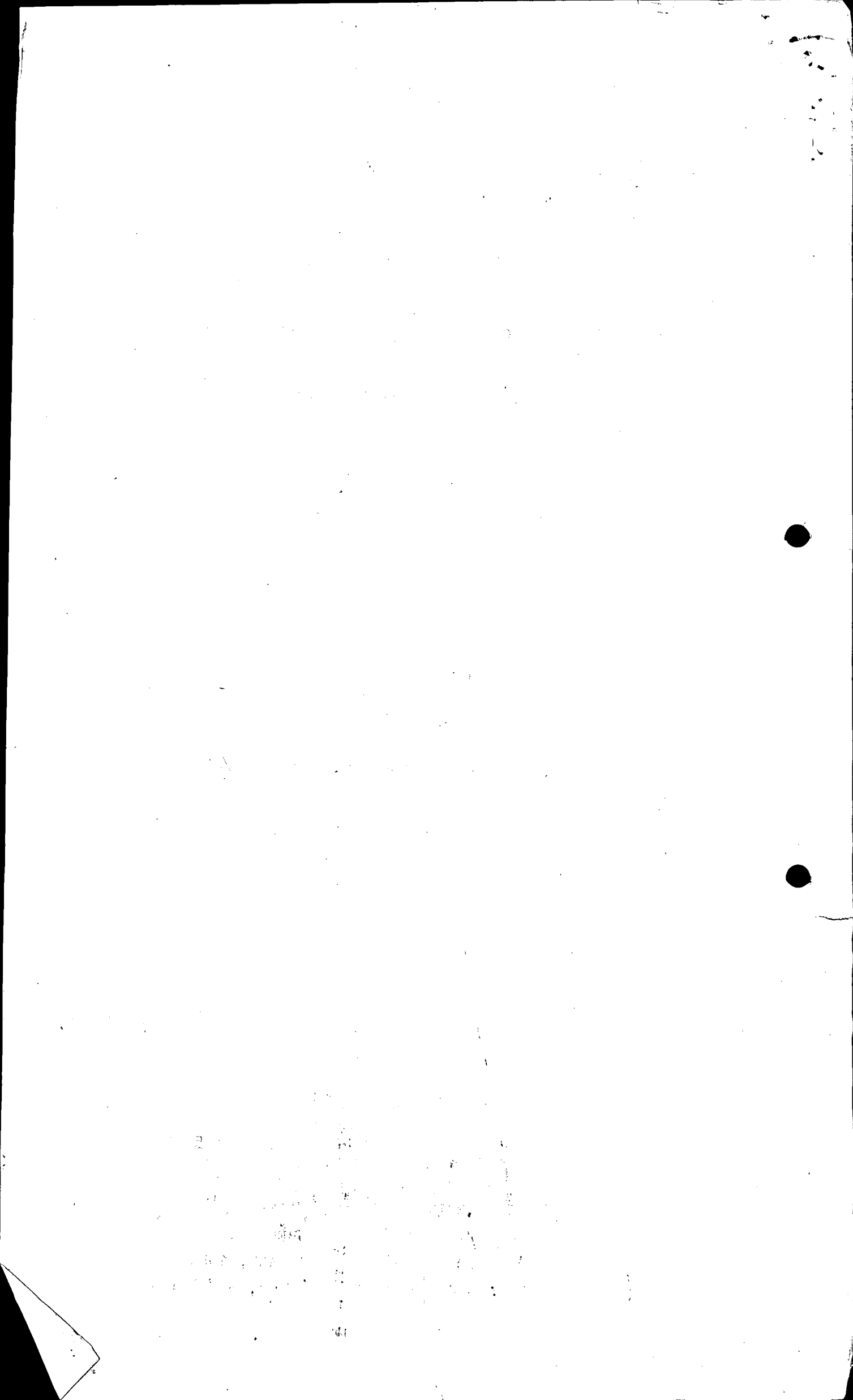


MINISTRY OF COMMUNICATIONS AND TRANSPORT

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT NO. CAV/ACC/1/83 ✓

REPORT ON THE ACCIDENT TO CESSNA 185F
AIRCRAFT REGISTRATION NUMBER N2795Q
WHICH OCCURRED ON 29TH JANUARY, 1983
AT DODOMA AIRPORT TANZANIA (6°08'S, 35° 45'E)



AIRCRAFT ACCIDENT REPORT NO. CAV/ACC/1/83

AIRCRAFT TYPE:

NATIONALITY AND REGISTRATION : CESSNA 185F
MARKS : N2795Q
ENGINE : ONE CONTINENTAL IO-520-D
REGISTERED OWNER : MISSIONARY AVIATION FELLOWSHIP
P.O. BOX 202, REDLANDS,
CALIFORNIA USA.
OPERATOR : MISSIONARY AVIATION FELLOWSHIP
P.O. BOX 491 DODOMA, TANZANIA
PILOT : 1 UNINJURED
PASSENGERS : 5, ONE SLIGHTLY INJURED
PLACE OF ACCIDENT : DODOMA AIRPORT, DODOMA
TANZANIA (6° 08' S, 35° 45' E)
DATE AND TIME : 29TH JANUARY, 1983 AT 0915 HRS

ALL TIMES IN THIS REPORT ARE GMT

SYNOPSIS

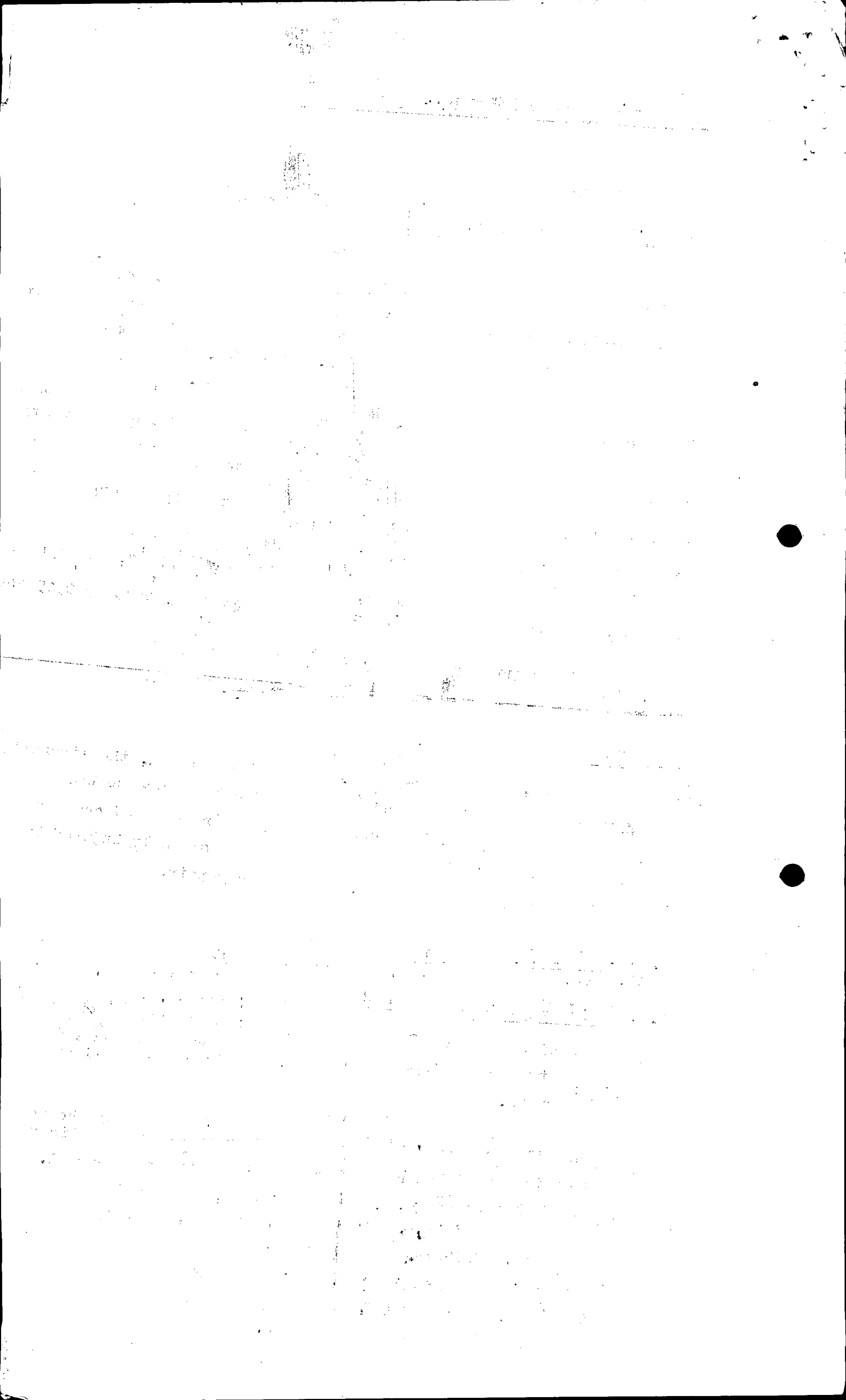
Having taken off from Dodoma on a flight to Arusha, the aircraft failed to gain height. The pilot decided to return to base but, in the process, lost control of the aircraft and crashed on the airport taxiway. One passenger was slightly injured but the aircraft was damaged beyond economic repair.

1. FACTUAL INFORMATION

1.1. History of the Flight

The aircraft with a pilot and five passengers on board took off from Dodoma Airport at 0909 hours on a flight to Arusha.

The pilot reported that shortly after take-off he noticed that the speed and rate of climb were lower than normal. The fuel flow gauge, according to him, was reading 14 gallons per minute as opposed to the expected figure of 22 gallons per minute. The engine speed had stood at 2850 revolutions per minute (r.p.m.). He decided to turn back to base and land on the active runway. On downwind, the aircraft developed a high rate of sink forcing the



pilot to cut short the approach circuit and head for a grass area alongside the runway.

The aircraft touched down heavily on a patch of grass adjacent to a taxiway damaging the main gear. After running about 100 feet, the aircraft tipped over its nose and continued sliding on its back across the taxiway before it finally came to rest. The occupants remained hanging trapped in their seats by means of seat belts and shoulder harnesses till rescue teams arrived at the scene in just over one minute. There was no fire. Only one passenger sustained minor injuries but the aircraft was damaged beyond economic repair.

1.2 INJURIES TO PERSONS

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	-	-	-
Serious	-	-	-
None	1	5	-

1.3 DAMAGE TO AIRCRAFT

The aircraft was damaged beyond economic repair.

1.4 OTHER DAMAGES

There was no third party damage.

1.5 PERSONNEL INFORMATION

The pilot was born on September 30th 1949 at Voorschoten in the Netherlands. He held a Commercial Pilots' Licence No. HP-223 and a Flight Radio Telephony Licence No. H.453. Both licences were granted on the strength of equivalent Dutch licences on January 21st 1983. Licences were current till September 21st 1983.

At the time of the accident the pilot claimed a total experience of 630 hours 15 minutes broken down as follows:

P1 Day - 536 hours 45 minutes

P2 Day - 93 hours 30 minutes.

His experience on Cessna 185 was 18 hours 30 minutes.

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Date	Description	Amount
1912	Jan 1	100.00
1913	Jan 1	100.00
1914	Jan 1	100.00
1915	Jan 1	100.00
1916	Jan 1	100.00

1917

1918

1919

1920

1921

1922

1923

1924

1925

1.6 AIRCRAFT INFORMATION

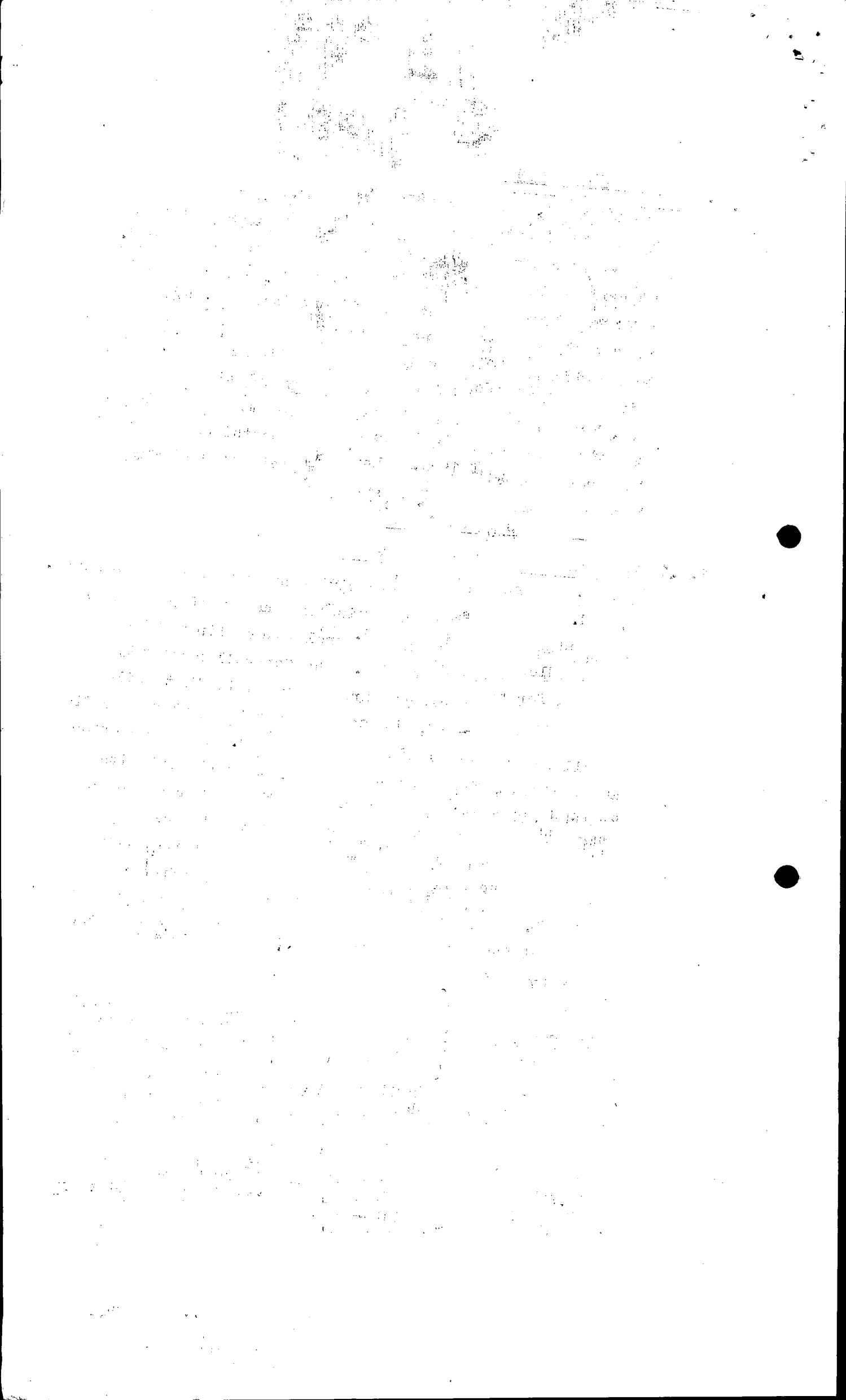
The aircraft, a Cessna 185F serial No. 185-03531 powered by one Continental LO-520-D engine was manufactured by the Cessna Aircraft Company at Wichita, Kansas, USA in 1977. It arrived in Tanzania on June 14th 1982 in possession of a US Standard Certificate of Airworthiness No. PC4, and a US Registration N 2795Q in the name of Missionary Aviation Fellowship P.O. Box 202 Redlands, California, USA. It has since been operated by the Missionary Aviation Fellowship P.O. Box 491 Dodoma, Tanzania. By the time of accident the aircraft whose certificate of Airworthiness was valid in accordance with the laws of the State of Registry had logged a total of 1499.40 hours.

1.6.1 LOADING AND C OF G DISPOSITION

The aircraft had full tanks giving an endurance of 5½ hours. There was discrepancy regarding the number of persons on board. The figure 6 on a Control Tower slip had been amended in script to read 5. The Controller on duty who handled the accident aircraft reported that while taxiing for take-off, the Commander had reported by radio a full complement of six souls on board. One hour after the accident, the Commander of the aircraft went with another pilot to the Tower to have the number of persons on board changed to five. When interviewed three weeks after the accident, the Commander could not remember exactly what he had told the Tower shortly after the accident. The same Commander later made an unproven statement that he had radioed the figure six (6) to the Tower by mistake.

One eye witness reported having seen the Commander, five passengers and six or seven cases being loaded on the aircraft just before it took off. The investigating team which arrived one day after the accident saw only one such case.

Working from these alleged figures the aircraft gross weight just before take-off was estimated as follows:-



<u>ITEM</u>	<u>WEIGHT (LB)</u>
Basic Airplane	1677
Baggage Pack	40
Fuel: 81 US gallons at 6 lb	486
Oil	22
Commander and Front Passengers	340
Second Row Passengers	340
Third Row Passengers	340
Cabin Baggage at 44 lb.	40 <u>264</u>
	3549
Maximum authorised weight	3350
Overload by	199

1.7 METEOROLOGICAL INFORMATION

It was a hot sunny day, temperature 25.3°C with a 285/10-15Kts wind visibility was over 10 Km.

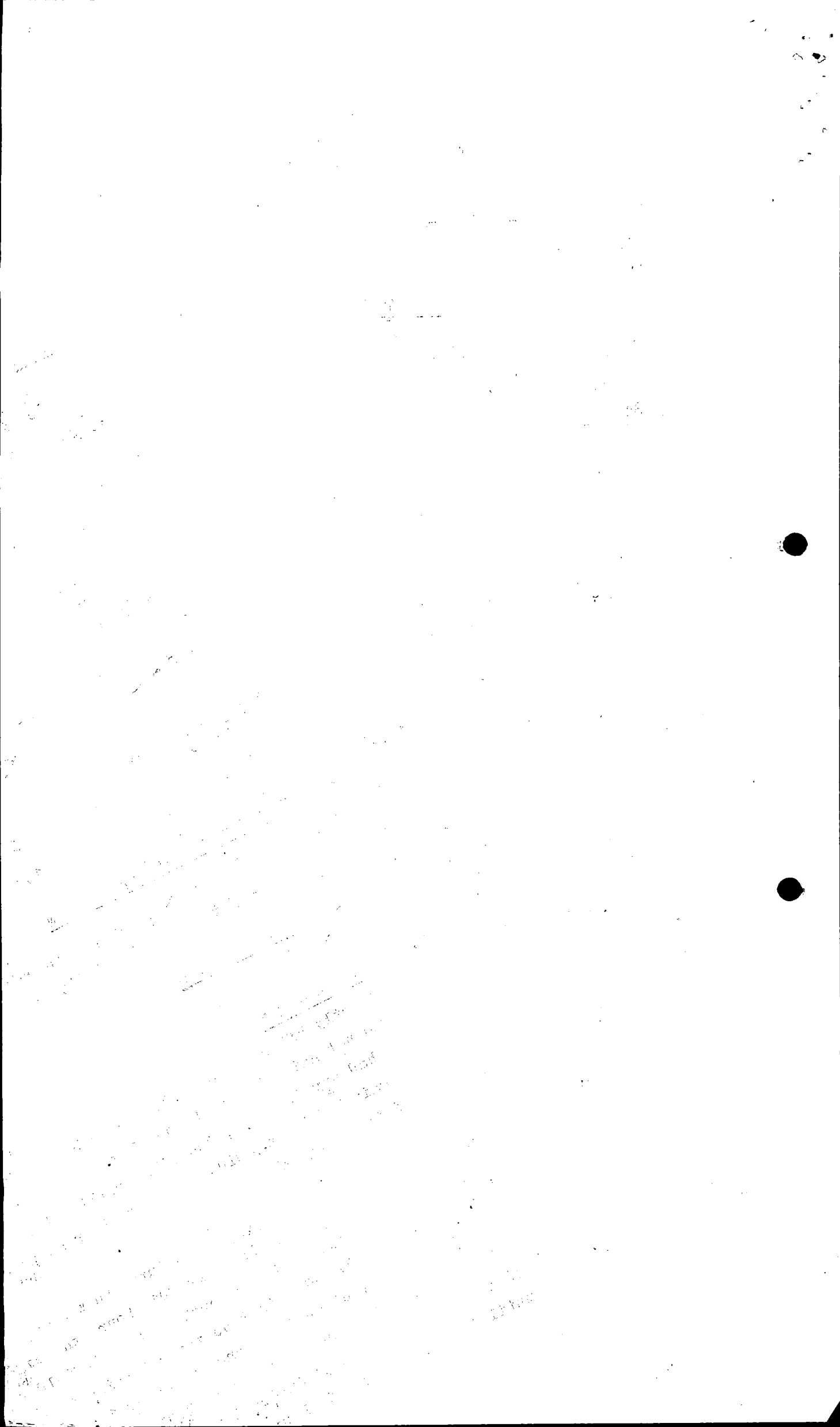
1.8 AIDS TO NAVIGATION

Not applicable.

1.9 COMMUNICATIONS

Shortly after take-off the Tower observed that the aircraft was not gaining height normally. When asked by the Tower if he had any problems, the pilot replied that he was trying to gain height but did not say whether he needed any assistance nor give his intentions.

The aircraft initiated a left turn and was obscured by a nearby hill for a while. At 0913 hours the aircraft was again sighted by the tower North of the airfield flying very low. The pilot reported that he was returning to base and was immediately cleared to land on runway 10. N2795Q was then seen to approach the runway at right angles. There was no further communication with the aircraft until it crashed at 0915 hours.



1.10 AERODROME INFORMATION

Runway Information

Runway : 10/28
Length : 1742 m.
Width : 30 m
Surface : Tarmac
Condition : Good
Elevation : 964 (3673 ft.) ASL
Apron : Tarmac
Strip ± Short

1.11 FLIGHT RECORDERS

Not required by Regulations: None fitted.

1.12 WRECKAGE INFORMATION

The aircraft was found lying on its back on a taxiway with its nose pointed into the direction it came from in the course of the attempted landing.

There was extensive damage to the starboard wing. This wing had struck a concrete block just before it entered the taxiway. The port wing was badly damaged. The propeller and the spinner suffered extensive damage. The engine was possibly shock loaded. The port undercarriage was found torn off the fuselage. The damage was assessed to be beyond economic repair.

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

Not applicable.

1.14 FIRE

There was no fire.

1.15 SURVIVAL ASPECTS

A rescue team arrived at the scene of the accident within a minute of aircraft coming to a halt. The occupants were found hanging from their shoulder harnesses while the aircraft lay on its back on a taxiway.

Only one occupant sustained a minor injury. The accident was survivable largely because there was no post impact fire.

1.16 TESTS AND RESEARCH

Fuel samples taken from the aircraft were found free from contamination. The six sparking plugs and the injector pump were also found serviceable.

The flap setting in the cockpit was found at 20 degrees. On a forced landing of this nature 40 degrees of flap selected at 80 m.p.h. would have served better in keeping the aircraft under control.

The critical parts of the engine were examined and found serviceable. Fuel was free from contamination. In fact the engine maintained its correct full power speed of 2850 r.p.m. during take-off and the attempted climb-out. Engine speed (and hence engine power) during take-off and climb phase is almost directly related to fuel flow so that it is not feasible to maintain the take-off engine speed of 2850 r.p.m. with a drastically reduced fuel flow.

2. ANALYSIS

Just before the take-off run was initiated the pilot checked the various gauges and found all of showing correct readings. The pilot reported that just after take-off, he noticed that the climb speed was much lower than normal. He again checked all instruments and found them still showing correct readings for the climb with the exception of the fuel flow gauge, which according to the pilot, was now indicating 14 gallons per hour (gph). The correct fuel flow during climb should be about 22 gph. The manifold pressure indicated 25 inches (hg) while the engine speed stood at the full-power rating of about 2850 r.p.m.

Some observers at the airport saw the aircraft running longer than normal before it became airborne. The aircraft then went into a shallow climb which was also noticed by the control tower. While flying downwind during the attempt to land on the active runway the aircraft developed a high rate of sink following which the pilot decided to land immediately on the patch of grass lying parallel to the runway. The stall warning horn was audible.

The estimation of the aircraft weight during take-off was complicated by the fact that the first-on-the-spot rescuers were also the aircraft operators. There is evidence that effort was made to put the pilot on the safe side for the subsequent investigations.

For example the Controller reported that about one hour after the accident had occurred, the pilot, escorted by another pilot of the same company who had been one of the first people to arrive at the scene of the accident, came to the Tower and requested that the number of persons on board the accident aircraft be changed from six to five. This, they said, was because the pilot had initially transmitted the figure six by mistake. The controller agreed to amend the figure on the slip to 5. However, some other records were not amended. They still read six persons on board. When interviewed three weeks later the pilot could not remember having amended any Tower records.

In practice the pilot should have amended this information any time before take-off. However after the aircraft had taken off and the Tower documents for the aircraft take-off had been filed, neither the pilot nor the Controller on duty had the mandate to alter these documents. It is for this reason that the figure for the purpose of this report has been held at six.

Another point concerned the baggage carried by the aircraft when the investigation team arrived at the scene of the accident one day later on 30/1/83 there was only one case and a few small packs of personal effects and books. Eye witness reports quoted six or seven cases being boarded on the aircraft before it took off.

If the number of occupants is put at six, the gross weight of the aircraft at take-off becomes 3549 lb which is 199 lb in excess of its allowed maximum take off weight. When the number of persons on board is reduced to 5 the aircraft would still be 29 lb above the allowed maximum. The weight of six cases was estimated at 264 lb which, when omitted from the calculations, gives an aircraft prepared for take-off weight of 3115 lb. This figure is 235 lb inside the airplanes weight envelope.

The effects of density altitude at Dodoma (elevation 3673 ft.) and the temperature at that time (25°) are considerable and, in any case, will erode the aircraft's ability to operate near its maximum weight limit. Added to these adverse factors was the presence of a cargo pack carried on the aircraft belly. The manufacturer's manual indicates that the form drage created by the cargo pack lowers the aircraft rate of climb by 40 feet per minute.

The combined effects of these three factors should greatly reduce the aircraft rate of climb even when the aircraft weight just falls within the allowed maximum.

In any case, under the circumstances of payload and fuel loading, the aircraft appears to have been able to lift off and execute a shallow climb partly because of the 10-15 Kt headwind and partly due to ground effect.

Having climbed out of ground effect and made a 180 degree turn into downwind, not only were the two favourable factors lost, but the aircraft now flew with an adverse tail wind component. It is probably for this reason, therefore, that the shallow climb no longer be sustained.

The aircraft would have remained controllable had the pilot attempted a forced landing straight ahead instead of executing the 180° turn in an attempt to return to base.

Whilst it was not possible to establish the exact aircraft weight at take-off, the performance of the aircraft showed that it was probably operating under some degree of overload.

One notable factor was the pilot's limited flying experience (630 hours). He had only 18 hours on the type. In fact he trained and flew in Holland and it was his first time to fly on duty alone since he arrived in this country. His experience in taking-off from hot and high airfields was very limited.

3. (a) Conclusion

1. The aircraft was properly licenced
2. The aircraft documents were in order
3. The aircraft was probably overloaded
4. The pilot did not show good airmanship by trying to turn back to base instead of effecting a precautionary landing straight ahead.

(b) Probable Cause

The accident was probably caused by the aircraft going into a stall due to overload.

(c) Contributory Factors

1. The adverse density-altitude conditions due to the high elevation of the airfield.
2. The high temperature at the time of take-off
3. The pilot's failure to select 40° of flap on the downwind leg.


C.M. Newa

CHIEF INSPECTOR OF ACCIDENTS