



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8508	
Aircraft Registration	ZU-EXT	Date of Accident	26 June 2008		Time of Accident	1240Z
Type of Aircraft	Extra Flugzeugbau 300 (Aeroplane)		Type of Operation		Private	
Pilot-in-command Licence Type		Airline Transport	Age	35	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	12 005.0		Hours on Type	162.9
Last point of departure		Rand Aerodrome (FAGM)				
Next point of intended landing		Rand Aerodrome (FAGM)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
10m to the left of Runway 11 at Rand Aerodrome						
Meteorological Information		Surface wind; 200°/7kt, Temperature; 18°C, Visibility; >10km				
Number of people on board	1 + 0	No. of people injured	0	No. of people killed	0	
Synopsis						
<p>The pilot took off from Rand Aerodrome and flew to the Syferfontein Aerobatic Area (FAD 184) with the intention of performing aerobatic flying training. While performing aerobatics, he suddenly noted that the right rudder pedal was without any authority and suspected that the rudder cable might have failed.</p> <p>The decision was made to return to Rand Aerodrome for landing, being a licensed aerodrome with emergency services available to render the necessary assistance, should it be required. After establishing communication with ATC (Air Traffic Control) at Rand Aerodrome, he informed them of the problem. He was advised to join the circuit from the West, with Runway 11 being the active runway.</p> <p>The aircraft touched down on Runway 11 and the pilot managed to maintain runway heading by using the left rudder and brake. At approximately 40 knots indicated airspeed, the aircraft suddenly yawed to the left and veered off the runway and ground looped. As a result the right main landing gear strut was severed, causing the right wing and two of the three propeller blades to make contact with the ground. The pilot was not injured in the accident.</p>						
Probable Cause						
The pilot lost directional control of the aircraft on landing, following the failure of the right rudder cable.						
IARC Date				Release Date		

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Radcool Investments (Pty) Ltd
Manufacturer : Extra Flugzeugbau GMBH
Model : EA-300
Nationality : South African
Registration Marks : ZU-EXT
Place : Rand Aerodrome
Date : 26 June 2008
Time : 1240Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997) this report was compiled in the interests of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and **not to establish legal liability**.*

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

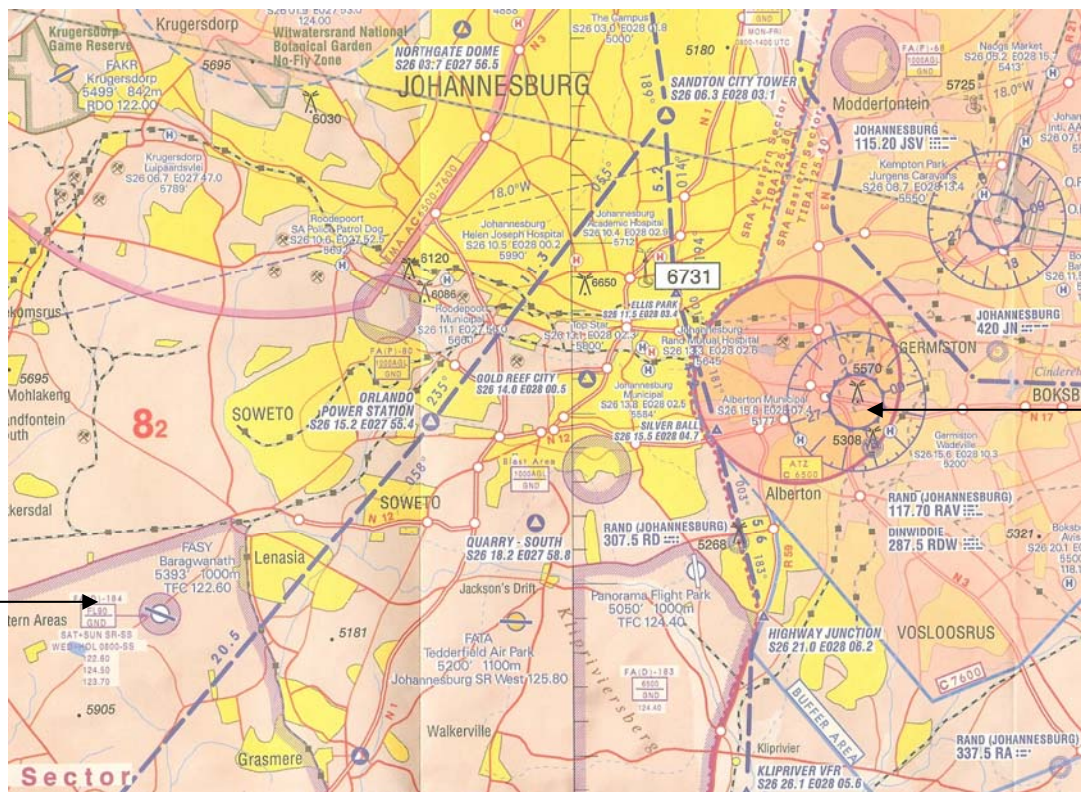
1.1 History of Flight:

1.1.1 The pilot took off from Rand Aerodrome and flew to the Syferfontein Aerobatic Area (FAD 184, see map on next page) with the intention of performing aerobatic flying training. While performing aerobatics, he suddenly noted that the right rudder pedal was without any authority and suspected that the rudder cable might have failed.

1.1.2 The decision was made to return to Rand Aerodrome for landing, being a licensed aerodrome with emergency services available to render the necessary assistance, should it be required. The pilot joined from the West and was advised by ATC (Air Traffic Control) at Rand Aerodrome to expect landing Runway 11, being the active

runway at the time.

- 1.1.3 The aircraft touched down on Runway 11 and the pilot managed to maintain runway heading by using the left rudder and brake. At approximately 40 knots indicated airspeed, the aircraft suddenly yawed to the left and veered off the runway and ground looped. As a result the right main landing gear strut broke off, the right wing impacted the ground and the aircraft nosed forward to such an extent that two of the three propeller blades impacted the ground and were substantially damaged. The pilot was not injured in the accident.



Rand Aerodrome

FAD 184

1.2 Injuries to Persons:

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	1	-	-	-

1.3 Damage to Aircraft:

1.3.1 The aircraft sustained substantial damage when the right main landing gear strut severed from the fuselage, causing the right wing and two of the three propeller blades to make contact with the ground.

1.4 Other Damage:

1.4.1 No other damage was caused.

1.5 Personnel Information:

Nationality	South African	Gender	Male	Age	35
Licence Number	*****	Licence Type	Airline Transport		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instrument Rating, Instructor Rating Grade 1, Test Pilot Rating Class 2				
Endorsements	Designated Examiner				
Medical Expiry Date	30 November 2008				
Restrictions	Nil				
Previous Accidents	None				

Flying Experience:

Total Hours	12 005.0
Total Past 90 Days	186.9
Total on Type Past 90 Days	10.0
Total on Type	162.9

1.6 Aircraft Information:**Airframe:**

Type	EA 300	
Serial Number	011	
Manufacturer	Extra Flugzeugbau GMBH	
Year of Manufacture	2004	
Aircraft Certification Status	Non Type Certified Aircraft	
Total Airframe Hours (At time of Accident)	2 408.8	
Last Annual Inspection (Hours & Date)	2 380.6	28 September 2007
Hours since Last Annual Inspection	28.2	
Authority to Fly (Issue Date)	28 September 2007	
Authority to Fly (Expiry Date)	28 September 2008	
C of R (Issue Date) (Present owner)	11 September 2006	
Operating Categories	Private Operation not for Reward.	

Engine:

Type	Lycoming AEIO-540-4B5D
Serial Number	L-24234-48A
Hours since New	2 408.8
Hours since Overhaul	121.7

Propeller:

Type	MT Propeller MTV-98C
Serial Number	06939
Hours since New	137.8
Hours since Overhaul	T.B.O. not yet reached

The last maintenance inspection that was conducted on the aircraft prior to the accident was an Annual Inspection that was certified on 28 September 2007. The aircraft was, however, partially disassembled in November 2007 when it was shipped in a container to Dubai in the United Arab Emirates, where it was re-assembled again and flown in an international aerobatic championship. After the event it was again disassembled and transported back to South Africa in a container where it was again re-assembled at an Approved AMO (Aircraft

Maintenance Organisation) No. 228 at Grand Central Aerodrome. Following the re-assembly of the aircraft flight, control rigging was performed and a dual inspection was carried out on the aircraft assembly and flight control rigging. Two Approved Persons signed off the dual inspection on page 87 in the aircraft logbook on 12 April 2008.

According to the maintenance inspection requirement documented in the Extra 300 Service Manual, Chapter 5 page 19, the aircraft rudder control cable system should be inspected every 50 hours. The aircraft had flown a total of 28.2 hours since the last Annual Inspection was certified on 28 September 2007, which was within the required maintenance inspection interval period as called for by the aircraft maintenance schedule. The specific page applicable to the requirement can be found on the next page of this report, with the required signature, date, aircraft serial number and AMO stamp as required.

Date: 28-09-07		Inspector:		
Serial No.: 011		Mechanic:		
Inspections				
O	O	7	Lubricate aileron rodend bearings, trim flap hinges and trim lever bolt.	✓
	O	8	Lubricate adjustment tube of electrical pedal adjustment.	✓
O	O	9	Check rudder cable system including sleeves, fairleads, pulleys and cable retracting springs per FAA-AC 43.13-1A.	✓
	O	10	Check for minimum 3.5 mm (1/8") clearance of rudder pedal versus safety stop when fully deflected for rudder cables having 50 h flight time minimum. On newly installed rudder cables the minimum spacing is 6 mm (1/4"). Refer to Figure 5. This check is to be performed with zero loading on the rudder pedals.	✓
	O	11	Rough check of safety stop clearance. With a force of approx. 90 kg (200 lbs) acting on the fully deflected rudder pedal the safety stop shall not be reached. If the stop is reached the control system indicates a too high flexibility which needs to be traced. In this case contact EXTRA for advice.	✓
O	O	12	Inspect all flight control ventilation holes for obstruction.	✓
	O	13	Inspect elevator balance weight for looseness and condition.	✓
	O	14	Inspect push rods.	✓
Landing gear				
O	O	1	Check landing gear for general condition.	✓
O	O	2	Check landing gear spring for dents and cracks.	✓
O	O	3	Inspect landing gear spring mounting clamps and bolts for security.	✓
	O	4	Lubricate landing gear center bolt and landing gear bearings.	✓
	O	5	Check wheel rake ($10^\circ \pm 0.5^\circ$) and toe-in ($1.5^\circ \pm 0.5^\circ$) per Chapter 32.	✓
Fairings:				
O	O	1	Disassemble fairings.	✓
O	O	2	Check fairings for dents and cracks.	✓
O	O	3	Check fairing ventilation hole for obstruction.	✓

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1.7 Meteorological Information:

1.7.1 Weather information was obtained from the pilot's questionnaire:

Wind direction	200°	Wind speed	7 knots	Visibility	> 10km
Temperature	18°C	Cloud cover	Nil	Cloud base	Nil
Dew point	Unknown				

1.8 Aids to Navigation:

1.8.1 No difficulties with the navigational aids were known or reported.

1.9 Communications:

1.9.1 No difficulties with the communication equipment were known or reported.

1.10 Aerodrome Information:

Aerodrome Location	1.5nm SW of Germiston	
Aerodrome Co-ordinates	South 26° 14.5 East 028° 09.1	
Aerodrome Elevation	5 483 feet	
Aerodrome Status	Licensed	
Runway Designations	1 660 x 15m	1 463 x 15m
Runway Dimensions	11/29	17/35
Runway Used	Runway 11	
Runway Surface	Asphalt	
Approach Facilities	NDB, VOR, DME, PAPI, Runway Lights	

1.11 Flight Recorders:

1.11.1 The aircraft was not fitted with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR), nor was it required by regulation.

1.12 Wreckage and Impact Information:

1.12.1 The pilot was able to maintain runway heading for some time following landing, but at approximately 40 knots indicated airspeed, the aircraft suddenly yawed to the left and veered off Runway 11. The aircraft ground looped, coming to rest approximately 10m from the runway edge, on the grass covered clear area next to the runway. Following the ground loop, the right main landing gear strut broke off near the fuselage attachment, which caused the right wing to impact with the ground and the aircraft to nose forward to such an extent that two of the three propeller blades made contact with the ground and were substantially damaged. The aircraft, however, did not nose over and remained in an upright position as can be seen in the picture below (Figure 1).



Figure 1: A view of the aircraft as it came to rest on the left side of the runway.

1.13 Medical and Pathological Information:

1.13.1 The pilot was the holder of a valid aviation medical certificate without any restrictions.

1.14 Fire:

1.14.1 There was no evidence of pre- or post-impact fire.

1.15 Survival Aspects:

1.15.1 The pilot was properly secured by making use of the aircraft-equipped four-point safety harness. The aircraft departed the runway at a relatively low speed with the cockpit/cabin area being undamaged, rendering the accident survivable.

1.16 Tests and Research:

1.16.1 The aircraft was recovered to a facility at FAGM and was inspected by SA:CAA Accident Investigators. It was noted that the right rudder cable had failed and was subjected to a substantial amount of scuffing in the area of the fairlead, which guides the cable underneath the horizontal stabilizer as it penetrates the fuselage from inside to the outside.



Figure 2. A view of the failed right rudder cable in the area of the fairlead.

1.16.2 Both ends of the failed rudder cable were removed from the fuselage and it was subjected to a SEM (Scanning Electron Microscope) examination by a Metallurgist. Several of the failed cable strands were scanned and enlarged to x150, and all of the strands displayed evidence of scuffing, which led to the weakening of the cable to such an extent that it could no longer withstand the forces it was designed for, and failed.

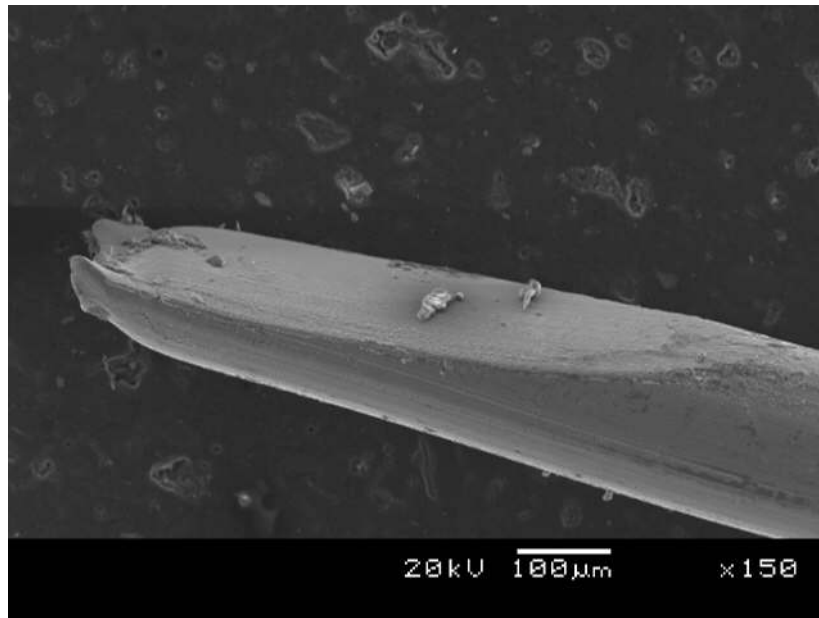


Figure 3. Cable strand enlarged under Scanning Electron Microscope x150 times.

1.17 Organisational and Management Information:

1.17.1 This was a private flight, with the pilot being a part owner of the aircraft.

1.17.2 The last Annual Inspection that was carried out on the aircraft prior to the accident was certified on 28 September 2007 by AMO (Aircraft Maintenance Organisation) No. 228. The person that certified the last Annual Inspection held a valid Approved Person accreditation from the CAA as well as a licence as an AME (Aircraft Maintenance Engineer).

1.17.3 Following the return transfer of the aircraft from Dubai (where it was utilized in an aerobatic championship in January 2008) to South Africa, the aircraft was removed from the container and was re-assembled by AMO No. 228 on 12 April 2008.

1.18 Additional Information:

1.18.1 None.

1.19 Useful or Effective Investigation Techniques:

1.19.1 None.

2. ANALYSIS:

- 2.1 The pilot, being a part owner of the aircraft, departed Rand Aerodrome on a private flight with the intention of performing some aerobatic flying training. While he was performing aerobatic manoeuvres, he suddenly realised that he had no right rudder pedal authority. He was able to maintain control of the aircraft and flew back to Rand Aerodrome where he knew he would have the assistance of emergency personnel, should it be required.
- 2.2 The pilot being correctly licensed and experienced on the aircraft type, was able to execute an uneventful landing at FAGM but as the speed decayed it became more problematic to maintain runway heading with what rudder, and brake authority he had available. With the aircraft suddenly yawing to the left below 40 knots indicated airspeed, it was not possible to correct the situation and the aircraft veered off the runway to the left and ground looped, resulting in the failure of the right main landing strut assembly and right wing ground impact followed.
- 2.3 Following the discovery of the failed right rudder cable, the maintenance records of the aircraft were inspected and it was noted that the aircraft had been subjected to an Annual Inspection on 28 September 2007. The inspection had been performed under the auspices of an Approved AMO, and the Extra 300 Service Manual Maintenance Schedule was used during such inspection. With reference to page 19 of the Service Manual, which calls for the rudder cable system inspection, including fairleads and sleeves, the inspection was signed off by the Approved Person.
- 2.4 The aircraft had flown a total of 28.2 hours since the last Annual Inspection had been certified, which was well within the 50-hour window period allowed until the next inspection was required on the rudder cable system. The maintenance practice as per approved maintenance schedule for the aircraft could therefore not be faulted. There is, however, always the question that needs to be answered, as to whether the rudder cable system was actually physically inspected during the maintenance inspection.
- 2.5 The SEM (Scanning Electron Microscope) examination of the cable clearly indicated that the cable had failed due to scuffing that had occurred in the area of the fairlead over a period of time. It was, however, not possible to determine the

time frame involved as it would be speculative.

- 2.6 What is of some concern to the writer is that the rudder cable is at no time hidden from the view of maintenance personnel or flying crew due to the design of the aircraft. The cable is attached to the rudder pedal and ran along the inner fuselage, guided at certain intervals by sleeve/s until such point where it penetrates the canvas fuselage at the aft section of the aircraft and then goes through the fairlead, followed by the attachment to the rudder quadrant. The design makes the cable easy visible for inspection, not only during maintenance intervals but also during pilot pre-flight inspections. The fact that the wear on the cable was not detected during any of the pre-flight inspections since the last maintenance inspection was performed, is indicative of the fact that the cable was not physically inspected in that area during pre-flight inspections. The failure of the cable could most probably have been prevented, should detailed pre-flight inspections have been conducted.
- 2.7 It is highly unlikely that the rudder cable or the fairlead could have been damaged during the transportation of the aircraft in a container to Dubai (U.A.E.) and back to South Africa, as it basically required the removal of the wings. Following re-assembly of the aircraft once it was back in South Africa, a dual inspection was signed out on the flight controls in the aircraft logbook on 12 April 2008. The possibility that the rudder cable was not inspected during the subsequent dual inspection in the area of the impending failure could have been possible, as the main emphasis would have been on the installation of the wings and the associate control rigging pertinent to the wings.
- 2.8 The service life of the rudder cable as well as the fairlead could not be determined as both units' area "On Condition" items with no tracking method or service life history being available. Looking at the condition of the rudder cable, the observation could be made that it was not recently replaced and therefore might have been in service for some time, most probably dating back to when the aircraft was manufactured.
- 2.9 In conclusion the failure of the rudder cable was due to collective complacency, by all role players, being maintenance personnel as well as flying crew neglecting to perform a proper visual inspection of the rudder cable in the area of the fairlead. This led to the systematic wear of the rudder cable in the area of the fairlead, which was aggravated by scuffing. Several cable strands started to fail, which most probably occurred over a period of time until the point where the cable could no longer withstand the forces it was designed for and failed, rendering the pilot

without right rudder pedal authority. The pilot was, however, able to maintain control of the aircraft and land.

3. CONCLUSION:

a) Findings

- (i) This pilot was the holder of a valid Airline Transport pilot's licence and the aircraft type was endorsed in his logbook.
- (ii) The pilot also held a Flight Instructor's Rating Grade 1, Instrument Rating Grade 2, as well as a Test Pilot Rating.
- (iii) The aircraft was maintained in accordance with the approved maintenance schedule, with the last Annual Inspection prior to the accident being certified on 28 September 2007.
- (iv) The aircraft had flown a total of 28.2 hours since the last Annual Inspection was certified.
- (v) The Approved Person that had certified the last Annual Inspection on the aircraft was accredited by the CAA.
- (vi) The required rudder cable system maintenance inspection did fall within the 50-hour window period as called for in the Extra 300 Service Manual.
- (vii) The aircraft was issued with an Authority to Fly, which was valid until 28 September 2008.
- (viii) The aircraft was disassembled in January 2008 and was transported to Dubai in the U.A.E. where it was re-assembled and flew in an aerobatic championship.
- (ix) The aircraft was engaged in aerobatic flying when the rudder cable failed in-flight.
- (x) The pilot was able to fly the aircraft back to Rand Aerodrome with the failed rudder cable.

- (xi) Shortly after landing the aircraft yawed to the left and veered off the runway.
- (xii) The right main landing gear strut assembly failed and the right wing impacted the ground, as did the propeller, which was damaged.
- (xiii) Fine weather conditions prevailed at the time and were not considered to have had a bearing on the accident.
- (xiv) A Scanning Electron Microscope examination of the rudder cable revealed that it was subjected to extensive scuffing over an undetermined period of time prior to failure.

b) Probable Cause/s:

- (i) The pilot lost directional control of the aircraft on landing, following the failure of the right rudder cable.

4. SAFETY RECOMMENDATIONS:

- 4.1 It is recommended that the CAA Airworthiness Department issue a MAN (Mandatory Advisory Notice) to all EA (Extra) 300 owners/operators on the South Africa Aircraft Register.

The MAN should address the inspection interval, which should be performed before the next flight but not later than the next scheduled maintenance inspection, whichever comes first.

The area of concern that should be highlighted in the MAN is the following:

- (i) Rudder Cables: A detailed inspection of the entire rudder cable installation (both left and right rudder sides) should be performed from the attachment at the rudder pedals all the way to the attachment at the rudder control surface. The condition and integrity of the cable should be the main emphasis of the inspection and should, any abnormalities/defect(s) be found, the cable should be replaced prior to the next flight.

- (ii) Fairleads: The condition of the fairleads, which act as a guide to the cable (located below the horizontal stabilizers on each side of the fuselage) should be subjected to a detailed inspection, with special emphasis on the inner guide race condition, as well as the presence of any sharp or untoward edges that might exist, and might initiate, or contribute to the rudder cable chafing, which could result in a rudder cable failure.

5. APPENDICES:

- 5.1 There are no appendices to this report.

-END-

Report reviewed and amended by the Advisory Safety Panel
24 February 2009