Boeing Commercial Airplane Group
P.O. Box 3707
Seattle, WA 98124-2207

May 3, 1995
B-U01B-15246-ASI

Mr. Thomas Haueter, AS-10
National Transportation Safety Board
490 L'Enfant Plaza SW
BOEING Washington DC 20594-2000

Subject: Main Rudder PCU Aft Mount Bolt Wear USAir 737-300 Accident N513AU/PP033 Near Pittsburgh September 8, 1994

Reference: Letter B-U01B-15018-ASI to Hector Casanova, November 23, 1994

Dear Mr. Haueter:

In the reference we requested more information for items in the maintenance records provided in the subject investigation. You recently clarified that one of those items was wear on the main Rudder Power Control Unit (RPCU) aft mount bolt. A review of our records found only one other report from United Airlines of wear in this area. A copy of that report is enclosed.

To attain a secondary load path, the aft mount a[illegible]ment of the RPCU to the rudder is made up of two bolts, an inner and ou[illegible] We examined two set of bolts that were submitted by United. (The origin of the other set of bolts was not provided to us.) The results of our examination are provide in the enclosed response to United. The wear discussed in our response is similar to that caused by a normally "clamped" (i.e. stationary inner race) bearing rotating on a bolt. The cause of this rotation is generally attributed to the joint not being sufficiently torqued. The rotation of the inner race on the bolt combined with an insufficiently torqued outer bolt will result in significant wear. The wear will manifest itself in the form of rudder surface freeplay. Wear of this sort will have no impact upon operation prior to becoming severe enough to be detected in one of three ways: scheduled rudder surface freeplay check, replacement of the RPCU, or surface vibration during flight.

Hardness tests confirmed the bolts, both inner and outer, were heat treated to the required strength in accordance with bolt specifications listed on the engineering drawings.

If you have questions, please contact Rick Howes [redacted] or me.

Very truly yours,

FLIGHT TEST

[redacted]

BOEING

John W. Purvis
Director, Air Safety Investigation
Org. B-U01B, M/S 14-HM
Telex 32-9430, STA DIR PURVIS
[redacted]

Enclosures: UAL-SFO-94-1485TR, 23 Nov 94
UAL-SFO-95-0157RR, 31 Jan 95

PREPARED FOR: Hamilton

DATE: 27-Mar-95 11:00am

View Message

Message Number:	Action File Name:	Status:
UAL-SFO-95-0157RR	UAL-SFO-94-1485TR	Closed

Model: 737 ATA: 2725-20

Subject: 737-322 RUDDER PCU AFT MOUNT BOLT

UAL-SFO-95-0157RR 31 JAN 95
ATA 2725-20 MODEL 737
737-322 RUDDER PCU AFT MOUNT BOLT
REF /A/ UAL-SFO-94-1485TR DTD 23 NOV 94 /C/
/B/ UAL-SFO-94-1985RR DTD 19 DEC 94
/C/ P/N 65-45160-1, POWER UNIT INSTL-RUD CONTROL
/D/ MM 27-21-91
/E/ IPC 27-21-91-01, ITEM 95
AIRPLANE HOURS/CYCLES
N950UA
PT431

THE FOLLOWING IS FURTHER INFORMATION TO THE REF /B/ TELEX REGARDING THE REF /A/ FORWARDED RUDDER PCU MOUNTING BOLTS. UAL REPORTED THESE BOLTS WERE FOUND WORN DURING REPLACEMENT OF THE RUDDER PCU ON THE DATUM AIRPLANE, AND REQUESTED THAT WE EXAMINE THEM IN AN EFFORT TO DETERMINE THE POSSIBLE CAUSE OF THE WEAR.

OUR EXAMINATION REVEALED RELATIVELY UNIFORM WEAR AROUND THE ENTIRE OUTER DIAMETER OF THE OUTER BOLTS. THIS INDICATES POSSIBLE ROTATION OF THE BOLT RELATIVE TO THE RUDDER PCU ROD END BEARINGS. NO DEFORMATION OF THE OUTER BOLTS WAS NOTED. FURTHER, THE INNER BOLTS APPEARED UNAFFECTED BY THE WEAR ON THE OUTER BOLTS.

WE ARE NOT PLANNING ANY FURTHER ACTION REGARDING THE REF /A/ REPORT AT THIS TIME. HOWEVER, WE WILL CONTINUE TO MONITOR THE SERVICE EXPERIENCE OF THESE BOLTS TO DETERMINE WHETHER FUTURE ACTION IS REQUIRED.

JOHNSON/BRANCHE/MIKE DIDONATO
CUSTOMER SERVICE ENGINEERING
BOEINGAIR M-7272 2H-95
/CAR

31 JAN 95 2032

PREPARED FOR: Hamilton

DATE: 27-Mar-95 11:00am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
UAL-SFO-94-1485TR	UAL-SFO-94-1485TR	Closed

Model: 737 ATA: 2725-20

Subject: 737-322 RUDDER PCU AFT MOUNT BOLT

DIR 617

/ATTN (617) MIKE DIDONATO M-7272 M/S 2H-95
/ MGR AIRLINE SUPPORT 737/757
/CC (BFSIND) MILT ANDERSON M-7422 M/S 2H-96 BFSIND

UAL-SFO-94-1485TR 23 NOV 94
ATA 2725-20 MODEL 737 8 DEC 94 H
737-322 RUDDER PCU AFT MOUNT BOLT
REF /A/ P/N 65-45160-1, POWER UNIT INSTL-RUD CONTROL
/B/ MM 27-21-91
/C/ IPC 27-21-91-01, ITEM 95
/D/ FEDEX AIRWAY BILL NUMBER 3613948531

AIRPLANE	HOURS/CYCLES
N950UA	5449/3290
PT431	

FOLLOWING MESSAGE SENT TO MIKE DIDONATO WITH COPY TO MILT ANDERSON BFSIND

UNITED WOULD LIKE BOEING TO EXAMINE AND ANALYZE TWO RUDDER PCU AFT MOUNTING BOLTS (NAS1107-54) REMOVED FROM DATA AIRPLANE. THESE BOLTS WERE FOUND WORN UPON REPLACEMENTOF THE RUDDER PCU. UNITED IS CONCERNED THAT THE BOLTS MAY NOT BE PROPERLY TREATED AND THAT THE WEAR PATTERN ON THE BOLTS MAY BE AN INDICATION OF EITHER A TOLERANCE PROBLEM OR POSSIBLE BENDING LOADS.

ACTION

1/ AFTER EXAMINING AND ANALYZING SUBJECT BOLT, PLEASE ADVISE FINDINGS.

DIAKS/RUSSELL BFSR SAN FRANCISCO

FSE-BOECOM WED 11/23/94 13:20:50
BOESEA-X2SO13-00030-11/23/94-2205Z