

DOCKET NO. SA-510

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

Douglas and Airbus Rudder Involved Upsets

M E M O

A I R B U S I N D U S T R I E



Airbus Electronic Mail System
Marten BOSMAN
AI/EF-S
Ext: 32053

Blagnac, 06-Apr-1995 11:00am TLS
Ref: NONE

TO: Mr.T.E.Haueter (FAX-01912023026576)

CC: Yves BENOIST AI/E-FS (BENOIST)
CC: Marten BOSMAN AI/EF-S (BOSMAN)

Subject: Response to NTSB request on rudder-involved upsets

1 Rond point Maurice Bellonte 8-31707 Blagnac Cedex FRANCE
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FACSIMILE TRANSMISSION FROM EF-S

DATE: 06-Apr-1995

From: AI/EF-S - Yves BENOIST/Marten BOSMAN

TO: Mr.T.E.Haueter (FAX_01912023826576)

CC: Yves BENOIST AI/E-FS (BENOIST)
Marten BOSMAN AI/E-FS (BOSMAN)

Our ref: 420.0112/95

Your ref; UEAir flight 437, N513AU Date: 31 March 1995

If transmission imperfect please call : (33) 61932053

Subject: Response to NTSB request on rudder-involved upsets.

MESSAGE :

Dear Mr. Haueter:

Following your fax with above mentioned reference, I herewith send you the information you requested.

In general:

As of today, there have been no rudder hard-over cases reported to Airbus for any Airbus Airplane type. The rudder control system (three servo jacks, three hydraulic circuits), and the yaw damper system (dual system, self monitored) were designed to achieve this high degree of reliability.

By Aircraft type:

Concerning the A310, we experienced only one rudder-involved



upset due to the electrical rudder trim system. It occurred in cruise at high altitude, The investigation concluded that the upset was due to an inadvertent rudder trim control knob activation in the cockpit. No system malfunction was found. A modified rudder trim control knob and an improved rudder trim control switch were developed and Service Bulletins are available for retrofit on the unmodified airplanes.

On the A320, one rudder-trim related event was reported. This event didn't lead to a significant upset. It appears that the take-off was made with the rudder trim misset well before take-off,


On other types of our aircraft there were no rudder-involved upsets reported.

Following your request we hereafter report the accumulated flight hours on all of our airplane types as per the end of February:

A300	:	7,413,302
A300-600	:	2,045,030
A310	:	4,358,093
A320	:	3,848,327
A330	:	15,938
A340	:	193,315

Hoping this information is supportive to your investigation.

Yours sincerely,



Yves Benoist
Director Flight Safety

YYMMDDSEQ CLASS MODEL
731119301 INCIDENT DC1040

PHASE 2ND
CRUISE

DATA SOURCES 2ND

BRIEF DESCRIPTION:

HARDOVER CAUSED BY LOSS OF AC BUS WHICH ALLOWED DC POWER TO CAUSE RUDDER ACTION. LOSS OF POWER TO YD (AC) WITHOUT LOSS OF POWER TO HYDRAULIC SHUTOFF VALVES (DC) CAN CAUSE RUDDER HARDOVER (5 DEGS JN CRUISE).

FULL NARRATIVE:

CORRECTIVE ACTION: 2ND 3RD 4TH
S/B 22-72

YYMMDDSEQ CLASS MODEL
820701301 INCIDENT DC1040

PHASE 2ND
CLIMB TO CRUISE

DATA SOURCES 2ND

BRIEF DESCRIPTION:

DURING CLIMB TO FL370, A/P COMMANDED INTERMITTENT ROLL & YAW COMMANDS TO AILERONS & RUDDER. #2 AUTOPILOT DISENGAGED & CLIMB CONT'D ON #1 A/P. ERROR CONDITION REOCCURED WHILE INVL AT ALT. SOURCE OF INPUT IDENTIFIED AS #2 INU

FULL NARRATIVE:

CORRECTIVE ACTION: 2ND 3RD 4TH

YYMMDDSEQ	CLASS	MODEL	OPERATOR	LOCATION	PISE	TATT	ITA
841105301	INCIDENT	DC92					

PHASE	2ND	DATA SOURCES	2ND
TAKEOFF - ROLL	LANDING - ROLL		

BRIEF DESCRIPTION:

A/C VEERED LEFT ON T/O. REQ'D UNIT RUD TRIM TO CENTER SLIP INDICATOR. DURING DESCENT, HYD PUMP-HI SELECTED & SITUATION WORSENER. RUDDER PWR CRANK FAILED THRU SPLINE, PART DESIGN CHG FROM ALUMINUM TO STEEL.

FULL NARRATIVE:

AIRCRAFT VEERED LEFT ON TAKEOFF. REQUIRED UNIT RUD TRIM TO CENTER THE SLIP INDICATOR. DURING DESCENT, HYDRAULIC PUMP-HIGH WAS SELECTED AND THE SITUATION WORSENER. RUDDER POWER CRANK FAILED THRU SPLINE, PART DESIGN CHANGE FROM ALUMINUM TO STEEL. (REF: IR-573/-841/-978).

CORRECTIVE ACTION:	2ND	3RD	4TH
OOB 9-8425	S/B 27-217	S/B 27-261	

YYMMDDSEQ	CLASS	MODEL
880901301	INCIDENT	DC1010

PHASE	2ND
TAXI	

BRIEF DESCRIPTION:

AIRCRAFT TAKEN OUT OF SERVICE DUE TO FULL RIGHT RUDDER DEFLECTION DURING TAXI TO GATE AFTER LANDING. CAPTAIN EXPERIENCED A FULL RIGHT RUDDER DEFLECTION DURING A RIGHT HAND TURN.

FULL NARRATIVE:

CAPTAIN EXPERIENCED A FULL RIGHT RUDDER DEFLECTION DURING A RIGHT HAND TURN, THEN RETURNING TO NORMAL & AGAIN FULL DEFLECTION TO THE RIGHT. ALL SYSTEMS PRESS & QUANTITY WERE NORMAL. NO DISCREPANCIES NOTED. INVESTIGATION REVEALED SPORADIC REPEATABILITY OF DISCREPANCY. TROUBLE-SHOOTING RESULTED IN REPLACEMENT OF UPPER & LOWER RUDDER ACTUATORS. TEARDOWN OF THE UPPER RUDDER ACTUATOR REVEALED A LOOSE HUCK BOLT WHICH WAS INTERFERING WITH THE INTERNAL CONTROL VALVE LINKAGE. THE HUCK BOLT HAD BEEN INADVERTENTLY LEFT INSIDE THE ACTUATOR AT THE PREVIOUS OVERHAUL. THE ACTUATOR HAD BEEN OVERHAULED IN JUNE, 1988. SINCE THIS INCIDENT WAS CAUSED BY AN INADVERTENT MAINTENANCE ACTION, & NO DESIGN CHANGES ARE REQUIRED, NO FURTHER ACTION IS REQUIRED.

CORRECTIVE ACTION:	2ND	3RD	4TH
OOB 8818			

YYMMDDSEQ CLASS MODEL OPERATOR LOCATION TIME FLTT ATA
 911124401 SRO DC93

PHASE 2ND 2ND

CLIMB TO CRUISE

BRIEF DESCRIPTION:

DUTCH ROLL IN CLIMB. **STAR** AUGMENTATION COMPUTER FAULT. PASSING **FL29.S** A/C
 SUDDENLY YAWED LFT-RETRIMMED BUT DUTCH ROLL COMMENCED 15-20 DEGS LFT/RT. A/P
 DISCONNECTED. A/C DESCENDED & SPEED REDUCED.

FULL NARRATIVE:

DUTCH ROLL IN CLIMB. **STAB** AUGMENTATION COMPUTER FAULT. PASSING **FL29.S** A/C
 SUDDENLY YAWED LFT-RETRIMMED BUT DUTCH ROLL COMMENCED 15-20 DEGS LFT/RT. A/P
 DISCONNECTED. A/C DESCENDED & SPEED REDUCED. DRILL CARRIED OUT TO SWITCH OFF
 RUDDER SERVO. CONDITION CORRECTED ON COMPLETION OF DRILL. STABILIZER
 AUGMENTATION COMPUTER CHG'D.

CORRECTIVE ACTION. 2ND 3RD 4TH

YYMMDDSEQ CLASS MODEL OPERATOR LOCATION TIME FLTT ATA
 930711301 INCIDENT DC1040

PHASE 2ND DATA SOURCES 2ND
 TAKEOFF INXT CLIMBCLIMB TO CRUISE

BRIEF DESCRIPTION:

DURING CLIMBOUT PASSING 20000FT A/C BEGAN UNCONTROLLABLE RUDDER OSCILLATIONS.
 HAD THE CREW SWITCHED OFF BOTH LOWER RUDDER YAW DAMP SWITCHES, OR SWITCHED OFF
 THE AFFECTED INS THE UNCOMMANDED YAW WOULD HAVE STOPPED.

FULL NARRATIVE:

DURING CLIMBOUT PASSING 20000FT A/C BEGAN UNCONTROLLABLE RUDDER
 OSCILLATIONS. ONLY CKPT INDICATION WAS ABNORMAL #1 INS WARN LITE. A/P WAS
 DISCONNECTED W/NO RELIEF & EACH YAW DAMPER WAS CYCLED ON & OFF W/NO
 RELIEF. OSCILLATIONS WERE VIOLENT W/REPEATED YAW INPUTS CAUSING PLUS OR MINUS
 20DEGS OF BANK. TURNING OFF #1 INS ALLOWED REGAIN OF CNTRL OF A/C.
 DECLARED EMR & ATB. NO INJURIES. R/R #1 INS. I/R X GYRO HAD FAILED
 RESULTING IN TUMBLING IRU SECTION. BECAUSE OF TUMBLING INTERMITTENT VALID
 SIGNAL SENT TO YAW COMPUTERS W/ACCOMPANYING YAW COMMAND WHILE VALID SIGNAL
 WAS PRESENT. RESULTANT RUDDER DEFLECTIONS. R/R #1 ADI AS PRECAUTIONARY.
 REVIEW OF THE DFDR DATA INDICATE THAT THE REPORTED RANKTNC WAS OVERSTATED IN
 THE PIREP. ACCORDING TO THE DATA THE A/C BANKED 23 TO 25 DEG TO THE LEFT
 WHICH APPEARS TO BE PART OF THE CREWS ATTEMPTS TO RETURN TO THE AIRPORT. THE
 RUDDER OSCILLATIONS WHICH WERE LIMITED TO 5 DEG OF DEFLECTION AS A FUNCTION OF
 YAW DAMP AUTHORITY CREATED 2 DEG OF A/C YAW. THIS YAW WHILE UNDESIREABLE WAS
 CONTROLLABLE ANI) SHOULD HAVE BEEN REPORTED AS UNCOMMANDED RATHER THAN
 UNCONTROLLABLE. ** THIS TEXT WAS ADDED FROM SDR CONTROL NO. 071693163 E/E

CORRECTIVE ACTION: 2ND 3RD 4TH

DAC TRI/TWINJET RUDDER ROLL EVENT STUDY.

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YYMMDDSEQ	CLASS	MODEL	APPROX	----
941.231356	SRO	DC982		

PHASE	2ND	DATA SOURCES	2ND
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BRIEF DESCRIPTION:

UPDATE TO FAA RPT 950103SIS12. DIV TULSA DUE "UNWANTED (UNCMD'D) RUDDER INPUTS". THE AUTO PILOT & YAW DAMPERS WERE OFF. U/L. MAINT REPLACED THE DUAL RUDDER SERVO DRIVE & RT RUDDER TRAVEL LITE SENSOR. OPS THEN CHECKED

FULL NARRATIVE:

UPDATE TO FAA RPT 950103SIS12. DXV TULSA DUE "UNWANTED (UNCMD'D) RUDDER INPUTS". THE AUTO PILOT & YAW DAMPERS WERE OFF. U/L. MAINT REPLACED THE DUAL RUDDER SERVO DRIVE & RT RUDDER TRAVEL LITE SENSOR. OPS THEN CHECKED GOOD. THE ACFT WAS RELEASED FOR DISPATCH. ON 2 JAN 95, A PILOT WRITE-UP INDICATED THAT IN ORDER TO MAINTAIN STRAIGHT & LEVEL FLT, THE RUDDER REQUIRED 3 UNITS OF RT TRIM & THE AILERON REQUIRED 3/4 UNIT OF RT WING DN. MAINT SUBSEQUENTLY FOUND THE RUDDER SPIRAL PLATE OUT OF RLG. RE-RIGGED SAME & REPLACED THE YAW DAMP ACTUATOR. SYS CHECKED GOOD & THE ACFT WAS RETURNED TO SVS. ::TWX.

CORRECTIVE ACTION:	2ND	3RD	4TH
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7 RECORDS READ