



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: December 3, 2007

In reply refer to: A-07-96

Honorable Robert A. Sturgell
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

On May 31, 2005, about 1938 central daylight time, the flight attendant on board United Express flight 5533, a Bombardier CL600-2B19 (CL65), N417AW, operated by Air Wisconsin, was ejected from the airplane's service door and sustained serious injuries following passenger boarding at Chicago O'Hare International Airport, Chicago, Illinois.¹ Of the 24 passengers, 1 flight attendant, and 2 flight crewmembers on board the airplane, only the flight attendant was injured; the airplane, including its service door, was not damaged. The proposed flight was operating under the provisions of 14 *Code of Federal Regulations* Part 121 on an instrument flight rules flight plan.

The airplane was parked at gate F6B, and the flight crew was preparing the airplane for flight when the accident occurred. An air conditioning (A/C) cart supplying pressurized, cooled air to the cabin was connected to the airplane at the exterior aft right side of the fuselage. The captain stated in a postaccident interview that he briefed the flight attendant in the terminal and in the airplane to keep the doors open but did not specify that the airplane would become pressurized if the doors were closed while the A/C cart was cooling the cabin. According to a postaccident interview with the flight attendant, both pilots were seated in the cockpit when she asked for and was granted permission to close the service door and the main cabin door. However, in his interview, the captain stated that he thought that the flight attendant asked him if she could close the main cabin door only; he also stated that he told her to make sure one door was open. After closing the service door, the flight attendant crossed the cabin and closed the main cabin door. As the flight attendant turned and walked toward the galley, the captain asked her if she had closed the service door. She responded, "Yes. Do you want it open?" and the captain responded, "Get the door open!" The flight attendant held the assist handle² with her left

¹ For more information about this accident, see DCA05MA071 at the Safety Board's Web site at <<http://www.nts.gov/nts/query.asp>>.

² An assist handle is the handle that flight attendants use to help them maintain their balance while opening a cabin door. A handle is located next to each cabin door, and flight attendants are supposed to hold the handle with one hand while opening the door with the other hand.

hand, and, as she lifted the door handle with her right hand, the door burst open. She was ejected out of the airplane and onto the ground, fracturing her right shoulder.

The National Transportation Safety Board determined that the probable cause of the accident was the opening of the service door when the airplane was pressurized. Contributing to the accident was the captain's failure to ensure that one of the airplane doors was open while a ground-cooling cart was connected, which resulted in pressurization of the airplane on the ground.

A CL65 airplane, like the one involved in this accident, is equipped with a main cabin door on the left side of the forward fuselage and a service door on the right side of the forward fuselage. The CL65's doors are designed differently than the plug doors on other aircraft in that they have stop fittings along each side of both the main cabin door and the service door and at the forward and aft ends of the fuselage doorframe.³ When the CL65's doors are opened, they move sequentially upward, outward, and forward relative to the fuselage. On aircraft that have plug doors, the doors open inward first, thus, they cannot burst open.

The CL65 flight crew can cool or heat the cabin on the ground without an auxiliary power unit (APU) or the engines running by using an A/C cart that provides low-pressure cooled or heated air to the cabin. At least one door must remain open when an A/C cart is providing cooled or heated air to the cabin because the flight crew cannot control the airplane's outflow valves when the APU or its engines are not operating. An A/C cart does not have a control that regulates the volume of pressurized air into the cabin.⁴

The flight attendant on board the accident airplane did not know that the A/C cart pressurized the cabin if the doors were closed. Safety Board review of the Air Wisconsin Flight Attendant Manual and the flight attendant training program revealed that, at the time of the accident, the manual and training program did not include information about keeping a door open to prevent pressurization of the cabin when an A/C cart is supplying heated or cooled air to the cabin on the ground. Further review found that the Air Wisconsin flight attendant manual specified only the following information in its Aircraft Familiarization section:

On occasion, the aircraft may be overpressurized, which could make opening the aircraft doors difficult and dangerous. When opening the door, if you hear a hissing sound or encounter resistance and must strain to operate the handles, STOP any attempts to open the exit until the aircraft is fully depressurized.

In her initial and recurrent training, the flight attendant received information stating that the airplane doors would be difficult to open if the airplane was pressurized; however, she told investigators that, when the accident occurred, she did not feel resistance as she opened the door.

³ A door stop fitting consists of a steel bolt and a stop pin, and a fuselage stop fitting consists of a steel tab. The door stop fitting pins along each side of the door must clear the top of the fuselage stop fittings, otherwise, the door cannot be opened.

⁴ The A/C cart that was connected to N417AW produces air at 1,500 cubic feet per minute with 20 inches of standard pressure.

Nearly 1 year after the accident, on May 6, 2006, Air Wisconsin changed its initial and recurrent flight attendant classroom training, home study materials, and flight attendant manual to include the following information for the CL65 airplane:

Ground air supply operations (carts positioned adjacent to the aircraft and attached in such a manner as to provide heated or cooled air to the cabin) could lead to pressurization of the aircraft on the ground. At least one door must remain open when an air cart is in use.

At the time of the accident, Air Wisconsin's flight crewmember and ramp operator training already included information about keeping the door open or not opening a door if all doors are closed while the A/C cart is in use. Flight crewmember training specifies that, when the A/C cart is supplying cooled or warmed air to the cabin, at least one door must remain open. The training manual states that the cabin will artificially pressurize on the ground when using the A/C cart and warns that if all doors are closed, "DO NOT OPEN ANY CABIN DOOR!!!" Air Wisconsin flight crewmembers also are trained to depressurize the cabin before opening a door by using APU bleed air⁵ to open the outflow valves⁶ or by disconnecting the A/C cart from the airplane. According to the Regional Airline Association (RAA), its members provide this training to all flight crewmembers operating airplanes with doors that could open when the airplane is pressurized on the ground. Air Wisconsin ramp operators' initial and recurrent training includes instructions to keep the passenger door open to prevent pressurization of the cabin when the A/C cart is connected to the airplane. In addition, Air Wisconsin procedures require ramp operators to receive permission from the flight crew to hook up and remove an A/C cart. If no flight crewmembers are present, ramp operators are required to stay within close proximity (within sight) of the airplane to ensure that a door remains open and that the airplane is secure. According to RAA, its member airlines place placards in the cockpit and near the external hookup connection to alert the pilots and service personnel to leave a door open.

The Safety Board has investigated other events involving doors that burst open. On November 20, 2000, about 1222 eastern standard time, a flight attendant/purser was ejected and killed during an emergency evacuation of American Airlines flight 1291, an Airbus Industrie A300B4-605R (A300), N14056, at Miami International Airport, Miami, Florida.⁷ As a result of the investigation of this accident, the Board issued Safety Recommendations A-02-22 and -23. Safety Recommendation A-02-22 asked the Federal Aviation Administration (FAA) to review air carriers' flight crew and cabin crew training manuals and programs to ensure they contain information about the signs of an overpressurized airplane on the ground and about the dangers of opening emergency exit doors while the airplane is overpressurized. Safety Recommendation A-02-23 asked the FAA to require that cabin crew training manuals and programs contain procedures to follow during an emergency evacuation when the airplane is

⁵ Bleed air is expelled compressed air from the compressor section of a turbine. It is typically used for anti-icing, de-icing, cabin pressurization, and cabin heating or cooling.

⁶ When the CL65 APU or the engines are running, the flight crew can open the outflow valves (spring loaded closed) and expel the pressurized air in the cabin.

⁷ For more information about this accident, see MIA01FA029 at the Safety Board's Web site at <<http://www.nts.gov/ntsb/query.asp>>.

overpressurized, but it did not indicate that an external A/C cart could be a source of pressurization.

In response to Safety Recommendations A-02-22 and -23, the FAA issued Notice 8400.35, “Transport Category Airplanes – Overpressurized Airplanes” on December 18, 2002, to all regional Flight Standards divisions and district offices. As a result of the FAA notice, the Safety Board classified Safety Recommendation A-02-22, “Closed—Acceptable Action,” and Safety Recommendation A-02-23, “Closed—Alternate Acceptable Action.” The notice encouraged principal operations inspectors and cabin safety inspectors (CSI) who oversee air carriers to recommend that “air carriers review training manuals and programs and revise, if necessary, information about the signs of an overpressurized airplane on the ground and the dangers of opening emergency exit doors while the airplane is overpressurized.” Although FAA Notice 8400.35 recommended that air carriers’ training manuals and programs include information about the signs of an overpressurized airplane and the dangers of opening an emergency exit when the airplane is overpressurized, it did not mention that the A/C cart could pressurize the cabin and that a door must remain open while the A/C cart is providing cooled or heated air to the cabin.

Review of the National Aeronautics and Space Administration’s (NASA) Aviation Safety Reporting System (ASRS) database⁸ revealed an incident involving a CL65 airplane that was being cooled with a ground A/C cart at Minneapolis-St. Paul International Airport, Minneapolis, Minnesota, in July 2004. The ASRS report stated that a portable ground power unit (GPU)⁹ was connected to the airplane and that the main cabin door and the service door were closed. Immediately after the main cabin door closed, the flight crew noticed that the airplane lost electrical power and asked the flight attendant to open the service door to request the ramp agent to reconnect the GPU. The flight attendant opened the service door and was ejected from the airplane but was not injured. The ASRS report stated that, at the time of the incident, the A/C cart was supplying low and high air pressure to the cabin.

The Safety Board’s investigation also found that, in addition to the CL65, Bombardier offers the external A/C cart connection as a customer option on the Challenger, Global Express, DeHavilland (DHC)-1 through -7, and DHC Dash 8 model airplanes. Although Bombardier’s Flight Attendant Training Manual still does not advise to keep one door open or not to open a door if all doors are closed, on March 15, 2006, Bombardier added the following warning to its manual for all aircraft with external A/C cart connections:

WARNING

During ground operations with the doors closed, and the external cart supplying air, the fuselage becomes slightly pressurized. If these conditions exist, the flight attendant should exercise caution when opening the passenger or service door, as increased internal air pressure may accelerate door opening.

⁸ ASRS reports are submitted voluntarily and anonymously by pilots and other aviation professionals when they want to alert others about a potentially unsafe condition or event. NASA manages the system, and the FAA funds it.

⁹ A GPU includes a motor generator and air compressor and supplies electrical power and compressed air for airplane system operations on the ground when the engines are not running.

Safety Board staff spoke to 9 FAA CSIs who are responsible for overseeing flight attendant training programs for 14 air carriers that operate Bombardier CL65 and Dash 8, Embraer ERJ, Dornier 328, Saab 340, and ATR-72 airplanes; these transport-category airplanes have doors that could open when the airplane is pressurized on the ground. Staff wanted to determine if operators other than Air Wisconsin include in their flight attendant manuals information about the A/C cart's ability to pressurize the cabin if the cabin doors are closed and information about opening a door when the airplane is pressurized. Eleven of the 14 air carriers did not provide this information in their flight attendant training programs. Therefore, the Safety Board is concerned that many flight attendants may not know that A/C carts are capable of pressurizing the cabin when the airplane is on the ground and the doors are closed, and those flight attendants are at greater risk of injury if they open a door when the airplane is pressurized. Training flight attendants on board transport-category airplanes to keep at least one door open to prevent cabin pressurization when an A/C cart is conditioning the cabin air would help prevent these events.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require air carriers to revise their cabin crew training manuals and programs to ensure that the manuals and programs state that a door must remain open while the air conditioning (A/C) cart is connected, advise that the A/C cart can pressurize the airplane on the ground if all doors are closed, and warn about the dangers of opening any door while the air conditioning cart is supplying conditioned (cooled or heated) air to the cabin. (A-07-96)

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred with this recommendation.

[Original Signed]

By: Mark V. Rosenker
Chairman