

The response from the FAA to the safety recommendation

The Japan Transport Safety Board received the response from the Federal Aviation Administration (FAA) of the United States of America to the safety recommendation issued September 25, 2014 as attached regarding a Serious Incident of JA16AN (Boeing 737-700) operated by Air Nippon Co., Ltd. at an altitude of 41,000ft about 69 nm east of Kushimoto, Japan on September 6, 2011.

JTSB safety recommendation to the FAA

It is highly probable that this serious incident occurred in the following circumstances: During the flight, the first officer erroneously operated the rudder trim control while having an intention of operating the switch for the door lock control in order to let the captain reenter the cockpit. The aircraft attitude became unusual beyond a threshold for maintaining the aircraft attitude under the autopilot control. The first officer's recognition of the unusual situation was delayed and his subsequent recovery operations were partially inappropriate or insufficient; therefore, the aircraft attitude became even more unusual, causing the aircraft to lose its lifting force and went into nosedive. This led to a situation which is equivalent to "a case where aircraft operation is impeded."

Of these, it is probable that the similarities between the switch for the door lock control of the Boeing 737-500 series aircraft and the rudder trim control of the Boeing 737-700 series aircraft in their shape, size and operability contributed to the first officer's erroneous operation of the rudder trim control with an intention of operating the switch for the door lock control.

In view of the results of the investigation of this serious incident, the Japan Transport Safety Board recommends the Federal Aviation Administration (FAA) of the United States of America to urge the aircraft designer and manufacturer involved (the Boeing Company) to take the following measures:

The aircraft designer and manufacturer shall study the need to reduce or eliminate the similarities between the rudder trim control and the switch for the door lock control of the Boeing 737 series aircraft, in terms of the shape, size and operability as mentioned in this report. In particular, it shall consider the effectiveness of changing the shape and size of the rudder trim control to the design adopted for the rudder trim control for Boeing models other than those of the Boeing 737 series, in which the switch has a cylindrical shape about 50mm in diameter without a brim, so that the difference of the size and shape can be recognized only with a touch.



U.S. Department
of Transportation
**Federal Aviation
Administration**

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MAY 20 2015

Norihiro Goto
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Dear Dr. Goto:

This is our initial and final response to Federal Aviation Administration (FAA) Safety Recommendation 15.031, issued by the Japan Transport Safety Board (JTSB) on September 19, 2014, and received by the FAA on January 28, 2015. The JTSB issued this safety recommendation regarding a Boeing 737-700 (B 737-700), registered JA16AN, operated by Air Nippon Co., Ltd., as the scheduled flight 140 of All Nippon Airways Co., Ltd., (ANA) following an airplane upset event that occurred on September 6, 2011. During cruise, the pilot inadvertently operated the rudder trim switch while intending to unlock the flight deck door. The autopilot initially countered the airplane roll, due to the rudder deflection, with an opposite wheel command. When the autopilot reached its authority limit, the airplane began to roll and pitched nose down resulting in a significant altitude loss and heading change before control of the airplane was recovered by the pilot. The FAA became aware of this incident in 2011 and began work to investigate and mitigate the issue at that time.

15.031. The Japan Transportation Safety Board recommends the Federal Aviation Administration (FAA) of the United States of America to urge the aircraft design and manufacturing organization, (the Boeing Company,) to take the following measures:

Studies about the necessity of reducing or eliminating similarities of the switch for the door lock control and the rudder trim control for the Boeing 737 series aircraft.

FAA Comment. The FAA conducted an investigation with Boeing to evaluate the risk of future occurrences. As a result of our investigation and analysis, it was determined that a Special Airworthiness Information Bulletin (SAIB) and Continued Airworthiness Notification to the International Community (CANIC) would be the appropriate mechanisms to notify domestic and international aviation communities regarding the issue.

During our investigation, we discovered the rudder trim switch on the incident airplane (B 737-700) is in approximately the same location as the flight deck door control switch on the operator's B 737-500. This creates a potential for confusion when pilots transition between aircraft. Although the rudder trim switch and flight deck door control switch are different in size and shape (cylindrical vs. blade shaped), and the flight deck door unlock side of the switch must

be depressed before turning, the general feel (spring force) to actuate the switches is similar. Both control switches are spring loaded to the center position. In this incident, the pilot thought he had operated the correct control, and the similarity of the control's operation exacerbated the situation.

Boeing's Actions

On June 25, 2012, Boeing issued Flight Operations Technical Bulletin (FOTB), Upset Recovery, applicable to all B 737, 747-400 and-800, 757, 767, 777, and 787 series aircraft, to provide increased flight crew awareness of the upset recovery non-normal maneuver, which focuses on disconnection of the autopilot.

On July 16, 2012, Boeing issued a Multi Operator Message (MOM) MOM-12-0489-01B, Information – Inadvertent Activation of Rudder Trim, to all B 737 operators, which described the subject event, provided common causes of airplane upsets, referenced the FOTB for the upset recovery non-normal maneuver training, and addressed the potential for confusion of the rudder trim and flight deck door control switches. The MOM also recommended the following:

- Operators should review their flight deck policies and consider requiring a crew member to enter the flight deck when a flight crew member leaves. Note that there are other advantages to having an additional crew member in the flight deck; e.g., in case of pilot incapacitation or illness;
- Operators should provide training to address rudder trim switch confusion due to aisle stand configuration variability in the switch location and similarity in the switch actuation. The training should instruct pilots to use visual identification prior to rotating the switch to reduce inadvertent activation of the switch; and
- Operators should minimize aisle stand configuration variations within their fleet to prevent inadvertent actuation of the flight deck controls.

Subsequently, on September 19, 2012, Boeing issued Service Letter (SL) 737-SL-27-238, "Inadvertent Activation of Rudder Trim," applicable to all B 737 Models, which re-emphasized the information provided in the MOM.

For the in-service fleet, Boeing recommends operators review the recommendations and implement the policy changes described in the MOM, SL, and FOTB (as appropriate) within one year. For airplanes in production, Boeing developed new design guidelines for the aisle stand configuration. The aisle stand is divided into three columns: left column (captain side), center column, and right column (first officer side). These guidelines minimize aisle stand configuration variations within an operator's fleet, and when possible, move the flight deck door control switch to the far right column as far aft as possible and move the rudder trim switch to the center column as far aft as possible. Having a consistent position for the rudder trim switch is paramount because it provides a direct input to the aircraft rudder and can induce both yaw and roll into the aircraft flight attitude. Also, because both the rudder trim switch and the flight deck door control switch have a similar feel and action (turn and hold), a standard location and sufficient separation between these controls is recommended. Placing the controls in the recommended locations is consistent with most Boeing-delivered airplanes, creates a distinctive reach posture, provides sufficient separation in relation to reach direction from both seats, and provides adjacent tactile landmarks. This includes the railing in the corner of the aisle stand and the guarded stabilizer trim switch located between the rudder trim switch and the flight deck

door control switch, which provides additional feedback to the pilot on which control is being touched.

FAA's Actions

The FAA uses an SAIB to alert, educate, and make recommendations to the aviation community about ways to improve the safety of a product. An SAIB contains non-regulatory information and guidance and is therefore, not mandatory. We determined that an SAIB is the appropriate mitigation because operators need to be aware of this airworthiness concern. The following data supports this conclusion:

- Numerous aisle stand configurations were identified due to the multitude of supplemental type certificate installations and significant variability in the Boeing-delivered configurations;
- Boeing analyzed modifying the shape of the flight deck door control switch; however, they determined the position of the switch is more important than the shape of the switch from a human factors perspective. The position of a switch, which affects pilot reach/posture, provides better feedback to the pilot than the shape of the switch that the pilot feels. There is no research that indicates modifying the switch shape alone would provide any benefit and could possibly introduce more errors; and
- Boeing determined the most important factor to minimize inadvertent activation of the control switches is aisle stand configuration consistency within an operator's fleet.

We determined that a CANIC is appropriate, because this information is relevant to many international operators and is in response to a high interest event. Also, based on the results of our investigation, we determined this issue may not affect many U.S. operators because their flight deck procedures include the following:

- The flight deck door control switch should not be used to unlock the flight deck door;
- A cabin crew member must enter the flight deck when another flight crew member leaves; and
- The flight deck door must be monitored with the view port or camera, and positive control of the door must be maintained until it is opened manually to allow re-entry of the flight crew member.

International operators that do not have similar procedural mitigations may be at a greater risk for inadvertent rudder trim actuation.

Our recommendations in the SAIB and the CANIC are applicable to all Boeing transport category airplanes, and as a result, will affect a large number of operators. Therefore, due to the Japan Civil Aviation Bureau's (JCAB) familiarity with this incident, we requested their assistance in validating our proposed recommendations developed to address this concern. We requested that JCAB review the draft SAIB and CANIC and provide any recommendations or comments prior to FAA issuance of these documents. We also requested that the JCAB, with help from an operator, validate the recommendations provided in the SAIB to ensure the recommendations were easy to understand and to ensure the changes recommended were feasible given the information provided.

In response to our request, the JCAB surveyed the Boeing airplanes operated by Japan Airlines and ANA. The data collected by the JCAB survey was consistent with the FAA's and Boeing's investigation, which showed many U.S. operators have different aisle stand configurations and often numerous configurations within one operator's fleet. This confirmed that our decision to issue a CANIC was appropriate because this issue appears to be systemic, and Civil Aviation Authorities (CAAs) should be made aware of the potential for confusion caused by inconsistent switch locations when pilots transition between aircraft.

We issued the CANIC on November 20, 2014 (enclosed), and SAIB NM-15-03, "Flight Controls," on November 24, 2014 (enclosed). The SAIB recommends operators make procedural changes, configuration changes, or both, to address this airworthiness concern. Procedural changes include adopting procedures, which eliminate the risk of actuating a flight critical switch in air while attempting to unlock the flight deck door. Configuration changes include minimizing aisle stand configuration variations within an operator's fleet to prevent inadvertent actuation of the flight deck controls. A recommended aisle stand configuration is provided in the SAIB to be consistent with most Boeing-delivered airplanes and to match the new design guidelines Boeing has developed for the aisle stand configuration for airplanes in production. The CANIC notified CAAs of the SAIB, and recommended international operators review their flight deck procedures and consider procedural changes to help mitigate this airworthiness concern, including requiring a crewmember to enter the flight deck anytime a pilot must leave the flight deck.

I believe the FAA has effectively addressed FAA Safety Recommendation 15.031 and consider our actions complete.

The FAA would like to thank the JTSB for submitting FAA Safety Recommendation 15.031 and its continued interest in aviation safety. If you have any questions, or need additional information regarding this safety recommendation, please contact

(Name and Phone Number)

Sincerely,

(Original signed)

Director, Office of Accident Investigation
And Prevention

Enclosures



FAA
Aviation Safety

SPECIAL AIRWORTHINESS INFORMATION BULLETIN

SUBJ: Flight Controls

SAIB: NM-15-03

Date: November 24, 2014

This is information only. Recommendations aren't mandatory.

Introduction

This Special Airworthiness Information Bulletin (SAIB) advises registered owners and operators of all **The Boeing Company Transport Category Airplanes** of an airworthiness concern regarding inadvertent actuation of the flight deck controls.

At this time, the airworthiness concern is not an unsafe condition that would warrant airworthiness directive (AD) action under Title 14 of the Code of Federal Aviation Regulations (14 CFR) part 39.

Background

On September 6, 2011, an upset event occurred on a The Boeing Company Model 737-700 airplane during cruise. The pilot inadvertently operated the rudder trim switch while intending to unlock the flight deck door. The autopilot initially countered the airplane roll, due to the rudder deflection, with an opposite wheel command. When the autopilot reached its authority limit, the airplane began to roll and pitched nose down, which resulted in a significant altitude loss and heading change before control of the airplane was recovered by the pilot.

During the investigation of this incident, numerous aisle stand configurations were identified due to the multitude of supplemental type certificate installations and significant variability in the Boeing-delivered configurations. On the incident airplane (Model 737-700), the rudder trim switch is in approximately the same location as the flight deck door control switch on the operator's Model 737-500 airplane. This creates a potential for confusion when pilots transition between aircraft. Positive training on one model can become negative when the pilot transfers to a different model. Although the rudder trim switch (Figure 1) and flight deck door control switch (Figure 2) are different in size and shape (cylindrical vs. blade shaped), and the flight deck door unlock side of the switch must be depressed before turning, the general feel (spring force) to actuate the switches is similar; both are spring loaded to the center position. In this incident, the negative transfer error allowed the pilot to think he had operated the correct control, and the similarity of the control's operation exacerbated the situation.

It was also determined through this investigation that this specific issue may not be applicable to many operators due to their flight deck procedures, which include:

- The flight deck door control switch should not be used to unlock the flight deck door.
- A cabin crew member must enter the flight deck when another flight crew member leaves.
- The flight deck door must be monitored with the view port or camera and positive control of the door must be maintained until it is opened manually to allow re-entry of the flight crew member.

Note: There are other advantages to having an additional crew member in the flight deck, e.g., in case of pilot incapacitation or illness.

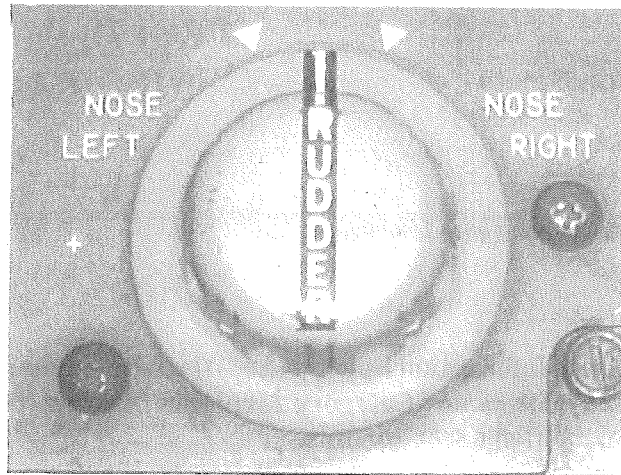


Figure 1 – Rudder Trim Switch

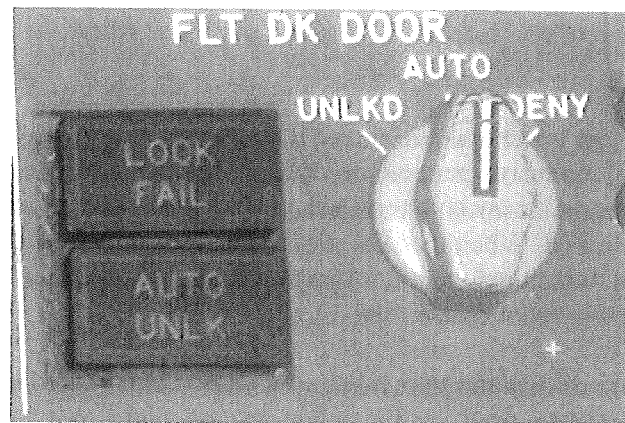


Figure 2 – Flight Deck Door Control Switch

In response to this incident, Boeing analyzed modifying the shape of the flight deck door control switch; however, they determined the position of the switch is more important than the shape of the switch from a human factors perspective. Position of a switch that affects pilot reach/posture provides better feedback to the pilot than the shape of the switch that the pilot feels. Boeing determined the most important factor to minimize inadvertent activation of the control switches is aisle stand configuration consistency within an operator's fleet.

Therefore, Boeing developed new design guidelines for the aisle stand configuration for airplanes in production. The aisle stand is divided into three columns: left column (captain side), center column, and right column (first officer side). These guidelines minimize aisle stand configuration variations within an operator's fleet and, when possible, move the flight deck door control switch to the far right column as far aft as possible and move the rudder trim switch to the center column as far aft as possible.

Having a consistent position for the rudder trim switch is paramount because it provides a direct input to the aircraft rudder and can induce both yaw and roll into the aircraft flight attitude. Because both the rudder trim switch and the flight deck door control switch have a similar feel and action (turn and hold), a standard location and sufficient separation between these controls is recommended. Placing the controls in the recommended locations is consistent with most Boeing-delivered airplanes and creates a distinctive reach posture, provides sufficient separation in relation to reach direction from both seats, and provides adjacent tactile landmarks. This includes the railing in the corner of the aisle stand and the guarded stabilizer trim switch located between the rudder trim switch and the flight

deck door control switch, which provides additional feedback to the pilot on which control is being touched.

Boeing issued Service Letter 737-SL-27-238, "Inadvertent Activation of Rudder Trim," dated September 19, 2012, to provide operators with additional information. The Service Letter is associated with the 737 fleet; however, Boeing agrees the recommendations it provides are pertinent to all Boeing airplanes.

Recommendations

The FAA recommends that operators make procedural changes or configuration changes—or both—to address this airworthiness concern.

Procedural Changes:

Operators that have flight deck procedures, or adopt flight deck procedures similar to those described in this SAIB eliminate the risk of actuating a flight critical switch in air while attempting to unlock the flight deck door.

Configuration Changes:

Operators that do not have flight deck procedures, or do not adopt flight deck procedures similar to those described in this SAIB should take action to mitigate the risk of actuating a flight critical switch in air while attempting to unlock the flight deck door.

For those operators, the FAA recommends minimizing aisle stand configuration variations within their fleets to prevent inadvertent actuation of the controls. If configuration variations are found, we recommend that the aisle stand layout be modified. When modifying the aisle stand layout, operators should always place controls in a location where they can get the most consistency within their fleets, and do the following, if possible:

1. Place the rudder trim switch in the center column as far aft as possible.
2. Place the flight deck door control switch in the far right column (first officer side) aft position.
3. Do not place the flight deck door control switch in the center column.

Both:

For operators that incorporate the procedural changes, the FAA still recommends that operators make the configuration changes to minimize aisle stand configuration variations within their fleets to prevent any inadvertent actuation of the controls. Also, the configuration changes would be unaffected by any future procedural changes.

For Further Information Contact

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