

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT REPORT CAV/ACC/1/77

AIRCRAFT: TYPE: PIPER PA 30 TWIN COMMANCHE
ENGINE: LYCOMING 10-360BIA
REGISTERED OWNER: TANZANIAN POLICE AIR WING -DAR ESSALAAM
OPERATOR: TANZANIAN POLICE AIR WING - " "
PILOT: CAPTAIN M.I. VUZO (SENIOR SUPERINTE-
NDENT OF POLICE) - INJURED.
PASSENGERS: THREE - INJURED
PLACE OF ACCIDENT: BUMBA VILLAGE, NEAR KIBITI
LONGITUDE 38°45' SOUTH, LATITUDE 8°
EAST
DATE AND TIME: 10TH FEBRUARY, 1977 AT 1300 HOURS

ALL TIMES IN THIS REPORT ARE GMT

SUMMARY

After refuelling in Dar es Salaam at the end of an early morning flight from Kilimanjaro Airport via Arusha, the aircraft had undertaken an uneventful flight from Dar es Salaam to Liwale. The return flight to Dar es Salaam was airborne Liwale at 1200 hours and was estimated to land in Dar es Salaam at 1330 hours. At approximately 1250 hours, the starboard engine began to malfunction. This engine lost a considerable amount of power followed later by loss of power to port engine, subsequent to which the pilot decided to make an emergency landing in a field four miles to his right.

While turning to the right, the aircraft stalled, entered a spin and crashed in the forest injuring all the four occupants.

1. INVESTIGATION

1.1. History of the Flight:

The previous day 9th February, 1977 this aircraft was flown to Kilimanjaro by Captain Vuzo to position for an early morning flight to Dar es Salaam via Arusha on 10th February, 1977. The purpose of this flight was to transport Tanzanian Police Air Wing Engineers from Arusha to Dar es Salaam.

The aircraft departed from Kilimanjaro at 0330 hours on the 10th February, 1977 and arrived in Arusha fifteen minutes later. Departure from Arusha was at 0415 hours arriving Dar es Salaam at 0615 hours; during this flight to Dar es Salaam, the right engine spluttered - this defect was quickly cleared by the pilot adjusting the right tanks' fuel selector.

In Dar es Salaam the aircraft was refuelled and prepared for Dar es Salaam - Liwale - Dar es Salaam round trip. The southern leg was uneventful. After fulfilling their duties in Liwale which involved inspection of a Tanzanian Police Airwing helicopter, the crew and the engineers (passengers) boarded the aircraft and were airborne Liwale by 1200 hours. Fifty minutes later the starboard engine became rough - this time the pilot was unable to clear the fault even by crossfeeding the engine from the left tank. The engine lost a considerable amount of power quickly but smoothly down to 1300 rpm. When a little while later the port engine also began to lose power, the pilot decided to carry out an emergency landing in a swampy field four miles to his right. While turning the aircraft to the right at an altitude of approximately four hundred feet above ground level, the aircraft stalled and entered a spin before recovery action could be effected. The spin continued until the aircraft hit trees and crashed in the forest sustaining substantial damage and injuring all four occupants.

1.2 Injuries to Persons:

<u>Fatal</u>	<u>Crew</u>	<u>Passengers</u>	<u>others</u>
Fatal	-	-	-
Serious Injury	1	3	-
Injured	-	-	-
Non-Injury	-	-	-

1.3. Damage to Aircraft:

The aircraft was damaged beyond economic repair. Other than the two engines, the vertical fin and rudder surfaces plus a few components, the aircraft is considered a total loss.

1.4. Other Damage:

The aircraft destroyed some trees in the forest as it tore its way to the ground below.

1.5. Crew Information:

Prior to entering service of the Tanzanian Police Air Wing, Captain Vuzo - a Tanzanian National - was employed by East African Airways Corporation as a pilot. Captain Vuzo qualified for Airline Transport Pilot's Licence and was issued with East African ATPL No.1561 (K.1403) on 10th February, 1975. The Licence was renewed for six months on 28th September, 1976. He was rated for the following groups.

Group 1 Piper PA 28 and PA 32.

Group 11. Douglas DC3 and Fokker F27-200 Series.

At the time of this accident he also held a valid East African Radio Transmitter's Licence No.2051 (K.1506) and Private Pilot's Licence on which he was flying PA 30 for Police duties.

His flying experience at the last Licence renewal comprised a total of 3,831 hours made up as given below:-

P1 Day 1208 hours	P1 Night 121 hours
P2 Day 2002 hours	P2 Night 500 hours

1.6. Aircraft Information:

The aircraft, a Piper PA 30 Twin Comanche Serial No.30-1037 powered by two lycoming 10-360 BIA engines, was manufactured in 1966 by Piper Aircraft corporation of Lock Haven, USA. The aircraft arrived in East Africa in 1966 in possession of FAA Export Certificate of Airworthiness No.70311 and after de-registration in America, it was registered in East Africa as the property of Tim Air Charters (Tanganyika) Ltd. on 30th May, 1966. An East Africa Certificate of Airworthiness No. T81 was also issued for the aircraft on 30th May, 1966. The C of A No.T81 was last renewed on 8th August, 1976 and would have expired on the 7th of August, 1977.

Ownership changed on 1st April, 1974 when the aircraft was acquired by and registered in the name of the Tanzanian Police Air Wing who were the owners and operators of the aircraft up to the time of the accident. The aircraft was maintained by Tim Air Charters of Dar es Salaam, CMC Aviation - Nairobi and Tanzanian Air Services of Dar es Salaam to Approved maintenance schedules appropriate for the type of operation. When the aircraft's Technical Log was examined it was noted that it contained 'Nil defect' entires over a long period of time up to the 10th of February, 1977 when a double engine failure was entered by the pilot after the accident.

Other details of the aircraft were as follows:-

Aircraft total time flown since new	2957.10 hours
Starboard Engine Serial No.L1517-55A Time run since new	2554.30 hours
Starboard Engine Serial No.L1517-55A Time run since overhaul	968.25 hours
Port Engine Serial No.L-2212-55A Time run since new	2942.15 hours
" " " " " " "overhaul	968.25 hours
Starboard Propeller Serial No.BG 3626 Time run since new	1856.35 hours
" " " " " " " overhaul	1484.35 Hrs.
Pot propeller serial No. BG3056 Time run since new	2171.40 Hrs.
" " " " " " overhaul	1461.40 Hrs.

The calculated weight of the aircraft with four people on board and full tanks from Dar es Salaam to Liwale and up to the accident area (less burn-off) was well below the authorized maximum weight. The Centre of Gravity of the aircraft in normal flight attitudes was within the prescribed envelope.

Note: Maximum Authorized Take off weight of this airplane is 3725 lbs.

1.7. Meteorological Information:

The weather in the area was fine at the time and was not considered contributory to the accident.

1.8. Aids to Navigation:

Before departure from Dar es Salaam on the outbound flight to Liwale, Captain Vuzo had requested that he be accompanied by another pilot, Mr. Mpango, for navigational purposes as he had made it known that he was not familiar with the Geography of the Southern Areas of Tanzania. To facilitate this arrangement, he ordered one of the scheduled passengers be off-loaded in favour of the pilot he wanted to aid him in navigation. There was no other navigational aid relevant to this flight.

1.9. Communications:

According to East African Air Navigation Regulations aircraft flying to and from an unmanned airfield such as Liwale is required to notify Eastair. In line with this, therefore, the pilot of 5H-MMS contacted Eastair on HF at 0814 hours before departing from Dar es Salaam for Liwale. At 0915 hours he again called Eastair when he had Liwale in sight.

Twenty three minutes after take-off from Liwale on the return flight to Dar es Salaam, the pilot was in Radio contact with Eastair and gave 1330 hours as his estimated time of arrival in Dar es Salaam. There was no further communication with the aircraft subsequent to this.

1.10. Aerodrome Information:

Not applicable to this accident.

1.11. Flight Recorders:

Not required by regulations. None fitted.

1.12. The wreckage:

Apart from the starboard wing tip which hit a tree trunk and broke off some distance away, the remaining part of the aircraft, although substantially damaged, was confined to one place. At the accident site it was not possible to check the instruments and components which rely on electrics since the primary source of electrical power had been damaged by impact. Examination of the wing tanks revealed that the starboard wing tanks were empty and that they had collapsed. The left wing tanks were, however, found to be full of fuel. Common to both wings were the filler caps - these were noticed to be of the type normally used on Piper PA23 Series tanks,

It was noticed that although the undercarriage was selected 'down' the gear had not commenced its down-travel

Both propellers were damaged in a manner which indicated that they struck the ground after the engines had stopped. It was noticed that after crashing through the forest, the aircraft came to rest 180° to its direction of flight.

Fuel tank selectors, which were intact, were checked for position selections and then removed for further investigation on the bench. Starboard engine injector unit serial number 18515/34 was also removed and subjected to bench checks.

The following were noted before disturbing the wreckage:-

Fuel Selectors:	LEFT SELECTOR TO MAIN	LEFT Fuel tanks- Full
	RIGHT "	TO MAIN RIGHT Fuel tanks-EMPTY
Power Levers:-	Both full open	
Propeller Controls:-	LEFT - full increase	
	RIGHT-	almost full increase (third notch)
Mixture:	LEFT - full rich	
	RIGHT -	Idle cut-off
Fuel Pumps:	OFF	
Magneto Switches:	OFF	
Generators:	OFF	
Cowl flaps:	OPEN	
Landing gear selector:	DOWN	

The above conditions may not be representative of the actual situation immediately after impact because it took some days to initiate investigation.

1.13. Medical and Pathological Information:

Not relevant to this accident.

1.14. Fire: There was no fire

1.15. Survival Aspects:

The accident was partially survivable. It should be noted that the aircraft first struck the soft tree-tops which cushioned the impact before it tore its way through trees to the ground. Note also that had the Captain not fired his starting pistol and a passenger made some scaring noise by vibrating the aircraft structure, perhaps all the four victims would have been mauled by the lion which appeared at night, roaring while approaching the wreckage. This lion eventually retreated.

The following morning 11th February, 1977 after daybreak, the Co-pilot made his way through the forest, with the aid of aircraft compass to the nearest village from where an alarm was raised for rescue of the three injured people who were still in the forest.

Investigation of the maintenance history revealed that starboard engine had had some recurring in-flight defect which had not been probed sufficiently, partly because the aircraft's Technical Log had no entry to that effect and partly owing to the fact that maintenance was carried out by a Company which had no jurisdiction over scheduling of aircraft down-time to facilitate maintenance.

As a result of a complaint by a passenger on 7th February, 1977 of a loud noise from and roughness of starboard engine during a flight into Dar es Salaam, the Captain had ordered that this engine be checked by an engineer. During the subsequent power and functional check, starboard engine was observed to be 300 rpm to 400 rpm down on maximum static power; the manifold pressure was also low. Despite the engineer's request for more time to investigate the cause of the engine malfunction, the pilot cleared the aircraft for further flights. This unrecorded defect was experienced again on the same engine on 10th February, 1977 during a flight from Arusha to Dar es Salaam. It was not possible, however, to determine how many other occasions this defect may have manifested itself without being recorded. It is concluded that owing to a fuel metering problem involving a large accumulation of water in the fuel system, both port and starboard engines lost power and while attempting to turn the aircraft and glide clear of the forest, the aircraft stalled and crashed.

2.2. Findings:

1. Maintenance of the aircraft was carried out by three Companies to Approved Maintenance Schedules and at the time of this accident, the Certificate of Maintenance was valid.
2. The aircraft's Certificates of Registration and Airworthiness were in order.
3. The aircraft was properly loaded and its Centre of Gravity within allowable limits.
4. The flight was authorised and the Captain, on the strength of his Private Pilot's Licence, was rated to fly this type of aircraft on Tanzanian Police Air Wing duties.
5. The Captain of 5H-MMS who had flown the aircraft on several occasions including the accident flight appeared to have overlooked the requirements of the East African Civil Aviation Act Cap.31, Regulation 8(5)(b).
6. When both engines lost power, the aircraft stalled in a right turn at low altitude, entered a spin and crashed in the forest.

2.3. Cause:

The accident was caused by the aircraft striking trees in the forest following a stall and spinning action during a right banked turn at low altitude with little engine power available. Contributory factors were:-

1. Emergency landing action was delayed until the aircraft got close to the forest.
2. The aircraft undertook the flight with a known but unrectified fuel metering defect.

1.16. Tests and Research:

At the accident site a check was carried out on the fuel tank selectors which functioned satisfactorily; selections were positive but there was no indication on the fuel gauges since these had been rendered unserviceable by impact. Further to this, the airplane's power supply had been interrupted. The fuel selectors were then removed for more detailed examination.

When the fuel selectors were dismantled, the bowls were found to contain appreciable amounts of water which had begun to corrode the non-stainless steel bowls. The right wing tank fuel selector bowl was affected more than the left. Piper service letter number 589 calls for fitting of stainless steels bowls on selector housing.

The starboard engine injector assembly serial number 18515/34 was also removed for calibration check on a test rig. During the bench check this unit was observed to be running very rich.

It was determined that one of the tanks in the starboard wing had had a large accumulation of water for some time. This water had entered the starboard fuel system either through condensation of moisture or rain seeping into the tank or tanks through the filler caps which provided only partial sealing. These filler caps were of the type normally recommended for use on Piper PA 23 Series only.

2.

ANALYSIS AND CONCLUSION

2.1. Analysis:

Recorded evidence allege that after the starboard engine began to lose power, the Captain tried to clear the snag by adjusting fuel tank selection and when the engine failed to respond he then selected crossfeed. It was after crossfeed selection that port engine began to run down on power.

It is mentioned in 1.16 above that the starboard fuel system of the aircraft had been contaminated to an alarming degree with the selector bowl badly corroded. There was a combination of water in the fuel system and an injector which was running rich. The effect of this would be a gradual loss of power as more and more water entered the injector system, gradually weakening the mixture at the engine intake.

Although it is not proven conclusively how the problem was transferred from starboard to port engine, it is highly probable that during the crossfeed when starboard engine lost power and stopped eventually, the port engine presumably sucked - through the interconnection of the selectors - the large accumulation of water in the starboard fuel system of the aircraft. This would invariably introduce the problem to the left (port) fuel system.

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