

CAV/ACC/16/75

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT

Report on the Accident to Piper PA 23-250

Aircraft Registration Number 5H-MOV

which occurred on the 4th July,

1975, 10 Metres off Runway

10 - Lindi Aerodrome,

TANZANIA.

EAST AFRICAN COMMUNITY

ACCIDENT REPORT

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CIVIL AIRCRAFT ACCIDENT REPORT NO. CAV/ACC/16/75

AIRCRAFT: PIPER PA 23-250 5H-MOV
ENGINES: TWO LYCOMING 10-540-C4B5
REGISTERED OWNER: BUSINESS MACHINES LTD. P.O. BOX 1599,
DAR-ES-SALAAM.
CREW: PILOT: M.S. MIGDOLL) NO
PASSENGER: ONE - LEONARD HORNBY) CASUALTY
PLACE OF ACCIDENT: 10 METRES OFF RUNWAY 10 - LINDI AERODROME
LAT. 0950S LONG. 3847E
DATE AND TIME: 4TH JULY, 1975 at 1200 HOURS.
ALL TIMES IN THIS REPORT ARE G.M.T.

SUMMARY

The first flight of the day departed Dar-es-Salaam in the early hours of the morning to Mtwara with the intention of calling at Lindi on the return sector - the purpose of this was to pick up a passenger who was left in Lindi that morning. Although there was a starter change to No. 2 engine some days prior to this incident, there was no indication of starter malfunction before landing in Lindi that day. As indicated in the analysis the starter was functionally tested and no malfunction of this or the starting vibrator was manifest. The subject engine behaved well during test bed run.

In the concluding paragraph of this report it is noted that by running the aircraft on the runway to try to windmill the No. 2 engine propeller, the pilot set himself a task which besides being dangerous, was beyond his capability.

1. INVESTIGATION

1.1. HISTORY OF THE FLIGHT

In the day of the accident flight there was a passenger stranded in Lindi awaiting transportation to Dar-es-Salaam. The flight was therefore scheduled to call at Lindi on its way from Mtwara en-route Zanzibar and onward to Dar-es-Salaam. The complete flight plan was Dar-es-Salaam, Mtwara, Lindi, Zanzibar, Dar-es-Salaam, Kilimanjaro and Mombasa.

Although there is no recorded communication between the aircraft and any ground control station on the southern leg from Dar-es-Salaam to Mtwara, the Air Traffic Control in Mtwara were in contact with 5H-MOV from 1005 hours when it departed Mtwara until 1014 hours when the aircraft reported having sighted Lindi. Contact was then lost and ATC in Mtwara assumed that the aircraft had landed safely in Lindi. Further communication was initiated by Lindi Fire Officer at 1239 hours when he telephoned Mtwara ATC to report that the aircraft had crashed in Lindi aerodrome after experiencing problems during take off.

According to the written statement of Mtwara ATC the pilot contacted engineers in Dar-es-Salaam by telephone and received instructions to take-off on one engine to carry out an airstart of No. 2 engine. Pilot's statement does not concur with this; none the less, after failing to start the engine by conventional methods, an attempt was made to windmill the No. 2 engine by running the aircraft on the runway with only the No. 1 engine operating. After take off and gear retraction, which was watched by Lindi aerodrome officials, the aircraft failed to gain height, commenced a turn and flared to land downwind on runway 10, but stalled and crashed while executing an overshoot owing to failure to extend the undercarriage.

1.2. INJURIES

Fatal	Non-fatal	Non-injury
nil	nil	nil

1.3. DAMAGE TO AIRCRAFT

The aircraft sustained major structural damage when the right wing struck the ground followed by the nose then the rear fuselage and the left wing respectively. The under surface of the fuselage was torn in the subsequent 180° turn before the aircraft came to rest.

Nose Section

The nose gear doors which were found in the gear up position and most of the surrounding structure completely shattered by impact when the front end of the aircraft struck the ground. Parts of the fibre-glass nose cone were located 20 metres away from the main wreckage.

Right Wing

Outer half of the wing warped, deeply dented and twisted. Front wing attachment to fuselage moved, aileron buckled and flap distorted and found tucked under the damaged wing.

Left Wing

Upper surface found wrinkled, wing outer third badly damaged by an upward shear force against the weight of the aircraft. Rivets on the structure pulled and the front wing to fuselage attachment distorted and cracked. The flap which was found folded under the wing was deeply dented and warped.

Rear Fuselage

From the flap trailing edge rearwards the fuselage was twisted and the skin badly wrinkled. Stabilator left tip distorted, tailcone shattered and the tail bumper lodged inside the damaged rear end of the fuselage.

The entire lower surface of the fuselage was torn and the structure distorted.

Right Engine (No. 2 engine)

Bearer arms kinked and broken. Exhaust dented and cracked, the upper and lower cowling fasteners came adrift. Because this engine struck the ground under no power conditions, the one propeller blade which struck the ground was only slightly bent rearwards in a manner consistent with engine state.

Left Engine

The prop. blades struck the ground under considerable engine power, this resulted in irreparable damage to the outer 1/3 of the two blades. Bearer arms bowed, kinked and cracked. Lower cowling damaged and the whole nacelle dislodged from the structure.

1.4. OTHER DAMAGE

Nil.

1.5. CREW INFORMATION

Mr. M.S. Migdoll was born in Kenya on 8.9.1954. In 1974 he obtained an FAA Commercial Pilot's Licence No. 2243648 dated 12.4.1974 and on his return to East Africa in the same year he was, on the strength of his FAA CPL, granted an East African Commercial Pilot's Licence No. 1548 (K.1391) dated 21.12.1974. Besides the foregoing, Mr. M.S. Migdoll also holds an E.A. Radio Transmission Licence No. 2472 (K.1857) issued on 19.7.1972. This Radio Transmission Licence is kept current in line with his East African CPL No. 1548 (K.1391). When he last renewed his licence on 2.9.1975, Mr. Migdoll claimed a total of 649 hours 20 minutes flying experience made up as follows:-

Pilot in Command	Day	-	497 hours 25 minutes.
	Night	-	43 hours 15 minutes.
Co-Pilot	Day	-	97 hours 20 minutes.
	Night	-	11 hours 20 minutes.

His licence also bears an Instrument Rating endorsement.

1.6. AIRCRAFT INFORMATION

The aircraft, a Piper PA 23-250 'Aztex' serial No. 27-4638, manufactured by Piper Aircraft Company in 1971, arrived in East Africa in the same year in possession of an Export Certificate of Airworthiness No. 99397 issued in Washington USA on 2.3.1971. It is powered by two Lycoming 10-540-C4B5 engines rated at 250 horsepower each. Later an East African Certificate of Airworthiness in Public Transport category was

issued in respect of the Aircraft on 10.6.1971. The C of A was endorsed to the effect that the aircraft must be operated in accordance with the approved FAA flight manual and Owner's handbook which form part of the C of A in force and must be carried in the aircraft on all flights.

After expiry of the C of A on 29.5.1974, the aircraft was dormant until the C of A was renewed again on 24.4.1975, after undergoing a Check III which was completed and certified on 16.2.1975. The current C of A expires on 23.4.1976. When this aircraft arrived in East Africa, it was registered in the name of Nello L. Teer of P.O. Box 2011, Dar es Salaam. On 7.11.1974 the ownership of the aircraft changed hands when it became the property of Business Machines Ltd. P.O. Box 1599 Dar es Salaam.

The Technical Log for the aircraft was not kept up to date as reflected by several omissions of vital entries regarding Certificate of Maintenance and Certification relating to pre-flight inspection.

On 28.5.1975 at 931.40 hours aircraft flying time, a Check I was carried out and certified. Another Check I was carried out on 17.6.1975 at 1028.20 hours flying time. In between the two checks another Check I should have been carried out as called for by the Approved Maintenance Schedule reference TIM/MS/3 - this check was omitted. At the time of the accident, the aircraft time was as under:-

Aircraft time since new		1179.45 hours.
No. 1 engine S/N L-9104-48	time since New	1179.45 hours.
" " " " " "	time since Overhaul	-
No. 2 engine S/N	time since New	1179.45 hours.
" " " " " "	time since Overhaul	-
No. 1 propeller S/N BP2576	time since new	not known
" " " " " "	time since Overhaul	254.45 hours
N. 2 " " " " " "	time since new	not known
" " " " " "	time since Overhaul	1179.45 hours.

The aircraft weight and balance was as calculated below:-

Aircraft basic weight	3127 lb.	Lever Arm + 90.3	Moment + 282368.1
Captain	165 lb	" " + 89.0	+ 14685.0
Passenger	165 lb	" " +126.0	+ 2090.0
Calculating Machine	50 lb	" " +183.0	+ 91.50
Fuel in Left Wing	198 lb	" " +113.0	+ 22374
Fuel in Right Wing	186 lb	" " +113.0	+ 21018
Total weight at take off	3891 lb		Resultant Moment +370385.1
C of G in this configuration	=	<u>370385.1</u>	
		3891	
	= +	95.19 inches aft of datum.	

The weight and the calculated C of G were within the prescribed limits. The aircraft's maximum authorised take off weight is 5,200 lbs.

1.7 METEOROLOGICAL INFORMATION

The weather forecast around Lindi area at the time of accident was as follows:-

- Wind - 180° 10 knots
- visibility - 10 kilometres or greater
- 4 octas of cumulus cloud at 2600 ft.
- Temperature + 29°C Dew point 17°C.
- QNH 1015 milibars and no significant change in weather conditions anticipated in the ensuing two hours

1.8 AIDS TO NAVIGATION

Not applicable in Lindi area.

1.9. COMMUNICATION

Although there is no record of communication between the aircraft and any ground station during the flight from Dar es Salaam to Mtwara, the Air Traffic Control in Mtwara reports contact with the aircraft from 1005 when it departed from Mtwara to Lindi, and the contact was maintained until 1014, when the aircraft reported to Mtwara that it had Lindi in sight. Subsequent to this there was no communication between ATC and the aircraft. Later that day at 1239 Lindi aerodrome staff telephone Mtwara to report 5H-MOV having crashed in Lindi aerodrome.

1.10 AERODROME AND GROUND FACILITIES

Lindi Aerodrome has no Air Traffic Control facilities, but it is moderately equipped with fire-fighting equipment and the necessary personnel. There are three runways in use - 04/22, 10/28, and 16/34. Runway 04/22 is murrum surface and is 1609 m. long 46 m. wide. Runway 16/34 is crushed coral and is 1847 m. long 46 m. wide. Runway 10/28 is crushed coral and is 1383 m. long 46m. wide.

1.11 FLIGHT RECORDERS

Not required. Not fitted.

1.12 THE WRECKAGE

The wreckage was scattered over a small area of roughly 400 square metres. The aircraft right wing struck the ground first, followed by the nose which disintegrated on impact with the ground scattering in diverse directions. The tail end of the aircraft then touched down forcefully buckling and twisting the rear half of the fuselage; this was followed by the left wing as the aircraft swung round 180° arc finishing up facing the point of first contact with the ground. In the process of about turn the bottom skin of the fuselage and wings was torn.

The position in the flight deck was as follows:-

- Landing gear selector - selected DOWN.
- Throttle - Mid-position.
- Propeller Control - Increase rpm.
- Mixture control - Mid-position.
- Altimeter - 65 ft. above mean sea level.
- No. 2 Engine Right Magneto - ON
- No. 1 Engine Left Magneto - OFF
- Pitot heater - ON Taxi and Landing Lights - ON
- L. Cowl flaps - ¾ open
- R. Cowl flaps - closed

the CO₂ bottle was found intact with the safety locking still on.

Fuel state:	Inboard Tanks		Outboard Tanks	
	Left	Right	Left	Right
	13	11	20	20
	ADF	ON		
	HF	ON		
	Flaps	Selected UP		

1.13. MEDICAL AND PATHOLOGICAL INFORMATION:

Not relevant.

1.14. FIRE

There was no fire.

1.15 SURVIVAL ASPECTS

Both pilot and the passenger, who was in the rear right hand seat, were wearing lap straps. As soon as the aircraft came to rest, the two occupants left the aircraft in a hurry through the flight deck door and ran a safe distance in anticipation of fire. The aerodrome fire brigade hurried to the scene of the crash which was within their view - about 1/2 Km. from their base - arriving only a few minutes after impact.

1.16 TESTS AND RESEARCH

Starboard Engine serial No. L-9073-48 was removed from the wreckage and flown to Nairobi for detailed tests. The propeller run-out check revealed no damage to the engine crankshaft. Visual Inspection of the engine was carried out and starter serial No. 3E000100 was removed from the engine and bench tested with satisfactory results. The engine was then mounted on a test bed and a test fan installed. The same starter S/N 3E000100 was re-installed on the suspect engine and at the first attempt, the engine would not start, even though the starter turned it. The engine was then re-primed and on the second attempt, it fired; it was then warmed up for a few minutes at 1200 rpm after which the throttle was moved to idling when the engine ran well for some time before power was advanced slowly to 1700 rpm. At 2000 rpm single ignition check was carried out, noting rpm drop for L. magneto and R. magneto - the drop on L. mag. was 75 rpm. and that for R. Magneto was 90 rpm. During this run from idling to full power, fuel flow was noticed to be normal, Cylinder Head temperature in the green band, oil pressure was normal and although slight vibration was noticed at first, this soon diminished with increased rpm.

The engine run was stopped for a few minutes and a further attempt to start the engine was successful.

The aircraft has one starting vibrator for both engines - this vibrator was removed from the aircraft for bench check. The unit functioned well on the bench for a short while, then began to malfunction. A strip examination was carried out to ascertain the condition of the functional parts. The vibrator points were found to be in good condition and the condenser was also found to be in good working order as indicated by no evidence of arcing at the points. The unit was re-assembled and re-tested on the bench where it functioned well for a number of minutes. This check was adjourned for four days purposely to ascertain the response of the unit to bench tests. When the check was resumed, the vibrator showed no signs of previous malfunction.

The spark plugs were removed and only one lower plug in No. 6 cylinder was found to be oiled but this may have been due to the orientation of the engine during transportation. No. 1 upper H.T. lead was found frayed but it had not lost its functional capabilities. A bench check was carried out on the magnetoes, which performed well even at very low speed of 300 rpm. It should be noted that this speed is well below the engine idling rpm.

2.

ANALYSIS AND CONCLUSION

2.1 ANALYSIS

If this type of engine is primed properly it presents no starting problems providing the ignition system is functional. The manifold valve of the fuel injector system needs only a 5 psi differential to crack open, and once open, the fuel supply is continuous until the pressure differential drops below 5 psi as happens when engine is shut down.

The pilot stated that he attempted to start with the electric starter but to no avail, then by hand cranking the engine which also failed. Although the pilot claims that the starter was malfunctioning this may be a matter of diagnosis, as the tests both on the bench and on the engine revealed no serious mechanical or electrical defect.

The starting vibrator might be suspected as a possible cause but as this unit serves both engines on this aircraft and had been employed successfully to start the number one engine this is unlikely. Bench tests of the unit however, showed an intermittent fault.

The source of electrical power for the starter and vibrator, DC battery, presented no problem as one engine was started and the respective generator/alternator was placed on line to supply aircraft electrical power requirements.

It has not been proved, but it is probable that the suspect engine may have become too rich during the abortive attempts to start it. On this assumption, the engine should have been blown out to rid it of excess fuel before making a determined effort to start it again. This problem prompted the pilot to resort to unorthodox means. Having consulted Das es Salaam by telephone for technical advice, the pilot decided to run the aircraft on one engine on runway 04 with the intention of windmilling No. 2 engine. In the process he had his finger on the starter button and the booster pumps switched on.

The two statements from the pilot and his passenger conflict in detail regarding sequence of events. The pilot claims that the engine started halfway down the runway.

If the passenger's allegation is correct then it should have been possible for the pilot to stop the aircraft before the end of runway 04, which is 1609 metres long. It should be noted that this method of starting engines as carried out by the pilot, is not recommended in any authorised publications. There is written

evidence from an eye witness alleging the pilot had intended to take off on No. 1 engine, climb to a safe altitude, start No. 2 engine and return to the airfield. The Statement adds that the aircraft did take off on one engine but, failed to gain height. Other statements from the pilot and his passenger suggest they took off on two engines and although the pilot states that he lost No. 2 engine, having made a right hand turn across the wind and another turn downwind, the passenger conflicts with this by mentioning that the engine stopped during the first right hand turn after take off.

2.2 OBSERVATIONS

The Aztec is rotated, on take off very close to the minimum calibrated airspeed at which should one engine stop, the aircraft remains controllable (Vmc). This makes the aircraft difficult to handle should one engine sign cut during take off because with one engine out the performance drops to approximately 20%.

Assuming 5H-MOV was on the threshold of Vmc during take off, the reduction of the total drag by retraction of the landing gear would raise the Vmc placing the aircraft below safe speed at take off thus presenting problems to the pilot.

It should be noted that even though the aircraft failed to gain height, the pilot managed to execute a right turn with the probable intention of landing on runway 10 which intersects runway 04. The landing gear is hydraulically operated and the single pump for the system which is driven by No. 1 engine was found to be serviceable. Besides this there is a Co₂ bottle for emergency extension of the landing gear, the actuating mechanism for this system was found intact.

From the foregoing it may be assumed that owing to a combination of factors the pilot may have remembered to extend the gear when / to he was too low subsequent to which he decided to overshoot on one engine without regard to the outcome of this action.

2.3 CONCLUSION

2.3.a FINDINGS


1. The aircraft was maintained to approved maintenance schedule TIM/MS/3 by Tim-Air and Wilken Aviation (CMC). Maintenance records revealed that the last check I was carried out at 103.20 hours. This was 96.40 hours after the check previous to the last check. Another check I should have been carried out in between the two.
2. The Certificate of Airworthiness for the aircraft was valid at the time of the accident.
3. The weight and centre of gravity as calculated were within the prescribed limits.

4. The pilot was properly licenced.
5. The Flight Manual and the Owner's handbook were not in the aircraft.
6. The aircraft had been idle from May 1974 to April 1975, when it resumed service after a check III, which was a pre-requisite for renewal of its C of A.
7. By taking off with No. 1 engine in working order and No. 2 engine in an uncertain condition, the pilot took a grave risk which proved to be beyond his capability.

2.3b CAUSE

The accident was caused by the aircraft striking the ground when the pilot attempted an overshoot on one engine. Contributory factors were:-

The decision to take off with No. 2 engine in an uncertain conditions and the pilots lack of appreciation of the behaviour of the aircraft in these circumstances which led to the late decision to extend the landing gear while struggling to control the aircraft.


O. Waryaro
INSPECTOR OF ACCIDENTS

OW/af