Docket No.: **SA-510**
Exhibit No.: **9M**

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

FAA and NTSB Correspondence Concerning Safety Recommendations A-91-77 and A-92-118 through 121

(1)

Docket No.: **SA-510**
Exhibit No.: **9M**

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

FAA and NTSB Correspondence Concerning
Safety Recommendation
A-91-77

(2)

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 20, 1991

In reply refer to: A-91-77

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On March 3, 1991, at 0944 mountain standard time, United Airlines Flight 585, a Boeing 737-291 airplane, crashed during an approach to the Colorado Springs, Colorado, airport. The crew of 5 and the 20 passengers were killed. The airplane was destroyed by the impact and a postcrash fire. The weather was clear with unlimited visibility. There were windshear reports during the day. At the time of the accident the surface winds were reported to be out of the northwest at 20 knots gusting to 28. The Safety Board has not determined the cause(s) of the accident, and an investigation of airframe, operational, and weather factors is continuing.

Although its relevance to the accident has not been established, the Safety Board is concerned about a flight control anomaly discovered during its investigation. During the postaccident examination of the rudder control components, it was noted that the input lever for the auxiliary (standby) actuator was seized to the point that it could not be moved by hand. According to the manufacturer, the maximum force to move the input lever relative to the actuator housing should not exceed 0.5 pounds. The 6.72-inch input lever is attached to the actuator input shaft (P/N 1087-23). The shaft is supported by a bearing (P/N 1087-22) that is threaded into the body (housing) of the standby rudder actuator. Because of the tight tolerance between the parts, the shaft and the bearing are a matched pair and together are referred to as P/N 1087-21 shaft assembly.

During assembly, the bearing should be installed into the actuator housing to a torque value specified by the actuator manufacturer and then a safety wire should be installed. During disassembly, a torque far in excess of that specified for assembly was needed to remove the P/N 1087-22 bearing from the actuator housing. The torque required during disassembly is the compound effect of rotating the bearing inside diameter surface around the actuator input shaft and the bearing outside diameter threads within the actuator housing. The Safety Board believes that most of the torque needed to remove the bearing was the result of binding between the bearing and housing threads caused by excessive heating of the hydraulic fluid during the postcrash fire.

The actuator input shaft is 0.613 inches in diameter and has a reduced diameter groove for the insertion of a teflon seal. Inward into the actuator from this seal, the shaft assembly is lubricated by hydraulic fluid. Outward of the seal, there is no lubrication between the shaft and the inside diameter surface of the bearing. After disassembly, the bearing and shaft displayed evidence of galling damage (metal transfer) on the unlubricated area of the parts. The metal transfer was from the softer 416 stainless steel bearing onto the harder 440C stainless steel shaft. The bearing wall had shallow cavity areas corresponding in size and shape to the areas of the shaft containing deposited metal. The size of the galled area on each part was estimated to be about 0.1 square inch.

When hydraulic power is applied to the main rudder power control unit (PCU), the standby rudder actuator input lever and shaft are normally free to rotate with the rudder control system torsion tube in response to rudder pedal input. Rotation of the torsion tube provides an input into the main rudder PCU, resulting in rudder deflections. If the standby rudder actuator shaft and lever become bound, the standby actuator lever will apply a force, through the push rod, to the torsion tube. The force at the torsion tube will cause input to the main rudder PCU, resulting in rudder deflection (deflection that is not commanded by inputs from the rudder pedals or yaw damper).

As part of the postaccident investigation, the Boeing Company performed tests of shaft assemblies with reduced clearance between the shafts and bearings to rapidly induce galling between the parts. The size of the galled area of each test specimen and the force needed at the end of a 6.72-inch lever arm to rotate the shaft in the bearing were measured. Safety Board personnel determined that the size of the galled area on the parts from the accident airplane corresponds to a force of 70 to 80 pounds at the end of the lever arm when using the force-versus-area data produced from tests. Data from Boeing indicate that galling forces of 70 to 80 pounds at the standby rudder input lever can result in uncommanded rudder deflections from 2 to 5.5 degrees. However, tests have also shown that with a sufficiently galled area, galling can increase the force required to move the lever to at least 125 pounds. A force of about 130 pounds can result in full rudder deflection (26 degrees).

Hydraulic fluid residue was cleaned from the bearing and housing threads on the parts from the accident airplane to facilitate reassembly of the bearing into the housing. After this reassembly, the galled portions of the bearing and shaft could be aligned when the bearing was fully seated and the lever was in the neutral position. However, comparison of the reassembled bearing in the housing to an x-ray radiograph made prior to disassembly showed that the bearing, as found after the accident, was backed off (unscrewed) about 30 degrees of rotation from its fully seated position on the housing boss. Soot accumulation on the underside of the bearing flange and on the housing boss surface confirmed that these surfaces were not mated together during the fire. Calculations and test data show that a 70- to 80-pound force at the end of the lever can untorque the bearing from the housing boss, if the shaft and bearing are galled and bound together.

Boeing indicated that the movement of the lever relative to the actuator housing boss is restricted to about 4 1/2 degrees by mechanical stops in the system. Therefore, the 30-degree displacement of the bearing relative to its torqued position within the actuator housing is not yet understood and its relation to preimpact loss of control of the accident airplane is unknown.

Maintenance records for the accident airplane indicate the occurrence of rudder control system anomalies on two other occasions prior to the accident. In addition, the Safety Board is aware of three other incidents involving galling of the rudder auxiliary actuator components in Boeing 737-100/-200 and -300 airplanes. These incidents are documented in Boeing's "In Service Activities" Report 86-05, dated May 8, 1986. In two of the three incidents, operators reported unsatisfactory yaw damper performance and rudder pedal feedback in flight along with erratic rudder pedal steering with the yaw damper engaged. Both airplanes had accumulated less than 50 flight hours. In the third incident, similar discrepancies were noted on an undelivered airplane. In all three incidents, the cause of this condition was traced to galling and binding of the actuator input shaft for the standby rudder actuator; the force needed to move the input lever was reported to be as great as 57 pounds.

During its analysis of the 1986 incidents, Boeing determined that the clearance between the bearing and shaft was less than the specified 0.0004 inch to 0.0005 inch, and that galling was a result of excessive tightening of the bearing during actuator assembly. In the rudder auxiliary actuator of the accident airplane, the clearance between the actuator input shaft and bearing away from the galled areas ranged from 0.0001 inch to 0.0004 inch.

As a result of the 1986 incidents of galling between the input shaft and bearing, a design change was made that increased the clearance between the two parts in the galled area by reducing the diameter of the unlubricated portion of the P/N 1087-23 shaft by 0.003 inches (revision G, adopted 9/3/86). Measurement of the diameter of the unlubricated parts of the accident airplane's rudder auxiliary actuator shaft showed that it had not been reduced to increase the clearance in this area. Boeing has indicated that despite the design change, there were no programs initiated to increase the clearance on parts already installed in airplanes, nor were inspections initiated to determine if other rudder auxiliary units contained inadequate clearances or excessive binding. The Safety Board understands that these same components are also used in the rudder controls of Boeing 727 model airplanes.

The Safety Board has not determined what effect, if any, the galling damage had on the controllability of the accident airplane. Nonetheless, the Safety Board is concerned that excessive binding between the input shaft and bearing for the standby rudder actuator could cause an uncommanded rudder input to these airplanes, which may lead to control difficulties.

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

> Issue an Airworthiness Directive requiring a check on all Boeing 737 and 727 model airplanes with the P/N 1087-23 input shaft in the rudder auxiliary actuator unit for the force needed to rotate the input shaft lever relative to the P/N 1087-22 bearing of the auxiliary actuator unit. During this check, the bearing should be inspected to determine if it rotates relative to the housing. All shaft assemblies in which rotation of the bearing occurs, or in which excessive force is needed to move the input lever, should be removed from service on an expedited basis and the assemblies should be replaced with a P/N 1087-21 shaft assembly that has a reduced diameter on the unlubricated portion of the shaft in accordance with revision G of the P/N 1087-23 engineering drawing. All assemblies meeting the force requirement should be rechecked at appropriate intervals until replaced with a P/N 1087-21 shaft assembly containing a P/N 1087-23 shaft that has a reduced diameter on the unlubricated portion of the shaft. (Class II, Priority Action)(A-91-77)

Chairman KOLSTAD, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in this recommendation.

[redacted]

By: James L. Kolstad
Chairman

(6)

NOV 21 1991

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington D.C. 20591

Dear Mr. Busey:

Thank you for your October 9, 1991 letter in response to the National Transportation Safety Board's Safety Recommendation A-91-77. This safety recommendation concerns the rudder auxiliary actuator units in the Boeing 737 and 727 model airplanes.

We are pleased to note that the Federal Aviation Administration agrees with the intent of this safety recommendation and is considering the issuance of a notice of proposed rulemaking requiring a check for the force needed to rotate the input shaft lever relative to the corresponding bearing. Pending notification of progress on the rulemaking action, Safety Recommendation A-91-77 is classified as "Open--Acceptable Response."

Sincerely,

Original Signed By
James L. Kolstad

James L. Kolstad
Chairman

cc: Mr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

any finding of cracks or forging laps is confirmed, prior to further flight, replace the defective beam assembly with a serviceable in accordance with the applicable ice bulletin. Such replacement constitutes minating action for the requirements of paragraph (b) of this AD. As of the effective date of this AD, none of the aft beam assemblies listed in the applicable service bulletin shall be installed on any airplane.

(2) Except as provided by paragraph (b)(3) of this AD, at the next engine removal or within 4,000 hours time-in-service after the effective date of this AD, whichever occurs first, perform a dip etch and a fluorescent penetrant inspection to detect cracks or forging laps in the aft engine mount beam assembly, in accordance with Part 2 of the applicable service bulletin.

(i) If no crack or forging lap is found as a result of the dip etch and fluorescent penetrant inspection, reinstall the beam assembly in accordance with the applicable service bulletin. No further action is required.

(ii) If any crack or forging lap is found as a result of the dip etch and fluorescent penetrant inspection, prior to further flight, replace the beam assembly with a serviceable part, in accordance with the applicable service bulletin. Such replacement constitutes terminating action for the requirements of this AD.

(3) If the requirements of paragraph (b)(2) of this AD result in a dual engine removal, the dip etch and fluorescent penetrant inspection of one of the two aft engine mounts may be deferred to the next 4,000 time-in-service or engine removal, hever occurs first, provided no crack or ging lap is found while accomplishing the visual inspections required by paragraph (b)(1) of this AD. If those inspections are deferred, repeat the visual inspection of the deferred aft engine mount, as required by paragraph (b)(1) of this AD, at intervals not to exceed 1,000 landings.

(4) Replacement of the aft engine mount beam assembly, in accordance with the applicable service bulletin, constitutes terminating action for the requirements of paragraph (b) of this AD.

(c) An alternative method of compliance or adjustment of the compliance time, which provides an acceptable level of safety, may be used when approved by the Manager, Standardization Branch, ANM-113, FAA, Transport Airplane Directorate. The request shall be forwarded through an FAA Principal Maintenance Inspector, who may concur or comment and then sent it to the Manager, Standardization Branch, ANM-113.

(d) Special flight permits may be issued in accordance with FAR 21.197 and 21.199 to operate the airplane to a location where the requirements of this AD can be accomplished.

Issued in Renton, Washington, on January 14, 1992.

Darrell M. Pederson,

Acting Manager, Transport Airplane ctorate, Aircraft Certification Service.

oc. 92-3312 Filed 2-11-92; 8:45 am]

NG CODE 4910-13-M

14 CFR Part 39

[Docket No. 91-NM-257-AD]

97085

Airworthiness Directives; Boeing Model 727 and 737 Series Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This notice proposed the adoption of a new airworthiness directive (AD), that is applicable to all Boeing Model 727 series airplanes and certain Boeing Model 737 series airplanes. This proposal would require inspection of the input shaft in the auxiliary (standby) rudder Power Control Unit (PCU), and reporting to the FAA of units that fail the inspection test procedure outlined in this proposed AD. This proposal is prompted by a report that the input shaft of the PCU of one airplane showed evidence of galling which may have greatly increased the force necessary to move the input shaft. The action specified by the proposed AD are intended to prevent an uncommanded rudder input and reduced controllability of the airplane.

DATES: Comments must be received no later than April 6, 1992.

ADDRESSES: Send comments in triplicate to the Federal Aviation Administration, Transport Airplane Directorate, ANM-103, Attention: Rules Docket No. 91-NM-257-AD, 1601 Lind Avenue SW., Renton, Washington 98055-4056. Comments may be inspected at this location between 9 a.m. and 3 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Kenneth W. Frey, Aerospace Engineer, Seattle Aircraft Certification Office, Systems and Equipment Branch, ANM-130S, FAA, Transport Airplane Directorate, 1601 Lind Avenue SW., Renton, Washington 98055-4056, telephone (206) 227-2673, fax (206) 227-1181.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications should identify the Rules Docket number and be submitted in triplicate to the address specified above. All communications received on or before the closing date for comments, specified above, will be considered before taking action on the proposed rule. The proposals contained in this notice may be changed in light of the comments received.

Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the proposed rules. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each FAA-public contact, concerned with the substance of this proposal, will be filed in the Rules Docket.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must submit a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket Number 91-NM-257-AD." The postcard will be date stamped and returned to the commenter.

Availability of NRPMs

Any person may obtain a copy of this NPRM by submitting a request to the FAA, Transport Airplane Directorate, Attention: Rules Docket No. 91-NM-257-AD, 1601 Lind Avenue SW., Renton, Washington 98055-4056.

Discussion

On March 3, 1991, a Boeing Model 737-291 airplane was involved in an accident during an approach to the Colorado Springs, Colorado, airport. The National Transportation Safety Board (NTSB) has not yet determined the cause(s) of the accident, and an investigation of airframe, operations, and weather factors is continuing.

During the post accident examination of the rudder control components, it was noted that the input lever for the auxiliary (standby) actuator was seized to the point that it could not be moved by hand. After disassembly, the bearing and shaft displayed evidence of galling damage (metal transfer) on the unlubricated area of the parts. It has not been determined what effect, if any, the galling damage may have had on the controllability of the accident airplane. Nonetheless, excessive binding between the input shaft and bearing for the standby rudder actuator could cause an uncommanded rudder input to these airplanes, which may lead to control difficulties.

After examining the circumstances and reviewing all available information related to the incidents described above, the FAA has determined that AD action should be taken to prevent an uncommanded rudder input and reduced controllability of the airplane.

(8)

Since the unsafe condition described is likely to exist or develop on other products of this same type design, the proposed AD would require a one-time inspection of all Boeing Model 727 and 737 airplanes, equipped with part number (P/N) 1087–23 input shaft installed in the rudder auxiliary actuator unit, to identify airplanes on which excess force is needed to rotate the shaft lever relative to the P/N 1087–22 bearing of the auxiliary actuator unit, and replacement of defective units. The shaft and bearing are a matched pair and together are referred to as "P/N 1087–21 shaft assembly." According to the manufacturer, the maximum force to move the input lever relative to the actuator housing should not exceed 0.5 pounds. Since the extent of the galling problem is not known, the FAA is proposing to require operators to submit a report of those standby rudder actuator units that are found to require excess force to operate. Based on the reports received, the FAA may consider further rulemaking.

There are approximately 1,943 Model 727 series airplanes and 1,370 Model 737 series airplanes of the affected design in the worldwide fleet. It is estimated that 1,414 airplanes of U.S. registry would be affected by this AD, that it would take approximately 6 work hours per airplane to accomplish the required actions, and that the average labor cost would be $55 per work hour. Based on these figures, the total cost impact of the AD on U.S. operators is estimated to be $466,620.

The regulations proposed herein would not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

For the reasons discussed above, I certify that this proposed regulation (1) is not a "major rule" under Executive Order 12291; (2) is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and (3) if promulgated, will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. A copy of the draft evaluation prepared for this action is contained in the Rules Docket. A copy of it may be obtained by contacting the Rules Docket at the location provided under the caption "ADDRESSES."

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

The Proposed Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration proposes to amend 14 CFR part 39 of the Federal Aviation Regulations as follows:

PART 39—[AMENDED]

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 1354(a), 1421 and 1423; 49 U.S.C. 106(g); and 14 CFR 11.89.

§ 39.13 [Amended]

2. Section 39.13 is amended by adding the following new airworthiness directive:

Boeing: Docket No. 91–NM–257–AD.

Applicability: All Model 727 series airplanes; and Model 737 series airplanes, line number 1 through line number 1370; certificated in any category.

Compliance: Required as indicated, unless accomplished previously.

To prevent an uncommanded rudder input, accomplish the following:

(a) Within 4,000 flight hours after the effective date of this AD, test the standby rudder actuator for excessive actuation force using the following method:

(1) Shutoff all hydraulic power.

(2) Gain access to the standby rudder actuator.

(3) Disconnect only the input rod from the standby actuator.

(4) Using a push/pull spring scale (minimum ±10% accuracy at 1.0 pound, preferably one having a peak load memory function), push on the standby rudder actuator input lever with sufficient force to move the lever from the neutral position up to, but not touching, the aft stop. The scale must be contacting the input lever at approximately the clevis bolt centerline. While applying the load required to move the lever, the scale must be maintained at an angle perpendicular to the lever arm (not to exceed 20 degrees from perpendicular). The force required to move the input lever throughout this range of motion must not exceed one pound.

(5) Repeat this test, moving the lever arm from the aft stop position up to the forward stop but not touching. The force required to move the input lever throughout this range of motion must not exceed one pound.

(6) Repeat this test moving the lever arm from the forward stop position back to the neutral position. The force required to move the input lever throughout this range of motion must not exceed one pound.

(7) If the actuation force encountered during any of the procedures required by paragraph (a)(4), (a)(5), or (a)(6) of this AD exceeds one pound, prior to further flight, replace the standby rudder actuator with a serviceable actuator, and test in accordance with paragraph (a)(9) of this AD.

(8) If the actuation force encountered during any of the procedures required by paragraph (a)(4), (a)(5), or (a)(6) of this AD is one pound or less, prior to further flight, reconnect the input rod to the standby rudder actuator, and test in accordance with paragraph (a)(9) of this AD.

(9) Perform a functional test of the standby rudder actuator in accordance with Maintenance manual 737–100/–200, chapter 27–21–141, removal/installation; or Maintenance Manual 737–300/–400/–500, chapter 27–21–24, removal/installation; or Maintenance Manual 727, chapter 27–20–151, removal/installation.

(10) Restore the airplane to its normal condition.

(b) Within 15 days after completion of the test required by paragraph (a) of this AD, submit a report on each unit that exceeded the one pound actuation force encountered during the procedures required by paragraph (a)(7) of this AD, to the Manager, Seattle Aircraft Certification Office, ANM–100S, FAA, Transport Airplane Directorate, 1601 Lind Avenue SW., Renton, Washington 98055–4056. The report should identify the airplane, specify the forces measured, include the total number of flight hours that the airplane has accumulated, and include the serial number of the standby actuator. Information collection requirements contained in this regulation have been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980 (P.L. 96–511) and have been assigned OMB Control Number 2120–0056.

(c) An alternative method of compliance or adjustment of the compliance time, which provides an acceptable level of safety, may be used when approved by the Manager, Seattle Aircraft Certification Office (ACO), FAA, Transport Airplane Directorate. The request shall be forwarded through an FAA Principal Maintenance Inspector, who may concur or comment and then send it to the Manager, Seattle ACO.

(d) Special flight permits may be issued in accordance with FAR 21.197 and 21.199 to operate airplanes to a base in order to comply with the requirements of this AD.

Issued in Renton, Washington, on January 3, 1992.

Darrell M. Pederson,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 92–3315 Filed 2–11–92; 8:45 am]

BILLING CODE 4910–13–M

---

14 CFR Part 39

[Docket No. 92–NM–13–AD]

Airworthiness Directives; Boeing Model 747–400 Series Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT

PAGE INTENTIONALLY OMITTED

10

MAR 27 1992

Honorable Barry L. Harris
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Harris:

Thank you for the Federal Aviation Administration (FAA) response of February 24, 1992, to Safety Recommendation A-91-77, issued by the Safety Board as a result of its investigation of an accident involving United Airlines flight 585, a Boeing 737-291 airplane. The crash occurred on March 3, 1991, during an approach to the Colorado Springs, Colorado, airport.

Safety Recommendation A-91-77 asked the FAA to issue an airworthiness directive (AD) applicable to Boeing 727 and 737 series airplanes, requiring (1) inspection of the P/N 1087-23 input shaft in the auxiliary rudder power control unit (PCU) for the force needed to rotate the input shaft lever relative to the P/N 1087-22 bearing; and (2) a check, during this inspection, of the bearing, P/N 1087-22, to determine if it rotates relative to the housing. The recommendation further stated that "all shaft assemblies in which rotation of the bearing occurs, or in which excessive force is needed to move the input lever, should be removed from service and the assemblies should be replaced with a P/N 1087-21 shaft assembly that has a reduced diameter on the unlubricated portion of the shaft."

The Safety Board is pleased to note that on January 3, 1992, the FAA issued a Notice of Proposed Rulemaking (NPRM) (Docket No. 91-NM-257-AD) proposing to adopt an AD that requires inspection of the input shaft in the auxiliary rudder PCU and to require reporting to the FAA on units that fail the inspection. However, the Safety Board is concerned that the second part of the recommendation, regarding inspection of the bearing, is not included in the NPRM. Because looseness of the bearing in the body of the actuator is an additional indication of the galling problem, the Safety Board believes that inspection of the bearing for rotation in the housing and for the integrity of the safety wire is an essential part of the entire inspection.

The Safety Board is also concerned that the proposed time for compliance for these inspections (4,000 flight hours) may be excessive. As indicated in the NPRM, the tests and inspections would take only about 6 hours. Because the components affected could cause an uncommanded rudder input, the Safety Board believes that these inspections should be performed as soon as possible or at the very least at the next available inspection of the airplane.

The proposed AD, if it includes the modifications described above, will fulfill the intent of Safety Recommendation A-91-77. Pending notification of progress on the rulemaking action, Safety Recommendation A-91-77 remains classified as "Open--Acceptable Response."

Sincerely,

Original Signed By
Susan Coughlin

Susan M. Coughlin
Acting Chairman

cc: Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

MAR 27 1992

Honorable Barry L. Harris
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Harris:

Thank you for the Federal Aviation Administration (FAA) response of February 24, 1992, to Safety Recommendation A-91-77, issued by the Safety Board as a result of its investigation of an accident involving United Airlines flight 585, a Boeing 737-291 airplane. The crash occurred on March 3, 1991, during an approach to the Colorado Springs, Colorado, airport.

Safety Recommendation A-91-77 asked the FAA to issue an airworthiness directive (AD) applicable to Boeing 727 and 737 series airplanes, requiring (1) inspection of the P/N 1087-23 input shaft in the auxiliary rudder power control unit (PCU) for the force needed to rotate the input shaft lever relative to the P/N 1087-22 bearing; and (2) a check, during this inspection, of the bearing, P/N 1087-22, to determine if it rotates relative to the housing. The recommendation further stated that "all shaft assemblies in which rotation of the bearing occurs, or in which excessive force is needed to move the input lever, should be removed from service and the assemblies should be replaced with a P/N 1087-21 shaft assembly that has a reduced diameter on the unlubricated portion of the shaft."

The Safety Board is pleased to note that on January 3, 1992, the FAA issued a Notice of Proposed Rulemaking (NPRM) (Docket No. 91-NM-257-AD) proposing to adopt an AD that requires inspection of the input shaft in the auxiliary rudder PCU and to require reporting to the FAA on units that fail the inspection. However, the Safety Board is concerned that the second part of the recommendation, regarding inspection of the bearing, is not included in the NPRM. Because looseness of the bearing in the body of the actuator is an additional indication of the galling problem, the Safety Board believes that inspection of the bearing for rotation in the housing and for the integrity of the safety wire is an essential part of the entire inspection.

The Safety Board is also concerned that the proposed time for compliance for these inspections (4,000 flight hours) may be excessive. As indicated in the NPRM, the tests and inspections would take only about 6 hours. Because the components affected could cause an uncommanded rudder input, the Safety Board believes that these inspections should be performed as soon as possible or at the very least at the next available inspection of the airplane.

The Safety Board is also concerned that the proposed time for performing the inspections (within 4,000 flight hours) may be excessive. Because the components affected could cause an uncommanded rudder input, the Safety Board believes that these inspections should be performed as soon as possible or, at least, during the next scheduled inspection of the airplane. As indicated in the NPRM, the tests and inspections would take only about 6 work hours per airplane to complete.

The Safety Board appreciates the opportunity to comment on this NPRM.

Sincerely,

Original Signed By
Susan Coughlin

Susan M. Coughlin
Acting Chairman

(14)

APR 1 1992

Federal Aviation Administration
Transport Airplane Directorate
ANM-103
Attention: Rules Docket No.91-NM-257-AD
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

Dear Sir:

The National Transportation Safety Board has reviewed your Notice of Proposed Rulemaking (NPRM), "Airworthiness Directives; Boeing Model 727 and 737 Series Airplanes," published in the Federal Register (Vol. 57, No. 29) on February 12, 1992.

On March 3, 1991, a United Airlines Boeing 737-291 airplane crashed during an approach to the airport at Colorado Springs, Colorado. Postaccident examination of the rudder control components revealed that the input lever for the auxiliary actuator had seized to the point that it could not be moved by hand. Further, the bearing was backed off (unscrewed) from its fully seated position. Disassembly of the auxiliary actuator revealed that two interrelated components, a shaft and a bearing, exhibited evidence of galling damage.

As a result of its investigation of the accident, the Safety Board issued Safety Recommendation A-91-77, which asked the Federal Aviation Administration (FAA) to require a check of certain auxiliary rudder power control units on Boeing 727 and 737 airplanes. The FAA's proposed rulemaking responds, in part, to this recommendation.

The Safety Board supports the proposed adoption of an airworthiness directive to require inspection of the input shafts in the auxiliary rudder power control units and concurs with the proposed FAA inspection procedure. However, the NPRM did not address the part of Safety Recommendation A-91-77 that states that "during the check, the bearing should be inspected to determine if it rotates relative to the housing." The Safety Board recently became aware of another occurrence of a loose bearing in the auxiliary rudder control unit of a United Airlines Boeing 737. Examination of the unit in the materials laboratory of the Safety Board revealed extensive galling between the shaft and the bearing.

Because looseness of the bearing in the body of the actuator can be an indicator of galling, the Safety Board believes that an inspection of the bearing for rotation in the housing and integrity of the safety wire is an essential part of the entire inspection procedure.

The proposed AD, if it includes the modifications described above, will fulfill the intent of Safety Recommendation A-91-77. Pending notification of progress on the rulemaking action, Safety Recommendation A-91-77 remains classified as "Open--Acceptable Response."

Sincerely,

Original Signed By
Susan Coughlin

Susan M. Coughlin
Acting Chairman

cc: Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

with gross annual receipts of less than $250,000, and small governmental entities with a population of less than 20,000, will reduce the impact on small entities. At the same time, these reduced annual fees are consistent with the objectives of OBRA–90. Thus, the revised fees for small entities maintain a balance between the objectives of OBRA–90 and the RFA. The NRC has used the methodology and procedures developed for the FY 1991 and FY 1992 fee rules in this proposed rule establishing the FY 1993 fees. Therefore, the analysis and conclusions established in the FY 1991 and FY 1992 rules remain valid for this proposed rule for FY 1993.

[FR Doc. 93–9296 Filed 4–22–93; 8:45 am]

BILLING CODE 7590–01–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 91–NM–257–AD]

Airworthiness Directives; Boeing Model 727 and 737 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Proposed rule; withdrawal.

SUMMARY: This action withdraws a notice of proposed rulemaking (NPRM) that proposed a new airworthiness directive (AD), applicable to all Boeing Model 727 series airplanes and certain Boeing Model 737 series airplanes. That action would have required inspection of the input shaft in the auxiliary (standby) rudder Power Control Unit (PCU), and reporting to the Federal Aviation Administration (FAA) of units that failed the inspection test procedure that was outlined in the proposed AD. Since the issuance of the NPRM, the FAA has re-evaluated the design data and has determined that the condition addressed in the NPRM is not an unsafe condition warranting issuance of an AD. Accordingly, the proposed rule is withdrawn.

FOR FURTHER INFORMATION CONTACT: Kenneth W. Frey, Aerospace Engineer, Seattle Aircraft Certification Office, Systems and Equipment Branch, ANM–130S, FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington 98055–4056; telephone (206) 227–2673; fax (206) 227–1181.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations to add a new airworthiness directive (AD), applicable to all Boeing Model 727 series airplanes and certain Boeing Model 737 series airplanes, was published in the Federal Register on February 12, 1992 (57 FR 5093). The proposed rule would have required inspection of the input shaft in the auxiliary (standby) rudder Power Control Unit (PCU), and reporting to the FAA of units that failed the inspection test procedure that was outlined in the proposed AD. That action was prompted by a report that the input shaft of the PCU of one airplane showed evidence of galling which may have greatly increased the force necessary to move the input shaft. The proposed actions were intended to prevent an uncommanded rudder input and reduced controllability of the airplane.

Since the issuance of that NPRM, the FAA has re-evaluated the design of the rudder control system on the Model 727 and 737 series airplanes and has determined that the flight crew would be capable of detecting the galling condition before it causes any rudder control problems. The galling condition would be detectable by:

(1) Increased force necessary to move the rudder pedal,

(2) Erratic nose gear steering with the yaw damper engaged,

(3) Rudder yaw damper kick back or yaw damper back drives on the rudder pedals during flight, and

(4) Erratic operation of the rudder yaw damper or erratic rudder oscillations with the yaw damper engaged.

None of these indications of galling represent a safety hazard.

Furthermore, the design of the control system on the Model 727 and 737 series airplanes ensures that the flight crew would be capable of continued safe flight and landing after any input shaft galling, up to and including a totally "welded" condition. If the input lever of the standby PCU suddenly became "welded" to the PCU housing while deflected to the most extreme off-neutral position due to yaw damper activity, the flight crew would be capable of returning the rudder almost to neutral, or all the way to neutral, through normal use of the rudder pedals. Additionally, on the Model 727 series airplanes, a rudder system shear-out provision will disconnect the galled standby PCU input linkage; and on the Model 737 series airplanes, the control system linkage between the main PCU and standby PCU is designed to allow enough deflection to occur to move the input lever to the main PCU. Further, on the Model 737 series airplanes, full rudder can be compensated with lateral controls in the majority of flight envelopes. Finally, Boeing Commercial Airplane Group has revised the Model 727 and 737 Maintenance Manuals to emphasize the indications of input lever binding in the standby rudder PCU, which would facilitate an operator's ability to determine the proper maintenance action.

Upon further consideration and re-evaluation of the design data, the FAA has determined that the condition addressed in the NPRM is not an unsafe condition warranting issuance of an AD. Accordingly, the proposed rule is hereby withdrawn.

Withdrawal of this notice of proposed rulemaking constitutes only such action, and does not preclude the agency from issuing another notice in the future, nor does it commit the agency to any course of action in the future.

Since this action only withdraws a notice of proposed rulemaking, it is neither a proposed nor a final rule and therefore, is not covered under Executive Order 12291, the Regulatory Flexibility Act, or DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979).

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

The Withdrawal

Accordingly, the notice of proposed rulemaking, Docket 91–NM–257–AD, published in the Federal Register on February 12, 1992 (57 FR 5093) is withdrawn.

Issued in Renton, Washington, on April 19, 1993.

Darrell M. Pederson,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 93–9495 Filed 4–22–93; 8:45am]

BILLING CODE 4910–13–P

DEPARTMENT OF THE TREASURY

Internal Revenue Service

26 CFR Part 1

[FI–189–84]

RIN 1545–AH48

Debt Instruments With Original Issue Discount; Imputed Interest on Deferred Payment Sales or Exchages of Property; Correction

AGENCY: Internal Revenue Service, Treasury.

ACTION: Correction to notice of proposed rulemaking.

SUMMARY: This document contains a correction to [FI–189–84], which was

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

AUG 5 1993

The Honorable Carl W. Vogt
Chairman, National Transportation
Safety Board
490 L'Enfant Plaza East, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in further response to Safety Recommendation A-91-77 issued by the Board on August 20, 1991, and supplements our letters dated October 9, 1991, and February 24, 1992. This recommendation was issued as a result of the Board's investigation of an accident on March 3, 1991, involving United Airlines Flight 585, a Boeing 737-291. The airplane crashed during an approach to the Colorado Springs, Colorado, airport. The airplane was destroyed by the impact and a postcrash fire. The weather was clear with unlimited visibility. There were windshear reports during the day. At the time of the accident the surface winds were reported to be out of the northwest at 20 knots gusting to 28. The 5 crewmembers and 20 passengers were killed.

A-91-77. Issue an Airworthiness Directive requiring a check on all Boeing 737 and 727 model airplanes with the P/N 1087-23 input shaft in the rudder auxiliary actuator unit for the force needed to rotate the input shaft lever relative to the P/N 1087-22 bearing of the auxiliary actuator unit. During this check, the bearing should be inspected to determine if it rotates relative to the housing. All shaft assemblies in which rotation of the bearing occurs, or in which excessive force is needed to move the input lever, should be removed from service on an expedited basis and the assemblies should be replaced with a P/N 1087-21 shaft assembly that has a reduced diameter on the unlubricated portion of the shaft in accordance with revision G of the P/N 1087-23 engineering drawing. All assemblies meeting the force requirement should be rechecked at appropriate intervals until replaced with a P/N 1087-21 shaft assembly containing a P/N 1087-23 shaft that has a reduced diameter on the unlubricated portion of the shaft.

FAA Comment. On January 3, 1992, the Federal Aviation Administration (FAA) issued a notice of proposed

rulemaking (NPRM) (Docket No. 91-NM-257-AD) proposing to adopt an airworthiness directive applicable to all Boeing Model 727 series airplanes and certain Model 737 series airplanes. This NPRM proposed to require inspection of the input shaft in the auxiliary (standby) rudder power control unit and to require reporting to the FAA on units that fail the inspection test procedure. Since the issuance of this NRPM, the FAA has reevaluated the design of the rudder control system on the Model 727 and 737 series airplanes and has determined that the flightcrew would be capable of detecting the galling condition by: (1) increased force necessary to move the rudder pedal; (2) erratic nose gear steering with the yaw damper engaged; (3) rudder yaw damper kick back or yaw damper back drives on the rudder pedals during flight; and (4) erratic operation of the rudder yaw damper or erratic rudder oscillations with the yaw damper engaged. None of these indications of galling represents a safety hazard. The FAA has determined that the condition addressed in the NPRM is not an unsafe condition warranting the issuance of an airworthiness directive.

Consequently, on April 19, 1993, the FAA issued a notice in the Federal Register to withdraw the NPRM. I have enclosed a copy of this notice for the Board's information. I consider the FAA's action to be completed on this safety recommendation.

Sincerely,

[redacted]

Joseph M. Del Balzo
Acting Administrator

Enclosure

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 91-NM-257-AD]

Airworthiness Directives; Boeing Model 727 and 737 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Proposed rule; withdrawal.

SUMMARY: This action withdraws a notice of proposed rulemaking (NPRM) that proposed a new airworthiness directive (AD), applicable to all Boeing Model 727 series airplanes and certain Boeing Model 737 series airplanes. That action would have required inspection of the input shaft in the auxiliary (standby) rudder Power Control Unit (PCU), and reporting to the Federal Aviation Administration (FAA) of units that failed the inspection test procedure that was outlined in the proposed AD. Since the issuance of the NPRM, the FAA has re-evaluated the design data and has determined that the condition addressed in the NPRM is not an unsafe condition warranting issuance of an AD. Accordingly, the proposed rule is withdrawn.

FOR FURTHER INFORMATION CONTACT: Kenneth W. Frey, Aerospace Engineer, Seattle Aircraft Certification Office, Systems and Equipment Branch, ANM-130S, FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (206) 227-2673; fax (206) 227-1181.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations to add a new airworthiness directive (AD),

applicable to all Boeing Model 727 series airplanes and certain Boeing Model 737 series airplanes, was published in the Federal Register on February 12, 1992 (57 FR 5093). The proposed rule would have required inspection of the input shaft in the auxiliary (standby) rudder Power Control Unit (PCU), and reporting to the FAA of units that failed the inspection test procedure that was outlined in the proposed AD. That action was prompted by a report that the input shaft of the PCU of one airplane showed evidence of galling which may have greatly increased the force necessary to move the input shaft. The proposed actions were intended to prevent an uncommanded rudder input and reduced controllability of the airplane.

Since the issuance of that NPRM, the FAA has re-evaluated the design of the rudder control system on the Model 727 and 737 series airplanes and has determined that the flight crew would be capable of detecting the galling condition before it causes any rudder control problems. The galling condition would be detectable by:

(1) increased force necessary to move the rudder pedal,

(2) erratic nose gear steering with the yaw damper engaged,

(3) rudder yaw damper kick back or yaw damper back drives on the rudder pedals during flight, and

(4) erratic operation of the rudder yaw damper or erratic rudder oscillations with the yaw damper engaged.

None of these indications of galling represent a safety hazard.

Furthermore, the design of the control system on the Model 727 and 737 series airplanes ensures that the flight crew would be capable of

continued safe flight and landing after any input shaft galling, up to and including a totally "welded" condition. If the input lever of the standby PCU suddenly became "welded" to the PCU housing while deflected to the most extreme off-neutral position due to yaw damper activity, the flight crew would be capable of returning the rudder almost to neutral, or all the way to neutral, through normal use of the rudder pedals. Additionally, on the Model 727 series airplanes, a rudder system shear-out provision will disconnect the galled standby PCU input linkage; and on the Model 737 series airplanes, the control system linkage between the main PCU and standby PCU is designed to allow enough deflection to occur to move the input lever to the main PCU. Further, on the Model 737 series airplanes, full rudder can be compensated with lateral controls in the majority of flight envelopes. Finally, Boeing Commercial Airplane Group has revised the Model 727 and 737 Maintenance Manuals to emphasize the indications of input lever binding in the standby rudder PCU, which would facilitate an operator's ability to determine the proper maintenance action.

Upon further consideration and re-evaluation of the design data, the FAA has determined that the condition addressed in the NPRM is not an unsafe condition warranting issuance of an AD. Accordingly, the proposed rule is hereby withdrawn.

Withdrawal of this notice of proposed rulemaking constitutes only such action, and does not preclude the agency from issuing another notice in the future, nor does it commit the agency to any course of action in the future.

Since this action only withdraws a notice of proposed rulemaking, it is neither a proposed nor a final rule and therefore, is not covered under Executive Order 12291, the Regulatory Flexibility Act, or DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979).

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

THE WITHDRAWAL

Accordingly, the notice of proposed rulemaking, Docket 91-NM-257-AD, published in the Federal Register on February 12, 1992 (57 FR 5093) is withdrawn.

Issued in Renton, Washington, on April 19, 1993.

[redacted]

Darrell M. Pederson, Acting Manager
Transport Airplane Directorate
Aircraft Certification Service

23

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

NOV 15 1993

OFFICE OF THE ADMINISTRATOR
NOV 17 12 03 PM '93
EXECUTIVE SECRETARIAT

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Hinson:

Thank you for the Federal Aviation Administration's (FAA) August 5, 1993, letter in response to the National Transportation Safety Board's Safety Recommendation A-91-77. This safety recommendation concerns the rudder auxiliary actuator units in Boeing 737 and 727 model airplanes.

The Safety Board is pleased to note that the FAA's evaluation of the design of the rudder control system on both airplanes has indicated that the galling between the input shaft and bearing is detectable by the pilot and is not an unsafe condition. Nonetheless, the Safety Board remains concerned that the galling can result in erratic flight control that could distract a flightcrew and, under some circumstances, could potentially be hazardous. However, the Safety Board has no further evidence that the galling can result in uncommanded rudder deflections of a significant magnitude. Therefore, Safety Recommendation A-91-77 is classified "Closed--Acceptable Alternate Action."

Sincerely,

[redacted]

Carl W. Vogt
Chairman

cc: Dr. Donald R. Trilling, Director
Office of Transportation Regulatory Affairs

Docket No.: **SA-510**
Exhibit No.: **9M**

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

FAA and NTSB Correspondence Concerning
Safety Recommendations
A-92-118 through 121

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 10, 1992

In reply refer to: A-92-118 through-121

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On July 16, 1992, during a check of the flight controls in a United Airlines (UAL) Boeing 737-300, while taxiing to takeoff from Chicago-O'Hare International Airport, the captain discovered that the airplane's rudder pedal stopped at around 25-percent left pedal travel. The airplane returned to the gate and the main rudder power control unit (PCU) was removed.

The PCU was tested at UAL's maintenance facilities in San Francisco, California, on July 20, 1992. During that testing, the PCU operated in an anomalous manner. Under certain conditions, the actuator piston would move in a direction opposite to the commanded and intended input. However, during other demonstrations, the PCU operated normally.

As a result of the initial observations, the unit was taken to the facilities of Parker Hannifin, the valve manufacturer, at Irvine, California, for further testing by Boeing, Parker Hannifin, and UAL. Test results showed that the dual concentric servo valve installed on the main rudder PCU could, under some circumstances, result in motion opposite to that commanded by the rudder pedals. Boeing and Parker Hannifin then initiated a design review to better understand the nature of the reversal, to develop a design change to preclude the reversal, as well as a plan to implement the design change.

On July 30, 1992, the Safety Board became aware of the taxi incident at Chicago and the subsequent investigation of the PCU. Testing and design change

efforts are continuing, and Safety Board specialists have participated in these efforts.

During subsequent testing of the rudder PCU, anomalous actions, ranging from sluggish movement of the actuator piston to full reversal in the commanded direction of piston travel, were observed when the input crank was held against the PCU body stops and the yaw damper piston was in the extend position. High internal fluid leakage was also noted. The capability of the PCU to produce force to move the rudder against aerodynamic loads was not measured. The interaction of the yaw damper and the PCU operation as observed is not fully understood. In addition, it is unknown whether the yaw damper was commanding rudder movement at the time that the UAL captain performed the rudder control check. During the tests, it was noted that lower hydraulic operating pressures aided in achieving anomalous actions. Tapping on the dual servo valve body or actuator summing levers prompted the PCU to return to normal operation. Releasing the force on the input crank also returned the PCU to normal operation.

In normal operation, the pilot applies force to the input crank through the rudder pedals. If the pilot releases pressure on the pedal when a direction reversal occurs, the tests show that the PCU should return to normal operation. However, it is highly unlikely that pilots would respond to a rudder reversal by releasing pedal pressure. If, as is far more likely, rudder pressure is held until the rudder has reversed position, the centering unit may supply sufficient force to the input crank to sustain the anomalous condition even though pedal pressure is released.

Analysis by Boeing and Parker Hannifin shows that the potential for rudder reversal could exist in all B-737 main rudder PCUs. The internal stops of the dual concentric servo valve can allow the secondary slide of some valves to overtravel under some conditions. Normally, the primary slide moves about 0.045 inch before the secondary slide moves. If the primary slide is pinned or jammed to the secondary slide, control inputs resulting in the normal movement of the primary slide can lead to the overtravel of the secondary slide. If the overtravel of the secondary slide is sufficient, hydraulic fluid could be routed through a flow passage located outside the normal valve travel range that could result in piston (and rudder) motion in the direction opposite to the input command.

According to Boeing and Parker Hannifin, the effects of an overtravel condition of the secondary slide would not be apparent during approved acceptance tests. Accordingly, one part of the acceptance test was modified to facilitate the

investigation. During this test, the primary and secondary slides were pinned together to prevent relative motion and were moved through an extended range of motion, as allowed by the internal secondary stops. This range of motion is greater than the normal range of motion of the secondary slide. As the overtravel progressed, the valve porting moved out of normal range, and the pressure and return porting to the respective slides of the actuator piston were interconnected and eventually reversed. The initial effect was excessive internal leakage. Full movement of the slide produced a 3,000 pounds per square inch (psi) reversed pressure drop across the actuator piston with the leakage slowed.

Boeing and UAL have developed a field test procedure to verify the proper operation of the dual servo valve. A total of 212 UAL B-737 airplanes were checked. One main rudder PCU was removed as a result of "hissing" sounds during part of the test. The source of these sounds was attributed to minor leakage in the PCU that was not associated with the dual servo valve. The unit passed acceptance tests and could have been returned to service. There were no other indications of abnormally operating PCUs during the fleet-wide checks. Tests and design analysis indicate that the anomalous operation will occur only when a unique condition prevents independent movement of the primary and secondary slides of the servo valve (a condition that could develop suddenly or occur intermittently). Thus, a one-time check may not ensure that reversal will not occur.

The dual servo valves removed from the B-737s that crashed in Colorado Springs, Colorado, on March 3, 1991, and in the Darien Province of Panama on June 6, 1992, were also tested. The results show that a 50 percent pressure drop could have developed on the Colorado Springs unit if a failure mechanism produced an overtravel of the secondary valve slide. As understood thus far, if such a pressure drop occurred, the main rudder PCU could only develop 50 percent of the rudder hinge moment capability, working in the proper direction. The pressure drop would be similar to losing either A or B redundant hydraulic systems. Moreover, the results show that a complete pressure drop, without reversal, could have developed on the Panama unit only if a failure mechanism produced an overtravel of the secondary slide valve. The unit would lose hinge moment capability, but movement of the rudder in the opposite direction beyond neutral would not occur.

Boeing aerodynamic data for the B-737-200 airplane shows that full rudder deflection (approximately 26 degrees) may be uncontrollable with full control wheel deflection (approximately 107 degrees) under certain conditions. Flap position and

airspeed are important when determining controllability during full rudder deflection.

Historical maintenance data shows that there have been five other incidents related to the main rudder PCU. It is believed that two of them were detected in flight. On July 24, 1974, the flightcrew of a B-737 reported that the rudder moved "full right" on touchdown. The investigation revealed that the primary and secondary control valves were stuck together by a shot peen ball lodged in the valve.

On October 30, 1975, the flightcrew of a B-737 reported that the rudder pedals moved to the right "half-way" and then jammed. This action was repeated three times and then corrected by cycling the rudder with the standby rudder system. Further examination indicated that the system was contaminated by metal particles.

Another report on October 30, 1975, indicated that during a PCU inspection, a jammed control valve was found. The data associated with this report is insufficient to determine the cause of the PCU removal.

On August 31, 1982, a B-737 reported that the rudder "locked up" on approach and that the flightcrew initiated a go-around and activated the standby rudder system. The landing was uneventful. The examination of the PCU revealed internal contamination and worn seals. It was suspected that high leakage from the worn seals resulted in the PCU having a limited capability to generate enough force to move the rudder.

On November 8, 1990, during an overhaul, a PCU was found to have internal corrosion. The primary slide was stuck at neutral to the secondary as a result of corrosion. There were no reports of malfunction prior to the disassembly.

Boeing and Parker Hannifin are currently developing design changes to the dual servo valve that would limit the travel of the secondary slide to eliminate the potential for pressure and return porting reversal. The Safety Board understands that the rudder PCUs would most likely be returned to Parker Hannifin for modification. Newly defined tolerances would require that parts from the dual servo valve be selectively fit and/or modified to produce acceptable test results. Boeing is planning a retrofit program.

More than 3,000 B-737 main rudder PCUs have been produced. The unit is not a high replacement item that requires large numbers of spares. At this time, only one test fixture is known to exist, and only one facility is prepared to implement the changes. The Safety Board understands that a significant period of time may be required to remove, overhaul, and return to service all rudder PCUs in the B-737 fleet.

The Safety Board recognizes that the B-737-series airplanes have flown about 50 million flight hours, providing safe transportation to the public. Only two confirmed airborne incidents have resulted from rudder operational anomalies, and these did not result in injury to passengers or damage to the airplanes. Nonetheless, the Safety Board believes that rudder malfunctions, as described in this letter, could present significant flight control difficulties under certain circumstances, for example, sudden, large rudder pedal inputs in response to an engine failure during initial climb. Therefore, the Safety Board believes that interim precautionary measures are warranted, pending completion of the long-term PCU overhaul and replacement program.

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

> Require that Boeing develop a repetitive maintenance test procedure to be used by B-737 operators to verify the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of anomalies attributed to the overtravel of the secondary slide. (Class II, Priority Action) (A-92-118)
>
> Require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide. (Class II, Priority Action) (A-92-119)
>
> Require operators, by airworthiness directive, to incorporate design changes for the B-737 main rudder power control unit servo valve when these changes are made available by Boeing. These changes should

(30)

preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide. (Class II, Priority Action) (A-92-120)

Conduct a design review of servo valves manufactured by Parker Hannifin having a design similar to the B-737 rudder power control unit servo valve that control essential flight control hydraulic power control units on transport-category airplanes certified by the Federal Aviation Administration to determine that the design is not susceptible to inducing flight control malfunctions or reversals due to overtravel of the servo slides. (Class II, Priority Action) (A-92-121)

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

By: Carl W. Vogt
Chairman

(31)

JUN 10 1993

Mr. Joseph M. Del Balzo
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Del Balzo:

Thank you for the Federal Aviation Administration's (FAA) response of January 19, 1993, to the National Transportation Safety Board's Safety Recommendations A-92-118 through -121.

Safety Recommendation A-92-118 asked the FAA to require that Boeing develop a repetitive maintenance test procedure to be used by B-737 operators to verify the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of anomalies attributed to the overtravel of the secondary slide. The Safety Board notes that the Boeing Airplane Company will issue service information to inspect and retrofit all Boeing Model 737 series airplanes. Following the issuance of this service information, the FAA will consider issuing a notice of proposed rulemaking (NPRM) to make compliance mandatory. Pending further information, the Safety Board classifies Safety Recommendation A-92-118 "Open--Acceptable Response."

Safety Recommendation A-92-119 asked the FAA to require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide. The Safety Board notes that the FAA believes that current preflight check procedures adequately ensure proper rudder operation. The Board is aware of the preflight check of a United Airlines Boeing 737-300 in which the main rudder control unit (s/n 2228A) stopped moving at approximately 25 percent left pedal travel. However, the Safety Board believes that rapid rudder pedal inputs were required to induce the lockup that occurred during the preflight check conducted by the pilot of the United Airlines Boeing 737-300 and that a routine preflight check would not have uncovered the problem. In all test cases that resulted in the locked-up condition or reversal, the input control was moved at a rate faster than the rudder actuator could respond, thus forcing the secondary valve into the overtravel position.

Furthermore, the Safety Board recognizes that rapid movement of the rudder pedals on the ground could result in damage to the airplane. Therefore, the Safety Board issued Safety Recommendation A-92-119 to require Boeing to develop a safe and effective procedure to uncover the type of problem present on the United Airlines Boeing 737-300. Based on this information, the Safety Board requests that the FAA reconsider its position concerning Safety Recommendation A-92-119 and classifies it "Open--Unacceptable Response."

Safety Recommendation A-92-120 asked the FAA to require operators, by airworthiness directive, to incorporate design changes for the B-737 main rudder power control unit servo valve when these changes are made available by Boeing. These changes should preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide. The Safety Board notes that the FAA will consider issuing an NPRM to address this safety recommendation as soon as Boeing issues the service information mentioned in response to Safety Recommendation A-92-118. Pending further information, the Safety Board classifies Safety Recommendation A-92-120 "Open--Acceptable Response."

Safety Recommendation A-92-121 asked the FAA to conduct a design review of servo valves manufactured by Parker Hannifin, which are similar in design to the B-737 rudder power control unit servo valve, which controls essential power control units on transport-category airplanes certified by the FAA, to determine if any such valve is susceptible to inducing flight control malfunctions or reversals due to overtravel of the servo slides. The Safety Board notes that the FAA has completed a design review of the servo valves manufactured by Parker Hannifin on all transport-category airplanes. A problem was found to exist only in the main rudder power control unit on the Boeing 737 model airplanes. Based on this information, the Safety Board classifies Safety Recommendation A-92-121 "Closed--Acceptable Action."

Sincerely,

Original Signed By
Carl W. Vogt

Carl W. Vogt
Chairman

cc: Mr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

(33)

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

DEC 2 1993

The Honorable Carl W. Vogt
Chairman, National Transportation
Safety Board
490 L'Enfant Plaza East, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in further response to Safety Recommendation A-92-119 issued by the Board on November 10, 1992, and supplements our letter dated January 19, 1993. This safety recommendation was issued as a result of an incident on July 16, 1992, during a pretakeoff check of the flight controls in a United Airlines Boeing 737-300. While taxiing to takeoff from Chicago O'Hare International Airport, the captain discovered that the airplane's rudder pedal stopped at around 25 percent left pedal travel. The airplane returned to the gate, and the main rudder power control unit was removed.

A-92-119. Require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

FAA Comment. The Federal Aviation Administration (FAA) agrees that rapid rudder inputs are a factor in uncovering problem servo valves. However, the FAA does not agree that a rapid rudder input procedure should be incorporated into the preflight check as requested by the Safety Board. Rapid rudder inputs put additional stress on the rudder structure. Accomplishing a rapid rudder input during every preflight check increases the possibility of structural rudder damage. Additionally, the characteristics of the rapid rudder input would vary greatly among the different pilots and it would be impossible to achieve consistent rudder inputs.

For these reasons, the FAA issued a notice of proposed rulemaking (NPRM) (Docket No. 93-NM-79-AD) proposing to require specially trained operators to perform a periodic inspection (intervals must not exceed 750 flight hours) of the

rudder system in accordance with Boeing Service Letter 737-SL-27-82-B, dated July 13, 1993, until the main rudder servo valve is reworked in accordance with Boeing Service Bulletin 737-27-1185, dated April 15, 1993. The rudder pedals will be cycled at the maximum rate during the inspection, and special instrumentation and additional observers will be available to detect properly any anomaly. Mandatory modification of the servo valve would be required within 5 years after the effective date of the final rule. I have enclosed a copy of the NPRM for the Board's information.

The inspection procedure in the Boeing Service Letter was specially developed by Boeing to identify excessive internal leakage in the main rudder power control unit servo valve which is a symptom of secondary slide-over travel. This procedure provides detailed instructions to ensure that the rudder pedals are cycled at the maximum rate during the inspection. This inspection will find servo valves that perform marginally because the internal leakage rate is measured during the inspection. A servo valve that has marginal performance would not be detected during a preflight check but would have a reduced hinge moment capability because of excessive internal leakage. This internal leakage rate cannot be measured during a preflight check.

The FAA believes that the combination of routine preflight checks and a dedicated, periodic ground test offer the best overall method to ensure proper rudder operation. I will provide the Board with a copy of any document that may be issued.

Sincerely,

[redacted]

David R. Hinson
Administrator

Enclosure

(35)

[4910-13-P]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 93-NM-79-AD]

Airworthiness Directives; Boeing Model 737 Series Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This document proposes the adoption of a new airworthiness directive (AD) that is applicable to certain Boeing Model 737 series airplanes. This proposal would require repetitive tests of the main rudder power control unit (PCU) to detect internal leakage of hydraulic fluid, and the eventual replacement of the main rudder PCU with an improved model. This proposal is prompted by results of an investigation which revealed that the secondary slide in the servo valve of certain PCU's can go past the intended maximum-travel position. The actions specified by the proposed AD are intended to prevent secondary slide overtravel from occurring, which could cause the rudder actuator piston and the rudder to move opposite to the intended direction and result in reduced controllability of the airplane.

DATES: Comments must be received by October 12, 1993.

ADDRESSES: Submit comments in triplicate to the Federal Aviation Administration (FAA), Transport Airplane Directorate, ANM-103, Attention: Rules Docket No. 93-NM-79-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056. Comments may be inspected at this location between 9:00 a.m. and 3:00 p.m., Monday through Friday, except Federal holidays.

The service information referenced in the proposed rule may be obtained from Boeing Commercial Airplane Group, P.O. Box 3707, Seattle, Washington 98124-2207. This information may be examined at the FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington.

FOR FURTHER INFORMATION CONTACT: Mr. Kenneth W. Frey, Aerospace Engineer, Seattle Aircraft Certification Office, Systems & Equipment Branch, ANM-130S, FAA, Transport Airplane Directorate, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (206) 227-2673; fax (206) 227-1181.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications shall identify the Rules Docket number and be submitted in triplicate to the address specified above. All communications received on or before the closing date for comments, specified above, will be considered before taking action on the proposed rule. The proposals contained in this notice may be changed in light of the comments received.

Comments are specifically invited on the overall regulatory, economic, environmental, and energy aspects of the proposed rule. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each FAA-public contact concerned with the substance of this proposal will be filed in the Rules Docket.

(37)

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must submit a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket Number 93-NM-79-AD." The postcard will be date stamped and returned to the commenter.

Availability of NPRMs

Any person may obtain a copy of this NPRM by submitting a request to the FAA, Transport Airplane Directorate, ANM-103, Attention: Rules Docket No. 93-NM-79-AD, 1601 Lind Avenue, SW., Renton, Washington 98055-4056.

Discussion

The manufacturer has advised the FAA that there have been two reports of rudder control anomalies on Boeing Model 737 series airplanes, which were discovered during preflight controls checks. In both cases, the flight crew reported that the rudder pedals operated normally in one direction, but that pedal travel was reduced in the opposite direction while being cycled in accordance with controls checks procedures. When foot pressure was released from the pedals, the pedals recentered as normal. Investigation of this anomaly revealed that, under certain conditions, the secondary slide in the dual servo valve on the rudder power control unit (PCU) can go past the intended maximum-travel position. This condition could cause hydraulic fluid bypass and could cause misdirected hydraulic pressure within the servo valve, which could then cause the rudder actuator piston and the rudder to move in a direction opposite to the intended direction. This condition, if not corrected, could result in reduced controllability of the airplane.

The FAA has reviewed and approved Boeing Service Letter 737-SL-27-82-B, dated July 13, 1993, that describes procedures for conducting a test of the main rudder PCU to detect excessive internal leakage of hydraulic fluid. If certain discrepancies are detected, the service letter recommends the replacement of the main rudder PCU.

The FAA also has reviewed and approved Boeing Bulletin 727-27-1185, dated April 15, 1993, that describes procedures for replacement of the main rudder PCU with an improved model that is not subject to the subject leakage problems.

Since an unsafe condition has been identified that is likely to exist or develop on other products of this same type design, the proposed AD would require periodic tests of the main rudder PCU to detect excessive internal leakage of hydraulic fluid, and correction of discrepancies. This proposed AD also would require the eventual replacement of the main rudder PCU with an improved model; such replacement would constitute terminating action for the periodic tests. The actions would be required to be accomplished in accordance with the service letter and the service bulletin described previously.

There are approximately 2,448 Model 737 series airplanes of the affected design in the worldwide fleet. The FAA estimates that 729 airplanes of U.S. registry would be affected by this proposed AD, that it would take approximately 19 work hours per airplane to accomplish the proposed actions, and that the average labor rate is $55 per work hour. Required parts would be supplied by the manufacturer at no cost to operators. Based on these figures, the total cost impact of the

proposed AD on U.S. operators is estimated to be $761,805, or $1,045 per airplane. This total cost figure assumes that no operator has yet accomplished the proposed requirements of this AD action.

The regulations proposed herein would not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

For the reasons discussed above, I certify that this proposed regulation (1) is not a "major rule" under Executive Order 12291; (2) is not a "significant rule" under the DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and (3) if promulgated, will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. A copy of the draft regulatory evaluation prepared for this action is contained in the Rules Docket. A copy of it may be obtained by contacting the Rules Docket at the location provided under the caption "ADDRESSES."

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

The Proposed Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration proposes to amend 14 CFR part 39 of the Federal Aviation Regulations as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. App. 1354(a), 1421 and 1423; 49 U.S.C. 106(g); and 14 CFR 11.89.

§39.13 - [Amended]

2. Section 39.13 is amended by adding the following new airworthiness directive:

BOEING: Docket 93-NM-79-AD.

Applicability: Model 737 series airplanes; line positions 1 through 2453, inclusive; certificated in any category.

Compliance: Required as indicated, unless accomplished previously.

To prevent the rudder actuator piston and the rudder to move opposite to the intended direction, which could result in reduced controllability of the airplane, accomplish the following:

(a) Within 750 flight hours after the effective date of this AD, perform a test of the main rudder power control unit (PCU), part number 65-44861-2/-3/-4/-5/-6/-7/-8/-9, to detect internal leakage of hydraulic fluid, in accordance with Boeing Service Letter 737-SL-27-82-B, dated July 13, 1993.

(1) If no discrepancy, as described in paragraph B. of the Service Letter, is detected, repeat the test at intervals not to exceed 750 flight hours.

(2) If any discrepancy, as described in paragraph B. of the Service Letter, is detected during any check, prior to further flight, replace the main rudder PCU with a new main rudder PCU having part number

(41)

65-44861-11 or 65C37052-2/-3/-4/-5/-6/-7/-8/-9, in accordance with Boeing Service Bulletin 737-27-1185, dated April 15, 1993. Such replacement constitutes terminating action for the tests required by paragraph (a)(1) of this AD.

(b) Within 5 years after the effective date of this AD, replace the main rudder PCU, part number 65-44861-(), with a new main rudder PCU having part number 65-44861-11 or 65C37052-2/-3/-4/-5/-6/-7/-8/-9, in accordance with Boeing Service Bulletin 737-27-1185, dated April 15, 1993. Such replacement constitutes terminating action for the tests required by paragraph (a)(1) of this AD.

(c) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Seattle Aircraft Certification Office (ACO), FAA, Transport Airplane Directorate. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Seattle ACO.

NOTE: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Seattle ACO.

(d) Special flight permits may be issued in accordance with FAR 21.197 and 21.199 to operate the airplane to a location where the requirements of this AD can be accomplished, provided that the airplane has not failed the internal leakage test required by this AD.

(42)

Issued in Renton, Washington, on August 9, 1993.

[redacted]

David G. Hmiel, Acting Manager
Transport Airplane Directorate,
Aircraft Certification Service.

(43)

JAN 12 1994

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Hinson:

Thank you for the Federal Aviation Administration's (FAA) letter of December 2, 1993, in further response to the National Transportation Safety Board's Safety Recommendation A-92-119.

Safety Recommendation A-92-119 asked the FAA to require that Boeing develop an approved preflight check of the Boeing 737 rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

The Safety Board notes that the FAA has issued a notice of proposed rulemaking (Docket No. 93-NM-79-AD) proposing required periodic inspections of the rudder system in accordance with Boeing Service Letter 737-SL-27-82-B, dated July 13, 1993, until the main rudder servo valve is reworked in accordance with Boeing Service Bulletin 737-27-1185, dated April 15, 1993. The FAA's proposed rule meets the intent of Safety Recommendation A-92-119, which is now classified "Open--Acceptable Response," pending implementation of the final rule.

Sincerely,

Original Signed By
Carl W. Vogt

Carl W. Vogt
Chairman

cc: Dr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

(44)

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

JAN 19 1993

The Honorable Carl W. Vogt
Chairman, National Transportation
Safety Board
490 L'Enfant Plaza East, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in response to Safety Recommendations A-92-118 through -121 issued by the Board on November 10, 1992. These safety recommendations were issued as a result of an incident on July 16, 1992, during a preflight check of the flight controls in a United Airlines Boeing 737-300. While taxiing to takeoff from Chicago-O'Hare International Airport, the captain discovered that the airplane's rudder pedal stopped at around 25 percent left pedal travel. The airplane returned to the gate, and the main rudder power control unit was removed.

A-92-118. Require that Boeing develop a repetitive maintenance test procedure to be used by B-737 operators to verify the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of anomalies attributed to the overtravel of the secondary slide.

FAA Comment. The Federal Aviation Administration (FAA) agrees with the intent of this safety recommendation. The Boeing Airplane Company will issue service information to inspect and retrofit all Boeing Model 737 series airplanes. As soon as the service information is issued, the FAA will consider the issuance of a notice of proposed rulemaking proposing to make compliance with this information mandatory.

I will provide the Board with a copy of any document that may be issued.

A-92-119. Require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

FAA Comment. The FAA does not agree with this safety recommendation. The United Airlines Boeing 737-300 main rudder power control unit (S/N 2228A), which stopped moving at approximately 25 percent left pedal travel, was discovered during a routine preflight check. The FAA believes that the current preflight check procedures adequately ensure proper rudder operation.

I plan no further action on this safety recommendation.

A-92-120. Require operators, by airworthiness directive, to incorporate design changes for the B-737 main rudder power control unit servo valve when these changes are made available by Boeing. These changes should preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

FAA Comment. The FAA agrees with the intent of this safety recommendation and will consider the issuance of a notice of proposed rulemaking to address this safety recommendation as soon as Boeing issues the service information mentioned in response to Recommendation A-92-118.

I will provide the Board with a copy of any document that may be issued.

A-92-121. Conduct a design review of servo valves manufactured by Parker Hannifin having a design similar to the B-737 rudder power control unit servo valve that control essential flight control hydraulic power control units on transport-category airplanes certified by the Federal Aviation Administration to determine that the design is not susceptible to inducing flight control malfunctions or reversals due to overtravel of the servo slides.

FAA Comment. The FAA agrees with this safety recommendation, and a design review of the servo valves manufactured by Parker Hannifin on all transport category airplanes was completed. The problem was found to exist in the main rudder power control unit only on the Boeing 737 model airplanes.

I consider the FAA's action to be completed on this recommendation.

Sincerely,

[redacted]

Thomas C. Richards
Administrator

(46)

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

JUL 14 1994

The Honorable James E. Hall
Acting Chairman, National Transportation
Safety Board
490 L'Enfant Plaza East, SW.
Washington, DC 20594

Dear Mr. Hall:

This is in further response to Safety Recommendations A-92-118 through -120 issued by the Board on November 10, 1992, and supplements our letters dated January 19, 1993, and December 2, 1993. These safety recommendations were issued as a result of an incident on July 16, 1992, during a pretakeoff check of the flight controls in a United Airlines Boeing 737-300. While taxiing to takeoff from Chicago-O'Hare International Airport, the captain discovered that the airplane's rudder pedal stopped at around 25 percent left pedal travel. The airplane returned to the gate, and the main rudder power control unit was removed.

A-92-118. Require that Boeing develop a repetitive maintenance test procedure to be used by B-737 operators to verify the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of anomalies attributed to the overtravel of the secondary slide.

A-92-120. Require operators, by airworthiness directive, to incorporate design changes for the B-737 main rudder power control unit servo valve when these changes are made available by Boeing. These changes should preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

FAA Comment. The Federal Aviation Administration (FAA) issued Airworthiness Directive (AD) 94-01-07 on January 3, 1994, applicable to certain Boeing Model 737 series airplanes. This AD requires repetitive tests of the main rudder power control unit to detect excessive internal leakage of hydraulic fluid, stalling, or reversal, and the eventual replacement of the main rudder power control unit with an improved model. I have enclosed a copy of the AD for the Board's information.

I consider the FAA's action to be completed on these safety recommendations.

A-92-119. Require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder power control unit servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

FAA Comment. The FAA has reconsidered its previous position on this safety recommendation and remains convinced that current preflight check procedures adequately ensure proper rudder operation. The FAA agrees that rapid rudder inputs are a factor in uncovering rudder control anomalies. However, as noted by the Board, a rapid rudder input during every preflight check increases the possibility of structural rudder damage. Additionally, it would be impossible to conduct this check with any degree of consistency because of variances among pilots. Finally, the FAA does not agree that all rudder control anomalies due to secondary slide overtravel can be detected during preflight checks.

For these reasons, instead of incorporating rapid rudder movements in the preflight check, the FAA issued AD 94-01-07 which requires specifically trained operators to perform a periodic (750 flight hours) inspection of the rudder system until the servo valve is reworked. The rudder pedals will be cycled at the maximum rate during this inspection, and special instrumentation and additional observers will be available to detect properly any anomaly. The requirements of the AD will also ensure the detection of high internal leakage within the main rudder power control unit servo valve which is a symptom of secondary slide overtravel. This inspection will find servo valves that perform marginally because the internal leakage rate is measured during the inspection. A servo valve that has marginal performance would not be detected during a preflight check but would have a reduced hinge moment capability because of excessive internal leakage. This internal leakage rate cannot be measured during a preflight check.

I believe that present preflight check procedures and the inspection requirements of AD 94-01-07 meet the full intent of

this safety recommendation, and I consider the FAA's action to be completed.

Sincerely,

[redacted]

David R. Hinson
Administrator

Enclosure

(49)

AUG 11 1994

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Hinson:

Thank you for the Federal Aviation Administration's (FAA) response of July 14, 1994, to the National Transportation Safety Board's Safety Recommendations A-92-118, through -120.

Safety Recommendation A-92-118 asked the FAA to require that Boeing develop a repetitive maintenance test procedure to be used by B-737 operators to verify the proper operation of the main rudder power control unit (PCU) servo valve until a design change is implemented that would preclude the possibility of anomalies attributed to the overtravel of the secondary slide.

Safety Recommendation A-92-120 asked the FAA to require operators, by airworthiness directive (AD), to incorporate design changes for the B-737 main rudder power control unit servo valve when these changes are made available by Boeing. These changes should preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

The Safety Board notes that on January 3, 1994, the FAA issued AD 94-01-07, which requires repetitive inspections of the Boeing 737 main rudder PCU at 750 hour intervals. This repetitive inspection will continue until the PCUs are replaced. This action by the FAA satisfies the intent of Safety Recommendations A-92-118, and -120. The Safety Board believes that in the interest of safety, all Boeing 737 main rudder PCUs should be modified at the earliest possible date, and since the compliance period appears to be founded on reasonable estimates of equipment availability, the Safety Board classifies these recommendations "Closed--Acceptable Action."

Safety Recommendation A-92-119 asked the FAA to require that Boeing develop an approved preflight check of the rudder system to be used by operators to verify, to the extent possible, the proper operation of the main rudder PCU servo valve until a design change is implemented that would preclude the possibility of rudder reversals attributed to the overtravel of the secondary slide.

(50)

The Safety Board notes that the FAA maintains that a quantitative preflight test cannot be developed. However, the Safety Board considers the FAA's requirement for repetitive inspections of the PCU at 750 hour intervals until terminating action sufficient to address the intent of Safety Recommendation A-92-119. Therefore, the Safety Board classifies the recommendation "Closed--Acceptable Alternate Action."

Sincerely,

ORIGINAL SIGNED BY
JIM HALL

Jim Hall
Acting Chairman

cc: Dr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs