

No. 13

Sterling Airways Ltd., DC-6B, OY-EAP, accident at Copenhagen Airport, Denmark, on 13 April 1963. Report, dated November 1963, released by the Directorate of Civil Aviation, Denmark.

1. Investigation1.1 History of the flight

On 12 April 1963, at 1521 hours GMT, Sterling Airways' DC-6B, OY-EAP, took off from Las Palmas Airport in the Canary Islands on a three-engine ferry flight bound for Copenhagen. After an intermediate refuelling stop at Barcelona, the aircraft departed again at 2224 GMT for Copenhagen. It contacted Copenhagen ATC when passing Michelsdorf on 13 April, at 0238 GMT. It was then at FL 110 which was maintained until the aircraft, when over ROBBY NDB, was cleared to descend to FL 45. At 0253 GMT, when passing PRESTO NDB at FL 60, the aircraft reported that Copenhagen Airport was in sight, whereafter the flight was performed with visual contact to this airport's runway 04. When passing marker beacon CODAN on the north coast of Stevns, the aircraft descended to 3 500-4 000 ft, the speed being normal, i.e. 170 kt. About 1-1/2 minutes later flaps were set to 20°, whereafter the speed in the course of the next few minutes was slowly reduced to 145 kt at which rate the undercarriage was extended and the flap angle was increased to 30°. The altitude was then approximately 1 500 ft and the approach towards the clearly visible runway was continued in a shallow glide. The approach was rather low, for which reason the engine power had to be increased several times in order to reach the runway. On short final - probably immediately before passing the first approach lights - the pilot-in-command ordered full flaps. The speed was then 110-130 kt and the height still rather low. Shortly after the flaps were fully extended the aircraft showed a tendency to bank which the pilot-in-command tried to counteract by applying aileron control. When the aircraft was 100-200 m from the runway threshold, the pilot-in-command realizing that he no longer had sufficient control to make a safe landing decided to abandon the landing. He ordered "pulling-up, full power, gear up, flaps twenty". The speed was then around 100 kt. The flight engineer immediately pushed the propeller pitch selector lever forward to full RPM position and thereafter advanced the throttles, at the same time moving the landing gear lever to the "up" position. When power was applied the aircraft immediately made a violent bank and an uncontrollable right-hand turn. About 10 seconds later the starboard wing tip hit the ground about 200 m beyond the threshold of runway 04 and 80 m to the right of the centre line. This caused the disintegration of the outer portion of the starboard wing whereupon the aircraft crashed. The aircraft came to a stop 220 m further on with its nose pointing roughly to 240°. The accident occurred at 0304 GMT, i.e. one hour before sunrise.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal			
Non-Fatal	2		
None	1		

1.3 Damage to aircraft

The aircraft was damaged beyond repair.

1.4 Other damage

No other damage was reported.

1.5 Crew information

In accordance with the flight manual only the minimum crew consisting of 2 pilots and one flight engineer were on board to carry out this ferry flight with one engine inoperative.

The pilot-in-command, age 43, held a valid Swedish Airline Transport Pilot's Licence, Class I, and also a Danish letter of validation. His last check flight was on 23 August 1962 under the supervision of the Danish Directorate of Civil Aviation after which he was granted a DC-6B rating. His total flying time at the time of the accident was 9 617 hours; 768 hours of which were as pilot-in-command on DC-6B aircraft.

The co-pilot, age 29, held a Danish Airline Transport Pilot's Licence Class III with instrument rating valid until 10 July 1963. His total flying time amounted, at the time of the accident, to 1 770 hours including 171 hours on DC-6B in the employ of Sterling Airways.

The flight engineer, age 42, held a Danish flight engineer's licence. His flying experience totalled about 4 000 hours, including 590 hours as flight engineer on Sterling Airways DC-6B.

All crew members' fatigue indexes were within the permissible maximum value at the time of the accident. All crew members were subjected to the sobriety test after the accident; no indication of alcohol was found.

1.6 Aircraft information

The Certificate of Airworthiness of the aircraft was valid until 27 August 1963. Of its total flying time of 33 819 hours, 103 hours had been flown since the last obligatory periodic inspection on 3 April 1963 and 36 hours since the last service check made on 9 April 1963. Sterling Airways' DC-6B fleet is maintained in accordance with an overhaul and inspection programme approved by the Directorate of Civil Aviation, Denmark. Nothing was found indicating that the aircraft maintenance was not carried out satisfactorily or that defects in the aircraft, other than the defective engine No. 4, could have affected the airworthiness of the aircraft. According to the approved Flight Manual ferry flights with one engine inoperative may be made provided the propeller of this engine has been removed or feathered.

The landing weight, approximately 31.5 t, was far below the maximum permissible landing weight. Location of the centre of gravity at the time of the accident was 15.5% MAC, i.e. well within the permissible range.

The type of fuel was not specified in the report.

1.7 Meteorological information

Weather conditions at Copenhagen Airport, Kastrup on 13 April at 0250 and 0320 hours were: wind: 310°/09; clouds: 1/8 at 800 ft; visibility: 15 km; no precipitation; barometric pressure at sea level varied from 1 016 to 1 017 mb (QNH). According to the crew the approach procedure was made in visual meteorological conditions in favourable weather.

At the time of the accident dawn was breaking on the horizon.

1.8 Aids to navigation

Runway 04 was not equipped with ILS.

1.9 Communications

Communications were normal.

1.10 Aerodrome and ground facilities

Aerodrome and ground facilities were adequate and normal. The lighting system of runway 04 was adequate and working perfectly at the time of the accident.

1.11 Flight recorders

No flight recorder was mentioned in the report.

1.12 Wreckage

A study of tracks on the ground and of the wreckage indicated that the starboard wing first hit the ground in a steep bank to the right of the runway approximately 80 m from its centre line and approximately 210 m beyond the runway threshold. No. 4 engine propeller was found quite straight, indicating that it had been stationary, while the other three propellers were twisted.

1.13 Fire

Fuel from the starboard wing was set on fire. The fire was observed from the control tower and the Airport's Fire Fighting Service was on the scene and had the fire under control within a few minutes. Fire damage was slight.

1.14 Survival aspects

The two pilots immediately evacuated the aircraft through the windows in the cockpit. When they realized that the flight engineer had not come out the pilot-in-command opened the foremost emergency exit on the port side, entered the aircraft and found the flight engineer unconscious in his seat. The pilot-in-command got him out of his seat and back to the emergency exit. The flight engineer then recovered sufficiently to leave the aircraft unassisted.

1.15 Tests and research

The four propellers with corresponding propeller governors were examined and bench tested with a view to ascertaining the engine power applied at the time of the

accident. It was concluded that No. 4 engine was feathered and that the three working engines were not set to maximum power (2 500 BHP) but to a power between 1 800 and 2 200 BHP. This corresponded to the 53" MP setting, which the flight engineer believed he remembered.

2. Analysis and conclusions

2.1 Analysis

Amongst the operational limitations for carrying out ferry flights with one engine inoperative, the following restriction is listed in the DC-6B Flight Manual: Flights with non-scheduled aircraft shall be performed in accordance with daylight contact flight rules. It was established that the accident occurred in the hours of darkness, which is in conflict with this provision. However, considering the extremely good visibility and the excellent lighting facilities on the runway, this did not seem to have contributed to the accident.

It is also clearly stated in the DC-6B Flight Manual that during the final approach with one engine inoperative the flaps shall not be lowered to more than 30° until the pilot is positive that he will be able to complete the landing; this is in order to maintain an adequate climb performance on three engines only.

The Manual also gives the procedure for carrying out an overshoot on three engines. This procedure presumes that the overshoot will be performed with flaps lowered to 30° only and landing gear extended, i. e. the configuration between approach and landing in which OY-EAP was until the pilot-in-command ordered full flaps about 1 km from the landing threshold. It would seem that the aircraft during the entire final approach was flying at a fairly low altitude and at a speed which was rather below normal. This, and the low weight of the aircraft, would seem to indicate that the selection of full flaps was not justified in the present case, as the aircraft hardly had more energy (speed and height) than was necessary to bring it, in its actual configuration, to the runway. In selecting full flaps, without increasing the engine power at the same time, the pilot-in-command allowed the accumulated energy to become exhausted before the aircraft reached the landing runway with the result that the speed necessary for a safe manoeuvring of the aircraft on three engines was no longer available at the end of the final approach.

2.2 Conclusions

Findings

The aircraft was airworthy within the limitations specified in the flight manual for ferry flights with one engine inoperative.

The weight and the centre of gravity of the aircraft were within prescribed limits.

The crew members were duly licensed.

The regulations governing flight, duty and rest time contained in the Company's operations manual were observed in respect of all crew members.

There was no indication that technical defects in the aircraft, apart from the inoperative engine No. 4, had any bearing on the accident.

The operational limitations for ferry flights with one engine inoperative were not complied with. The flight was, contrary to the provisions of the Flight Manual, carried out as an IFR flight. This must, however, in the circumstances, be regarded as having had no bearing on the accident. The flight was carried out on the order of the Company's Flight Operations Officer who, like the pilot-in-command, overlooked this provision.

The accident occurred during performance of a pull-up manoeuvre, when the aircraft was in a configuration in which it was not certificated to carry out such a manoeuvre. This is clearly stated in the Flight Manual.

By order of the pilot-in-command to lower flaps to landing position, the aircraft was brought into the above-mentioned landing configuration at a time when its altitude and speed, in relation to the remaining approach distance, probably did not warrant such disposition.

Cause or
Probable cause(s)

During the approach to runway 04 with the starboard outer engine inoperative, the speed of the aircraft decreased to a value critical for safe manoeuvring. Because of this the pilot-in-command attempted an overshoot. In the course thereof he lost control of the aircraft which, in a heavy bank, went into an uncontrolled right-hand turn, its starboard wing hit the ground, and the aircraft crashed.

That the aircraft got into the above-mentioned critical situation must, to an essential degree, be attributed to the fact that the pilot-in-command selected full flaps at a time when the altitude and speed of the aircraft in relation to the distance from the runway threshold did not justify such disposition.

3. Recommendations

No recommendations were contained in the report.

4. Action taken

Following the subject accident the crew members went through a special training programme and submitted to medical tests and test flights.

Also, a warning was issued against premature application of full flaps in cases where multi-engined aircraft are approaching to land with one engine inoperative.

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Commercial (ferry flight) international Landing Loss of control Pilot - improper use of flaps
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