

MINISTRY OF COMMUNICATIONS & WORKS

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT NO. CAV/ACC/3/84

REPORT ON THE ACCIDENT TO CESSNA 310 AIRCRAFT
REGISTRATION NO. 5H-TAS WHICH OCCURED ON 9TH AUGUST, 1984
AT DAR ES SALAAM INTERNATIONAL AIRPORT, TANZANIA (06° 20'S,
37° 35'E)

AIRCRAFT ACCIDENT REPORT NO. CAV/ACC/3/84

AIRCRAFT TYPE : CESSNA 310

NATIONALITY AND REGISTRATION MARKS : 5H-TAS

ENGINES : TWO CONTINENTAL 10-520M

REGISTERED OWNER : TANZANIA AIR SERVICES LTD
P.O. BOX 364 DAR ES SALAAM

OPERATOR : SAME AS REGISTERED OWNER

PILOT : ONE - UNINJURED

PASSENGERS : THREE - UNINJURED

PLACE OF ACCIDENT : DAR ES SALAAM INTERNATIONAL
AIRPORT (06°20'S, 37°35'E)

DATE : 9TH AUGUST 1984

TIME : 14.35 Hours

ALL TIMES IN THIS REPORT ARE GMT

SYNOPSIS

The aircraft was operating a charter flight from Mufindi to Dar es Salaam. It made a normal approach to runway 23 of Dar es Salaam International Airport and executed a wheels-up landing. There were small but isolated pockets of fire behind the aircraft which the pilot extinguished using the aircraft fire fighting gear.

Although the aircraft sustained substantial damage, the pilot and the three passengers escaped unhurt.

1. FACTUAL INFORMATION

1.1. History of the flight

On August 9, 1984 5H-TAS was scheduled to operate two sectors Dar es Salaam - Mkangira - Dar es Salaam and Dar-Mufindi-Dar. The pilot reported to have slept for about 6 to 7 hours and woke up at 0030 hours. He was picked up at 0215 hours and, during the journey to the airport, he had to return home to collect a flash light.

There had been no snags filed in the aircraft tech-log on the previous flight. On the pre-flight check for Dar-Mkangira flight the pilot noticed three snags. i.e. the right fuel quantity indicator, the DME and the autopilot were unserviceable. The aircraft left Dar es Salaam for Mkangira at 0315 hours on IFR flight plan with a small quantity of cargo aboard. The pilot later narrated that on increasing the electrical load during the Dar-Mkangira flight by switching on the instrument lights, the pitot heat, landing lights and retracting the gear the left alternator failure warning light flickered. The electrical load was then reduced by disconnecting most of the circuit breakers (CB) and the flight to Mkangira was continued. On lowering the gear for landing at Mkangira, switching on the landing light and selecting flaps down the left alternator failure warning light flickered again. The aircraft landed at Mkangira at 0425 hours.

During the pre-flight check at Mkangira both alternators functioned property. The alternator snag, however, recurred on the return flight to Dar es Salaam with three passengers on board. The aircraft landed at Dar es Salaam at 0600 hours.

The pilot said he reported the alternator snag, the defective fuel indicator, the DME, the autopilot, the directional gyro and the No.2 radio. He listed the snags in the wrong column of 5H-TAS techlog. When interviewed by two inspectors of accidents he said that two of his company's maintenance engineers had advised him to undertake the next planned flight to Mufindi as they could do nothing about the snags then. They also advised him to reduce as much electrical load as possible during the flight by tripping the applicable circuit breakers.

At 07.00 hours 5H-TAS took off from Dar es Salaam with two passengers under the command of the same pilot en-route to Mufindi with an endurance of 4 hours. During the flight to Mufindi, all the snags in the DAR-Mkangira flight re-appeared on the respective indicators upon which the pilot reduced the electrical load by tripping the appropriate circuit breakers as soon as the gear was retracted. He flew VFR relying on DR compass for navigation since the DG was

unserviceable. The aircraft had to be flown manually all the way because of a defective autopilot. 5H-TAS landed at Mufindi at 08.40 hours. 5H-TAS remained on the ground at Mufindi for 4 hours 30 minutes eventually taking off for DAR es Salaam at 1310 hours with three passengers. During this flight the pilot tripped all the circuit breakers except those of the COMM/NAVIGATION radio, the automatic direction finder, the elevator trim, the marker beacon and equipment fan.

When interviewed by an inspector of accidents, one passenger recalled that he had been scared 10 minutes after take-off from Mufindi when engines spluttered. He went on to say that the pilot then immediately switched tanks subsequent to which the normal engine sound was restored. The same streak occurred about 40 minutes later and, although engine speed was restored, the passengers became alarmed and restless. Infact immediately after touch down at Dar es Salaam when the aircraft came at an abrupt stop on the runway one passenger felt relieved and was

about to thank the pilot for the "very smooth landing" when he saw the pilot rushing out of the aircraft with a fire extinguisher - an anticlimax. 5H-TAS was cleared to land on runway 23 of Dar es Salaam International Airport at 1431 hours. The pilot said he had heard and felt a jolt just after selecting "gear down". One passenger also heard a clicking sound and interpreted this as sound of gear locking down. The pilot also believed that the Cessna 310 was impossible to slow down to approach speed in the gear-up configuration. The pilot's first indication that something was wrong was the scraping noise heard in the cockpit shortly after touchdown. Next he noticed the propeller blade tips were bent. By this time the aircraft had come to an abrupt stop on the runway with the trailing debris on fire which was quickly put out by the pilot the passengers disembarked hurriedly but safely before the fire engines arrived 20 minutes after the accident.

1.2. Injuries to Persons

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	-	-	-
Serious	-	-	-
None	1	3	-

1.3. Damage to Aircraft

The aircraft sustained substantial damage to the belly and the propellers.

1.4. Other Damages

The tarmac surface on the runway was slightly chipped by the propellers.

1.5. Personnel Information

The pilot was born on March 5, 1950 in Sint-Truiden, Belgium. He held an airline Transport Pilot Licence No. HP-219 granted on March 14, 1984. By the time of the accident this licence was valid up to September 8, 1984. His flying experience before March 14, 1984 was 3254 hours.

He was rated to fly aeroplanes under Group 1 as follows: PA 32, Cessna 210, Cessna 310 and Cessna 414. At the time of the accident he claimed a total flying experience of 3,547.10 hours on 29 types of aircraft. However most of the hours were logged on the following aircraft:

Cessna 150	-	645	Hours
Cessna 172	-	560	"
Cessna 177	-	143	"
PA 18	-	185	"
PA 30	-	166	"

His total experience on Cessna 310 was 271.25 hours.

1.6. Aircraft Information

The aircraft, a Cessna 310 serial No. 310R-0854 powered by two Continental IO-520M engines, was manufactured by the Cessna Aircraft Company at Wichita, Kansas, USA in 1977. It was first given a U.S. registration N 3501F in the name of the manufacturer. On October 22nd, 1977 it acquired a Tanzanian registration 5H-TAS in the name of Tanzania Air Services LTD of Box 364 Dar es Salaam. It has since been operated by the same company under a certificate of Airworthiness was valid until July 5th, 1985. It was being operated in the Public Transport (Passengers) category.

1.6.1. Loading and C of G disposition

The aircraft C of G was within the allowed limits.

1.7. Meteorological Information

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

1.8. Communications

5H-TAS took off from Dar es Salaam International Airport for Mufindi at 0700 hours and remained in contact with the Dar es Salaam tower at 118.3Hz till Zone Boundary after which the flight was assigned the frequency 123.3 Hz. 5H-TAS exchanged height information with 5H-TBW which was in the area at that time and flying VFR. The aircraft were communicating on the DAR Centre frequency of. / About 10NM/123.3 Hz from Mufindi the two aircraft again established contact on 118.2 Hz.

The aircraft took off from Mufindi for Dar es Salaam at 1310 hours with its radio tuned on 118.2 Hz. At Top Of the Climb (TOC), The pilot tuned his radio on 123.3Hz but made no transmission. 5H-TAS made the first contact with the Dar es Salaam Centre on 118.3Hz just before entering the Control Zone and was subsequently cleared to land on runway 23 of the Dar es Salaam International Airport.

1.9. Aerodrome Information

Runway Information

Runway	:	05/23
Length	:	3000m
Width	:	46m
Surface	:	Tarmac
Condition	:	Good
Elevation	:	50.5m
Apron	:	Tarmac

1.10. Flight Recorders

Not required by regulations. None fitted.

1.11. Wreckage information

The accident occurred in the evening of Tuesday August 9th, 1984 on runway 23 of Dar es Salaam International Airport. By the time the accident investigation team got to the airport on the following day, the wreckage had already been salvaged by the operator to his premises at the airport. The immediate salvage operation was necessary because of the need to clear the runway for inbound flights.

Examination of the aircraft showed extensive damage in the underside and forward including propeller blades which had bent forward on impact with the runway.

1.11.1. The Cockpit

The landing gear switch was in the "gear down" position and the flap lever was in the "15⁰" position. All the circuit breakers had been tripped except those of the Directional gyro, the COMM/NAV No.1, the ADF, the Marker Beacon, the Elevator trim and the Turn and Bank indicator.

1.12. Medical and Pathological information

Not applicable

1.13. Fire

There were isolated pockets of fire behind the aircraft when it came to an abrupt stop on the runway. The pilot extinguished these pockets by means of the aircraft fire extinguisher. The fire slightly scorched the inboard under surface of the starboard wing.

1.13.1. Airport Fire Services

The Airport Fire trucks arrived at the scene of the accident twenty minutes after the accident took place. By this time, the pilot had already extinguished the fire and all the passengers had disembarked. A poor show indeed.

1.14. Survival Aspects

There were pockets of small fires behind the aircraft when it stopped on the runway. However fuel tanks were not ruptured. The fires were extinguished by the pilot using the portable fire extinguisher in the aircraft.

There were no injuries to the pilot or the passengers. As mentioned earlier in 1.1, a passenger mentioned that he was about to thank the pilot for the "very smooth" landing when he suddenly saw the pilot rush out of the cabin with a fire extinguisher. On realising that there was a fire, the passenger in question quickly lifted his wife and his two year old daughter and got out of the aircraft.

1.15. Tests and Research

The aircraft was jacked up and the gear mechanism cycled repeatedly using external power and nothing untoward was noticed during the check.

The aircraft engines were run with different propellers. Circuit breakers were tripped to simulate the flight conditions obtaining on the flights to and from Mkwangira. Both alternators functioned satisfactorily when loads were applied. No alternator failure warning light flickered when the landing light was switched on.

2. ANALYSIS

It was established that the landing gear was up and locked at the time of the attempted landing. The damage to the flaps was consistent with the flaps selection i.e. "up" (zero degrees).

The gear mechanism was tested and found serviceable including the gear/power lever configuration warning horn. The landing gear switch was found in the "gear down" position. The reason for the gear failing to disengage and travel was that the gear motor circuit breaker was not engaged. In the circumstances, if the approach had been made in the wrong configuration for landing, the gear warning horn would have been activated. The failure of this warning system to function as expected was attributed to the gear horn circuit breaker not being engaged during the approach and subsequent flare. It should be noted that the inspector of accidents arrived at the operator's premises some 21 hours after the accident when the operator had tampered with the wreckage by removal and installation of various components and parts. For this reason, although not proven conclusively, it is safe to assume that the failure of the gear to disengage and travel down may have been as a result of the pilot failing to reset the appropriate circuit breaker. It should also be noted that the pilot had been advised to reduce the load by tripping CB's which included those of the gear retraction and that of the gear warning horn.

There are a number of factors which contributed to the pilot's forgetfulness to engage the circuit breakers prior to the attempted landing at Dar es Salaam. The autopilot was inoperative and the pilot had to fly the aircraft physically through the two sectors. This increased his workload. The Directional gyro (DG) was also faulty and the pilot had to do the navigation using the magnetic compass. The circuit breaker dashboard of the Cessna 310 requires half a turn to reset. The increased pilot's workload would have made him concentrate on the instruments that were readily visible at a glance.

There were no records to show how much fuel was carried on each of the four flight sectors covered by 5H-TAS on the day of the accident. The operator did not prepare load sheets for the flights and had no provision for these. The absence of load sheets makes it impossible to determine clearly how much fuel was carried on board unless the tanks were full.

The company aircraft tech-logs are poorly kept. Personnel do not log anything that is likely to ground aircraft. This practice, in the light of what happened to 5H-TAS, is potentially dangerous.

The pilot reported to have heard a jolt after selecting "gear down". This jolt was also heard by one of the passengers. The pilot said that he also knew that the Cessna 310 was impossible to slow down to approach speed in "gear-up" configuration. The two factors put together, he said, convinced him that the gear was down and locked shortly after selecting gear down". In all probability he did not specifically look for the three "gear-down" greenlights. In the landing drill it is mandatory that green lights illuminate to indicate the gear-down-and-locked configuration. The jolt heard & felt inside the aircraft may have been caused by a bird strike. While the lowering of the gear slows down the aircraft by increasing form drag, it is not impossible to attain approach speed with the aircraft in the gear up configuration.

3. CONCLUSIONS

(a) Findings

1. The pilot was properly licenced.
2. The aircraft documents were not in order. There was no load sheet prepared for the flight and snags had been entered into the wrong column of the aircraft tech log.
3. The aircraft had been in possession of a certificate of airworthness which was rendered invalid when the aircraft was despatched with an unserviceable alternator.
4. The pilot reported a no-go snag which was not rectified at base. Company maintenance crew advised the pilot to make a flight to Mufindi with reduced electrical load. This contravenes regulation 9 of the East African Air Navigation Regulations.
5. The aircraft was being flown with snags which had been entered in the wrong column of the aircraft tech log.
6. The aircraft executed a wheels up landing because the gear warning and the gear motor circuit breakers had not been reset.

(b) Cause

The accident was caused by the aircraft executing a wheels-up landing. The probable reason for the gear being up and locked on landing was that the appropriate circuit brakers had been tripped rendering the electrical circuit inoperative.


C. Nawa
CHIEF INSPECTOR OF ACCIDENTS

CONTRIBUTORY FACTORS

1. The non-serviceability of the left alternator made it necessary for the pilot to take the unusual practice of disconnecting circuit breakers which he later forgot to reset.
2. The defective autopilot and directional gyro forced the pilot to physically fly the aircraft all the time while doing the navigation with the compass. This increased the pilot's workload.
3. The failure of the pilot to satisfactorily complete the pre-landing drill by looking for "wheels down" green lights.