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MINISTRY OF CIVIL AVIATION

CIVIL AIRCRAFT ACCIDENT

Report on the Accident to
Hermes G-ALDN
in Mauritania (French West Africa)
on 26th May, 1952

LONDON: HER MAJESTY'S STATIONERY OFFICE

1952

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Final Report of the Investigation

on

The Accident to the B.O.A.C. Hermes Aircraft G-ALDN
in Mauritania (French West Africa) on 26th May, 1952

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1. PARTICULARS REGARDING THE ACCIDENT

- (a) **Location:** Desert of Mauritania 200 n.m. from the coast, 270 n.m. from Port Etienne.

Geographical co-ordinates—

Lat. $19^{\circ} 27' N.$, Long. $12^{\circ} 35' W.$

Polar co-ordinates—

About 130 km. SSE of ATAR aerodrome and, more precisely, 15 km NE of Hassi el Motleh.

Elevation—about 120 m.

- (b) **Date and Time**

26th May, 1952, at about 0845 U.T. (†).

- (c) **Nature of Flight**

Public Transport.

- (d) **Purpose of the Flight**

Scheduled service BA 251/072 from TRIPOLI to KANO.

- (e) **Date and time at which the Investigator was notified of the accident**

The Accidents Investigation Branch of the Secretariat General for Civil and Commercial Aviation received its first notification of the accident by telegram at 1600 hours on 26th May.

(†) All the times given in this report are expressed in Universal Time (G.M.T.).

M. Kungler, Air Navigational Engineer, Head of Dakar Airport, was appointed investigator at 2145 hours on 26th May. An accredited representative of the United Kingdom participated in the Inquiry.

(f) **Date and Time of the arrival of the Investigator at the scene of the Accident**

2nd June, 1952, at 0600 hours.

2. **SUMMARY OF THE ACCIDENT**

With practically no fuel and over the desert, consequent on an error in navigation, the 4-engined Hermes aircraft G-ALDN made a belly landing in a wide depression littered with shifting sand-dunes surrounded by rocky escarpments.

The port wing struck the top of a dune and was torn off. The remainder of the aircraft slewed to the left and shortly afterwards came to a standstill, without breaking up, at an angle of 90° to its initial line of approach. As no fire broke out the occupants of the aircraft were evacuated without difficulty. There were then only six slightly injured persons.

3. **PARTICULARS REGARDING THE AIRCRAFT**

(a) *Registration marks:* G-ALDN

(b) *Type of aircraft and constructor's serial No.:*
Hermes HP 81, Series 4, No. HP 81/15, constructed at Cricklewood by Handley Page Ltd.

(c) *Type of engines: arrangement and constructor's serial No.:*
Hercules—Series 763—No. 1: H 140,065
No. 2: H 140,157
No. 3: H 140,054
No. 4: H 140,016

(d) *Certificate of Registration: No. and date of issue:*
No. 12449/1 issued on 31st October, 1949, replaced by Certificate of Registration No. R.1966/1 issued on 30th December, 1950.

(e) *Certificate of Airworthiness: No. and date of expiry:*
No. A. 1966—19th July, 1952.

The number of the original Certificate of Airworthiness was 10950 and it was issued on 20th July, 1950. It had been replaced by Certificate of Airworthiness No. A.1966 issued on 18th October, 1950, which

included various amendments, in particular an increase in the maximum (total) weight authorised, which was raised from 82,000 lbs. to 86,000 lbs. The Certificate was last renewed on 20th July, 1951, which rendered it valid until 19th July, 1952.

(f) *Safety Certificate: date and time of issue and duration of validity:*

Issued on 25.5.52 at 1000 hours at London, by the Engineer holding licence No. 3879.

(g) *Date of construction of the airframe:* 1949.

(h) *Name and address of owner:*

British Overseas Airways Corporation, London.

(i) *Gross Weights:*

Maximum permitted by the Certificate of Airworthiness—86,000 lbs. or 39,000 kg. at take-off, 75,000 lbs. or 34,019 kg. on landing.

Actual weight at the moment of the accident—About 28,500 kg.

(j) *Loading*

	<i>Index</i>
Limit of trim authorised by C. of A.	Between 10 and 35
Trim at beginning of flight	21.25
Trim at the time of the accident	31

(k) *Previous history of airframe:*

Flight time since new... .. 3,388 hours
Flight time since last periodic check 17 hours

(l) *Previous history of the engines:*

		<i>No. 1</i>	<i>No. 2</i>	<i>No. 3</i>	<i>No. 4</i>
Flight time since new ..	Hours	1,383	1,232	1,490	1,410
Flight time since gen. overhaul	"	624	319	186	124
Flight time since periodic check	"	17	17	17	17

(m) *Previous history of the accessories:*

The only accessories involved in the accident are the compasses and the periscopic sextant.

(1) *P.12 Magnetic Compass No. 11123H:* installed on 18th May, 1951: underwent regulation on: 5.7.51, 5.10.51, 23.10.51, 17.11.51, 5.4.52, 21.4.52. Checked, after the accident, by the makers (Messrs. Kelvin & Hughes Ltd.), on 23.6.52 and found in normal condition.

(2) *CL 2 Sperry Gyrosyn Compass, No. M.I.L. 695:*

Last checked at London Airport on 21st April, 1952, when it showed no deviation on any bearing.

- (3) *Hughes Periscopic Sextant, No. 2092*:
Has a 7° field of vision and a magnification of 4. This instrument, which was used during the flight, was checked after the accident by the makers (Messrs. Kelvin & Hughes Ltd.), on 23rd June, 1952, and found to be functioning normally.

4. PARTICULARS REGARDING THE CREW

4.1. The Pilot-in-command:

Captain Robert Langley was born on 21st August, 1921. He joined the R.A.F. in July, 1941 and completed his training as pilot in December, 1942. After completing his period of service in the R.A.F., during which he was awarded the D.F.C., he joined B.O.A.C. on 3rd April, 1945 as a First Officer. He was appointed Junior Captain on No. 2 Line (Lancastrians and Yorks) on 13th July, 1946 and promoted to Senior Captain (2nd Class) on 1st July, 1951.

Captain Langley was first issued with Pilot's B Licence No. 22013 on 16th March, 1945. He passed the examination for the Navigator's Licence (2nd Class) in January, 1949 (at the third attempt) and was issued with Licence No. 3457 on 4th February, 1949. On the basis of these two licences he was issued with Airline Transport Pilot's Licence No. 22013 on 30th January, 1950. At the time of the accident this licence was valid until 31st July, 1952, for Hermes IV (Group I), Lancastrians and Yorks (Group 2).

His Instrument Rating was valid until 3rd July, 1952. Captain Langley also held General Radio Telephony Licence No. 500 issued on 26.1.50.

Flying Experience :

In the R.A.F.—		Day	Night
As 1st Pilot	... Hours	351	275
As 2nd Pilot	... „	194	33
with B.O.A.C.—			
As 1st Pilot	... „	2,903	1,205
As 2nd Pilot	... „	460	137
	„	3,908	1,648

Total Flying Hours ... 5,556

N.B.—Captain Langley had completed 348 hours flying as pilot during the six months preceding the accident. He had made in all 18 return flights across the Sahara as pilot-in-command.

Training on Hermes aircraft:

Hermes Technical Conversion Course—12.12.49 to 27.1.50.

Hermes flying training—30.3.50 to 21.4.50.

Hours flown during training—

Dual	10.05 day	1.20 night
Solo	4.45 day	1.25 night

Three Route trips as 1st Pilot under supervision in June and July, 1950.

Injuries caused by the accident: Nil.

Accidents since joining the B.O.A.C.: Nil.

4.2. The Co-Pilot:

First Officer Edward Meyrick Haslam was born on 12th July, 1921. He was trained as a pilot in the R.A.F. during 1941 and joined B.O.A.C. as First Officer on 30th May, 1947. Mr. Haslam was first issued with a B Licence, No. 27153, on 3rd October, 1947. During the period 1949 to 1952 he made seven unsuccessful attempts to pass the examination for the Senior Commercial Pilot's Licence.

Mr. Haslam was issued with Commercial Pilot's Licence No. 27153 on 5th September, 1950. This licence which included an Instrument Rating was endorsed for Hermes IV (Group I), Lancastrians and Yorks (Group 2) and was valid until 12th September, 1952. Mr. Haslam also held General Radio Telephony Licence No. 1304.

Flying Experience:

In the R.A.F.—		Day	Night
As 1st Pilot	... Hours	2,084	199
As 2nd Pilot	... „	143	30
With B.O.A.C.—			
As 1st Pilot	... „	25	2
As 2nd Pilot	... „	2,020	644
	„	4,272	875

Total Flying Hours ... 5,147

N.B.—First Officer Haslam had completed 196 hours flying as 2nd pilot during the six months preceding the accident.

Training on Hermes aircraft:

Hermes Technical Conversion Course: 22.10.51 to 30.11.51.

Hermes Flying Training: December, 1951 to January, 1952.

Hours flown: Dual 9.25 Solo 3.50.

Last six-monthly check: May, 1952.

Injuries sustained owing to the accident:

Scalp wounds.

Mr. Haslam subsequently died from exhaustion brought about by strain and heat, on 31st May, 1952.

Accidents since joining B.O.A.C.: Nil.

4.3. The Navigating Officer:

First Officer Trevor Lloyd de Nett was born in New Zealand on 7th May, 1919. He joined the R.A.A.F. in July, 1941. He joined British South American Airways on 24th April, 1947, and in 1949 was transferred to B.O.A.C. He flew as First Officer in York aircraft based in Nassau until 1951 when he completed a B.O.A.C. Navigation Course. He was then posted to No. 2 Line as First Officer/Navigator.

Mr. de Nett held Australian B Licence No. B.2088 dated 14th February, 1947. He was issued with Commercial Pilot's Licence No. 26529 on 31st July, 1950, and this licence, which included an Instrument Rating, was valid at the time of the accident.

During 1947-48 Mr. de Nett made four unsuccessful attempts to pass the Navigator's Licence (2nd class) examination. He also made an unsuccessful attempt to pass the examination for the Senior Commercial Pilot's Licence in July, 1950.

Flying Experience:

	Day	Night
Before joining B.S.A.A.C.		
As 1st or 2nd pilot Hours	854	234
With B.O.A.C.—		
As 2nd pilot	1,809	889
As navigator	450	222

Total flying hours (including 672 hours as navigator) 3,113 1,345

N.B.—First Officer de Nett had completed 136 hours as Navigator and 88 hours as Second Pilot during the six months preceding the accident.

Training as Navigator:

26.2.51 to 29.3.51 Practical Navigation Course
 April to June, 1951 Flying as Navigator under supervision on the Nairobi, Johannesburg and Accra routes.

Total flying hours: 105 by day; 68 by night.

Navigating Officer's Certificate issued by the Corporation on 26th June, 1951.

Last check as Navigator carried out on 12.9.51.
 Number of return flights as Navigator, including three under supervision:

4—U.K./Nairobi	—Hermes
3—U.K./Johannesburg	—Hermes
4—U.K./Accra	—Hermes
2—U.K./Singapore	—York
1—U.K./Bahrein	—York

Injuries caused by the accident: Nil.

Accidents since joining the Corporation: Nil.

4.4. The Radio Officer:

Radio Officer Alexander Reid Hirst was born in New Zealand on 18th December, 1913. He joined B.O.A.C. in 1945 after having served in the R.N.Z.A.F. Mr. Hirst holds Certificate of Competency in Wireless Telegraphy and Radio Telephony No. 447 which was issued to him on 21st August, 1950. His licence No. 1169 was issued on 4th October, 1950, and is valid until 24th September, 1952. He had made seven return flights across the Sahara.

Flying Experience:

	Radio Officer Hours	Radio Officer under Supervision Hours
In the R.N.Z.A.F.	725	—
With B.O.A.C.	4,283	641
	Hours 5,008	641
Total flying hours (including 592 in Hermes aircraft)	5,600	5,649

Injuries: bruised right shoulder: twisting of the lumbar region.

4.5. The Engineer Officer:

Engineer Officer Thomas William Smith was born on 29th March, 1920. He was a Warrant Officer Fitter IIE Flight Engineer in the R.A.F. and joined B.O.A.C. in 1944. At the time of the accident he held the following licences:

Flight Engineer's Licence No. 363 renewed on 31st December, 1951, and valid for Hermes IV until 3rd January, 1953.

Maintenance Engineer's Licence No. 5125 issued on 11th February, 1952, and endorsed A—Avro York, C—Rolls-Royce Merlin.

Flying Experience as Engineer Officer:

Before joining B.O.A.C.	1,095 hours
With B.O.A.C.	4,766 ..

Total flying hours (including 1,101 hours in Hermes aircraft) 5,861 ..

Injuries: Bruising of head and arm, causing unconsciousness for 20 minutes.

4.6. **The Cabin Personnel** consisted of:

1st Steward —Leonard Henry Smee
2nd „ —Thomas Ernest Green
Stewardess —Monica Osborn

Injuries: Mr. Green, the 2nd steward, got his ankle sprained, and Miss Osborn, the stewardess, sustained several slight bruises.

5. **PASSENGERS** (10 including an infant)

Mr. J. Gurney, Mrs. Gurney, Child R. Gurney; Mr. S. Parkinson; Mr. E. Rode; Mr. D. Welsh; Mr. R. Parry; Mr. R. Huxtable; Mr. G. Keith Allen (bruises); Mr. H. Tahjr (sustained slight injuries to the back).

6. **WEATHER CONDITIONS**

Forecast: The weather forecast drawn up by the Meteorological Office at Castel Benito indicated fine weather en route and thunderstorms in the Kano area.

Actual: The weather reports for the aerodrome of destination and alternate aerodromes received by the aircraft during the flight mentioned thunderstorms in the Kano area, which bore out the forecast. The winds encountered by G-ALDD, which was coming from the South at 11,000 ft. during the same period, agreed generally with the winds forecast. In fact, the weather encountered by G-ALDN was fine, with no cloud throughout the flight. It should be added that the weather conditions have no direct bearing on the accident, apart from the fact that the thundery conditions caused atmospheric which greatly hampered radio communications.

At the scene of the forced landing: Clear sky, good visibility, slight wind estimated as North, 10 knots.

7. **NAVIGATIONAL AIDS** (in alphabetical order)

(a) **Ground facilities available:**

(1) **In British territory** (primarily)

Accra—NDB, HVDF, CS, TWR
Castel Benito (Tripoli)—NDB, HVDF, RSP, CS, TWR
Jos—NDB, HDF, CS, TWR
Kano—NDB, HDF, RSP, CS, TWR
Lagos—NDB, HDF, RSP, CS, TWR
Wheelus (Tripoli)—RNG, NDB, HDF, CS, TWR

(2) **In French territory** (primarily)

Atar—NDB, MVDF, CS
Bamako—MHDF, TWR, CS
Dakar—RNG, NDB, MHVDF, RSP, L, CS, APP, TWR, ZM, ILS
Gao—NDB, MHVDF, TWR, CS
Niamey—NDB, MDF, L, CS, TWR
Port Etienne—NDB, MHDF, CS, TWR
Tunis—NDB, RNG, HDF, MDF, VDF, CS, TWR

(Secondarily and only on request or on several hours' prior notice)

Aioum el Atrouss—NDB, MVDF
Aoulef—NDB, MDF, VDF, CS
Rhadames—MDF, CS
Rhat—MDF, CS
Tamanrasset—MDF, CS
Tessalit—NDB, VDF, CS
Zinder—NDB, MDF, L, CS

(b) **Airborne navigational aids:**

(1) **Radio Equipment**

Marconi AD107 HF/AD 108 (Duplicated)
—HF
Standard STR—12A—VHF
Marconi AD7092 A (Duplicated)—ADF
RAF ARI 5506—Homing and Approach
Ultra U.A.17—Intercom.
Standard SR14 A/SR.15A—I.L.S.

(2) **Navigational Instruments**

1 Hughes periscopic sextant, No. 2092
1 bubble sextant Mk.9B
1 CL2 Sperry Gyrosyn Compass, No. M.I.L. 695
1 P12 reflecting magnetic compass, No. 111234
1 drift meter
1 automatic pilot
1 set of flags
2 masts for flags

(3) **Maps, charts and documents**

17 Route Maps. U.K.-Tripoli-Kano-Lagos-Accra, covering the track from London to Marseilles, the Central Mediterranean area and the part of the Sahara enclosed within the points 150 miles East and 200 miles West of Tripoli, 250 miles East and 500 miles West of Kano.

Approach charts for:

Liverpool	Bordeaux	Cagliari
London	Toulouse	Lagos
Hurn	Marseilles	Accra
Manston	Tunis	Takoradi
Paris	Tripoli	Rome

Topographical Maps:

$\frac{1}{2}$ mile to 1 inch Malta and Gozo.

1:500,000 Great Britain Nos. 5, 6, 7, 8, Le Havre, Paris, Nantes, Dijon, Lyons, Toulouse, Marseilles, Bordeaux, Torino, Nice, Brest.

1:1,000,000 Great Britain Nos. 1 and 2, Ireland, London-Paris, Brussels-Frankfurt, Lyons-Milan, Bordeaux-Limoges, Marseilles-Nice, Fort Flatters, Aegean.

1:2,000,000 Consol Chart N.W. 36/10 (Lisbon-Berne).

Plotting Charts:

(2) U.K.-Gibraltar-Malta.

(1) Algiers-Accra, covering an area extending from 04° N. to 38° N. and from $06^{\circ} 21'$ W. to 15° E.

B.O.A.C. Operations Manual:

Part II (Africa and Asia) Vol. IA.

Part II (Hermes and Yorks) Vol. II.

Part III (London-Castel Benito-Accra-Johannesburg)—3 Volumes.

Star Chart

Airspeed Correction Table

Air Almanac May-August, 1952

Rapid Navigation Tables—Myerscough and Hamilton.

Star Tables for Air Navigation: H.O.249.

(c) Ground aids used and their efficacy:

GAO: M.F. Non-directional radio beacon (XTG—364 Kc/s)

The identification signal of this beacon was duly received but the signal strength was insufficient to allow of taking a bearing. The following aids, on the other hand, provided a large number of valuable position data (QTE) and bearings:

Port Etienne: M.F. Non-directional radio beacon (XTP—394 Kc/s)

Bamako (XTB)

Port Etienne (XTP)

Dakar (XTO)

} HF D/F.

In addition, the station at Tamanrasset (FXM) acted, on its own initiative, as relay between the aircraft and Kano, at about 0200 hours, when Kano did not hear the direct signals from the aircraft. It was not, however, asked for a bearing; the radio operator even entered an interrogation mark in his log against this, to him, unknown station, which was nevertheless shown on the airborne navigation chart.

(d) Comments by the Investigator:

The scarcity of radio facilities on the Tripoli-Kano desert route casts celestial navigation for an important role on this sector and should, at all events, prompt the fullest possible utilization of the conveniently contactable radio facilities at the point of take-off.

We note, however, the existence of available radio facilities which were not utilized, in particular those at Tripoli, use of which might have prevented the aircraft from going astray at the outset, and those at Atar aerodrome which, at a pinch, the aircraft might have been able to reach.

8. FIRE-FIGHTING EQUIPMENT

No fire broke out, probably owing to the fact that the supply of petrol was almost totally exhausted. The crash switches had operated and carried out their functional duties, by cutting off all electric current and triggering the extinguishers.

9. WITNESSES (Names and Addresses)

Mr. Rode, passenger in G-ALDN, 41, Torkington Road, Hazel Grove, Stockport, Cheshire.

Mr. Welsh, passenger in G-ALDN (address unknown).

Mohamed oul Sidi and

Mohamed oul Sidihamed.

Ouled sassi group of the Idichilli Tribe.

10. OTHER STATEMENTS

Those by the crew members (with the exception of the co-pilot—deceased).

11. EXAMINATION OF THE WRECKED AIRCRAFT

Fuselage

Nose undamaged, empennage units undamaged, fuselage bent and buckled in line with main spar. Central part of wall destroyed at this point.

All seats in the forward cabin still securely attached to the floor.

All safety exits open.

All seat-belts attached and in good condition.

Two seats in the after cabin slightly damaged but still securely attached to the floor.

The doors of the forward and aft freight compartments were jammed.

The crew had broken open the wall of the fuselage with axes to obtain access to the freight compartments.

Floor of after cabin by the wardrobe splintered and buckled.

Centre plane

Starboard section: almost undamaged but owing to inertia it had penetrated 20 cm. into the fuselage.

Port section: smashed in pieces. The front spar was torn off at the point of attachment to the fuselage. Fuselage buckled and destroyed round the wing root fillet.

Port Mainplane

Scattered over a distance of about 240 metres, the majority of the larger pieces being within 120 metres of the fuselage.

No. 1 engine was lying 70 metres from the fuselage, facing in the opposite direction and still attached to a large portion of the front spar.

No. 2 engine was lying in normal position 50 metres from the fuselage.

The outer part of the plane was lying ahead of the wreckage and at right-angles to the axis of the wing.

The engines had been set alight by the crew to make signal flares (remains of the oil). These fires had been fed with crates of freight; much debris of half-burned or melted freight was lying scattered round the engines.

A completely carbonized petrol tank was lying beside No. 1 engine (signal fire prepared by crew).

Starboard Mainplane

Almost undamaged, attached to the fuselage, slightly scratched and dented. Engine attachments partly wrenched loose.

Ailerons and Flaps

Starboard—aileron undamaged and free to move.

—flap undamaged, slightly buckled, in 40° down position.

—servo tabs undamaged.

Port —aileron undamaged, still attached to (detached) portion of plane.

—flap wrecked and torn off.

Tail unit and Fin: undamaged.

Undercarriage (retracted)

Starboard leg undamaged; port leg destroyed; nose leg undamaged.

Crew Compartment (undamaged)

Control column jammed and pushed hard forward.

Throttle levers all in fully open position.

Ignition switches "off."

Undercarriage "up" button pressed.

Brake pressure still remained.

Pilots' seats undamaged.

Radio officer's and Engineer's seats wrenched slightly loose at the base.

Engines:

No. 1 Engine, torn off—wrecked mainly by the impact. Still attached to a portion of front spar about 3 metres long. Was set alight by the crew for signalling purposes. Lying back to front.

No. 2 Engine, torn off, lying by itself, wrecked by the impact. Set alight by the crew for signalling purposes.

No. 3 Engine, only very slightly damaged, attachments wrenched slightly loose.

No. 4 Engine, only very slightly damaged, attachments wrenched slightly loose, centre-line slightly out of true.

12. TELECOMMUNICATIONS

(Particulars regarding the telecommunications and their functioning.)

Serious difficulties in radio communication were encountered both by the aircraft's radio operator and by the ground stations. They were due mainly to the heavy atmospherics resulting from the thundery conditions that night, intensified in the aircraft's case by an unsuspected remoteness due to its error in navigation and complicated at the critical moment of daybreak by the familiar anomalies in propagation.

13. RECONSTRUCTION OF THE FLIGHT UP TO THE MOMENT OF THE ACCIDENT

The aircraft Hermes G-ALDN left London Airport at 1330 hrs. on 25th May, 1952, under the command of Captain Earthrowl, arriving at Castel Benito Airport, Tripoli, at 2115 hrs. No defects on the aircraft were reported during this flight which are in any way relevant to this accident. Both the CL2 and P12 compasses had been checked and were working normally.

Captain Langley's crew who had arrived at Tripoli at 2045 hrs. on 24th May, 1952, reported at Castel Benito airfield at 2030 hrs. on 25th May in order to take over G-ALDN for the stage Tripoli to Accra via Kano and Lagos. The crew members were briefed normally by the Meteorological Office and Air Traffic Control, the only outstanding points in the briefing were:— Scattered thunderstorms in the Kano area, and the Kano M/F non-directional beacon was reported to be unreliable.

The aircraft taxied out at 2154 hrs. and was airborne at 2203 hrs. climbing on track. When the aircraft levelled out at cruising altitude (12,000 ft.) the Captain noticed that there was a difference of 25° in the readings of the two compasses. The CL2 gyrosyn compass was reading 201° and the P12 magnetic compass was reading 226° . The Captain asked the Navigator to check the true course by means of an astral observation. As a result of a periscopic sextant observation made at 2230 on POLARIS the Navigator informed the Captain that the CL2 was reading correctly and the P12 was in error. Meanwhile, the Captain and Engineer Officer tested various electric circuits which might have accounted for deviation in the P12, but without any result. No attempt was made to check track made good by means of radio aids.

The Captain decided to proceed with the flight steering by means of the CL2 compass and rejecting the P12 compass as unserviceable.

Shortly afterwards a three star observation was attempted using pre-computed settings on the periscopic sextant. VEGA did not line up and was rejected but a two star fix on ALTAIR and ANTARES was accepted and used for the 2300 hrs. Pomar. Before midnight another astro fix was attempted but the pre-computations proved to be unsatisfactory and so for the midnight Pomar a dead reckoning position was used. An observation on DENEK was made at 0016 hrs. but for the 0100 hrs. Pomar a dead reckoning position was again used. At 0124 hrs. a three star fix using DENEK, ALTAIR and POLARIS was obtained. (VEGA had again been rejected because it would not line up.) This fix indicated that the aircraft was about 20 miles East of the direct track and a little over half way between Tripoli and Kano. By this time the difference in the compass readings had increased to 54° but course was being maintained on the CL2 and the reading of the P12 was ignored. At 0204 hrs. a four star fix indicated that the aircraft was slightly West of track about 450 miles North of Kano. At 0324 hrs. a two star fix indicated that the aircraft was 100 miles North West of Kano. As the estimated time of arrival at Kano was 0402 hrs. the Navigator then attempted to tune in the MF beacon at Kano but without success. The Radio Officer had meanwhile been in contact with Malta and Kano passing the hourly Pomars and in addition had received meteorological information from Kano which indicated that Kano was experiencing electrical storms; no storms were, however, seen by the crew. About the time of the ETA radio reception was very bad owing to heavy atmospherics, but Kano confirmed that their M/F and Eureka Beacons were switched on and working normally. The only beacon that

could be picked up on the radio compass at this time was Gao but the needle was rotating through 360° .

At approximately 0400 hrs. the Engineer Officer noticed that the Variation Setting Control on the CL2 Gyrosyn Master Unit was set at 60° W. On checking with the Navigator it was discovered that the Navigator was under the impression that it was set at 6° W. The V.S.C. which enables True courses to be steered is not normally used. On this occasion, however, the Navigator had decided to use it but in doing so he had mis-read the graduation and had initially set 30° W. increasing this progressively to 60° W. during the flight, thinking that the setting was 3° W. increasing to 6° W. This error was immediately reported to the Captain and when the V.S.C. was reset to zero the CL2 compass reading agreed with the reading of the P12 compass. It was then realised that the P12 was in fact fully serviceable and throughout the whole flight of six hours the aircraft had been heading up to 54° off course. All the astro shots had been made on the wrong stars, as the difficulty in lining up on the pre-computed settings should have indicated. The periscopic sextant consists of a periscopic tube which is mounted in a hole through the ceiling of the navigator's compartment. Because of the limited field of vision of the instrument in order to shoot a given star it is necessary to know approximately the position of the aircraft to enable the navigator to calculate the altitude and azimuth of the star from the astro navigation tables. As the setting of the sextant particularly in respect of azimuth was inaccurate the stars actually observed were not the ones for which the pre-computations had been made. The intercept which had been obtained in each case was the difference between the calculated altitude of one star and the observed altitude of another star, which was meaningless. As each of these intercepts had been plotted with reference to D.R. positions on the intended track the resulting fixes were in every case close to the direct track line between Tripoli and Kano. Thus at 0400 hrs. instead of being close to Kano as every one of the crew up to that time had imagined, a reconstruction of the flight shows that the aircraft was probably about 900 miles north west of Kano, about 800 miles east of Port Etienne, and 400 miles north west of the airfield at Gao. At this time there was sufficient fuel remaining for about four hours at cruising power.

A Dead Reckoning position was estimated but owing to this being based on a 60° course error instead of an error increasing progressively from 27° to 54° this position indicated that the aircraft was very much further north than it actually could have been. No alteration of course is

recorded until 0444 hrs. when the Captain decided to fly east. About this time the Captain gave instructions to the Engineer Officer to reduce power in order to conserve fuel. At 0454 hrs. the course was altered to 055° and again at 0515 hrs. to 180°. During this time no decisive action was taken and at 0558 hrs. when S.O.S. procedure was adopted the aircraft was probably still within 400 miles of Gao heading west. The decision to head towards Port Etienne appears to have been made because at 0535 hrs. Port Etienne Beacon was picked up on the Radio Compass and the aircraft started homing on it, although the navigation chart carried in the aircraft stopped over 600 miles short of that airport. From the radio log the first indication that anything was other than normal appears at 0430 hrs. with the report to Kano "Not sure of position, will call as soon as possible." From 0438 hrs. until 0544 hrs. the aircraft called successively Accra, Lagos, Kano on various frequencies but received no reply. At 0532 hrs. URGENCY procedure was adopted and at 0544 hrs. Gao replied to a call but was unable to give a QTE owing to unfavourable wave propagation conditions due to sunrise. At 0557 hrs. Gao confirmed that their M/F beacon was switched on but at 0558 hrs. when the first S.O.S. message was sent on the same frequency no acknowledgment was received. The stations at Gao, Niamey, Kano and Tessalit were at that time communicating with one another, in particular on the subject of G-ALDN. Successive S.O.S. calls were then made on various frequencies but no reply was received until 0615 hrs. when Accra and Kano both acknowledged receipt of the following distress message:—

"Lost approximate position 20N 09W 0600Z QDT 10000 ft. QTI 280 QTK 180 Kts. Hermes G-ALDN lost heading for FHET. Fuel remaining 2 hours."

At this point it must be mentioned that the plot on the chart of the D.R. position at 0600 hrs. which was, however, already too optimistic, shows a distance of 460 miles to be covered in order to reach Port Etienne. At the speed reported, the aircraft would not have been able to reach Port Etienne until 0835 hrs. Yet it had stated that it had only two hours' petrol left.

At the request of the Radio Operator of G-ALDN Accra had accepted control of the aircraft at 0621 hrs. and during a long radio telephonic conversation which followed the Captain requested and was given all the information about Port Etienne which appeared to be his sole objective.

When accepting the control that the aircraft requested, Accra, so it would seem, should have put the Captain on his guard against his illusive

hope of reaching Port Etienne and have told him of the possibilities offered by ATAR which was practically within reach on his route. This omission is the more inexplicable in that Kano ATC—later on, it is true—specifically drew Accra ATC's attention to this point, in a message at 0730 hrs.

During this period, on the strength of highly optimistic D.R. positions (which are not explained by the shots first on Jupiter and subsequently on the sun), the aircraft heading west, continued to home on the Port Etienne radio beacon and at 0658 hrs. stated that it was one hour from the coast, thereby completely upsetting any calculations which might have been made regarding its progress.

The aircraft first contacted Dakar by radio at 0722 hrs. and from then until the time of the forced landing at 0845 hrs. QTE's were passed regularly by Bamako, Dakar and Port Etienne.

At 0812 hrs. Dakar logged the first distress signal from the aircraft which had at last realized the impossibility of its reaching the coast. The Captain had asked the Engineer Officer to warn him when there was only sufficient fuel left for descent, two overshoots and landing. When that moment arrived the aircraft descended and after a circuit near a native village made a belly landing, on the sand, heading S.E.

14. DISCUSSION OF THE EVIDENCE

The identification of the stars actually shot by the Navigator and the utilization of the corresponding measured altitudes should have given accurate astro fixes permitting a close reconstruction of the route actually flown. This research was attempted but without a complete measure of success. It is to be feared that First Officer Acting Navigator de Nett was content with shooting stars of minor importance provided merely that he succeeded in lining them up with his pre-setting.

However that may be, in the majority of the cases the recorded altitudes when applied either to the sun or to possible stars line up fairly well with the other known data (time and place of departure and arrival, relative speed, corrected courses, measured drifts, estimated winds, radio bearings) and have made it possible to reconstruct to a satisfactory approximation the path probably followed by the aircraft.

The plot is shown on the chart attached to the present Report, together with the boundaries of the Control Areas concerned and the main fixes obtained on board the aircraft during the flight.

With respect to the work of the ground stations, it should be noted that as the aircraft had omitted

to send a repetition of its state of urgency to Dakar until 0812 hrs., the latter Control Centre, misinformed about G-ALDN's flight conditions, had no apprehensions regarding the inadequacy of the aircraft's range, an inadequacy which was to prove disastrous for it.

Accra for its part did not make sure that Dakar was acquainted in time with all the factors of the problem, or that the aircraft was in possession of information, in respect of Atar's ability to be of great assistance to it.

Finally, at the request of Accra, the aircraft had communicated for nearly **an hour** on radio telephony 11360 Kc/s **thus precluding** the use of radio bearings during that period.

To sum up, the investigation has established that the aircraft, crew and Corporation were in order with respect to the legislation in force, that the airworthiness was not in question but that, in varying degrees, the aircrew members, with the exception of the Engineer Officer and Cabin Personnel did not display the full measure of competency required for the accomplishment of their mission. There is no doubt that defective telecommunications constituted a circumstance promoting the occurrence of the accident.

15. CAUSES

Arranged in chronological order, the causes of the accident may be set forth as follows:—

- (1) Faulty use by the Navigator of the Variation Setting Control on the CL2 gyrosyn compass.
- (2) Faulty checking of the compasses by an incorrect astral bearing and without the aid of radio bearings.
- (3) Incorrect inference drawn by the Captain in pronouncing the CL2 gyrosyn compass correct and the P12 magnetic compass unserviceable.
- (4) Fault on the part of the Captain in not returning to Tripoli when the P12 magnetic compass was regarded as unserviceable (in breach of B.O.A.C. regulations).
- (5) Inability of the crew to realize that the astro shots were being taken on the wrong stars.
- (6) Inability of the crew to determine the aircraft's position properly by the standard methods when the V.S.C. setting error was discovered.
- (7) Lack of decisive action on the part of the Captain once he knew he had lost his way.
- (8) Ignorance, on the part of those on board, of the assistance which could have been afforded by Atar airfield:

which finally resulted in the need to make the forced landing which brought about the accident, the aircraft having by then exhausted its supply of fuel before reaching an airport.

16. RECOMMENDATIONS

16.1. The graduation of an instrument should not cause confusion and if the figures indicate tens instead of units, it is desirable that this should be clearly indicated by a characteristic sign. (The V.S.C. of the CL2 compass on board was marked in tens but did not have the sign X10 which the manufacturer on his own initiative had added on the more recently manufactured instruments).

16.2. Use of the periscopic sextant, which has a very restricted field of vision, should form the subject of special precautions with a view to the certain identification of the stars shot.

16.3. In-flight checking of a compass by an astral bearing should rest only on a reliably identifiable star.

16.4. On long range aircraft the carrying of a second magnetic compass of simple and robust design would constitute a wise precaution in anticipation of difficulties similar to that which was the source of the loss of G-ALDN.

16.5. The Captain should always be competent to judge the quality of the Navigator's work.

16.6. Possession of an official navigator's licence by a member of the crew should be required for long range flights over areas indifferently equipped with ground aids, such as those we have been considering. (At present United Kingdom regulations require the carriage of a licensed navigator for a flight over water of at least 1,000 nautical miles or for a non-stop flight of more than 1,500 nautical miles over land. The distance from Tripoli to Kano is 1,264 nautical miles).

16.7. An increase in the number of ground aids on the Tripoli-Kano stage is desirable. The practical realization of the projects to equip Rhadames, Rhat and Agades with continuous operation radio beacons would meet the requirements revealed by the abnormal flight discussed in this Report.

16.8. Against the preceding recommendation it must be pointed out afresh that any inadequacies in the equipment of an air route render it incumbent on users to make the best possible use of the available existing facilities, which in the present instance was not done in respect of the radio aids at Tripoli on take-off.

16.9. Examination of the communications exchanged between the ground radio stations

reveals the need for closer liaison between the British and French Control Centres in Africa. Thus the failure to make use of the possibilities presented by Atar airfield appears to have been the result of insufficient co-operation between Kano, Accra and Dakar.

(Sgd.) M. CLÉRIOT,
Investigating Officer.

Examined—no comment.

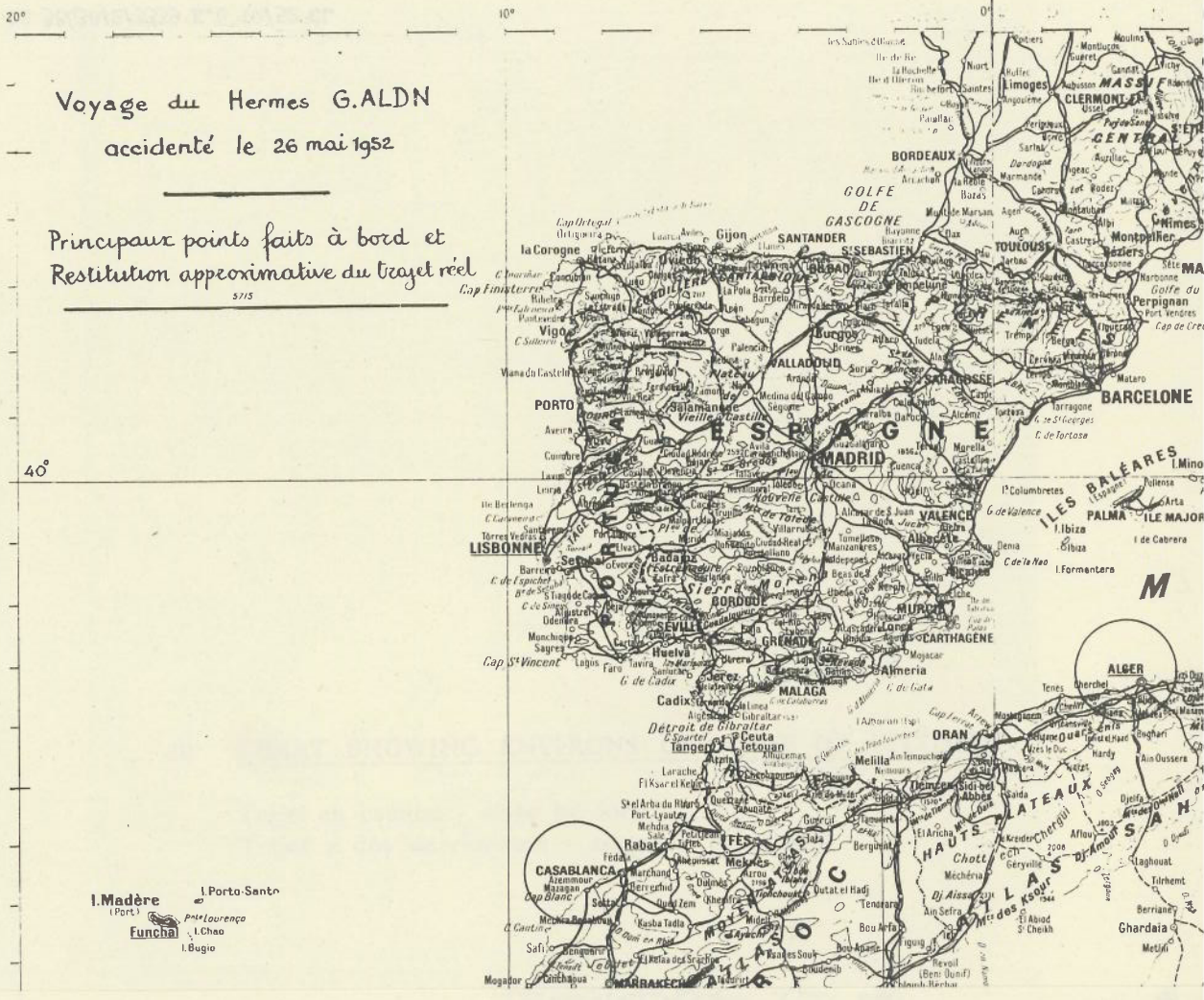
(Sgd.) GIRARDOT,
*Air Navigation Engineer-in-Chief,
Head of Air Safety Section.*

15th September, 1952.

ANNEXES

17. MEANING OF ABBREVIATIONS USED IN THE TEXT

- APP —Approach Control.
- ATC —Air Traffic Control.
- FHET —Port Etienne (Radio Call sign).
- HDF —High frequency radio direction finding.
- ILS —Instrument Landing System.
- L —Radio Locator Beacon.
- MDF —Medium frequency radio direction finding.
- NDB —Non-directional radio beacon.
- QTE —Your true bearing from me is.....
- QTI —My true track is.....
- QTK —My groundspeed is.....
- QDT —I am flying in VFR weather conditions.
- RNG —Radio Range.
- RSP —Radio Responder beacon.
- TWR —Aerodrome Control.
- VDF —Very high frequency radio direction finding.
- ZM —Radio Z marker.
- CS —Communication Station.



Voyage du Hermes G.ALDN
accidenté le 26 mai 1952

Principaux points faits à bord et
Restitution approximative du trajet réel

18. CHART SHOWING ROUTE FLOWN

Voyage du Hermes etc. - Flight by the Hermes aircraft G-ALDN which was involved in an accident on 26th May, 1952.

Principaux points faits à bord - main fixes obtained by aircraft.

Restitution approximative du trajet réel - approximate reconstruction of route actually followed.



SCENE OF ACCIDENT TO HERMES AIRCRAFT G-ALDN.
DESERT OF MAURITANIA (FRENCH WEST AFRICA).