Bureau of Air Accident Investigation

Ministry for Competitiveness and Communications
Malta

Investigation into accident to Ferrari Tucano microlight aircraft 9H-UME at Luqa Airport, Malta on 16 January 2004

Report Number 01/04
BAAI/MCC/0104
3rd December 2004

Hon. Mr. Censu Galea
Minister for Competitiveness and Communications

Sir,

I have the honour to submit report compiled by the undersigned, on the circumstances of the accident involving ‘Tucano’ microlight aircraft registration 9H-UME, which occurred at Malta International Airport on the 16th January 2004.

Yours respectfully

Captain Denis Caruana
Chief Inspector of Air Accidents

T: +356 2123 3699 M: +356 7942 7700 F: +356 21239278 E: denis.caruana@gov.mt
C/o Department of Civil Aviation, Luqa, Malta
Contents

Introduction

Synopsis

1.0 Factual Information
  1.1 History of the Occurrence
  1.2 Injuries to persons
  1.3 Damage to aircraft
  1.4 Other damage
  1.5 Personnel information
  1.6 Aircraft information
  1.7 Meteorological information
  1.8 Aids to navigation
  1.9 Communications
  1.10 Aerodrome information
  1.11 Flight recorders
  1.12 Wreckage and impact information
  1.13 Medical and pathological information
  1.14 Fire
  1.15 Survival aspects
  1.16 Tests and research
  1.17 Other information
  1.18 New investigation techniques

2.0 Analysis
  2.1 General
  2.2 Operational considerations

3.0 Conclusions
  3.1 Findings
  3.2 Causes

4.0 Safety Recommendations

5.0 Appendices
ACCIDENT REPORT (01/04)

Operator : Private
Manufacturer : Ferrari U L M, Italy
Model : Tucano
Nationality : Maltese
Registration : 9H-UME
Place of incident : Runway 24, Luqa Airport, Malta
Time and date : 15:37hrs. 16th January 2004

All times in this report are UTC

INTRODUCTION

The investigation into the occurrence detailed in this report was conducted under the provision of Civil Aviation Legal Notice 135 of 2002. The occurrence by definition within the foregoing Legal Notice was deemed an accident.

Notification to the International Civil Aviation Organisation (ICAO) was not required.

SYNOPSIS

The occurrence was notified to the Chief Inspector of Air Accidents by the Director General of Civil Aviation on 16th January 2004. The Chief Inspector of Air Accidents appointed Major Ronald Xuereb, Inspector of Air Accidents (Engineering), to assist in the investigation.

The accident occurred when, Microlight aircraft 9H-UME (ME), commenced its take-off run off runway 24 at Malta International Airport. Prior to rotation, a piece of cloth fabric was picked up by the aircraft's pusher propeller causing it to entangle between the propeller blades and the right hand aileron assembly. On initial examination there was evidence that the cloth fabric impinged the R/H aileron torque tube forcing the assembly (inboard and aft), into the rotating propeller causing the blades to disintegrate. Once airborne, the propeller blades, in turn, impinged on the aircraft structure with
resultant damage. The aircraft commander managed to land the aircraft in the remaining runway length. There were no injuries.

1.0 FACTUAL INFORMATION

1.1 HISTORY OF THE OCCURRENCE

The aircraft, a Tucano microlight, registered 9H-UME (ME) was scheduled to fly two consecutive pleasure flights around Malta. At 13:15hrs. the Commander and owner of the aircraft was granted clearance, by Malta Air Traffic Services (MATS), to tow aircraft out of the “Island Microlight Club” hangar and proceed to the start-up point on taxiway Quebec (Appendix B). After performing the standard start-up checks the Commander requested Tower Control to taxi via taxiway Romeo, undershoot 14 and Kilo, and proceed to Park 1. The first passenger boarded the aircraft at 13:55hrs. The aircraft was taxied out of Park 1, via taxiway Kilo, for departure along runway 32. The aircraft touched down an hour later on runway 32 and was backtracked along runway 24 onto Park 1. The engine was shut down at 15:05hrs. During the interview, the Commander stated that the flight was uneventful and a post-flight check did not reveal any visual mechanical anomalies.

The Commander picked up his second passenger, also a microlight pilot, on Park1 and prepared his aircraft for the second flight of the day. A pre-flight check (walk-around) was carried out.

At 15:33hrs the Commander requested start up clearance with Tower Control (Appendix A). Air Traffic Information Services (ATIS) and ATC gave wind velocity as ‘calm’. Pre take-off checks were performed on Park 1. Taxi clearance to runway 24 was approved by Tower control and ME was taxied via undershoot of runway 24 past the concrete surface threshold and stopped on the centreline upon reaching the asphalt portion of the runway. At 15:37, Tower Control cleared (ME) for take-off. During the take-off roll and prior to the precision approach path indicators (PAPI), with maximum engine power applied (6800 Rpm) and at an indicated speed of 80 Km/h, the aircraft was rotated to take-off attitude.

Immediately, on rotating the crew heard a loud noise and felt the aircraft judder momentarily. The engine lost power within 2 to 3 seconds. The aircraft continued to climb with a gradual drop of airspeed indication. At an estimated height of 25 feet above runway level, the Commander pushed the control stick forward, closed throttle lever and attempted to maintain runway direction for an emergency landing.
During the interview, the Commander stated, that although he had elevator control, he could not maintain the recommended glide speed of 70 km/h. At 60 km/h (approximately 10 km/h above stall speed), a steeper glide angle was attained. The Commander flared the aircraft but sunk rapidly. Adequate height to recover was not available. The Commander stated that the main undercarriage touched the ground first in a heavier than usual landing. The aircraft continued rolling until the left hand wheel axle and the related tubular structure collapsed. At that stage, the aircraft veered to the left by about 60 degrees off the runway’s centreline, where the aircraft came to rest (Appendix C Fig1).

During the landing roll phase, the passenger/pilot informed Tower Control that 'take-off' was aborted. On stopping, the Commander carried out the standard emergency drill. Tower Control was informed that the crew was 'fine', and replied that fire services were not required. Tower Control was also informed that the aircraft had an undercarriage problem and could not be moved. The Commander, at that stage, was not aware of the extent of damage sustained by the aircraft. It was later noted that a shredded piece of fabric (a torn garment) was near the vicinity of the debris.

Subsequently a fire tender was despatched to attend to the accident site. However prior to arrival on site the fire tender was advised to return to base/station, by ATC controllers, since the aircraft commander had notified that no assistance was required.

1.2 INJURIES TO PERSONS

None.

The Commander and passenger were medically examined, shortly after the accident, by an Aviation Medical Examiner.

1.3 DAMAGE TO AIRCRAFT

The aircraft was extensively damaged. A comprehensive damage report is held on file at the BAAI. The following is a summary of the damage incurred by ME. (See also Appendix C Figs 2-5):

- Nose wheel bearings and tyre, damaged.
- The L/H undercarriage support and airframe tubular structures bent and badly distorted.
• R/H aileron torque tube was sheared and aileron assembly extensively damaged.

• Starboard aileron torque tube, dented.

• Port wing support tube, bent.

• Engine mountings and structure support tubes, bent and distorted.

• Engine accessories and related systems, adrift and damaged.

• Engine assembly pushed out of alignment.

• Propeller hub dented and scored. Propeller blades (wooden) were shattered and found scattered on runway.

1.4 OTHER DAMAGE

Negligible – Shallow scuff on Runway.

1.5 PERSONNEL INFORMATION

Commander: Male, Aged: 38 years

Licence: UK PPL (Aeroplane) (Microlight Only) Issued on 1st May 2002

DCA Malta Certificate of Validation
Valid until 28th April 2004

Aircraft Ratings: Aircraft Part 1, Pilot in Command:
Microlight aeroplanes (landplanes), as defined in the UK CAA Air ANO. Issued on 1st May 2002

Instrument Rating: Not applicable.

Medical Certificate: Class 2 – Valid until 20th October 2005.

Limitations: To wear vision correcting lenses.

Flying Experience:

Total: 113:00 hrs.
Total Command: 80:00 hrs.
Total on type: 79:00 hrs.
Total last 24 hours: 01:00 hrs.
Total previous 90 days: 25:30 hrs.

### 1.6 AIRCRAFT INFORMATION

<table>
<thead>
<tr>
<th>Details</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Ferrari ULM, (Flylab S.R.L), Italy</td>
</tr>
<tr>
<td>Model</td>
<td>Tucano, S/N 0122</td>
</tr>
<tr>
<td>Engine</td>
<td>Rotax 582 S/N 3917602</td>
</tr>
<tr>
<td>Propeller</td>
<td>GT’ Italia (Three Blade, Fixed Pitch, Wooden propeller.)</td>
</tr>
<tr>
<td>Max Take-off Wt</td>
<td>450 Kg</td>
</tr>
<tr>
<td>Max Air Speed</td>
<td>135 Km/h</td>
</tr>
<tr>
<td>Cruise Speed</td>
<td>110 Km/h</td>
</tr>
<tr>
<td>Min Crew</td>
<td>1 Pilot</td>
</tr>
<tr>
<td>Seats</td>
<td>2</td>
</tr>
<tr>
<td>Operating Conditions</td>
<td>Day VFR</td>
</tr>
<tr>
<td>Total Hrs (Aircraft)</td>
<td>648:00 hrs</td>
</tr>
<tr>
<td>Certificate of Registration</td>
<td>Certificate Number 100, Issued on 9th August 2001.</td>
</tr>
<tr>
<td>Certificate of Airworthiness</td>
<td>Permit to Fly Category, Expiry Date – 30th July 2004.</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Last Annual inspection was carried out on 30th June 2003 (601:0 hrs)</td>
</tr>
<tr>
<td></td>
<td>Next check due at 650:00 hrs. (50 hr. Check)</td>
</tr>
<tr>
<td>Engine</td>
<td>Rotax 582 S/N 3917602</td>
</tr>
<tr>
<td>Total hours</td>
<td>648:00hrs</td>
</tr>
</tbody>
</table>
1.7 **METEOROLOGICAL INFORMATION**

Weather observed at MIA. at 1607hrs on the 16\textsuperscript{th} January 2004.

- **Wind:** Variable at 03Kts
- **Ceiling and visibility:** CAVOK
- **Temperature:** 12\textdegree{} C
- **Dew point:** 04\textdegree{} C
- **Mean sea level pressure:** 1020hPa

1.8 **AIDS TO NAVIGATION**

Not applicable. Flight conducted under VFR.

1.9 **COMMUNICATIONS**

- **Luqa Tower:** Freq: 127.1MHz
- **ATIS:** Freq: 127.4MHz

1.10 **AERODROME INFORMATION**

Luqa airfield, (airfield reference point: N35.51.5 E 14.28.7) has an elevation of 300 feet and is served by runways 14/32 and 06/24. Park 1 is used for General Aviation operations.

Air Traffic Services are effected as follows:
- By Tower Control extending from ground to 2000 feet.

1.11 **FLIGHT RECORDERS**

Not applicable.

Transcripts of communications between Tower Control and the aircraft were derived from actual Malta Air Traffic Services recordings. See Appendix A.

1.12 **WRECKAGE AND IMPACT INFORMATION**

The aircraft came to rest on Runway 24, about 530 metres from Threshold 24, and veered 6.5 metres to the left off the Runway’s centreline markings. The exact point of touchdown could not be clearly established. However, the engine’s air filter fell off the aircraft at a distance of about 410 metres from Threshold Rwy. 24
Debris of the shattered wooden propeller blades were found scattered on Rwy 24, over a distance of about 36 meters (starting, approximately at 360 metres from Threshold Rwy 24). Two broken-off sections from the R/H aileron were also found in this area. One of the propeller blades, sheared-off the metal hub, was discovered in one piece on the grass, about 8 metres to the right of Rwy 24, in line with the rest of the scattered debris on the Runway. This propeller blade had a damage imprint on the inboard section of the leading edge, corresponding to the damaged end of the sheared R/H aileron torque tube.

An on site examination revealed that the aircraft was extensively damaged. The L/H undercarriage and support structural tubing was buckled and damaged in several locations. Other serious structural, engine, and accessory damage was noted. The aircraft was transported away from the accident site, on a trailer, for further detailed examinations.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The crew suffered no injuries.

At the time of occurrence, the Commander was in possession of a Class 2 medical certificate valid until 20th October 2005. Applicable limitations on the certificate refer to the mandatory use of vision correcting lenses, whilst exercising the privileges of his licence.

The results of the subsequent medical examination concluded that the Commander was in a fit physical and mental state to conduct the flight.

1.14 FIRE

There was no evidence of fire. Although the aircraft was extensively damaged, no fuel leakage occurred.

1.15 SURVIVAL ASPECTS

The Commander stated that the first to arrive at the accident site, were two officers from ATC. The "Island Microlight Club" President arrived shortly on scene, after being called by the Commander on the mobile phone. The MIA Fire Services Crash Combine was manned and proceeded to the crash location when the crash alarm sounded. However, ATC
requested Crash Combine to return back to their Section, as (ME’s) Commander informed Tower Control, that assistance was not required.

A fire extinguisher, carried in the aircraft's cockpit was serviceable, but had fire broken out, or the crew were incapacitated due to the crash, it was most probable that the crew would have suffered serious injuries without the prompt assistance of the emergency services.

In spite of the severe damage to the aircraft, it is remarkable that the crew walked out of the aircraft uninjured.

1.16 TESTS AND RESEARCH

Fuel used by (ME) was automotive petrol purchased from local service stations, in containers. All owner members at the “Island Microlight Club” adopt this procedure and is an acceptable practice.

A fuel sample was drawn from the left fuel tank and tested for water and dirt contamination, no abnormalities were found. Full laboratory analysis of the fuel sample were not deemed necessary considering the evident cause of the power-loss.

1.17 OTHER INFORMATION

The Commander supplied the following documents to the investigators:

- Pilot’s Operating Handbook, Inspection Schedule and Spare Parts List.
- Island Microlight Club, Incident Report Form.
- Personal flying Log Book.
- Copy of Airframe and Engine maintenance Log Book (No. 2).
- UK PPL. and DCA Malta Certificate of Validation.
- Medical Certificate.

• Copy of DGCA letter, Operating Conditions/Limitations for Microlight Activity in Malta.

• Certificate of Registration of Aircraft, issued on 9th August 2001.

• Permit to Fly Certificate No PF-140/03, issued from 31st July 2003, to 30th July 2004.

1.18 NEW INVESTIGATION TECHNIQUES

Not Applicable.

2.0 ANALYSIS

2.1 GENERAL

The accident occurred when a piece of fabric (a torn piece of clothing) entangled with the propeller and impinging the right hand aileron torque tube assembly. This caused the torque tube to distort and bend, impacting the rotating wooden propeller. This resulted in the shearing of the R/H aileron torque (control) tube assembly in three separate sections, and shattering the propeller causing the three blades to part from the metal hub.

The right hand aileron was bent downwards 90° to the wing span axis, and pulled inboard off its hinges, by 4cm from the wing tip. (Appendix C Fig 4) The remaining two (broken off) torque tube inboard sections, (measuring 56cm and 58cm respectively), entangled with the propeller and the surrounding structure, causing the wooden propeller to shatter. Wooden splinters punctured the ‘Mylar’ skin covering of the right hand aileron and wing, in several places. The lower structure main beam (keel beam), had evidence of being impacted by a parting propeller blade, causing the elevator and rudder control cables pulley block assembly, to break off its mounting and rotate 180 deg. This resulted in the slackening of the rudder and elevator cables, causing limitations to the Pitch and Yaw controls of the aircraft.

The aircraft sustained severe airframe and engine/accessories damage. Appendix C Fig.3.

Amongst the debris, pieces of torn clothing were found scattered on the Runway. When examined later, the cotton fabric was identified as a part of a ladies summer nightshirt. A torn piece, measuring about
30cm x 30cm, had evidence of wooden splinters, Kevlar shavings, and fragments of red plastic tape, embedded in the fabric. Appendix D.

The Kevlar fragments were examined and found to match the propeller’s reinforcement skin covering. The fragments of red plastic were discovered to be plastic tape (glued on by the owner) on the left and right aileron control torque tubes, to indicate the ‘Danger Line’ propeller tip path markings. This is consistent with the fabric (torn clothing) becoming entangled with the propeller blades and the R/H aileron control torque tube. Appendix C Figs 6&7.

When interviewed, the Commander and his passengers stated that they had never seen that particular piece of torn clothing before. The torn fabric (scattered on the runway amongst other propeller debris) was shown to the Commander after the occurrence.

The aircraft was semi controllable, but a hard landing occurred, thus damaging the left hand main landing gear axle and related structural components. Appendix C Fig.2.

The fire services were initially called to the to the site, but were advised to stand down when the Commander notified ATC that no assistance was required. Under the circumstances, it would have been appropriate that the fire services attend to the site to assess the conditions first hand.

2.2 OPERATIONAL CONSIDERATIONS

None.

3.0 CONCLUSION

3.1 FINDINGS

(i) The Commander was properly licensed for the conduct of the flight.

(ii) The aircraft had been properly maintained in accordance with the manufacturer, and the British Microlight Aircraft Association maintenance schedules, as accepted by the Malta DCA Airworthiness Inspectorate.

(iii) A valid Permit to Fly certificate was current.
(iv) The primary causal factor of the accident can be attributed to foreign object damage (FOD).

(v) The origin of the FOD could not be determined.

(vi) The Malta International Airport Fire Services reacted promptly. However, after communicating with the Commander, Tower Control informed the Fire Services that their assistance was not required. This in turn prompted the crash combine to return to base without assessing the site.

3.2 CAUSES

The accident was caused by the sudden disintegration of the ‘pusher’ type propeller, due to FOD, when a piece of fabric (a torn garment) entangled with the propeller. The fabric, in turn, impinged on the right hand aileron torque tube assembly causing it to bend and pull the assembly inboard into the rotating propeller.

The wooden propeller was shattered when it came into contact with the bent aileron torque tube. On parting the aircraft, the propeller blades caused severe damage to the surrounding airframe structure, right hand wing, flight controls and engine/related systems.

The sudden loss of the propeller/engine power, and limited controllability of the aircraft, resulted in a hard landing causing extensive damage to the aircraft's left-hand landing gear assembly and related structural supports.
4.0 SAFETY RECOMMENDATIONS

The following safety recommendation was made during the course of the investigation:

01/04/01 Malta International Airport Fire Services should promulgate the practice that the sole jurisdiction over an accident site rests with the Forward Incident Commander (FIC). As such the FIC should ensure that the evaluation of the conditions of the accident site is conducted by him.

Captain Denis Caruana
Chief Inspector of Accidents
Bureau of Air Accident Investigation
30th September 2004
5.0 APPENDICES

APPENDIX A

Transcript of voice recording between Tower (frequency 127.1) and 9HUME
Date of recordings: 16 Jan 2004

<table>
<thead>
<tr>
<th>Time</th>
<th>A/C</th>
<th>Tower</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:33:16</td>
<td>9-Mike-Echo good afternoon start up approved.</td>
<td></td>
</tr>
<tr>
<td>15:34:38</td>
<td>Start up approved 9-Mike-Echo.</td>
<td></td>
</tr>
<tr>
<td>15:36:40</td>
<td>Tower 9-Mike-Echo after departure runway 24 request to proceed to Hal-Far area.</td>
<td>9-Mike-Echo roger, after departure proceed to Hal-Far area not above 1500 feet, report ready to taxi.</td>
</tr>
<tr>
<td>15:37:01</td>
<td>9-Mike-Echo line runway 24 QNH 1020.</td>
<td>9-Mike-Echo line runway 24 QNH 1020 9-Mike-Echo.</td>
</tr>
<tr>
<td>15:37:26</td>
<td>9-Mike-Echo is rolling.</td>
<td>Roger.</td>
</tr>
<tr>
<td>15:38:26</td>
<td>(we’ve got a puncture?…garbled speech…) sorry 9-Mike-Echo abandon aborting take off.</td>
<td>9-Mike-Echo confirm ops normal.</td>
</tr>
<tr>
<td>15:39:26</td>
<td>9-Mike-Echo say again</td>
<td>9-Mike-Echo say again</td>
</tr>
<tr>
<td>15:40:26</td>
<td>Confirm ops normal</td>
<td>9-Mike-Echo confirm ops normal</td>
</tr>
<tr>
<td>15:41:26</td>
<td>Er…not quite</td>
<td>9-Mike-Echo do you require assistance? The fire section are on their way.</td>
</tr>
<tr>
<td>15:42:26</td>
<td>Tower</td>
<td>Yes eh there’s no need to.</td>
</tr>
<tr>
<td>15:43:26</td>
<td>Roger.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

Airfield Plan Malta International Airport

Location of impact
APPENDIX C

Fig 1

Fig 2

Shattered Propeller Blades

Dislodged axle and wheel fairing

Bent keel tube
APPENDIX C (Cont.)

Fig 3

Deformed engine mount support structure

Detached carburettors

Fig 4

Missing torque tube
APPENDIX C (Cont.)

Fig 5

Bent aileron assembly

Fig 6

Red plastic tape on detached torque tube

Fig 7

Kevlar reinforcement on shattered propeller blade
APPENDIX D

Fig 1

Kevlar fragment embedded in fabric FOD

Fig 2

Red plastic tape embedded in fabric FOD