check on A320: January 8, 2009
Last Proficiency check on A320: December 31, 2008

2.2.4 The F/O's Flight Times

The accident F/O's flight times, based on US Airways employment records:

Total pilot flying time	15,643 hours
Total PIC time	1,001 hours
Total SIC time	8,977 hours
Total flying time in A320	36 hours, 37 minutes
Total A320 second-in-command (SIC) time	36 hours, 37 minutes
Total flying time last 24 hours	4 hours, 59 minutes
Total flying time last 7 days	20 hours, 12 minutes
Total flying time last 30 days	37 hours, 8 minutes
Total flying time last 60 days	55 hours, 4 minutes
Total flying time last 90 days	124 hours, 21 minutes
Total flying time last 12 months	630 hours, 0 minutes

2.2.5 The F/O's 72-Hour History

On January 12, 2009, the F/O began a 4-day pairing with the accident captain. The F/O had been off for the 3 days prior to this pairing. The flight crew departed from CLT at 1806 EST and arrived in SFO at 2119 PST. The F/O said he was not tired when he arrived at the hotel so he went out and walked for an hour. He came back to the hotel and went to bed. He estimated that he was walking around 2200 PST and went to bed around 2300 PST, but was not sure.

On January 13, 2009, the F/O did not recall when he awoke but said he felt rested. He said he got up and walked 5-6 miles. He came back and spent some time in the hotel room before going to the airport. The flight crew flew from SFO to PIT for a short layover. He said he stayed at a hotel and had less than 8 hours in PIT. He did not recall when he went to bed.

On January 14, 2009, the F/O awoke at 0510 EST (all times hereafter are EST) for a 0600 van. The accident crew flew from PIT to LGA and back to PIT. He said the flight crew had a long layover in PIT and they stayed in a hotel downtown. He walked to see a movie and then walked back to the hotel. He did not recall when he went to bed.

On January 15, 2009, the F/O awoke at 0640 and felt rested. The quality of his sleep was good. He did not eat breakfast which he said was typical. He left the hotel at 0730. The flight crew departed PIT for CLT at 0856 and arrived in CLT at 1055. The flight crew switched airplanes in CLT. The F/O ate in the airport. The flight crew departed CLT at 1154 and arrived at LGA at 1423. In LGA, the F/O got off the airplane and did the walk around. The turn was quick because the flight in to LGA arrived late. The flight crew departed LGA for CLT at 1503.

2.3 Medical and Pathological Information

2.3.1. The Flight Crew's Post-Accident Toxicological Testing

On the evening of January 15, 2009, the captain and F/O complied with a company request to provide urine specimens for drug testing and to participate in breathalyzer tests. US Airways reported that these tests yielded no evidence of drug or alcohol use.[5]

3.0 Weight and Balance

The following information was obtained from the US Airways weight manifest (unless otherwise noted):

Basic Operating Weight	98,000 lbs
Passenger Weight	29,250 lbs
Baggage & Cargo	2,910 lbs
Zero Fuel Weight	130,160 lbs
Fuel	22,100 lbs
Ramp Weight	152,260 lbs
Taxi Fuel Burn	750 lbs
Takeoff Weight	151,510 lbs
Maximum Takeoff Weight Allowed	151,600 lbs

[5] US Airways provided results certificates to the Safety Board indicating that both pilots tested negative for the following drugs: marijuana, cocaine, amphetamines, opiates, and PCP. The certificates stated that the captain and first officer performed a breathalyzer at 2205 and 2221, respectively, on January 15, 2009, and the test results were negative.

Estimated Ditching Weight	150,000 lbs[6]

US Airways used a computerized weight and balance system provided under contract by electronic data systems (EDS), and included a load planning system (LPS), a takeoff performance system (TPS), and a flight planning system (FPS). The TPS was the primary tool utilized to assure that the structural loading limits, takeoff weight limits, and the center of gravity (CG) limits were not exceeded on an airplane for a particular flight.[7]

The Operations/Human Performance Group obtained weight and balance data for the accident flight and determined, using Airbus performance data and manuals that the takeoff CG and weight was within the approved limits of the airplane for takeoff from runway 4 at LGA.

4.0 Aerodrome Information

Airport information was obtained from the Federal Aviation Administration's National Aeronautical Charting Office (NACO) Terminal Procedures Publication (TPP) and Airport Facility Directory (AFD).

At the time of the bird strike, the nearest suitable airports to the accident airplane were LGA and Teterboro Airport (TEB). The accident airplane collided with birds about 40° 50' 53.16" N, 73° 52' 33.92" W which was about 4.5 miles from the approach end of LGA runway 22 and about 9.5 miles from the approach end of TEB runway 24. The point of touchdown in the Hudson River was about 40° 46' 16.67" N, 74° 00' 20.51" W. The distance from the point of impact with the birds to the point of touchdown in the Hudson River was about 8.5 miles.

5.0 Company Overview

US Airways, Inc. was an operating unit of US Airways Group headquartered in Tempe, Arizona, and was certificated as a Federal Aviation Regulation (FAR) part 121 air carrier for both domestic and flag operations. At the time of the accident, US Airways had major hubs at CLT, Philadelphia International Airport (PHL), and Phoenix Sky Harbor International Airport (PHX), and operated over 300 airplanes manufactured by The Boeing Company, Airbus Industrie, and Embraer.

According to information provided on the company's web site,[8] US Airways began passenger service in 1949 as All American Airways. In 1953, All American Airways changed its name to Allegheny Airlines and to USAir in 1979. In 1988, USAir Group merged with Pacific Southwest Airlines (PSA) and with Piedmont Airlines in 1989, which was known as the largest merger in airline history. USAir Group became US Airways Group in 1997. In 1999, US Airways acquired its first A320 airplane and offered daily scheduled service between PHL and Los Angeles

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[6] Estimated Ditching Weight based on takeoff weight minus estimated fuel burn in climb to 3,000 feet and descent at idle thrust.

[7] US Airways Weight and Balance Analysis and Methodology Manual, p. 27.

[8] Information received from website of US Airways <http://www.usairways.com/awa/content/aboutus/pressroom/history/chronology.aspx> (accessed May 6, 2009)

International Airport (LAX). US Airways Group, Inc. filed for reorganization under Chapter 11 of the US Bankruptcy code in 2004 (the second time since 2002), and a similar process was being considered by America West Airlines. In 2005, US Airways Group, Inc. merged with America West Holdings, and following the merger, US Airways Group, Inc. was no longer in bankruptcy.

The accident airplane was owned by Wells Fargo Bank Northwest NA Trustee, and operated by US Airways for FAR Part 121 passenger carrying operations.

6.0 Bird Strike Hazard

In 1999, the NTSB issued Safety Recommendation A-99-091 which recommended that all operators be required to report bird strikes to the FAA. The recommendation was not accepted and at the time of this accident, bird strike reporting was voluntary.

The FAA maintained a database which contained information on bird strikes to civil airplanes. The FAA National Wildlife Strike Database contained strike reports that were voluntarily reported to the FAA by pilots, airlines, airports and others. At the time of the accident, research indicated that only about 20 percent of bird strikes were reported.[9]

The database indicated that the total number of reported bird strikes to airplanes had increased from 1,738 in 1990 to over 7,400 in 2007, and that 92 percent of the strikes occurred below 3,000 feet agl (above ground level).

The US Airways Flight Operations Manual (FOM), chapter 4.16.2, page 4-23, included guidance for pilots to notify the controlling dispatcher following a bird strike on any flight. Additional guidance on page 4-31 of the FOM required a flight crew member to notify the controlling dispatcher as soon as practical, to make an entry in the FDML (flight deck maintenance log), and to complete an Event/ASAP (Aviation Safety Action Program) report within 48 hours of completing the trip.

7.0 ECAM and QRH

The Airbus A320 was equipped with an electronic centralized aircraft monitor (ECAM) system which presented data on the flight deck engine/warning display (E/WD) and the system display (SD). In the event that an airplane system failure was detected by the flight warning computer (FWC), the E/WD displayed the title of the failure and actions to be taken by the crew. The failure message may also be accompanied by an aural warning and/or master caution or warning lights on the flight deck.

[9] Information received from website of FAA National Wildlife Strike Database <http://wildlife-mitigation.tc.faa.gov> (accessed May 6, 2009).

In certain instances, an abnormal procedure could not be sensed by the ECAM, or the procedure presented on the ECAM did not include actions to be taken that were added after the original design specifications of the airplane.

The US Airways Quick Reference Handbook (QRH) was carried on board the airplane and included abnormal and emergency procedures, including those that could not be sensed by, or presented on the ECAM system, and expanded procedures to be used in the event that an ECAM procedure was identified where it was recommended that the QRH be used. The US Airways QRH included six procedures for which a QRH procedure must be used in lieu of an ECAM action. These six procedures were referred to as "ECAM Exceptions".

The US Airways QRH contained immediate action items, an index of ECAM procedures, an alphabetical listing of procedures contained in the QRH. On the back cover of the QRH was a list of immediate action items and ECAM Exceptions[10] with reference to page numbers where each procedure was located.

8.0 Non-Normal Procedures/Methodology

Non-normal procedures and non-normal methodology were contained in the US Airways A319/320/321 Pilot Handbook (PH) Chapter 9: Non-Normal Operations. Page 9-5 of the PH stated in part:

> ***9.1.4 Procedures.*** *When a non-normal situation is evident, methodically accomplish the following steps:*

1. PF - Maintain Aircraft Control
2. Identify the Non-normal
PM - Cancels the Warning or Caution, if applicable
3. PM - Determine if Immediate Action or ECAM Exception
4. PM - Accomplish Immediate Action Items, if applicable
5. Captain - Assigns PF
6. PM - Accomplish Non-normal procedure
7. PM - Accomplish ECAM Follow-Up procedures, if applicable

The expanded step 3 was presented on page 9-6 of the PH and stated in part:

> *3.* ***PM - Determine if Immediate Action or ECAM Exception.***
> *Once:*
> *— the airplane flightpath and configuration are properly established,*
> *and*
> *— the airplane is not in a critical phase of flight (e.g., takeoff, landing), the PM determines and verbalizes whether the non-normal is an Immediate Action Item*

[10] See attachment 8 – ECAM Exceptions

or an ECAM Exception. The Immediate Action Index and ECAM Exception Index are available on the back of the QRH.

9.0 Dual Engine Failure

Interviews conducted with Airbus personnel indicated that the Airbus ENG DUAL FAILURE[11] checklist was amended in 2004. As part of the Airbus Continuing Improvement Process, procedures previously located in different checklists were incorporated into the Airbus ENG DUAL FAILURE procedure. One improvement noted during interviews was to differentiate between a no fuel remaining and a fuel remaining scenario.

US Airways ENG DUAL FAILURE[12] checklist was based on the Airbus checklist but was designed by US Airways personnel and approved for use by the FAA.

9.1 Operator Procedures and Checklist

Following the bird strike, the captain took control of the airplane and called for the dual engine failure checklist. The F/O, having recently been through training, recognized the event as an ECAM exception and promptly found the procedure listed on the back cover of the US Airways QRH. The title of the procedure was ENG DUAL FAILURE and was located on pages 27 through 29 of the QRH. In accordance with US Airways procedures, the flight crew elected to follow the QRH procedure in lieu of the ECAM procedure. The F/O executed the procedure.[13]

The US Airways ENG DUAL FAILURE procedure[14] incorporated three parts.

Part 1 of the procedure required the crew to differentiate between a “no fuel remaining” and a “fuel remaining” condition and included steps to attempt an engine re-start. According to crew statements, the flight crew elected to follow the steps for a fuel remaining condition.

Part 2 of the procedure included guidance to follow in the event an engine restart was successful and guidance and procedures to configure airplane systems in the event that an engine restart was not possible.

Part 3 of the procedure contained guidance and procedures to follow in the event a forced landing was anticipated, or in the event a ditching was anticipated.

According to crew statements and due to the low altitude and limited time available, the crew was unable to initiate part 2 or part 3 of the ENG DUAL FAILURE checklist.

The US Airways QRH, page 27, of the ENG DUAL FAILURE procedure stated in part:

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[11] See attachment 9 – Airbus QRH DUAL ENG FAILURE
[12] See attachment 10 – US Airways QRH ENG DUAL FAILURE
[13] See attachment 1 – Flight Crew Interviews
[14] See attachment 10 – US Airways QRH ENG DUAL FAILURE

If fuel remaining:

a. ENG MODE Selector.. IGN

b. THR LEVERS.............................. Confirm ....IDLE

c. Airspeed ....Optimum relight speed 300 kts(CFM)/280 kts(IAE)

(1) If A319 or A320:

[For airspeed indication failure (volcanic ash) the pitch attitude for optimum relight speed is 4.5°(CFM)/ 2.5°(IAE) nose down. Add 1° nose up for each 22,000 lbs. above 110,000 lbs.

CFM: At 300 kts, the aircraft can fly approximately 2.0 nautical miles per 1000 feet (no wind)

IAE: At 280 kts, the aircraft can fly approximately 2.2 nautical miles per 1000 feet (no wind)]

If A321:

[For airspeed indication failure (volcanic ash) the pitch attitude for optimum relight speed is 4.5° nose down. Add 1° nose up for each 22,000 lbs. above 132,000 lbs.

At 300 kts, the aircraft can fly approximately 2.0 nautical miles per 1000 feet (no wind)]

d. Landing Strategy .... Determine

[Determine most appropriate place for forced landing/ditching.]

e. EMER ELEC PWR (if EMER GEN not on-line) ....MAN ON

f. ATC (VHF1, HF1, ATC1).. Notify

(1) If unable to contact ATC on assigned frequency:

(a) ATC Code A7700

(b) Distress Message ....Transmit

[Use one of the following frequencies: VHF 121.5 MHz, HF 2182 KHz or 8364 KHz]

g. FAC 1...OFF then ON

[Resetting FAC 1 enables recovery of characteristic speeds displayed on the PFD and permits recovery of rudder trim even if no indication is available.]

If no relight after 30 seconds:

h. ENG MASTER 1 and 2 ....Confirm...OFF

Wait 30 seconds:

i. ENG MASTER 1 and 2 ....ON

Note: *Unassisted start attempts can be repeated until successful or until APU Bleed is available.*

If unsuccessful:

j. CREW OXYGEN MASKS (Above 10,000')Verify ....ON

When below FL250:

k. APU... START

l. WING ANTI ICE...OFF

When below FL200:

m.APU BLEED...ON

Note: *If APU Bleed is available, APU Bleed assisted starts may be accomplished at Green Dot Speed.*
n. ENG MASTER 1 and 2 ....Confirm...OFF
Wait 30 seconds:
o. ENG MASTER 1 and 2 (one at a time) ....ON

Step "a." in the procedure directed the crew to position the ENG MODE selector to the IGN position. The captain had already accomplished this step by memory prior to calling for the checklist. Step "b." directed the crew to move the engine thrust levers to idle. Although the crewmembers could not recall which of them accomplished this task, both stated that the engine thrust levers were moved to the idle position.

Step "c." directed the crew to attain the "optimum relight speed" in order to attempt a windmilling[15] restart of the engines. According to crew statements, the crew determined that due to the airspeed and low altitude at the time, they would be unable to reach the optimum relight speed.

Step "d." directed the crew to determine a landing strategy and included the following note:

Determine most appropriate place for forced landing/ditching.

The captain stated in interviews that he determined, given the circumstances, a ditching in the Hudson River was the most appropriate strategy. (See section 13.4 "Landing Strategy" for more details.)

Step "e." required the selection of the RAT MAN ON[16] switch if the emergency generator was not on line. Immediately following the loss of thrust in both engines, the captain had initiated the start sequence for the auxiliary power unit (APU). Preliminary digital flight data recorder (DFDR) information indicated that the airplane was not in the ELEC EMER configuration. The crew stated that they had determined electrical power was established.

The captain complied with step "f." when he notified ATC of the situation via radio. The F/O carried out step "g." to reset the FAC 1.[17]

Step h." directed the crew to select, after confirmation by both crewmembers, both engine master switches to the off position. According to crew statements, the number one engine appeared to still be operating at a reduced level. For this reason, the F/O opted to select only the number two engine master switch to off initially. The purpose of selecting the master switch to off was to reset the FADEC.[18] The procedure also called for a delay of 30 seconds prior to selecting the master switch back to the on position in order to ventilate the engine combustion chamber before attempting a restart.

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[15] "Windmilling restart" refers to an emergency in-flight procedure in which the effect of ram airflow passing through the engine provides rotational energy to turn the engines core.
[16] "RAT MAN ON" refers to the ram air turbine manual on.
[17] "FAC 1" refers to the flight augmentation computer 1.
[18] "FADEC" refers to the full authority digital engine control.

The F/O stated that he did not use a timing device and was not sure how long he waited before selecting the engine 2 master switch back to the on position in accordance with step "i." of the procedure. The F/O stated that at some point after attempting the relight of engine number 2 and after determining that there was not much time remaining; he selected the engine 1 master switch to off. After a short delay, he selected the engine 1 master switch on to initiate a restart of that engine.

According to crew statements, they were unable to continue beyond step "i." of the procedure due to the short amount of time prior to landing.

9.2 Manufacturer Procedures and Checklist

Interviews conducted with Airbus personnel indicated that, regarding the ECAM and QRH procedures, the Engine Dual Failure was an ECAM exception and Airbus recommended during training that the flight crew refer to the QRH procedure.

The ENG DUAL FAILURE – FUEL REMAINING[19] procedure was contained in the Airbus QRH pages 1.16 through 1.19. A note at the beginning of the procedure read as follows:

> *As long as none of the engines recover, the flight crew should apply this paper procedure and then, if time permits, clear ECAM alerts and check the ECAM STATUS page.*

The procedure directed the crew to determine a landing strategy. The ENG DUAL FAILURE – FUEL REMAINING procedure stated in part:

> *LANDING STRATEGY…………………………………………………………….DETERMINE*
> *Determine whether a runway can be reached, or the most appropriate place for a forced landing/ditching.*

The procedure contained in the Airbus QRH included steps to be taken to attempt an engine restart, and in the event an engine restart was not possible; steps to configure the airplane for a forced landing, and steps to configure the airplane for a ditching.

9.3 Airplane Configuration

The US Airways QRH and the Airbus QRH ENG DUAL FAILURE procedures both provided guidance that indicated flaps 3 was to be used for ditching. In addition, the procedures directed the crew to configure the airplane for ditching prior to descending below 3,000 feet above ground level.

The US Airways QRH, ENG DUAL FAILURE procedure, page 28 stated in part:

> *For landing..Use FLAPS 3*
> *[Only slats will extend and operating time is noticeably increased, as only blue hydraulic power is available from the RAT.]*

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[19] See attachment 9 – Airbus QRH ENG DUAL FAILURE

And on page 29:

If Ditching is anticipated:
Prior to 3,000' AGL:
a. FLAPS…………………………………………Configure for landing

The Airbus QRH, <u>ENG</u> DUAL FAILURE procedure, page 1.19 stated in part:

IF DITCHING ANTICIPATED
APPROACH
-FOR LANDING…………………………………………USE FLAPS 3
Only slats extend, and slowly.

And

At a suitable altitude (not below 3,000 feet AGL), configure the aircraft for ditching (CONF 3[20]; L/G UP)

Preliminary information obtained from the DFDR indicated that the accident airplane lost thrust in both engines at about 3,000 feet agl. The crew stated that due to the limited time available, they did not reach the section of the checklist that provided guidance on airplane configuration. The flight crew elected to use flaps 2 for landing.

The US Airways and Airbus checklist procedures both provided guidance indicating that only slats, and no flaps, were available[21] following a failure of both engines due to the loss of the green and the yellow engine driven hydraulic pumps and resultant loss of hydraulic pressure in those systems.
The Airbus FCOM volume 1 page 1.27.50 P 5 stated in part:

The FLAPS lever selects simultaneous operation of the slats and flaps.
The five lever positions correspond to the following surface positions:

<table>
<tr><th>Position</th><th>SLATS</th><th>FLAPS</th><th>Indications on ECAM</th><th colspan="3"></th></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td><td rowspan="2"></td><td>CRUISE</td><td rowspan="2">HOLD</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">18</td><td>0</td><td>1</td><td rowspan="3"></td></tr>
<tr><td>10</td><td>1 + F</td><td rowspan="3">TAKEOFF</td><td></td></tr>
<tr><td>2</td><td>22</td><td>15</td><td>2</td><td rowspan="2">APPR</td></tr>
<tr><td>3</td><td>22</td><td>20</td><td>3</td><td rowspan="2">LANDING</td></tr>
<tr><td>FULL</td><td>27</td><td>35</td><td>FULL</td><td></td><td></td></tr>
</table>

[20] CONF 3 – CONF refers to airplane flap and slat configuration and the FLAPS lever positions. The FLAPS lever selects simultaneous operation of the slats and flaps. CONF 3 corresponds to slat position 3 and flap position 3.
[21] See attachment 11 - Airbus Flight Crew Operating Manual (FCOM) vol. 1 – Hydraulic System Architecture

It can be seen from the chart presented above that the airplane configuration of flaps 3 recommended in the ENG DUAL FAILURE procedure would result in slats 22 and flaps 0 due to the loss of green and yellow hydraulic systems.

Preliminary information obtained from the DFDR indicated that none of the three (green, blue, or yellow) hydraulic systems indicated low pressure[22]. It can be seen from the chart above, and preliminary information from the DFDR indicated that the selection of flaps 2 in the accident scenario resulted in slats 22 and flaps 15.

9.4 Approach Speed

The US Airways QRH and the Airbus QRH ENG DUAL FAILURE procedures both provided guidance for the speeds to be flown if an engine relight was not possible, and for approach. Both checklist procedures directed the crew to fly initially at Green Dot[23] speed in clean configuration, and then to calculate an approach speed to be used after flaps were selected.

The US Airways QRH, ENG DUAL FAILURE procedure, dated 11 FEB 08, page 28 stated in part:

> *a. Airspeed……………………………………………………Optimum speed Green Dot [Green dot is displayed on the Captain's PFD. It represents best L/D. At Green dot speed the aircraft can fly up to approximately 2.5 nautical miles per 1000 feet with no wind. Average rate of descent is 1600 feet per minute.]*

And on page 29:

> *g. V_{APP}………………………………………………………………………Determine*
>
> ***NOTE:** A319/320 V_{REF} + 25/150 kts minimum*

The Airbus QRH, ENG DUAL FAILURE procedure, page 1.17 stated in part:

-OPTIMUM SPEED………………………………………………REFER TO TABLE BELOW[24]

GREEN DOT SPEED WITH ALL ENGINES INOPERATIVE (KNOTS)			
Weight (1000 lb)	*At or below FL 200*	*FL 300*	*FL 400*
160	*230*	*240*	*250*
150	*221*	*231*	*241*
140	*212*	*222*	*232*

[22] Refer to Systems Group Chairman's Factual Report for additional information regarding hydraulic system operation.
[23] "Green Dot speed" refers to the speed that offers the best lift to drag ratio. It is represented by a green dot on the Primary Flight Display speed tape and is the engine out operating speed in clean configuration.
[24] Green Dot Speed Table abbreviated for clarity

At green dot speed, the aircraft can fly up to approximately 2.5 nautical miles per 1000 feet (with no wind).
Average rate of descent is approximately 1600 feet/min.

And on page 1.19:

-MIN APPROACH SPEED………………………………………………………………………150 KT
-VAPP……………………………………………………………………………………DETERMINE
Vapp is the maximum between Vref + 25 knots / 150 knots:

Weight (1000 lb)	*96*	*104*	*112*	*120*	*128*	*136*	*144*	*152*	*160*	*168*	*172*
Vapp	*150*	*150*	*150*	*150*	*152*	*156*	*160*	*164*	*168*	*171*	*173*

The crew stated that due to the limited time available, they did not reach the section of the checklist that provided guidance on speeds to be flown.

The captain stated in interviews that he was attempting to maintain green dot speed prior to deploying the flaps. The captain stated in interviews that following deployment of the flaps, he could not recall exactly what speed they were flying but said he was referencing the speed tape and keeping it "safely above V_{LS}".[25]

Preliminary information obtained from the DFDR indicated that following the bird strike, and prior to selecting flaps, the accident airplane speed varied between about 220 knots and about 180 knots. Preliminary information obtained from the DFDR indicated that following the selection of flaps, the accident airplane speed was variable and decreasing from about 180 knots to about 130 knots at touchdown.

9.5 Airspeed Indications on PFD

An airspeed scale[26] was displayed on the left side of the primary flight display. The airspeed scale was presented as a white scale on a grey background which moved in front of a fixed yellow reference line and yellow triangle to show airspeed.[27]

In addition to the airplane speed, there were characteristic speeds and protection speeds[28] presented on the airspeed scale. Among them were:

F speed - The target speed for approach when the airplane was in CONF 2 or CONF 3 was represented by "F" on the speed scale.

[25] "V_{LS}" refers to the lowest selectable speed, represented by the top of an amber strip along the airspeed scale on the PFD. Airbus FCOM vol. 3, chapter 3.04.10, p. 2.
[26] See attachment 12 – Airspeed Scale
[27] Airspeed scale – Airbus FCOM vol. 1, chapter 1.31.40, p. 5
[28] Characteristic and Protection speeds from Airbus FCOM vol. 3, chapter 3.04.10, pp. 1-4

V_{LS} - Lowest selectable airspeed providing an appropriate margin to the stall speed, was represented on the speed scale by the top of an amber strip and was computed by the Flight Augmentation Computer (FAC) based on aerodynamic data.

Vα PROT – Alpha protection speed was indicated by the top of a black and amber strip along the speed scale. The Alpha protection speed represented the speed corresponding to the angle of attack at which the alpha protection became active, and varied according to airplane weight and configuration.

Vα MAX – Maximum angle of attack speed was represented by the top of a red strip along the speed scale. Maximum angle of attack speed corresponded to the maximum angle of attack that may be reached in pitch normal law, and varied according to airplane weight and configuration.

9.6 High Angle-Of-Attack (AOA) Protection

The Airbus Flight Crew Training Manual (FCTM), "Operational Philosophy," chapter 020, page 1 stated in part:

> *The relationship between the Pilot Flying's (PF's) input on the sidestick, and the aircraft's response, is referred to as control law. This relationship determines the handling characteristics of the aircraft. There are three sets of control laws, and they are provided according to the status of the: Computers, peripherals, and hydraulic generation.*
>
> *The three sets of control laws are:*
> - *Normal law*
> - *Alternate law*
> - *Direct law.*

The Airbus A320 incorporated flight envelope protections. When in normal law, the flight computers would prevent excessive maneuvers and exceedence of the safe envelope in pitch and roll axis.[29]

The high AOA protection allowed the pilot to pull full aft on the side stick to achieve the best possible lift while the high AOA protection minimized the risk of stall or loss of control. The Airbus FCOM volume 1, chapter 1.27.20, page 4 stated in part:

> *Under normal law, when the angle of attack becomes greater than αprot, the system switches elevator control from normal mode to a protection mode, in which the angle of attack is proportional to sidestick deflection. That is, in the αprot range, from αprot to αmax the sidestick commands α directly. However, the angle of attack will not exceed αmax, even if the pilot gently pulls the sidestick all the way back. If the pilot releases the sidestick, the angle of attack returns to αprot and stays there.*

[29] Airbus FCOM vol. 1, chapter 1.27.10, p. 1

Preliminary information indicated that, following the bird strike, the airplane maintained a speed at or near the speed at which Alpha protection would be activated. Refer to Aircraft Performance Study[30] for additional information.

9.7 Low Speed Awareness

The Airbus A320 airplane incorporated a low energy warning to enhance the pilot's awareness of a low speed/energy condition. The Airbus FCOM volume 1, chapter 1.22.40, page 5 stated in part:

> *An aural low-energy "SPEED SPEED SPEED" warning, repeated every 5 seconds, warns the pilot that the aircraft's energy level is going below a threshold under which he will have to increase thrust, in order to regain a positive flight path angle through pitch control. It is available in Configuration 2, 3, and FULL…*

The warning was inhibited when the airplane was below 100 feet radio altitude, and when the ground proximity warning system (GPWS) alert was triggered.

Interviews with the crew indicated that the GPWS alert was triggered repeatedly during the descent.

10.0 Ditching

In accordance with the Department of Transportation, FAA document FAA-H-8083-3A, "Airplane Flying Handbook," Chapter 16, page 1, dated 2004, a ditching was defined as:

> *Ditching - A forced or precautionary landing on water.*

The US Airways QRH and Airbus QRH both included an abnormal procedure to be followed in the event of ditching.

The vice president of Flight Operations Support & Services at Airbus, stated that the ditching procedure contained in the QRH was based on the assumption that at least one engine was operating.

10.1 Operator Procedures and Checklist

The US Airways ditching procedure was contained in the US Airways QRH, page 89. [31] The first step in the procedure stated in part:

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[30] National Transportation Safety Board, Office of Research and Engineering, Aircraft Performance Study, Airbus A320, Hudson River, NJ, January 15, 2009, NTSB accident number DCA09MA026. (Contact NTSB at pubinq@ntsb.gov).

[31] See attachment 13 – US Airways QRH Ditching

1. ***If no engines are running:***
   a. *Ditching Checklist complete, and*
      Accomplish ENG DUAL FAILURE on page 27.

The US Airways ENG DUAL FAILURE procedure, part 3, included guidance and procedures to follow in the event a ditching was anticipated. The US Airways QRH, page 29, included the following note:

> *Note: In case of strong crosswind, ditch facing into the wind. In the absence of strong crosswind, ditch parallel to the swell. Touchdown with approximately 11 degrees of pitch and minimum vertical speed.*

The captain stated that he was attempting to touchdown with a pitch attitude of 10° or less. As noted previously, the crew stated in interviews that due to the limited amount of time available; they did not reach the section of the checklist that provided guidance if a ditching was anticipated.

10.2 Manufacturer Procedures and Checklist

The Airbus ditching procedure was contained in the A319/A320/A321 QRH, page 1.23.[32] A note at the beginning of the procedure stated in part:

> *This procedure applies when engines are running. If engines are not running, refer to the QRH "ENG DUAL FAILURE" (with or without fuel remaining) procedure, which has been amended to include the ditching procedure when the engines are not running.*

And an additional note included in the procedure stated in part:

> *In case of strong crosswind, ditch face into the wind.*
> *In the absence of strong crosswind, prefer ditching parallel to the swell. Touchdown with approximately 11 degrees of pitch and minimum aircraft vertical speed.*

10.3 Airplane Configuration

The ditching procedures contained in the US Airways QRH and the Airbus QRH both included guidance that directed the use of maximum available slats and flaps for final approach and touchdown.

11.0 Post-Ditching Evacuation

The crew stated in interviews that following the ditching, the F/O initiated the evacuation procedures[33] contained in the QRH. The captain stated he considered completing his checklist but

[32] See attachment 14 – Airbus QRH Ditching
[33] See attachment 15 – US Airways QRH Evacuation

realized that the items would not help the situation and he thought evacuating was better than waiting. Due to loss of electrical power after the ditching an announcement over the PA system was not an option so the captain opened the flight deck door and issued a verbal “Evacuate” command. The captain stated in interviews that at the time he exited the flight deck, the cabin crew had already initiated the evacuation of passengers from the airplane.

In accordance with US Airways procedures, the captain and F/O assisted the cabin crew with the evacuation of the airplane. The crew stated in interviews that they noticed a number of passengers had evacuated the airplane without a life vest. The captain and F/O obtained life vests from under the passenger seats in the cabin and passed them out to passengers outside of the airplane.

The captain stated in interviews that following the evacuation, he inspected the cabin to ensure no more passengers or crewmembers were aboard. The captain and F/O exited the airplane onto a raft at the L1 door.

After evacuating the airplane, the captain coordinated with crews of ferry boats to pick up passengers and crewmembers located on rafts and on the wings of the airplane.

12.0 US Airways Training

According to the US Airways Airbus Fleet Captain, US Airways has been operating under the AQP since 2002. AQP was a voluntary program approved and overseen by the FAA that seeks to improve aviation safety though customized training and evaluation in Part 121 operations.[34] US Airways AQP Volume 1 indicated that there were four core curricula provided under AQP: Indoctrination Training, Qualification Training (QT), Continuing Qualification Training (CQT), and Requalification Training (RQT).[35] Company personnel stated that the RQT curriculum was not in use by US Airways at the time of the accident.

Indoctrination Training was a 9-day course required for new hires to US Airways to provide them with an overview of the policies, procedures and practices at US Airways. Successful completion of indoctrination training allowed new hires to attend aircraft ground and flight training courses.

QT was a 23-day course which covered ground school, maneuvers validation (MV), and line oriented evaluation (LOE).[36] Simulator training was divided into two phases – phase 1 covered 4 days of maneuvers training where pilots developed proficiency of core skills and maneuvers and a 5th day of maneuvers validation. Phase 2 covered 3 days of additional simulator training where the focus was on Threat and Error Management and proficiency in line operations. Simulator session 9 was a LOFT (line-oriented flight training) scenario and session 10 was an LOE for certification. Following the LOE, a flight crewmember completed OE in line operations under the supervision of a company check pilot.

[34] Information obtained from website of FAA <http://www.faa.gov/training_testing/training/aqp/more/background/> (accessed May 6, 2009).
[35] US Airways AQP vol. 1, p. 2-3
[36] US Airways A319/320/321 Qualification Syllabus and Simulator Guide

According to the US Airways manager of AQP, the US Airways program was based on a 24 month cycle with a 12 month training evaluation period. Following qualification on an airplane, a crewmember was required to complete CQT on an annual basis as well as Distance Learning Modules quarterly and, in some cases, an Opportunity for Training Day (OTD).[37]

The US Airways manager of AQP stated that conducting the distance learning modules quarterly allowed the company to address hot topics in a timelier manner compared to doing one larger training module annually.

CQT was a 3-day course which included technical ground school (TGS), Continuing Qualification Maneuvers Observation (CMO) consisting of briefings and simulator scenarios, and Continuing Qualification Line Operational Evaluation (CLO) consisting of simulator sessions similar to line checks.[38] Under AQP, the CQT was revised yearly based on data and lessons learned from integrated data sources. A new CQT program was launched on May 1 of each year and was valid for one year. US Airways had a flight data analysis group that reviewed data from integrated data sources such as ASAP (Aviation Safety Awareness Program), FOQA (Flight Operations Quality Assurance), FAIR (Flight Airline Incident Report) reports and any other industry data that came in. That group reviewed the data to make recommendations to the Flight Operations Standards Board (FOSB) for training objectives. US Airways also held monthly curriculum development meetings to keep members of the FOSB informed of CQT development.

When asked how the training he received at US Airways helped him in the accident event, the captain stated the training "absolutely" helped because he was trained on fundamental values to "maintain aircraft control, manage the situation, and land as soon as the situation permits".

12.1 Bird Strike Avoidance Training

According to personnel in the US Airways training department, training for bird strikes was not included in the ground school curriculum or simulator syllabus.[39] A ground school instructor stated that bird strikes did come up in the lecture environment when pilots asked about "what if" scenarios. He said in these cases, instructors tried to answer the questions to the best of their knowledge. According to the Airbus fleet captain, he thought US Airways had a distance learning module related to bird strikes that had been used in the past but was airplane non-specific.

The vice president of Flight Operations Support & Services at Airbus stated in an interview that bird strike hazards were not specifically addressed in the Airbus training program. The topic was covered in a Flight Operations Briefing Notes (FOBN) titled "Operational Environment: Birdstrike Threat Awareness" which was available to all Airbus operators on the Airbus.com website.[40]

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[37] "OTD" refers to a scheduled CQT simulator session for pilots not eligible for, or not desiring a standard 12 month evaluation period. US Airways AQP vol. 1, p. 3-68
[38] US Airways Airbus 319/320/321 AQP/CQT Guide
[39] See attachment 6 – Charlotte Interviews
[40] See attachment 17

During training at Airbus, the use of exterior airplane lights was discussed in before takeoff SOP (standard operating procedure) as a method to help minimize bird strike hazards. Airbus included engine failure/damage scenarios in the flight simulator training curriculum, but did not specifically identify the scenarios as being caused by a bird strike.

12.2 Ditching Training

Ditching training at US Airways was covered on day 1 of qualification ground school and consisted of a PowerPoint presentation that reviewed the US Airways QRH DITCHING checklist.[41] The US Airways QRH DITCHING checklist assumes the "engines are running". The ground school also included training on airplane specific equipment and the use of slides, life vests, and life rafts, and training on airplane systems related to ditching. According to interviews and the US Airways Pilot Handbook Training Manual, the function and use of the ditching push button was discussed in ground school lecture and in the FTD (flight training device) in the QT curriculum, and pre-ground school SBT (scenario-based training) in the CQT curriculum.

The US Airways FOM TM included non-airplane specific guidance on ditching procedures and techniques. In addition, the FOM TM briefly discussed ditching when power was not available. Specifically, page 14-7 stated:

> **Power Not Available.** If no power is available, a greater than normal approach speed should be used until the flare. This speed margin will allow the glide to be broken early and gradually, decreasing the possibility of stalling high or flying into the water.
>
> If the wings of the aircraft are level with the surface of the sea rather than the horizon, there is little probability of a wing contacting a swell crest. The actual slope of a swell is very gradual. If forced to land into a swell, touchdown should be made just after the crest. If contact is made on the face of the swell, the aircraft may be swamped or thrown violently into the air, dropping heavily into the next swell. If control surfaces remain intact, the pilot should attempt to maintain nose up attitude by rapid and positive use of the controls.

Ditching scenarios were not included in the simulator training curriculum at either US Airways or at Airbus.

12.3 Dual Engine Failure Training

US Airways included training for dual engine failure in the A320 qualification curriculum. The dual engine failure training was conducted during simulator session 6 (T6) SPOT 2.[42]

According to interviews with US Airways training department personnel, the US Airways instructors used tools such as slide presentations and a virtual simulator to conduct briefings with a crew prior to the simulator session. During the prebrief, an instructor went through the QRH ENG

[41] See attachment 18
[42] See attachment 19

DUAL FAILURE checklist with the crew, providing training on the procedures contained in that checklist.

The dual engine failure T6 simulator scenario was initiated at FL250. The crew was led to attempt a windmilling relight of the engines. The scenario was designed, and the simulator programmed, so that the windmilling relight was not successful; leading the crew to start the APU and attempt an APU assisted restart of one of the engines. The scenario was completed after a successful relight of an engine using APU bleed air. In an interview conducted by the Operations/Human Performance Group, a US Airways instructor stated that the scenario was normally completed at about 8,000 feet msl (mean sea level).

The investigation revealed that the dual engine failure training conducted by Airbus was similar to the training included in the US Airways curriculum. Airbus dual engine failure training was included in Full Flight Simulator (FFS) session 5. The dual engine failure was initiated at FL 350 and the scenario included a windmilling relight attempt followed by an APU assisted restart of an engine. The training scenario was considered completed after the training crew restarted one engine.

Interviews conducted with personnel at Airbus and US Airways indicated that both considered the dual engine failure scenario to be a captain flying scenario based on the assumption that the F/O's flight instruments would be inoperative following the failure of both engines and the airplane being in the ELEC EMER (emergency electrical) configuration.

12.4 Autothrust Protections and Flight Control Laws Training

US Airways provided training on autothrust and angle of attack protections (including αprot) on days 5 and 9 of QT. Training consisted of two PowerPoint presentations presented during ground school training. In addition, autothrust, angle of attack protections, and flight control laws were demonstrated during simulator session T1 of QT. Information was also provided to pilots in the A319/320/321 Training Manual and the A319/320/321 Controls and Indicators Manual.[43]

12.5 Crew Resource Management and Threat and Error Management Training

US Airways provided crew resource management (CRM) and threat and error management (TEM) training to all pilots under AQP. According to the manager of AQP at US Airways, there was a module in basic indoctrination training which introduced pilots to CRM and TEM, the 6th generation of CRM.[44] He said this training was provided on a continuing qualification/recurrent basis in the classroom and in distance learning modules.

In addition, US Airways integrated CRM and TEM in to all aspects of training, from the ground school to the flight simulator. According to a US Airways instructor pilot, TEM "was based on the realization that pilots made mistakes and threat and error management was designed to find ways to prevent mistakes and correct errors". The TEM program offered by US Airways was built on a

[43] See attachment 20 – Flight Control Laws Training
[44] See attachment 6 – Charlotte Interviews

concept of three colors (red, yellow and green) or situation awareness markers that allowed pilots to say; "I'm no longer in the green".[45] Instructors worked with pilots to help them identify where they were with their situation awareness and task loading (the number of tasks to be completed divided by the amount of time available to complete them).

TEM at US Airways also focused on the ABCs - Assess what the situation is and/or threats are, Balance available barriers using policies, procedures and flows, checklists, automation, external resources, human factors, and knowledge of aircraft handling, Communicate effectively and understand callouts, and Standard operating procedures. Posters in classrooms and briefing rooms depict TEM and are encouraged for use during debriefings. According to the Airbus fleet captain, "debriefing was the most valuable portion of the training to make sure the pilots walked away with even higher levels of understanding and hopefully, correlation".

Instructor pilots focused on TEM during simulator sessions T7-T9. At the completion of an event, the crew's TEM was rated on a scale of 1 to 5 (1 = unsatisfactory, 5 = no errors). Session T9 was a Line Oriented Flight Training (LOFT) scenario that included two legs of flying and special airport training. At the completion of T9, a crew would be signed off for the Line Oriented Evaluation (LOE), the qualification check where pilots demonstrate their proficiency and get their type rating.

12.6 Training Program Evaluation

The US Airways Manager of AQP stated that the evaluation of the AQP training program included a continual review of information collected from integrated data sources and an annual review by an extended review team. The extended review team met each year in July and included members from US Airways, FAA AFS-230, and the US Airways Certificate Management Office. US Airways prepared a presentation for this meeting each year to provide an overview of data collected, highlight significant events, and to discuss any recommended changes.

13.0 Additional Information

13.1 Abnormal and Emergency Situations

A National Aeronautics and Space Administration (NASA) report published in June 2005 discussed the challenges of emergency and abnormal situations in aviation.[46] The report highlights that "some situations may be so dire and time-critical or may unfold so quickly" that pilots must focus all of their efforts on the basics of aviation – flying and landing the airplane – with little time to consult emergency checklists. Although pilots are trained for emergency and abnormal situations, it is not possible to train for all possible contingencies. Furthermore, while training under AQP

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[45] See attachment 21 – TEM Training

[46] B.K. Burian, I. Barshi, and K. Dismukes. *The Challenge of Aviation Emergency and Abnormal Situations*, NASA Technical Memorandum 2005-213462 (Moffett Field, California: National Aeronautics and Space Administration, 2005).

provides operators with greater flexibility than guidance provided under FAR Part 121 appendix H, operators are faced with time and financial constraints limiting the "range and depth" of the emergencies trained to those that are most common and for which the checklist procedures work as expected.

Also limited is the ability of the simulations to replicate real world emergency and abnormal situations and demands. The report, however, stresses that training for these situations do benefit pilots and a review of voluntary reports filed on the Aviation Safety Reporting System (ASRS) indicated that over 86 percent of "textbook emergencies" (i.e., those in which a good checklist exists) were handled well by flight crews. Unfortunately only about seven percent of non-textbook emergencies were handled well by flight crews.

One reason for this is that human capabilities are limited. One study found that underlying errors made in response to emergency and abnormal situations were the result of normal cognitive limitations experienced by humans when faced with stress, concurrent task demands, and time pressure.[47] This can in turn lead to distractions from cockpit duties.[48] The reason for this is that identifying the problem and selecting the appropriate procedure requires extensive attention from the flight crew. In addition, because flight crews have limited opportunities to practice abnormal situations, performing the appropriate procedures requires greater effort and concentration. Finally, abnormal or emergency situations lead to flight crews narrowing their attention and becoming cognitively rigid, which can reduce the crew's ability to analyze and resolve the situation.

13.1.1 Ditching Reviews in the Literature

The US Department of Transportation (DOT) report "Transport Water Impact and Ditching Performance,"[49] dated 1996, stated that between 1959 and 1991, there were 1 planned (ditching[50]) and 13 unplanned water landings[51] worldwide by transport category aircraft. Similar findings were presented in the FAA report, "Study on Transport Airplane Unplanned Water Contact."[52] From the review, the DOT report concluded that a majority of water related mishaps occur during takeoff, approach and landing, when an airplane is in close proximity to the airport. It was also found that most water related accidents result in fuselage separation and/or crush, to some degree, which could impact passenger safety and evacuation.

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[47] R.K. Dismukes, B.A. Berman, and L. Loukopoulos, *The Limits of Expertise: Rethinking Pilot Error and The Causes of Airline Accidents*, (Aldershot, United Kingdom: Ashgate Publishing Company, 2007).

[48] K. Dismukes, G. Young, and R. Sumwalt, "Cockpit Interruptions and Distractions," *ASRS Directline*, vol. 10 (1998), pp. 4-9.

[49] A.A. Patel and R.P. Greenwood, Jr., *Transport Water Impact and Ditching Performance*, DOT/FAA/AR-95/54 (Washington, DC: Department of Transportation, 1996).

[50] "Ditching" refers to a landing as the result of planned water contact in which the touchdown rate must be ≥ 5 feet/second and the longitudinal and vertical loads are within the design parameters of the aircraft. Occupants also have several minutes of preparation time prior to impact and injuries are less severe.

[51] "Unplanned water landings" refers to a landing in which aircraft velocities, forces and damage are high. In addition, occupants have minimal, if any, time to prepare, and injuries are severe.

[52] R. Johnson, *Study on Transport Airplane Unplanned Water Contact*, DOT/FAA/CT/84-3 (1984).

A review of US civil aircraft operating between 1979 and 1983 revealed 214 ditchings.[53] Of these, 16 percent resulted in fatalities. Furthermore, 63 percent of ditchings occurred during non-overwater operations.

A document published by the US Coast Guard states that for ditchings that occur when no power is available, the approach speed used should be greater than normal down to the flare.[54] It continues that this will provide the pilot with a speed margin to break the glide earlier and more gradually, thus allowing the pilot time and distance to "feel for the surface." It is also stated that when no power is available to the airplane, using flaps may result in the airplane flying at a lower nose attitude and descending more steeply, and flaps may also make it more difficult for the pilot to judge the flare.[55] The author notes that the benefits achieved when using flaps, such as a lower stall speed, should be weighed against the challenges associated with using flaps.

13.2 Flight Crew Coordination

Coordination involves the ability of crewmembers to incorporate and synchronize the tasks required of them in a correct and timely manner,[56] and requires optimal effort from all crewmembers in order to work effectively. When crews share an understanding of the tasks (what they are and how to accomplish them), research indicates that this leads to improved and more efficient communication, which is critical during periods of high workload.[57]

The accident captain was asked to describe the crew coordination between him and the F/O during the accident event. The captain said it was amazingly good considering how suddenly the event occurred, how severe it was, and the little time they had. The captain said he did not have time to exchange words but through observations of the event and hearing the F/O say things, the captain knew that the F/O knew what he had to do. The captain was immediately aware that he and the F/O were on the same page and the F/O was doing his part. The F/O made similar statements indicating that he and the captain each had specific roles and knew what each other was doing and they interacted when they needed to. The captain credited the CRM training provided at US Airways that gave them the skills and tools that they needed to build a team quickly and open lines of communication, share common goals and work together.

13.3 Naturalistic Decision Making

Naturalistic decision making refers to how people make decisions, using their expertise and prior experiences, in real-world settings.[58] The recognition-primed decision making (RPD) model is a

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[53] R.L. Newman, "A Case History and Review of the Record," *SAFE Journal*, vol. 18, no. 1 (1988), pp. 6-15.
[54] "Aircraft Emergency Procedures Over Water," USCG CG-306; USAF AFM-64-6; Army FM-20-151; USN OPNAV INST 3730.4A, November 1968
[55] Newman, 1988
[56] J.A. Cannon-Bowers, S.I. Tannenbaum, E. Salas, and C.E. Volpe, "Defining Team Competencies and Establishing Team Training Requirements," in R. Guzzo, E. Salas, & Associates, eds., *Team Effectiveness and Decision Making in Organizations* (San Francisco: Jossey-Bass, 1995), pp. 333-380.
[57] R.J. Stout, J.A. Cannon-Bowers, E. Salas, and D.M. Milanovich, "Planning, Shared Mental Models, and Coordinated Performance: An Empirical Link is Established," *Human Factors*, vol. 41, no. 1 (1999), pp. 61-71.
[58] C.E. Zsambok, "Naturalistic Decision Making: Where Are We Now?," in C.E. Zsambok and G.A. Klein, eds.,

technique used by experts to come rapid decision when faced with complex situations.[59] To help them make decisions, experts proceed through the RPD process: (1) cues in the environment are identified to help them recognize patterns, (2) patterns activate action scripts from memory of past similar experiences, (3) action scripts are assessed through mental simulation (playing through 'what if' scenarios), and (4) a decision made and executed based on the best available options.

RPD reveals a critical difference between experts and novices when presented with recurring situations.[60] Experts in general will make quicker decision because the situation may match a prototypical situation they have encountered before. Novices, lacking this experience, must cycle through different possibilities, and tend to use the first course of action that they believe will work. The inexperienced also have the tendencies of using trial and error through their imagination.

Interviews with the flight crew focused on decisions made during the accident sequence (see also section 13.4 "Landing Strategy"). For example, when asked about his decision to use flaps 2 versus flaps 3 as called for in the ENG DUAL FAILURE checklist, the captain stated that there were operational advantages to using flaps 2 that became obvious to him. He was concerned about having enough energy remaining to successfully flare the airplane and reduce the rate of descent sufficiently for landing. He knew that going to flaps 3 would not give him much more of an advantage in terms of lowering the stall speed, and drag would have increased. From his experience, flaps 2 would give him a slightly higher nose attitude when landing, but felt that in the accident situation, flaps 2 was the optimum setting.

13.4 Checklist and Procedure Design for Emergency and Abnormal Situations

Researchers at NASA have studied the implications of emergency/abnormal situations in aviation on checklist and procedure design.[61] While it is noted that it is not possible to develop a checklist and procedure for all possible contingencies, the report highlights the importance of having emergency/abnormal situation checklists or procedures for "for all phases of flight in which they might be needed". Furthermore, emergency/abnormal checklists and procedures must include the necessary information and steps to respond appropriately.[62] The report states that when designing for emergency/abnormal situations, attention should be paid to the wording, organization and structure of the checklist and procedures to make sure they are easy to use, clear, and complete for flight crews. As attention narrows during emergency/abnormal situations due to increased workload and stress, checklists and procedures should minimize the memory load on flight crews, and some airlines and manufacturers are reported to have reduced the number of memory items that flight crews are required to memorize.

Naturalistic Decision Making (Mahwah, NJ: Erlbaum, 1997), pp. 3-16.

[59] G. Klein, *Intuition at Work*, (New York: Currency Doubleday, 2003).

[60] E. Salas and G. Klein, eds., *Linking Expertise and Naturalistic Decision Making*, (Mahwah, NJ: Lawrence Erlbaum Associates, 2001).

[61] Burian, Barshi, and Dismukes, pp. 8-11.

[62] B.K. Burian, R.K. Dismukes, and I. Barshi, "The Emergency and Abnormal Situations: A Review of ASRS Reports", in R. Jensen, ed., *Proceedings of the 12th International Symposium on Aviation Psychology*, (Dayton, OH: Wright State University Press, 2003).

Checklist developers face a dilemma of developing a checklist that is not cumbersome but that is also complete. Short checklists offer an increased likelihood that crews can complete all pertinent items related to the emergency or abnormal without distracting crews from other cockpit duties. However, accidents and incidents have shown that flight crews can become so fixated on the emergency/abnormal that routine items (e.g., configuring for landing) are overlooked. For this reason, emergency and abnormal checklists include reminders for flight crews of items that may be forgotten. Additionally, flight crews can lose their place in checklists if they are required to alternate between various checklists or are distracted by other cockpit duties, however, combining checklists can result in lengthy procedures that are difficult to follow.

13.5 Landing Strategy

Ditching the airplane into the Hudson River was considered by the crew to be the safest option for a forced landing. The captain stated in his interview that based on the flight's position, altitude, airspeed, heading away from the airport, and the amount of time it took to stabilize the airplane and analyze the situation, returning to LGA was not possible.[63] The captain stated that returning to LGA would have been an "irrevocable choice" and if he had attempted to land there and realized that he could not, he would have had no other landing options. He stated that before he would make the decision to land on a runway, he would need to be sure that he could make it without landing short or long, he could line up the flight path with the runway, he could stay on the runway, and that he would have a sink rate that was survivable and would not collapse the landing gear and create a post crash fire. He stated that he could not afford to make the wrong decision and he was confident that he could make a successful water landing. The F/O stated in his interview that the crew discussed returning to LGA but it was far away at the decision making point and the airplane was coming down fast.

Regarding attempting to land at TEB, the captain stated they were "too far away, too low and too slow" and the only other option that was long enough, smooth enough and wide enough was the Hudson River. The F/O stated that TEB did not look viable and appeared too far away. He said "if the image is rising in the windshield you aren't landing there" and the only other option was straight ahead down the river.

14.0 Procedures and Checklist Development

Airbus had a Continuous Improvement Process within the Flight Operations Support & Services department that worked closely with the training department and had direct relations with the airlines.[64] The Continuous Improvement Process received input from the flight crew training symposium, in-service difficulty reports and event reports and based on this information, Airbus would evaluate whether or not a change was needed to existing procedures.

The typical process for a change was that a draft proposal would be sent to the training department for review, which sometimes included testing in a flight simulator. In the case of an

[63] See attachment 1 – Flight Crew Interviews
[64] See attachment 3 – Airbus VP Flight Operations Support and Services Interview

abnormal procedure, the procedure would be evaluated in the simulator by a training captain during the first stage of the proposal. The Airbus Flight Operations Support & Services department had 10 pilots in the department, four of whom were qualified as test pilots and who would conduct the simulator sessions. Following this, the proposal would proceed through a formal evaluation process with an operational evaluation panel consisting of personnel from the training department, flight department and flight safety personnel within Airbus. The evaluation panel would approve or disapprove requested changes and the vice president of Flight Operations Support & Services at Airbus would be in charge of the new procedure. Additional testing with a test pilot group would be conducted to determine that all steps in the procedure were written correctly before the change was implemented.

Airbus would send details of the new procedures to the operators, publish the information on Airbus World, and communicate in meetings, conferences, and in the manual revision the reason for the change as well as a description of the change. After operators reviewed the procedures, they would present questions or comments that would be reviewed by Airbus. The new procedures would be used in training and Airbus received immediate feedback from the training department about the efficiency of the procedures.

Airbus did not have direct access to operators' documentation but they conducted 30-40 visits to operators each year. During the visits Airbus discussed with management, the documentation the operator used and how they incorporated the Airbus manuals in their programs. Airbus had no authority to make sure the operators used Airbus issued materials in their manuals, and it was up to the operator and the regulatory authority that approved the operators' manuals.

In 2004, Airbus made a change to the ENG DUAL FAILURE checklist procedure. The main improvement was to institute two parallel steps – one for a fuel remaining scenario and the other for a no fuel remaining scenario where no relight could be reattempted. In addition, the change included merging different procedures that were located in different locations in to one checklist. The ENG DUAL FAILURE checklist became a "stay in checklist" that could be used by crewmembers without the need for them to use other checklist procedures. These changes were made as a part of the Continuous Improvement Process at Airbus and were based on a review of accident reports in which crewmembers stated it was not easy to jump from one procedure to another. This change process took several months to complete and the new procedure became effective in 2005. Airbus made a 30 minute presentation in 2004 to operators regarding changes to the ENG DUAL FAILURE checklist procedure.

The ENG DUAL FAILURE checklist was developed for the occurrence of a dual engine failure at high altitudes above 20,000 feet. According to Airbus, the ENG DUAL FAILURE checklist procedure was developed based on the highest probability in time of exposure that a dual engine failure would occur. The probability of a dual engine failure occurring at low altitude was very low and the discussion of a low altitude ENG DUAL FAILURE checklist was not specifically addressed.

15.0 FAA Oversight

The FAA Certificate Management Office (CMO) for US Airways was located in Coraopolis, Pennsylvania. At the time of the accident, there was one aircrew program manager (APM) assigned to the US Airways Airbus fleet and one assistant APM who was in training.[65]

Interviews conducted with the APM indicated that there were five aviation safety inspectors (ASI) who assisted him with oversight of US Airways Airbus training and operations. Oversight activity included surveillance and observation of flight crew members, instructors, check airmen, and aircrew program designees (APD) in training, checking, and line operations. In addition, the APM stated that he was also assigned some Element Performance Inspections through the Air Transportation Oversight System (ATOS).

The APM said that he spent the majority of his time overseeing the APD's while the inspectors assisting him spent more time observing training activities. According to interviews, each inspector or APM conducted, on average, two or three surveillance activities per week at US Airways.

The principle operations inspector (POI) for US Airways was stationed at the CMO in Coraopolis, PA. Interviews conducted with the POI[66] indicated that there were also three assistant POI's assigned to the US Airways certificate. US Airways and America West Airlines had merged a few years prior and all oversight was then managed from the CMO in Pennsylvania.

The POI said that he did not normally conduct surveillance activities himself but had oversight of the APM's and operational programs for each fleet at US Airways. The POI stated that he had daily interaction with the APM's.

The POI was responsible for the approval of amendments to training and operational procedures manuals at US Airways. The POI stated that he required a review and recommendation by the APM's prior to approving any amendments. In addition, any airplane specific procedures were compared to the manufacturer's recommended procedures, and changes to non-normal procedures were coordinated with the certification office before approval. US Airways conducted training under the AQP and any change to the training program or training manuals was coordinated with FAA AFS-230 before approval was granted.

Submitted by:

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[65] See attachment 4 – APM and POI Interviews
[66] See attachment 4 – APM and POI Interviews