

CAV/ACG/14/67

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT

Report on the accident to Lockheed 382B
Aircraft Registration 9J-RCY which
occured on the 1st June, 1967,
at Dar es Salaam Airport,
Tanzania.

EAST AFRICAN COMMUNITY

CAV/ACC/14/67

EAST AFRICAN COMMUNITY,
ACCIDENT INVESTIGATION BRANCH,
P.O. BOX 30163,
NAIROBI.

MARCH, 1968

The Secretary General.

Sir,

I have the honour to submit a report by Mr. D.C. Frost, Inspector of Accidents, into the circumstances of the accident to Lockheed 382B, Aircraft Registration 9J-RCY which occurred on the 1st June, 1967 on Dar es Salaam Airport, Tanzania.

I have the honour to be,
Sir,
Your obedient servant,



D.C. Stewart

CHIEF INSPECTOR OF ACCIDENTS

DGS/VPS

ACCIDENT REPORT
ACCIDENTS INVESTIGATION BRANCH

CIVIL ACCIDENT REPORT NO. CAV/ACC/14/67

AIRCRAFT: Lockheed 382B - 9J-RCY. ENGINE. ALLISON 501-D22

OWNER: Government of the Republic of Zambia.
P.O. Box RW 65, Lusaka, Zambia.

CREW: Pilot - Mr. W.C. Albert - uninjured
co-Pilot - Mr W.E. Drew - uninjured
Flight Engineer - Mr. D.J. Bell - uninjured

PASSENGERS: Nil.

PLACE OF ACCIDENT: Dar es Salaam Airport, Tanzania.

DATE AND TIME: 1st June, 1967 at 1025 G.M.T.

ALL TIMES IN THIS REPORT ARE G.M.T.

SUMMARY

The pilot, having a starter motor gear failure on No. 1 engine, attempted to start this engine by the 'windmill start' procedure. Five runs were made up and down the runway; on the final run a fire was observed in the left hand undercarriage nacelle. There was considerable damage to the aircraft structure. There were no injuries.

1. INVESTIGATION

1.1. The aircraft was one of a number engaged on the transportation of fuel to Zambia with a return load of copper to Dar es Salaam. On the 1st June, 1967, having loaded 80 drums of diesel oil for the return trip to Ndola, it was found that the drive to the gear box from the starter motor of No. 1 engine had sheared. The pilot, Mr. W.C. Albert, was advised at 0910 hours by radio from a sister aircraft, 9J-RCV flown by the operator's Chief Pilot to....."Remove starter pad not required and attempt windmill start No. 1 engine". An hour later the faulty drive to the starter motor had been removed by the Flight Engineer, and the starter motor replaced as a pad. At 1010 hours clearance was given by A.T.C. to taxi on Runway 05 in order to attempt a 'windmill start'. A total of five runs were made in the next 15 minutes. At the end of the fifth run it was observed by A.T.C. that smoke was issuing from the aircraft's left hand undercarriage nacelle. The airport fire fighting equipment was on the scene within 2 minutes after smoke was first seen.

1.2. Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Non-Fatal	-	-	-
None	3	-	-

1.3. Damage to Aircraft

Extensive damage by fire was sustained by the port main landing gear assemblies and retracting mechanism, port fuselage wall internally and externally, and port under-carriage nacelle.

1.4. Other damage

No other damage.

1.5. Crew Information

Mr. Warren Charles Albert is the holder of a United States Commercial Pilot's Licence No. 257367 endorsed for Lockheed 382 with instrument rating, issued on 21st January, 1966, a Zambian validation was granted on the strength of this. His total experience on the subject type of aircraft is 2,800 hours.

Mr. William Edward Drew is the holder of South African Airline Transport Pilot's Licence No. 4165 endorsed for DC3, DC4, Carvair and Vickers Viking aircraft and validated by Zambia until 27th August, 1968 to include the subject type aircraft. His total flying experience amounts to 18,750 hours including 27 hours on the subject type of aircraft.

Mr. David James Bell, Flight Engineer, is the holder of a Zambian Flight Engineer's Licence No. 2 valid until June, 1968. His total flying experience amounts to 7,200 hours including 348 hours on the subject type of aircraft.

1.6. Aircrew Information

The aircraft, a four engined, high wing monoplane manufactured by the Lockheed-Georgia Co. of Marietta, Georgia, U.S.A., was issued with a Zambian Certificate of Airworthiness on the 5th October, 1966 valid until 12th August, 1967.

The aircraft was maintained in accordance with an approved Maintenance Schedule the last check being the 16th carried out on 23rd May, 1967, a Certificate of Maintenance being issued valid for 150 flying hours, 69 hours prior to the accident.

The aircraft had completed 2292 hours since manufacture. The No. 1 engine had completed the same number of hours since manufacture and had had no major overhaul.

Examination of the aircraft records show that there were no defects experienced which might have had a bearing on the accident.

At the time of the accident the weight was below the maximum authorised and the centre of gravity within the specified limits. Contrary to the Zambian Air Navigation Regulations Section 24(1), a Load Sheet had not been completed for the flight, however it is estimated that the aircraft was at a total weight of approximately 135,000 lbs.

1.7. Meteorological Information

Conditions on Runway 05/23, the runway in use at the time of the accident were:-

Wind/Velocity	120/08
Ambient Temperature	27.6°C
Runway Temperature	28.35°C estimated.

1.8. Aids to Navigation

Not relevant.

1.9. Communications.

Not relevant.

1.10. Aerodrome and ground facilities.

Within two minutes of the alarm being given the Airport Fire fighting equipment reached the scene of the accident. Some difficulty appears to have been experienced by the fire crew in operating their equipment immediately and containing the fire. Ten minutes after their arrival a request was made for the assistance of the Dar es Salaam City Fire Service which arrived some five minutes later. The fire was then brought under control.

1.11. Flight Recorder

Not relevant.

1.12. Wreckage

The aircraft was finally brought to rest in the North East portion of the loop taxi track. Examination showed a tyre mark and hydraulic oil spillage extending in a curve back on to the Runway to a point 700 feet from the threshold of Runway 23. Burnt pieces of brake disc were collected to a point 850 feet from the threshold.

The Utility Hydraulic Reservoir, capacity 3.2 U.S. gallons which supplies, among other services, the main landing gear brakes, was found to be empty. The specification of the hydraulic fluid in use is MIL - H - 5606 with a petroleum base. The fire point is known to be 255° F and ignition will take place when dropped onto a hot body at a temperature of 470° F. Hydraulic fluid lines supplying the brakes are installed adjacent to the main wheel assemblies in the undercarriage nacelle. Damage by fire was such that identification of the fractured pipe line was impossible.

1.13. Fire.

Observed from the A.T.C. tower by the Air Traffic Control Officer, the first sign of fire was at a distance approximately 1150 feet from the threshold of Runway 23. Smoke and flames increased as the aircraft came to a standstill in the loop taxi track.

Fire, clearly initiated by the action of hydraulic fluid falling on hot brake assemblies, became progressively more intense as the contents of the Utility Hydraulic Reservoir emptied.

The enclosed nature of the undercarriage nacelle made access to the seat of the fire difficult.

1.14. Survival aspects.

No injuries or burns were sustained by the crew. Evacuation of the aircraft was carried out without incident.

1.15. Tests and Research.

The practice of "windmill starts" was developed as an operational expediency by users of the military version of this aircraft, the Lockheed C.130 "Hercules". The manufacturers of this aircraft do not approve this practice, but a procedure has been laid down in the U.S. Air Force Technical Order 10-130E-1, Section VII, Systems Operation. Recommendations are:-

1. Gross weight not to exceed 135,000 lbs.
2. Runway length to be greater than 7000 feet
3. To decelerate to a stop when aircraft reaches a speed of 100 k.IAS or a point where 4,000 feet of the runway remains whichever occurs first.

The Federal Aviation Agency do not prohibit the use of this procedure but the Operations Manual should contain the following information:-

1. Data to compute accelerate/stop distance within 75% of available runway.
2. Ensure starter system disengaged
3. Inspect engine to ensure no mechanical malfunction has occurred.
4. Assure 50% reverse thrust available for stopping.
5. Permit only cockpit crew on board.
6. Crosswind should not exceed 10K. with gusts to 15K
7. Runway should be dry.
8. No tailwind component permitted.
9. Ensure that brakes are cool before take off or reattempt to start.
10. Crew members should be trained in this procedure.

1.46. Medical aspects

Not relevant.

2. ANALYSIS AND CONCLUSIONS

2.1. Analysis.

From the evidence it has been shown that on application of brakes on the final and fifth run, one, or more than one, brake disc commenced to disintegrate. A partially dislodged fragment or a fragment projected within the nacelle must then have fractured a brake hydraulic line, resulting in this inflammable fluid pouring on hot brake assemblies.

It is also evident that little regard, if any, was paid by the Captain, Mr. W.C. Albert to the runway conditions prevailing, i.e. an ambient temperature of 27.6°C, a small wind component of only 3 kts. at maximum, and less than the 7000 ft. of runway length required. No regard, similarly, was given to brake cooling, five runs being made up and down the runway in the period of approximately 15 minutes.

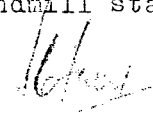
2.2. Conclusions.

(a) Findings.

- (i) With the exception of the Load Sheet the aircraft documentation was in order.
- (ii) The crew were properly licensed.
- (iii) The aircraft was properly maintained.
- (iv) Full compliance had not been made with the procedures laid down for the 'windmill start' of an engine.

(b) Cause.

The accident resulted from mishandling of the aircraft during attempts to 'windmill start' an engine.


D.C. Frost
INSPECTOR OF ACCIDENTS