No. 31

Air Work Limited, HERMES 4-A, ditched between Port of Trapani and the Island of Formica on 21 August 1952

(This investigation was conducted by Italy in conformity with Annex 13 of the Convention of the International Civil Aviation Organization. The report was also prepared in accordance with the Accident Report form contained in the Manual of Aircraft Accident Investigation. ICAO Doc 6920/AN-855 Appendix "B")

Circumstances

The aircraft, engaged on a non-scheduled flight from Blackbushe, England to Wadi Seidna, Khartoum, via Malta, took off from Blackbushe Airport at 1925 hours GMT on 24 August 1952 with 51 passengers and 6 crew. The flight was normal until 0025 hours GMT when the aircraft reached a position about 20 miles West of Trapani. At this time, No. 2 and No. 3 engines showed signs of abnormal functioning and were deliberately shut down and the propellers feathered. Without electrical power except from the batteries which were depleted of their charge by use of the radio equipment for emergency signals, Nos. 1 and 4 engines began to show signs of abnormal functioning. At approximately 0100 hours GMT, a ditching was carried out on the sea between the Port of Trapani and the island of Formica. Four passengers were drowned and two missing, one stewardess was also missing.

Investigation and Evidence

According to statements of crew members, the failure of No. 2 engine (over-speed) occurred less than one minute after No. 3 engine was shut down. The inquiry examined the possibility of an error in manipulating the engine controls while No. 3 engine was being shut down and feathered. It was pointed out that the flight engineer's panels were inverted since the flight engineer's post faces the back of the aircraft. There is also an unsymmetrical arrangement of some of the control levers. The limited experience of the flight engineer, - a total of 954 hours flying to his credit and only 154 on the Hermes type aircraft, - lent further strength to the probability of a manipulating error. From the evidence available, it was further assumed by the inquiry that failure occurred in No. 2 engine only, and that No. 3, to which all the symptoms of an abnormal functioning had been mistakenly attributed, was shut down unnecessarily. The inquiry found difficulty in determining the nature of the failure of No. 2 engine although it was decided that the failure was of a similar type to that which had occurred in earlier incidents with this type of engine.

Since the only two generators on the aircraft were connected to engines 2 and 3, after a failure of these engines the electrical equipment was supplied by batteries only which were insufficient for the supply of power, even for the most essential services for any length of time. (The S.O.S. on VHF was not completed for lack of sufficient power.) This prevented any successful communication with the aircraft and Search and Rescue operations were thus hampered by lack of information on the location of the ditching.

After the failure of Nos. 2 and 3 engines, Nos. 1 and 4 engines were increased to maximum continuous power to maintain the aircraft in flight. However, a few minutes later, the Engineer reported decreasing oil pressure on the remaining Nos. 1 and 4 engines, although their temperatures remained almost constant. In view of the doubt on the two remaining engines and the complete lack of radio communication required for prolonged navigation, the Captain decided to return to Trapani, where, on arrival, a red Very cartridge was fired. Although the Captain was aware that the Trapani airport was not equipped for night traffic, he nevertheless proceeded to the airport area in the hope of drawing the attention of the ground personnel and having them light up a runway with whatever means were available. A few minutes later, it having become apparent that it would be impossible to land at Trapani, and under the impression, shared by the crew, that the two remaining engines 1 and 4 had started vibrating and were showing signs of improper functioning, the Captain definitely decided to ditch the aircraft and warned the crew of this decision, with the presumed intention that they should also warn the passengers. The probability of a ditching had already been envisaged earlier, but the final warning was given between five and eight minutes before the ditching actually occurred. Another Very cartridge was fired while the aircraft was over Trapani, descending towards the sea. The ditching

manoeuvre was brilliantly performed in complete darkness with the lights of Trapani as sole reference and using only the airspeed indicator and altimeter which were read out loud continuously by the First Officer. The aircraft ditched between the Port of Trapani and the island of Formica at about 0100 GMT.

The landing gear and flaps were in the retracted position and the speed of impact was estimated at about 120 knots.

The impact tore off the landing gear legs and the detachable portions of the spar. The fuselage probably commenced to flood through the damaged portion of the under nose skin. The aircraft floated for about 10 minutes, then remained half submerged in the vertical position with the tail up for another few minutes and finally sank.

Although malfunction of engines 1 and 4 was indicated, the Board, however, considered that the working limits of this type of engine were not exceeded and the flight could have been continued for a longer period.

The passengers were warned of the engine trouble either by the abnormality of the engine noises and vibrations, or by the changes in the intensity of the lighting or by the alarmed appearance of the two hostesses. About 25 minutes prior to the ditching, the hostesses suggested to the passengers, that they should strap themselves in their seats, not smoke, awaken those who were asleep, put their seats in the upright position, take out their life-jackets, etc. in order to be ready for any emergency.

These suggestions apparently were not made in the form of instructions and statements addressed to all the passengers generally and were therefore not heard and fully appreciated by everyone. One hostess asked how the life-jackets should be put on and used; she did not seem to be very sure. In spite of this, the passengers found and put on the 47 life-jackets located under each seat; a few passengers read the instructions for the use of these jackets, which were posted in the cabin.

It appears from the statements of the passengers, as well as from the findings of the Commission, that there was some difficulty in inflating the life-jackets, either by means of the CO_2 flask or by mouth. The difficulty was due partly to the inadequate instructions given to the passengers on the use of life-jackets, and partly to certain defects of the jackets themselves, which, as a result of this accident, have led the Air Registration Board to issue Notice No. 39 of 15 September 1952.

From statements made by passengers it was also determined that certain defects (imperfect watertightness, flash lights ineffective, etc.) could be attributed to the improper maintenance of the life-jackets and their accessories.

Dinghies

Since the number of life-jackets (54) was smaller than the number of persons on board (57), some other emergency equipment had to be carried. (4 young children were not provided with life-jackets because they were not occupying separate seats.) The most suitable were the dinghies which are provided especially for the benefit of children and infants. Although some evidence indicated that two "K" type dinghies were on board, there was conflicting evidence that they were not on board. In any case, dinghies were not released or used.

One hostess managed only at the last moment to find and put on a life-jacket while the other hostess remained without one, in spite of the fact there must have been two others on board.

No serious consequences on ditching (except a few cases of shock, contusion, temporary fainting, etc...) were reported by the passengers, who, in spite of the total darkness on board had got out of the aircraft through the main door and the smaller doors located near their seats without disorder or panic.

In the sea, the passengers generally had difficulty in inflating their life-jackets, many of which had to be manipulated by members of the crew and some of the passengers who had gone through similar experiences previously, before they were of any use.

In view of the inadequacy of the sole, incomplete distress signal intercepted by Malta and of the fact that four red flares fired by the aircraft were spread over a very large area of

Western Sicilia, the determination of the point of ditching was made very difficult, and the search and rescue facilities could not be directed to the spot immediately.

However, rescue operations were begun shortly after 0200 GMT when a survivor hailed motor fishing vessels passing through the area and by 0500 GMT 53 persons including 3 dead had been recovered.

Probable Cause

The probable cause of the accident lay in a failure of one or both of the two inner engines Nos. 2 and 3. The reason for the failure was undetermined.

The contributory causes were;

a) State of mind arising from the knowledge of another accident, only a short time before, to an aircraft of the same type, which was proved to have been due to power-plant failure.

b) Failure of electrical generators when No. 2 and No. 3 engines stopped.

c) Batteries inadequate for ensuring normal flight functions and not even sufficient for satisfactory transmission of distress messages.

d) Limited experience of the crew and of the hostesses on this type of aircraft.

e) Limited training of the crew.

f) Emergency procedures not properly followed, particularly by the hostesses.

g) Life rafts either missing or not used.

h) Failure of lifebelts.

The Commission was of the opinion that only one of the two inner engines (Nos. 2 and 3) failed of its own accord and that the stoppage and failure of the other one was caused by an error of the flight engineer.

RECOMMENDATIONS

1. Power-plants - Several previous cases of serious failure similar to the present one having been confirmed, it was recommended that, in addition to the measures already being taken, all necessary steps be taken to prevent recurrence of further incidents of this nature.

2. Generators - The provision of only two generators on a four-engined aircraft such as the HERMES appears to be insufficient. Installation of a third generator - which has already been undertaken - was supported and recommended by the Commission.

3. Flight engineer's station - It was recommended that, with a view to making the engineer's control movements and handling more instinctive, consideration be given to modifying the flight engineer's control panel on board HERMES aircraft to make the position of the various control levers reflect the position of the various controls and to arranging the levers in series for each engine.

4. Number of lifebelts - Strict compliance was recommended with the ICAO Standards (Annex 6 paragraph 6.3.2.2)* which provides that landplanes shall carry "one lifebelt or equivalent individual floatation device for each person on board".

5. Location of lifebelts and rafts - Strict compliance was recommended with the ICAO Standards (Annex 6 paragraphs 6.3.2.2 and 6.3.3 a)* which provide that lifebelts shall be "stowed in a position easily accessible from the seat of the person for whose use it is provided", and shall be "stowed so as to facilitate their ready use in emergency". It was further recommended that the location of this emergency equipment be clearly indicated in the HERMES and in the flight manual thereof and that the stowing of this equipment be checked in order to ensure compliance with the above-mentioned standards.

* References to Annex 6 are to the Third Edition of that document, issued in May 1952.

6. Lifebelts - It was recommended that, in addition to the measures adopted by the Air Regulations Board in its Notice No. 39 of 15/9/53, the method of automatic and mouth inflation of the lifebelts be considerably improved in order to make them safer and more practical to use.

7. Emergency procedures - It was recommended that those concerned comply strictly with the ICAO Standards on emergency procedures and, in particular, with paragraphs 4.2.7.5, 4.2.8, 4.2.8.1 and 4.2.8.2 of Annex 6*.

8. Documents associated with the Certificate of Airworthiness - With reference to paragraph 4.2.3 of Annex 6*, it was recommended that the flight manual, even if only a document associated with the certificate of airworthiness, and not an official document forming a part thereof, as in the present case, should always be maintained valid and up-to-date.

9. Maintenance - It was felt justifiable to recommend greater care in the inspection and maintenance of aircraft, engines and accessories.

10. Composition of crews - It was considered desirable that, in forming aircrews, the following factors be taken into account:

a) Assigning together individuals who have a minimum of experience of the particular aircraft type;

b) Assigning together individuals who have already done a minimum of flying together. The above "minima" should be established mainly on the basis of the complexity of the aircraft type and of the total accumulated flight time of the individual crew members.

11. "Status" of the hostess - It was considered desirable to define the "status" of the hostess as being a member of the flight crew. Pending such definition, it was considered desirable that at least the requirements for a licence be established.

12. It was considered desirable that in the cases (Annex 6 paragraphs 6.3.1 and 6.3.2) where equipment with lifebelts only is required, a raft should also be provided, capable of carrying at least:

- the first aid kit specified in paragraph 6.2 a) of Annex 6;

- the sea anchor specified in paragraph 6.3.1 c) of Annex 6;

- the equipment for making pyrotechnical distress signals, specified in paragraph 6.3.3 a) of Annex 6;

- the portable self-buoyant radio transmitter specified in paragraph 6.3.3 b) of Annex 6;

- two persons to operate the above equipment.

Such a raft could be called a "service raft" (Battellino di Servizio). In this connection, it should be noted that if the crew of the aircraft had been able, on ditching, to use a portable radio transmitter and pyrotechnical distress signals, all the rescue facilities, both organized and unofficial, could have been directed immediately to the scene of the accident.

13. Lifebelts for infants - It was considered desirable:

a) To adopt as "equivalent individual floatation device" (Annex 6, paragraph 6.3.2.2) special lifebelts for children, since they cannot use those normally worn;

b) That, in the absence of such children's lifebelts, a sufficient number of life-rafts be carried, capable of carrying at least all the children on board.

In this connection, it was pointed out that, in this accident, out of a total of 11 children on board, 2 (aged 3 and 6 years) were found dead with their lifebelts deflated, and two others (infants without lifebelts) were missing.

* References to Annex 6 are to the Third Edition of that document, issued in May 1952.

14. Rafts for all occupants - According to paragraph 6.3.3 of Annex 6, this HERMES was not compelled to carry life-saving rafts for all the occupants when flying across the Mediterranean, irrespective of the route flown, in view of the speed of the aircraft.

This accident shows, however, that if the aircraft had been at a more unfavourable point in the Mediterranean, instead of at the tip of Sicily, it might have ditched at a distance from the coast such that the time required to bring means of assistance would have exceeded the physical endurance of the occupants of the aircraft.

It was considered desirable, therefore, that the above-mentioned paragraph 6.3.3 be modified and made more restrictive. In this connection, the Italian authorities have laid down that Italian aircraft shall be equipped with life-saving rafts for all occupants on flights of 250 km or more from shore. The Italian authorities have specified this distance rather than a flight time, because they consider that, in cases of this type, the speed of the rescue units is of more importance than the speed of the aircraft.