Testimony of the Honorable Deborah A.P. Hersman
Chairman
National Transportation Safety Board
Before the
Committee on Commerce, Science & Transportation
United States Senate
Hearing on
Aviation Safety: FAA's Progress on Key Safety Initiatives
Washington, DC
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Good afternoon Chairman Rockefeller, Ranking Member Thune and Members of the Committee. I appear before you today during the safest period of U.S. commercial aviation history. Although significant technological advances, new and important statutory mandates and regulatory changes, and more comprehensive crew training have greatly contributed to aviation safety, it was not that long ago—36 years ago last month—that the world's most deadly aviation accident occurred in Tenerife, Canary Islands, when two jumbo jets collided on the airport runway, killing a total of 583 passengers and crewmembers. Since that disaster, the aviation industry has made steady progress in improving safety and advancing technology quickly. There have been significant technological advances, new and important statutory mandates and regulatory changes, and more comprehensive crew training—all greatly contributing to the current level of aviation safety.

Yet, also at this time the National Transportation Safety Board (NTSB) is investigating a battery incident that led to the grounding of the 787 fleet by the Federal Aviation Administration (FAA). (The FAA has not grounded a fleet since 1979.) Concurrent investigations of two separate, but similar incidents involving 787 batteries are occurring in the United States and Japan—the coordination and sharing of information with our international investigative partners is going well.

Today, I will discuss current aviation safety issues being addressed by the NTSB, including our continuing investigation of the Boeing 787 battery smoke and fire event in Boston, airport surface operations, general aviation safety, helicopter emergency medical service (HEMS) operations, pilot training and distraction, flight and duty time, and the recent Memorandum of Understanding between the NTSB, FAA, and various aviation industry organizations to share deidentified aggregate safety information to help prevent accidents.

The NTSB's Most Wanted List and Aviation Safety

The annual Most Wanted List identifies the NTSB's top advocacy priorities for improving transportation safety. The current list identifies the following five aviation safety-related issues:

- Improve Safety of Airport Surface Operations, discussed further below
- Improve General Aviation Safety, also discussed below

- Improve Fire Safety in Transportation
- Preserving the Integrity of Transportation Infrastructure
- Eliminate Distraction in Transportation, also discussed below

For the aviation safety issues identified in its Most Wanted List, the NTSB continues to work with the FAA, manufacturers, operators, labor organizations, airports, and aviation safety organizations to reduce the safety risks to the traveling public, crewmembers, and others. Also, although NTSB data show that it has classified 113 of its Recommendations to the FAA regarding safety issues identified in various NTSB Most Wanted Lists as "Open-Unacceptable Response," the FAA has made steady progress in reducing the number of its overall open safety recommendations. During calendar year 2012, the FAA reduced by 7.7% its total number of NTSB open safety recommendations, and during the first three months of 2013 the FAA has further reduced the number of open safety recommendations by 4.5% compared to end of 2012. I am also heartened that Administrator Huerta has made the FAA's reduction in the number of open NTSB safety recommendations a major priority for the agency.

Boeing 787 Battery Fire and Smoke Incident at Boston's Logan International Airport

On January 7, 2013, a Japan Airlines (JAL) Boeing 787 was parked at the gate at Boston's Logan International Airport after completing a flight from Narita, Japan, when a member of the cleaning crew discovered smoke in the rear of the cabin. At about the same time, a maintenance manager in the cockpit observed the automatic shut down of the auxiliary power unit (APU), which was providing power to the aircraft at the time. A mechanic opened the rear electronic equipment bay, which is only accessible from outside the aircraft, and reported finding heavy smoke in the compartment and flames coming from the front of the APU battery case which housed a lithium ion battery. Airport firefighters were called to the plane and worked to contain the heat generated by the battery for 1 hour and 40 minutes.

Figure 1. Smoke emanating from the aft electronic equipment bay. Source: *Boston Herald*.

As indicated above, fire safety was placed on the NTSB's Most Wanted List of transportation safety improvements in November 2012. For that reason, among others, the NTSB responded to the JAL event by sending investigators to evaluate the aircraft in Boston. About a week later, a similar event occurred while an All Nippon Airways 787 was in flight over Japan. The NTSB is investigating the JAL event and the Japan Transport Safety Board (JTSB) is investigating the ANA event, however both agencies are cooperating and sharing investigative information.

The lithium ion battery is comprised of 8 cells, and the nominal charge of each cell is 3.7 volts. Flight data recorder data show that about 36 seconds before the APU shut down, the voltage began to fluctuate and dropped from a full charge of 32 volts to 28 volts 7 seconds before the shutdown.

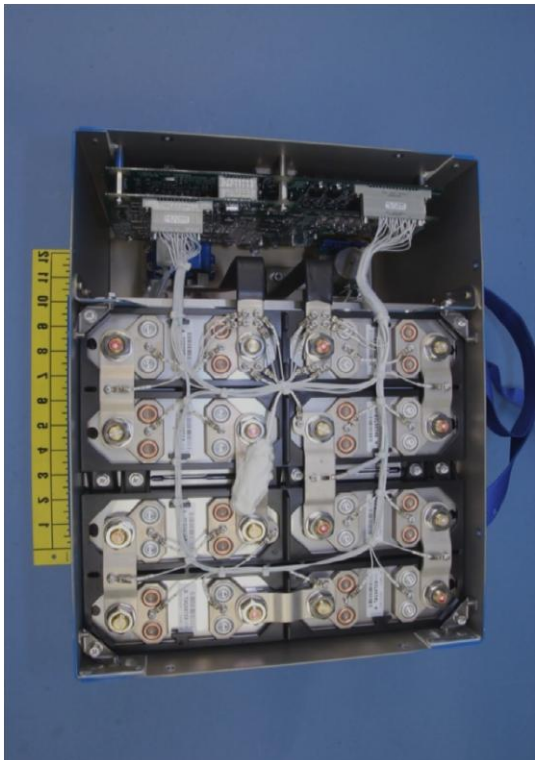

Figure 2. 787 Exemplar battery.

In the JAL event, each of the 8 cells experienced some thermal damage, and investigators believe there were multiple short circuits in battery cell 6 that started a thermal runaway that progressed throughout the battery. The side of the battery where cell 6 is located had the most extensive damage. All 8 cells have vent discs, which rupture when the internal pressure in a cell increases to a predetermined level. Seven of the eight discs ruptured, and the cell with the unopened vent disc lost electrolyte liquid.

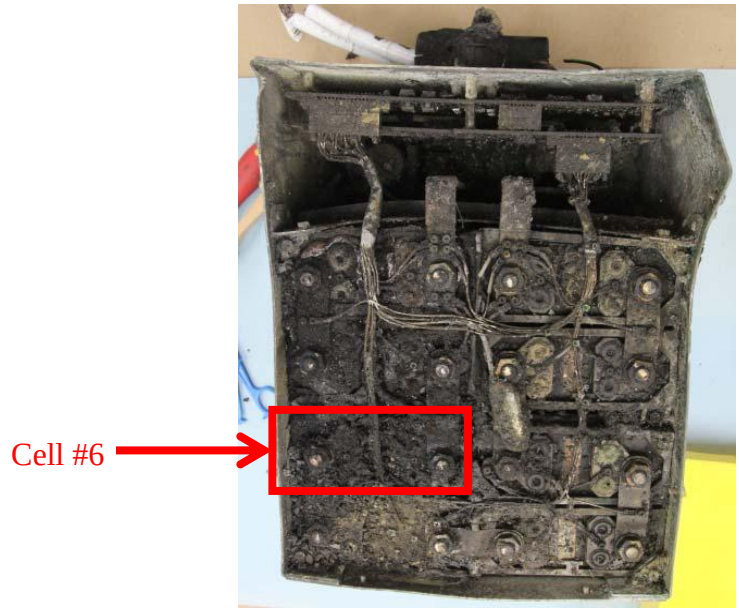

Figure 3. Damaged APU battery highlighting cell 6, the source of the short circuit.

In its notice of proposed Special Conditions for the Boeing 787 airplane issued in 2007, the FAA indicated that large, high capacity, rechargeable lithium ion batteries were a novel or unusual design feature in transport category airplanes. The FAA noted that this type of battery has certain failure, operational, and maintenance characteristics that differ from those of the nickel-cadmium and lead-acid rechargeable batteries approved at that time for installation on large transport category airplanes. As such, the FAA approved the use of these batteries by issuing nine special conditions to provide a level of safety equivalent to existing airworthiness regulations. Boeing performed a series of tests to demonstrate that the battery complied with the conditions and would not pose a higher safety risk. It was determined that the probability of a smoke event was once in every 10 million flight hours. However, as of January 16, 2013, when the FAA issued its airworthiness directive grounding the 787 fleet, the fleet had accumulated less than 52,000 in-service flight hours and had two smoke events involving its lithium ion batteries.

The NTSB continues to devote significant resources to its investigation of the Boston incident. We continue to serve as the accredited representative to the JTSB investigation of the January 15, 787 battery incident in Japan. Recently, NTSB has tested exemplar batteries and cells. Also, investigators travelled to the battery manufacturer to observe the manufacturing process and interview personnel, and staff has met with Thales Avionics Electrical System of France, the company with which Boeing contracted to design and manufacture the 787 electrical power conversion subsystem.

Last week, the NTSB held a public forum on lithium ion batteries in transportation. We learned that lithium ion batteries are becoming more prevalent in the various transportation modes, national defense, and space exploration. Panelists stated that because of their high energy density and light weight, these batteries are natural choices for energy. These benefits, however, also are the source of safety risks. We also heard about manufacturing auditing, robust testing, and monitoring and protection mechanisms to prevent a catastrophic event. Next week, we will hold an investigative hearing on the design, certification, and manufacturing process for the 787 lithium ion battery system. We will continue to provide factual updates as our investigation of the Boeing 787 battery fire incident proceeds.

Airport Surface Operations

While we have seen a reduction in airborne accidents, surface operations remain problematic, and this is the reason that Airport Surface Operations is on the NTSB's Most Wanted List. Safety of Airport Surface Operations includes runway incursions, runway excursions, runway confusion, and collisions with other aircraft and/or airport vehicles.

Figure 4. Southwest Airlines Flight 1248, Runway excursion and collision during landing at Chicago, Midway International Airport, December 8, 2005.

The NTSB has over 20 open safety recommendations to the FAA addressing airport surface safety, including 6 that we have classified as "Open-Unacceptable Response." These recommendations are as recent as September 2012 as well as dating back to 2000 and address a myriad of subjects that include ground safety movement systems for flight crews, wing tip clearance safety systems, enhanced wind dissemination information to flight crews, and pre-landing distance assessments.

General Aviation Safety

As I stated earlier, the U.S. commercial aviation system is experiencing an unprecedented level of safety. General aviation (GA) fatality rates have shown little movement in spite of efforts to improve safety. There have been about 1,500 GA accidents per year for the past decade. Although GA represents about 51 percent of the estimated total flight time of all U.S. civil aviation, it accounted for 97 percent of fatal accidents in 2010.[1] The NTSB determines the probable cause of all 1,500 of these accidents, and one thing we have learned is that unfortunately, the same factors continue to cause most of the accidents.

[1] http://www.ntsb.gov/doclib/reports/2012/ARA1201.pdf

Figure 5. Sioux Falls, SD general aviation accident, December 9, 2011.

The leading causes of GA accidents are loss of control, engine failure, flying in conditions that are beyond the pilot or aircraft's abilities, and collision with terrain. GA is essentially an airline or maintenance operation of one, which means the entire aviation community must work harder to reach each pilot or mechanic who populates this community to address these issues and ensure this deadly cycle is broken. GA Safety is on the NTSB's Most Wanted List for the second year in a row in order to bring attention to the issue.

Within the last year, the Board has issued a number of safety alerts as a way to reach the GA community to highlight many of these high risk issue areas. For example, to address the risks associated with flight into severe weather, the NTSB issued a safety alert to raise awareness in the GA community about the latency of NEXRAD weather images; that the age of the actual data used to generate the weather images on the display could differ significantly from the age indicated on the display screen. Just last week, we held a Board meeting to discuss GA safety and issued 5 new safety alerts, which are included with my testimony. The NTSB's purpose in issuing these safety alerts is to increase awareness, education, and training for private pilots and aviation maintenance technicians. The alerts are brief information bulletins that pinpoint particular safety hazards and offer practical remedies to address these risks. They will also serve to focus the NTSB's GA outreach efforts during the coming year. The specific alerts are:

"Reduced Visual References Require Vigilance"
"Prevent Aerodynamic Stalls at Low Altitude"
"Is Your Aircraft Talking to you? Listen!"
"Mechanics: Manage Risks to Ensure Safety"
"Pilots: Manage Risks to Ensure Safety"

Additionally, over the past several years, the NTSB has conducted several GA safety studies. In 2012, we examined experimental aircraft, which represents about 10 percent of the GA fleet but represent a higher proportion of GA accidents. The NTSB recommended expansion of documentation requirements for initial aircraft airworthiness certification, verification of the completion of Phase I flight testing, improvement of pilots' access to transition training, encouragement of the use of recorded data during flight testing, ensuring that buyers of used experimental aircraft receive necessary operating and performance documentation, and improvement of aircraft identification in registry records. In a study of airbag restraints in GA aircraft, the NTSB concluded that aviation airbags can mitigate occupant injuries in some severe but survivable crashes. In 2010, the NTSB looked at "glass cockpits" in GA, which are the newer electronic displays in some planes. The results of this study suggest that the introduction of glass cockpits has not yet resulted in a measurable improvement in safety when compared to similar aircraft with conventional instruments. There is a need to ensure pilots have system specific knowledge to safety operate aircraft with glass cockpit avionics and to capture maintenance and operational information to assess the reliability of glass cockpit avionics.

We will continue our efforts to improve the safety record of general aviation and look forward to finding new and innovative ways to communicate this message to more pilots and mechanics.

Helicopter Emergency Medical Service (HEMS)

Helicopter EMS operations provide an important service to the public by transporting seriously ill patients or donor organs to emergency care facilities. The pressure to safely and quickly conduct these operations in various environmental conditions (for example, inclement weather, at night, and unfamiliar landing sites for helicopter operations) has the potential to create more risk for HEMS than other passenger operations.

The NTSB has issued more than 20 safety recommendations during the past 13 years to the FAA to improve the safety of these operations and conducted a 4-day public hearing on HEMS safety in February 2009. In 2010, the FAA issued a notice of proposed rulemaking (NPRM) to address many of the NTSB's recommendations, such as the carriage of safety related equipment, flight data recorders, operational requirements, better weather monitoring and reporting, development and implementation of safety management systems and flight-risk evaluation programs, including training, and amendments to load manifest requirements for single-engine Part 135 operations.

Section 306(a) of the FAA Modernization and Reform Act of 2012 (Pub. L. 112-95) required the FAA to complete this rulemaking by June 1 of last year. Unfortunately, that rulemaking has stalled.

Last week, on April 9, the NTSB held a Sunshine Act public meeting to discuss the crash of an EMS helicopter on August 26, 2011, near Mosby, Missouri that resulted in the deaths of the pilot, flight nurse, flight paramedic, and the patient. The NTSB determined that the probable causes of this accident were the pilot's failure to confirm that the helicopter had adequate fuel

onboard to complete the mission before departing on the mission's first leg, his improper decision to continue the mission and make a second departure after he became aware of a critically low fuel level, and his failure to successfully enter an autorotation when the engine lost power due to fuel exhaustion. Contributing to the accident were (1) the pilot's distracted attention due to personal texting during safety-critical ground and flight operations, (2) his degraded performance due to fatigue, (3) the operator's lack of a policy requiring that an operational control center specialist be notified of abnormal fuel situations, and (4) the lack of practice representative of an actual engine failure at cruise airspeed in the pilot's autorotation training in the accident make and model helicopter.

Figure 6. HEMS accident in Mosby, MO, August 26, 2011.

Currently, the NTSB is investigating 12 HEMS accidents, including 6 that have occurred since December. We see the same problems in our accident investigations and believe that if the following recommendations are incorporated in to HEMS operations, they will be safer.

- Operate under Part 135 rules
- Establish Operations Control Centers (OCC)
- Perform recurrent training and testing of OCC personnel
- Improve HEMS pilot training
- Perform more stringent weather evaluations
- Require flight risk evaluation programs

- Install safety equipment on HEMS helicopters (terrain awareness and warning systems, night vision imaging equipment, autopilots, recorders, radio altimeters, 406 MHz emergency locator transmitter, water safety equipment)
- Receive regular instrument flight training
- Establishment of Safety Management Systems for HEMS operators
- Better airspace infrastructure for low altitude helicopter operations

Pilot Training and Distraction

The last U.S. commercial aviation accident occurred on February 12, 2009, while Colgan Air flight 3407 crashed on approach to the Buffalo Niagara International Airport in Buffalo, NY. As a result of that accident investigation, the NTSB made pilot training recommendations, some of which Congress included in the Airline Safety and Federal Aviation Administration Extension Act of 2010 (Pub. L. 111-216). The NTSB called for crew training requirements, establishment of mentoring and professionalism programs, and a pilots' records database. In the Colgan Air flight 3407 accident investigation, we found that industry changes - including two-pilot cockpits and the advent of regional carriers- had resulted in opportunities for pilots to upgrade to captain without having accumulated significant experience as a first officer in a Part 121 operation. Without these important opportunities for mentoring and observational learning, which characterize time spent in journeyman pilot positions, it was difficult for a pilot to acquire effective leadership skills to manage a multicrew airplane.

Also as a result of the NTSB's investigation of both Northwest Flight 188 that overflew their destination of Minneapolis because they were distracted by their laptops and the Colgan Air Flight 3407, we issued a safety recommendation to the FAA to amend the Federal Aviation Regulations to require Part 121, 135, and 91 subpart K operators to incorporate explicit guidance to pilots prohibiting the use of personal portable electronic devices on the flight deck. The Congress mandated that the FAA promulgate a rule which would prohibit the use of personal wireless communications devices and laptop computers by flight crewmembers during all phases of flight in Part 121 operations. The FAA is required by the statute to issue a final rule implementing the prohibition no later than February 2014. I would note that the FAA issued an NPRM for this requirement this past January. The NTSB recently submitted comments to the docket in support of the proposed rule but recommended that the final rule incorporate the broader scope of its February 2010 safety recommendation by expanding the proposed rule to Part 135 and 91 subpart K operators.

Flight and Duty Time

For more than 20 years, the issue of reducing accidents caused by fatigue was on the NTSB's Most Wanted List of safety improvements. We removed fatigue from our Most Wanted List in November 2012 to acknowledge the new flight and duty time rules enacted by the FAA. For the first time, the new rule recognizes the universal factors that lead to human fatigue such as time of day, length of duty day, workload, whether an individual is acclimated to a new time zone and the likelihood of being able to sleep under different circumstances. However, we remain concerned that the new rule does not apply to cargo pilots. Fatigue is fatigue, whether you transport passengers or pallets; it degrades every aspect of human capability. Another

fatigue issue not addressed by the new rules is pilot commuting; a concern identified in the Colgan Air accident.

We have seen the effects of fatigue in too many of our accident investigations. We will continue working toward one level of safety throughout the industry.

Aviation Safety Information Analysis and Sharing (ASIAS) System

Aviation has experienced great improvements in safety due in part to embracing and understanding data. As I have pointed out in speeches over the past several years, "data saves lives … and, in this era of dynamic growth and greater complexity, data is more important than ever." Also, data collection, analysis, and dissemination are important international aviation safety issues. For example, the Safety Information Protection Task Force of the International Civil Aviation Organization (ICAO) has been looking at the various sources of safety information, the diverse requirements of member states regarding public transparency and personal privacy, and the different civil and criminal justice systems. The willingness of the FAA and the aviation industry to share data with the NTSB will have a direct positive effect on aviation safety and is consistent with a provision in the FAA Modernization and Reform Act of 2012 concerning public disclosure of aggregate, de-identified aviation safety information.

As a result of almost two years of discussions, the NTSB and the FAA and industry ASIAS Executive Board Co-Chairs signed a Memorandum of Understanding last November that outlines the procedures, guidelines, and roles and responsibilities for the ASIAS Executive Board to address specific written NTSB requests for ASIAS information.[2] The NTSB will initiate written requests for ASIAS information related to aircraft accidents involving U.S. air carriers that occur in the United States and address safety issues that both the NTSB and the ASIAS board determine are significant. The NTSB will not publicly disclose ASIAS information it receives via the process unless the ASIAS Executive Board agrees. In addition, the MOU requires the NTSB to share with ASIAS its archived air carrier accident and incident flight data recorder information related to a request.

Closing

I appreciate the opportunity to appear before you today to discuss aviation safety and I am prepared to answer your questions.

[2] ASIAS began in 2007 and now has 44 airline members and receives voluntary data representing 95 percent of all commercial air carrier operations. It connects 131 data and information sources across the industry and is integrated into the Commercial Aviation Safety Team (CAST) process. CAST is a joint government and industry effort that uses a data-driven strategy to reduce the risk of commercial aviation fatalities. ASIAS uses aggregate, protected data from industry and government voluntary reporting programs, without identifying the source of the data, to proactively determine safety issues, identify safety enhancements, and measure the effectiveness of solutions. ASIAS is managed by an Executive Board and consists of representatives of various FAA offices, the National Aeronautics and Space Administration, U.S. military safety organizations (the latest membership summary shows USAF Safety Center and Naval Air Force Atlantic as government participants), commercial airlines, manufacturers, and labor organizations.