DOCKET NO: SA-510

EXHIBIT NO: 9AB

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

BOEING CORRESPONDENCE REGARDING CONTINENTAL AIRLINES UPSET

11E0 6535 /dev/sio2 vopems 04/12/94 11:47
DIR PURVIS

/ATTN (PURVIS) JOHN PURVIS DIRECTOR AIR SAFETY INVESTIGATION

CAL-IAH-94-0002-ASI 12 APR 94
ATA 0240-00 MODEL 737-300
FLIGHT DIVERSION FOR EMERGENCY LANDING DUE FLIGHT CONTROL ANOMALY
REF /A/ TELCON HAGAN/RUWARD-R. HOWES 11 APR 94

AIRPLANE	HOURS/CYCLES
N17344	23076/10715
PP715	

N17344/PP715, OPERATING AS CONTINENTAL FLIGHT 1057 HOUSTON (IAH) TO TEGUCIGALPA HONDURAS (TGU) EXPERIENCED FLIGHT CONTROL ANOMALIES AND DIVERTED TO SAN PEDRO SULA (SAP) FOR AN EMERGENCY LANDING.

WHILE IN THE VICINITY OF BELIZE THE FLIGHT CREW REPORTED HEARING A MUFFLED BOOM OR POP JUST BEFORE EXPERIENCING YAWING AND ROLLING DIFFICULTIES. THE CREW DISENGAGED THE AUTO PILOT AND YAW DAMPER WHICH DID NOT IMPROVE THE CONDITION. AIRSPEED WAS REDUCED TO 250KTS TO MAINTAIN CONTROL.

THE AIRPLANE WAS LANDED AT SAP WITH 15 UNITS OF FLAPS AND AN APPROACH SPEED OF 160KTS. IT WAS ALSO REPORTED THAT 50 DEGREES OF AILERON AND RIGHT RUDDER WERE REQUIRED.

CONTINENTAL CONTACTED THE NTSB AND THE NTSB REQUESTED THE COCKPIT VOICE RECORDER AND FLIGHT DATA RECORDER BE REMOVED FOR READ OUT.

A CONTINENTAL TEAM DEPARTED HOUSTON THE MORNING OF 12 APR 94.

NO INJURIES OR DAMAGE TO THE AIRPLANE WERE REPORTED.

ACTION:

FOR YOUR INFORMATION.

RUWARD - BCSR - HOUSTON

FSE-BOECOM TUE 04/12/94 10:55:29

BOESEA-DDSO27-00158-04/12/94-1858Z

REF AOG N344//FLT 1057/APR 11/LOG PAGE 8199474
///AILERON DISPLACEMENT MOVED FROM 10 DEGREES RIGHT TO 40 DEGREES LEFT. DIRECT RATIO THE SLOWER WE FLEW THE WORSE IT GOT. FOUND A CONFORTABLE SPEED 160 KTS WITH GEAR DOWN FLAP 15. THE MORE THE FLAP EXTENDED THE MORE IT ROLLED TO THE RIGHT CMA THE MORE I SLOWED THE MORE IT ROLLED.
CONTINUED ON LOG PAGE 8199475///
RICK LOYOLA/MX COORD///

PROPRIETARY 2

12 1741 D81222 JA SAP
BXC 947

HDQMC HOUDC MEXMX GUAMX SAPKK SAPOO.SAPOO
REF A/C N344///LOG PG 8199475
///MADE EMERGENCY LANDING WITH STATUS QUO CONFIGURATION CMA 160 KTS/ 15 FLAPS AND FLAP DOWN. POST FLT REVEALED NO UNUSUAL CONFIGURATION CMA SAVE GROUND AIRCONDITION SERVICE DOOR BEING OPEN. NO FLUID LEAKS CMA NO DENT CMA NOTHING MISSING//////END OF THIS REPORT.
ON LOG PAGE 8199476//READS////
FLT RECORDER VOICE RECORDER CIRCUIT BREAKER PULLED FOR REPORTABLE INCIDENT////SIGNED BY THE CAPTAIN///
RICK LOYOLA/MX COORD.

12 1741 D81222 JA SAP
BXC 948

START

HDQMC HOUDC MEXMX GUAMX SAPKK SAPOO.SAPOO
REF AOG N344//FLT 1057/APR 11/LOG PAGES 8199472/73/74/75
///AT APPROXIMATELY 1810Z APR 11/94 IN NORMAL CRUISE AT FL 37 DEGREES EXPERIENCE A SEVERE YAW TO THE RIGHT CMA SIMULTANEOUS MUEFLED POP CMA OR SMALL BOOM .INSTANT ROLL TO THE RIGHT CMA AUTO PILOT DISENGAGED MANUALLY BY CAPT INMEDIATELLY. CAPT INSTANT ASSESMIENT WAS A VERY SERIOUS CONTROL PROBLEM.///CONTINUED ON LOG PG 8199473///
RICK LOYOLA/MX COORD///

12 1730 D81222 JA SAP
BXC 944

HDQMC HOUDC MEXMX GUAMX SAPKK SAPOO.SAPOO
REF A/C N344///LOG PG 8199473
///IT TOOK MAYOR LEFT AILERON INPUT TO STOP THE ROLL AND REGAIN CONTROL OF THE AIRCRAFT. FIRST CONTROLABILITY CHECK SHOWED 10 DEGREES RIGHT AILERON DISPLACEMENT TO MAINTAIN WINGS LEVEL. PRESSURE TO HOLD AILERON POSITION SEEMED AB NORMALLY HIGH. WITH SPEED REDUCTION FR 300 KTS TO 250 KTS.
///CONTINUED ON LOG PG 8199474//////
RICK LOYOLA/MX COORD///

12 1731 D81222 JA SAP
BXC 945

G.BJORGSS 2H-95 ENTZ 2H-94 VARGAS 2H-95 MAXEY CH-62
DE JONGE 2H-80 UMPHENOUR 2H-30 AVX* FHL* STUECK 2T-01

BFS DEN CAL
     CC   J. HAGAN - CUSTOMER SERVICES DIVISION
BFS IAH CAL
     ATTN R. RUWARD - CUSTUMER SERVICES DIVISION
BFS LAX CAL
     CC   W. PORTER - CUSTOMER SERVICES DIVISION

SAPPRCO
     ATTN: G. BEDOYA - ACFT 344

CAL-IAH-94-0073RR 12 APR 94
ATA 2217-00 MODEL 737-300
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF TELECON R. RUWARD/G. BEDOYA ET AL TO J. RINGBLOOM/J. HAMILTON, DTD 12 APR 94

PROPRIETARY

THE FOLLOWING MESSAGE SENT TO R. RUWARD (BFS-IAH) WITH A COPY TO G. BEDOYA (SITA SAPPRCO) AND J. HAGAN AND W. PORTER (BCSRS).

IN THE REFERENCE TELECON, CAL REPORTED EXPERIENCING A CONDITION ON 737-300 AIRPLANE PP715 WHERE IF EITHER THE "A" OR "B" AUTOPILOT IS ENGAGED, THE AILERONS MOVE TO 6 DEGREES RIGHT AND THE RUDDER MOVES TO 3/4 FULL TRAVEL. THE FOLLOWING PROVIDES RECOMMENDED DFCS BITE CHECKS FOR CHECKING THE AUTOPILOT SYSTEM ON THIS AIRPLANE:

1. SELECT "INDEX" ON THE CONTROL DISPLAY UNIT (CDU) (LSK 6L).
2. SELECT "MAINT" (LSK 6R).
3. SELECT "DFCS" (LSK 2L).
4. PRESS THE "NEXT PAGE" KEY ON THE CDU.
5. SELECT "GROUND FUNCT TEST" (LSK 1L).
6. SELECT "COMPLETE TESTS"
7. THE DFCS BITE WILL THEN RUN THROUGH ALL THE DFCS GROUND FUNCTIONAL TESTS.
8. RECORD WHICH LIBRARY TESTS FAIL (FOR EXAMPLE, TEST 6/1ST "MCP DISPLAY/SELF-TEST").
9. SELECT "GROUND FUNCT TEST" AGAIN.
10. SELECT "TEST SELECTION".
11. ENTER THE LIBRARY TEST NUMBER FOR EACH TEST THAT PREVIOUSLY FAILED. EXECUTE THESE TESTS.
12. AFTER EACH TEST FAILURE, ENTER "SDT" IN THE CDU SCRATCHPAD AND SELECT "FREEZE".
13. RECORD ALL DATA DISPLAYED ON THE CDU SCREEN FOR EACH TEST AND SUBTEST FAILURE.

NOTE 1: BASED ON THE DATA PROVIDED, THE FOLLOWING LIBRARY TESTS ARE KEY IN TROUBLESHOOTING THE REPORTED CONDITION:

- 3J - AILERON CONTROL
- 5U - MODE CONTROL PANEL PUSHBUTTONS
- 5S - BANK ANGLE LIMIT SWITCH
- 5T - MCP DISPLAY/SELF-TEST
- 3J - [illegible] INTERLOCK
- 7C - FCC SELF-TEST

PROPRIETARY

14. SELECT "RIGGING" (LSK 2L).
15. SELECT "AILERON"
16. RUN THE ENTIRE DFCS BITE AILERON RIGGING CHECK AND RECORD ANY SUBTEST FAILURES.

IN THE REF TELECON, CAL ALSO REQUESTED THE NUMBER OF INCHES THAT IS EQUATED TO 3 DEGREES OF RUDDER MOVEMENT. THE FULL AUTHORITY OF THE YAW DAMPER IS 3 DEGREES OF RUDDER MOVEMENT. THIS IS APPROXIMATELY 4 INCHES OF TRAILING EDGE SURFACE TRAVEL.

ACTION

J. RINGBLOOM AND J. HAMILTON WILL BE STANDING BY AT 0700 FOR THE 13 APR 94 TELECON. PLEASE PROVIDE THE RESULTS OF THE DFCS BITE CHECKS FOR THIS AIRPLANE.

JCH

RINGBLOOM/BWA/BRUCE CROSS
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 ZH-95
/CAP 04/12/94 1752

G.D.CROSS 2H-95 ENTZ 2H-84 VARGAS 2H-95 MAXEY 2H-82
DE JONGE 2H-80 UMPHENOUR 2H-30 AV** FHL* STUECK 2T-01

BFS DEN
    CC J. HAGAN - CUSTOMER SERVICES DIVISION
BFS IAH
    ATTN R. RUWARD - CUSTOMER SERVICES DIVISION
BFS LAX
    CC W. PORTER CUSTOMER SERVICES DIVISION
BFS SAL
    CC G. OSTLUND - CUSTOMER SERVICES DIVISION

SAPKKCO
    ATTN G. BEDOYA ACFT 344
SAPOOCO
    ATTN G. BEDOYA - ACFT 344
SAPRRCO
    ATTN G. BEDOYA - ACFT 344

PROPRIETARY

CAL-IAH-94-0075RR 13 APR 94
ATA 2700-00 MODEL 737-300
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP??5
REF /A/ CAL-IAH-94-0073RR DATED 12 APR 94 /ATA 2217-00/
    /B/ TELECON G. BEDOYA, C. TANNER ET AL/ J. HAMILTON, J. RINGBLOOM, L. HIRN

FOLLOWING MESSAGE SENT TO R. RUWARD /BFS-IAH/ AND G. BEDOYA /CAL/ WITH COPIES TO W. PORTER /BFS-LAX/, J. HAGAN /BFS-DEN/, AND G. OSTLUND /BFS-SAL/

THE REFERENCE /A/ TELEX PROVIDED SUGGESTED DFCS [illegible] CHECKS TO BE ACCOMPLISHED ON CAL AIRPLANE [illegible]7344. THE FOLLOWING INFORMATION PROVIDES ADDITIONAL [illegible] THAT [illegible] SUGGEST [illegible] ACCOMPLISH ON THE AIRPLANE.

DURING ACCOMPLISHMENT OF THE [illegible] CHECK [illegible] BE [illegible] STORED [illegible] MEMORY [illegible]

1. SELECT [illegible]

2. SELECT [illegible]

3. SELECT [illegible]

4. [illegible] THE [illegible] PAGE.

5. ENTER [illegible] NUMBER [illegible] CDU SCRATCHPAD AND PRESS LSK 6R. THE DISPLAY WILL DISPLAY THE FAULT SUMMARY PAGE.

6. SELECT CONTINUE [illegible]

8. RECORD ALL THE DATA THAT IS DISPLAYED ON THE CDU SCREEN FOR EACH FLIGHT [illegible] SHOULD [illegible] FAULT DATA FOR THE LAST TEN FLIGHTS.

THE FOLLOWING PROCEDURE WILL [illegible] IDENTIFY WHETHER THE ROLL

ANOMALY IS DUE TO AUTOPILOT SYSTEM OR MECHANICAL/HYDRAULIC SYSTEM DISCREPANCY. PROPRIETARY

1/ REMOVE THE NUT ON THE ATTACHMENT BOLT BETWEEN THE LATERAL AUTOPILOT SERVOS EXTERNAL LINKAGE AND THE CONTROL ROD CONNECTING TO THE AILERON PWR AND CENTERING MECHANISM IN THE LEFT WHEEL WELL.

2/ WITH THE AUTOPILOT ENGAGED, VERIFY RUDDER SURFACE TRAVEL AND RUDDER PEDAL DEFLECTION.

3/ VERIFY AILERON DEFLECTION.

4/ DISENGAGE AUTOPILOT, AND VERIFY WHETHER THE CONTROL SURFACES STAY AT THEIR PREVIOUSLY COMMANDED POSITION.

5/ ATTEMPT TO SLIP THE ATTACHMENT BOLT FROM STEP /1/ ABOVE OUT.

6/ IF THE BOLT EASILY SLIPS OUT, THE ROLL DISCREPANCY IS MOST LIKELY DUE TO EXCESSIVE FRICTION IN THE AILERON MECHANICAL/HYDRAULIC SYSTEM. IF THE BOLT IS VERY DIFFICULT TO REMOVE, THE ROLL DISCREPANCY IS MOST LIKELY IN THE AUTOPILOT SYSTEM.

7/ IF THE BOLT IN STEP /5/ IS DIFFICULT TO REMOVE, DISCONNECT THE ELECTRICAL CONNECTORS TO ONE OF THE TWO AUTOPILOT SERVOS AND REPEAT STEP /5/. IF THE BOLT IS STILL DIFFICULT TO REMOVE, DISCONNECT THE ELECTRICAL CONNECTIONS TO THE OTHER AUTOPILOT SERVO AND REPEAT STEP /5/.

ADDITIONALLY, PLEASE [illegible]

1/ PLEASE APPROXIMATE THE [illegible] AUTOPILOT ENGAGED AND HYDRAULIC POWER [illegible] WHEEL TOWARDS UP/L, AND AWAY FROM NEUTRAL.

2/ WHAT ARE THE CONTROL WHEEL FORCES [illegible] AUTOPILOT ENGAGED, POWER ON, TO MOVE THE WHEEL TOWARDS UP/L AND AWAY FROM NEUTRAL.

3/ WHAT ARE THE CONTROL WHEEL FORCES [illegible] AUTOPILOT ENGAGED, HYDRAULIC POWER OFF, TO MOVE THE WHEEL TOWARDS UP/L AND AWAY FROM NEUTRAL.

4/ WITH BOTH HYDRAULIC SYSTEMS [illegible] AND /2/ AUTOPILOT SYSTEMS, DO BOTH ENGAGED CONTROL WHEEL IN THE UP/L POSITION FOR LONGER THAN 30 SECONDS /2/

WE FURTHER SUGGEST AS TIME PERMITS THAT [illegible] CHECK OF THE VERTICAL AND HORIZONTAL STABILIZER AND THE UPPER FUSELAGE CROWN SKIN FOR ANY DEFECTS SUCH AS MISSING OR LOOSE PANELS, OR PULLED FASTENERS. [illegible] /2/ OR THE RUDDER AND ELEVATOR SURFACES /2/.

JOHN HAMMOND

HAMILTON/SWA/BRUCE CROSS
CUSTOMER SERVICES DIVISION
BOEINGATR M-7272 24-95

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:41am PAGE: 1

View Message

Message Number:		Action File Name:	Status:
CAL-IAH-94-0154TR	PROPRIETARY	CAL-IAH-94-0154TR	Closed

Model: 737-300 ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

11E0 7488 /dev/sio2 vopems 04/18/94 11:05
DIR 617BOE

/ATTN (617) BRUCE CROSS MGR, 7/7/7 AIRLINE SUPPORT
/CC (BFSLAX) W. PORTER BCSM LOS ANGELES
/CC (BFSDEN) J. HAGAN BCSM DENVER

CAL-IAH-94-0154TR 18 APR 94
ATA 2217-00 MODEL 737-300
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF /A/ CAL-IAH-94-0081RR
/B/ CAL-IAH-94-0076RR
/C/ CAL-IAH-94-0075RR
/D/ CAL-IAH-94-0073RR
/E/ TELCON J.HAMILTON/RUWARD 18 APR 94
AIRPLANE ,'hP HOURS/CYCLES
N17344 23090/10722
PP715

FOLLOWING MESSAGE SENT TO B. CROSS WITH COPY TO J. HAGAN AND W. PORTER.

THE DATA AIRPLANE RETURNED TO HOUSTON (IAH) 16 APR 94 FROM SAN PEDRO SULA (SAP).

AFTER ARRIVAL AT HOUSTON MAINTNENANCE REPLACED THE FOLLOWING COMPONENTS AS RECOMMENDED.

RUDDER PCU: OFF P/N 65-44861-7 S/N 1597, ON P/N 65C37052-9 S/N 1628A.

A/P ACCSSORY UNIT: OFF P/N 65-52817-5 S/N D00404 ON S/N D00181.

WHILE IN SAN PEDRO SULA THE FOLLOWING COMPONENTS WERE REPLACED;

MODE CONTROL PANEL: OFF P/N 4051601-932 S/N 86030334 S/N ON 84080113

YAW DAMPER COUPLER: OFF P/N 4030952-906 S/N 84122126 S/N ON 86052381

FCC: OFF P/N 4051600-913 S/N 86060590 S/N ON 86100733
FCC: OFF P/N 4051600-913 S/N 87020808 S/N ON 87040860.

THE DATA AIRPLANE WAS RETURNED TO REVENUE SERVICE 17 APR 94.

ACTION:

FOR YOUR INFORMATION.

RUWARD - BCSR - HOUSTON
\\CUNNINGHAM-TANNER-VELA-EVANS-FEID-CARROLL//

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:41am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0110RR PROPRIETARY	CAL-IAH-94-0183TR	Closed

Model: 737-300 ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

CAL-IAH-94-0110RR 05 MAY 94
ATA 2217-00 MODEL 737-300 18 MAY 94 H
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF CAL-IAH-94-0183TR DTD 28 APR 94 /C/

THE FOLLOWING MESSAGE SENT TO R. RUWARD WITH A COPY TO J. HAGAN AND W. PORTER.

IN THE REFERENCE TELEX REQUESTED THAT BOEING ADVISE THE DATES FOR TESTING OF THE COMPONENTS THAT WERE REMOVED FROM 737-300 AIRPLANE PP715 IN SAN PEDRO SULA, HONDURAS. THE FOLLOWING PROVIDES THIS INFORMATION:

PART NBR - S/N	SHIPPED TO	STATUS
65-52817-5/D00404	BOEING	TESTING COMPLETED 5 MAY
4051601-932/86030334	BOEING	TESTING COMPLETED 5 MAY
4051600-913/86060590	BOEING	TESTING COMPLETED 5 MAY
4051600-913/87020808	BOEING	TESTING COMPLETED 5 MAY
4030952-906/84122126	HONEYWELL	SCHEDULED FOR 9-10 MAY
65-44861-7/1597	PARKER HANNIFAN	TESTING COMPLETED 28 APR

DURING THE BOEING LAB TESTING AND FLIGHT SIMULATIONS, NO FAULTS WERE NOTED WITH THE MCP, THE FCC'S, OR THE AUTOPILOT ACCESSORY UNIT. OUR PLAN IS NOW TO SHIP THE UNITS TO HONEYWELL AND HAVE THEM TESTED ON THE AUTOMATED TEST STATION BEFORE BEING RETURNED TO HONEYWELL. WE WILL PROVIDE A REPORT OF THE SHOP FINDINGS OF THE MCP, FCC, AUTOPILOT ACCESSORY UNIT, AND YAW DAMPER COUPLER NO LATER THAN 18 MAY 94.

RINGBLOOM/BWA/BRUCE CROSS
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 05/05/94 1927

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:55am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0085RR	CAL-IAH-94-0085RR	Closed

Model: 737-300 PROPRIETARY ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

CAL-IAH-94-0085RR 18 APR 94
ATA 2217-00 MODEL 737-300
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF /A/ CAL-IAH-94-0154TR DATED 18 APR 94
/B/ TELECON R. RUWARD/ J. HAMILTON ON 18 APR 94
/C/ CAL-IAH-94-0002-ASI DATED 12 APR 94
AIRPLANE HOURS/CYCLES
N17344
PP715

THE FOLLOWING MESSAGE SENT TO R. RUWARD WITH A COPY TO J. HAGAN AND W. PORTER (BCSRS) AND TOBY CARROLL (CAL FLIGHT SAFETY).

THE REFERENCE /A/ TELEX PROVIDED THE PART NUMBER AND SERIAL NUMBER OF COMPONENTS REMOVED FROM CAL AIRPLANE N17344 FOLLOWING THE REPORTED ROLL AND YAW ANOMALY DISCUSSED IN THE REFERENCE /C/ TELEX.

WE ARE INTERESTED IN COORDINATING WITH THE SUPPLIER OF EACH COMPONENT REGARDING TESTING AND REPAIR OF THE UNITS. UPON CAL/S RECEIPT OF AUTHORIZATION FROM THE NATIONAL TRANSPORTATION SAFETY BOARD /NTSB/, WE RECOMMEND THAT THE PARTS BE FORWARDED TO THE FOLLOWING LOCATIONS.

PLEASE FORWARD THE RUDDER PCU - P/N 65-44861-9, SERIAL NUMBER 1597, TO -
PARKER HANNIFIN
ATTN WALLY WALZ
16666 VON KARMAN AVENUE
IRVINE, CA 92714

PLEASE FORWARD THE YAW DAMPER COUPLER - P/N 4030952-906, S/N 84122126, TO -
HONEYWELL, INC
COMMERCIAL FLIGHT SYSTEMS GROUP
AIR TRANSPORT SYSTEMS DIVISION
ATTN PAM KALISH
21111 N 19TH AVE
PHOENIX, AZ 85036

PLEASE FORWARD THE MODE CONTROL PANEL - P/N 4051601-932, S/N 86030334, THE FCC/S/ - P/N 4051600-913, S/N 86060590 AND S/N 87020808, AND THE A/P ACCESSORY UNIT - 65-52817-5, SERIAL NUMBER D00404, TO -
BOEING COMMERCIAL AIRPLANE GROUP
SPARES DISTRIBUTION CENTER
WARRANTY AND OVERHAUL AREA
2201 SOUTH 142ND ST.
SSA111, BLDG 22-01, DOOR W10
SEATAC, WASHINGTON 98168

PLEASE INCLUDE A TAG ON THE UNIT, //ATTENTION WARRANTY STORE - PLEASE CONTACT BRUCE CROSS AT 544-9800 OR [redacted] FOR

ENGINEERING EVALUATION WHEN THIS UNIT ARRIVES//. PROPRIETARY

PLEASE ADVISE US WHEN SHIPPING INFORMATION IS AVAILABLE SO WE CAN ADVISE THE SUPPLIER/S OF THE ANTICIPATED PARTS RECEIPT DATE.

HAMILTON/BWA/BRUCE CROSS
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 04/18/94 1936

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:41am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0183TR	CAL-IAH-94-0183TR	Closed

Model: 737-300 ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

11E0 9489 /dev/sio2 vopems 04/28/94 14:37 PROPRIETARY
DIR 617BOE

/ATTN (617) BRUCE CROSS MGR, 7/7/7 AIRLINE SUPPORT
/CC (BFSDEN) J. HAGAN BCSM DENVER
/CC (BFSLAX) W. PORTER BCSM LOS ANGELES

CAL-IAH-94-0183TR 28 APR 94
ATA 2217-00 MODEL 737-300 26 MAY 94 H
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF /A/ CAL-IAH-94-0085RR
/B/ CAL-IAH-94-0154TR
AIRPLANE HOURS/CYCLES
N17344
PP715

FOLLOWING MESSAGE SENT TO B. CROSS WITH COPY TO W. PORTER AND J. HAGAN.

THE AUTO PILOT ACCESSORY UNIT, MODE CONTROL PANEL, AND TWO FLIGHT CONTROL COMPUTERS, WHICH WERE REMOVED FROM THE DATA AIRPLANE, HAVE BEEN SHIPPED TO BOEING AS REQUESTED IN REFERENCE /A/. ADDITIONALLY THE YAW DAMPER COUPLER WAS SHIPPED TO HONEYWELL AND THE RUDDER PCU WAS SHIPPED TO PARKER/HANNIFIN. ALL ITEMS WERE SHIIPED 20 APR 94. SHIPPING DETAILS AS FOLLOWS:

PART NBR/S/N	SHIPPED TO	AIRWAY BILL	WORK ORDER
65-52817-5/D00404	BOEING	2937400314	601606
4051601-932/86030334	BOEING	2937400314	601611
4051600-913/86060590	BOEING	2937400314	601612
4051600-913/87020808	BOEING	2937400314	601613
4030952-906/84122126	HONEYWELL	2937400410	601610
65-44861-7/1597	PARKER/HANNIFN	2937423812	601594

CONTINENTAL ENGINEER AL MENDEZ WOULD LIKE TO BE PRESENT WHEN UNITS ARE TESTED.

ACTION:

1. PLEASE ADVISE DATES UNITS WILL BE TESTED.

RUWARD - BCSR - HOUSTON
\\TANNER-CUNNINGHAM-BINGAMAN-EVANS-BOLFING-MENDEZ//

FSE-BOECOM THU 04/28/94 13:29:40

BOESEA-DDSO01-00060-04/28/94-2138Z

13

ENGINEERING REPORT

Subject: Rudder Assembly
P/N 65-44861-9, S/N 1597A

Date: 05-11-94

BACKGROUND

PROPRIETARY

Rudder unit S/N 1597A was returned to Parker Customer Support for a suspected uncommanded hard over rudder condition. This unit was removed from aircraft number 344, position 01.

RECEIVING INSPECTION

Rudder Assembly P/N 65-44861-9, S/N 1597A, was visually inspected and entered into the Parker repair system on repair order 7042116-100. There were no documents (from continental) received with the unit to indicate any control anomalies.

RECEIVING TESTING

Initial receiving testing indicated a resistance failure of 500 OHMS in the P/N 59600 solenoid/manifold electrical circuit. Subsequent testing could not repeat this reading. A resistance of 68 OHMS was recorded on the test data sheet. Solenoid S/N 5533 was removed from the manifold and subjected to a pin to pin continuity and resistance test. The resistance was 70 OHMS and there was no loss of continuity. The minimum resistance requirement is 71 OHMS. There were no indications of a wiring problem in the manifold.

Top assembly hydraulic testing showed that the unit, with the following exceptions, tested satisfactorily. There was no sign of a loss of control or a hard over condition.

1. Rod leakage was 6 dps/25 cycles. The requirement is 5 dps/25 cycles.

2. The input force verses input travel plot was slightly out of limit. A photo copy of the plot is included with this report.

CONCLUSION

Examination of the unit during top assembly testing incorporated manual and electrical input commands, and visual inspection of the output position. There was no indication of a hard over condition or any instability. Based on test findings Parker has determined that the rejection on this unit is non-verified.

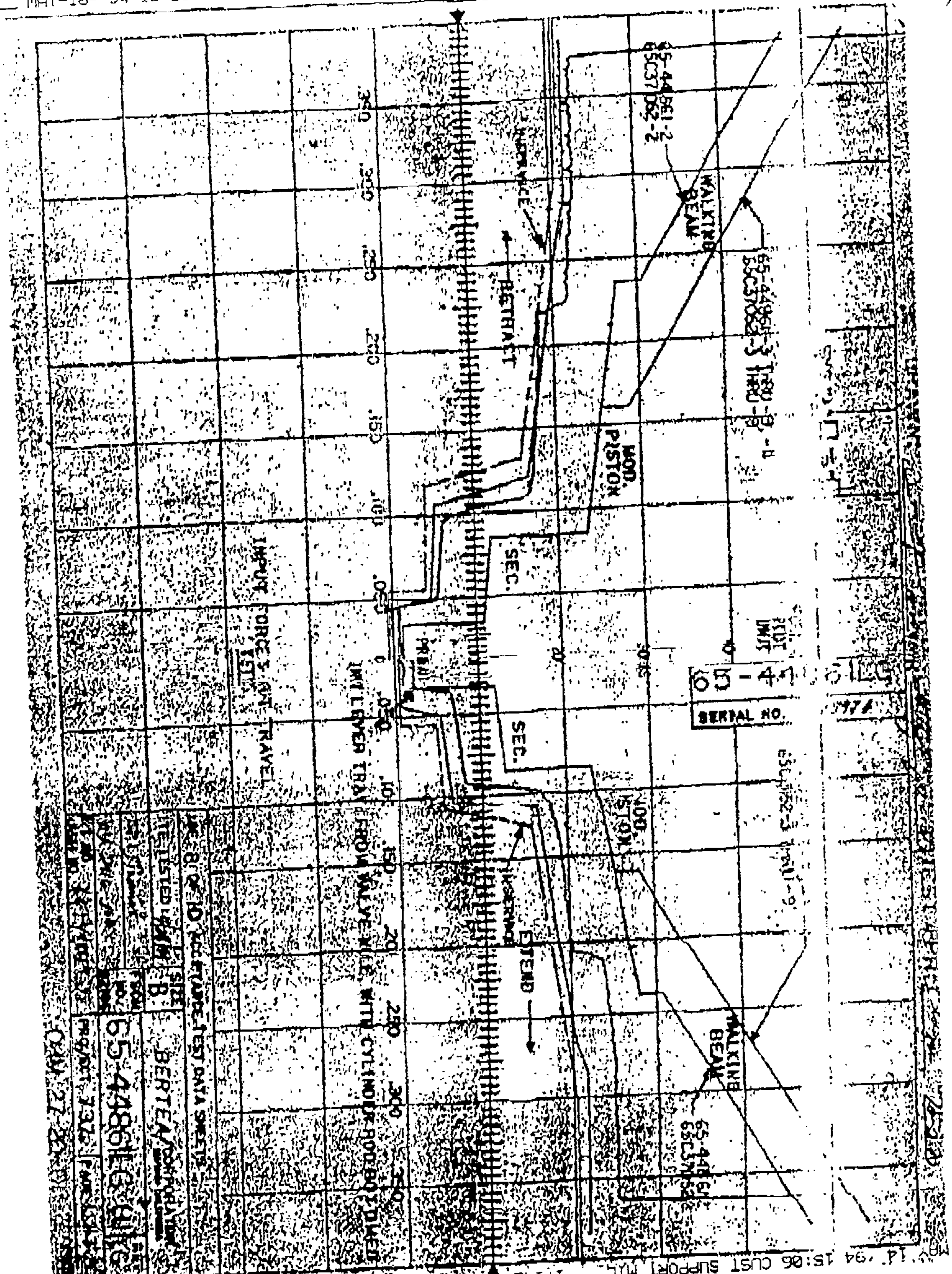
[redacted]
Larry Moore
Technical Support Engineer

CC: W. Walz
J. Lemire
B. Lange
D. Donnelly
File

FROM :AIR SAFETY INV TO : 544 9697 1994.05-18 14:26 #359 P.04/04

MAY-18-'94 15:26 ID:CONTINENTAL SAFETY TEL NO:713-985-1530

14



PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:55am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0162RR	CAL-IAH-94-0162RR	Open

Model: 737-300 ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

CAL-IAH-94-0162RR 07 JUN 94 **PROPRIETARY**
ATA 2720-00 MODEL 737-300 21 JUN 94 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0183TR DATED 28 APR 94 /ATA 2217-00/
/B/ CAL-IAH-94-0148RR DATED 27 MAY 94 /ATA 2217-00/
/C/ CAL-IAH-94-0137RR DATED 18 MAY 94 /ATA 2217-00/
/D/ CAL-IAH-94-0002-ASI DATED 12 APR 94 /ATA 0240-00/
/E/ TELECON M. BRYANT /CAL/ TO J. HAMILTON /BOEING/ ON 7 JUNE 1994

THE FOLLOWING MESSAGE SENT TO R. RUWARD WITH A COPY TO J. HAGAN AND W. PORTER.

THE FOLLOWING INFORMATION IS PROVIDED AS AN UPDATE OF OUR INVESTIGATION OF THE RUDDER CONTROL ANOMALY ON CAL AIRPLANE PP715/N17344 IN HONDURAS.

THE REFERENCE /B/ TELEX ADVISED THAT THE RUDDER PCU, P/N 65C37052-9, SERIAL NUMBER 1597A, WAS BEING TESTED AT BOEING IN AN EFFORT TO SIMULATE YAW DAMPER INDUCED KICKS. WE HAVE NOW COMPLETED OUR TESTING OF THIS UNIT. OUR TESTING DISCLOSED THAT THE NULL VOLTAGE OF THE RUDDER PCU FEEDBACK SIGNAL WHEN THE YAW DAMPER IS DISENGAGED IS APPROXIMATELY 47 MILLIVOLTS AC. THE SPECIFICATION OF THE YAW DAMPER SYSTEM STATES THAT THIS OFFSET VOLTAGE SHOULD BE 0 PLUS/MINUS 50 MILLIVOLTS. THE 47 MILLIVOLT OFFSET VOLTAGE IS REPETATIVE AND DOES NOT VARY WITH HYDRAULIC PRESSURE, ENGAGE CYCLES, OR RUDDER PCU INPUT LEVER POSITION.

OUR TESTING FURTHER DISCLOSED THAT IF THE RUDDER PCU SOLENOID VALVE HAS AN OPEN CIRCUIT, THEN AFTER APPROXIMATELY 11 MINUTES, THE OFFSET VOLTAGE CAN INTEGRATE UP AND RESULT IN A YAW DAMPER HARDOVER COMMAND. IF THE SOLENOID VALVE REMAINS IN AN //OPEN// CONDITION FOR LONGER THAN 11 MINUTES, THE INTEGRATOR WILL CONTINUE TO BUILDUP AND CAUSE AN EXTENDED YAW DAMPER HARDOVER COMMAND OF 3 DEGREES RUDDER. ONCE THE SOLENOID VALVE //CLOSES// TO ITS NORMAL IN-FLIGHT POSITION, THE YAW DAMPER HARDOVER SIGNAL WILL CAUSE THE RUDDER PCU TO COMMAND UP TO 3 DEGREES RUDDER DEFLECTION. THE TIME THAT THE RUDDER IS DEFLECTED WILL VARY ACCORDING TO THE INTEGRATOR BUILDUP. THE LONGEST THE RUDDER CAN BE DEFLECTED IS APPROXIMATELY 110 SECONDS. FOR THE OFFSET VOLTAGE ON THIS PCU, THE RUDDER DEFLECTION WILL ALWAYS BE TRAILING EDGE LEFT. THIS RUDDER DEFLECTION CAN BE A ONE-TIME OCCURRENCE OR SPREAD OVER SEVERAL INTERVALS, DEPENDING UPON WHETHER THE SOLENOID //CLOSES// ONCE OR SEVERAL TIMES.

WE CONFIRMED THAT THE SOLENOID VALVE REMOVED FROM THE CAL RUDDER PCU, SERIAL NUMBER 1597A, COULD INTERMITTENTLY //OPEN// AND //CLOSE//.

WE ARE CONTINUING TO EVALUATE THE FLIGHT DATA RECORDER DATA TO DETERMINE WHETHER A SERIES OF YAW DAMPER INDUCED KICKS WERE THE CAUSE FOR THE CONTROL ANOMALIES ON CAL AIRPLANE N17344. ADDITIONALLY, WE ARE PLANNING TO DISASSEMBLE AND EXAMINE THE

SOLENOID VALVE, BERTEA P/N 59600-5003 /BOEING SPECIFICATION 10-60811-1/ SERIAL NUMBER CY5533, IN OUR LAB TO DETERMINE THE CAUSE FOR THE INTERMITTENT VALVE OPERATION. WE HAVE OFFERED CAL AND PARKER HANNINFIN THE OPPORTUNITY TO BE PRESENT DURING THIS EXAMINATION. WE ANTICIPATE THAT WE CAN PROVIDE THE RESULTS OF THIS EXAMINATION AND THE RESULTS OF OUR SIMULATOR ANALYSIS BY 21 JUNE 1994.

PROPRIETARY

THE RUDDER PCU, P/N 65C37052-9, SERIAL NUMBER 1597A, IS BEING FORWARDED TO THE SUPPLIER, PARKER HANNIFIN, THIS DATE.

PLEASE NOTE CHANGE IN ATA AND SUBJECT.

HAMILTON/BWA/MIKE DIDONATO
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 06/07/94 1703

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:56am

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0197RR	CAL-IAH-94-0162RR	Closed

Model: 737-300 PROPRIETARY ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

CAL-IAH-94-0197RR 22 JUN 94
ATA 2720-00 MODEL 737-300 07 JUL 94 H 28 JUN 94 F
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF CAL-IAH-94-0162RR DATED 07-JUN-94 /H/

R E S E N D TO ADD INFORMATION TO 4TH PARA OF TEXT AND ADD FIELD DUE DATE
PLEASE DISREGARD ORIGINAL MESSAGE DATED 21-JUN-94
GDM 06/22/94 1258

FLWG MSG SENT TO R. RUWARD WITH COPIES TO J. HAGAN AND W. PORTER /BCSRS/

THE FOLLOWING INFORMATION IS PROVIDED AS AN UPDATE OF OUR INVESTIGATION OF THE RUDDER CONTROL ANOMALY ON CAL AIRPLANE PP715/N17344 IN HONDURAS.

THE REFERENCE /A/ TELEX ADVISED THAT THE RUDDER PCU SOLENOID VALVE, BERTEA P/N 59600-5003, SERIAL NUMBER CY5533, WAS CONFIRMED TO HAVE AN INTERMITTENT //OPEN// ELECTRICAL CONDITION. WE FURTHER ADVISED THAT WE PLANNED TO EXAMINE THE SOLENOID VALVE TO DETERMINE THE CAUSE FOR THE INTERMITTENT VALVE OPERATION.

WE HAVE COMPLETED OUR EXAMINATION OF THE VALVE. OUR EXAMINATION DISCLOSED THE PRESENCE OF HYDRAULIC FLUID AROUND THE SOLENOID VALVE COIL WINDINGS. FURTHER EXAMINATION DISCLOSED MULTIPLE SITES OF COIL WIRE CORROSION/DETERIORATION. THE WIRE CORROSION/DETERIORATION WAS ATTRIBUTED TO GALVANIC CORROSION DUE TO THE PRESENCE OF HYDRAULIC FLUID WITH A DC VOLTAGE. THIS CONDITION HAS BEEN PREVIOUSLY OBSERVED ON SEVERAL PREVIOUS -5003 SOLENOID VALVE ASSEMBLIES. ACCORDINGLY THE PARKER P/N 881600-1001 /BOEING SPECIFICATION 10-60811-13/ SOLENOID VALVE WAS PREVIOUSLY DEVELOPED. THIS VALVE HAS AN ENCAPSULATED COIL WHICH WILL PREVENT HYDRAULIC FLUID FROM LEAKING INTO THE COIL AREA.

WE ARE CONTINUING TO EVALUATE THE FLIGHT DATA RECORDER DATA TO DETERMINE WHETHER A SERIES OF YAW DAMPER INDUCED KICKS WERE THE CAUSE FOR THE CONTROL ANOMALIES ON CAL AIRPLANE N17344. TO ASSIST US IN OUR EVALUATION, WE DESIRE ADDITIONAL DETAILS REGARDING THE REPORTED EVENT. PLEASE PROVIDE THE FOLLOWING INFORMATION BY 28 JUNE 94, OR WE WILL WELCOME A PHONE CALL WITH THE FLIGHT CREW TO DISCUSS THE EVENT.

1/ PLEASE CONFIRM THE YAW DAMPER SWITCH WAS NOT TURNED OFF FOLLOWING THE INITIAL UPSET.

2/ PLEASE ADVISE WHETHER THE CONTROL WHEEL FORCES WERE EXCESSIVE FOR A GIVEN WHEEL POSITION, OR WAS ADDITIONAL CONTROL WHEEL INPUT REQUIRED TO MAINTAIN WINGS LEVEL, DURING THE LATER STAGES OF THE FLIGHT FOLLOWING THE INITIAL UPSET.

WE ANTICIPATE THAT WE CAN PROVIDE YOU OUR CONCLUSIONS BY 7 JULY 1994.

HAMILTON/BWA/MIKE DIDONATO
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/GJB 06/21/94 1608

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:41am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0137RR	CAL-IAH-94-0183TR	Closed

Model: 737-300 **PROPRIETARY** ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

CAL-IAH-94-0137RR 18 MAY 94
ATA 2217-00 MODEL 737-300 27 MAY 94 H
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF /A/ CAL-IAH-94-0183TR DTD 28 APR 94 /C/
/B/ CAL-IAH-94-0110RR DTD 05 MAY 94 /H/
/C/ PARKER HANNIFAN SERVICE BULLETIN 68010-27-162, DTD 1 MAR 93

THE FOLLOWING MESSAGE SENT TO R. RUWARD (BCSR) AND T. CARROLL (SITA HDQQSCO) WITH A COPY TO W. PORTER AND J. HAGAN (BCSRS).

THE REFERENCE (B) TELEX ADVISED THAT WE WOULD PROVIDE THE SHOP FINDINGS FOR THE FOLLOWING COMPONENTS REMOVED FROM 737-300 AIRPLANE PP715:

1. S/N D00404 AUTOPILOT ACCESSORY UNIT
2. S/N 86060590 FLIGHT CONTROL COMPUTER
3. S/N 87020808 FLIGHT CONTROL COMPUTER
4. S/N 84122126 YAW DAMPER COUPLER
5. S/N 1597 RUDDER POWER CONTROL UNIT

THE AUTOPILOT ACCESSORY UNIT AND FLIGHT CONTROL COMPUTERS WERE SHIPPED TO BOEING-IRVING AND HONEYWELL-RENTON, RESPECTIVELY, ON 17 MAY 94. AS REPORTED IN THE REF (B) TELEX, BOEING DID NOT DETECT ANY DISCREPANCIES WITH THESE UNITS DURING LAB TESTING ON 3-4 MAY 1994. WE WILL PROVIDE THE BEI AND HONEYWELL SHOP FINDINGS TO CAL, OR A STATUS OF THE TESTING, ON 27 MAY 94. FOLLOWING ARE THE SHOP FINDINGS FOR THE YAW DAMPER COUPLER AND RUDDER PCU:

S/N 84122126 YAW DAMPER COUPLER

HONEYWELL CONFIRMED A FAULT WITH THE RATE GYRO (YAW RATE SENSOR) IN THE COUPLER. HOWEVER, WE DO NOT BELIEVE THAT THE PARTICULAR FAULT THAT WAS FOUND COULD HAVE CAUSED THE AIRPLANE RESPONSE AS RECORDED BY THE FLIGHT RECORDER. THE TYPE OF FAILURE IN THE YAW RATE SENSOR WOULD MOST LIKELY CAUSE A LOW AMPLITUDE OSCILLATION OF THE RUDDER.

S/N 1597 RUDDER POWER CONTROL UNIT

UPON RECEIPT AT PARKER, THE PCU WAS TESTED PER THE ACCEPTANCE TEST PROCEDURE. DURING THIS PROCEDURE A HIGH IMPEDIANCE CONDITION WAS IDENTIFIED AT THE PCU SOLENOID VALVE, BERTEA P/N 59600-5003 (BOEING SPECIFICATION 10-60811-1), SERIAL NUMBER 5533. THE SOLENOID VALVE WAS SUBSEQUENTLY REPLACED. PARKER ENGINEERING THEN OBTAINED THE UNIT AND RE-INSTALLED THE ORIGINAL SOLENOID VALVE AND RE-ACCOMPLISHED FUNCTIONAL TESTING OF THE PCU. EXCESSIVE EXTERNAL LEAKAGE WAS NOTED. HOWEVER, NO ANOMALIES WERE OBSERVED THAT WOULD HAVE RESULTED IN A RUDDER KICK OR HARDOVER. THE ORIGINAL SOLENOID VALVE WAS THEN RE-REMOVED FROM THE PCU AND TESTED AT PARKER. NO DISCREPANIES WERE OBSERVED WITH THE SOLENOID VALVE. THE SOLENOID VALVE HAS BEEN SUBSEQUENTLY

FORWARDED TO BOEING FOR OUR TESTING. INITIAL TESTING AT BOEING DISCLOSED AN INTERMITTENT OPEN IMPEDIANCE CONDITION IN SOLENOID VALVE. HOWEVER, FURTHER TESTING IS PLANNED TO ATTEMPT TO FURTHER DUPLICATE THE DESCREPANCY. WE WILL ADVISE CAL OF OUR TEST RESULTS ON OR BEFORE 27 MAY 1994.

WE UNDERSTAND THAT THE RUDDER PCU, SERIAL NUMBER 1597, WAS REWORKED PER THE REFERENCE (C) SERVICE BULLETIN, AND WILL BE FUNCTIONALLY TESTED BEFORE BEING RETURNED TO CAL. PARKER ANTICIPATES THAT THE PCU WILL BE FORWARDED TO CAL BY 27 MAY 1994.

RINGBLOOM/BWA/BRUCE CROSS
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 05/18/94 2208

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:41am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0148RR	CAL-IAH-94-0148RR	Closed

PROPRIETARY

Model: 737-300 ATA: 2217-00

Subject: AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715

CAL-IAH-94-0148RR 27 MAY 94
ATA 2217-00 MODEL 737-300 07 JUN 94 H
AUTOPILOT, AILERON, AND RUDDER ANOMALIES ON PP715
REF /A/ CAL-IAH-94-0183TR DTD 28 APR 94
/B/ CAL-IAH-94-0110RR DTD 05 MAY 94 /H/
/C/ CAL-IAH-94-0173RR DTD 27 MAY 94

THE FOLLOWING MESSAGE SENT TO R. RUWARD WITH A COPY TO J. HAGAN AND W. PORTER.

THE REFERENCE (C) TELEX PROVIDED A REPORT OF HONEYWELL AND PARKER HANNIFIN TESTING OF THE S/N 84122126 YAW DAMPER COUPLER AND S/N 1597 RUDDER PCU, RESPECTIVELY. THE FOLLOWING PROVIDES SHOP FINDINGS FOR THE S/N D00404 AUTOFLIGHT ACCESSORY UNIT, AND A FURTHER REPORT ON THE SOLENOID VALVE REMOVED FROM THE S/N 1597 RUDDER PCU.

S/N D00404 AUTOPILOT ACCESSORY UNIT

THIS UNIT WAS TESTED AT THE BOEING ELECTRONICS FACILITY IN IRVING, TEXAS. DURING TESTS, ALL CIRCUITS INTERNAL TO THE AUTOFLIGHT ACCESSORY UNIT THAT INTERFACE WITH THE YAW DAMPER COUPLER WERE TESTED FOR INTERMITTENT OPEN CIRCUITS OR WIRE SHORTS. NO DISCREPANCIES WERE FOUND WITH THE UNIT. OUR PLAN NOW IS TO ACCOMPLISH A FULL FUNCTIONAL TEST ON THE UNIT, ATTACH A SERVICEABLE TAG IF THE UNIT PASSES WITH NO FAULTS, AND RETURN THE UNIT TO CAL ON 31 MAY 94.

S/N 1597 RUDDER POWER CONTROL UNIT

AS MENTIONED IN THE REFERENCE (C) TELEX, THE RUDDER PCU SOLENOID VALVE WAS FORWARDED TO BOEING FOR OUR TESTING. INITIAL TESTING AT BOEING DISCLOSED AN INTERMITTENT OPEN IMPEDANCE CONDITION IN THE SOLENOID VALVE. WE SUBSEQUENTLY REQUESTED THAT THE RUDDER PCU BE FORWARDED FROM PARKER TO BOEING FOR ADDITIONAL TESTING. WE HAVE RECEIVED THE PCU AND HAVE INITIATED FURTHER TESTING. OUR TESTING INCLUDES CONNECTING THE PCU TO A YAW DAMPER COUPLER, A FUNCTION GENERATOR BOX AND A BREAKOUT BOX TO SIMULATE INFLIGHT YAW DAMPER SYSTEM OPERATION AND AN INTERMITTENT SOLENOID VALVE OPERATION. WE ANTICIPATE THAT OUR TESTING WILL BE COMPLETED BY 3 JUNE 1994. BASED ON THE RESULTS OF THIS TESTING WE INTEND TO FURTHER SIMULATE YAW DAMPER INDUCED KICKS IN OUR FLIGHT SIMULATOR IN OUR EFFORTS TO UNDERSTAND THE CAUSE OF THE REPORTED ROLL AND YAW ANOMALY. WE ANTICIPATE THAT WE CAN PROVIDE YOU THE RESULTS OF OUR TESTING BY 7 JUNE 1994.

S/N 86060590 AND S/N 87020808 FLIGHT CONTROL COMPUTERS

THE S/N 86060590 AND S/N 87020808 FLIGHT CONTROL COMPUTERS WERE SENT TO HONEYWELL FOR TESTING ON 17 MAY 94. HONEYWELL ADVISED US TODAY THAT FURTHER ADMINISTRATIVE COMMUNICATION AND COORDINATION WAS REQUIRED WITH CAL BEFORE THE UNITS COULD BE TESTED. HOWEVER, HONEYWELL ALSO STATED THAT THEY HAVE THE INFORMATION THEY NEEDED

FROM CAL AND THAT TESTING OF THE UNITS WILL BE COMPLETED NEXT WEEK. WE WILL PROVIDE A REPORT OF HONEYWELL'S FINDINGS IN OUR 07 JUN 94 REPORT.

PROPRIETARY

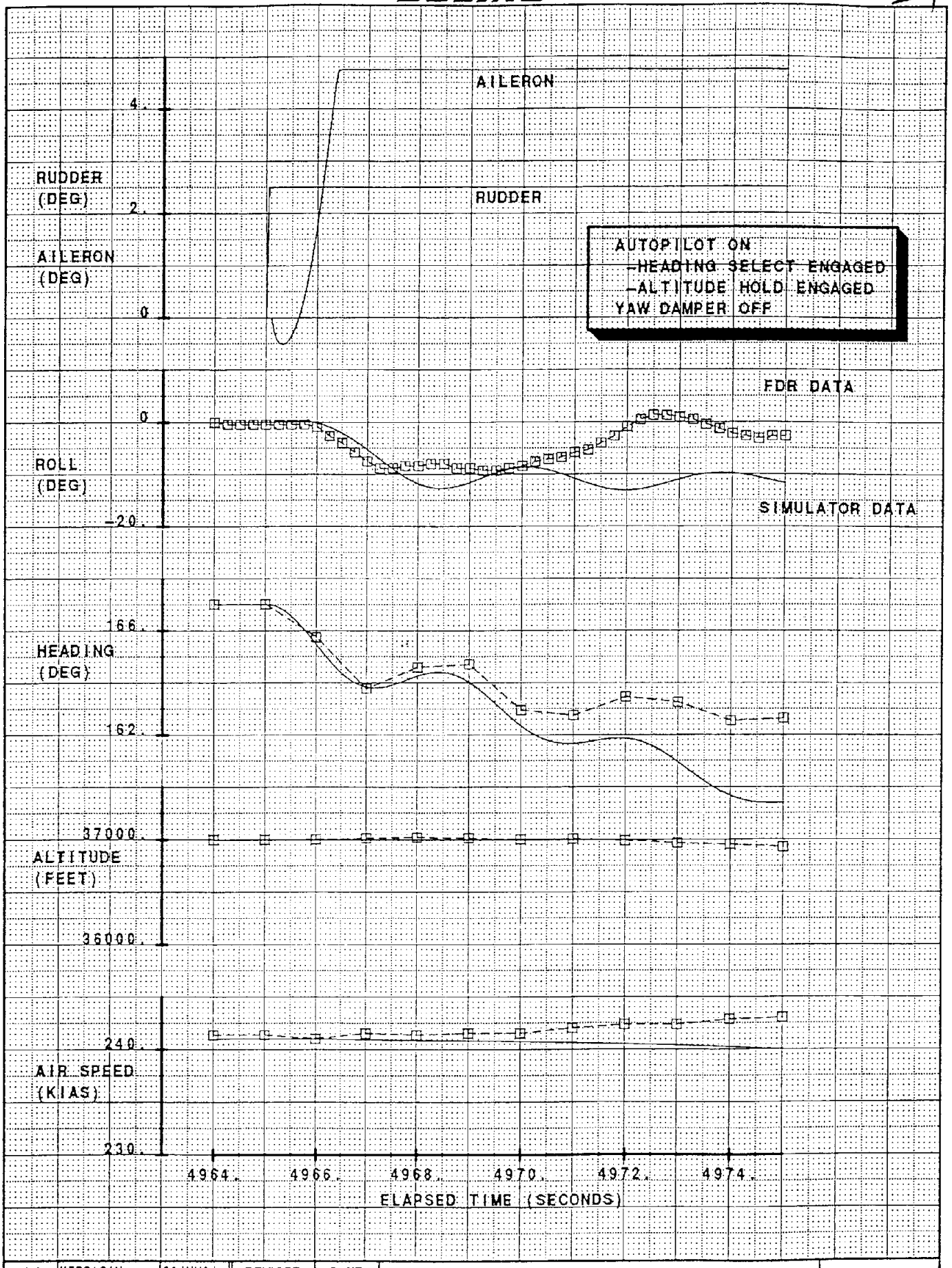
RINGBLOOM/BWA/MIKE DIDONATO
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 05/27/94 2142

Continental Airlines 737-300 (PP715) - Uncommanded Roll

PROPRIETARY

Preliminary analysis of the flight data recorder (FDR) from the Continental Airlines 737-300 that experienced uncommanded roll and yaw enroute from Houston to Tegucigalpa, Honduras has been completed. The crew diverted to San Pedro Sula, Honduras for an emergency landing.

At an altitude of 37000 feet and an indicated airspeed of 241 knots the airplane rolled to the left approximately nine degrees. It was reported that the the autopilot was engaged when the incident occurred. Using the simulator, the roll and heading experienced during the incident have been duplicated. Preliminary analysis shows that the event is consistent with a sustained rudder input of approximately 2.5°. This is equal to the yaw damper authority at that flight condition. A comparison of the simulator to FDR traces is attached. Bank angle can be matched for only a few seconds, probably because of pilot lateral control input following the initial occurrence. Note that rudder and lateral control inputs were not recorded on the FDR. A rudder hardover to the blowdown limit ($\delta_r = 8.84°$) could not have occurred since the event was matched with only 2.5° of rudder. The possibility of an autopilot hardover was also evaluated using the simulator, but the traces of roll and heading angle did not resemble the FDR traces. Analysis of the portion of the flight after the initial event occurred is continuing.



CALC	KERRIGAN	29JUN94	REVISED	DATE
CHECK			S LEWIS	29JUN94
APPD				
APPD				

PRELIMINARY FDR DATA
CONTINENTAL PP715

737-300

FIGURE

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:56am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0236RR	CAL-IAH-94-0162RR	Closed

Model: 737-300 PROPRIETARY ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

CAL-IAH-94-0236RR 07 JUL 94
ATA 2720-00 MODEL 737-300 04 AUG 94 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0162RR DATED 7 JUN 94 /H/
/B/ CAL-IAH-94-0197RR DATED 22 JUN 94

THE FOLLOWING MESSAGE SENT TO R. RUWARD (BCSR) AND T. CARROLL (CAL FLIGHT SAFETY) WITH A COPY TO J. HAGAN AND W. PORTER (BCSRS).

THE FOLLOWING INFORMATION IS PROVIDED AS AN UPDATE OF OUR INVESTIGATION OF THE RUDDER CONTROL ANOMALY ON CAL AIRPLANE PP715/N17344 IN HONDURAS.

OUR ANALYSIS TO DATE HAS DISCLOSED THAT A YAW DAMPER KICK OF 2.5 DEGREES TO THE LEFT WILL RESULT IN THE AIRPLANE HEADING AND BANK ANGLE CHANGES SHOWN ON THE FDR TRACES DURING THE INITIAL UPSET. HOWEVER, THIS TYPE OF ANOMALY DOES NOT CLEARLY CORRELATE TO THE SUBSEQUENT CONTROL ANOMALIES FOLLOWING THE PILOTS CORRECTION OF THE INITIAL UPSET. WE ARE PLANNING TO ACCOMPLISH FURTHER ANALYSIS OF THE FLIGHT PARAMETERS FOLLOWING THE INITIAL UPSET TO DETERMINE WHETHER OTHER FLIGHT CONTROL DISCREPANCIES COULD HAVE ACCOUNTED FOR THE SUBSEQUENT ANOMALIES, INCLUDING THE REPORTED EXCESSIVE AILERON CONTROL. HOWEVER, ADDITIONAL TIME IS REQUIRED DUE TO THE LIMITED FLIGHT DATA RECORDER PARAMETERS AVAILABLE. WE ANTICIPATE THAT WE CAN PROVIDE FURTHER INFORMATION ON THIS SUBJECT ON OR BEFORE 4 AUGUST 1994.

HAMILTON/ARNOLD/MIKE DIDONATO
CUSTOMER SERVICES DIVISION
BOEINGAIR M-7272 2H-95
/CAR 07/07/94 2209

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

July 15, 1994
B-U01B-14846-ASI

Mr. Greg Phillips
National Transportation Safety Board
490 L'Enfant Plaza East, SW
Washington, D.C. 20594

BOEING

PROPRIETARY

Subject: 737 Rudder Anomalies

Reference: a) NTSB Memorandum, Greg Phillips to Jack Drake, dated June 1, 1994
b) Meeting with you in Seattle on June 8, 1994

Dear Mr. Phillips,

You sent a copy of the reference a) memorandum to us by telefax on June 3, and we discussed in some detail, in the reference b) meeting, the events which you were following in the memorandum.

As you had requested, our engineers briefed you on our understanding of the events. You requested several items in the reference b) meeting and these action items and our responses are listed below.

1. When Brad Johnson and John Hamilton, Boeing Service Engineering, discussed in detail the reference a) events they discussed findings which were uncovered during the examinations. You requested that we provide Boeing comments to reference a). Enclosure 1 contains Boeing comments on the events. This enclosure includes a summary of the United 737-300 event in Seattle on Jan 4, 1993, which we did not have at the reference b) meeting but which Paul Cline discussed briefly. It also includes a write-up on an additional America West 737 event.

2. You requested a copy of the Boeing Service Bulletin on the main rudder PCU which addresses the overstroking of the servo valve slides. A copy of 737-27-1185 Revision dated April 14, 1994 is found in enclosure 2.

3. You requested a copy of the service letter related to lubrication of the rudder feel and centering unit. A copy of 737-SL-27-57 dated December 5, 1989 is found in enclosure 3.

4. We indicated that we had done some DFDR analysis of the Continental Airlines event. Enclosure 4 contains the data we have developed on that event.

5. We indicated in the meeting that we believed a message had been sent to operators advising them of the availability of the modified yaw damper engage solenoid. You requested a copy of this message. We have not found such a message. We are preparing an In-Service Activity report (ISAR) which concerning the availability of the modified yaw damper engage solenoid. We will send you a copy when it is released. In addition, we are revising spares lists to show the old valves as inactive for procurement.

BOEING

6. We indicated a change was being considered to the 737 Operations Manual which would include wording similar to that in the the FAA approved Flight Manual (AFM) regarding rudder oscillations. We indicated it was expected such a revision should be released by the end of 1994. We will provide you a copy of this change when it is released.

A copy of this letter will be provided through normal channels, to the FAA personnel who were at the reference b) meeting.

We believe this completes the action items from the meeting. We appreciated the opportunity to discuss the issues and compare notes on findings. If the Boeing Company can be of further assistance, do not hesitate to contact me.

Very truly yours,

FLIGHT TEST

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

Enclosures: 4 as noted

EQUIPMENT QUALITY ANALYSIS REPORT

BOEING COMMERCIAL AIRPLANE GROUP
RENTON DIVISION

PROPRIETARY

TO:	John A. Hamilton	2H-80	**EQA NO:**	6679R
CC:	Paul J. Cline	67-61	**DATE:**	July 21, 1994
			CUSTOMER:	CAL
			MODEL:	737-300
			A/P NO:	PP715
			LINE NO:	1383

SUBJECT: Rudder PCU Solenoid Valve

IDENTIFICATION: Hydraulic Solenoid Valve Assembly
P/N 10-60811-1
Bertea P/N 59600-5003
S/N CY5533, Assy. Date 4Q86

REFERENCE: (a) Telex CAL-IAH-94-0002-ASI, Dated April 12, 1994

BACKGROUND:

The reference telex indicated that CAL reported Flight Control anomalies on A/P PP715. The airplane had accumulated 23,090 hours and 10,722 cycles. The Rudder PCU, P/N 65-44861-9 (S/N 1597A) was one of the components removed from the airplane during troubleshooting. The Rudder PCU was returned to Parker Hannifin Corporation, Customer Support Operations for test. It was noted at this time that the Rudder PCU Solenoid Valve, P/N 10-60811-1 (S/N CY5533) failed the dielectric and insulation resistance tests. The solenoid valve was subsequently removed from the Rudder PCU and forwarded to Boeing for evaluation.

EXAMINATION AND TEST RESULTS:

A preliminary test at Boeing revealed that the resistance between pins A and B (interconnected) and pin D varied between 67 ohms and 28 megohms. This could result in an intermittent operating condition. The nominal resistance should be 71 to 87 ohms. A complete analysis was conducted at the Renton Division EQA Lab on June 15, 1994.

29

ANALYSIS:

1. The solenoid valve was disassembled and the coil assembly housing was sectioned to expose the coil assembly. The presence of fluid was observed under the insulation wrap on the coil assembly following removal of the outer hard epoxy coating. The fluid was identified to be BMS3-11 hydraulic fluid. The fluid bubbles can be observed under the insulation wrap. See photograph 1, attachment A.

2. Removal of the insulation wrap and continued evaluation of the coil wire revealed multiple site coil wire corrosion and wire deterioration. See photograph 2, attachment A and photographs attachments B and C.

3. The coil wire corrosion and deterioration is a result of electrochemical galvanic corrosion reaction. The BMS3-11 fluid provides an electrolyte path that allows the DC voltage to galvanically corrode the copper wire.

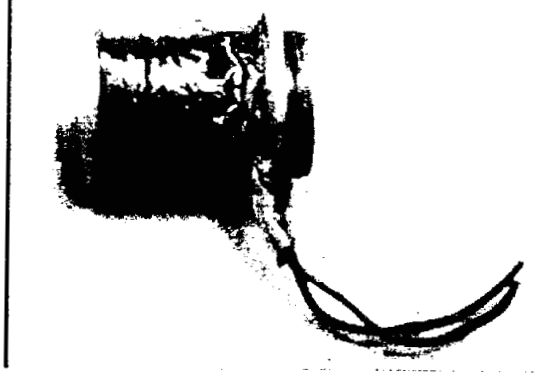
SUMMARY:

The above information is provided to the concerned personnel for review and actions as considered necessary. No further action is contemplated by the EQA Group on this matter at this time. This report is considered closed.

prepared by [redacted] 7/21/94
J. Calvin
M/S 96-03, Telephone: [redacted]

Approved by [redacted]
G. Hines
M/S 96-03, Telephone: [redacted]


600- 5003 HYD
0 PSI 28 VDC
10-60811-1
CY 5523

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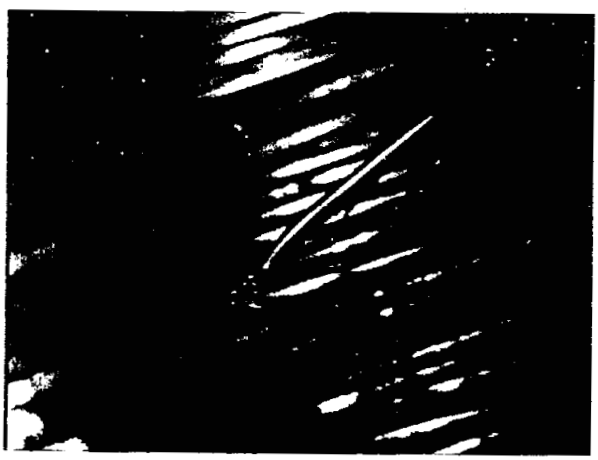

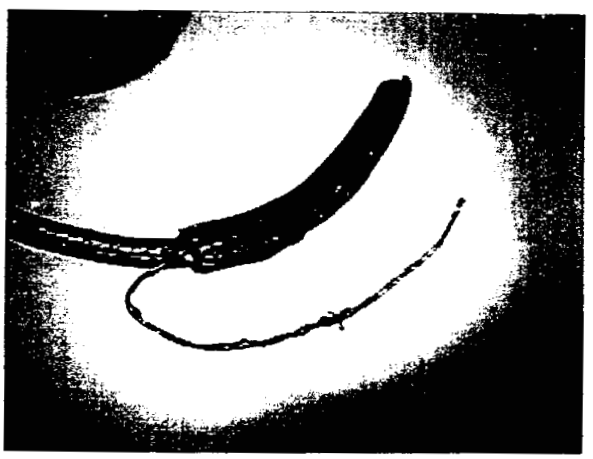

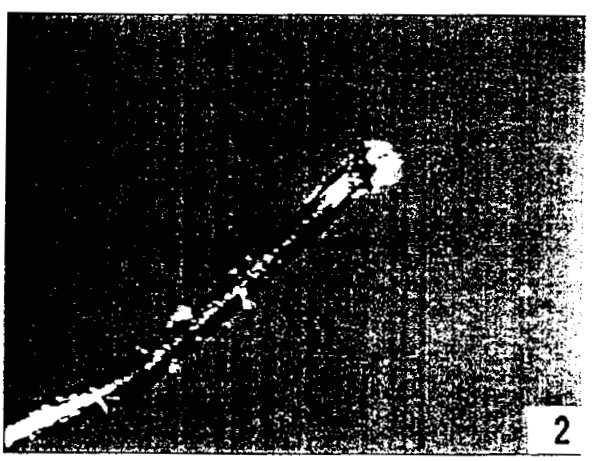
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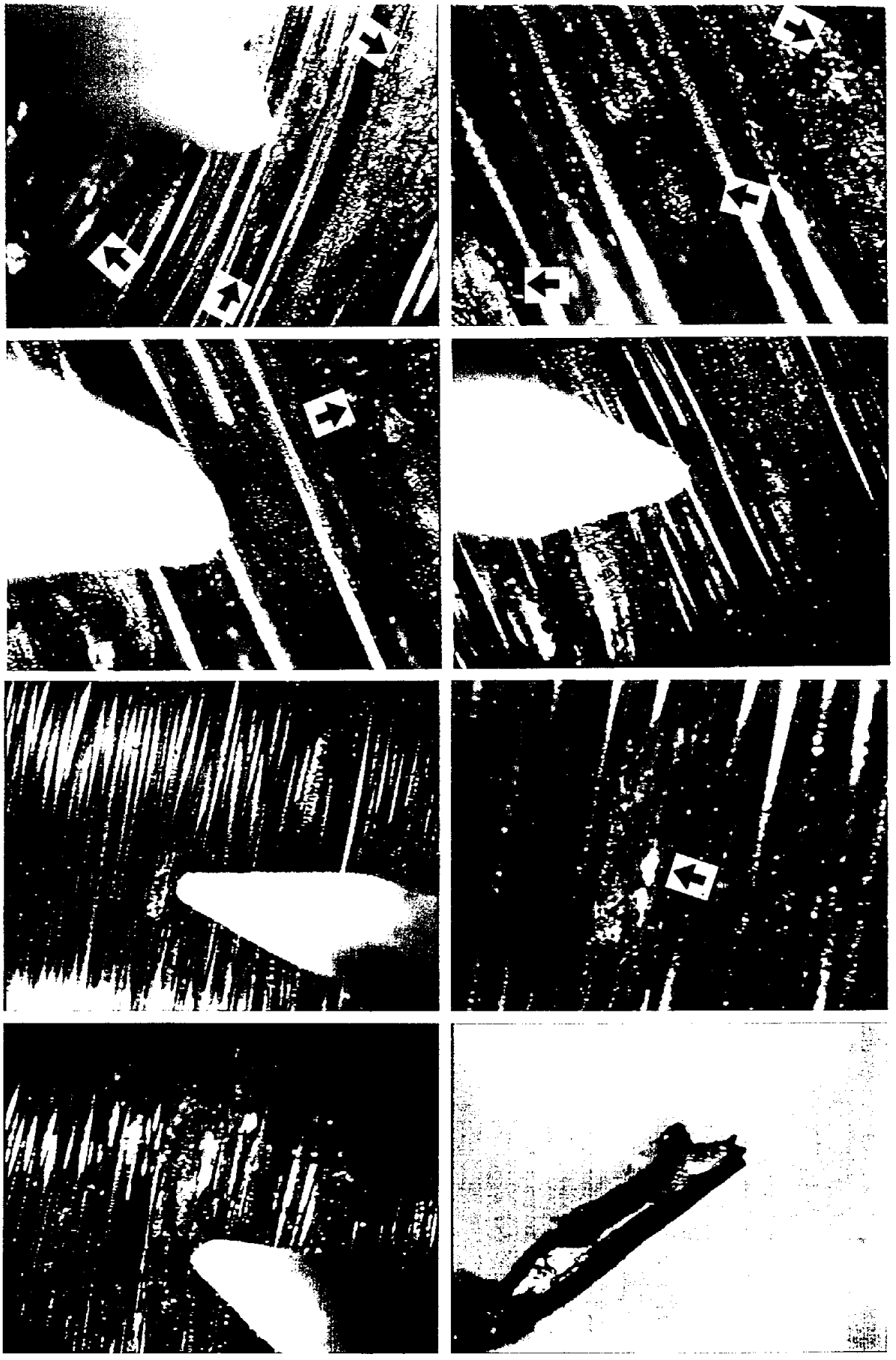

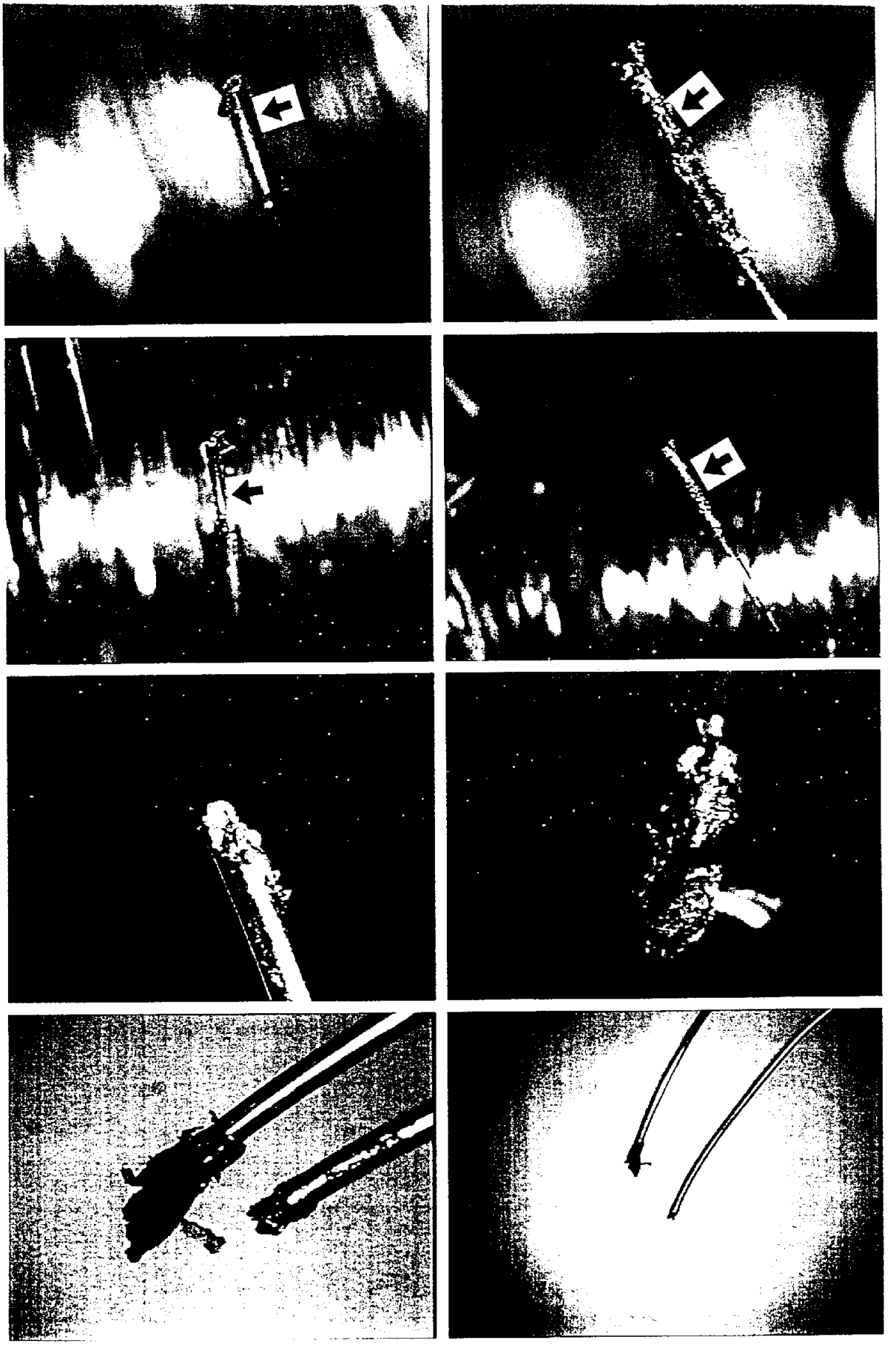

dlnc 33
4-11-94

CAL-IAH-94-0287RR 29 JUL 94
ATA 2720-00 MODEL 737-300 01 SEP 94 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0162RR DATED 7 JUN 94 /H/
/B/ CAL-IAH-94-0236RR DATED 7 JUL 94

PROPRIETARY

THE FOLLOWING MESSAGE SENT TO R. RUNARD (BCSR) AND T. CARROLL (CAL FLIGHT SAFETY) WITH A COPY TO J. HAGAN AND W. PORTER (BCSRS).

THE FOLLOWING INFORMATION IS PROVIDED AS AN UPDATE OF OUR INVESTIGATION OF THE RUDDER CONTROL ANOMALY ON CAL AIRPLANE PP715/N17344 IN HONDURAS.

IN THE REFERENCE /B/ TELEX, WE ADVISED THAT WE PLAN TO ACCOMPLISH FURTHER ANALYSIS OF THE FLIGHT PARAMETERS TO DETERMINE WHETHER ANY FLIGHT CONTROL DISCREPANCIES COULD HAVE ACCOUNTED FOR THE REPORTED ANOMALIES SUBSEQUENT TO THE INITIAL UPSET. WE HAVE NOT YET COMPLETED THIS ANALYSIS.

WE ANTICIPATE WE CAN PROVIDE [illegible] ON THIS SUBJECT ON OR BEFORE 1 SEPTEMBER 1994.

HAMILTON ARNOLD [illegible]
CUSTOMER SUPPORT [illegible]
BOEING [illegible]
[illegible]

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:56am PAGE: 1

View Message

Message Number:	Action File Name:	Status:
CAL-IAH-94-0571TR	CAL-IAH-94-0571TR	Closed

Model: 737-300 ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

DIR 617BOE

/ATTN (617) MIKE DIDONATO MGR. 7/7/7 AIRLINE SUPPORT
/CC (BFSDEN) J. HAGAN BCSM DENVER
/CC (BFSLAX) D. MILES BCSM LOS ANGELES

CAL-IAH-94-0571TR 29 SEP 94
ATA 2720-00 MODEL 737-300 5 OCT 94 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0356RR
/B/ CAL-IAH-94-0162RR
/C/ CAL-IAH-94-0287RR
/D/ TELECON MATT BRYANT/BRAD JOHNSON

FOLLOWING MESSAGE SENT TO M. DIDONATO WITH COPY TO J. HAGAN (BFSDEN) AND D. MILES (BFSLAX).

DURING THE REFERENCE /D/ TELECON AN UPCOMING FLIGHT TEST AS PART OF BOEING INVESTIGATION INTO SUBJECT ANOMALY WAS DISCUSSED. CONTINENTAL HAS REQUESTED THAT IF ACCEPTABLE TO BOEING, AL MENDEZ AND/OR MATT BRYANT WOULD LIKE TO BE PRESENT FOR THE FLIGHT TEST.

ALSO DURING THE REFERENCE /D/ TELECON PROPOSED CHANGES TO THE FLIGHT MANUAL REGARDING DISENGAGING THE YAW DAMPER SYSTEM FROM THE COCKPIT IF ABNORMAL YAWING CONDITIONS OCCUR TO DETERMINE IT THIS CORRECTS/IMPROVES CONTROL ANOMALIES BEING EXPERIENCED.

ACTION:

1. WOULD IT BE ACCEPTABLE FOR AL MENDEZ AND/OR MATT BRYANT TO BE PRESENT DURING THE ABOVE MENTIONED FLIGHT TEST?

2. IF ACCEPTABLE PLEASE ADVISE WHEN FLIGHT TEST IS SCHEDULED.

3. PLEASE CONFIRM ISSUE DATES FOR ABOVE MENTIONED FLIGHT MANUAL CHANGES.

RUWARD - BCSR - HOUSTON
\\M.BRYANT-M.BRYANT-T.CARROLL-B.EVANS-B.BOLFING-G.MASON-M.MORAN-S.CUNNINGHAM//

FSE-BOECOM THU 09/29/94 05:08:00
BOESEA-X2SO11-00012-09/29/94-1310Z

PREPARED FOR: Hamilton

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Message Number:	Action File Name:	Status:
CAL-IAH-94-0421RR	CAL-IAH-94-0571TR	Closed

Model: 737-300 ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

CAL-IAH-94-0421RR 05 OCT 94
ATA 2720-00 MODEL 737-300 26 OCT 94 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0571TR DTD 29 SEP 94 /C/
/B/ TELECON MATT BRYANT/BRAD JOHNSON
/C/ CAL-IAH-94-0162RR DTD 7 JUN 94 /H/

THE FOLLOWING MESSAGE SENT TO R.RUWARD /BCSR/ WITH A CC TO J.HAGAN/D.MILES /BCSR/.

THE FOLLOWING INFORMATION IS PROVIDED IN REPSONSE TO THE REF /A/ TELEX REGARDING THE FLIGHT CONTROL ANOMALIES ON THE SUBJECT AIRPLANE IN HONDURAS. AS DISCUSSED IN THE REF /B/ TELECON, THE NEXT STEP IN OUR INVESTIGATION OF THESE ANOMALIES IS A FLIGHT TEST ON WHICH WE WILL TRY TO SIMULATE THESE ANOMALIES. IN THE REF /A/ TELEX, CAL QUERIED WHEN THIS TEST IS SCHEDULED, AND WHETHER CAL REPRESENTATIVES COULD BE PRESENT DURING THIS TESTING. CAL ALSO QUERIED REGARDING FORTHCOMING FLIGHT MANUAL CHANGES.

WE HAVE NOT YET BEEN ABLE TO SCHEDULE THE AFOREMENTIONED FLIGHT TEST. THIS DUE TO AVAILABILITY OF AND REQUIRED OPERATOR PERMISSION TO US A PRE-DELIVERY AIRPLANE FOR THIS TESTING. ACCORDINGLY, WE ARE UNABLE TO ADVISE CAL AT THIS TIME WHETHER IT WILL BE POSSIBLE FOR THEIR REPRESENTATIVES TO BE PRESENT DURING THIS TEST. HOWEVER, WHEN THE TEST IS SCHEDULED, WE WILL TRY TO MAKE THE NECESSARY ARRANGEMENTS AND GAIN THE APPROPRIATE PERMISSIONS TO ACCOMMODATE THIS CAL REQUEST.

PLEASE BE ADVISED THAT WE DO NOT INTEND TO MAKE ANY REVISIONS TO THE AFM. HOWEVER, THE FLIGHT OPERATIONS MANUAL WILL BE REVISED TO ADVISE FLIGHT CREWS TO DISENGAGE THE YAW DAMPER SYSTEM IF UNCOMMANDED RUDDER MOVEMENTS ARE DETECTED. THIS INFORMATION WILL BE INCLUDED IN THE NEXT FLIGHT OPERATIONS MANUAL REVISION WHICH IS SCHEDULED TO BE SHIPPED ON 09 DEC 94.

WE WILL ADVISE CAL OF THE STATUS OF THE AFOREMENTIONED FLIGHT TEST BY BY 26 OCT 94 IN OUR NEXT UPDATE TO THE REF /C/ TELEX.

JOHNSON/ARNOLD/DIDONATO
CUSTOMER SERVICE ENGINEERING
BOEINGAIR M-7272 2H-95
/VNB

05 OCT 94 1641

PREPARED FOR: Hamilton

DATE: 10-Jan-95 10:56am PAGE: 1

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Message Number:	Action File Name:	Status:
CAL-IAH-94-0598RR	CAL-IAH-94-0162RR	Closed

Model: 737-300 ATA: 2720-00

Subject: RUDDER CONTROL SYSTEM ANOMALY ON PP715

CAL-IAH-94-0598RR 20 DEC 94
ATA 2720-00 MODEL 737-300 01 FEB 95 H
RUDDER CONTROL SYSTEM ANOMALY ON PP715
REF /A/ CAL-IAH-94-0162RR DTD 07 JUN 94 /H/
/B/ CAL-IAH-94-0554RR DTD 01 DEC 94

THE FOLLOWING MESSAGE SENT TO R. RUWARD WITH A COPY TO D. MILES.

THE FOLLOWING IS FURTHER INFORMATION TO THE REF /B/ TELEX REGARDING THE FLIGHT CONTROL ANOMALIES ON THE SUBJECT AIRPLANE IN HONDURAS. WE HAVE BEEN PLANNING A FLIGHT TEST DURING WHICH WE WILL TRY TO SIMULATE THESE ANOMALIES.

AS DISCUSSED IN THE REF /B/ TELEX, WE CONDUCTED A FLIGHT TEST ON AN AIRPLANE EQUIPPED WITH AN ELECTRONIC AILERON FORCE LIMITER. THIS TEST DID NOT PROVIDE ANY SIGNIFICANT RESULTS. WE ARE CURRENTLY PLANNING TO CONDUCT A SECOND FLIGHT TEST ON AN AIRPLANE EQUIPPED WITH A MECHANICAL AILERON FORCE LIMITER, SIMILAR TO THE SUBJECT AIRPLANE. THIS TEST HAS NOT YET BEEN SCHEDULED. WE WILL ADVISE CAL OF THE STATUS OF THIS TEST BY 01 FEB 95.

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

20 DEC 94 2022