

No. 9

Trans Mediterranean Airways, DC-4 (C-54A), OD-AEB, accident in the Koh-i-Safid Mountains, Afghanistan on 12 December 1963. Report, dated November 1964, released by the Afghan Air Authority

1. Investigation1.1 History of the flight

The aircraft was on a non-scheduled international cargo flight from Beirut, Lebanon to Kabul, Afghanistan via Kuwait, carrying a crew of three. The trip to Kuwait was uneventful, and it arrived there at 0036 hours GMT on 12 December. Departure from Kuwait for Kabul was at 0256 hours and the flight reported passing Kandahar at 0838 and Kalat at 0900 flying at flight level 110. While en route the aircraft was provided with the Kandahar and Kabul weather. At 0942 hours it reported passing Ghazni at 0940, flying at flight level 150 and estimated its arrival time at Kabul as 1010 hours. However, at 0958 (i. e. 12 minutes before ETA) it reported overhead Kabul and requested the latest weather situation which was provided. As the aircraft could not land at Kabul because of the weather conditions it reported at 0959 hours that it was diverting to Lahore. Shortly thereafter it reported it was proceeding to Zahedan via Ghazni (ETA 1025), Kandahar (ETA 1130) Zahedan (ETA 1315). It would maintain flight level 150 to Ghazni, 130 to Kandahar and 110 to Zahedan. At 1003 hours the Kabul tower passed the Kandahar weather to the flight and 5 minutes later the flight reported it was 25 miles out from Kabul, at flight level 150. The aircraft was then cleared by Kabul tower to route frequency and nothing further was heard from it. The wreckage of the aircraft was first sighted on 16 August 1964, after the snow had melted, at an elevation of 13 940 ft amsl in the Koh-i-Safid Mountains 50 NM west of Ghazni and 42 NM from the approved air route. The coordinates of the accident site were estimated to be 33° 37'N 67° 35'E (See Figure 7). The time of the accident was some time after 1015 hours GMT on 12 December 1963.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	3		
Non fatal			
None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

No damage was sustained by objects other than the aircraft.

1.5 Crew information

The pilot-in-command joined TMA in January 1963. In April 1963 he failed to pass his first check flight with the Company, and it was stated that he needed more practice on instrument flying. However, he passed the check in May 1963 and again in November 1963. He held a valid Lebanese airline transport pilot's licence at the time of the accident. His total flying experience amounted to 9 957 hours which included 3 193 hours on DC-4 aircraft and 8 000 hours flown in command. He had been given three months' notice of termination of his employment due to a reduction in the Company's activities and was making his last flight for the Company. He had previously worked for at least five other aircraft operators, and the prospect of changing once more might have occupied his mind.

The co-pilot had been discharged three times from the Company as a result of adverse reports on his flying and for not being able to keep up his licence. However, since 1961 he had shown definite improvement and had managed to restore his professional pilot's licence and pass a DC-4 flight check in August 1963. He had flown over the route to Kabul on numerous occasions. He had flown 2 842 hours including 743 hours on DC-4 aircraft.

The third crew member was also flying in the capacity of co-pilot. He also held a professional pilot's licence and had flown 2 655 hours including 29 hours on the DC-4. Most of his flying experience was acquired as second pilot on DC-3 and Viscount aircraft.

The aircraft was scheduled to take-off from Beirut at 1900 hours GMT on 11 December, and the crew had, therefore, been on duty for at least sixteen hours. They had been flying for about 2-1/2 hours in an unpressurized aircraft at 15 000 ft and the pilot-in-command had mentioned to another pilot while en route that his oxygen was getting very low. Therefore fatigue and a lack of oxygen may have contributed to the accident.

1.6 Aircraft information

The aircraft's certificate of airworthiness was valid until 23 January 1964. No information was contained in the report concerning the aircraft's maintenance history aside from the times since last overhaul of the engines and propellers.

Errors were found in the weight and balance sheet as to the amount of fuel carried from Kuwait. This indicated possible carelessness or fatigue on the part of the pilot. On departure from Kuwait the aircraft carried a load of 3 201 kg and an estimated 3 306 U.S. gal of fuel. The latter was incorrectly entered as 3 000 gal.

1.7 Meteorological information

Evidence indicated that the pilot took off from Kuwait at 0256 hours for the flight to Kabul without obtaining any route or terminal weather forecast. In fact, none was available at Kuwait. However, he filed a flight plan indicating that after passing the Iran/Afghan frontier it would be under VFR, with Kandahar as the alternate.

Almost the entire route to Kabul via Kandahar and Ghazni coincided at this time with the line of a cold front which was slowly moving eastwards and was followed by a secondary front.

At 0900 hours when the aircraft had passed Kandahar, bad weather extended over the north, east, southeast and central parts of Afghanistan.

Kabul was overcast with continuous rain and the lowest clouds were at 600 m. Ghazni and Maimana were overcast with snow. By 1200 hours the main cold front had passed east of Kabul and Ghazni with occluded front conditions between. Kabul still had continuous rain. Ghazni had cloud down to 600 m but no precipitation at that time. Kandahar had rising dust, and the sky was not visible. Zahedan, Birjand, and Herat were clear.

While en route, Kandahar Flight Information Centre passed several weather reports to the flight concerning the weather conditions at Kabul and Kandahar. The pilot advised that he was proceeding to Kabul and if he was unable to land there, he would divert to Lahore. At 0900 hours the flight was provided with the following weather forecast for Lahore:

"scattered thunderstorms/rain accompanied by gusty winds with moderate turbulence associated with 24/8 CB at 3 500 ft likely Lahore FIR period 120550. 121800 surface wind NE/may rise to 40 kts and visibility may fall to one mile or less in rain gust."

At 0955 hours the flight contacted Kabul Tower and was provided with the following actual weather situation:

"cloud 8/8 surface wind 270/2kt. Visibility 1 NM snow and rain.
Cloud 8/8 NS 250 metres relative humidity 100%. Temperature - 2°C."

The actual weather picture for 1000 hours followed shortly thereafter:

"Cloud 8/8 NS. 300 metres visibility 1-1/2 NM slight rain, QNH 29.90 inches."

The flight then reported that it could not land at Kabul and was diverting to Lahore and it requested the actual weather at Kandahar. Having been advised by the pilot of Iranian Airways Flight 422 flying from Tehran to Zahedan and Kabul, that Zahedan was clear, it finally decided to divert instead to Zahedan.

At 1003 hours Kabul Tower provided the flight with the 0900 hour weather reports for Kandahar and Ghazni as follows:

Kandahar: "Sky invisible, surface wind 150°/18 kt gusting to 24 kt. Visibility 200 m, duststorm, QNH 1011.1."

Ghazni: "Cloud 8/8, surface wind 360°/2 kt. Visibility 10 km, snowing clouds 5/8 SC at 3 300 ft, 8/8 NS at 4 000 ft."

At 1004 hours the flight was heard relaying these two reports to Iranian Flight 422, as requested by Kabul Tower.

1.8 Aids to navigation

There were MF beacons in the accident area as well as at Kabul. The pilot of Flight 422, flying in the area around the time of the accident said that reception of the MF beacons was very good. Also, the subject flight was apparently able to home on the Kabul beacon during the inbound flight.

1.9 Communications

The aircraft was in contact with Kandahar Flight Information Centre (on HF) and with Kabul Tower (on VHF) during the flight. At 1008 hours it reported it was 25 miles out from Kabul at flight level 150 and was cleared by Kabul Tower to route frequency. Nothing further was heard from the flight. Flight IR 422 was in VHF contact with the aircraft up until approximately 1015 hours.

1.10 Aerodrome and ground facilities

They were not relevant to this accident.

1.11 Flight recorders

No flight recorder information was contained in the report.

1.12 Wreckage

The aircraft wreckage was scattered over a wide area of mountainside (See Figures 8 and 9) at an elevation established by an altimeter as 13 940 ft amsl. The aircraft appeared to have struck the top of a ridge when flying in a southwesterly direction and to have disintegrated. It then fell down a steep slope on the other side of the ridge.

All four engines had broken away from the wings, and the propellers had broken away from the engines. The manner in which the propeller blades were bent by the impact indicated that the engines were developing power at the time of the accident. There were no signs that any one of the propellers had been feathered at impact. The fuselage had broken into many pieces.

1.13 Fire

There was no fire following impact.

1.14 Survival aspects

Heavy snow on the mountains covered the wreckage. An extensive aerial search covered the scene of the accident, but it was not possible to find the wreckage of the aircraft until after the snow melted. It was first sighted on 16 August 1964, i. e. 8 months after the accident occurred.

Two experienced search parties reached the accident site, however, both encountered considerable difficulty in getting there because of the mountainous terrain in which the aircraft had crashed.

1.15 Tests and research

No information of this sort was contained in the report.

2. Analysis and conclusions

2.1 Analysis

A number of charts from Jeppesen route guides were recovered by the search party from the wreckage. The latest of these showed a non-directional radio beacon located at Ghazni. However, it had not been operating since March 1962. This was confirmed by a Class I Notam (No. 018, dated 25 March 1962). The flight plan from Kuwait indicated that the aircraft was equipped with ILS, VOR and radio compass. However, none of the ADF tuning units were recovered from the wreckage and it was therefore impossible to establish which beacons were used by the crew at the time of the accident.

The following tracks could have been followed by the aircraft between Kabul and Zahedan:

Kabul - Ghazni	212°T
Kabul - Zahedan direct	237°T
Kabul - site of the crash	239°T

The wreckage was found 42 NM from the centre line of the route via Ghazni. The pilot may, therefore, have intended to take the direct route.

Following an examination of the pilot-in-command's log book which was recovered from the wreckage it was believed that he had little knowledge of the route and might not have been aware of the inadequacy of the maps found in the aircraft. The maps were of the 1:1 million topographical World Aeronautical Chart series published by the U.S. Air Force in 1951 and 1952 with amendments up to 1957. Sheet No. 431 of this series showing the position of the accident, was not found in the wreckage, but a copy issued by World Aeronautical Chart Series - U.S.A., supplied by the airline through the Lebanese authorities showed the highest ground in the area of the crash as 12 000 ft. The elevation of the wreckage was accurately measured as 13 940 ft.

A more recent map issued by the U.S. Air Force (Operational Navigation Chart - 06, on the scale 1:1 million, shows a spot height of 14 500 ft in the area, and a recent aerial photogrammetric survey shows terrain in the area of heights exceeding 15 800 ft.

An analysis was made of the groundspeed and track vectors shown in the various sectors of the Kuwait-Kabul flight plan and the reported details of the return from Kabul to Zahedan in order to discover the wind speed and direction used by the pilot.

These vectors, when plotted, revealed that the pilot was counting on a mean tail wind component of 10 kt. This was also true for the second half of the flight from Langeh to Kabul. The plotted vectors also suggested that during the second half of the flight the pilot probably counted on a mean wind direction of about 240°.

The pilot made various position reports between Kandahar and Kabul which indicated a wide and unaccountable fluctuation in ground speeds. After reporting over Ghazni at 0940, the pilot reported over Kabul at 0958. This would have indicated a groundspeed of 240 kt.

It appeared that the winds used to calculate the flight plan were reasonably accurate as far as Kandahar but while in flight from Kandahar to Kabul the pilot was probably unable to maintain visual contact with the ground and became confused about the actual wind speed and direction.

Estimated times given by the pilot for the diversion to Zahedan were as follows:

Reporting point	Time GMT	Next reporting point	Distance NM	ETA GMT	EET Min	G/s kt
Kabul	0959	Ghazni	72	1025	26	166
Ghazni	1025	Kandahar	181	1130	65	167
Kandahar	1130	Zahedan	282	1315	105	169

These groundspeeds suggested that the pilot was expected about the same wind speed and direction for his diversion to Zahedan as he had calculated for his inbound flight to Kabul although he reported flying at 15 000 ft from Kabul compared with an average of 11 000 ft for the inbound flight.

A viscount which diverted from Kabul back to Zahedan at an altitude between 19 000 and 16 000 ft took 2 hours 55 minutes. Its groundspeed was, therefore, only 185 kt although its true airspeed is believed to have been 245 kt.

The pilot-in-command of that flight (IR 422) stated, following the accident that the only check on winds aloft was made between Kandahar and Zahedan at flight level 160. This was found to be 315°/72 kt. It was found necessary to maintain exactly 30° drift correction on that segment of flight between Kandahar and the FIR. At the FIR, a radical wind change was noted, and the drift correction was lessened to 10° and maintained at such for about 10 minutes until overhead Zahedan. The wind on the surface at Zahedan at the time of arrival of IR 422 was 300°/12 kt.

If such high winds actually occurred after the pilot of the subject flight diverted from Kabul, it is obvious that his groundspeed must have been lower than expected and his estimated time over Ghazni would have been wrong.

The Committee then considered reports by two eye witnesses from villages between Kabul and Ghazni to the effect that an aircraft was seen turning towards the south or southwest in the afternoon. At first these reports were considered too vague to be positively associated with the TMA aircraft since the witnesses could not state the actual time, and it did not agree with the pilot's reported intention to stay at 15 000 ft until after passing Ghazni. However, the Committee also noted that at about this time the secondary cold front was just passing over Ghazni, and the weather behind it was becoming clear.

The pilot had reported to IR 422 while en route that his oxygen was very low and the Committee considered that it was probable that:

- a) He assumed that he had reached Ghazni when in fact he was still north of that town;
- b) The cloud cover was beginning to break with the passing of the cold front;
- c) He endeavoured to find a hole in the cloud cover to get below it, or he steered a westerly course where the sky was getting lighter.

Since the only other aircraft flying on the Kabul-Ghazni route was known to have remained at 19 000 ft, the Committee considered that the evidence of the two separate witnesses on the ground could be taken to support possibility (c) above.

Other circumstances were considered which might have contributed to an error of navigation and the desire of the pilot-in-command to avoid continued flying at high altitude or in cloud. The various crew members' flying histories were studied and it was felt that the pilot-in-command may have been preoccupied with the prospect of changing his position once more to the exclusion of the more urgent aspects of this last flight.

The flight was being continued to Kabul although the pilot had received ample warning of the bad weather which extended over the route and at Kabul and Kandahar airports. Lahore was given as the new alternate to Kandahar although the weather situation there was unsatisfactory and the frontal conditions were moving eastwards over Afghanistan and would lie across the diversion route to Lahore. These facts convinced the Committee that the pilot-in-command could not have understood the meteorological situation over Northern India and Afghanistan at the time and that this might well have been a contributory cause for a subsequent navigational error.

Errors were found in the calculation of the dead reckoning positions on the flight between Kandahar and Kabul and in the amount of fuel carried from Kuwait as shown in the weight and balance sheet. These errors indicate either carelessness or fatigue on the part of the pilot-in-command.

The crew had been on duty for at least 16 hours and had been flying for about 2-1/2 hours in an unpressurized aircraft at 15 000 ft. Also oxygen supply was getting very low. Fatigue and lack of oxygen, may therefore, have contributed to cause an error in navigation and the desire to descend to a lower altitude.

The following hypotheses were also considered:

- a) the pilot may have intended taking the direct route, since the accident site was practically on the direct route from Kabul to Zahedan;
- b) icing;
- c) engine failure or malfunctioning which forced it to descend.

They were not finally considered as being probable causes to the accident because:

- a) at least one pilot knew the route well and must have been aware of the high mountains along this route. Also, the pilot had worked out and reported ETAs over Ghazni and Kandahar. The actual saving in distance is only 17 NM.
- b) neither the TMA pilot nor the pilot of the Viscount which flew in the same area reported any icing conditions.
- c) the pilot had reported no difficulty, and following the accident the condition of the propellers indicated that the engines were under power at the time of impact.

2.2 Conclusions

Findings

The crew were properly certificated and had considerable flying experience. At the time of the accident they had been on duty for about 16 hours, the last 2-1/2 hours of which were flown in an unpressurized aircraft at 15 000 ft with a very low supply of oxygen. Due to a reduction in the Company's activities the pilot-in-command was making his last flight for the Company. This may have been on his mind at the time of the accident.

The aircraft's certificate of airworthiness was valid until 23 January 1964. Errors were found in the weight and balance sheet as to the amount of fuel carried from Kuwait. This indicated possible carelessness or fatigue on the part of the pilot. No evidence of malfunction or failure of the aircraft or its equipment were found.

On take-off from Kuwait the pilot had not obtained any route or terminal weather forecast since none was available. Yet he intended to fly VFR after passing the Iran/Afghan border. He was kept informed while en route of the weather conditions to be expected, and he made several position reports between Kandahar and Kabul which showed unaccountable fluctuations in groundspeeds. Because he was probably unable to maintain visual contact with the ground, he became confused about the wind speed and direction. His log book which was recovered, indicated that he had little knowledge of the route. Also, he may not have been aware that the charts carried aboard the aircraft were inadequate. An error in navigation was the end result, and the aircraft struck a mountain at an elevation of 13 940 ft amsl.

Cause or Probable cause(s)

A wrong estimation of the wind speed and direction resulted in a navigation error which brought the aircraft 42 NM from the approved air route. Possible contributing factors were: lack of weather forecast prior to take-off, personal worries, fatigue and lack of oxygen, inadequate charts and maps.

3. Recommendations

Following this accident the Investigating Committee made the following recommendations:

- 1) the Company should ensure in future that adequate meteorological information is made available to all their pilots before entering Afghan territory.

The Committee has been informed that this can be arranged in Kuwait with the Meteorological Office, Bahrein, provided that the Company's agent gives the Kuwait authorities adequate warning of the requirement.

- 2) The pilot-in-command of the subject flight filed a flight plan indicating a flight under VFR after entering Afghan territory. This could not be justified by the actual and forecast weather reports. The Company's attention should therefore be drawn to the provisions of Annex 6 to the Convention on International Civil Aviation and in particular to para. 4.3.2.1 (Fifth Edition).

"A flight to be conducted in accordance with visual flight rules shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under visual flight rules are, and will continue to be such as to make it possible for the flight to be conducted in accordance with visual flight rules."

- 3) After passing Kandahar and in spite of receiving adverse weather reports indicating that conditions would be below VMC at both Kabul and Kandahar, the pilot continued his flight indicating that he would divert to Lahore if unable to land at Kabul. In fact, Lahore had not been shown in the flight plan as an alternate and the weather forecast there was unsatisfactory. The Company's attention should therefore be drawn to the provisions of para. 4.4.1 of Annex 6 (Fifth Edition), and to the Afghanistan AIP-RAC Section 5-1-1, para. 1.1.

"A flight shall not be continued towards the aerodrome of intended landing unless the latest available meteorological information indicates that conditions at that aerodrome will, at the expected time of arrival, be at or above the meteorological minima specified for such aerodromes in the Operations Manual."

"AIRCRAFT OPERATIONS IN ACCORDANCE WITH VFR

All aircraft operations shall be conducted in accordance with the visual flight rules as specified in Annex 2 to the Convention of Civil Aviation, Chapter 4, Table 1, except outside of control zones or control areas where Table 2 will apply. Page 5.1-3 shows the Visual Flight Rules in chart form.

Except when an air traffic control clearance is obtained from an air traffic control, VFR flights shall neither take off or land at an aerodrome within a control zone, nor enter the aerodrome traffic zone or the traffic pattern of such an aerodrome if the ground visibility is less than 8 km (5 miles) or if the ceiling is less than 450 m (1 500 ft)."

- 4) When in the vicinity of Kabul the pilot reported that his oxygen supply was very low. It is recommended that the Company ensure that all future flights are provided with sufficient oxygen to meet the requirements of para. 4.3.4 of Annex 6. An effort should also be made to check how many oxygen bottles were carried in the aircraft and when they were last replenished. Two were found in the wreckage.

- 5) The Committee recommends that all maps of Afghanistan which have been issued to the Company's pilots or which are used for briefing purposes should be withdrawn for checking. The USAF World Aeronautical Chart in the 1:1 million topographical series published over ten years ago is inaccurate in several important details and should be marked or over-printed accordingly.
- 6) Section 5.12 of the TMA Operations Manual relates to minimum flight altitudes and levels in IMC and specifies a clearance of at least 1 000 ft above the highest point of ground within 10 NM of the desired track. Whenever more than one hour elapses without an accurate fix the minimum clearance should be increased to 2 000 ft above the highest ground within 20 NM of the track. Since the possibility of navigational error increases only longitudinally and laterally with increasing distance from the last positive fix, there does not appear to be any mathematical justification for increasing the vertical clearance above known ground elevations.

On the other hand ground elevations in certain areas of Afghanistan are not accurately shown on existing aeronautical maps, and the Committee recommends that a note to this effect should be added to the TMA Operations Manual. The additional 1 000 ft clearance is not sufficient to cover inaccuracies in existing maps. A corollary to this is that pilots must not attempt to fly in IMC over Afghan territory until minimum en route flight levels have been established by the appropriate authority, and this should also be emphasized in all route manuals.

- 7) The Afghanistan AIP section RAC 5.1-2, para. 1.6 requires pilots when flying between 3 000 ft above ground level and less than flight level 290 to maintain cruising levels according to the quadrantal rule. In this case the TMA aircraft should have been flown at a flight level appropriate to the 180°-269° quadrant and the Committee recommends that this should be brought to the attention of the Company.
- 8) Map sheet ME(H/L)3 of the Jeppesen route guide dated 8 October 1963 showed a non-directional beacon in use at Ghazni on 293.5 kc. This beacon had not been in use since March 1962 and notification of this was given in Afghan Class I Notam No. 018, dated 25 March 1962. The Committee recommends that this should be brought to the attention of the publishers of the guide book.

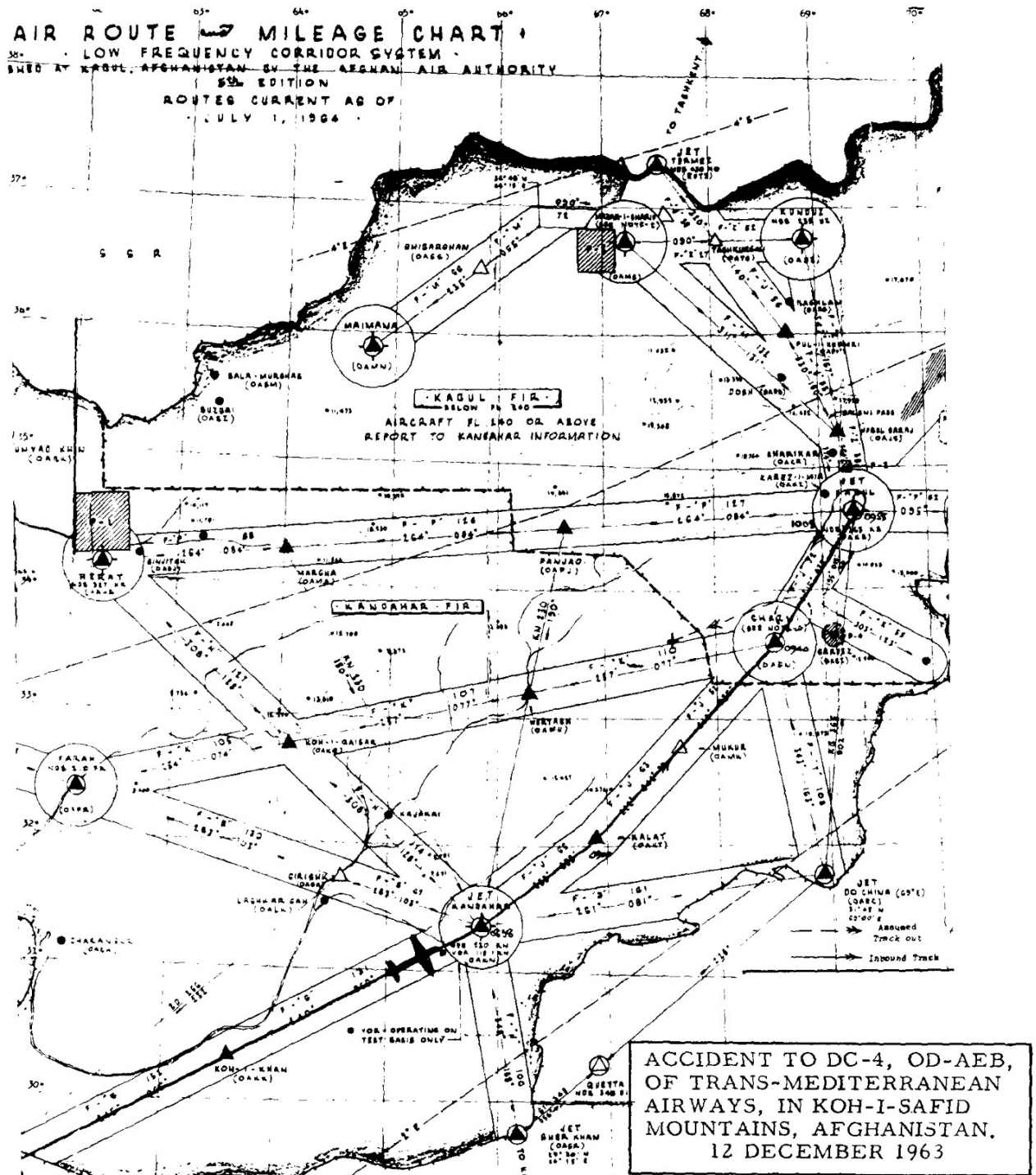
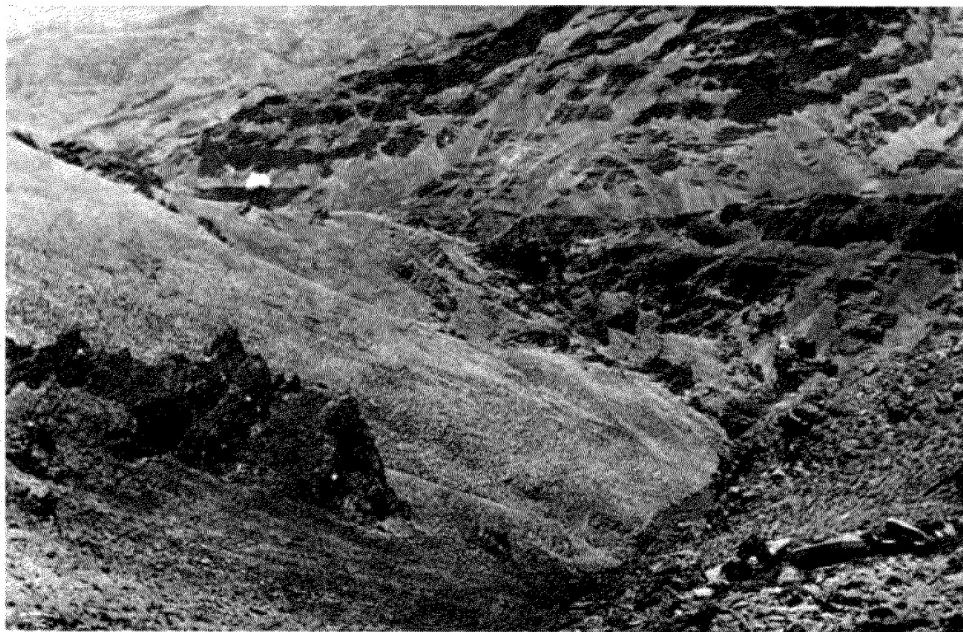


FIGURE 7

ACCIDENT TO DC-4, OD-AEB, OF TRANS-MEDITERRANEAN AIRWAYS,
IN KOH-I-SAFID MOUNTAINS, AFGHANISTAN. 12 DECEMBER 1963



Aircraft struck ridge at 13940 feet (4250 metres) above sea level
and disintegrated.

FIGURE 8



Wreckage fell down steep slope on other side of ridge

FIGURE 9