U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

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February 23, 2009

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Aviation

FROM: Subcommittee on Aviation Staff

SUBJECT: US Airways Flight 1549 Accident

PURPOSE OF HEARING

The Subcommittee will meet on Tuesday, February 24, 2009, at 10:00 a.m. in room 2167 Rayburn House Office Building to receive testimony on the US Airways Flight 1549 Accident.

BACKGROUND

On January 15, 2009, US Airways Flight 1549 ditched[1] into the Hudson River at approximately 3:30 p.m. following a double-engine failure while en route to Charlotte Douglas International Airport. There were 150 passengers onboard the Airbus A-320 (N106US), in addition to the following five flight crew: Captain Chesley "Sully" B. Sullenberger III, First Officer Jeffrey Skiles, and flight attendants Sheila Dail, Doreen Welsh, and Donna Dent. Approximately 90 seconds after Flight 1549 departed LaGuardia International Airport ("LGA"), Captain Sullenberger reportedly experienced a double-bird strike on both CFM56-5B/P engines at approximately 2,700 feet above sea level,[2] causing loss of thrust and power in both engines.[3] During this time, Captain Sullenberger communicated with Air Traffic Control Specialist, Patrick Harten, at the New York TRACON LaGuardia Departure Facility regarding the status of Flight 1549.[4]

Captain Sullenberger reported that following the bird strike he took control of the aircraft from First Officer Skiles. Captain Sullenberger conferred with air traffic control ("ATC") to ascertain immediate landing sites. The first option contemplated was to return back to LGA; the

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[1] Ditching is a prepared emergency landing in water.
[2] Telephone conversation with NTSB officials (Feb. 17, 2009).
[3] *60 Minutes* (CBS television broadcast Feb. 8, 2009).
[4] FAA Memorandum from the New York Terminal Radar Approach Control Facility to the Aircraft Accident File (Feb. 2, 2009) (On file with author).

second was to land at Teterboro Airport in New Jersey. Mr. Harten communicated with 14 entities, including other aircraft in the vicinity and controllers at other ATC facilities to hold aircraft and to assist Flight 1549 in landing.[5] Meanwhile, the pilots ran through their dual-engine failure checklist.[6] They attempted to restart the engines and regain power in the aircraft, but the engines did not restart.

When it became apparent that they would have to ditch the aircraft, Captain Sullenberger announced to the flight attendants and passengers that they should brace for impact. Passengers reported that after this announcement was made, the flight attendants began to shout instructions to passengers in unison – "heads down, stay down." The pilots then landed the aircraft smoothly in the Hudson River. From there, reports from passengers and crew indicate that the evacuation was fairly orderly. Passengers filed out onto the aircraft wings and into the raft slides on both the right and left front of the aircraft. Within minutes after the water landing, ferry boats, police boats, and the U.S. Coast Guard rescued all 155 people. Four were injured, including Flight Attendant Welsh.

The National Transportation Safety Board ("NTSB") responded to investigate the accident scene, and its investigation is ongoing. On February 4, 2009, the NTSB announced that organic samples were recovered from the engines and were sent to the U.S. Department of Agriculture ("USDA") for a DNA analysis to gain information about the bird(s) species.[7] One feather was recovered from a wing and was sent to the Smithsonian Institution's National Museum of Natural History for bird identification, and was recently confirmed to be a Canada Goose.[8]

I. Pilot and Crew Procedures for Emergency Landings

Pilots and flight attendants have specific responsibilities when preparing an airplane and passengers for an emergency landing. In the cockpit, pilots communicate with ATC and attempt to land the airplane safely. The level of communication between the pilots and the flight attendants varies depending on the complexity of the situation and the workload level in the cockpit. If a crash is imminent, the pilot notifies the flight attendants so that they can ensure that able-bodied passengers are seated in the exit rows. (If there is not enough time to notify the flight attendants separately, the pilot may make an announcement to the entire cabin, as was the case with Flight 1549.) As the landing nears, flight attendants shout instructions to passengers in unison. Following landing, flight attendants assist in opening exits and evacuating passengers onto raft slides, and pilots also assist in evacuation.

In a crash, passengers must be evacuated within 90 seconds since a post-crash fuel-fed fire can quickly engulf an aircraft. An important component of an aircraft's airworthiness certification is that each air carrier must be able to show that "each type and model of airplane with a seating capacity of more than 44 passengers . . . allows the evacuation of the full capacity, including crewmembers, in 90 seconds or less."[9] This must be demonstrated with only one half of the

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[5] Ibid.

[6] These checklists differ by airline and plane type. The airplane manufacturer submits a suggested dual-engine failure checklist to the airline. The airline compiles a checklist that it wants to adopt and submits it to FAA for approval.

[7] NTSB, Advisory: Third Update on Investigation into Ditching of US Airways Jetliner into the Hudson River (Feb. 4, 2009).

[8] NTSB, Advisory: Fourth Update on Investigation into Ditching of US Airways Jetliner into the Hudson River (Feb. 12, 2009).

[9] 14 C.F.R. § 121.291(a) (2008).

emergency exits.[10] According to the FAA, the A-320 was certified for ditching. If aircraft certification with ditching procedures is requested, the requirement for evacuation is that the manufacturer must show, "under reasonable probable water conditions, the flotation time and trim of the airplane will allow the occupants to leave the airplane and enter the liferafts."[11]

II. Crew Training

Commercial pilots and flight crew undergo many different kinds of training that are governed by federal regulations, Federal Aviation Administration ("FAA") advisory notices, and U.S. airline policies. Pilots' and flight attendants' training, as provided by air carriers, includes indoctrination, initial, transition, recurrent (every 12 months), and emergency. Every 24 months, crewmembers all must go through recurrent, emergency hands-on training. This training must provide instruction in emergency assignments and procedures; location, function and operation of emergency equipment – including equipment used in ditching, fire extinguishers, emergency exits, etc; and instruction on handling emergency situations. Recurrent training includes: cockpit preparation and procedures; crew coordination; passenger briefing and cabin preparation; donning and inflation of life preservers; use of life-lines; and boarding passengers and crew into a raft or slide.[12] Pilots and flight attendants are not required to undergo a ditching simulation. In addition to the training that airlines are required to provide, the Civil Aerospace Medical Institute ("CAMI") offers a 1-day physiology training course for U.S. civil aviation pilots and flight crews that covers psychological flight stresses, training for flight conditions in emergency situations, and physical effects of air travel in varying challenging situations.[13]

FAA also requires pilots and flight attendants to undergo Crew Resource Management ("CRM") training. CRM focuses on improving communications between the pilots and crew, while taking into account human factors, hardware, and information. CRM also focuses on "situation awareness, communication skills, teamwork, task allocation, and decisionmaking within a comprehensive framework of standard operating procedures" with the goal of preventing accidents and dealing with stressful situations by improving performance through enhanced coordination.[14] Air carriers are required to provide CRM training. Joint flight attendant and pilot training for CRM is not required by regulation, but FAA reports that many airlines have been practicing it for many years. Joint training is useful for gaining mutual understanding of the issues that affect different groups and the specialized training that each receives. CRM exercises are also useful in reconciling incompatible training practices.[15]

On January 12, 2009, FAA issued a Notice of Proposed Rulemaking ("NPRM") to overhaul specific crew training requirements. The primary purpose of the NPRM is to establish new requirements for traditional air carrier training programs to ensure that safety-critical training is included. The rulemaking is part of the FAA's efforts to reduce fatal accidents in which human error was a major contributing cause. Some of the training requirements proposed are to require: training and evaluating flight crewmembers in a complete flight crew environment; the use of flight

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[10] 14 C.F.R. § 121 Appendix D (2008).
[11] 14 C.F.R. § 25.801 (2008).
[12] 14 C.F.R. § 121.417 (2008).
[13] FAA, Airman Education Programs (May 6, 2008), http://www.faa.gov/pilots/training/airman_education/aerospace_physiology/.
[14] DOT/FAA, Crew Resource Management Training, AC 120-51E (Jan. 22, 2004).
[15] Ibid.

simulation training devices ("FSTD") for training, testing, and checking flight crewmembers; additional training and practice in the use of CRM principles; training in an FSTD with a complete flight crew; flight attendants to complete "hands on" performance drills using emergency equipment and procedures every 12 months; flight attendants to complete operating experience by aircraft type; and trained and qualified flight attendant ground instructors and evaluators.[16] According to the proposal, FSTD will allow for more in-depth training in a safer environment. FSTD have become a widely-used tool to simulate real life situations that may not have otherwise been possible and to optimize human performance and reduce human error.[17] FSTD are not often used to simulate ditching situations. The NPRM's training enhancements include academic training, known as "ground training" and job performance training, known as "flight training".

III. Crash Survivability

U.S. airline fatalities have fallen, and crash survival rates have increased as safety has improved.[18] According to aerospace researchers, "[t]he most important factor affecting the survivability of an aircraft accident is the evacuation efficiency of the passengers and crew on board."[19] According to the NTSB, "[s]urviving an accident is the result of many factors," including "cabin structural integrity, seat belts, seat design, child restraint systems, and brace positions." CAMI conducts research on many aviation issues, including crash survivability, the best evacuation patterns, the best size of exit rows, and seat cushion design and techniques for use. The FAA William J. Hughes Technical Center has conducted research into crashworthiness, active vibration control, and fire protection.

Research and NTSB recommendations have led to airplanes designed to be more resilient to disasters. According to the NTSB, the following airplane design features can all assist in allowing passengers to escape after an accident: "fire retardancy, exit design, aircraft configuration, and evacuation procedures."[20] Other improvements in design contributing to survivability are: "fire detection and suppression systems in lavatories and cargo compartments, modifications in cargo compartments to delay fires from spreading, and fire blocking of cabin and seat materials that also prevent fires from spreading, . . . floor level escape lighting systems, heat resistant slides, . . . and improvements for the crashworthiness of passenger seats."[21] The NTSB also notes that passenger education, such as preflight briefings and safety cards, plays a large role in increasing occupant survival. Additionally, as a result of psychological research, flight attendants are trained to shout orders to passengers repeatedly in unison so that passengers understand what to do.

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[16] Qualification, Service, and Use of Crewmembers and Aircraft Dispatchers, 74 Fed. Reg. 1280 (proposed Jan.12, 2009) (to be codified at 14 C.F.R. pts. 65, 119, 121 et al.).

[17] Ibid.

[18] Bureau of Transportation Statistics, Annual Report (2007).

[19] Z. Xue, & C.L. Bloebaum, A Particle Swarm Optimization-Based Aircraft Evacuation Simulation Model – *Vacate Air,* American Institute of Aeronautics and Astronautics, at 1 (Jan. 7-10, 2008).

[20] NTSB, Safety Report: Survivability of Accidents Involving Part 121 U.S. Air Carrier Operations, PB2001-917001, at 19 (Feb. 21, 2001).

[21] Ibid.

IV. Bird Strikes

As aircraft traffic has increased, so too have wildlife "strikes," or collisions. Populations of many large bird species have also increased. There were 82,057 reported bird strikes from 1990-2007, with 7,439 in 2007 alone.[22] According to the U.S. Department of Agriculture's Wildlife Services ("USDA/WS"), "[w]ildlife strikes cause more than 550,000 hours of aircraft downtime and cost U.S. civil aviation in excess of $500 million every year." Approximately 97 percent of wildlife strikes are bird strikes.[23] Historical data illustrates that most bird strikes (62 percent) occur during the day and most (60 percent) occur during the landing, approach, or landing roll phase of flight. FAA collects bird strike data primarily from voluntary reports submitted by airline operators, pilots, tower operators, and airport operators and personnel.[24] Most bird strikes also occur fairly close to the ground. Sixty percent of bird strikes occurred at 100 feet or less above ground level ("AGL"), 73 percent at 500 feet or less AGL, and 92 percent at 3,000 feet or less AGL.

ATC is required to report unsafe runway or airport conditions to airport personnel. Controllers issue advisories from information obtained from pilot- or controller-reported, or radar-observed bird activity. Controllers must also report information to flight service stations when the wildlife could affect safety. Likewise, pilots are encouraged to report unsafe conditions to ATC.

Engine Design and Testing. Commercial air carriers are replacing older aircraft with newer airplanes that have more technologically advanced engines. The engine bird ingestion requirements (e.g., bird size and numbers) vary based on the size of the engine inlet. When ingesting bird(s) of a particular size and weight as set forth by the regulations, the engine should be designed to prevent a "hazardous engine effect," such as significant power loss or the inability to shut the engine down.[25]

Airport Bird Mitigation Strategies. Wildlife is attracted to airports when a desirable habitat is present, including available food, water, shelter, and nesting areas. USDA/WS offers consultation and management assistance to airports to assess wildlife problems, improve safety, and reduce wildlife hazards. FAA also has a staff biologist.

Under FAA regulations for airport certification and operation, airports must conduct wildlife hazard assessments when there is a multiple-wildlife strike, engine wildlife ingestion, or substantial damage to an aircraft from striking wildlife.[26] The assessment must be completed by a wildlife damage management biologist. The USDA/WS reports that it has over 300 such biologists that assist airports with assessments and mitigation plans.[27] Once the assessment is completed, the airport is required to submit a mitigation plan to the FAA Administrator for approval and determination of the need for a wildlife hazard management plan by looking at a variety of factors, such as airport size and activity and the breadth of the wildlife problem. If the Administrator

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[22] Only about 20 percent of strikes involving civil aircraft are reported and only about 44 percent of reported strikes identify the wildlife species group responsible.

[23] USDA/WS, Strike One—You're Out! Wildlife Services Helps Reduce Wildlife Conflicts at Airports (Aug. 2006).

[24] DOT/FAA and USDA/WS, Wildlife Strikes to Civil Aircraft in the United States 1990-2007, at 16 (June 2008).

[25] 14 C.F.R. § 33.75-6 (2008). Manufacturers report that in engine testing, they use dead birds (that are humanely killed), which are typically obtained through federal agencies or commercial sources. The regulations do allow engine manufacturers to use substitute objects, such as a gelatin bird, which mimic the size, weight, and density of a real bird. The bird(s) are shot through devices into the engine at the most critical velocity, engine speed, and location.

[26] 14 C.F.R. § 139.337 (2008).

[27] USDA/WS, phone conversation (Feb. 17, 2009).

determines that a mitigation plan is needed, the airport will develop such a plan, and submit it back to the Administrator for approval before it can begin implementation. The airport will then include the plan in its Airport Certification Manual.

Plans have to take into account varying complexities of federal, state, and local government statutes and policies. For example, the U.S. Fish and Wildlife Service ("USFWS") is responsible for conservation of migratory bird populations, and threatened and endangered species. USFWS renders opinions on proposed activities that might impact these populations and habitats. The U.S. Environmental Protection Agency ("EPA"), state EPAs, local governments and zoning boards are responsible for landfill permitting.[28] Migratory birds are protected by federal law, including their nests and eggs, so doing anything to affect those populations would have to be permitted through USFWS. A key to successful mitigation is understanding the various bird populations. Examples of mitigation strategies and factors that an airport takes into account when developing bird mitigation plans are: waste disposal facility coordination; protection of approach or departure airspace (5 miles is recommended); eliminating accessible above-ground water sources; aircraft flight schedule modification; habitat modification and exclusion techniques to make the area uninviting or inaccessible; repellent and harassment techniques, like pyrotechnics, runway sweeps, chemical repellants, radio-controlled model aircraft; wildlife removal; use of nonlethal projectiles; and trapping or destroying eggs and nests.[29]

Since fiscal year 2007, FAA has funded $2.5 million per year for research on wildlife hazard mitigation. FAA's Airport Improvement Program can be used for capital improvements to reduce wildlife hazards if the actions are designed to produce long-term solutions. Capital improvements include habitat modification and the purchase of bird hazard reduction equipment.

Bird Radar Detection. Radar detection devices have been in development for many years. The concept for a radar device is that it scans the runway and above ground level to detect birds, that information is sent to ATC, which then provides automated monitoring and alerting to the controller. The radar devices would be placed at the ends of major runways. Another component of the system would show ATC the risk in the runway vicinity taking into account many factors, like environmental changes, and the size of the bird(s) in the area. The U.S. Air Force uses radar detection at some bases, and National Aeronautics and Space Administration is currently using bird radar technologies for space shuttle launches. One manufacturer of such technology estimates that an airport can purchase its entire radar system for between $500,000 and $1.5 million. FAA is evaluating experimental bird radars at Chicago O'Hare, Dallas/Fort Worth, and Seattle-Tacoma airports under its Airport Technology Research Program. FAA asserts that more testing is required to ensure that the radar is operationally effective. Some companies dispute that and say that the technology is ready.

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[28] E. C. Cleary & R. A. Dolbeer, Wildlife Hazard Management at Airports: A Manual for Airport Personnel (July 2005).
[29] Ibid.

WITNESSES

PANEL I

Captain Chesley B. Sullenberger, III
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First Officer Jeffrey B. Skiles
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Flight Attendant Sheila Dail
US Airways, Inc.

Flight Attendant Donna Dent
US Airways, Inc.

Flight Attendant Doreen Welsh
US Airways, Inc.

Mr. Patrick F. Harten
Air Traffic Control Specialist
New York Terminal Radar Approach Control

PANEL II

The Honorable Robert L. Sumwalt, III
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Accompanied by:
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National Transportation Safety Board

Ms. Margaret Gilligan
Associate Administrator for Aviation Safety
Federal Aviation Administration

Captain John Carey
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US Airline Pilots Association (USAPA)

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