



# AIB Bulletin

We

[www.tcaa.go.tz](http://www.tcaa.go.tz)

**AIB No. 6** Ref. CAV/ACC/6/10 Category: 1.3

**Aircraft Type:** Cessna U206G Reg. 5H-MVI Serial No. 206-04655

**No. and type of Engines:** One Continental IO-550-F21B

**Year of Manufacture:** 1979

**Date and Time (UTC):** 28<sup>th</sup> July 2010 at 1212 hours (1512 hours local time)

**Location:** En-route Mikumi-Siwandu, 34.3 km N 86° W of Matambwe.  
**Latitude** S 07° 30.591'  
**Longitude** E 037° 27.477'  
**Elevation** 900 ft

**Type of Flight** Air Charter

**Persons on Board:** Crew - 1 Passengers - 2

**Injuries:** Crew - 1 (None) Passengers - 2 (None)

**Nature of Damage:** The aircraft was damaged beyond economic repair

**Commander's Licence:** Commercial Pilot's License

**Commander's Age:** 25 years.

**Commanders Experience:** 1,600 hours (of which about 180 hours were on type)  
**Last 90 days:** 93 hours  
**Last 28 days:** 87 hours

**Information Source:** Telephone call from Coastal Travels Ltd, Dar es Salaam

**All times in this report are UTC**

---

*The Bulletin contains facts relating to the accident which have been determined up to the time of issue. This information is published to inform the public and the aviation industry of the general circumstance of the accident at the preliminary/stage and must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available.*

## **SUMMARY**

The accident was reported to the Tanzania Accident Investigation Branch by Coastal Travels Ltd, Dar es Salaam, who was raised by the Kiba Camp on HF radio.

The aircraft was operating a company charter flight from Mikumi to Siwandu in the Selous Game Reserve. It was carrying one pilot and two passengers. The pilot reported that he had to force land inside a forest following engine failure during cruise. There was no fire but the aircraft was Damaged beyond economic repair. There were no injuries to the three occupants.

### **History of the Flight**

On 28 July 2010 at around 1200 hours, a six seat Cessna U206G with registration letters 5H-MVI took off from Mikumi airstrip (Mikumi National Park) for a charter flight to Siwandu located in the Selous Game Reserve. It was carrying one pilot and two passengers. The expected time of arrival was 1235 hours.

Just before takeoff from Mikumi, the pilot checked the fuel level and established that he had 240 litres or 0400 hours endurance. He also had 7 quarts of engine oil (from the measurements taken using the dip stick). He added one more quart for a total of 8 quarts.

The pilot said that the initial phase of the flight was uneventful. During cruise, when all engine parameters had stabilized, he observed that the oil pressure was lower than normal but was within the safe range. The oil temperature was also high but was still within the safe range. At 1212 hours while he was cruising at FL 055, a loud bang was heard from the engine. The lid on top of the cowling opened up and oil came out of the engine and on to the wind shield. The engine stopped and pilot started the emergency procedures as per company standard operating procedures. These, he said, included pressing the ELT button, “pressing *nearest* on GPS” and calling MAY DAY on the radio as well as preparing for landing.

The pilot realized that he could not make it to the nearest airstrip and so he started looking for an alternative place to force land. The search was made difficult by the presence of oil on the wind shield. With the assistance of the two passengers he located a place on a ridge that had fewer trees than the rest of the densely forested areas. At around 1215 hours he succeeded in putting the aircraft down on the chosen place. The aircraft collided with trees and came to rest inside a tropical rain forest. There was no fire and all the occupants deplaned safely.

The occupants determined that they were all intact with nothing except a few scratches and bruises. The aircraft was extensively damaged and has since been written off.

### **Examination of the wreckage**

The wreckage was found on a ridge in the middle of a rain forest located in the Mikumi National Park. The exact location of the crash site was 18.51 nautical miles (34.3 km) N86°W of Matambwe airstrip. There was no fire damage. The aircraft collided with trees before and after touchdown and came to rest 42 metres beyond the first tree of impact. This tree was chopped by the left wing at a height of approximately 10 metres.

The left wing suffered extensive damage to its leading edge. The damage to the right wing was confined to the flap and aileron. The nose landing gear separated in the accident sequence. The right main wheel also separated from the gear spring after colliding with a stump. This collision had the effect of turning the aircraft through 90 degrees before it came to rest. There was no damage to the left main landing gear. The baggage pod contacted the ground when the two landing gears separated. It assisted in slowing down the aircraft and was damaged in the process.



Main wreckage



Tail section – note damage to horizontal stabilizer



Engine



Front section

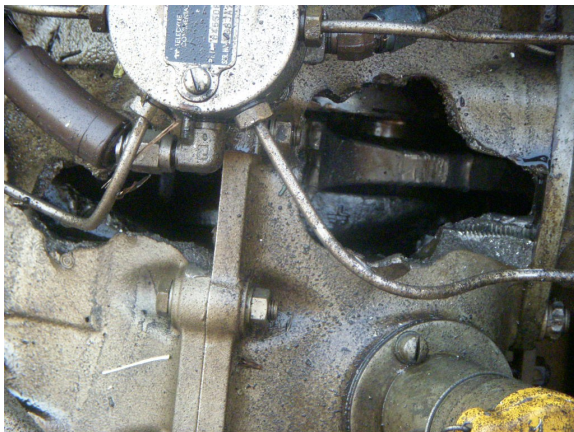
The rear fuselage section was partly detached from the main fuselage as a result of the right horizontal stabilizer colliding with a tree. The engine also separated from its mounting points but remained held on to the aircraft by cables.

The wind shield broke into large pieces on collision with the vegetation. However, these pieces did not cause injuries to the occupants.

### *The engine*

The damage to the propeller indicated that the engine was inoperative at the time of impact with the terrain. The engine was itself partially separated from the aircraft as a result of one propeller blade digging in when the aircraft was turning.

The engine, a factory re-manufactured Teledyne Continental Motors IO-550-F21B serial number 100138, had a time between overhaul of 1,700 hours. It was fitted on 5H-MVI on 4 June 2009. At the time of the accident it had done 868 hours.



Punctured crank case



Propeller blade – no power indication

The engine crank case was found splattered with engine oil on the top surface. The crank case was punctured near cylinders number 4 and number 3. The bigger hole in the crank case was found in the position of the No.4 cylinder. This appeared to have been caused by the failure of the connecting rod number 4. The connecting-rod failed at the big end bearing. The oil filter was found to contain metal particles that were typical of bearing failure.

### *The Graphic Engine Monitor*

The aircraft was equipped with an Insight Instrument Graphic Engine Analyzer (GEA) STC No. SA 157NE. The equipment was retrieved from the wreckage and the contents of its memory downloaded on a computer at the company aircraft maintenance organization in Dodoma.

The readings of the exhaust gas temperature (EGT) of the number 4 cylinder showed very low values (32°C) for the first 4 minutes followed by a sudden rise to abnormally high temperature of 1,529°C (45% above average temperature for the remaining five cylinders) lasting for only a few seconds. The temperature subsequently dropped by approximately 12% below the average value of the remaining 5 cylinders where it consistently stayed till the time when temperatures for the 5 cylinders started going down. The cylinder number four EGT also started going down simultaneously for 3 seconds after which it suddenly rose to 1,435°C and then rapidly fell to 41°C in a few seconds. The EGT then remained at 41°C for 6 minutes until the engine stopped. This pattern is repeated in a number of previous flights.

### *Management of engine oil*

The aircraft Technical log book shows that the engine oil level was 9 quarts after the last check on 17 July 2010 when the engine oil was changed. The type of engine oil used was Shell W120. The Technical log book shows that there were 9 quarts still remaining on 20 July 2010. At that time the aircraft had since flown 11.2 hours. On 22 July 2010 there were 6 quarts remaining and the aircraft had flown 10 more hours. On 23 July 2010 one quart was added for a total of 7 quarts and 5H-MVI had flown 1.7 hours.

On 26 July 2010 the engine oil level had reduced to 6 quarts after flying for a total of 4.8 hours. Four flights were made on 26 July 2010 covering a total of 4.8 hours. On 27 July 2010 one quart was added bringing the oil level to 6 quarts. This should imply that 5 quarts were remaining before the top up.

On 27 July 2010 the aircraft made 5 flights logging a total of 3.9 hours. According to the pilot, one quart was added on 28 July 2010, raising the oil level to 7 quarts.

The company Standard Operating Procedures (SOP) Walk Around checks for the Cessna U206G requires pilots to ensure that there is a minimum of 7 quarts – 8 quarts for long flights. The operator said they arrived at these figures as a result of experience.

The Pilot's Operating Handbook (POH) for the Cessna 206G states that the capacity of the oil sump is 12 quarts [a further 1 quart is contained in the oil filler]. It further says "Do not operate on less than 9 quarts".

The Cessna 206 POH also states that: To minimize loss of oil through breather, fill to 10 quart level for normal flights of less than 3 hours. For extended flight, fill to 12 quarts.

### **The weather**

It was reported to be a bright sunny day. The weather does not appear to be a factor in this accident.

### **The crash site**

The aircraft force landed in the middle of a tropical rain forest located inside the Mikumi National Park at around 315 pm local time (1215 hours UTC). The area around the crash site had tall trees and tall, dry elephant grass. The aircraft was resting on top of a ridge at the edge of a deep valley.

It was feared that the three survivors of the accident stood a risk of being attacked by wild animals. The pilot said that no animals were visible during the daylight hours. However, sounds of hyenas were heard within a distance of about 200 metres during the night. The three survivors lit a fire using the parts of trees broken by the aircraft in the accident sequence and one of the aircraft tyres. The purpose of the fire was to scare away wild animals and also to keep them warm during the cold night.

## **Rescue operation**

The pilot made a *May Day* call at 1212 hours on 118.2 MHz and gave his position as 40 miles south of Morogoro. He also called on 121.5 MHz and 122.22 MHz before switching back to 118.2 MHz. No aircraft responded. However, the transmission was picked by the Kiba Lodge in the Selous National Park who raised Coastal Travel Services, Dar es Salaam on the HF radio.

The operator subsequently arranged a rescue operation from Matambwe Camp in the Selous. The rescue party sent by the Matambwe Camp shortly after the accident failed to locate the aircraft. This was because the GPS co-ordinates supplied by the pilot were not accurate. The pilot himself said that his GPS did not give accurate results because it had no antenna and therefore could not capture enough satellites for the calculation of the exact coordinates of the crash site.

The position given by the accident pilot was 780 metres N 133° 22' S of the actual location of the crash site. The thick vegetation and the undulating terrain of the area did not allow good visibility.

On the following day another rescue party was dispatched. They arrived at the given GPS position but also failed to see the wreckage and the survivors. They decided to make loud calls and they heard human voices replying to the calls.

## **Remarks**

The force landing inside a forest was necessitated by the engine stoppage in flight. The engine was found to have seized due to lubrication failure. The in-flight engine seizure was initiated by the fracture of the number 4 connecting rod. The connecting rod appears to have fractured at the big end as a result of bearing failure.

Physical examination of the failed parts and the oil filter point to the number 4 crank shaft bearing failure from over temperature. In the circumstances, over temperature could have occurred as a result of oil starvation.

The Engine Graphic Analyzer shows signs of distress in the number 4 cylinder during the accident flight and also during number of previous flights. The distress was evident in the noticeably low exhaust gas temperatures during cruise as well as the exhaust gas temperature excursions during climb and descent.

## **Further work**

Further investigations into the circumstances of the accident are continuing and interim reports will be issued. The final report will be issued and made public with permission from the Minister of Infrastructure Development.