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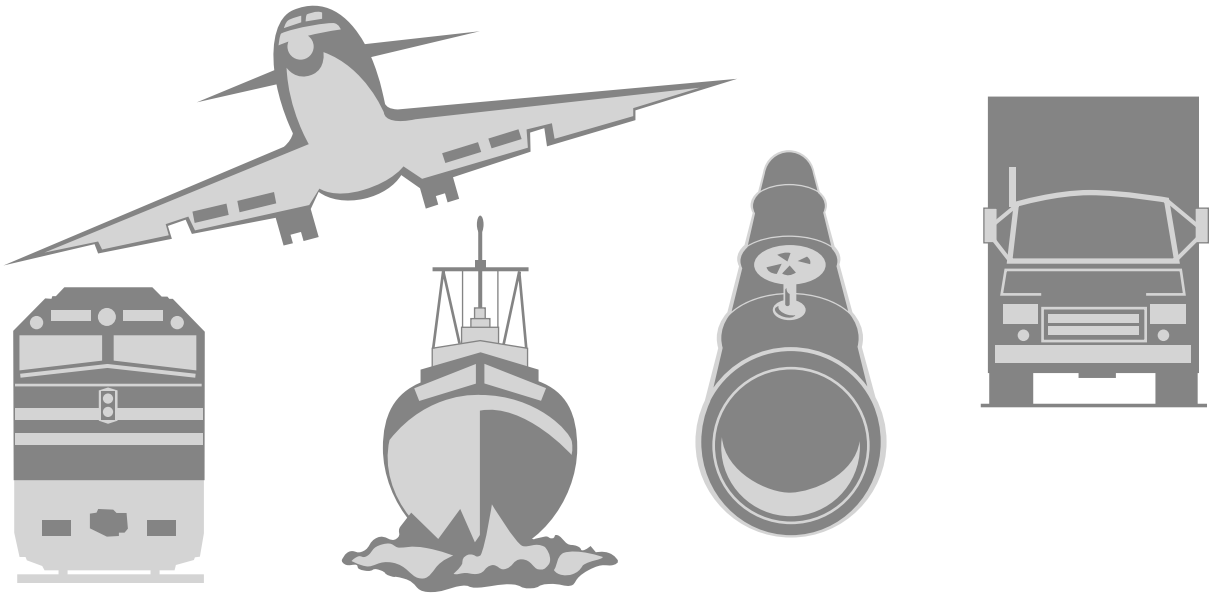
NTSB/REC-08/02

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

SAFETY RECOMMENDATIONS

ADOPTED AUGUST 2002



National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: August 2, 2002

In reply refer to: A-02-20 through -23

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

Background

On November 20, 2000, about 1222 eastern standard time, a flight attendant/purser was killed during an emergency evacuation of American Airlines flight 1291, an Airbus Industrie A300B4-605R (A300), N14056, at Miami International Airport (MIA), Miami, Florida. The airplane was pressurized until the flight attendant/purser opened the left front (1L) emergency exit door; he was then forcibly ejected from the airplane. There were 133 persons on board. During the emergency evacuation, in addition to the 1 flight attendant/purser who was killed, 3 passengers sustained serious injuries; 18 passengers and 1 flight service director[1] sustained minor injuries; and the 2 pilots, 6 flight attendants, 1 off-duty flight attendant, 1 flight service director, and the remaining 100 passengers reported no injuries. The airplane sustained minor damage.[2]

The flight was operating as a 14 *Code of Federal Regulations* Part 121 scheduled international passenger flight. Visual meteorological conditions prevailed, and an instrument flight rules flight plan was filed. The flight departed MIA for Port Au Prince International Airport, Haiti, and had been airborne for about 8 minutes when the flight crew encountered a problem with the automatic pressurization system. The captain later stated to National Transportation Safety Board investigators that the automatic cabin pressurization controllers would not control cabin pressure when the airplane was climbing through 16,000 feet and that the electronic centralized airplane monitor (ECAM) display[3] indicated that the forward outflow

[1] Flight service directors are language translators who are assigned to selected flights to assist flight attendants in communicating with passengers. Although flight service director training requires that they observe flight attendant emergency procedures training, they are not qualified as flight attendants.

[2] The description for this accident, MIA01FA029, can be found on the National Transportation Safety Board's Web site at <http://www.ntsb.gov>.

[3] The ECAM display is a cathode ray tube screen located in the cockpit. The system is automatic and displays messages and system diagrams to pilots. It provides operational assistance for both normal and abnormal airplane system situations.

valve[4] was fully open.[5] The cabin altitude was climbing at a rate of 2,000 feet per minute, and the cabin altitude indicator showed 7,000 feet. The captain decided to operate the pressurization system in the manual mode and, about 11 minutes after departure, indicated to air traffic control (ATC) that the flight would return to MIA. At that point, the pilots began performing the American Airlines A300[6] Cabin Pressurization Manual Control Checklist,[7] which is contained in the American Airlines A300 operating manual.

The captain stated to Safety Board investigators that during the return to MIA, the flight attendant call chimes sounded erratically, and the lavatory smoke detectors sounded continually. Passengers and cabin crewmembers complained about pressure in their ears. About 3 minutes before landing, the captain declared an emergency to ATC and requested that aircraft rescue and firefighting (ARFF) personnel stand by for the landing. After the airplane landed at MIA, ARFF personnel checked the exterior of the airplane and reported no signs of fire. The cockpit voice recorder (CVR) indicates that a flight attendant reported smelling smoke to the flight crew. The captain indicated to Board investigators that he observed the illumination of a "cargo loop light"[8] on the cockpit overhead panel. The captain then ordered an emergency evacuation of the airplane, and the American Airlines A300 Ground Evacuation Checklist[9] was performed.

The flight attendants heard the sounding of the evacuation signaling system and attempted to open the emergency exit doors to begin the emergency evacuation but were having difficulty doing so. One flight attendant requested and received assistance from a passenger to open the 3L emergency exit door, but the door could not be opened. Flight attendants at the 3L and 4L emergency exit doors then announced to passengers that their exits were blocked. A flight attendant reported to the flight crew that the doors would not open. While the flight attendant/purser was struggling to open the 1L emergency exit door of the airplane, the door suddenly burst open, and he was forcibly ejected onto the ramp and was killed. Preliminary findings from the investigation revealed that excess air pressure inside the cabin caused the door to burst open when the flight attendant/purser attempted to open it. After the 1L emergency exit door opened, all of the other emergency exit doors with handles in the open position opened, and the escape slides deployed. This accident investigation is ongoing.

During the Safety Board's investigation of this accident, a similar accident occurred on October 20, 2001. In that accident, one flight attendant was killed and another flight attendant was seriously injured during the deplaning of TunisAir flight TARB631, an Airbus A300-605R, Tunisian registration TS-IPA, at Djerba Airport, Djerba, Tunisia. The flight was conducted as a

[4] The two outflow valves open and close during flight and on the ground to maintain control of cabin pressurization.

[5] At this point in flight, the valves would normally be over halfway closed. Postaccident examination of the airplane by the Safety Board's Systems Group revealed that insulation blankets partially blocked the forward outflow valve and almost fully blocked the aft outflow valve.

[6] All A300 airplanes that American Airlines operates are A300-600 airplanes.

[7] The American Airlines A300 Cabin Pressurization Manual Control Checklist is similar to that of Airbus. The entire checklist cannot be performed at one time; rather, pilots must initiate the checklist and then complete it later in flight. According to the accident captain, he did not perform all of the items in the Cabin Pressurization Manual Control Checklist because of his other priorities at the time, including addressing the smoke indications and landing the airplane.

[8] Illumination of a light on the CARGO COMPT SMOKE DET panel may indicate a fire in the cargo compartment. No evidence of fire was found in the Safety Board's postaccident examination of the airplane.

[9] The American Airlines A300 Ground Evacuation Checklist, which is contained in the American Airlines A300 operating manual, is similar to the Airbus A300-600 On Ground/Emergency Evacuation Checklist.

scheduled international passenger flight from Geneva, Switzerland, to Djerba. There were 2 flight crewmembers, 10 cabin crewmembers, and 134 passengers on board.

According to Airbus, on the flight to Geneva before the October 20, 2001, accident flight, the flight crew received an excessive cabin altitude warning and then placed the pressurization system in manual mode. The airplane landed safely at Geneva, and maintenance personnel inspected the airplane and found no anomalies. The airplane was then dispatched on the accident flight from Geneva to Djerba.

According to Airbus, while the flight was en route to Djerba, the flight crew again received an excessive cabin altitude warning and immediately placed the pressurization system in manual mode. The remainder of the flight and the landing at Djerba were uneventful. The airplane was parked at Djerba, and the engine bleed air was still turned on, allowing pressurized air into the airplane. While an air stair was being positioned to the 2L door of the airplane, a flight attendant attempted to open the 2L door. Excessive cabin pressure caused the door to burst open, and the flight attendant who opened the door was ejected and sustained serious injuries. A flight attendant who was standing near the flight attendant who opened the door was also ejected from the airplane and was killed.[10]

Discussion

The type of overpressurization event[11] that occurred in these accidents could occur in any air carrier airplane equipped with doors of a similar design if it is not fully depressurized when the emergency exit doors are opened and if it is not equipped with systems on its emergency exit doors to relieve pressure. All transport-category aircraft have outflow valves that regulate pressure inside the cabin. If air is prevented from flowing through the outflow valves because of a command to close the valves or a blockage of the valves, this type of overpressurization event could occur again.

Emergency Exit Door Design

During its investigation of the November 20, 2000, accident, the Safety Board examined the design of the Airbus A300 emergency exit doors. The Airbus A300 is equipped with eight emergency exits that have door stop fittings along each side of the door and fuselage stop fittings[12] along each side of the fuselage frame. (Figure 1 shows a picture of the November 20, 2000, accident airplane's emergency exit door that burst open. The door has been rotated in the doorframe because of damage sustained during the accident.) Opening the emergency exit door moves it sequentially upward, outward, and forward parallel to the fuselage. Upper and lower

[10] Two other occurrences of injuries that resulted from excessive cabin pressure were found in the National Aeronautics Space Administration Aviation Safety Reporting System. In one incident, a mechanic sustained a head injury when he opened a door on a pressurized ATR-72 from the outside. In the other incident, a flight attendant received minor injuries when she opened a cabin door on a pressurized Canadair CL65 Bombardier and was ejected from the airplane.

[11] The cabin is considered to be overpressurized when it is pressurized at a level that is higher than the intended pressure level for that phase of flight.

[12] 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 when the door is opened.

connecting links attach a support arm to the door. The lower connecting link, a lifting lever, moves the emergency exit door up and over the fuselage stop fittings, and the door opens. Guide arms keep the door parallel to the fuselage. A damper/emergency operation cylinder powered by a gas bottle, which is mounted inside the emergency exit door's support arm, assists the forward movement of the door and slows its momentum so that it does not damage the adjacent fuselage when it opens. According to Airbus, a person of the same size and stature (183 pounds and 5 feet 10 inches tall) as the flight attendant/purser could exert enough force on the handle to open the emergency exit door even if the airplane is overpressurized. Airbus A300 emergency exit doors do not have built-in systems to relieve pressure before the door is opened.

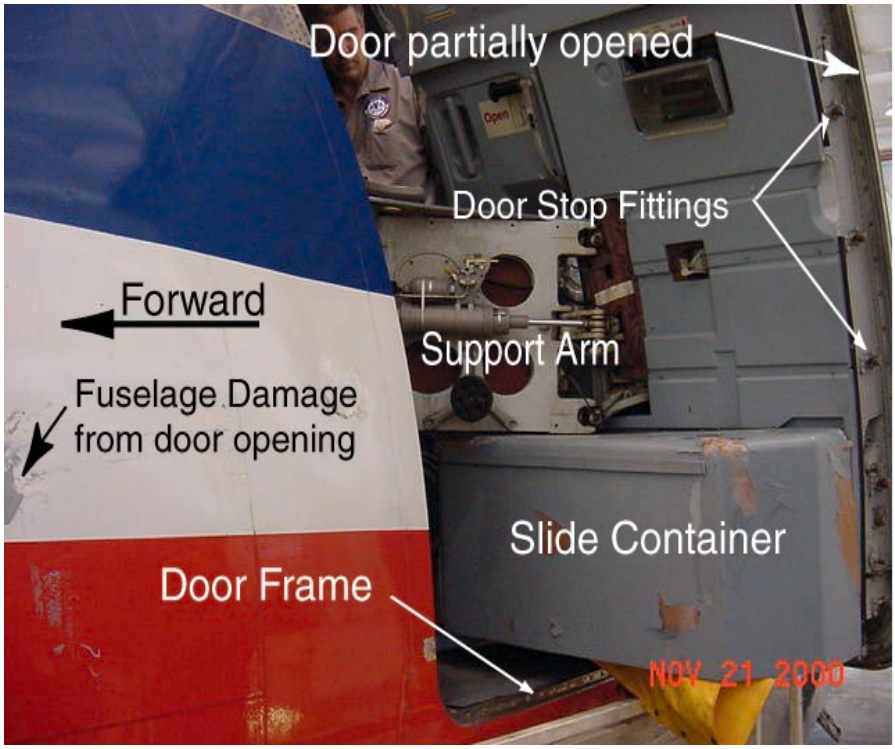


Figure 1. November 20, 2000, Accident Airplane's (Airbus A300) Emergency Exit Door.

During its investigation of the November 20, 2000, accident, the Safety Board found that the 1L emergency exit door's lower guide arm was fractured and its support arm was cracked, consistent with the door bursting open because of excess pressure. The investigation also revealed that a section of each of the emergency exit door's aft eight door stop fitting pins was flattened, consistent with them having been forced up and over the fuselage stop fittings before the door burst open.

Some models of transport-category aircraft are equipped with systems to relieve pressure, such as vent doors or gates, on emergency exit doors. For example, in some cases, floor-level emergency exit doors are equipped with a vent door that is linked to the door handle and relieves cabin pressure to a safe level before the emergency exit door can be opened. The Safety Board is concerned that, on airplanes like the Airbus A300 that do not have pressure relief systems for their emergency exit doors, forcing open the doors when the airplane is overpressurized could result in events similar to those described earlier or in more serious events. The Board notes that if the emergency exit doors on the airplanes had been equipped with pressure relief systems, the

flight attendants would likely not have been able to open the doors until the pressure was relieved. The Board recognizes that pressure relief systems for emergency exit doors would depressurize an airplane slower than the opening of the outflow valves, which is the preferred method of depressurizing the airplane. However, even this slower rate of depressurization would provide some protection against injury or death associated with opening the door while the airplane is still pressurized. Further, if the November 20, 2000, accident airplane had pressure relief systems for its emergency exit doors, they may have depressurized the airplane at a faster rate than the flight crew's opening of the outflow valves, which were partially blocked.[13]

The Safety Board notes that some new production transport-category aircraft are not being equipped with emergency exit door pressure relief systems. The Board considers any pressure relief system that prevents the opening of emergency exit doors on overpressurized airplanes on the ground until a safe differential pressure level is attained[14] to be beneficial to safety. Therefore, the Safety Board believes that the Federal Aviation Administration (FAA) should require that all newly certificated transport-category airplanes have a system for each emergency exit door to relieve pressure so that they can only be opened on the ground after a safe differential pressure level is attained. Further, the Safety Board believes that for those transport-category airplane emergency exit doors that can be opened on the ground when the airplane is overpressurized, the FAA should require air carriers to provide specific warnings near the emergency exit doors (such as lights, placards, or other indications) that clearly identify the danger of opening the emergency exit doors when the airplane is overpressurized.

Flight and Cabin Crew Manuals and Training Programs

When the captain of American Airlines flight 1291 decided to return to MIA, he made a public address (PA) announcement to the flight attendants and passengers that the flight was returning to MIA because of a problem with the airplane's air conditioning system. No mention was made of pressurization problems during the PA announcement. In addition, flight crewmembers were unaware that the airplane was overpressurized when they signaled the flight attendants to begin the emergency evacuation. Flight attendants were also unaware that the airplane was overpressurized when they responded to the evacuation signal.

Several of the flight attendants reported after the accident that they were unsure why their doors would not open during the emergency evacuation. However, the flight attendant at the 4R emergency exit door indicated to Safety Board investigators in a postaccident interview that when she had worked for another air carrier, she observed a pressurization test of an airplane and learned that the emergency exit doors would not open when the airplane was overpressurized on the ground. She stated that, on the accident airplane, she pulled "up on the door handle and it went about 1/2 way up and then…put it back down." She indicated that she informed the flight attendants at the 4L emergency exit door that they would not be able to open their emergency exit doors because the airplane was not depressurized, and they both ceased trying to open their doors.

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[13] Although the flight crew's manual opening of the outflow valves would likely have allowed the airplane to depressurize, the depressurization would have occurred at a rate that is substantially slower than normal because of the partial blockage of the valves' openings.

[14] Differential pressure, indicated by a cabin differential pressure gauge on the pressurization panel in the cockpit, is the difference between the pressure inside the airplane and that outside of the airplane.

One of the flight service directors standing at the 1R flight attendant jumpseat stated that the flight attendant/purser tried to open the 1L emergency exit door using one hand on the door handle and the other hand on the handhold by the side of the door but was unable to do so. The flight attendant/purser told the flight service director that something was wrong, entered the cockpit, and then returned to the cabin. The CVR indicates that, approximately 40 seconds before the event, the flight attendant/purser made a comment about pressurization. The flight service director then noticed the flight attendant/purser try to open the 1L emergency exit door using both hands on the door handle. The 1L emergency exit door then burst open, forcibly ejecting the flight attendant/purser from the airplane.

The flight attendants on the November 20, 2000, accident flight were trained in accordance with the emergency evacuation procedures in the American Airlines Flight Attendant Safety Manual, which provides guidance for all airplanes operated by American Airlines. The manual instructs flight attendants to evacuate the airplane immediately "upon signal from the cockpit" and to "assess conditions" for danger outside of the airplane before opening their emergency exit doors. The manual does not address a situation in which all of the emergency exit doors fail to open during an evacuation and does not instruct flight attendants on recognizing the signs of an overpressurized cabin. In addition, FAA Cabin Safety Specialists reported to the Safety Board that the flight attendant safety manuals and training programs of 12 air carriers, including American Airlines, do not include information about how to recognize the signs of an overpressurized airplane.[15] Further, the American Airlines flight crew operating manual and training program also do not include information about recognizing the signs of an overpressurized airplane.

The Safety Board is concerned that because of this lack of information about the signs of an overpressurized airplane on the ground, flight and cabin crewmembers might not recognize the signs of an overpressurized airplane.[16] The Board notes that if the flight attendants had been trained to recognize signs of overpressurization, the flight attendant/purser would not likely have attempted to forcibly open the 1L emergency exit door. Further, the Board recognizes the need for information about the signs of overpressurization and exit operation for flight and cabin crewmembers regardless of whether the airplane is equipped with pressure relief systems on its emergency exit doors. Therefore, the Safety Board believes that the FAA should review all air carriers' flight and cabin crew training manuals and programs and require revisions, if necessary, to ensure that they contain information about the signs of an overpressurized airplane on the ground and the dangers of opening emergency exit doors while the airplane is overpressurized.

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[15] Signs of an airplane that has not been depressurized on the ground may include a hissing sound around the exits and failure of the exits to open when normal forces are exerted on the exit handle.

[16] On May 8, 2001, the Safety Board issued Safety Recommendations A-01-16 through -22 to the FAA regarding information contained in the Airbus Industrie A300-600 operating manual and checklists and A300-600 operators' operating manuals, checklists, and training programs. Safety issues included the adequacy of information regarding depressurization of the airplane when the pressurization system is being operated in the manual mode; the need for the flight crew to verify that the cabin differential pressure is 0 pounds per square inch (psi) before signaling the flight attendants to begin an emergency evacuation; and the need for the flight crew to verify that the cabin differential pressure is 0 psi before permitting the flight attendants or gate agents to open the cabin doors. In a January 23, 2002, letter to the FAA, the Board classified Safety Recommendations A-01-16, -17, and -20 "Open—Acceptable Response" and Safety Recommendations A-01-18, -19, -21, and -22 "Open—Unacceptable Response."

Further, the Safety Board believes that the FAA should require that cabin crew training manuals and programs contain procedures to follow during an emergency evacuation when the airplane is overpressurized.

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

> Require that all newly certificated transport-category airplanes have a system for each emergency exit door to relieve pressure so that they can only be opened on the ground after a safe differential pressure level is attained. (A-02-20)
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> For those transport-category airplane emergency exit doors that can be opened on the ground when the airplane is overpressurized, require air carriers to provide specific warnings near the emergency exit doors (such as lights, placards, or other indications) that clearly identify the danger of opening the emergency exit doors when the airplane is overpressurized. (A-02-21)
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> Review all air carriers' flight and cabin crew training manuals and programs and require revisions, if necessary, to ensure that they contain information about the signs of an overpressurized airplane on the ground and the dangers of opening emergency exit doors while the airplane is overpressurized. (A-02-22)
>
> Require that cabin crew training manuals and programs contain procedures to follow during an emergency evacuation when the airplane is overpressurized. (A-02-23)

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA and BLACK concurred in these recommendations.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 2, 2002

In reply refer to: P-02-01 and -02

Honorable Ellen G. Engleman
Administrator
Research and Special Programs Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

On the morning of April 7, 2000, the Piney Point Oil Pipeline system, which was owned by the Potomac Electric Power Company (Pepco), experienced a pipe failure at the Chalk Point Generating Station in southeastern Prince George's County, Maryland. The release was not discovered and addressed by the contract operating company, Support Terminal Services, Inc. (ST Services), until the late afternoon. Approximately 140,400 gallons of fuel oil were released into the surrounding wetlands and Swanson Creek and, subsequently, the Patuxent River as a result of the accident. No injuries were caused by the accident, which cost approximately $71 million for environmental response and clean-up operations.[1]

The National Transportation Safety Board determined that the probable cause of the April 7, 2000, Piney Point Oil Pipeline accident at the Pepco Chalk Point, Maryland, generating station was a fracture in a buckle in the pipe that was undiscovered because the data from an in-line inspection tool were interpreted inaccurately as representing a T-piece. Contributing to the magnitude of the fuel oil release were inadequate operating procedures and practices for monitoring the flow of fuel oil through the pipeline to ensure timely leak detection.

Among other issues, the investigation considered the sufficiency of the evaluation procedures for pipe wrinkles. After the accident, the Research and Special Programs Administration (RSPA) required Mirant Piney Point, LLP (Mirant), which became the pipeline's owner some months after the accident, to prepare an integrity study of the Piney Point Oil Pipeline before it would allow the pipeline to be returned to service. Data from the 1997 in-line inspection of the pipeline were compared to the actual geometry of various wrinkles in pipeline bends, obtained after excavating the most severe wrinkles and determining geometry by field measurements. After correlation between the in-line inspection data and the field measurements was completed, the 1997 in-line inspection data were used as the basis for the evaluation of wrinkles that had not been excavated and inspected. An analysis was performed to determine if identified wrinkles needed to be removed. As a result of this work, Mirant developed quantitative acceptance criteria for pipe wrinkles remaining in the pipeline. RSPA accepted the analysis that

[1] For additional information, see forthcoming Pipeline Accident Report—*Rupture of the Piney Point Oil Pipeline and Release of Fuel Oil near Chalk Point, Maryland, April 7, 2000* (NTSB/PAR-02/01).

indicated that some wrinkles could remain in the pipeline and allowed the pipeline to return to service.

Field bends containing wrinkles were installed in pipelines before the hazardous liquid pipeline safety regulations went into effect in 1970. Since then, pipeline regulations have prohibited the installation of pipe containing wrinkle bends during pipeline construction.[2] However, pipe wrinkles that were not discovered during the construction inspection process or that formed sometime after construction are still periodically found in pipelines.

According to RSPA's pipeline integrity management rule, when an in-line inspection tool is selected by a pipeline operator to assess the condition of the pipeline, it must be "capable of detecting corrosion and deformation anomalies including dents, gouges, and grooves" in high-consequence areas.[3] The regulation states that "an operator must evaluate all anomalies and repair those anomalies that could reduce a pipeline's integrity."[4] Although the language in this regulation does not specifically designate wrinkles as a category of deformation anomaly, when questioned by Safety Board staff, RSPA officials indicated that the regulation applies to wrinkles.

Wrinkles can sometimes be identified through the use of in-line inspection tools. However, operators do not have nationally recognized quantitative criteria with which to assess the effect of a specific wrinkle characteristic on a pipe or to determine whether a pipeline can be safely operated while it contains some wrinkles. Therefore, the Safety Board concluded that because pipeline operators have no nationally recognized criteria with which to evaluate pipe wrinkles, they may not be effectively determining whether pipe containing wrinkles should be allowed to remain in service. The Safety Board believes that RSPA should establish quantitative criteria, based on engineering evaluations, for determining whether a wrinkle may be allowed to remain in a pipeline.

The accident investigation also addressed the efficiency of the leak notification procedures used following the pipeline rupture. Once ST Services personnel confirmed that they had a leak, they began to initiate an emergency response. The emergency response was affected by several communications breakdowns. Pepco did not provide accurate information about the volume of the Chalk Point oil release to public agencies, nor did it ensure that its internal information exchanges were effectively coordinated. The failures left responders with inadequate information with which to evaluate the threat posed by the release.

In the case of the Chalk Point accident, the response of deploying booms initially contained the oil spill, despite failures to effectively notify responders about the scope of the accident and to inform local response agencies early in the response effort. However, in future incidents involving pipeline leaks, such notification errors could cause responders to fail to respond with the resources needed to deal with a release, which could have negative consequences.

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[2] 49 *Code of Federal Regulations* (CFR) 195.212.

[3] 49 CFR 195.452(c)(1)(i)(A).

[4] 49 CFR 195.452(h)(1).

On the day of the accident, between 1538, when the pipeline was shut down, and 1850, when the National Response Center received notification of the Chalk Point spill, miscommunications and the creation of a release estimate lacking any factual basis took place among the various Pepco officials managing the release. By the time they shut down the pipeline, ST Services personnel were aware that they had a line balance discrepancy of about 3,000 barrels (126,000 gallons). Sometime before 1620, the ST Services assistant terminal manager told the Pepco engineering supervisor that the line balance discrepancy was about 3,000 barrels. The Pepco engineering supervisor informed the Pepco Chalk Point general supervisor for operations about the discrepancy at 1620, stating that it was about 2,000 to 3,000 barrels. At this time, the Pepco Chalk Point general supervisor for operations noted in his log that there was a discrepancy of 2,000 barrels.

About 1827, a still more significant error took place concerning the estimation of the size of the spill. The Pepco Chalk Point shift supervisor told the Pepco qualified individual (when pressed to provide an estimate) that the amount of the spill was "1,000 gallons, 2,000 gallons, [expletive] mess, tell them what you want." This unfounded estimate was reported to the Pepco Chalk Point general supervisor for operations, who, in consultation with the Pepco senior environmental coordinator during a phone conversation, agreed to report a release of 2,000 gallons to the National Response Center and the Maryland Department of the Environment. About 1840, ST Services provided additional confirmation to the Pepco Chalk Point general supervisor that the line balance shortage was approximately 3,000 barrels (126,000 gallons). About 1850, the Pepco senior environmental coordinator called the National Response Center and reported a 2,000-gallon No. 2 fuel oil release from a pipeline at Pepco's Chalk Point Generating Station, even though the Pepco Chalk Point general supervisor had updated information that the line balance shortage was actually about 3,000 barrels (126,000 gallons).

By 2015, the estimated release amount of 3,000 barrels (126,000 gallons) had been posted on the Chalk Point command center information blackboard. Shortly after 2100, the Pepco engineering group confirmed with line balance calculations that the amount of flushing oil involved in the release was 3,089 barrels (129,738 gallons).

Pepco officials could have updated the National Response Center when they learned that the information they had initially reported was inaccurate, but they did not. The Pepco senior environmental coordinator learned within 2 hours that the 2,000-gallon release estimate he had given the National Response Center did not approach the true magnitude of the release, but neither he nor any other Pepco manager updated the report. When asked why he never updated the National Response Center, the Pepco senior environmental coordinator said he believed that by 2130 on April 7, representatives of all the notified agencies were on the scene or were in contact with each other. In fact, the Environmental Protection Agency Federal On-Scene Coordinator was not advised of the revised spill estimate until she arrived at Chalk Point, at 1015 on April 8, about 13 hours after Pepco had confirmation that the likely size of the spill was 3,089 barrels (129,738 gallons). Thus, those oil spill responders who received notification from the National Response Center were not informed of the significant size of the product release and the spill's potential impact on the environment until they arrived on the scene.

During a May 16, 2002, meeting between RSPA officials and Safety Board staff, RSPA officials stated that National Response Center notification reports are intended to provide responders, as quickly as possible, the information they need to activate appropriate resources to control, mitigate, and/or clean up a product spill. Emergency responders, as well as accident investigators, rely on the information provided by the National Response Center when preparing their response efforts. Inaccurate or incomplete information can hamper these activities. For instance, if the initial information reported erroneously indicates that the release is minor, some Government responders needed on the scene to carry out containment or mitigation efforts may decide not to respond to the accident. And if they do respond, they may not bring sufficient resources to manage the spill. For those Government agencies that send personnel to the accident, the National Response Center report may be the only information that the responders have before arriving on the scene. The more complete the information is, the better prepared Government responders will be to react to the particular circumstances of the accident.

In addition to the Chalk Point accident, the Safety Board is aware of other cases in which pipeline owners or operators reporting an incident to the National Response Center did not update their initial reports when more comprehensive and accurate information became available.[5] The Safety Board concluded that because pipeline owners and operators sometimes do not update their initial reports to the National Response Center, the notifications provided to emergency responders may not always contain the complete and accurate information needed to develop an effective incident response. The Safety Board believes that RSPA should require pipeline owners and operators to provide follow-up telephone updates to the National Response Center when they discover that the information they initially reported contains significant errors or when they identify significant new information directly related to the reporting criteria.

Therefore, the National Transportation Safety Board makes the following safety recommendations to the Research and Special Programs Administration:

> Establish quantitative criteria, based on engineering evaluations, for determining whether a wrinkle may be allowed to remain in a pipeline. (P-02-01)
>
> Require pipeline owners and operators to provide follow-up telephone updates to the National Response Center when they discover that the information they initially reported contains significant errors or when they identify significant new information directly related to the reporting criteria. (P-02-02)

The Safety Board also issued one safety recommendation to the Environmental Protection Agency.

Please refer to Safety Recommendations P-02-01 and -02 in your reply. If you need additional information, you may call (202) 314-6177.

[5] A March 30, 1998, accident in Sandy Springs, Georgia, that was originally reported to the National Response Center as a release of 150 gallons of gasoline was later found to be a release of over 15,800 gallons. An August 20, 2001, accident in Jackson County, Oklahoma, that was initially reported to the National Response Center as a release of 8,400 gallons of crude oil was later found to be a release of about 126,000 gallons.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 2, 2002

In reply refer to: P-02-03

Honorable Christie Whitman
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the effectiveness of incident command. The recommendation is derived from the Safety Board's investigation of the rupture of the Piney Point Oil Pipeline and release of fuel oil near Chalk Point, Maryland, on April 7, 2000, and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued three safety recommendations, one of which is addressed to the Environmental Protection Agency (EPA). Information supporting this recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

On the morning of April 7, 2000, the Piney Point Oil Pipeline system, which was owned by the Potomac Electric Power Company (Pepco), experienced a pipe failure at the Chalk Point Generating Station in southeastern Prince George's County, Maryland. The release was not discovered and addressed by the contract operating company, Support Terminal Services, Inc. (ST Services), until the late afternoon. Approximately 140,400 gallons of fuel oil were released into the surrounding wetlands and Swanson Creek and, subsequently, the Patuxent River as a result of the accident. No injuries were caused by the accident, which cost approximately $71 million for environmental response and clean-up operations. [1]

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[1] For additional information, see forthcoming Pipeline Accident Report—*Rupture of the Piney Point Oil Pipeline and Release of Fuel Oil near Chalk Point, Maryland, April 7, 2000* (NTSB/PAR-02/01).

station was a fracture in a buckle in the pipe that was undiscovered because the data from an in-line inspection tool were interpreted inaccurately as representing a T-piece. Contributing to the magnitude of the fuel oil release were inadequate operating procedures and practices for monitoring the flow of fuel oil through the pipeline to ensure timely leak detection.

Among other issues, the investigation considered the effectiveness of the incident command during the response to the accident. The Safety Board found that the lack of effective incident command had a negative effect on the emergency response to the Chalk Point release. ST Services, Pepco, and the spill recovery contractors on the scene on April 7 and 8, 2000, were initially successful in deploying a boom system that contained the leading edge of the spill. On the night of April 8, however, with the arrival of a severe storm that included heavy rains and 50-mph winds, the boom containment system was overwhelmed. The spill escaped containment and ultimately traveled an estimated 17 miles (linear) downstream and oiled 40 miles of shoreline in Prince George's, Charles, Calvert, and St. Mary's Counties. Responders were unable to effectively mitigate the environmental impact of the oil's entry into the Patuxent River, due in part to incident management and oversight deficiencies.

The EPA Federal On-Scene Coordinator arrived on the scene at 1015 on April 8 and began attempting to coordinate the Unified Command without establishing an Incident Command System. Instead, she relied on a project management structure that gave the responsible party, Pepco, primary responsibility for directing and monitoring the activities of response contractors. Throughout April 8, the Unified Command's efforts were focused on containing the spill within the Swanson Creek wetlands area. Pepco's contractors conducted the booming operation based on the directions they received from Pepco officials, who received their orders from the Unified Command.

Management problems were evident even at this early stage. The Pepco officials working with the contractors were on rotating 8-hour shifts, and those personnel going off-duty sometimes did not fully discuss response developments and necessary tasks with those coming on-duty. This lack of continuity caused problems with task and status communication and coordination. Instances of miscommunication and problems with unclear lines of authority occurred. Important meetings were not attended by all necessary personnel, and Pepco contractors sometimes did not fully understand the tasks they were assigned. The EPA Federal On-Scene Coordinator also did not have extensive Federal response resources to draw upon at this time.

A storm was predicted for that evening, and the Unified Command and the EPA Federal On-Scene Coordinator ordered, and Pepco's contractors took, reasonable precautions to maintain the containment they had achieved in the Swanson Creek wetlands area. However, the storm was more severe than had been anticipated, and the outer booms at the Patuxent River were breached about 2030, releasing a significant amount of oil into the river.

For the next 2 days (April 9 and 10), the Unified Command, under the direction of the EPA Federal On-Scene Coordinator, attempted to mount an effective response to the oil spill's escape into the river. Significant resource and organizational problems arose immediately. Pepco had difficulty obtaining contractor resources that could carry out marine operations, and the EPA Federal On-Scene Coordinator encountered similar problems when she attempted to augment the

response effort with Federal resources. Even more importantly, the contractors hired by Pepco were not completing urgent assigned tasks, and the delays in the response effort were not being promptly and accurately reported to the Unified Command. The EPA Federal On-Scene Coordinator stated that in the 2 days following the escape of the oil into the river, the Unified Command repeatedly directed Pepco to ensure that several environmentally sensitive creeks leading into the river were protectively boomed. According to the EPA Federal On-scene Coordinator, Pepco repeatedly indicated that appropriate action was being taken and that the booms would be placed as soon as possible. As of April 11, no booms had been deployed to protect the creeks, and two creeks showed evidence of oil contamination.

To address the coordination and communication problems and the contractors' inability to complete assigned tasks, the EPA Federal On-Scene Coordinator decided that an Incident Command System structure had to be implemented. Such a system is designed to provide more direct Federal control over response activities, a quicker response to spill developments, greater access to a wider range of resources, and better responder coordination. Consequently, she requested at 1430 on April 10 that U.S. Coast Guard officials assisting on scene develop such a structure. She also urged Pepco to hire a spill management contractor to improve the logistics of its contractors' efforts.

On the morning of April 11, the Coast Guard Captain of the Port of Baltimore arrived with additional personnel to staff the Incident Command System structure that had been developed. The new personnel were deployed to monitor the field operations being conducted by Pepco's contractors to ensure that work was completed as directed. Almost immediately, with the marshalling of the additional personnel and equipment, the effectiveness of the recovery operations improved. Protective booms were provided for the threatened creeks on April 12 and 13. Within days, marine-specialist responders finished collecting the free oil in the main body of the Patuxent River, and they were able to concentrate their efforts on oil collection from the affected creeks and other environmental mediation projects.

In their postaccident assessments of the Chalk Point accident, both the Coast Guard and the Regional Response Team review committee concluded that the response would have benefited from earlier use of an Incident Command System as the incident's coordination and management structure. In fact, the Regional Response Team review committee recommended that the EPA develop a manual on how to use Incident Command System/Unified Command structures and train all Federal On-Scene Coordinators in Incident Command System/Unified Command principles. In her own assessment of the response, the EPA Federal On-Scene Coordinator acknowledged that the decision not to implement an Incident Command System structure immediately upon her arrival at the accident scene ultimately had a detrimental effect on the response effort.

Once the oil escaped from containment in the wetlands and the situation became more complex and difficult to resolve, the short-term project management approach could not achieve results with the speed and efficiency needed to avoid a serious environmental impact. The Incident Command System has proven its effectiveness in incidents covering a wide range of transportation modes, and it has usually improved the management of a complex incident response effort, such as the one that evolved from the Chalk Point oil leak. Once the structure was applied at Chalk Point, response efforts soon became more efficient and successful. The

Safety Board concluded that, because it did not initially put a fully implemented Incident Command System in place, the Unified Command was for several days unable to mobilize and control an effective response to the loss of oil containment that took place on the evening of April 8, 2000.

The Safety Board has previously recognized the benefits an Incident Command System structure may provide during a pipeline spill response effort. As a result of its investigation of the October 1994 pipeline failures on the San Jacinto River near Houston, Texas,[2] the Safety Board determined that implementing the Unified/Incident Command structure and operational principles in the National Response Team's technical assistance document addressing Incident Command System/Unified Command enhances the overall preparedness for responding to oil spills. Consequently, the Safety Board recommended that the National Response Team:

> I-96-2
>
> Motivate National Response Team agencies to integrate into their area contingency plans the command and control principles contained in Technical Assistance Document *Incident Command System/Unified Command* and encourage them to train all personnel assigned management responsibilities in those principles.

In a January 17, 2001, response to Safety Recommendation I-96-2, the National Response Team stated that it was working on methods to ensure that all member agencies have integrated into their area contingency plans the principles contained in the Technical Assistance Document *Incident Command System/Unified Command—Managing Responses to Oil Discharges and Hazardous Substance Releases under the National Contingency Plan*, as requested. The Safety Board classified Safety Recommendation I-96-2 "Open–Acceptable Response," pending notification that the action is complete.

The National Response Team is made up of 16 Federal departments and agencies. The EPA is the permanent Chair of the National Response Team. Since the San Jacinto accident, the EPA has distributed the Technical Assistance Document *Incident Command System/Unified Command—Managing Responses to Oil Discharges and Hazardous Substance Releases under the National Contingency Plan* to all EPA on-scene coordinators, and EPA headquarters has encouraged its regional coordinators to incorporate the guidance from the document in their area contingency plans. Nevertheless, an EPA official stated in an April 24, 2001, postaccident letter to the Safety Board that "EPA currently has no formal policy on the use of Incident Command System/Unified Command." The EPA has not mandated that all its regions use the Incident Command System. Although the EPA's Office of Emergency and Remedial Response is developing an EPA policy position on the Incident Command System, the Safety Board is concerned that no final EPA Incident Command System policy, the development of which began in 1996 in response to lessons learned during the 1994 San Jacinto pipeline accident, has been completed.

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[2] National Transportation Safety Board, *Evaluation of Pipeline Failures During Flooding and of Spill Response Actions, San Jacinto River Near Houston, Texas, October 1994*, Pipeline Special Investigation Report NTSB/SIR-96/04 (Washington, DC: NTSB, 1996).

The lack of incident command during the Chalk Point emergency response indicates that the EPA needs to make a greater commitment to incorporating Incident Command System principles in its response procedures and to training its people more effectively about the benefits provided by the use of the system.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the Environmental Protection Agency:

> Require all your regions to integrate the principles contained in the National Response Team's Technical Assistance Document *Incident Command System/Unified Command—Managing Responses to Oil Discharges and Hazardous Substance Releases under the National Contingency Plan* in their area contingency plans and require the regions to train all personnel who are assigned responsibility to implement the plans according to those principles. (P-02-03)

The Safety Board also issued safety recommendations to the Research and Special Programs Administration. In your response to the recommendation in this letter, please refer to Safety Recommendation P-02-03. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 8, 2002

In reply refer to: H-02-07

Honorable Mary E. Peters
Administrator
Federal Highway Administration
400 Seventh Street, S.W.
Washington, DC 20590

Ms. Leila Osina
Executive Director
National Committee on Uniform Traffic Laws and Ordinances
107 South West Street, Suite 110
Alexandria, Virginia 22314

On November 17, 2000, about 4:35 p.m., eastern standard time, near Intercession City, Florida, a 23-axle, heavy-haul vehicle, operated by Molnar Worldwide Heavy Haul Company, was delivering a condenser to the Kissimmee Utility Authority Cane Island Power Plant. The private access road to the plant crossed over a single railroad track owned by CSX Transportation, Inc. (CSXT). As the vehicle, traveling between 1 and 3 mph, crossed the tracks, the crossing warning devices activated and the gates came down on the load. Seconds later, Amtrak train 97, operated by the National Railroad Passenger Corporation, collided with the right side of the rear towed four-axle tractor. No injuries occurred. The collision destroyed the tractor and caused over $200,000 damage to the train and crossing signals.[1]

The National Transportation Safety Board investigated a similar accident that occurred on November 30, 1993, at the same location.[2] In that accident, an overdimenson, low-clearance vehicle operated by Rountree Transport and Rigging, Inc., was en route to deliver an 82-ton turbine to the electricity generating plant. The cargo deck of the transporter bottomed out on the roadway surface as the vehicle moved across the tracks. To gain sufficient clearance, the four-member truck crew shimmed the transporter while the cargo deck was on the tracks. About 12:40 p.m., the lights and bells at the grade crossing activated; the crossing gates descended, striking the turbine. Seconds later, Amtrak train 88, carrying 10 crewmembers and 89 passengers, struck the side of the cargo deck and the turbine. Six people sustained serious injuries and 53 suffered

[1] For additional information, read National Transportation Safety Board, *Collision Between Amtrak Train 97 and Molnar Worldwide Heavy Haul Company Tractor-Trailer Combination Vehicle at Highway-Rail Grade Crossing in Intercession City, Florida, on November 17, 2000*, Highway Accident Report NTSB/HAR-02/02 (Washington, DC: NTSB, 2002).

[2] For additional information, read National Transportation Safety Board, *Collision of Amtrak Train No. 88 With Rountree Transport and Rigging, Inc., Vehicle on CSX Transportation, Inc., Railroad Near Intercession City, Florida, November 30, 1993*, Highway Accident Report NTSB/HAR-95/01 (Washington, DC: NTSB, 1995).

minor injuries. The vehicle and turbine were destroyed; the locomotive and first three railcars were damaged extensively. Total damage exceeded $14 million.

The National Transportation Safety Board determined that the probable cause of the November 2000 collision of Amtrak train 97 with the tractor-combination vehicle was the failure of the Kissimmee Utility Authority, its construction contractors and subcontractors, and the motor carrier to provide for the safe passage of the load over the grade crossing.

In this accident, due to the intersection's proximity to the crossing and the elevated configuration of the vehicle, the maximum speed the vehicle could maintain near the crossing was between 1 and 3 mph. Based on this speed, the minimum time the vehicle would occupy the crossing was between 57 seconds and 2 minutes 50 seconds. Active railroad grade crossing devices are required to provide a minimum of 20 seconds of warning time to motorists before the arrival of a train, and typically these devices provide between 20 and 25 seconds of warning. The warning devices at this crossing provided a warning time of 25 seconds. Thus, the accident truck required at least two and as much as seven times more warning of an approaching train than the active warning devices provided, effectively neutralizing the active warning devices.

Additionally, although the train engineer applied the brakes prior to actually identifying the truck on the crossing, he had no opportunity to avoid the collision. His brake application and throttle reduction during the approximately 16 seconds before the accident reduced the train speed by 19 mph, delaying his arrival at the crossing by about 1.71 seconds. While the train's reduced speed and slightly delayed arrival at the crossing may have altered the collision dynamics, there was still not enough time to avoid the collision. The truck would have needed an additional 3.4 seconds to 10.27 seconds to clear the tracks.

Uniform Vehicle Code 11-703 and Florida State Statute (FSS) 316.170 specify that if a vehicle traversing a grade crossing has a normal operating speed of 10 mph or less or a ground clearance of ½inch-per-foot of the distance between any two axles, or a ground clearance of less than 9 inches, the operator of that vehicle must notify the railroad before crossing. The truckdriver indicated that the normal operating speed of the accident vehicle exceeded 10 mph. Safety Board investigators examined the accident vehicle at the scene; applying the formula provided in FSS 316.170 to this vehicle (1/2 inch per foot times 52 feet), the critical ground clearance was 26 inches. The accident vehicle's cargo bed could be raised to 32 inches. It is not clear that the accident vehicle would have met the definition for a vehicle required to notify the railroad in advance of crossing its tracks as found in the *Uniform Vehicle Code* and the Florida statute. However, due to the time this vehicle occupied the crossing, it clearly created a hazard.

Uniform Vehicle Code, Section 11-703, "Moving Heavy Equipment at Railroad Grade Crossings," and the various State laws that are modeled after it do not cover the situation found in this accident, in which the proximity of an intersection to a grade crossing limits vehicle speed to less than 10 mph. The Safety Board has investigated several accidents (1993 Intercession City, Florida; Glendale, California; and Sumner, Washington)[3] involving transporters of oversize loads

[3] (a) NTSB/HAR-95/01. (b) National Transportation Safety Board, *Collision Between Metrolink Train 901 and Mercury Transportation, Inc., Tractor-Combination Vehicle at Highway-Railroad Grade Crossing in Glendale, California, January 28, 2000*, Highway Accident Report, NTSB/HAR-01/02 (Washington, DC: NTSB, 2001). (c) On December 23, 2000, near Sumner, Washington, a truck, towing a house, had stopped on the tracks to adjust tow dollies when it was struck by an Amtrak train. The load was being escorted by a pilot car and three uniformed, off-duty county police officers. No permit had been obtained to cross the tracks. (National Transportation Safety Board Docket No. Highway-01-IH013).

whose normal operating speed was greater than 10 mph, but, due to the proximity of intersections, had to reduce their speed through the turn and over the grade crossing. In addition, unless a low-clearance vehicle stops well in advance of a crossing to raise the cargo deck to clear the crossing, it cannot reach highway speed. The relevant speed is the actual speed over the crossing. The Safety Board concludes that the definition of a vehicle required to notify the railroad of its intention to cross a highway-rail grade crossing found in the FSS 316.170[4] and *Uniform Vehicle Code*, Section 11-703, is inadequate because it is based on normal operating speed rather than the actual speed over the crossing.

The National Committee on Uniform Traffic Laws and Ordinances (NCUTLO) maintains the *Uniform Vehicle Code*. The Federal Highway Administration (FHWA) Office of Safety currently has a contract with the NCUTLO to develop a model law on grade crossing safety, and the FHWA Office of Freight Management and Operations provides limited Federal oversight on the transportation of oversize/overweight loads. Therefore, the Safety Board believes that the FHWA and the NCUTLO should revise *Uniform Vehicle Code*, Section 11-703, to define which vehicles, under what circumstances, need to notify the railroad before crossing a highway-rail grade crossing. The Specialized Carriers & Rigging Association (SC&RA) represents the heavy-hauling or oversize/overweight industry, and the Truck Trailer Manufacturers Association has knowledge of the operating characteristics of the specialized trailers used in the heavy-hauling industry. The Safety Board encourages the FHWA and the NCUTLO to work with the Federal Railroad Administration, Federal Motor Carrier Safety Administration, American Association of State Highway Transportation Officials, SC&RA, Truck Trailer Manufacturers Association, American Short Line and Regional Railroad Association, and representatives from all class 1 and regional railroads to meet the intent of this recommendation.

The National Transportation Safety Board recommends that the Federal Highway Administration and the National Committee on Uniform Traffic Laws and Ordinances:

> Revise *Uniform Vehicle Code*, Section 11-703, to define which vehicles, under what circumstances, need to notify the railroad before crossing a highway-rail grade crossing. (H-02-07)

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[4] FSS 316.170 states:

No person shall operate or move any crawler-type tractor, steam shovel, derrick, or roller, or any equipment or structure having a normal operating speed of 10 or less miles per hour or a vertical body or load clearance of less than 1/2-inch per foot of the distance between any two axles or in any event of less than 9 inches, measured above the level surface of a roadway, upon or across any tracks at a railroad grade crossing without first complying with this section.

Notice of any such intended crossing shall be given to a station agent or other proper authority of the railroad, and a reasonable time shall be given to the railroad to provide proper protection at the crossing.

Before making any such crossing the person operating or moving any such vehicle or equipment shall first stop the same not less than 15 feet nor more than 50 feet from the nearest rail of the railroad and while so stopped shall listen and look in both directions along the track for any approaching train and for signals indicating the approach of a train, and shall not proceed until the crossing can be made safely.

The Safety Board also issued safety recommendations to the Federal Motor Carrier Safety Administration, American Association of State Highway and Transportation Officials, Kissimmee Utility Authority, and all class 1 and regional railroads.

Please refer to Safety Recommendation H-02-07 in your reply. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 8, 2002

In reply refer to: H-02-08

Honorable Joseph M. Clapp
Administrator
Federal Motor Carrier Safety Administration
400 Seventh Street, S.W.
Washington, DC 20590

On November 17, 2000, about 4:35 p.m., eastern standard time, near Intercession City, Florida, a 23-axle, heavy-haul vehicle, operated by Molnar Worldwide Heavy Haul Company, was delivering a condenser to the Kissimmee Utility Authority (KUA) Cane Island Power Plant. The private access road to the plant crossed over a single railroad track owned by CSX Transportation, Inc. (CSXT). As the vehicle, traveling between 1 and 3 mph, crossed the tracks, the crossing warning devices activated and the gates came down on the load. Seconds later, Amtrak train 97, operated by the National Railroad Passenger Corporation, collided with the right side of the rear towed four-axle tractor. No injuries occurred. The collision destroyed the tractor and caused over $200,000 damage to the train and crossing signals.[1]

The National Transportation Safety Board investigated a similar accident that occurred on November 30, 1993, at the same location.[2] In that accident, an overdimenson, low-clearance vehicle operated by Rountree Transport and Rigging, Inc., was en route to deliver an 82-ton turbine to the electricity generating plant. The cargo deck of the transporter bottomed out on the roadway surface as the vehicle moved across the tracks. To gain sufficient clearance, the four-member truck crew shimmed the transporter while the cargo deck was on the tracks. About 12:40 p.m., the lights and bells at the grade crossing activated; the crossing gates descended, striking the turbine. Seconds later, Amtrak train 88, carrying 10 crewmembers and 89 passengers, struck the side of the cargo deck and the turbine. Six people sustained serious injuries and 53 suffered minor injuries. The vehicle and turbine were destroyed; the locomotive and first three railcars were damaged extensively. Total damage exceeded $14 million.

The National Transportation Safety Board determined that the probable cause of the November 2000 collision of Amtrak train 97 with the tractor-combination vehicle was the failure

[1] For additional information, read National Transportation Safety Board, *Collision Between Amtrak Train 97 and Molnar Worldwide Heavy Haul Company Tractor-Trailer Combination Vehicle at Highway-Rail Grade Crossing in Intercession City, Florida, on November 17, 2000*, Highway Accident Report NTSB/HAR-02/02 (Washington, DC: NTSB, 2002).

[2] For additional information, read National Transportation Safety Board, *Collision of Amtrak Train No. 88 With Rountree Transport and Rigging, Inc., Vehicle on CSX Transportation, Inc., Railroad Near Intercession City, Florida, November 30, 1993*, Highway Accident Report NTSB/HAR-95/01 (Washington, DC: NTSB, 1995).

of the Kissimmee Utility Authority, its construction contractors and subcontractors, and the motor carrier to provide for the safe passage of the load over the grade crossing.

This accident was very similar to the 1993 accident. Although the motor carrier was different, the KUA was not only the owner of the crossing and the receiver of both loads, it also had representatives at the crossing during both collisions. Additionally, no one contacted the railroad in either accident to determine whether it was safe to cross the tracks.

In 1993, the Amtrak train hit the truck near the center of its load, and as a result, the locomotive and three railcars were damaged extensively, 59 people were injured, and damages exceeded $14 million. In 2000, by contrast, the Amtrak train hit the rear of the combination vehicle at the pusher truck. The train essentially pushed the truck and its 82-ton load out of the way, and the train remained upright and on the tracks. However, had the truck started to cross the tracks several seconds later or the train arrived several seconds sooner, the collision may have occurred near the center of the 82-ton load, and the consequences could have been quite different.

In this accident, due to the intersection's proximity to the crossing and the elevated configuration of the vehicle, the maximum speed the vehicle could maintain near the crossing was between 1 and 3 mph. Based on this speed, the minimum time the vehicle would occupy the crossing was between 57 seconds and 2 minutes 50 seconds. Active railroad grade crossing devices are required to provide a minimum of 20 seconds of warning time to motorists before the arrival of a train, and typically these devices provide between 20 and 25 seconds of warning. The warning devices at this crossing provided a warning time of 25 seconds. Thus, the accident truck required at least two and as much as seven times more warning of an approaching train than the active warning devices provided, effectively neutralizing the active warning devices.

Additionally, although the train engineer applied the brakes prior to actually identifying the truck on the crossing, he had no opportunity to avoid the collision. His brake application and throttle reduction during the approximately 16 seconds before the accident reduced the train speed by 19 mph, delaying his arrival at the crossing by about 1.71 seconds. While the train's reduced speed and slightly delayed arrival at the crossing may have altered the collision dynamics, there was still not enough time to avoid the collision. The truck would have needed an additional 3.4 seconds to 10.27 seconds to clear the tracks.

The vehicle created a hazard at this crossing, since it occupied the tracks well beyond the standard minimum warning time provided for a vehicle to cross safely. The only prudent way to minimize the risk was to notify the railroad sufficiently in advance of crossing to ensure that train traffic was stopped or not present at the time the vehicle traversed the tracks. The Safety Board concludes that neither the KUA, nor its contractors, nor the motor carrier properly considered the risks of crossing the tracks without first notifying the railroad to arrange safe passage.

Despite the trucking industry's education and training efforts since 1993, awareness of the hazards of maneuvering oversize/overweight vehicles at grade crossings and the consequent need to notify railroads is still lacking. For instance, the Safety Board discovered during its investigation of the November 2000 Intercession City accident that prior to the accident, neither the shippers, nor the motor carrier, nor the receivers notified the CSXT of the oversize/overweight load traversing its tracks. Furthermore, the lack of clarity in the Florida

permit process allowed the motor carrier, pilot car drivers, and truckdriver to plausibly argue that they were not aware of the need to notify the railroad.

To better understand why those involved with the movement of this oversize/overweight load did not notify the railroad and request safe passage at this crossing, the Safety Board examined the roles and responsibilities of those involved in planning and executing the movement of this oversize load.

The truckdriver told Safety Board investigators that he was not aware that any States had requirements to notify the railroad before crossing its tracks. He was also unaware of the minimum warning times at railroad grade crossings or how the warning devices operated. In addition, he stated that he did not see the emergency signs with the CXST 1-800 number posted at the crossing. Since the carrier did not have a formal training program, the truckdriver received no specific training on the hazards of long, slow-moving vehicles at grade crossings. Although the truckdriver may have been exposed to some information regarding grade crossing safety through the commercial driver's license (CDL) program, the CDL tests do not specifically address the operation of grade crossing warning devices and the hazards of long, slow-moving vehicles at grade crossings.

In addition to the two accidents that occurred at the same highway-rail grade crossing in Intercession City on November 30, 1993,[3] and November 17, 2000, the Safety Board has investigated five other accidents at highway-rail grade crossings involving four low-clearance or slow-moving vehicles (Sycamore, South Carolina;[4] Glendale, California;[5] Sumner, Washington;[6] and Milford, Connecticut[7]) and a long combination vehicle (Portage, Indiana[8]) and published a safety study[9] on passive grade crossings.

During these accident investigations, the Safety Board discovered that few of the participants involved were aware of the hazards associated with maneuvering

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[3] NTSB/HAR-95/01.

[4] National Transportation Safety Board, *Highway-Rail Grade Crossing Collision Near Sycamore, South Carolina, May 2, 1995*, Highway Accident Report NTSB/HAR-96/01 (Washington, DC: NTSB, 1996).

[5] National Transportation Safety Board, *Collision Between Metrolink Train 901 and Mercury Transportation, Inc., Tractor-Combination Vehicle at Highway-Railroad Grade Crossing in Glendale, California, January 28, 2000*, Highway Accident Report, NTSB/HAR-01/02 (Washington, DC: NTSB, 2001).

[6] On December 23, 2000, a truck, towing a house, had stopped on the tracks to adjust tow dollies when it was struck by an Amtrak train. The load was being escorted by a pilot car and three uniformed, off-duty county police officers. No permit had been obtained to cross the tracks. (National Transportation Safety Board Docket No. Highway-01-IH013).

[7] On October 3, 1995, a low-bed semitrailer, transporting an excavator, was struck by a commuter train after becoming lodged on the railroad tracks; the truckdriver attempted to raise the semitrailer for 3 or 4 minutes before the train arrived. No one contacted the railroad before attempting to cross the tracks or after the accident. (National Transportation Safety Board Docket No. Highway-SRH-96-MH001).

[8] National Transportation Safety Board, *Collision of Northern Indiana Commuter Transportation District Train 102 With a Tractor-Trailer, Portage, Indiana, June 18, 1998*, Railroad Accident Report, NTSB/RAR-99/03 (Washington, DC: NTSB, 1999).

[9] National Transportation Safety Board, *Safety at Passive Grade Crossings*, Safety Study NTSB/SS-98/03 (Washington, DC: NTSB, 1998).

oversize/overweight, low-clearance, slow-moving vehicles over highway-rail grade crossings or of the need or a requirement to notify the railroad before attempting such maneuvers.

The Safety Board has addressed the issue of training truckdrivers about the hazards of railroad crossings in previous safety recommendations. The Board has been advised that the development of a truckdriver training tool is the subject of discussions between the Federal Motor Carrier Safety Administration (FMCSA) Southern Service Center and the Federal Railroad Administration (FRA) Office of Safety in Atlanta, Georgia. According to FMCSA and FRA officials, they plan to develop a brochure, video, or Web site that addresses the dangers of grade crossings and the new FMCSA regulations regarding disqualification for highway-rail grade crossing violations. The new regulations, found in subpart D–Driver Disqualifications and Penalties (49 *Code of Federal Regulations* 383.51), list six disqualifying offenses at highway-rail grade crossings. The regulations at section (vi), "For all drivers, failing to negotiate a crossing because of insufficient undercarriage clearance," state that the first violation carries a 60-day disqualification, the second violation within a 3-year period carries a 120-day disqualification, and the third violation within a 3-year period carries a disqualification penalty of at least 1 year. This regulation becomes effective October 2002. The development of such a module is commendable.

The CDL disqualification and the penalties for highway-rail grade crossing violations, effective October 2002, should promote railroad grade crossing safety. However, these actions do not address the issue of railroad notification.

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

> Amend *Code of Federal Regulations* 383.51 (e), "Disqualification for railroad-highway grade crossing violation," to include a violation for drivers of low-clearance or slow-moving vehicles who fail to make arrangements with the railroad for safe passage, when required. (H-02-08)

The Safety Board also issued safety recommendations to the Federal Highway Administration, National Committee on Uniform Traffic Laws and Ordinances, American Association of State Highway and Transportation Officials, Kissimmee Utility Authority, and all class 1 and regional railroads.

Please refer to Safety Recommendation H-02-08 in your reply. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 8, 2002

In reply refer to: H-02-09 through -11

Mr. John Horsley
Executive Director
American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W., Suite 249
Washington, DC 20001

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the adequacy of the railroad notification requirement and the consistency and availability of information regarding railroad notification. The recommendations are derived from the Safety Board's investigation of the November 17, 2000, tractor-trailer combination vehicle and train collision in Intercession City, Florida,[1] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued eight safety recommendations, three of which are addressed to the American Association of State Highway and Transportation Officials (AASHTO). Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

On November 17, 2000, about 4:35 p.m., eastern standard time, near Intercession City, Florida, a 23-axle, heavy-haul vehicle, operated by Molnar Worldwide Heavy Haul Company (Molnar), was delivering a condenser to the Kissimmee Utility Authority Cane Island Power Plant. The private access road to the plant crossed over a single railroad track owned by CSX Transportation, Inc. (CSXT). As the vehicle, traveling between 1 and 3 mph, crossed the tracks, the crossing warning devices activated and the gates came down on the load. Seconds later, Amtrak train 97, operated by the National Railroad Passenger Corporation, collided with the right side of the rear towed four-axle tractor. No injuries occurred. The collision destroyed the tractor and caused over $200,000 damage to the train and crossing signals.

[1] For additional information, read National Transportation Safety Board, *Collision Between Amtrak Train 97 and Molnar Worldwide Heavy Haul Company Tractor-Trailer Combination Vehicle at Highway-Rail Grade Crossing in Intercession City, Florida, on November 17, 2000*, Highway Accident Report NTSB/HAR-02/02 (Washington, DC: NTSB, 2002).

The National Transportation Safety Board investigated a similar accident that occurred on November 30, 1993, at the same location.[2] In that accident, an overdimenson, low-clearance vehicle operated by Rountree Transport and Rigging, Inc., was en route to deliver an 82-ton turbine to the electricity generating plant. The cargo deck of the transporter bottomed out on the roadway surface as the vehicle moved across the tracks. To gain sufficient clearance, the four-member truck crew shimmed the transporter while the cargo deck was on the tracks. About 12:40 p.m., the lights and bells at the grade crossing activated; the crossing gates descended, striking the turbine. Seconds later, Amtrak train 88, carrying 10 crewmembers and 89 passengers, struck the side of the cargo deck and the turbine. Six people sustained serious injuries and 53 suffered minor injuries. The vehicle and turbine were destroyed; the locomotive and first three railcars were damaged extensively. Total damage exceeded $14 million.

The National Transportation Safety Board determined that the probable cause of the November 2000 collision of Amtrak train 97 with the tractor-combination vehicle was the failure of the Kissimmee Utility Authority, its construction contractors and subcontractors, and the motor carrier to provide for the safe passage of the load over the grade crossing.

Molnar obtained specialized moving permits from 10 States: Utah, Wyoming, Colorado, Kansas, Oklahoma, Arkansas, Mississippi, Alabama, Georgia, and Florida. Molnar used State Permits Company, Akron, Ohio, a private permit service, for the Georgia and Mississippi permits[3] and obtained the remaining permits directly from the other eight States. Each permit specified the authorized routes, dates, and times for movement of the load.

Some States, including Florida, require that slow-moving (less than 10 mph) or low-clearance (8 to 9 inches) vehicles notify railroads before crossing their tracks. The Florida ordinance (Florida State Statute [FSS] 316.170) was modeled on the *Uniform Vehicle Code*, Section 11-703, published by the National Committee on Uniform Traffic Laws and Ordinances (NCUTLO).[4] According to the "Foreword" of the 1987 edition of the *Uniform Vehicle Code*,[5] the set of motor vehicle laws was first published in 1926 and was designed and advanced as a comprehensive guide or standard for State motor vehicle and traffic laws. The NCUTLO general counsel said that the railroad notification model law has been in effect for more than 30 years and no information is available concerning the history of the law or how vehicle speed and ground clearance criteria were first determined.

The only information on the Florida permit regarding railroad notification requirements was a statement that the "movement shall be in compliance with W/FS 316.08, 316.170, and F.A.C. rule 14-26." Neither the text of the referenced statutes was on the permit (or on an attachment) nor was a telephone number listed for contacting the railroad. According to the

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[2] For additional information, read National Transportation Safety Board, *Collision of Amtrak Train No. 88 With Rountree Transport and Rigging, Inc., Vehicle on CSX Transportation, Inc., Railroad Near Intercession City, Florida, November 30, 1993*, Highway Accident Report NTSB/HAR-95/01 (Washington, DC: NTSB, 1995).

[3] Private permit services are often used to obtain permits by transporters moving loads interstate when the permit process is complicated or the transporting company is unfamiliar with the permitting process for a particular State.

[4] The National Committee on Uniform Traffic Laws and Ordinances is a private, nonprofit membership organization dedicated to providing uniformity of traffic laws and regulations. Reference: <www.ncutlo.org/news.html>.

[5] *Uniform Vehicle Code and Model Traffic Ordinance 1987*, National Committee on Uniform Traffic Laws and Ordinances, Evanston, Illinois.

Molnar Safety Director, the company made several attempts to determine the text of these sections. Molnar called the permit office of the Florida Department of Transportation (FLDOT) and the CSXT and stated that it was unable to get any information from either source. According to Molnar, one agency told the company "go look it up in the local library." Safety Board investigators called several FLDOT offices (permit, highway, and railroad) and were unable to obtain information regarding the Florida railroad notification requirement.

The Safety Board's report of the investigation of the November 30, 1993, accident in Intercession City found that when FLDOT issues permits, "it does not advise applicants that Florida law requires operators of certain low-clearance vehicles to provide railroads with advance notification of the applicant's intent to travel over grade crossings." The Safety Board recommended that AASHTO encourage the States to revise their permit documents to state that compliance with this notification requirement is a condition of permitting. On June 28, 1996, Florida revised its permit form to include the reference to the applicable statute.

In addition, the FLDOT Railroad Division published the brochure *Florida Department of Transportation Low-clearance Information – Don't Get Hung Up On The Tracks.*[6] The brochure lists the railroad contact telephone numbers and emergency police and highway patrol telephone numbers and also includes the text of FSS 316.170. A FLDOT Railroad Division representative said that the brochure was provided to permit applicants through the FLDOT permit office. According to a representative of the FLDOT permit office, the brochure was available at one time only, some time before 1997, and, not being in stock, is not sent to permit applicants.

This representative also indicated that from May to July 2001, the permit office sent a one-page document with the text of FSSs 316.170 and 316.550 (requirement to obtain a permit for oversize vehicles) to the private permit service companies with which they conduct business. In addition, the permit office attaches this document to each issued permit.

The need to notify the railroad to obtain safe passage at a given highway-rail grade crossing should be evaluated individually for each at-risk vehicle. The evaluation should take into account the compatibility of the crossing configuration, including approach and departure grades, and the proximity to turns, as well as the vehicle configuration, including ground clearance, axle spacing, overall length, and vehicle speed.

The data needed to perform this evaluation are currently found in different places and are not readily available to all participants in the process. The States should have the public crossing configuration information, although the approach and departure grade records may not be current. Many States require a route survey only when the vehicle and load exceed a certain height. Yet route surveys are important to an evaluation of the need to notify the railroad before crossing and should routinely be part of this process. The American Association of Railroads/Federal Railroad Administration Highway-Rail Grade Crossing Inventory is available on the internet. Although the inventory provides information about the proximity of an intersection, it does not include approach and departure grades or whether the crossing is humped. In addition, vehicle operators may not be aware the inventory exists.

[6] Florida Department of Transportation, revised December 1997.

The vehicle operator should know the configuration of the vehicle. Most States do not collect information about ground clearance or operating speed as part of the permit application process. The only point in the process at which all information becomes readily available is when the vehicle is at the crossing. Even then, the operator can notify the railroad only if an emergency number is posted at the crossing and if telephone access is available. Arrangements for a given railroad to protect the crossing take time (in the case of CSXT, 2 weeks) and, generally, space to safely park the vehicle is not available.

The notification process should be consistent and user-friendly for all participants. The vehicle operator needs to know when it is necessary to notify the railroad, which railroad to notify, and how to do so. Currently, the sources of information about railroad notification requirements provide inconsistent guidance.

The Safety Board examined the railroad notification requirements of the 10 States traversed by the slow-moving, low-clearance vehicle convoy during the movement of this oversize/overweight load. Investigators reviewed four separate sources of information available to a motor carrier when planning the movement of an oversize/overweight load: (1) the permit offices from the 10 States that issued permits for this accident load; (2) the Specialized Carriers & Rigging Association (SC&RA) guide entitled *Oversize/Overweight Permit Manual*[7] (updated quarterly, according to the SC&RA, from information provided by the individual State permit offices); (3) the Federal Railroad Administration (FRA) publication entitled *Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings*[8] (also available on the FRA Web site); and, (4) the text of each State's motor vehicle laws.

Eight of the 10 States have statutes in their motor vehicle codes requiring railroad notification. Of the eight, only one State permit office indicated that the State had such a requirement. The SC&RA publication indicated that four States had a requirement, and the FRA document listed six States as having such a requirement.

The Safety Board also contacted the remaining 40 States in February 2002 about their railroad notification requirements. Among all 50 States, 34 have statutes in their motor vehicle codes that require railroad notification. Of these 34, only 10 State permit offices indicated that a requirement existed in their States.

No State requires information about ground clearance or normal operating speed as part of the permit application process. Several State permit office representatives indicated that because such information is not gathered as part of their permit process, they do not know whether a vehicle is a low-clearance or slow-moving vehicle that meets the requirements of the railroad notification statutes. Alaska, Montana, New York, Utah, and Washington have requirements for notifying the railroad before traversing a highway-rail grade crossing based on size or weight dimensions, but not for low-clearance vehicles. Oregon adopted a regulation in 2002 that makes it an offense to obstruct a highway-rail grade crossing if a vehicle "fails to negotiate the rail grade crossing because of insufficient undercarriage clearance." (ORS [Oregon Statute] 811.475)

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[7] Specialized Carriers & Rigging Association, *Oversize/Overweight Permit Manual* (Fairfax, Virginia: September 2000).

[8] U.S. Department of Transportation, Federal Railroad Administration, *Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings*, 3rd edition, January 6, 2000.

All States have a provision on their permits indicating that transporters are required to comply with all State laws and regulations and that the transporter is responsible for the safe movement of the load on the highways.

In 24 of 34 States that have railroad notification requirements, the person contacted in the State permitting office did not know the State had railroad notification requirements. In addition, the data in the two published resources are not consistent with State statutes. Thus, the likelihood that a State will make the vehicle operator aware of the requirement is not great. Even if vehicle operators are aware of the State notification requirement, they are not told which railroad to notify. The Safety Board concludes that accurate and complete information pertaining to the requirement for low-clearance or slow-moving vehicles to notify the railroad prior to traversing grade crossings is lacking. The Safety Board has recommended that the class 1 and regional railroads provide easily accessed contact and notification information for use by vehicle operators requiring railroad assistance to ensure safety at grade crossings. (H-02-12) In addition, the Board has recommended that the FHWA and NCTLO should revise the *Uniform Vehicle Code*, Section 11-703, to define which vehicles, under what circumstances, need to notify the railroad before crossing a highway-rail grade crossing. (H-02-07)

The Safety Board considers that once the *Uniform Vehicle Code*, Section 11-703, "Moving Heavy Equipment at Railroad Grade Crossings," has been revised, the States should adopt the revised *Uniform Vehicle Code*, Section 11-703, and require operators of low-clearance and slow-moving vehicles to conduct route surveys. The AASHTO Highway Subcommittee on Highway Transport is concerned with the relationship between commercial vehicle operations and the Nation's highway systems, and this AASHTO subcommittee deals with permitting issues. Therefore, the Safety Board believes that AASHTO should encourage the States, once the *Uniform Vehicle Code*, Section 11-703, has been revised, (a) to adopt the revised *Uniform Vehicle Code*, Section 11-703, (b) to include vehicle ground clearance as part of the permitting process, and (c) to require permitted slow-moving vehicles and those permitted vehicles that do not meet the ground-clearance provisions of the *Uniform Vehicle Code* to conduct route surveys. To avoid problems in determining the text of State railroad notification requirements, the States should include the text of the revised *Uniform Vehicle Code*, Section 11-703, on the face of permits. Therefore, the Safety Board believes that AASHTO should encourage the States, once the revised *Uniform Vehicle Code*, Section 11-703, has been adopted, to include the text of the revised State statute on the face of permits.

In this accident, government officials missed several opportunities to inform the carrier of the railroad notification requirement, and the carrier found it difficult to discover the requirements on its own. Critical information, such as railroad notification requirements, should be easily available, frequently advertised, and regularly provided to motor carriers needing the information. Consequently, State employees who interface with the heavy-hauling industry should be knowledgeable about the State's railroad notification requirements. Therefore, the Safety Board believes that AASHTO should encourage the States to conduct initial and recurrent training for State employees in the permit offices and State employees involved in commercial vehicle enforcement regarding the railroad notification requirements.

Therefore, the National Transportation Safety Board recommends that the American Association of State Highway and Transportation Officials:

Encourage the States, once the *Uniform Vehicle Code*, Section 11-703, has been revised, (a) to adopt the revised *Uniform Vehicle Code*, Section 11-703, (b) to include vehicle ground clearance as part of the permitting process, and (c) to require permitted slow-moving vehicles and those permitted vehicles that do not meet the ground-clearance provisions of the *Uniform Vehicle Code* to conduct route surveys. (H-02-09)

Encourage the States, once the revised *Uniform Vehicle Code*, Section 11-703, has been adopted, to include the text of the revised State statute on the face of permits. (H-02-10)

Encourage the States to conduct initial and recurrent training for State employees in the permit offices and State employees involved in commercial vehicle enforcement regarding the railroad notification requirements. (H-02-11)

The Safety Board also issued safety recommendations to the Federal Highway Administration, Federal Motor Carrier Safety Administration, National Committee on Uniform Traffic Laws and Ordinances, Kissimmee Utility Authority, and all class 1 and regional railroads. In your response to this letter, please refer to Safety Recommendations H-02-09 through -11. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 8, 2002

In reply refer to: H-02-12

All Class 1 and Regional Railroads
(List Attached)

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the adequacy of railroad notification requirement and the consistency and availability of information regarding railroad notification. The recommendation is derived from the Safety Board's investigation of the November 17, 2000, tractor-trailer combination vehicle and train collision in Intercession City, Florida,[1] and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued eight safety recommendations, one of which is addressed to all class 1 and regional railroads. Information supporting this recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

On November 17, 2000, about 4:35 p.m., eastern standard time, near Intercession City, Florida, a 23-axle, heavy-haul vehicle, operated by Molnar Worldwide Heavy Haul Company, was delivering a condenser to the Kissimmee Utility Authority Cane Island Power Plant. The private access road to the plant crossed over a single railroad track owned by CSX Transportation, Inc. (CSXT). As the vehicle, traveling between 1 and 3 mph, crossed the tracks, the crossing warning devices activated and the gates came down on the load. Seconds later, Amtrak train 97, operated by the National Railroad Passenger Corporation, collided with the right side of the rear towed four-axle tractor. No injuries occurred. The collision destroyed the tractor and caused over $200,000 damage to the train and crossing signals.

[1] For additional information, read National Transportation Safety Board, *Collision Between Amtrak Train 97 and Molnar Worldwide Heavy Haul Company Tractor-Trailer Combination Vehicle at Highway-Rail Grade Crossing in Intercession City, Florida, on November 17, 2000*, Highway Accident Report NTSB/HAR-02/02 (Washington, DC: NTSB, 2002).

The National Transportation Safety Board investigated a similar accident that occurred on November 30, 1993, at the same location.[2] In that accident, an overdimenson, low-clearance vehicle operated by Rountree Transport and Rigging, Inc., was en route to deliver an 82-ton turbine to the electricity generating plant. The cargo deck of the transporter bottomed out on the roadway surface as the vehicle moved across the tracks. To gain sufficient clearance, the four-member truck crew shimmed the transporter while the cargo deck was on the tracks. About 12:40 p.m., the lights and bells at the grade crossing activated; the crossing gates descended, striking the turbine. Seconds later, Amtrak train 88, carrying 10 crewmembers and 89 passengers, struck the side of the cargo deck and the turbine. Six people sustained serious injuries and 53 suffered minor injuries. The vehicle and turbine were destroyed; the locomotive and first three railcars were damaged extensively. Total damage exceeded $14 million.

The National Transportation Safety Board determined that the probable cause of the November 2000 collision of Amtrak train 97 with the tractor-combination vehicle was the failure of the Kissimmee Utility Authority, its construction contractors and subcontractors, and the motor carrier to provide for the safe passage of the load over the grade crossing.

The CSXT railroad has a program to grant permits to oversize vehicles to pass over railroad crossings in Florida. According to a CSXT project manager, the CSXT has an agreement with the permit section of the Florida Department of Transportation (FLDOT), under which the FLDOT informs any trucking company applying for a State permit that the company needs to contact the CSXT to obtain the required railroad permits. (According to an FLDOT representative, none of the supervisors in the FLDOT permit offices was aware of any oral or written agreement with the CSXT to provide any information related to the railroad.) The CSXT project manager stated that the CSXT has no other method of receiving notification when oversize vehicles operate over CSXT tracks at grade crossings.

After receiving notice from a trucking company (the railroad requires a minimum 2-week notice), the CSXT issues a permit to the hauling company, charging $350 for this service, and sends an e-mail to the roadmaster, supervisor-train control, chief dispatcher, train master, and manager-billable expenditures, notifying them of the proposed date and time of the oversize/overweight vehicle move. The appropriate CSXT personnel then make arrangements to protect the move across CSXT tracks. The CSXT railroad further requires the trucking company to contact the roadmaster and the supervisor-train control at least 48 hours before the date of the planned move to verify all arrangements.

To determine railroad notification practices of other railroads, the Safety Board contacted representatives from the Burlington Northern Santa Fe (BSNF), Canadian Pacific (CP), Norfolk Southern (NS), Union Pacific, and Kansas City Southern (KCS) railroads.

All five railroads had programs to ensure the safe crossing of a slow-moving or low-clearance vehicle when notified of the intended crossing. The BNSF indicated that it also issued a permit to cross when a carrier supplied proof of insurance and release of liability forms. Most railroads indicated that they preferred a week's notice of an intended crossing but could be

[2] For additional information, read National Transportation Safety Board, *Collision of Amtrak Train No. 88 With Rountree Transport and Rigging, Inc., Vehicle on CSX Transportation, Inc., Railroad Near Intercession City, Florida, November 30, 1993*, Highway Accident Report NTSB/HAR-95/01 (Washington, DC: NTSB, 1995).

flexible depending on the circumstances. Some railroads had internal procedures for alerting those that needed to know about a crossing and sent a flagger to the crossing. Others had the motor carrier or truckdriver call the dispatcher directly when at the crossing and either remain on the telephone until across the tracks or call after completing the crossing.

The KSC said that a vehicle operator can call the 1-800 number posted at the crossing or the number listed on the Web page, both of which are staffed 24 hours a day. The NS representative indicated that unless a motor carrier knew the correct telephone number, finding and contacting the right person in the railroad would be difficult.

None of these class 1 railroads indicated that a charge is made to the motor carrier for providing safe passage. CP indicated that if it does not have to move signal wires or appliances, a $500 deposit is required and that if signal devices must be moved and reinstalled, a $1,000 deposit is required. Once the move is completed, CP returns the balance. All railroads indicated that they charged for damages to track, signal, or warning devices.

The need to notify the railroad to obtain safe passage at a given highway-rail grade crossing should be evaluated individually for each at-risk vehicle. The evaluation should take into account the compatibility of the crossing configuration, including approach and departure grades, and the proximity to turns, as well as the vehicle configuration, including ground clearance, axle spacing, overall length, and vehicle speed.

The data needed to perform this evaluation are currently found in different places and are not readily available to all participants in the process. The States should have the public crossing configuration information, although the approach and departure grade records may not be current. Many States require a route survey only when the vehicle and load exceed a certain height. Yet route surveys are important to an evaluation of the need to notify the railroad before crossing and should routinely be part of this process. The Federal Railroad Administration (FRA) and the American Association of Railroads (AAR) maintain a highway-rail grade crossing inventory; the AAR/FRA Highway-Rail Grade Crossing Inventory is available on the internet. Although the inventory provides information about the proximity of an intersection, it does not include approach and departure grades or whether the crossing is humped. In addition, vehicle operators may not be aware the inventory exists.

The vehicle operator should know the configuration of the vehicle. Most States do not collect information about ground clearance or operating speed as part of the permit application process. The only point in the process at which all information becomes readily available is when the vehicle is at the crossing. Even then, the operator can notify the railroad only if an emergency number is posted at the crossing and if telephone access is available. Arrangements for a given railroad to protect the crossing take time (in the case of CSXT, 2 weeks) and, generally, space to safely park the vehicle is not available.

The notification process should be consistent and user-friendly for all participants. The vehicle operator needs to know when it is necessary to notify the railroad, which railroad to notify, and how to do so.

The AAR/FRA Highway-Rail Grade Crossing Inventory lists the railroad that controls a track if the vehicle operator can identify the crossing by location or knows the crossing number and is familiar with the FRA Web site inventory. In addition, most railroad Web sites publish the track routes. But once a vehicle operator knows which railroad to notify, finding the correct person to contact can be difficult. Various pages of the CSX Corporation Web site include the 1-800 emergency telephone number, and information about grade crossing safety, and a link to Operation Lifesaver, Inc., is also available. However, investigators found no one source that listed all essential steps that operators of low-clearance or slow-moving vehicles must take to ensure safety and no railroad contact information for the arrangement of crossing safety. Investigators examined the Web sites of the other major railroads with similar results. The Safety Board concludes that safety would be enhanced if the CSXT and other railroads publicized contact information, via the Internet or other means, for those who need to arrange protection at grade crossings.

Therefore, the National Transportation Safety Board recommends that all class 1 and regional railroads:

> Provide easily accessed contact and notification information for use by vehicle operators requiring railroad assistance to ensure safety at grade crossings. (H-02-12)

The Safety Board also issued safety recommendations to the Federal Highway Administration, Federal Motor Carrier Safety Administration, National Committee on Uniform Traffic Laws and Ordinances, American Association of State Highway and Transportation Officials, and Kissimmee Utility Authority. In your response to the recommendation in this letter, please refer to H-02-12. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 8, 2002

In reply refer to: H-02-13 and -14

Mr. James C. Welsh
President and General Manager
Kissimmee Utility Authority
1701 West Carroll Street
Kissimmee, Florida 34741-8406

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the ineffective execution of the roles and responsibilities of the power company and its contractors and subcontractors, the Florida Department of Transportation, the motor carrier, the truckdriver and pilot car drivers in planning and effecting the movement of oversize load; the adequacy of the railroad notification requirement; and the lack of low-clearance warning signs and standard 1-800 emergency number signs. The recommendations are derived from the Safety Board's investigation of the November 17, 2000, tractor-trailer combination vehicle and train collision in Intercession City, Florida,[1] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued eight safety recommendations, two of which are addressed to the Kissimmee Utility Authority (KUA). Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

On November 17, 2000, about 4:35 p.m., eastern standard time, near Intercession City, Florida, a 23-axle, heavy-haul vehicle, operated by Molnar Worldwide Heavy Haul Company (Molnar), headquartered in Athens, Texas, was delivering a condenser to the KUA Cane Island Power Plant. The private access road to the plant crossed over a single railroad track owned by CSX Transportation, Inc. (CSXT). As the vehicle, traveling between 1 and 3 mph, crossed the tracks, the crossing warning devices activated and the gates came down on the load. Seconds

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later, Amtrak train 97, operated by the National Railroad Passenger Corporation, collided with the right side of the rear towed four-axle tractor. No injuries occurred. The collision destroyed the tractor and caused over $200,000 damage to the train and crossing signals.

The National Transportation Safety Board investigated a similar accident that occurred on November 30, 1993, at the same location.[2] In that accident, an overdimenson, low-clearance vehicle operated by Rountree Transport and Rigging, Inc., was en route to deliver an 82-ton turbine to the electricity generating plant. The cargo deck of the transporter bottomed out on the roadway surface as the vehicle moved across the tracks. To gain sufficient clearance, the four-member truck crew shimmed the transporter while the cargo deck was on the tracks. About 12:40 p.m., the lights and bells at the grade crossing activated; the crossing gates descended, striking the turbine. Seconds later, Amtrak train 88, carrying 10 crewmembers and 89 passengers, struck the side of the cargo deck and the turbine. Six people sustained serious injuries and 53 suffered minor injuries. The vehicle and turbine were destroyed; the locomotive and first three railcars were damaged extensively. Total damage exceeded $14 million.

The National Transportation Safety Board determined that the probable cause of the November 2000 collision of Amtrak train 97 with the tractor-combination vehicle was the failure of the Kissimmee Utility Authority, its construction contractors and subcontractors, and the motor carrier to provide for the safe passage of the load over the grade crossing.

This accident was very similar to the 1993 accident at the same location. Although the motor carrier was different, the KUA was not only the owner of the crossing and the receiver of both loads, it also had representatives at the crossing during both collisions. Additionally, no one contacted the railroad in either accident to determine whether it was safe to cross the tracks.

In 1993, the Amtrak train hit the truck near the center of its load, and as a result, the locomotive and three railcars were damaged extensively, 59 people were injured, and damages exceeded $14 million. In 2000, by contrast, the Amtrak train hit the rear of the combination vehicle at the pusher truck. The train essentially pushed the truck and its 82-ton load out of the way, and the train remained upright and on the tracks. However, had the truck started to cross the tracks several seconds later or the train arrived several seconds sooner, the collision may have occurred near the center of the 82-ton load, and the consequences could have been quite different.

In this accident, due to the intersection's proximity to the crossing and the elevated configuration of the vehicle, the maximum speed the vehicle could maintain near the crossing was between 1 and 3 mph. Based on this speed, the minimum time the vehicle would occupy the crossing was between 57 seconds and 2 minutes 50 seconds. Active railroad grade crossing devices are required to provide a minimum of 20 seconds of warning time to motorists before the arrival of a train, and typically these devices provide between 20 and 25 seconds of warning. The warning devices at this crossing provided a warning time of 25 seconds. Thus, the accident truck required at least two and as much as seven times more warning of an approaching train than the active warning devices provided, effectively neutralizing the active warning devices.

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Additionally, although the train engineer applied the brakes prior to actually identifying the truck on the crossing, he had no opportunity to avoid the collision. His brake application and throttle reduction during the approximately 16 seconds before the accident reduced the train speed by 19 mph, delaying his arrival at the crossing by about 1.71 seconds. While the train's reduced speed and slightly delayed arrival at the crossing may have altered the collision dynamics, there was still not enough time to avoid the collision. The truck would have needed an additional 3.4 seconds to 10.27 seconds to clear the tracks.

The vehicle created a hazard at this crossing, since it occupied the tracks well beyond the standard minimum warning time provided for a vehicle to cross safely. The only prudent way to minimize the risk was to notify the railroad sufficiently in advance of crossing to ensure that train traffic was stopped or not present at the time the vehicle traversed the tracks. The Board concludes that neither the KUA, nor its contractors, nor the motor carrier properly considered the risks of crossing the tracks without first notifying the railroad to arrange safe passage.

KUA contracted with Black & Veatch Corporation (Black & Veatch) to serve as architect-engineer and construction manager for both the 1993 and 2000 construction projects. Although KUA officials claimed to be aware of the hazards of low-clearance, slow-moving vehicles at this crossing since the November 30, 1993, accident, the Safety Board could not identify changes to their procedures to accommodate the special needs of these movements. Since the KUA Power Road crossing is a private crossing and the only oversize/overweight vehicles that traverse this crossing are those making deliveries during a KUA construction phase, KUA and its construction contractors and subcontractors have a responsibility for ensuring safety at this highway-rail grade crossing. Moreover, because of the 1993 accident, all these participants should have been acutely aware of the potential risk at this grade crossing and should have ensured that the railroad was notified.

The condenser involved in the November 17, 2000, accident was built by Mark Steel of Salt Lake City, Utah, and installed in Kissimmee by Thermal Engineering International Company (TEi) of Joplin, Missouri, which hired Molnar to haul the condenser from Salt Lake City to the construction site. According to KUA, all carriers were supposed to be advised to notify the railroad before moving oversize loads over the railroad crossing, although this requirement was not specified in writing. Safety Board investigators found that TEi and Molnar disagreed with one another about whether they exchanged information on railroad notification requirements. The railroad was not notified, and safe passage was not provided.

Obtaining transit times from the railroad is insufficient. In the 1993 Intercession City accident, the truckdriver stated that a KUA or Black & Veatch employee advised the truck crew to hurry because they could expect a train at a certain time; therefore, the truckdriver believed that KUA was in contact with the railroad. KUA denied that such a conversation occurred. Because these large, low-clearance, slow-moving vehicles require so much time to clear grade crossings and have the potential to bottom out or get stuck, it is imperative that the railroad control train traffic on the track until these vehicles are clear. To do this, the railroad has to be aware that a low-clearance, slow-moving vehicle needs to cross its track.

KUA and its contractor should know when they are to take delivery of a load and should ensure that the railroad is notified. They could accomplish the latter by terms of their contracts and by erecting signs in advance of the crossing that advise low-clearance or slow-moving

vehicle operators to notify the railroad before traversing the tracks. Therefore, the Safety Board believes that KUA should require that the CSXT railroad is notified in advance of accepting delivery by any low-clearance or slow-moving vehicles.

Although the combination vehicle did not get stuck or hang up on the crossing, the physical evidence and witness statements indicated that the vehicle did scrape the roadway on the departure grade. According to the 2001 American Association of State Highway and Transportation (AASHTO) guidelines, the roadway surface should not be more than 3 inches higher or lower than the top of the nearest rail at a point 30 feet from the rail, unless track superelevation makes a different level appropriate. At a point 30 feet from the rail, the north approach was 6.84 inches below the plane of the superelevation extension. Therefore, the Safety Board concludes that under current AASHTO guidelines, the north approach makes the KUA Power Road crossing a humped crossing.

Although the presence of slow-moving, oversize/overweight trucks appears to be related to construction cycles at the plant, the possibility that other low-clearance delivery trucks will traverse this crossing still exists. Truckdrivers should be warned that it is a humped crossing. Therefore, the Safety Board believes that the KUA should install low-clearance highway-rail grade crossing signs (W10-5s) at the KUA Power Road crossing.

Therefore, the National Transportation Safety Board recommends that the Kissimmee Utility Authority:

> Require that the CSX Transportation, Inc., railroad is notified in advance of accepting delivery by any low-clearance or slow-moving vehicles. (H-02-13)
>
> Install low-clearance highway-rail grade crossing signs (W10-5s) at the KUA Power Road crossing. (H-02-14)

The Safety Board also issued safety recommendations to Federal Highway Administration, Federal Motor Carrier Safety Administration, National Committee on Uniform Traffic Laws and Ordinances, American Association of State Highway and Transportation Officials, and all class 1 and regional railroads. In your response to this letter, please refer to Safety Recommendations H-02-13 and -14. If you need additional information, you may call (202) 314-6177.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Marion C. Blakey
Chairman

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 29, 2002

In reply refer to: A-02-24 and -25

Mr. Monte R. Belger
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

The Safety Board has had longstanding concerns about the availability of cockpit voice recorder (CVR) information following reportable accidents or incidents. The CVR can be one of the most valuable tools used for accident investigation. Unfortunately, an increasing number of the Board's safety investigations are being hampered because of a lack of CVR data. Our audio laboratory regularly receives CVRs with missing or irrelevant data.

Two primary issues cause these recordings to be deficient: (1) the tape or memory has been overwritten by events subsequent to the incident, or (2) the recording system was malfunctioning or inoperative at the time of the incident. These issues are discussed below and solutions are recommended to address them.

Overwritten Cockpit Voice Recordings

The most frequently recurring problem with CVRs is that the relevant recorded information is overwritten by events subsequent to the incident or accident. For most CVR installations, the CVR system is designed to operate whenever the airplane's electrical system is on, and it continually overwrites the oldest data stored on the tape or memory module. The recording can be preserved only if the CVR is deactivated before the relevant portion becomes overwritten.

In the event of a severe or catastrophic accident, the CVR is typically deactivated due to a loss of electrical power, and the relevant audio that was recorded prior to the accident is preserved. However, many of the CVRs examined in the Safety Board's laboratory are from incidents or accidents in which the airplane's electrical system remains functional after an event occurs. For example, this can occur after events such as

- loss-of-control incidents in which the airplane is recovered and lands safely;
- tail strikes;
- taxiway or runway incursions;
- rejected takeoffs;
- precautionary or emergency landings; and
- runway overruns.

For events such as these, nearly every CVR recording examined by the Safety Board has been overwritten. These recordings often contained only background sounds in an unoccupied cockpit while the airplane sits stationary at the gate because the CVR was not deactivated soon enough after the event took place.

A CVR needs to be deactivated promptly because of its relatively short recording duration. Most CVRs currently in service have a recording duration of about 30 minutes.[1] This means that once the CVR is turned off, only the most recent 30 minutes of recorded audio is retained.

In some cases it may take longer than 30 minutes to safely land and secure the airplane following an in-flight incident, and overwriting some or all the pertinent audio is unavoidable. In these situations, a newer CVR with a 2-hour duration would provide more time to return to the airport, land, and taxi to the gate before the relevant audio would be erased. However, as illustrated by the following two incidents, an increased recording duration alone will not prevent the recording from being overwritten.

American Eagle EMB-120 Loss of Pitch Control. On December 27, 2000, at 9:10 p.m. central standard time, an Embraer EMB-135LR, N721HS, operating as American Eagle flight 230, encountered pitch control problems during the initial climb after takeoff from runway 9R at O'Hare International Airport, Chicago, Illinois (NTSB incident CHI01IA055). The flight crew made two attempts to land the airplane before landing it on the third attempt, on runway 4R at O'Hare.

The airplane was equipped with an Allied Signal solid-state 2-hour CVR; however, the CVR was not deactivated after the incident flight was completed. As a result, it continued to record, overwriting the relevant audio while the airplane remained parked at the gate with the electrical power on. The lack of CVR information has hampered the Safety Board's ongoing investigation into this serious incident.

The entire incident flight lasted about 30 minutes. Had the CVR been stopped shortly after the airplane was secured at the gate, the 2-hour recording would have been sufficient to capture not only the entire flight, but both the pre- and post-flight operations as well.

United Airlines Boeing 767-300 Dual Engine Shutdown. On March 4, 2001, at about 00:52 Greenwich mean time (G.m.t.), a Boeing 767-300 operated by United Airlines experienced a dual engine shutdown during climbout from Kona, Hawaii (NTSB incident DCA01SA025). The engines were restarted and the airplane returned to Kona and landed safely. The 30-minute solid-state CVR was overwritten and did not contain any audio relevant to the incident investigation.

The entire flight from gate to gate lasted 71 minutes, nearly half of which could have been captured by the CVR had it been deactivated promptly after the airplane was safely secured on the ground. The timing information recorded in the CVR's memory module indicated that the

[1] Title 14 *Code of Federal Regulations* (14 CFR) Part 121.359(f) requires that CVRs record the most recent 30 minutes of operation. Similar regulations also exist for certain operations of CVR-equipped aircraft subject to Parts 135, 125, and 91.

recorder was not powered off until 05:55:35 G.m.t., more than 4 hours after the airplane arrived at the gate following the incident.[2] Had this airplane been equipped with a 2-hour duration CVR, the relevant information still would have been entirely overwritten.

The following table lists several other recent incidents/accidents in which the CVR was not shut down after the incident flight, and the relevant data were overwritten.

NTSB accident number	Operator	CVR duration (minutes)	Aircraft	Location	Date	Description
MIA01IA047	British West Indies Airways	30	MD-83	Miami, Florida	01/01/02	Runway overrun.
DCA01MA031	Comair	30	EMB-120	West Palm Beach, Florida	03/19/01	Icing encounter, loss of control; substantial damage to horizontal stabilizer and elevators.
DEN01IA036	Delta Air Lines	120	MD-90	Salt Lake City, Utah	12/30/00	Struck approach lights on landing.
NYC01LA054	Atlantic Southeast Airlines	30	EMB-120	Charleston, West Virginia	12/06/00	Struck deer on landing.
NYC01IA024	Comair	30	CRJ	Near Falmouth, Kentucky	10/26/00	Uncommanded roll.
NYC01LA023A	American Trans Air	30	Boeing 727	LaGuardia, New York	10/22/00	Ground collision.
NYC00IA231	USAirways	30	F100	Norfolk, Virginia	08/17/00	Thrust reverser deployment in flight.
LAX00SA272	Mesa Airlines	30	CRJ	Monterey, California	07/18/00	Loss of pitch trim control.

Previous Safety Recommendations to Address Overwritten CVR Recordings

In 1972, the Safety Board recommended that the Federal Aviation Administration (FAA) ". . . delineate the responsibility of the pilot-in-command for ensuring the preservation of recorded information on a cockpit voice recorder following an occurrence . . . ."[3] At that time, the FAA elected to monitor the situation in order to determine how serious the problem actually was. In December 1974, the FAA issued Air Carrier Operations Bulletin 74-8 in response to the Board's recommendation. This bulletin (enclosed) advised FAA Principal Operations Inspectors (POIs) that they "should make every effort" to have carriers include instructions for CVR deactivation in their flight manuals. It also stated that the CVR should be deactivated, preferably as a part of the "After Landing Checklist" following a reportable occurrence. The information, instructions, and guidance in that bulletin were not only appropriate in 1974, but they continue to

[2] According to the operator, the airplane departed the gate at 00:18 G.m.t. and returned to the gate at 01:29 G.m.t., as reported by the Aircraft Communications Addressing and Reporting System (ACARS). This newer solid-state type CVR was configured to capture G.m.t. time. Currently, most CVRs do not record any timing information.

[3] National Transportation Safety Board Safety Recommendation A-72-118 was issued in August 1972 and classified "Closed—Acceptable Alternate Action" in December 1975.

be particularly applicable to this day. However, because the bulletin provided only guidance instead of actual requirements, it has proven to be ineffective in the prevention of overwritten recordings. The need for additional action by the FAA and by operators still exists.

Despite the FAA's issuance of a bulletin, the Safety Board's experience has shown that a large majority of recordings examined by the Board have been overwritten after noncatastrophic incidents occur. Although in some of these cases an overwritten recording may have been unavoidable (because of the short CVR duration of either 30 minutes or 2 hours), many recordings have been overwritten simply because the operator did not deactivate the CVR immediately upon completion of the flight. In other cases, the CVR was initially deactivated but then turned on again at a later time by maintenance personnel. As a result, the critical data captured by the CVR was lost.

In January 1996, the Safety Board investigated a hard landing accident involving a ValuJet DC-9 in Nashville, Tennessee (NTSB accident MIA96FA059). After discovering that the CVR had been overwritten, the Board again recommended that the FAA take action to prevent the loss of CVR data. This recommendation asked the FAA to "require all airlines to revise their procedures to stipulate that flightcrews turn off power to the cockpit voice recorder as part of the engine shutdown procedure . . . ."[4] In response, the FAA issued a temporary Flight Standards Information Bulletin for Air Transportation (FSAT 97-09,[5] enclosed) in August 1997, which partially met the safety recommendation but fell short in several key areas. For example, the "ACTION" statement in the bulletin begins with the qualifying phrase "Until such time that new technology CVRs with extended recording capability become available, principal operations inspectors (POI) shall review the procedures established by the airlines for which they have responsibility, in order to ensure that those carriers have established procedures to safeguard CVR data."

The Board remains concerned that the language used in the FSAT 97-09 implies that once 2-hour duration recorders are installed, POIs will no longer be required to ensure that the carriers have established procedures to safeguard CVR data. As highlighted by the two incidents described earlier (Chicago, Illinois, and Kona, Hawaii), increasing the recording duration alone cannot fully address the problem. In these two incidents, a 2-hour CVR would have been sufficient to capture the incidents and allow for the time required to land and secure the airplane, yet neither CVR was turned off after the incident flight was completed. As a result, all the relevant data were lost in both cases.

The Safety Board and the FAA agree that the required duration of CVR recordings needs to be increased, and the FAA has indicated an intent to issue a notice of proposed rulemaking on this issue since March 1999.[6] Currently, 2-hour duration recorders are available and are being installed on some airplanes even though they are not yet required. Contrary to the language in

[4] Safety Recommendation A-96-170 was issued on December 20, 1996, and classified "Closed—Unacceptable Action" on April 6, 1999.

[5] This temporary bulletin originally had an expiration date of August 31, 1998, but it has been extended until further notice and currently remains in effect.

[6] Safety Recommendation A-99-16, issued to the FAA on March 3, 1999, addresses the need for a 2-hour CVR duration. The recommendation is currently classified "Open—Unacceptable Response" because the FAA has repeatedly delayed the issuance of an NPRM and final rule regarding this issue.

FSAT 97-09, deactivation of the CVR must occur as soon as safely practical upon completion of the flight,[7] regardless of the recorder's duration, to retain the relevant portions of the recording.

The FSAT 97-09 bulletin also states "these procedures . . . shall only be accomplished when the flight crew believes that the CVR data, which may be of use in subsequent investigations conducted by the NTSB, is contained within the tape's 30-minute duration." The Safety Board continues to believe that this guidance is inappropriate. Relevant data may exist within the tape's duration (which could be longer than 30 minutes), despite the opinion of the flight crew. Further, it is not the responsibility of the flight crew to decide whether or not CVR data may be useful in an investigation conducted by the Safety Board. An erroneous decision could result in unnecessarily recording over potentially valuable CVR data, as it did in the following case.

United Airlines Boeing 777/Lufthansa Airlines Boeing 747 Taxiway Incursion. On June 3, 2001, a United Airlines Boeing 777 struck a Lufthansa Airlines Boeing 747 while taxiing at Washington Dulles International Airport, Sterling, Virginia, causing substantial damage to the auxiliary power unit cowling area and minor damage to the horizontal stabilizer of the 747 (NTSB incident DCA01SA047A). The United 777 crew subsequently taxied the airplane to the gate and shut down the airplane but did not deactivate the CVR. Later, after having discussions with the flight crew, a United Airlines safety officer decided that the CVR may have captured some useful information concerning the ramp control operations and instructed maintenance personnel to pull the CVR circuit breaker. According to the safety officer, on the following day, he assumed that the 30-minute duration of the CVR was not long enough to capture information relative to the incident, and he instructed the maintenance personnel to push the CVR circuit breaker back in. By the time the CVR was removed from the airplane, the recorded data had been entirely overwritten.

In this case, the decisions made by the operator, although consistent with the guidance provided by FSAT 97-09, resulted in the CVR data being needlessly overwritten. It took a significant amount of time for the operator to assess the situation, conclude that the incident was reportable to the Safety Board, then determine whether or not the event occurred within the 30-minute time period captured by the CVR, and subsequently arrange for the CVR to be deactivated by pulling the circuit breaker. The CVR data may well have been overwritten during this time.

The Safety Board believes that the proper procedure should be to deactivate the CVR first (immediately after the airplane is safely secured, such as when the engines are shut down), and then evaluate the situation. It is difficult for the flight crew to remember every occurrence that is reportable to the Safety Board, and it may be difficult to evaluate in a timely manner when the event occurred.

Another case highlighting the problem of overwritten CVR data is the Safety Board's current investigation into a recent incident involving a Boeing 737 rudder event.

[7] The Safety Board does not advocate the deactivation of the CVR during flight.

United Airlines Boeing 737-322 Rudder Malfunction. On December 13, 2001, at about 12:00 p.m. central standard time, United Airlines flight 578 declared an emergency because of a reported "rudder malfunction" during descent into O'Hare International Airport, Chicago, Illinois (NTSB incident CHI02IA050). The 30-minute solid-state CVR was overwritten and did not contain any audio relevant to the incident investigation.

According to data gathered from the digital flight data recorder (DFDR), the airplane landed and came to rest on the runway about 13 minutes after the initial event began. About 7 minutes later, the engines were shut down. The airplane was subsequently towed from the runway to the gate. Review of the CVR in the Safety Board's laboratory revealed that the recording captured only the operation of the airplane being moved from the gate to a maintenance hangar.

In this case, the CVR's 30-minute duration was more than adequate to capture the audio from the initial event through descent, landing, and engine shutdown. The recording was overwritten because the operator did not deactivate the CVR promptly.

The operator's procedures for deactivating the CVR are outlined in the United Airlines *Flight Operations Manual.* The section "Policies and Procedures—Pre-departure Procedures," in reference to flight recorders, states, in part:

> The use of the cockpit voice recorder is limited to accident investigation. The tape must not be erased.
>
> If an incident that requires immediate notification of the NTSB occurs within the last 30 minutes before landing, contact the Flight Operation Duty Manager as soon as possible by ACARS, voice or phone for instructions on how to remove power from the cockpit voice recorder. Reportable incidents include the following:
>
> - Flight control system malfunction or failure
> - Fire
> - Substantial damage to airplane (engine failures, tires, dents are not considered substantial)
> - Fatal or serious injury to any person.

These procedures are well within the guidelines specified by the FAA in FSAT 97-09. The Board recognizes that the intent of these procedures is to preserve CVR data after a reportable event occurs. In practice, however, they may be ineffective and allow too much time to elapse before the CVR is deactivated. First, the procedures are listed in the pre-departure section of the flight manual, yet they address actions that are to be performed after a flight has been completed. The current placement in the manual could result in their being overlooked when the crew performs its post-flight duties. Second, they advise the flight crew to contact an Operations Duty Manager and then wait for instructions on how to remove power from the CVR. That procedure could cause another unnecessary delay.

The problem of overwritten CVR data is not unique to scheduled air carrier operations. The Safety Board receives overwritten CVRs from smaller, on-demand carriers as well as private and business airplane operators. The CVR procedures proposed herein are applicable to all operators who have CVR-equipped aircraft. The Safety Board believes that the Federal Aviation

Administration should require that all operators of airplanes equipped with a CVR revise their procedures to stipulate that the CVR be deactivated (either manually or by automatic means) immediately upon completion of the flight, as part of an approved aircraft checklist procedure, after a reportable incident/accident has occurred. These procedures must also ensure that the recording remains preserved regardless of any subsequent operation of the aircraft or its systems. Any doubt as to whether or not the occurrence requires notification of the Safety Board must be resolved after these steps have been taken to preserve the recording.

Malfunctioning or Inoperative Cockpit Voice Recorder Systems

In addition to the problem of overwritten recordings, the Safety Board has conducted a number of accident and incident investigations involving CVRs that were either malfunctioning or completely inoperative at the time of the event. Examples of malfunctioning or inoperative CVR systems are summarized below.

Amway FalconJet Loss of Pitch Control. On October 9, 1999, a Dassault Aviation FalconJet DA-900B, N523AC, operated by the Amway Corporation experienced a series of pitch oscillations while leveling off at 11,000 feet mean sea level during a descent into Grand Rapids, Michigan (NTSB accident CHI00FA006). The aircraft load factor followed the aircraft pitch attitude and reached magnitudes between +3.3g and -1.2g. The CVR installed on this airplane was a Fairchild tape-based 30-minute model. The tape did not contain any audio information. Subsequent testing of the CVR at the recorder manufacturer's facility revealed an open transformer on one channel whereas the other channels were found to be fully operational. The cause of the failure was not determined; a possible explanation is that the CVR was not fully inserted into its mounting rack, causing incomplete electrical connections.

Executive Airlines Jetstream 3101. On May 21, 2000, an East Coast Aviation Services (doing business as Executive Airlines) British Aerospace Jetstream 3101 crashed at Bear Creek Township, Pennsylvania, about 11 miles south of Wilkes-Barre/Scranton International Airport (NTSB accident DCA00MA052). The airplane was destroyed by impact forces and post-impact fire, and the 17 passengers and 2 flightcrew members were fatally injured. This airplane was equipped with a Fairchild tape-based 30-minute CVR. The tape contained no recorded information for the accident flight or any other flight. Except for a 1.8 second, 400Hz, 20db tone, the only other signal present on the tape was an artifact of the bulk erase function. An inspection and subsequent tests of the recorder indicate that it likely had not functioned since the time it was installed, nearly 3 months before the accident occurred. The airplane reportedly flew an average of nine scheduled flights per week.

Comair Canadair Regional Jet Control Problem. On June 6, 2000, a Canadair Regional Jet operated by Comair experienced a "frozen yoke and no aileron control capability" while in the cruise phase of flight near Harrisburg, Pennsylvania (NTSB accident NYC00SA153). The airplane was equipped with a Fairchild tape-based 30-minute CVR. The CVR was found to have an inoperative magnetic erase head and consequently could not erase any of the previous recordings. The resultant audio on all four channels was indiscernible.

American Trans Air Lockheed L-1011 Engine Failure. On March 5, 2001, a Lockheed L-1011 operated by American Trans Air, Inc., experienced an uncontained engine failure during

climbout from Honolulu, Hawaii (NTSB accident DCA01IA027). The airplane was equipped with a Fairchild tape-based 30-minute CVR. Although the CVR was deactivated promptly after the airplane landed, the recorded audio on all four channels was unintelligible. The cause of the CVR malfunction is currently under investigation.

Emery Boeing/McDonnell Douglas DC-8 Gear-Up Landing. On April 26, 2001, a Boeing/McDonnell Douglas DC-8 operated by Emery Worldwide Airlines sustained a left main gear-up landing in Nashville, Tennessee (NTSB accident MIA01IA129). The Sundstrand tape-based 30-minute CVR recovered from this airplane did not exhibit any external damage and appeared to be in good condition. However, the magnetic tape transport mechanism inside the CVR was found to be mechanically jammed. The condition of the components indicated that the transport had been jammed for an extended period of time. None of the audio recorded on the tape was discernible.

In the cases described above, the CVR recordings were entirely unusable. However, in other cases, some channels on the recording were usable whereas others were not. Broken wires were found in the cockpit area microphones in two separate cases: an American Eagle Saab 340 that overran the runway in Killeen, Texas, in March 2000 (NTSB accident FTW00FA101); and a Comair CRJ that experienced an uncommanded roll while flying near Falmouth, Kentucky, in October 2000 (NTSB incident NYC01IA024). The Comair CVR is also listed in the earlier table of overwritten recordings.

Some of these malfunctions would be difficult or impossible to determine using the built-in test feature found on the CVR control unit in the cockpit. Others, such as the one found with the Executive Airlines Jetstream 3101 mentioned earlier, should be readily detectable. However, most or all of the malfunctions found by the Safety Board could have been detected by the operator with a more robust test procedure, such as listening to the output of the headphone jack in the control unit.

Previous Safety Recommendations to Address Malfunctioning or Inoperative CVRs

The Safety Board has issued 10 separate safety recommendations to the FAA regarding poor CVR performance. Most of the recommendations have focused on specific CVR models; for example, one issued in 1997 addressed a fleet-wide problem with CVR installations in Beech 1900 aircraft.[8]

In its efforts to ensure that all CVR systems function properly and are adequately inspected and maintained, the Safety Board recommended in 1978 and 1990 that the FAA require proper testing of a CVR system before each flight.[9] The FAA responded favorably to the

[8] Safety Recommendation A-97-36 asked for the prompt inspection of the CVR system on all Beech 1900 aircraft to ensure that the recordings were intelligible. The airplane manufacturer has subsequently developed a hardware upgrade to remedy the problem. Based on the FAA's issuance of SD 2000-20-07 on September 26, 2000, which mandated the CVR modifications in accordance with Raytheon Service Bulletin 23-3094, this recommendation was classified "Closed—Acceptable Action" in January 2001.

[9] Safety Recommendation A-78-21, issued in April 1978, was classified "Closed—Acceptable Action" in August 1978; Safety Recommendation A-90-70, issued in May 1990, was classified "Closed—Acceptable Action" in April 1995.

recommendations by issuing a notice and bulletin, respectively. In the most recent Air Transportation Operations Inspector's Handbook Bulletin HBAT 91-27 (enclosed), the FAA advised POIs to ensure that their operators addressed CVR preflight checks and indicated that these checks ". . . should include a check using headphones for CVRs having recording monitoring provisions."

Unfortunately, as highlighted by the examples above, CVR systems continue to malfunction. In some cases, such as private operations, the operators may not have a POI to review their specific CVR testing and maintenance procedures. In other cases, some operators apparently are not testing CVRs regularly, or perhaps are not using headphones to verify that the recording is intelligible. Further, flight crews may be relying solely on the CVR self-test indicator, which cannot detect many of the deficiencies the Safety Board is finding. The self-test feature provided with most recorders is limited and can test only certain functions internal to the CVR itself. The self-test feature does not test the system components that provide signals to the CVR or the associated wiring that connects them. As a result, one or all of the CVR channels may record erroneous or poor quality audio, even when the self-test feature indicates that the CVR is functioning normally. Additionally, an internal failure of a single channel in the CVR may be difficult to determine from the self-test indicating meter in the cockpit. This is because the meter shows the status of each channel sequentially,[10] and a "pass" indication for any single channel may be misinterpreted by the flight crew as an indication that all channels are functioning normally.

As with overwritten recordings, the problem of malfunctioning or inoperative CVRs is not unique to scheduled air carrier operations. These types of problems are found with recorders from smaller, on-demand carriers as well as private and business airplane operators. Therefore, the Safety Board believes that the FAA should require that all operators of airplanes equipped with a CVR test the functionality of the CVR system prior to the first flight of each day, as part of an approved aircraft checklist. This test must be conducted according to procedures provided by the CVR manufacturer and shall include, at a minimum, listening to the recorded audio on each channel to verify that the audio is being recorded properly, is intelligible, and is free from electrical noise or other interference.

Summary

The examples noted above demonstrate what the Safety Board believes is a systemic problem with the availability of CVR data after an accident or incident occurs. The Board continues to believe that reliable procedures are needed to safeguard CVR data. Despite current FAA regulations,[11] valuable CVR recordings continue to be overwritten far too frequently. The FAA has attempted to address this problem by issuing bulletins to its POIs; however, issuance of the bulletins has not resulted in appropriate action being taken by the operators after incidents occur. The current bulletin (FSAT 97-09) advises that the CVR should be deactivated only when the flight crew believes it is appropriate to do so.

[10] For most tape-based CVR installations.

[11] 14 CFR 121.359(h) requires that CVR recordings be retained by the certificate holder after a reportable accident or occurrence. Similar regulations also exist for operations subject to Parts 135, 125, and 91.

Additionally, many operators of CVR-equipped airplanes are not overseen by POIs. The Safety Board believes that the FAA should take action to ensure that these operators preserve CVR data after an occurrence as well.

Although the reliability of CVRs generally continues to improve, many variables affect CVR performance. The system components, wiring, and installation can all have an effect on the resulting recording. Self-test features are not designed to evaluate the performance of the entire system and cannot verify that the incoming audio signals are valid and audible.

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

> Require that all operators of airplanes equipped with a cockpit voice recorder (CVR) revise their procedures to stipulate that the CVR be deactivated (either manually or by automatic means) immediately upon completion of the flight, as part of an approved aircraft checklist procedure, after a reportable incident/accident has occurred. These procedures must also ensure that the recording remains preserved regardless of any subsequent operation of the aircraft or its systems. Any doubt as to whether or not the occurrence requires notification of the National Transportation Safety Board must be resolved after the steps have been taken to preserve the recording. (A-02-24)

> Require that all operators of airplanes equipped with a cockpit voice recorder (CVR) test the functionality of the CVR system prior to the first flight of each day, as part of an approved aircraft checklist. This test must be conducted according to procedures provided by the CVR manufacturer and shall include, at a minimum, listening to the recorded signals on each channel to verify that the audio is being recorded properly, is intelligible, and is free from electrical noise or other interference. (A-02-25)

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Marion C. Blakey
Chairman

Enclosures (3)

1. Air Carrier Operations Bulletin No. 74-8
2. Flight Standards Information Bulletin for Air Transportation (FSAT) 97-09
3. Air Transportation Operations Inspector's Handbook Bulletin (HBAT) 91-27

Enclosure 1

CHANGE

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

8430.6A CHG 88

12/3/74

Cancellation Date: after filing

SUBJ: AIR CARRIER OPERATIONS INSPECTOR'S HANDBOOK

PURPOSE: This change transmits Air Carrier Operations Bulletin No. 74-8 which sets forth a requirement for periodic review, with the air carrier's crews, the mandatory reportable occurrences as listed in NTSB Part 430.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
---	---	Appendix 3 Pages 225 (and 226)	12/3/74

C. A. McKAY, Acting Chief
Flight Operations Division
Flight Standards Service

Distribution: FFS-2, 4, 5, 7 & 8 (wide); ZFS-843
FFS-1 & 3 (minimum); FIA-0 (minimum)
AAC-951A (50 copies); AAC-955 (80 copies)

Initiated By: AFS-424

AIR CARRIER OPERATIONS BULLETIN NO. 74-8

SUBJECT: Preservation of Cockpit Voice Recorder (CVR) Data Following NTSB Reportable Occurrences

There have been a significant number of instances over the past several years, subsequent to a landing after experiencing an incident or occurrence reportable to the NTSB under Part 430, where the flight crew has failed to halt the operation of the CVR. This has caused the erasure of all the recording pertinent to the occurrence and potentially valuable accident prevention material has been lost.

Federal Aviation Regulations (FAR) are explicit in requiring the certificate holder to retain the CVR recorded information relative to a flight which had an occurrence that requires immediate notification to the NTSB and which occurrence results in the termination of the flight. The inadvertent erasures usually result from neglect of the flight crew to cause the deactivation of the recorder and subsequent erasure when power is again applied to the aircraft.

Principal inspectors will review the provision of CAB Regulation Part 430.5 and FAR 121.359 or 127.127 with their assigned carrier. Since it is difficult for an aircrew to remember every occurrence that is to be reported in accordance with CAB Regulation 430.5, this item should be periodically reviewed during the pilot's recurrent training program. Principal operations inspectors should make every effort to have their assigned carrier include specific instructions and rationale for the deactivation of the CVR in the carrier's appropriate operations flight manuals.

Care must be taken to ensure that no flight crewmember construes the above directions as a requirement to deactivate the CVR immediately after an in-flight NTSB reportable occurrence. The CVR must not be deactivated until after landing and then, preferably, as a final checklist item, on the "After Landing Checklist." The amplified portion should expand on this item as being applicable only when a reportable occurrence has been experienced.

Because there is a possibility of inadvertent erasure of the desired recording due to the subsequent power application to an aircraft, coordination should be effected with the principal avionics inspector to assure the proper instructions are also included in a company maintenance manual.

Principal inspectors who are unable to obtain satisfactory carrier compliance will advise AFS-400, through normal channels, of the present company procedures and any particular areas that may cause difficulty.

Enclosure 2

FSAT 97-09 - Action to Conserve Data Contained within Cockpit Voice Recorders (CVR) Following an Incident or Accident

Flight Standards Information Bulletin for Air Transportation (FSAT)
{New-97-9}
EFFECTIVE DATE: 08-05-97
TRACKING: NTSB Safety Recommendations A-96-170, A-96-171

NOTE: THIS BULLETIN REQUIRES PTRS INPUT. SEE ITEM 5.

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1. PURPOSE. This bulletin contains information on procedures for ensuring that data contained within aircraft Cockpit Voice Recorders (CVR) is preserved following a reportable incident or accident aboard an air carrier aircraft equipped with a CVR.

2. DEFINITIONS. (Taken from NTSB 830, Accident and Incident Notification, Subpart A - General, paragraph 830.2)

A. Reportable Incident. An incident means an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.

B. Accident. An accident means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and which any person suffers death or serious injury, or in which the aircraft receives substantial damage.

3. BACKGROUND.

A. Investigation by the National Transportation Safety Board (NTSB) regarding a recent accident involving a scheduled domestic air carrier, resulted in a safety recommendation. This recommendation requires all airlines to revise their procedures to stipulate that flight crews turn off power to the CVR as part of the engine shutdown procedure in the event of a reportable incident or accident (A-96-170).

B. The NTSB stated that the investigation of this accident was complicated by the fact that the 30-minute closed loop CVR tape did not include documentation of pertinent information necessary to the investigation because of the 30-minute tape duration. The NTSB concluded that had the flight crew turned off power to the CVR after the airplane was safely stopped on the

ground, investigators would have had access to valuable documentation of the events surrounding the subject accident. Therefore, the NTSB believes that the Federal Aviation Administration (FAA) should require all airlines to revise their procedures to stipulate that flight crews turn off power to the CVR as part of the engine shutdown procedure in the event of a reportable incident/accident.

4. DISCUSSION. A review of the time sequence of events surrounding the subject accident resulting in NTSB recommendation A-96-170, confirms that had the flight crew taken action to preclude the continuous recording of the CVR shortly after they completed their final landing, additional information would have been made available to their investigators.

A. Although the FAA supports the intent of the NTSB's recommendation, it does not believe that crew initiated action will, in all cases, provide NTSB investigators with additional information that A-96-170 seeks to achieve.

B. There are additional issues involving flight crew action in deactivating a CVR which the NTSB's recommendation has not fully addressed. These issues include:

(1) Due to the current 30-minute duration of the continuous tape found on current CVRs, inflight incidents or accidents which are resolved more than 30 minutes prior to the aircraft landing, would not provide the NTSB investigators with the information they are seeking to safeguard under A-96-170. For example, a flight between Hawaii and the Continental United States which experiences an incident after becoming airborne may require several more hours of flight before landing at its destination. Since the NTSB's recommendation would require the flight crewmembers to deactivate the CVR after completing the engine shutdown procedures, the CVR tape would be without any useable data concerning the incident/accident which occurred much earlier in the flight.

(2) The current generation of CVRs are not equipped with an on/off switch readily accessible to the flight crew, but rather require the pulling of a remotely located electrical control circuit breaker in order to interrupt the operation of the continuous tape. Since the location of the control circuit breaker for the CVR varies with each aircraft type (as well as variations within type), deactivation of the CVR may require crewmembers to leave their duty station in order to accomplish this task. The FAA believes that this type of activity is inconsistent with safe operating practices when conducted during flight. Such action in post flight operations is not normally considered a flight crew duty, and may distract or delay the flight crew from accomplishing safety related procedures (e.g. aircraft evacuation checklists).

C. The FAA believes that resolution of this issue lies in new technology CVRs with increased taping capability. The NTSB agrees with this approach, and has made an additional recommendation, A-96-171, which would require that all newly manufactured CVRs intended

for use on airplanes have a minimum recording duration of 2 hours. The FAA has indicated that it will revise the existing Technical Standard Order (TSO) C123a, Cockpit Voice Recorder System, to reference the standard for a 2-hour CVR as a requirement.

D. However, the FAA does agree with the NTSB that specific action directed at deactivating an aircraft's CVR after the flight crew has completed the engine shut down checklist, may produce additional pertinent data regarding an inflight incident/accident, although the appropriateness of such a procedure would be limited to an event similar to that which resulted in A-96-170.

5. ACTION. Until such time that new technology CVRs with extended recording capability become available, principal operations inspectors (POI) shall review the procedures established by the airlines for which they have responsibility, in order to ensure that those carriers have established procedures to safeguard CVR data. These procedures shall ensure that flight crew actions are not initiated prior to completing the engine shut down checklist, stopping the airplane safely, and shall only be accomplished when the flight crew believes that CVR data, which may be of use in subsequent investigations conducted by the NTSB, is contained within the tape's 30-minute duration. A procedure which informs the flight crew to notify/direct maintenance personnel to open the CVR circuit breaker would be considered an acceptable methodology.

6. PROGRAM TRACKING AND REPORTING SUBSYSTEM (PTRS) INPUT. POI's shall make a PTRS entry to record the actions directed by this bulletin with each of their operators as outlined in HBAT 94-08. The PTRS entry shall be listed as activity code number 1381 and the "national use" field entry should be "FSAT9709". POI's should use the comments section to record comments of interaction with the operators.

7. INQUIRIES. This bulletin was developed by AFS-220, Air Transportation Division. Any questions or comments concerning this guidance should be directed to AFS-220 at (202) 267-3755.

8. EXPIRATION. This bulletin is scheduled to expire on August 31, 1998. However, this FSAT may be extended as needed.

/s/
Katherine M. Hakala
Acting Manager, Air Transportation Division

Enclosure 3

HBAT 91-27 - Cockpit Voice Recorder (CVR) Preflight Procedures

A. BACKGROUND. Recently, numerous aircraft accident reports have revealed regular findings of poor CVR performance. This degradation of CVR performance can be greatly alleviated by better CVR maintenance and effective preflight check procedures.

B. ACTION. Principal operations inspectors (POI) shall bring the contents of this bulletin to the attention of their respective operators. POIs shall ensure that their operators' training programs and operations manuals adequately address the frequency of flightcrew CVR preflight checks and the preflight check procedures based upon the guidelines established by the manufacturer. The preflight procedures should include a check using headphones for CVRs having recording monitoring provisions.

As a minimum, these CVR checks should be accomplished on the first flight of the day and whenever a flightcrew change occurs during that day.

C. PTRS INPUT. POI's shall make a PTRS entry to record the actions directed by this handbook bulletin with each of their operators. The PTRS entry shall be listed as activity code number 1380 in section 1, and as code A831 in the "Primary/Key" column in section IV. POI's should use the comments section to record comments of interaction with the operators.

D. FURTHER GUIDANCE. Any questions or clarifications regarding this bulletin may be addressed to AFS-510.