

MINISTRY OF COMMUNICATIONS AND WORKS
ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT NO. CAV/ACC/6/84

REPORT ON THE ACCIDENT TO PIPER PA 32-300
CHEROKEE AIRCRAFT REGISTRATION 5H-MOE
WHICH OCCURRED AT KIWALANI 1 KM SHORT OF
RUNWAY 23 OF THE DAR ES SALAAM
INTERNATIONAL AIRPORT, TANZANIA
(06° 20'S, 20° 35'E)

AIRCRAFT ACCIDENT REPORT NO. CAV/ACC/6/84

AIRCRAFT TYPE : PIPER PA 32-300 CHEROKEE
NATIONALITY AND REGI- : 5H-MOE
STATION MARKS :
ENGINES : ONE LYCOMING IO-540 KIAS
REGISTERED OWNER : TANZANIA AIR SERVICES,
P.O. BOX 364,
DAR ES SALAAM,
TANZANIA.
OPERATOR : SAME AS REGISTERED OWNER
CREW PILOT : ONE - KILLED
MAINTENANCE CREW : ONE - KILLED
PASSENGERS : NIL
PLACE OF ACCIDENT : KIWALANI, 1 KM SHORT OF RUNWAY 23 OF
DAR ES SALAAM INTERNATIONAL AIRPORT
(06° 20'S 20° 35'E)
DATE : 21ST AUGUST, 1984
TIME : 12:51 HOURS

ALL TIMES IN THIS REPORT ARE GMT

SYNOPSIS :

The aircraft was making an air test following a repair on the engine oil cooler. Just over four minutes after take off the pilot reported a complete engine failure and advised the Tower that he was executing a forced landing. While descending for the forced landing on a grass field the aircraft hit a coconut tree and crashed killing the two occupants - the pilot and the maintenance engineer. There was no fire but the aircraft was completely destroyed by impact with the ground.

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1. FACTUAL INFORMATION

1.1 History of the Flight :

Following a repair on the engine oil cooler and a successful ground run at the company base in Dar es Salaam, it was decided to take 5H-MOE on an air test.

The aircraft, with a company pilot and one maintenance crew member taxied to the threshold of runway 23 and was cleared for take-off at 12:46:38 hrs. Take-off run was initiated at 12:46:42 hrs. Just over three minutes later when the aircraft was already airborne, the pilot requested an immediate return to the airfield. He subsequently reported a "complete engine failure".

One observer who was in the compound of a garments factory heard an unusual aircraft engine sound. According to this observer, the engine misfired for a short while and stopped. He saw the aircraft descending and as it did so, the starboard wing hit the top section of a coconut tree and crashed in the vicinity. There was no fire.

The pilot of a light aircraft which was in the area heard the distress transmission from 5H-MOE and saw a Piper Cherokee gliding with a high rate of sink before it finally crashed. He circled the area of the accident in order to direct rescue teams.

1.2 Injuries to Persons :

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	2	NIL	N/A
Serious	NIL	NIL	N/A
None	-	-	-

1.3 Damage to Aircraft :

The aircraft was completely destroyed by impact.

1.4 Other Damage :

The top seven feet of the coconut tree were chopped off by the starboard wing of the aircraft.

1.5

Personnel Information :

The pilot was born in Kahama, Tanzania on October 10th, 1948. He held a Commercial Pilot's Licence No. PH-242 granted on April 2nd, 1984 which was valid till January 8th, 1985. At the time of the accident he claimed a total experience of 937 hours broken down as follows :

Hours in Command	-	525
Hours under Instruction	-	404
Total experience on PA-300	-	8

1.6

Aircraft Information :

The aircraft, a Piper PA 32-300 Cherokee Serial No. 32-40506 powered by one Lycoming 10-540 KIAS engine was manufactured by Piper Aircraft Corporation at Lockhaven, Pennsylvania, USA in 1968. It arrived in East Africa in the same year under a U.S. Registration N4179R in the name of Tim Air Charters, Box 804 Dar es Salaam on February 14, 1969. On February 27, 1978 the ownership was transferred to Tanzanian Air Services Ltd.

The aircraft was granted a local Certificate of Airworthiness No. 18 in the Public Transport (passenger) category on February 27, 1970 which has since been kept current. By the time of the accident its C of A was valid till October 25, 1984.

5H-MOE was involved in an accident at Msembe airstrip on June 4, 1974. It overran the airstrip and the starboard wing hit a tree.

1.6.1

Loading and C of G Disposition :

The aircraft C of G was within the allowed limits.

1.6.2

The Engine Oil Cooler :

Two days prior to the accident 5H-MOE landed at Tanga airport with signs of oil leakage under the engine cowlings. Examination of engine revealed a crack on the engine oil cooler. A fresh supply of engine oil was brought in from the company base in Dar es Salaam and the aircraft was flown to Dar es Salaam.

The crack was subsequent sealed by means of an ARALDITE - type adhesive on August 20, 1984. On the following day the engineer who refitted the oil cooler to 5H-MOE requested for a pilot to test fly the aircraft after performing a bench pressure test on the cooler as well as a successful ground engine run.

1.7 Meteorological Information :

It had been a bright sunny day. The weather is not considered as a factor in this accident.

1.8 Communications :

5H-MOE initiated communications with the Dar es Salaam Control Tower on 118.3 MHz at 12:35:57 hours. It was cleared for take-off from runway 23 and at 12:46 hours the pilot radioed "Oscar Echo rolling".

At 12:50:03 hours when the aircraft was already airborne the pilot requested immediate return to the airfield. The Tower advised the pilot to report back when he reached the left base of runway 23 and also warned of a Piper Navajo which was then making a left turn out proceeding to the South-East. At 12:50:16 hours 5H-MOE reported that it was near left base of runway 23. Thirty eight seconds later 5H-MOE reported complete engine failure and advised the Tower that it was force landing. At 12:51:40 hours another aircraft, 5H-TIB, which was in the area advised the Tower that 5H-MOE had crashed. The Tower subsequently acknowledged that 5H-MOE was on sight and it was then calling the fire brigade.

1.9 Aerodrome Information :

Not applicable.

1.10 Flight Recorders :

Not required by regulations. None fitted.

1.11 Wreckage Information

1.11.1 Distribution of the Wreckage :

The Acting Chief Inspector of Accidents arrived at the scene of the accident at 12:55 hours but was denied access to the wreckage by the policeman on guard.

When access was allowed on the following day, the Inspector found the wreckage confined to an area approximately 70m x 30m in a 300° direction. Both wings had detached and the main wreckage was lying 30 metres ahead of the point of the main impact. The outer portion of the starboard main plane trailed the scattered pieces of the wreckage. There was no fire damage. Fuel was still in the tanks.

1.11.2 Accident Site :

The aircraft crashed inside a fenced compound of a Garments Factory about 900 metres from the threshold of Runway 23 of Dar es Salaam International Airport. The rectangular compound measuring about 100 metres by 50 metres was flat with a hard dry surface.

There were a number of coconut trees on the eastern end of the compound and the surrounding area.

1.11.3 Airframe :

The starboard wing of the aircraft struck a coconut tree about half way from the wing root and broke into two parts along this wing station. The last two metres of a 30-metre tall coconut tree were sheared off by the impact with the wing. The outboard end of the wing trailed the whole wreckage while the rear section of the fuselage including the tail and tail cone lay in front of the wreckage and sustained little damage. The starboard wing also detached on impact and was found 40 metres to the right of the main wreckage.

1.11.4 Engine :

The engine and propeller became detached as a unit. The rear outer sections of the engine were littered with engine oil. The propeller showed no evidence of power on impact. The engine oil cooler, which was recovered intact, showed signs of repair that had ruptured.

A strip examination of the engine was carried out and detailed examination revealed that the engine had seized due to oil starvation. The No.1 connecting rod, which appeared to have been on a compression stroke when the engine seized, was found broken and burnt. The big end bearings and the crank shaft mounting bearings had been ground to thin metal sheets and burnt. Examination of the oil cooler revealed an opening, about 1mm by 4mm near the inlet end. There were signs of ruptured repair work around this opening. It is probably through this opening that engine oil escaped.

1.11.5 The Oil Cooler :

The oil cooler was initially reported to have a tiny crack near the inlet end through which oil was leaking. The crack was examined and found small enough to be acceptable for a ferry flight from Tanga to the company maintenance base in Dar es Salaam. In fact 5H-MOE made the one-hour flight and landed uneventfully at Dar es Salaam where the crack was sealed using an adhesive.

However, after the accident the cooler was observed to have a four-square millimetre opening at the point where the crack was previously observed and the adhesive applied.

1.12 Medical and Pathological Information :

No medical evidence was found to account for the accident. The pilot and the maintenance engineer died from multiple fractures and severe lacerations sustained in the accident.

1.13 Fire :

There was no fire.

1.14 Survival Aspects :

The pilot was alive when he was removed from the wreckage but died on the way to hospital. The engineer who was occupying the right hand seat was found dead by the rescue team which arrived shortly after the accident. This was not a survivable accident.

1.15 Test and Research :

An engine strip examination showed that it had seized due to oil starvation. Engine oil had escaped through an opening in the oil cooler which had been sealed using an adhesive material. The adhesive seal appeared to have given way in flight.

2. ANALYSIS :

The aircraft had been airborne for about three minutes when it developed engine trouble and requested an immediate return to the airfield. Fifty-one seconds later it reported engine failure and advised the Tower that it was force-landing. It would appear therefore that the attempted force-landing was necessitated by the loss of power.

An engine strip examination was therefore carried out to determine the possible cause of engine failure. In the course of the examination it was found that the engine bearings and a connecting rod had failed and burnt due to oil starvation. It was considered that lubricating oil might have escaped through an opening near the inlet end of the engine oil cooler. The oil cooler had shown signs of leakage two days prior to the accident. In fact the aircraft flew for an hour to Dar es Salaam after a fresh supply of engine oil was brought in.

At the company base in Dar es Salaam the area of leakage was sealed with an arildite-type adhesive whose trade name was STABILIT ULTRA (manufactured by Henkel Company in Dusseldorf, West Germany).

This adhesive is normally used in aircraft on non-load carrying components. The engine oil cooler carries oil pressure, thermal and vibration loads. The normal working oil pressure on this Lycoming Engine varies between 75 and 85 pounds per square inch. The oil temperature is normally between 165^o-230^oF

From the maintenance point of view, a defective oil cooler must be replaced by a serviceable unit. Alternatively, the defective cooler could be sent to the manufacturers or an approved overhaul organization for re-conditioning.

The initial rate of oil leakage should have been very small compared to that obtaining on the accident flight. It is considered that the crack on the oil cooler had been expanded into a substantial opening when it was stop drilled and sealed.

3. CONCLUSION :

(a) Findings :

1. The pilot was properly licensed to undertake the flight.
2. The aircraft documents were in order.
3. A non-standard and unacceptable repair was made on the oil cooler.
4. The engine seized in flight due to oil starvation. Engine oil was probably lost when the adhesive seal on the opening at the inlet end of the oil cooler gave way.
5. The aircraft hit a tree and crashed in an attempted force landing on a grass field.

(b) Cause :

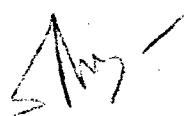
The accident was caused by the aircraft hitting a tree during an attempted force-landing on a grass field.

(c) Contributory Factors :

The force landing was made necessary by the engine failure.

4. RECOMMENDATIONS :

The operator should formulate regulations governing the experience of crew chosen to carry out test flights.



C. Nawa
CHIEF INSPECTOR OF ACCIDENTS