



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 30, 1998

In reply refer to: A-98-122 through -124

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On June 2, 1998, a Boeing 757-232 (B-757), N629DL, owned and operated by Delta Airlines, Inc., was damaged when its left off-wing emergency evacuation slide separated from the airplane during a scheduled flight operated under Title 14 Code of Federal Regulations Part 121 en route from LaGuardia Airport (LGA) to Cincinnati/Northern Kentucky International Airport (CVG). The pilot reported that during climbout from LGA he noticed the engine indication and crew alerting system (EICAS) light illuminate, indicating that the left off-wing slide door was open. The flight continued to CVG and landed without further incident. None of the occupants were injured.

After the airplane landed, a Delta Airlines mechanic performed a walk-around inspection. During the inspection he saw that the left off-wing emergency escape slide had separated from the airplane, the left side of the fuselage aft of the slide was damaged, the slide was missing, and the restraining hook that mounted to the slide platform was broken, which allowed the platform to over-rotate, causing damage to the wing and fuselage (see figure 1). The slide carrier, the platform, and the door latching tube remained with the airplane. Further inspection found significant damage to the left side of the fuselage aft of the trailing edge of the left inboard flap.

During its investigation of the B-757 off-wing escape slide, the National Transportation Safety Board found that Delta Airlines had performed a replacement of the left off-wing emergency escape slide 2 days before the incident. The two mechanics who replaced the slide stated that it was the first time they had replaced a B-757 off-wing slide. The mechanics stated that they referred to the B-757 maintenance manual, sections 25-65-00 and 25-65-01, and the placard on the inside of the maintenance access door while they replaced the slide.¹ One mechanic maneuvered the round yellow actuator handle that secures the off-wing emergency slide door within the slide compartment (see figure 2), and the other mechanic held the slide door closed (by sitting on the wing and pressing on the door with both his feet.) The mechanic who manipulated the round yellow actuator handle said it was difficult to ensure that the handle was in the full-

¹ Section 25-65-00 describes the operation of the B-757 off-wing escape system, and 25-65-01 describes the removal/installation of the B-757 off-wing escape slide pack.

Log 2677
SR

down position, stating that “it took several attempts to move the actuator handle to the latched position.” The mechanics stated that after the door was latched one mechanic ran his finger around the door to ensure it was closed, and then both mechanics checked the EICAS in the cockpit to ensure that the door was closed. One of the two mechanics said that he had received instructions on how to replace the slide about 4 or 5 years ago during a 2-week B-757 initial maintenance training class that provided instructions on all B-757 systems. The other mechanic had not yet received training on the B-757 off-wing escape slide replacement during his 3 months of employment at Delta.

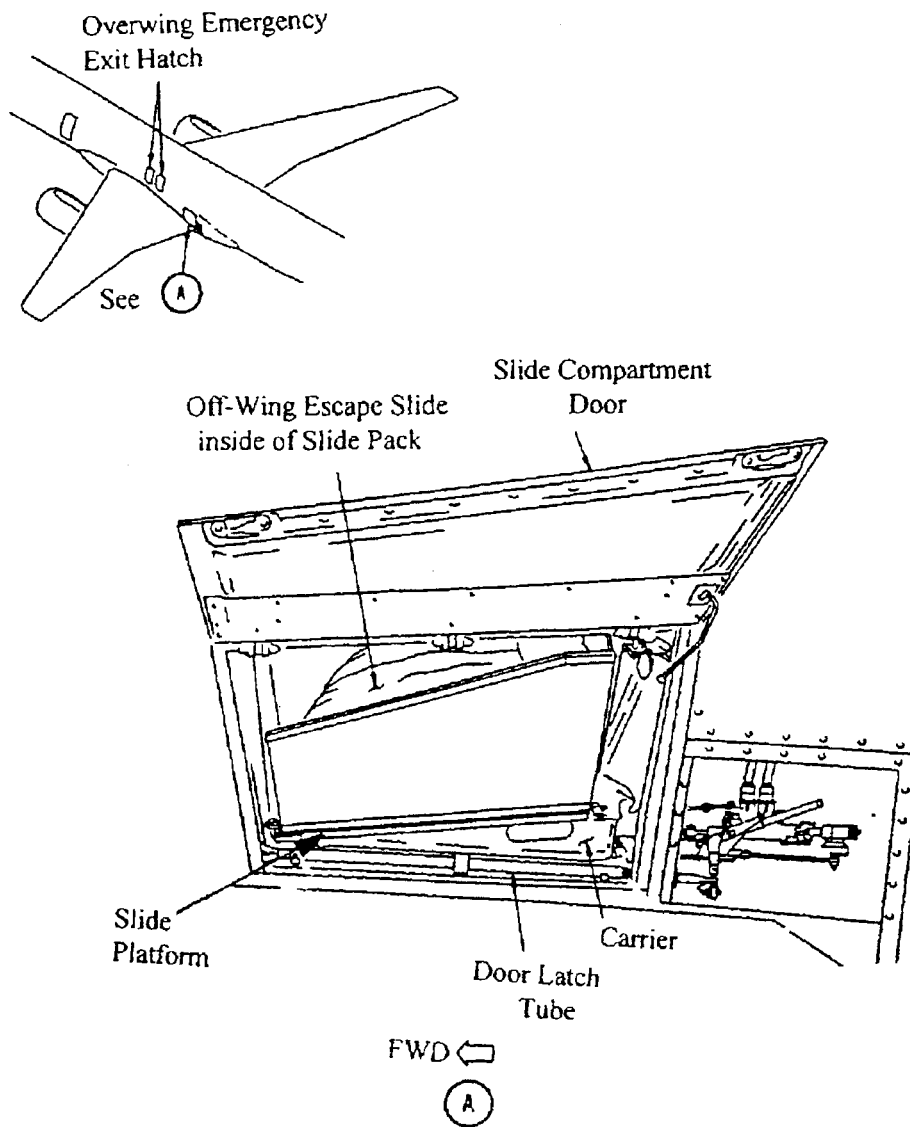


Figure 1.—B-757 Off-Wing Escape Slide Assembly

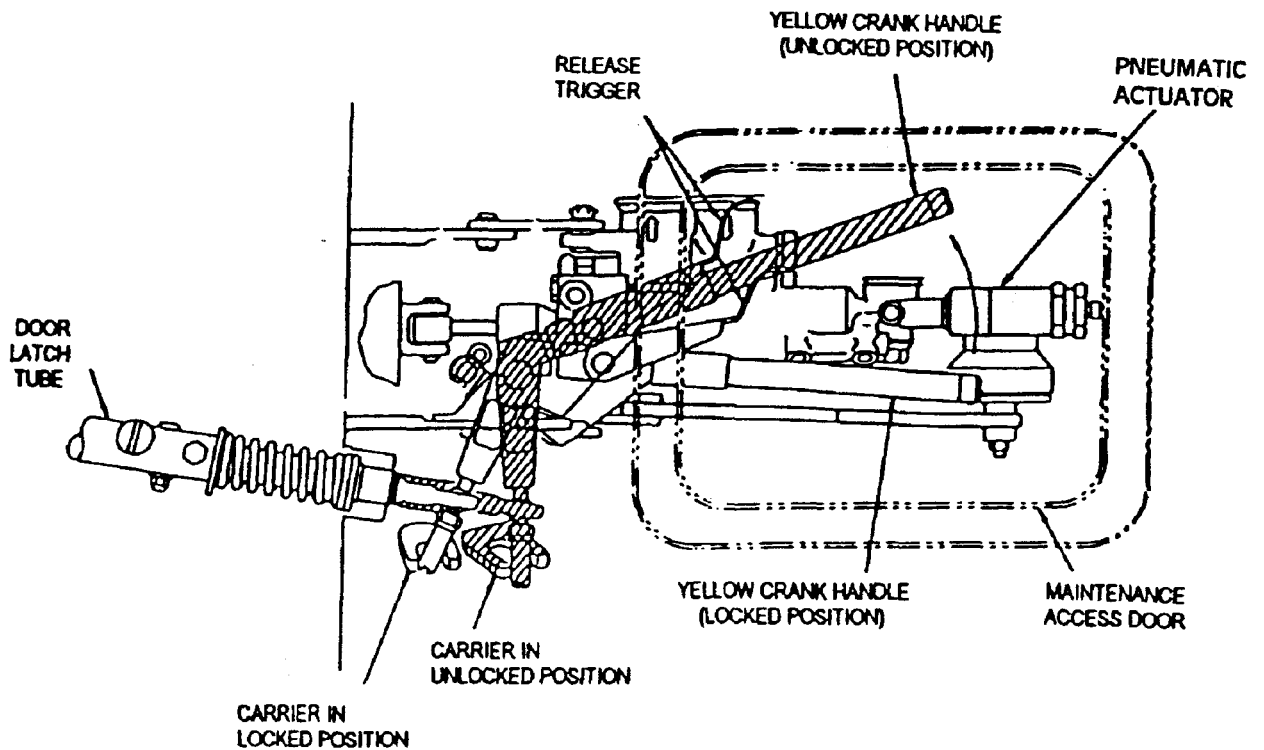


Figure 2.—B-757 Off-Wing Escape Slide Actuator Assembly

Previous In-flight Separations of Off-Wing Emergency Escape Slides

On October 16, 1997, a B-757, operated by United Airlines, Inc., was damaged when its left off-wing emergency evacuation slide separated from the airplane during a scheduled flight en route from Seattle, Washington, to Denver, Colorado. The captain stated to Safety Board investigators that as the airplane was rotated for liftoff, he noticed the EICAS light illuminate, indicating that the left wing slide door was open. The flight continued to Denver International Airport (DIA), and during its descent for landing, a flight attendant who was in the midcabin heard a loud noise on the left side of the airplane. The airplane landed without further incident at DIA, and none of the occupants were injured.

The Safety Board's investigation found that United had performed a routine replacement of the left off-wing emergency escape slide the evening before the incident. One of the two mechanics who replaced the slide that evening stated that it was only the second time in his 12-

year career with the airline that he had replaced a B-757 off-wing slide. He had replaced the first slide about 10 years earlier. The mechanic stated that when he replaced the slide the night before the incident, he had been outdoors (on the ramp) using a flashlight and had referred to the B-757 maintenance manual. The mechanic stated that he was not aware that there were instructions (which indicated the proper positioning of the yellow actuator handle that secured the off-wing emergency slide door within the slide compartment) on a placard inside the maintenance access door. The mechanic also stated that he had not received any formal training from Boeing or from United for installing the off-wing escape slide system and that he relied solely on the B-757 maintenance manual. The other mechanic stated that this was the first time that he had replaced a B-757 off-wing escape slide. He said that he had not received training on the B-757 off-wing escape slide replacement during his 11 years of employment at United.

On June 8, 1993, a B-757 left off-wing emergency escape slide deployed while United Airlines flight 382 was climbing through flight level 250. The captain heard an "explosive noise" followed by the airplane rolling sharply to the left.² The flightcrew declared an emergency and made an uneventful landing at Los Angeles International Airport, Los Angeles, California. A postincident inspection found that the left off-wing escape slide had deployed and had separated (at an unknown time) in flight. The Safety Board's investigation of the incident found that United had performed maintenance on the left off-wing escape slide before the flight.

Information on Servicing and Replacing the Off-Wing Emergency Escape Slide

The B-757 off-wing emergency escape slide system is located just above the trailing edge of each wing in the aft wing/body fairing and consists of a ramp/slide folded into a "slide pack" attached to a packboard and installed on a carrier assembly. To service the slide, a mechanic must first open the slide maintenance access door and release the trigger on a round yellow handle. The yellow handle actuates a pneumatic actuator, which unlatches the slide compartment door. The slide compartment door is locked in the closed position by lowering the yellow handle to its lowest position; this secures the door latch tube that is located along the lower edge of the slide compartment (see figure 2). A door sensor (micro switch) located on the aft edge of the door sill activates the "EMER DOORS" light on the cockpit overhead annunciator panel and displays the "L WING SLIDE" or "R WING SLIDE" EICAS message if either off-wing slide door opens more than 0.24 inch at its sensor switch.

Replacement of the slide requires that a mechanic remove the main landing gear wheel well access cover located directly beneath the slide carrier compartment to remove the bolts that secure the slide pack to the carrier. Also, the carrier has a locking pin that can only be viewed by a mechanic from the lower wheel well. When the slide's carrier is fully locked in place and the yellow crank handle is moved to the down and locked position, the locking pin should be fully engaged in the carrier's locking lug. The maintenance manual provides step-by-step guidance for the removal and installation of the B-757 off-wing emergency escape slide, and section 25-65-09

² For more detailed information, read Brief of Incident LAX93IA245 (enclosed).

recommends, "Push the handle down to its lowest position while you push inboard on the carrier to make sure the carrier is locked in the inboard position."

In-Service Activities Report and Service Bulletin History Regarding B-757 Off-Wing Escape Slides

In its September 14, 1993, B-757 In-Service Activities Report (SAR) No. 93-17, Boeing alerted operators of B-757s with off-wing slides (part number 93-17-2565-00) of the June 8, 1993, incident.³ The SAR stated that the fuselage's paint had been scuffed in several large areas aft of the slide compartment door and on the leading edge of the left horizontal stabilizer. The SAR further stated that the aft latch of the airplane's left off-wing escape slide compartment door was only partially engaged, allowing the forward edge of the compartment door to open in the air stream and then to flex further into the air stream until it was forced open. The SAR further revealed that after the door had opened, the escape slide's carrier freely rotated out of its compartment, the slide release pin was pulled, and the escape slide unpacked and tore free from its packboard. Finally, the SAR stated that the B-757 maintenance manual's section 25-65-09 would be updated on September 20, 1993, to incorporate slide access door placard instructions and to clarify maintenance procedures for closing and properly locking the off-wing slide door.

On October 10, 1996, Boeing issued Service Bulletin (SB) 757-25-0182 to all operators of B-757 airplanes with off-wing escape slide systems through airplane production line position 727 (the 727th B-757 produced). The SB reported that two additional incidents had occurred since June 1993 in which air carrier operators had experienced the separation in flight of an off-wing emergency escape slide that resulted in damage to the airplane fuselage aft of the slide compartment.⁴ All three incidents had occurred following maintenance. The SB stated that Boeing's analysis of the off-wing slide separations found three problems that induced the separations:

- difficulty in visually inspecting the forward edge of the slide compartment door to ensure that it is correctly latched,
- the aft location of the door's electrical sensor may not clearly indicate whether the forward edge of the slide compartment door is latched, and
- the incorrect installation of the lockbase retainer on the door latch tube, which can prevent locking the door latch tube in the latched position.

To remedy these problems, the SB provided instructions to replace the lockbase retainer and the bearing for the door's latch tube and to relocate the door's sensor forward on the slide compartment door.

³ About 50 percent of the B-757 airplanes manufactured by Boeing are equipped with off-wing emergency escape slides.

⁴ The two previous B-757 off-wing emergency escape slide incidents involved separations of right off-wing slides on a Continental Airlines B-757 on September 25, 1995, and a Boeing flight test B-757 airplane on November 15, 1995.

Since Boeing issued SB 757-25-0182, three other in-flight B-757 off-wing emergency escape slide separations have occurred following maintenance of the slides: the Delta Airlines N629DL on June 2, 1998; the United Airlines N581UA on October 16, 1997; and one involving an American Airlines B-757 on June 24, 1997. These airplanes had not been modified as directed by SB 757-25-0182. American Airlines subsequently painted a red stripe on the B-757 off-wing escape slide compartment door frames to help mechanics determine when the slide compartment door is properly positioned and latched.

On November 13, 1997, subsequent to the United and American separations, Boeing issued All-Operator Message M-7272-97-5654 to advise B-757 operators of the importance of incorporating SB 757-25-0182. The message informed operators of the importance of incorporating the SB at their earliest opportunity, of placing a new decal on the inside of the access door, of placing a paint stripe or tape on the lip of the maintenance access door (to show proper alignment and the locked position of the round yellow crank handle), and of removing the access panel from the container shroud in the main gear wheel well while a mechanic visually inspects that the carrier latch pin is fully engaged with the lock carrier fitting. Boeing reported that on May 20, 1998, the contents of the All-Operator Message were incorporated into its maintenance manuals.

The Safety Board commends all of the efforts made by Boeing; however, the Board is concerned that because these measures are not mandatory some operators may not perform the actions set forth in the SB. Therefore, the Safety Board believes that the Federal Aviation Administration (FAA) should issue an airworthiness directive (AD) to make compliance with Boeing SB 757-25-0182 mandatory to reduce the current potential for in-flight separation of the off-wing escape slides.

In a June 30, 1998, letter to the Safety Board, Boeing stated that it was designing the following three new system enhancements for the B-757 off-wing escape slides:

- 1.) installation of a bumper on the slide pack carrier to ensure it is pushed in far enough to be locked in place and to prevent movement of the carrier before actuation of the yellow crank handle,
- 2.) the addition of a witness mark on the lip of the maintenance access door frame that aligns with the yellow crank handle to ensure the handle is in the locked position, and
- 3.) the rewriting of the instructions on the placard on the inside of the maintenance access door to provide clear, concise direction to ensure the door is faired and latched prior to flight.

Boeing further reported that the three system enhancements are currently in the design phase and will be incorporated into the B-757 production line in December 1998. Boeing proposed that the B-757 fleet retrofit will be handled by a SB that will incorporate all three

enhancements. Therefore, as a further safety measure, the Safety Board believes that the FAA should, upon release of the SB that incorporates the B-757 off-wing escape slide system enhancements currently in work by Boeing, issue an AD to mandate the incorporation of the improvements.

The Safety Board is concerned that mechanics may not be aware of Boeing's recently completed and proposed system enhancements on the B-757 off-wing escape slides. Further, because the B-757 off-wing escape slides are not frequently serviced or replaced, updated training would acquaint the mechanics with the recent changes and improvements to the B-757 off-wing escape slide system. Therefore, the Safety Board believes the FAA should issue a flight standards information bulletin to require that principal maintenance inspectors ensure that all mechanics are trained on the new off-wing escape slide system enhancements on the B-757.

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

Issue an airworthiness directive to make compliance with Boeing Service Bulletin 757-25-0182 mandatory to reduce the current potential for in-flight separation of the off-wing escape slides. (A-98-122)

Upon release of the service bulletin that incorporates the B-757 off-wing escape slide system enhancements currently in work by Boeing, issue an airworthiness directive to mandate the incorporation of the improvements. (A-98-123)

Issue a flight standards information bulletin to require that principal maintenance inspectors ensure that all mechanics are trained on the new off-wing escape slide system enhancements on the B-757. (A-98-124)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By:


Jim Hall
Chairman

Enclosure

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

Adopted 08/01/1994

LAX93IA245
FILE NO. 5028 06/08/93 LOS ANGELES, CA AIRCRAFT REG. NO. N540UA TIME (LOCAL) - 10:59 PDT

MAKE/MODEL - BOEING 757-222
ENGINE MAKE/MODEL - P & W 2037
AIRCRAFT DAMAGE - Minor
NUMBER OF ENGINES - 2

	FATAL	SERIOUS	MINOR/NONE
CREW	0	0	13
PASS	0	0	184

OPERATING CERTIFICATES - Flag carrier/domestic
NAME OF CARRIER - UNITED AIRLINES
TYPE OF FLIGHT OPERATION - Scheduled
- Domestic
- Passenger

REGULATION FLIGHT CONDUCTED UNDER - 14 CFR 121

LAST DEPARTURE POINT - Same as Incident
DESTINATION - DENVER, CO CONDITION OF LIGHT - Daylight

AIRPORT PROXIMITY - Off airport/airstrip WEATHER INFO SOURCE- Pilot

BASIC WEATHER - Visual (VMC)
LOWEST CEILING - None
VISIBILITY - 0050.000 SM
WIND DIR/SPEED - Unk/Nr
TEMPERATURE (F) - Unk/Nr
OBSTR TO VISION - None
PRECIPITATION - None

PILOT-IN-COMMAND AGE - 58

FLIGHT TIME (Hours)

CERTIFICATES/RATINGS
Airline transport
Single-engine land, Multiengine land
INSTRUMENT RATINGS
Airplane

TOTAL ALL AIRCRAFT	- 18400
LAST 90 DAYS	- Unk/Nr
TOTAL MAKE/MODEL	- Unk/Nr
TOTAL INSTRUMENT TIME	- Unk/Nr

The aircraft was climbing through 25,000 feet in light turbulence when the crew felt two jolts and heard a loud explosive noise followed by a sharp roll to the left. A visual inspection revealed that the left overwing emergency escape slide deployed and separated in flight. The crew returned to Los Angeles and made an uneventful landing. Post incident examination revealed that the slide compartment door was unlatched and open, and, the adjacent maintenance access door was open, with the latching handle in the unlocked position. The flight prior to the incident one had experienced two EICAS warning messages concerning the left overwing slide door. After landing, maintenance personnel accessed the compartment, cleaned a proximity switch then functionally tested the system. The flight was then dispatched with no open items. The maintenance closing procedure in effect at the time of the incident called for one mechanic to

hold the bottom corners of the 33 inch wide slide door closed while
access 12 inches aft of the slide door. The procedure has since
the door closed while the second manipulates the latching handle.

manipulating the latching handle in a maintenance
changed to require two mechanics, one to hold

Brief of Incident (Continued)

LAX93IA245
FILE NO. 5028

06/08/93

LOS ANGELES, CA

AIRCRAFT REG. NO. N540UA

TIME (LOCAL) - 10:59 PDT

Occurrence# 1 MISCELLANEOUS/OTHER
Phase of Operation CLIMB - TO CRUISE

Findings

1. - MISC EQPT/FURNISHINGS, SLIDES - UNLATCHED
2. - MAINTENANCE, ALIGNMENT - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
3. - PROCEDURE INADEQUATE - MANUFACTURER

The National Transportation Safety Board determines that the probable cause(s) of this incident was:
the inadvertent deployment of an overwing emergency escape slide due to the inadequate latching of the slide compartment door following access by maintenance personnel. A factor in the accident was the inadequate door closing procedure specified by the manufacturer and the airline in the maintenance instructions.

Format Revision 4/97