

AIRCRAFT ACCIDENT REPORT NO. CAV/ACC/5/89

Aircraft type : Cessna 310 H

Nationality and  
Registration Marks : 5H - CCA

Engines : Two Continental IO-470-D Engines

Registered Owner : Cross Country Aviation Ltd  
P.O. Box 3911  
Dar es Salaam Tanzania

Operator : Same as registered Owner

Pilot : One - Seriously injured

Passengers : Three - Seriously injured

Place of Accident : Malongwe Railway Station  
Tabora Region, Tanzania  
( 30° 40'E, 5° 30'S )

Date and Time : 5 September 1989 at about 0700 Hours

ALL TIMES IN THIS REPORT ARE UTC

MINISTRY OF COMMUNICATION & WORKS  
ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT NO. CAV/ACC/5/89

REPORT ON THE ACCIDENT TO CESSNA 310H AIRCRAFT REGISTRATION  
5H-CCA WHICH OCCURRED NEAR MALONGWE RAILWAY STATION, TABORA  
ON 5 SEPTEMBER 1989.

(30° 40'E, 5 30's)

## SYNOPSIS

The aircraft was operating a charter flight from Dar es Salaam to Tabora. It took off from Dar es Salaam at 0415 hours and the estimated time of arrival was 0623 hours. The initial phase of the flight was uneventful. The pilot reported that he flew at 12,500 feet (3,800 metres) till he was about 10 minutes from destination when he descended to 8,500 feet (2,600 metres) and was then expecting to see Tabora. When Tabora was not sighted then, he changed course and flew in a reciprocal direction till Tura airstrip was sighted. He subsequently made a U-turn and flew along the Central Railway Line. When 5H-CCA was 10-15 minutes from Tura the left engine stopped. The pilot decided to turn back again for an emergency landing at Tura airstrip. The aircraft started losing altitude while flying on one engine. It crashed in a savannah forest near Malongwe railway station. The aircraft was completely destroyed and all occupants sustained serious injuries. There was no fire.

### 1. FACTUAL INFORMATION

#### 1.1. History of the flight

On September 5, 1989 the aircraft took off from Dar es Salaam International Airport at 0415 hours. It was operating a charter flight to Tabora, carrying three passengers and one pilot. The estimated time of arrival (ETA) at Tabora was 0623 hours. Its endurance was five hours. The initial phase of the flight was uneventful. At 0528 hours the aircraft raised Dodoma and reported OPS normal. The pilot reported that he flew at 12,500 feet (3,800 m) till his time reference gave about 10 minutes from destination when he broke cloud and descended to 8,500 ft. (2,600m). At this time he was expecting to see Tabora. He said that he maintained his heading for about five to ten minutes past his ETA but Tabora was not sighted. One passenger, who was seating behind him said that the pilot asked him whether he knew Tabora. However, none of the passengers (all of whom knew Tabora) had seen the town. Referring to an airstrip which was sighted a few minutes before, the pilot subsequently told the passengers that there were two airstrips in the region one located before Tabora - which is which?

According to the passenger, the pilot made a U-turn at about 0630 hours and flew in the opposite direction along the central railway line. The passenger then asked the pilot about his intentions but he remained quiet.

When Tura airstrip was in sight the passenger informed the pilot that the airstrip was not Tabora. The pilot subsequently made a U-turn and flew along the central railway line.

One of the passengers advised the pilot that he knew Tabora very well and would advise when Tabora is sighted.

The flight went on normally for about 10 minutes when the pilot made yet another U-turn. The passengers an explanation as to whether something was wrong. The pilot remained quiet and was seen busy manipulating a knob on the floor. At about 0640 hours he told the passengers that the fuel gauge of the left tank was dropping fast. At this time the occupants started smelling fuel in the cabin. The left engine stopped shortly afterwards. The pilot told the passengers that he was proceeding back to Tura airstrip for an emergency landing following the engine failure.

One passenger expressed concern to the pilot that the aircraft was losing height very rapidly and might not reach Tura after all. The pilot maintained that he would make it to the airstrip. When an open space was seen near the railway line at Malongwe the passenger requested the pilot to force-land there. There was no reply. However, when the aircraft and just passed this open space a stall warning horn was heard. The pilot initiated a left turn with the intention of landing on what looked like a maize field. The aircraft had turned through 120 degrees when it started hitting trees. It came down in a savannah forest 2.5 kilometres North East of Malongwe railway station.

There was no fire but the aircraft was completely destroyed by impact with trees and the ground. All the four occupants were seriously injured.

## 2. Injuries to Persons

UNJURIES	CREW	PASSENGERS	OTHERS
Fatal	-	-	-
Serious	1	3	-
None	-	-	N/A

### 1.3. Damage to Aircraft

The aircraft was completely destroyed.

### 1.4. Other Damages

Nil

**1.5. Personnel Information.**

The pilot was born on 30 December, 1957 at Kabale, Uganda. He held a Tanzania Commercial Pilot's Licence (CPL) No. HP 277 which was granted on February 8, 1986 on the strength of his Ugandan equivalent Licence No. X - 302.

The Licence expired for about one year but was renewed in 1989 and was to expire on 3 May 1990.

He also held a Radio Licence No. H-533 which was kept current in line with his CPL. He was rated to fly Cessna 172 and Cessna 310 in group one.

In his latest application for renewal of his licence he claimed to have a total experience of 2,248 hours 40 minutes, broken down as follows;

P.	1	day	1988.20	hours
P.	1	night	114.55	hours
P.	3	day	143.25	hours
P.	3	night	02.00	hours

His experience on Cessna 310 in 1986 when he applied for the CPL was 8.50 hours in command and 143.25 hours as P3 (student).

**1.6. Aircraft Information**

The aircraft, a Cessna 310H serial No. 310H 0067 powered by two Continental IO-470D engines was manufactured by the Cessna Aircraft Company at Wichita Kansas, U.S.A. in 1963. It arrived in Tanzania on 20 February 1989 with a Swazi Registration 3D-GAB which was changed to a Tanzanian registration 5H-CCA in the name of Cross Country Aviation Ltd. A local certificate of airworthiness No. 272 was granted on 8 April, 1989 to expire on 7 April 1990. The aircraft was being operated in accordance with FAA approved Cessna 310H Owners Manual in Public Transport category.

**1.7. The Weather**

It was a bright sunny day with temperatures about 26°C. The pilot reported that the cloud base enroute was about 10,000 feet (3,000 metres). The weather had no bearing on this accident.

**1.8. Aids to Navigation**

There is an NDB at Tabora airport. This was unserviceable at the time of the accident.

9. **Communications**

5H-CCA made the normal communications with the Dar es Salaam Tower on 118.1 MHz during take off and climb out. At 0528 hours the aircraft raised Dodoma Tower and reported OPS normal and gave its estimated time of arrival at Tabora as 0623 hours.

The pilot reported that he subsequently tried to raise Tabora on 123.3MHz to no avail. he transmitted distress message on this frequency but there was no reply from the Tabora Tower.

At 0745 hours the Tabora Tower raised Dodoma on the tie line and advised that there was difficulty in raising Dodoma. The Dodoma Tower confirmed this and said that when Dar es Salaam is speaking to Mwanza or Comm. It was not easy to notice another call on the switch board.

At this time the Dodoma Tower put Tabora through to ACC. ACC were asking whether 5H-CCA had landed at Tabora. When it was established that 5H-CCA had not landed, the Tabora Tower contacted Dodoma and Mwanza at 0747 hours. It was then that 5H-CCA was declared missing. At 0800 hours the Tabora Tower passed the message on to the police signals as well as the Tanzania Railways Corporation. At 0822 hours the Tabora Tower transmitted an alert signal to ACC, CATS, Mwanza, Dodoma and Dar Tower, with reference ATC 529.

At 0838 hours, the Railways District Traffic Manager 9Tabora0 advised the Tower that an aircraft, registration 5H-CCA had crashed near M longwe Railway Station and all the four occupants had been injured, one of them bleeding profusely. He also advised that arrangements were being made to take them to a nearby dispensary.

1.10. **Aerodrome Information**

Not applicable

1.11. **Flight Recorders**

Not required by regulations  
None fitted.

1.12. **Wreckage Information**

The aircraft came down virtually in one piece and was upside down. The right engine and the right main fuel tank had separated as a result of impact with a nearby tree and were a few metres away from the main wreckage.

The left main gear leg was down and locked while the right main gear leg was folded about three - quarters of the way. The wings, having taken most of the impact forces, were completely destroyed. However, there was fuel spilling out of the right reserve tank by the time the inspector arrived at the scene of the accident on 7 September, 1989.

Both propellers had their blades bent backwards indicating that they were not under power at the time of impact.

**1.13. Fire**

There was no fire.

**1.14. Survival Aspects**

According to the pilot and the passengers, the aircraft was flying at stalling speed when it first made contact with tree tops at Malongwe. The stall warning horn was on at this time frightening the passengers.

One passenger said that the pilot made effort to steer the aircraft in between the trees. It was evident from examination of wreckage that the most severe impact with the trees was taken by the right wing. The left wing also showed signs of impact damage. The fuselage took less severe impact loads. There was relatively little damage to the cabin. This was a crucial factor behind the survival of the occupants. The occupants sustained face, shoulder and arm injuries which were consistent with being shot sideways and forward on impact.

The pilot opened the door immediately before impact with the trees and was the first to get out of the wreckage. He said that two passengers who were in the middle seats were probably thrown out of the wreckage by impact forces. One passenger who was alone in the back seat was unconscious. He was extricated by the pilot.

One old man who was in the vicinity brought a bed to the wreckage on which they took the unconscious survivor to his own house. This old man had sent a message to the nearby railway station and dispensary when he saw the aircraft crashing. The nearby villagers rushed to his house and transported the wounded survivors to the dispensary on bicycles. The four survivors were first treated at the Malongwe dispensary and were later put on a rail car for transport to Tabora.

When the Tabora railway station was advised by the Tura station of the accident, the Station Master immediately arranged for a doctor from the Tabora Regional Hospital to proceed to Tura on a special wagon. When the two transports met, the survivors were transferred to the wagon.

The doctor said one person was about to die of excess bleeding when he received blood transfusion on the wagon. The pilot was also in critical condition. The four were first admitted at Tabora and were later referred to the Muhimbili Medical Centre in Dar es Salaam for further treatment.

It would look therefore that the survival of some of the occupants was partly due to the efficient rescue operation mounted by the villagers at Malongwe and partly due to the well co-ordinated communications and rescue effort of the Tanzania Railways Corporation.

The aircraft was equipped with lap straps on its six seats. There were no upper diagonal torsos. Two seats failed on impact and were torn from the floor. One of these belonged to the pilot and the other was the number two seat in the middle row. The passenger in the rear seat does not appear to have been strapped in his seat. He suffered serious head injuries. He was still complaining of forgetfulness five months after the accident.

#### 1.15. Tests and Research

The aircraft fuel system was retrieved for examination. parts of fuel lines routed through the wings were severely damaged while some others were not recovered from the crash site. No defects were found in those parts which were examined. The two engines were also examined in Dar es Salaam. No defects were found.

#### 2. ANALYSIS

5H-CCA took off from Dar es Salaam at 0415 hours. The pilot had calculated his ETA (Estimated Time of Arrival) at Tabora as 0623 hours. This should give his flying time as 2 hours 8 minutes. The route chosen covered a distance of about 405 n.m.\* (nautical miles). At 0528 hours he raised the Dodoma Tower on its own frequency and reported OPS normal. He advised Dodoma that his EAT at Tabora was 0623 hours.

The Dodoma Tower estimated that he was abeam Dodoma at about 0540 hours.

On his chosen route, Dodoma is 220 n.m. from Dar es Salaam. Since this distance was covered in 1:25 hours (1.4167 hours), then the average ground speed should have been 155 kt (nautical miles per hours). Given this average speed, the remaining distance (Dodoma - Tabora) of 185 n.m. should have been covered in 1:12 hours (72 minutes), which should give an ETA at Tabora of 0652 hours. However, from the information collected from the Dodoma Tower, the pilot did not revise his ETA.

He therefore expected to reach Tabora in about 43 minutes i.e. at 0623 hours as registered with the Dar es Salaam Tower. Indeed this appears to be the reason why he descended on Tura while he thought he was descending on Tabora. Tura airstrip is along the central railway line and near Tura railway station. It is located 120 n.m. west of Dodoma. This distance should have been covered in 46 minutes given that 5H-CCA was averaging 155 kt.

In order to estimate how far 5H-CCA was from Tabora when the first U-turn was executed, the testimony of one eyewitness was evaluated.

This eye witness who was near Malongwe railway station said that the aircraft flew overhead in the direction of Tabora. 20 minutes later it flew overhead again in the opposite direction. On a basic assumption that 5H-CCA flew the forward and return legs in equal times, the aircraft should have flown for 10 minutes in the direction of Tabora.

At the average ground speed of 155 kt the aircraft should have executed a U-turn when it was 25 n.m. west of Malongwe railway station. This position is about 28 n.m. (52 km) east of Tabora (see Appendix).

Most of the components of the fuel system were recovered. It was, however, not possible to retrieve some parts of the fuel lines which were routed through the wings. This was partly due to the complete destruction of the wings and partly because the wreckage had been tampered with before security was provided at the crash site.

Examination of the parts of the fuel system which were recovered did not reveal any unserviceabilities which could have accounted for the loss of fuel in flight.

Fuel was found in the right reserve tank. It was still spilling out slowly two days after the accident.

There was no fuel in the left reserve tank. The left main tank was completely destroyed by impact. When the right wing hit a large tree, the right main tank sheared off its wing tip attachment points and was projected ahead of the main wreckage. And so was the right engine.

On impact with the tree the right engine broke off its mountings because of its high mass (175 kg). The right main tank has a capacity of 51 US gallons (193 litres). To have projected itself ahead of the main wreckage, the right tank should have been heavy which implies that it should have been carrying a substantial fuel load.

In order to explain the loss of fuel from the left main tank and the subsequent left engine failure two theories were considered.

The first theory was that since there was fuel in both tanks of the right wing, the aircraft may have been using fuel from the left wing tanks only. This theory is supported by the fact that since the left engine stopped at 0645 hours, i.e. after 2:30 hours flying time while the aircraft endurance was five hours, then the left tank (which contained 2:30 hours fuel) may have been at the point of exhaustion at 0645 hours.

The smell of fuel may have occurred as a result of fuel running out in the left tank. However, one passenger who had been watching both fuel gauges in flight, said the two gauges were working and both had dropped to around 30 when the pilot started complaining of rapid fuel flow on the left gauge.

The second theory was the possibility of a fuel leak on a fuel line inside the left wing. The components of the fuel system retrieved from the wreckage were examined. There were no signs of precrash failure. However, some parts of the fuel lines were not recovered for conclusive examination.

There is evidence that fuel crossfeeding was attempted in an effort to re-start the left engine. Passengers testified to have seen the pilot manipulating the fuel selector on the floor. The pilot reported that the crossfeed system failed to function when it was activated. There was, however, no entry in the aircraft techlog which indicated the unserviceability of the system. The left tank hooster pump was found in the "OFF" position while the right booster pump was in the "ON" position. If these were the positions of booster pump switches when fuel crossfeeding was attempted, then it could not have been be easy to re-start the left engine. The pilot said that he tried to activate the crossfeed system using the left booster pump without success and he switched off both pumps when he realised that impact was imminent. The wreckage had been tampered with and no reliance could be placed on the positions of switches and controls on the flight deck.

The pilot tried unsuccessfully to raise Tabora on 123.3 MHz. This was because the Tabora Tower was not manned till 0700 hours. There was only one controller in Tabora who was sick. He had first to go to hospital and had then to walk about 15 kilometres to the airport.

Even if the Tower had been manned at the material time, it is questionable whether it would have made any difference at all. Power supply was intermittent in Tabora. The airport standby generator was unserviceable. The teleprinter was also unserviceable.

The left engine stopped when the aircraft was flying at 8,500 feet above sea level. The aircraft was flown on one engine but could not maintain height. It remained airborne for about 15 minutes before hitting tree tops at Malongwe whose elevation is 3,900 feet. While regulations require a twin-engined aircraft to be capable of flying on one engine, experience has shown that single engine controllability is marginal on aircraft of this transport category. The high elevation of Malongwe (3,900 feet or 1,200 metres) did not help matters along.

### 3. CONCLUSIONS

#### (a) Findings

1. The pilot was properly licenced to undertake the flight.
2. The aircraft was properly maintained and its documents were in order.
3. The pilot failed to revise his estimated time of arrival as he flew abeam Dodoma.
4. The left engine stopped in flight, possibly due to fuel starvation.
5. The aircraft could not maintain height on a single engine for the flight to Tura airstrip.

#### (b) Cause

The aircraft hit trees when it failed to maintain height on one engine for the flight to Tura airstrip.

#### (c) Contributory Factors

- (i) The pilot's failure to revise his ETA after sighting landmarks on his route.
- (ii) The pilot's failure to execute a forced landing on open spaces when height could not be maintained for the flight to Tura.

(iii) The unserviceable navigation equipment at Tabora.

4. **SAFETY RECOMMENDATIONS**

- (1) DCA should make it mandatory for operators of light aircraft to install upper diagonal torsos on aircraft seats.
  - (2) Navigation aids at Tabora should be reactivated and maintained.
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\* 1 nautical mile = 1.1516 statute miles  
= 1.8529 kilometres



C. M. Newa

**CHIEF INSPECTOR OF ACCIDENTS**

APPENDIX

5H - CCA ACCIDENT AT MALONGWE

