THE CIVIL AVIATION ACT, 1949

THE CIVIL AVIATION (INVESTIGATION OF ACCIDENTS) REGULATIONS 1951

Report of the Public Inquiry into the causes and circumstances of the accident which occurred on the 8th April, 1954, to Comet aircraft G-ALYY

AIRCRAFT: Comet G–ALYY ENGINES: Four de Havilland Ghost 50

REGISTERED OWNERS: British Overseas Airways Corporation

OPERATORS: South African Airways (under charter)

CREW: Senior Captain W. K. Mostert—Killed
First Officer B. J. Grove—Killed
Navigation Officer A. E. Sissing—Killed
Flight Engineer Officer A. R. Lagesen—Killed
Radio Officer B. E. Webbstock—Killed
Steward J. B. Kok—Killed
Air Hostess P. Reitz—Killed

PASSENGERS: 14—All Killed

PLACE OF ACCIDENT: Over the Mediterranean, S.E. of Naples.

TIME OF ACCIDENT: 8th April, 1954, at about 1910 G.M.T.

All times in this Report are G.M.T.

PART I

INTRODUCTORY

(a) *Matters in common with the Report on G–ALYP*

1. In my Report of today on the accident to Comet aircraft G–ALYP (sometimes called Yoke Peter) I gave a short explanation of the constitution and functions of the Air Registration Board (A.R.B.) and of the Air Safety Board (A.S.B.) which I need not repeat here. It is also unnecessary for me to repeat the account I gave in that Report of the origin and history of the Comet aircraft.

2. As the two Inquiries were conducted together, the evidence in the Inquiry into the loss of Yoke Peter is the evidence in the present Inquiry. I need not, therefore, append any lists of the witnesses or parties represented at the hearings or the dates of such hearings.

(b) *Arrangements with South African Airways*

3. South African Airways are the national operators of the Government of the Union of South Africa. Air communication between London and South Africa was carried on under arrangements made between British Overseas Airways Corporation (hereinafter called "B.O.A.C.") and South African Airways. I need not go in full into the history of the arrangements between the two operators. Suffice it to say that the arrangements were revised on the 3rd October, 1953 and it was agreed, amongst other things, that South African Airways should participate with B.O.A.C. in the operation of the standard class services between England and the Union of South Africa by operating Comet aircraft chartered from B.O.A.C. The Corporation trained the necessary South African Airways crews to carry out this arrangement. Amongst the aircraft so chartered to South African Airways was Comet G–ALYY (sometimes hereinafter called Yoke Yoke).

PART II

THE ACCIDENT

4. Yoke Yoke left Ciampino Airport, Rome, at 1832 hours on the 8th April, 1954 on a flight to Cairo. After taking off the aircraft from time to time gave its position by radio telephone to Rome Air Control at Ciampino and on the last

such occasion at about 1857 hours reported that it was abeam Naples and climbing to 35,000 ft. This position and those given earlier indicated that the flight was proceeding according to the B.O.A.C. flight plan. At 1905 hours Cairo received a signal from the aircraft reporting its departure from Rome and giving its estimated time of arrival at Cairo. Thereafter no message was received from Yoke Yoke and all attempts to make contact failed.

5. A chart, which is Figure 1 of my Report on Yoke Peter, was prepared by a Navigating Officer of B.O.A.C. from all the information available, and shows the probable flight track of the aircraft. It also indicates the position in which bodies and wreckage were found on the day following the accident. It is evident from the chart that something catastrophic happened to the aircraft at about 1910 hours when it must have been at or near the end of its climb to 35,000 ft.

Part III

THE AIRCRAFT

6. Yoke Yoke was the same in all relevant respects as Yoke Peter. Details of Yoke Peter are given in my Report thereon and I need not repeat them here.

7. Yoke Yoke was granted a Certificate of Registration No. R.3221/1 on the 18th September, 1951 in the name of B.O.A.C. as owners and first flew on the 10th September, 1952. On the 23rd September, 1952 it was certified and approved by A.R.B. for the issue of its Certificate of Airworthiness and this Certificate, No. A.3221, was issued by the Ministry of Civil Aviation on the 30th September, 1952. After approval by A.R.B. on the 21st September, 1953 the Certificate of Airworthiness was renewed on the 23rd September, 1953 and was valid at the time of the accident.

8. After the accident to Yoke Peter on the 10th January, 1954, special checks, in addition to the routine Check 4 in accordance with the Approved Maintenance Schedules, were carried out on Yoke Yoke and a number of modifications were made affecting the airframe, the controls and the fire detection and protection at the engines. On the 15th February, 1954, the fuselage was subjected to a proving test to 11 lb/sq. in. The aircraft was returned available for service on the 24th February, 1954.

9. On the 2nd April, 1954, following a Check 1 inspection in accordance with the Approved Maintenance Schedules, carried out at London Airport, a Certificate of Maintenance signed by duly licensed airframe and engine maintenance engineers and expressed to be valid for 75 flying hours, was issued. Further reference to this Certificate is made in paragraphs 21 and 22 of this Report. On the 7th April, 1954, an Aircraft Radio Station Certificate of Serviceability was issued and showed no items unserviceable.

10. At the time of the accident Yoke Yoke had had a total flying life of about 2,704 hours, including 841 since the renewal of its Certificate of Airworthiness and including less than 75 hours since the issue of the Certificate of Maintenance on the 2nd April, 1954.

11. From examination of the airframe and engine log books and maintenance records it appeared that all routine inspections of airframe and engines had been regularly carried out within the limits of time specified by the Approved Maintenance Schedules and that the flying life of each of the engines since its last complete overhaul was within, and in two cases very well within, the approved life between complete overhauls. Save as mentioned in paragraphs 21 and 22 of this Report the evidence disclosed no irregularity in connection with any such inspection.

Part IV

THE CREW

12. Senior Captain Willem Karel Mostert, who was in command of Yoke Yoke was born on the 27th April, 1916. Before joining South African Airways he had flown 2,812 hours in the South African Air Force and had served as a flying instructor. He joined South African Airways on the 10th June, 1946, was promoted Captain on the 1st November, 1946 and on the 15th June, 1949 became a Flying Instructor. On the 15th May, 1953, he became Senior Flying Instructor and on the same day was promoted to the rank of Senior Captain. In June, 1953, Captain Mostert was transferred to the Comet Line of South African Airways and became the Comet Line Instructor. In South African Airways, captains who are appointed Line Instructors have to spend two-thirds of their time on route flying and one-third on instruction within the line. During his service with South African Airways Captain Mostert flew a total of 8,159 hours of which about 51 hours by day and 35 hours by night were flown in Comets within the six months preceding the accident.

13. Captain Mostert's last "six monthly check" prior to the accident was carried out on the 19th December, 1953 and his report was: "Proficient. (Very well executed flight)". He had not been involved in any previous accident. Captain Mostert was the holder of a Union of

South Africa Air Line Transport Pilot's Licence No. 65A valid until the 11th June, 1954. A rating for Comet aircraft had been added to this licence by the British Ministry of Transport and Civil Aviation. I am satisfied that Captain Mostert was fully equipped to carry out his normal duties as a pilot and as a captain and to deal with emergencies.

14. The second pilot was First Officer Barent Jacobus Grove who was born on the 15th July, 1922. After service in the South African Air Force, in which he had flown a total of 1,640 hours, he joined South African Airways on the 29th January, 1953, as a First Officer and was posted to the Comet Line on the 26th February, 1953. While with South African Airways First Officer Grove flew for a total of 54 hours, including about 47 hours in Comets during the 90 days preceding the accident. There was no evidence of First Officer Grove having been involved in any previous accidents save as a result of enemy action. His last check took place on the 20th February, 1954, when he obtained a satisfactory pass. First Officer Grove was the holder of a Union of South Africa Senior Commercial Pilot's Licence No. 48 (S), valid until the 11th June, 1954, to which a Comet rating had been added on the 2nd March, 1954. I am satisfied that he was fully equipped to carry out his normal duties and to support his captain in emergencies.

15. Navigation Officer Albert Escourt Sissing was born on the 1st January, 1917. After training in the South African Air Force he joined South African Airways on the 16th October, 1946 and from then until his death had 4,840 hours flying experience including about 155 hours in Comets in 1953 and about 51 hours in Comets during 1954, all of the latter during the 90 days preceding the accident. At his last six monthly check, in March, 1954, he passed in Comet Refresher Flight Planning and Plotting. Navigation Officer Sissing was the holder of a Union of South Africa Navigator's Licence No. 17(N) valid until 1st December, 1954 and I am satisfied that he was a capable officer.

16. Radio Officer Bertram Ernest Webbstock was born on the 17th June, 1917. He joined South African Airways on the 23rd April, 1946 and after spending some time on the London service passed a Comet course on the 20th June, 1953 and thereafter flew only in Comets. His total flying hours were 4,373 of which about 98 hours were during the 90 days preceding the accident. He was passed as proficient in his Comet check on the 5th October, 1953. Radio Officer Webbstock was the holder of a Union of South Africa First Class Flight Radio Operator's Licence No. 348 valid until the 30th April, 1954 and I am satisfied that he was a capable officer.

17. Flight Engineer Officer August Ranwald Lagesen was born on the 22nd May, 1920. He had wide experience of several types of aircraft both during the war and after rejoining South African Airways on the 16th February, 1945. There was no positive evidence relating to his flying hours prior to the 11th May, 1950 but such records as were available suggested that up to that date he had flown a total of about 4,300 hours. After the 11th May, 1950 he had a total flying time of 2,290 hours 35 minutes. He had flown about 203 hours in Comets including about 141 hours during the 90 days preceding the accident and had completed a Comet Conversion Course on the 2nd September, 1953, a Comet Refresher Course on the 19th December, 1953 and a further refresher course and flight training programme on the 21st March, 1954. He was examined on the 19th December, 1953 and found proficient. Flight Engineer Officer Lagesen was the holder of a Union of South Africa Aircraft Maintenance Engineer's Licence No. 387, valid until the 26th February, 1955, and Flight Engineer's Licence No. 10 valid until the 22nd February, 1955. I am satisfied that he was a capable officer.

18. Air Hostess Pamela Reitz, who was born on the 16th February, 1932 and Steward Jacobus Bruwer Kok, who was born on the 18th December, 1918 had both flown extensively with South African Airways.

Part V

THE PASSENGERS AND CARGO

19. Yoke Yoke carried 14 passengers all of whom were killed in the accident. There was nothing in the cargo which could have been relevant to the cause of the accident and I am satisfied that, despite the off-loading of a small bag of aircraft spares at London after the Load Sheet had been completed, the aircraft was loaded and trimmed within the prescribed limits.

Part VI

PRE-FLIGHT INCIDENTS

20. Yoke Yoke, in common with the rest of the Comet fleet of B.O.A.C., had been grounded by B.O.A.C. after the accident to Yoke Peter. The circumstances in which Comet services were resumed are fully stated in paragraphs 54 to 57 of my Report on the accident to Yoke Peter and I need not repeat them here.

21. Yoke Yoke arrived at Ciampino on the 7th April from London and was due to depart

from Ciampino the same evening. However, on completion of refuelling it was discovered that the centre tank contents gauge showed no reading although the tank was full. The fault was eventually traced to a co-axial cable for which a replacement had to be flown from England and the departure of the aircraft was consequently delayed for about 24 hours. While the fault was being traced a number of bolts were found lying about in the port wing of the aircraft and further inspection revealed that an equal number of bolts were missing from the inspection panel providing access between the rear spar and the wheel-well wall and that the remainder of the bolts securing the panel, though in position, were not properly tightened. The missing bolts were replaced and all were properly tightened. The maintenance engineer who supervised this work was satisfied from visual examination and from the readiness with which the missing bolts were refitted that no distortion of the panel or adjacent structure had occurred during the absence of the bolts.

22. As has been stated in paragraph 9 a Check 1 inspection was carried out on Yoke Yoke before the issue of the Certificate of Maintenance on the 2nd April. It is quite clear that it must have been during that inspection that the panel was removed and incorrectly refitted and I was informed that disciplinary action had been taken against the inspectors concerned.

23. The arrangements for safeguarding the aircraft during its stay at Ciampino were the subject of a great deal of evidence. For the greater part of this period Yoke Yoke was under observation by B.O.A.C. officials whose duties, however, were not primarily concerned with security. For the rest of the time it was guarded by an Italian Finance Guard whose main duty was to prevent smuggling. In all the circumstances I consider it unlikely that any unauthorised person gained access to the aircraft.

24. Apart from the above-mentioned defects, the Refuel and Departure checks disclosed nothing unusual.

Part VII

WEATHER CONDITIONS AT THE TIME OF THE ACCIDENT

25. From the take-off at Rome at 1832 hours on the 8th April, 1954 until the time of the accident, which was approximately 1910 hours, Yoke Yoke climbed through three moderately thick layers of cloud. In the top layer there may have been slight to moderate icing conditions but these would have been insufficient to cause anxiety. It is unlikely that any severe turbulence was encountered either during the climb through the cloud layers or in the clear air above. It can, therefore, be assumed that the state of the weather was not a contributory cause of the accident.

Part VIII

ACTION TAKEN AFTER THE ACCIDENT

26. As in the case of the accident to Yoke Peter the assistance of the Royal Navy was invoked and on the 9th April, 1954, H.M.S. *Eagle* and H.M.S. *Daring* proceeded to search for Yoke Yoke. Avenger aircraft of H.M.S. *Eagle* were used to assist in the search as also were certain United States aircraft. A number of dead bodies as well as some aircraft seats and other wreckage were identified in the water and in due course recovered. The depth of water where the bodies and wreckage were found varied between approximately 520 fathoms and 580 fathoms and the evidence established that at that depth the prospect of further recovery was hopeless.

27. The six bodies recovered were not examined by Professor Fornari, who had examined the bodies recovered at Elba, but four of them were examined at Uxbridge on the 12th April, 1954 by Dr. Teare, one was not subjected to autopsy and the other was examined by the Italian authorities.

These examinations did not disclose anything inconsistent with the view that the accident to Yoke Yoke was attributable to the same cause as the accident to Yoke Peter.

28. As a result of the accident to Yoke Yoke the Royal Aircraft Establishment (hereinafter referred to as R.A.E.) were directed to conduct a full investigation into it and the accident to Yoke Peter. In the absence of any wreckage from Yoke Yoke R.A.E. could only proceed with their investigations in the light of *a priori* reasoning and experiments and of conclusions to be drawn from the wreckage of Yoke Peter. I have dealt at length with the R.A.E. investigations and Report in my Report on the accident to Yoke Peter.

Part IX

THE COURT'S CONCLUSION AS TO CAUSE OF ACCIDENT

29. R.A.E's conclusion as regards the cause of the accident to Yoke Yoke is expressed in the following paragraph:—"Owing to the absence of wreckage, we are unable to form a definite opinion on the cause of the accident near Naples, but we draw attention to the fact that the explanation offered for the accident at Elba

appears to be applicable to that at Naples". I agree with this conclusion and have only to add that it is impossible in the case of the Naples accident to be dogmatic that defects of the kind considered in paras. 108–144 of my Report on Yoke Peter were not contributory causes to the Naples accident. I am therefore glad to note that the programme of future action outlined by the de Havilland Aircraft Company Limited and set forth in Appendix VIII to my Report on Yoke Peter includes measures to deal with those defects.

PART X

RESPONSIBILITY

30. I have dealt at length with this question in my Report on the accident to Yoke Peter. There is, however, one matter on which criticism was made which is applicable only to Yoke Yoke and that is the decision, after the accident to Yoke Peter, to allow the Comet passenger services to be resumed on the 23rd March, 1954. I have set out in paras. 52 and 53 of my Report on the accident to Yoke Peter the nature of the full investigation carried out by the Committee under the chairmanship of Mr. Abell, the Deputy Operations Director (Engineering) of B.O.A.C. and the modifications made on the recommendation of that Committee.

31. Before deciding to authorise the resumption of the Comet passenger services the Minister of Transport and Civil Aviation consulted A.R.B. and A.S.B. Both of these bodies recommended that consent should be given. When they did so, there had been only one accident to a Comet aircraft for which no explanation had been furnished. According to the evidence it was certainly not the practice either in the United Kingdom or elsewhere to ground all aircraft of a type because of an unexplained accident to one aircraft of that type. The evidence indicated that steps had been taken to deal with what the experts then considered to be all potentially dangerous features. In these circumstances I am of the opinion that no blame can be attached to any one for permitting the resumption of the services.

PART XI

FUTURE

32. I cannot usefully add anything to what I have said on this branch of the Inquiry in my Report on the accident to Yoke Peter.

PART XII

QUESTIONS AND ANSWERS

My answers to the questions submitted on behalf of the Attorney-General are as follows:—

Question 1. What was the cause of the accident?

Answer. Owing to the impossibility of salvaging any appreciable part of the wreckage of the aircraft no positive answer can be given to this question but the fact that this accident occurred in similar weather conditions, at approximately the same height and after approximately the same lapse of time after take-off from Rome as that to G-ALYP makes it at least possible that the cause was the same as in that case. The state of the bodies recovered was, as in the case of G-ALYP, consistent with the accident being due to failure of the cabin structure owing to metal fatigue.

Question 2. If several factors caused the accident what were such factors and to what extent was each contributory?

Answer. I cannot usefully add anything to my answer to Question 1.

Question 3. Was the accident due to the act or default or negligence of any party or of any person in the employment of that party?

Answer. There was no evidence on which I could attribute the accident to the wrongful act or default or negligence of any party or of any person in the employment of any party.

Question 4. At the time of the accident:

Question 4 (*a*). Had the aircraft been properly maintained in accordance with the current approved maintenance schedules? If not did any defect in maintenance affect the safety of the aircraft or contribute to the accident?

Answer. The aircraft had been properly maintained save that on arrival at Rome a number of bolts were

found lying in the port wing of the aircraft and further inspection revealed that an equal number of bolts were missing from the inspection panel providing access between the rear spar and the wheel-well wall and that the remainder of the bolts securing the panel though in position were not properly tightened. The missing bolts were replaced and all were properly tightened and I am satisfied that this defect in maintenance did not affect the safety of the aircraft or contribute to the accident.

Question 4 (*b*). Was the aircraft airworthy so far as could reasonably have been then ascertained?

Answer. Yes.

Question 4 (*c*). Was there a valid Certificate of Airworthiness in respect of the aircraft?

Answer. *Semble* yes. I do not find it necessary to deal with the legal question whether the default in reassembly referred to in paras. 21 and 22 of this Report had any effect on the validity of the Certificate of Airworthiness since I am satisfied that this default did not contribute to the accident.

Question 4 (*d*). Was there a valid Certificate of Maintenance in respect of the aircraft?

Answer. *Semble* yes. See my answer to Question 4 (*c*) on Certificate of Airworthiness.

Question 4 (*e*). Was the radio station of the aircraft serviceable and was there a valid Certificate of Serviceability in respect thereof?

Answer. Yes.

Question 4 (*f*). Was the aircraft properly loaded and trimmed within the limits specified in the Fight Manual?

Answer. Yes.

Question 4 (*g*). Were all members of the crew properly licensed and adequately experienced to make the flight? If not did any defect in the licence of any member of the crew affect the safety of the aircraft or contribute to the accident?

Answer. Yes. The second part of the question does not arise.

Question 5. Was the Minister of Transport and Civil Aviation properly advised in March, 1954 that Comet services should be resumed?

Answer. Yes. See paragraph 31 of this Report.

Question 6. Upon consideration of all facts disclosed by this Inquiry what steps should be taken to increase the safety of civil aircraft?

Answer. See paragraphs 140-155 of my Report on Yoke Peter.

(Signed) COHEN.
W. S. FARREN.
W. J. DUNCAN.
A. H. WHEELER.

1st February, 1955.

(81687) Wt. 4517— K12 2/55 D.L.

Printed and published by
HER MAJESTY'S STATIONERY OFFICE

To be purchased from
York House, Kingsway, London W.C.2
423 Oxford Street, London W.1
P.O. Box 569, London S.E.1
13A Castle Street, Edinburgh 2
109 St. Mary Street, Cardiff
39 King Street, Manchester 2
Tower Lane, Bristol 1
2 Edmund Street, Birmingham 3
80 Chichester Street, Belfast
or through any bookseller

Price 8*s.* 0*d.* net

Printed in Great Britain

S.O. Code No. 56-14*