



REPUBLIC OF SRI LANKA,
MINISTRY OF TRANSPORT,
DEPARTMENT OF CIVIL AVIATION.

**REPORT ON THE ACCIDENT TO
MARTINAIR DC 8
PH-MBH ON 4 DECEMBER 1974**

Colombo.
16 June 1975.

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CONTENTS

		PAGE
PART I		
1.	INTRODUCTION	1
1.1	Accident Details	1
1.1.1	Location	1
1.1.2	Date and Time of Accident	1
1.1.3	Name of Owner, Operator and Hirer	1
1.1.4	Aircraft Type and Registration	1
1.1.5	Extent of Damage	1
1.1.6	Injuries to Persons	1
1.1.7	Type of Operation	1
1.1.8	Phase of Operation	2
1.1.9	Type of Accident	2
1.2	Summary	2
1.2.1	Brief summary of events leading to the accident	3
1.2.2	Notification of Accident	3
1.2.3	Information of authority conducting investigation and representation by other States	3
PART II		
2.	FACTS ASCERTAINED BY INVESTIGATION	4
2.1	Aircraft Information	4
2.1.1	Registration Marking	4
2.1.2	Aircraft Type and Makers Serial No.	4
2.1.3	Engine Types	4
2.1.4	Engine Position	4
2.1.5	Certificate of Registration Number and Validity	4
2.1.6	Certificate of Airworthiness Number and Validity	4
2.1.7	Year of Construction of Airframe	4
2.1.8	Name and Address of Owner	4
2.1.9	Aircraft Information	4
2.1.10	Engines	5
2.1.11	Special Features	5
2.2	Crew Information	5
2.2.1	Pilot in Command	6
2.2.2	Co-pilot	8
2.2.3	Flight Engineer	8
2.3	Weather Information	8
2.3.1	Weather — Bandaranaike International Airport Katunayake	8
2.3.2	Weather En-route	9
2.4	Navigational Aids	9
2.4.1	VOR BIA	9
2.4.2	NDB Kat.	9
2.4.3	NDB PL	9
2.4.4	NDB China Bay	9
2.4.5	NDB Koggala	9
2.5	Communications	9
2.6	Air Traffic Control Information	10
2.7	Aerodrome Ground Facilities	10
2.8	Facts pertaining to Flight	12
2.9	Flight Data Recorder	12
2.10	Location of Accident and Description of Impact Area	12
2.10.1	Geographic Location of the Accident site	12
2.10.2	Description of Impact Area	12
2.11	Examination of wreckage and technical Investigation	13
2.12	Pathological Report	13

PART III

3.	DISCUSSION OF EVIDENCE	14
3.1	Flight Data Recorder	14
3.1.2	Examination of Wreckage at Site	14
3.1.3	Route	14
3.1.4	Approach Control	15
3.1.5	Public Representations	15
3.1.6	Reconstruction of Flight Path	15
3.1.7	Crew Familiarisation	17
3.1.8	Crew Fatigue	18
3.1.9	Operational Requirements	18
3.1.10	Operation and Maintenance at Surabaya	18
3.1.11	Peculiarities of PH-MBH	19
3.1.12	Possibilities of position determination	23
3.2	Conclusions	23
3.3	Probable Causes	24
3.4	Recommendations	24

Annexes

1.	Pathological Report	2-11
2.	Extract of VHF Communications	2-11
3.	Reconstruction of Flight Path	2-12
4.	Statement of Captain Andriesse	2-13
5.	Statement of Captain H. P. Corssmit	2-14
6.	Summary of Martinair route qualification procedure	2-15
7.	List of Passengers	2-16
8.	List of Crew	2-17
9.	Sketch of Accident Site	2-18
10.	Photographs	2-19
11.	List of Abbreviations	2-20
		2-21
		2-22
		2-23
		2-24
		2-25
		2-26
		2-27
		2-28
		2-29
		2-30
		2-31
		2-32
		2-33
		2-34
		2-35
		2-36
		2-37
		2-38
		2-39
		2-40
		2-41
		2-42
		2-43
		2-44
		2-45
		2-46
		2-47
		2-48
		2-49
		2-50
		2-51
		2-52
		2-53
		2-54
		2-55
		2-56
		2-57
		2-58
		2-59
		2-60
		2-61
		2-62
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		2-80
		2-81
		2-82
		2-83
		2-84
		2-85
		2-86
		2-87
		2-88
		2-89
		2-90
		2-91
		2-92
		2-93
		2-94
		2-95
		2-96
		2-97
		2-98
		2-99
		2-100

PART I

1. INTRODUCTION

1.1 Accident Details

1.1.1 Location

On the 5th mountain of the range of hills popularly known as "Anjimalai" at Theberton Estate, Maskeliya, Sri Lanka, at a latitude of 6° - 53' - 32.22"N and longitude 80° - 29' - 25.30"E at a height of 4355 feet above Mean Sea Level and at a distance of approximately 40 nautical miles from Bandaranaike International Airport, Colombo, located in Katunayake.

1.1.2 Date and Time of Accident

On 4 December 1974 at approximately 1641 G.M.T.*

1.1.3 Name of Owner, Operator and Hirer

Owner : Martinair Holland N.V.
Operator : Martinair Holland N.V.
Hirer : Garuda Indonesian Airways.

1.1.4 Aircraft Type and Registration

Type : Mc Donnell Douglas DC 8 55F.
Registration : PH-MBH.

1.1.5 Extent of Damage

Aircraft destroyed.

1.1.6 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	9	182	—
Non Fatal	—	—	—
None	—	—	—

1.1.7 Type of Operation

Non-scheduled transport service

1.1.8 Phase of Operation

En-route descent to Primary Approach Facility.

*All times in this report are G.M.T. To convert to local time add 7 hours for Indonesia and 5 hours 30 minutes for Sri Lanka.

1.1.9 Type of Accident

Collision with rising terrain.

1.2 Summary

1.2.1 Brief summary of events leading to the accident

The aircraft PH-MBH took off from Surabaya Airport Indonesia, at approximately 1200 hours on 4 December 1974, to proceed to Jeddah, Saudi Arabia, with a programmed technical stop at Bandaranaike International Airport, Katunayake, Sri Lanka. Aircraft contacted Bandaranaike International Airport Approach Control at 1616.45 hours indicating that they were 130 miles out at 35,000 feet, in reply to which Bandaranaike International Airport Approach Control passed on the weather and requested the aircraft to change over to Colombo Area Control on 119.1 MHz for descent clearance. This message was acknowledged by the aircraft and contact made with Area Control accordingly. The aircraft was descended from 35,000 feet by Area Control and handed over to Approach Control, at 1634.14 hours and the aircraft contacted Approach Control at 1638.10 hours, informing Approach Control that they were out of 7,000 for 6,000 at a distance of ONE FOUR (14) miles out. Approach Control acknowledging this message cleared the aircraft to 2,000 feet with instructions to report 'Kilo Alpha Tango' (Katunayake Non-Directional Beacon) or 'airfield in sight.' This message was acknowledged by the aircraft. There was no further communication with the aircraft. Eye-witnesses state that the aircraft was sighted flying at an altitude lower than normal over Castlereigh, Bogawanthalawa and Agrapatana, and to all appearances the engines sounded normal and there was no evidence of any fire on board during flight. The sound of the aircraft exploding on impact was heard clearly by residents close to the site of crash and subsequently it was discovered that the aircraft had crashed into the 5th mountain on the range of hills called "Anjimalai" at Maskeliya, with fatal injuries to all on board. The aircraft was completely destroyed consequent to the impact.

Repeated attempts by Approach Control to establish contact with the aircraft met with no success, and in consultation with Area Control Colombo the distress phase was initiated, search and rescue operations being organised subsequently.

1.2.2. Notification of Accident

A telephone message was received in the Approach Control Tower at Bandaranaike International Airport from one Mr. Maldeniya (night telephone operator, Post Office, Hatton) to the effect that an aircraft had crashed at Maskeliya. This was the first intimation of the accident.

1.2.3. Information of authority conducting investigation and representation by other States

Under the Sri Lanka Air Navigation Regulations of 1955, Regulation 266(i), the Director of Civil Aviation is the Chief Inspector of Accidents. Within the provisions of this regulation, the Director of Civil Aviation, Mr. C. W. M. Aponso appointed Mr. D. J. Rosa, Assistant Director of Civil Aviation (Aeronautical Inspection) as Inspector of Accidents to conduct preliminary investigations and submit a draft report. Accordingly preliminary investigations were completed with the assistance of Assistant Aeronautical Inspectors Mr. S. K. P. Samaranayake and Mr. T. Sivasambo. Subsequent to preliminary investigations a draft report compiled by Mr. D. J. Rosa with the assistance of Mr. S. K. P. Samaranayake was submitted to the Chief Inspector of Accidents. Mr. G. P. S. de Silva, Senior State Counsel of the Attorney General's Department was appointed Legal Adviser to the Chief Inspector of Accidents.

The State of Registry of the aircraft namely the Kingdom of the Netherlands and the State of Manufacture, namely the United States of America were forthwith informed of the accident. The Republic of Indonesia was also informed since the passengers were nationals of that State. These States were invited to send their accredited representatives. The Representatives of the Kingdom of the Netherlands, namely Mr. A. W. Fournier and of the Republic of Indonesia, namely Mr. D. Suwardi arrived in Sri Lanka on 5 December 1974, visited the site and assisted in the preliminary investigations. The United States of America through her Embassy in Sri Lanka indicated that she would consider it necessary to participate in the investigation only if the probable cause of the accident was traced to a technical deficiency in the manufacture of the aircraft.

In terms of the Sri Lanka Air Navigation Regulations, Regulation 266(3) a notice calling for representations from the members of the public was published in the Government Gazette Number 144 of 27 December 1974 and in Newspapers on 21 December 1974 and 23 December 1974.

On completion of the preliminary report, the Governments of the Kingdom of the Netherlands, United States of America and the Republic of Indonesia were invited to send their accredited representatives to participate in the investigation. Mr. A. W. Fournier from the Netherlands and Mr. D. Suwardi from Indonesia participated in the investigation with their advisers.

2.1.11 Special Features

After delivery to Martinair PH-MBH was modified to KLM-standards. The aircraft was maintained by KLM. Inasmuch as the conversion in certain instances was incomplete there were certain deviations from KLM-standard systems which will be dealt with later on in this report.

2.2 Crew Information

2.2.1 Pilot in Command

Name : Hendrik Lamme
Born : 6 June, 1916 at Leiden
Nationality : Netherlands
Address : Dolderseweg 44, Bos en Duin (Den Dolder)
Profession : Airline Captain

2.2.1.1 Licences

- Royal Navy — Pilot Licence since 1938
 - Airline Transport Pilot's Licence No. 52-16, issued 16 June 1952, valid until 13 May 1975.
 - Radio Telephony Licence 52-129, issued 18 June 1952
 - Flight Navigator Licence 58-05, issued 14 April 1958, valid until 15 June 1975.
- These licences have been issued by the Netherlands.

2.2.1.2 Type Ratings

L749/L1049	valid	until	20.6.1952
Convair 240/340	..	..	12.1.1957
Douglas DC 4	..	..	27.1.1959
Douglas DC 6	..	..	10.3.1961
Douglas DC 7C	..	..	16.6.1964
Douglas DC 8	..	..	13.5.1975 (issued 13.12.1963)

2.2.1.3 Last Proficiency Check 31.10.1974 on Douglas DC 8, Passed.

2.2.1.4 Experience

Total No. of flying hours Approximately 26,770 hours of which approximately 4,000 hours were on the DC 8.

2.2.1.5 Last Medical Examination

13.11.1974. Fit for Airline Transport Pilot's Licence, with corrective glasses.

2.2.1.6 Most recent Flying Experience

His recent flying experience was as follows :

Since 1 December 1973 — 428.23 hours DC 8
Since 4 September 1974 — 103.03 hours DC 8
Since 4 November 1974 — 10.00 hours DC 8

His last flight has been on 30.11.74 as Captain in Command on DC 8 on a trip Amsterdam-Alicante/Alicante-Amsterdam, lasting 5 hours.

2.2.1.7 Rest Time

On 1 December 1974 he left Amsterdam as passenger to Djakarta and was booked in on 2 December 1974 at 1449 hours at the Hotel Borobudur at Djakarta. On 3 December 1974 he flew as passenger from Djakarta to Surabaya where he was booked in at Hotel Mirama at 1500 hours. On 4 December 1974 he left Hotel Mirama at 1000 hours for the flight.

2.2.1.8. Personal History

Captain Hendrik Lamme started his career as a pilot of the Royal Netherlands Navy Airforce in September 1936 and was posted to Indonesia where he served upto July 1948. During this period in addition to his normal flying he had occasion to fly several mapping and surveying sorties over New Guinea as well as serving in No. 321 Squadron in Ceylon (now Republic of Sri Lanka) during World War II. From October 1948 upto January 1952 he was a pilot with KLM and served as Captain in Command on Catalina, Dakota and Convair aircraft. In January 1952 he returned to the Netherlands having accumulated a total of 8064 flying hours. From January 1952 upto June 1972 he served with KLM in the Netherlands totalling around 15,000 hours. During this period he had flown the types DC 6, DC 7, DC 8 33/50, DC 8 63. He held a Check-Pilot Rating on the DC 6 valid from 1 January 1958 to 1 May 1960 and a Route-Instructor's Rating on DC 8 33/50 valid from 1 January 1968 to 1 October 1969. Captain Lamme retired from KLM in June 1972 and was employed by Martinair since March 1973 as a Free-lance Captain in Command of DC 8 33/50. His total number of flying hours with Martinair was 803 hours, all flown on DC 8 aircraft of which 488 hours had been as Captain in Command. Since 7.12.73 he had flown 439 hours 08 minutes of which 139 hours 30 minutes were in command and 299 hours 30 minutes were as co-pilot. Of these hours, 178.15 were flown on PH-MBH of which 82.25 were as Captain in Command and 95.53 as co-pilot. His last flight on PH-BMH was on 10.10.74 as co-pilot.

2.2.1.9 Route Experience

This was Captain Hendrik Lamme's first flight on sector Surabaya/Colombo. There has been no route familiarisation or check procedures carried out prior to this flight. His most recent flight in the Far Eastern Region was in April 1974, where he flew as co-pilot on the route Amsterdam-Abadan/Abadan-Kuala Lumpur/Bangkok-Dubai/Dubai-Istanbul/Istanbul- Amsterdam..

2.2.2 Co-pilot

Name : Robert Blomsma
Born : 9 October 1941 at Leiden
Nationality : Netherlands
Address : Laan van Ouderzorg
52, Leiderdorp.
Profession : Airline Pilot.

2.2.2.1 Licences

Commercial Pilot's Licence No. 70-08 issued by the Netherlands with Instrument Rating on 5 February 1970, valid until 4 September 1975. The instrument rating as such was valid until 22 April 1975.

2.2.2.2 Type Ratings

Douglas DC 3	valid until	:	5.10.1972
Fokker F28	„ „	:	4.09.1975
Douglas DC 8*	„ „	:	22.10.1975

*(obtained 22.10.1974 with restriction for crosswind landing 15 kts. This restriction was endorsed on licence in terms of the practice prevailing under the Netherlands regulations).

2.2.2.3 Type Rating Check

22-10-1974 on Douglas DC 8 at Schiphol. No remarks.

2.2.2.4 Experience

Total number of flying hours	— approx.	2480 hours.
Co-pilot hours on Fokker F28	—	2193 hours.
Total flying hours on DC 8	—	47 hours.

(of the 47 hours on the DC 8, 24 hours and 05 minutes have been supernumerary flying and 22 hours 55 minutes as co-pilot).

2.2.2.5 Last Medical Examination

4.9.1974 Medically fit for ATPL

2.2.2.6 Most Recent Flying Experience

Since 1 December 1973, 294 hours on F28 and 47 hours on DC 8.

Since 4 September 1974, 10.50 hours on F28 and 47 hours on DC 8.

Since 4 November 1974, 21.15 hours on DC 8.

His last flight prior to the accident was on 20 November 1974 from Amsterdam to Tripoli and back of duration 6 hours 30 minutes. He had not flown on the far Eastern Routes at any time.

2.2.2.7 Rest Time

On 1 December 1974 he left Amsterdam as passenger to Djakarta and was booked in on 2 December 1974 at 1449 hours at the Hotel Borobudur at Djakarta. On 3 December 1974 he flew as passenger from Djakarta to Surabaya where he was booked in at Hotel Mirama at 1500 hours. On 4 December 1974 he left Hotel Mirama at 1000 hours for the flight.

2.2.2.8 Personal History

Co-pilot Robert Blomsma joined Martinair in January 1971 and upto September 1974 he served as co-pilot on F28 accumulating a total of 2193 hours. Since September 1974 he served as co-pilot on DC 8 33/50 totalling 47 flying hours, of which 24 hours 05 minutes have been supernumerary flying. He has not flown on the PH-MBH prior to this flight.

2.2.2.9 Route Experience

From the evidence available this was the first flight that co-pilot Blomsma had made on the Far Eastern Sector. There has been no route familiarisation or check procedures carried out prior to this flight.

2.2.3 Flight Engineer

Name : Johannes Gijsbertus Wijnands
Born : 13 September 1926 at Apeldoorn
Nationality : Netherlands
Address : Dr. Kuypcrstraat 7, Zandvoort
Profession : Airline flight engineer

2.2.3.1 Licences

Flight Engineer's Licence No. 58-21, issued by the Netherlands on 14 June 1958, valid until 20 February 1975.

2.2.3.2 Experience and Type Ratings

DC 3 -- 6,866 hours
CV 240 -- 1,459 hours
CV 340 -- 1,079 hours
DC 7C -- 450 hours
DC 7 -- 800 hours

DC 8 Approx. 3,000 hours— The type rating on the DC 8 was issued by the Netherlands on 2.3.73 based on German flight engineers licence number 67-46, issued on 29.4.72 and subsequent DC 8 type training.

2.2.3.3 Last Medical Examination

20.2.1974 Fit for Flight Engineer's Licence
Medically fit for ATPL.

2.3 Weather Information

2.3.1 Weather — Bandaranaike International Airport Katunayake

Surface wind — 1210 to 1240 hrs. 350/06-07 kts.
1310 to 1540 hrs. Calm.
1610 to 1740 hrs. 030-040/08-10 kts.
Visibility — above 10 KM throughout period
Weather — lightning seen 1240 to 1340 hrs.
otherwise NIL
Cloud — 1 — 2 cb 1240 to 1340 hrs. to the east of Kat.
2 — 5 Cu at 480M 1210 to 1340 hrs.
2 — 3 Cu at 480M 1410 to 1810 hrs.
QNH — 1007.3 increasing to 1009.6 at 1540 hrs. and falling
to 1009.0 at 1810 hrs.

2.3.2 Weather En-route

Weather — Isolated thunderstorm over hills.
Cloud — Isolated Cb with broken middle level layer clouds
Upper winds — 500 mb 070-090/10 kts. — 06°C
300 mb 240/15 kts. — 33°C
250 mb 250/10 kts. — 43°C
200 mb 220/10 kts. — 54°C

2.4 Navigational Aids

The Navigational Aids relevant to this flight were as follows :

- 2.4.1 **VOR BIA** This has been Notamed as 'On test.'
Working This VOR has not been flight calibrated. All reports received by aircraft indicate that this was functioning normally.
- 2.4.2 **NDB KAT** Operating Normally
Working
- 2.4.3 **NDB PL** Operating normally.
Working
- 2.4.4 **NDB China Bay** Operating normally.
Working
- 2.4.5 **NDB Koggala** Notam to the effect.
Not Working

2.5 Communications

Communications between PH-MBH and Approach Control Bandaranaike International Airport are recorded on the Bandaranaike International Airport Control Tape. There is no recording facility at Ratmalana for recording of Area Control messages, but Flight Progress Strips are available for that sector. When changing from HFRT to VHF in spite of the HFRT operator mentioning the correct Area Control frequency the co-pilot had first called on the Approach Control frequency instead of Area Control frequency. This error was subsequently corrected by Approach Control. The Colombo Area Control frequency is stated as 119.7 MHz instead of 119.1 MHz in the KLM Navigational Chart — South East Asia, dated April 1974. In this operation the crew probably used the KLM chart referred to, for the sector Surabaya/Colombo, as is the usual practice with Martinair.

2.6 Air Traffic Control Information

The Air Traffic Control Services provided by the Directorate of Civil Aviation, Sri Lanka, consists of two units located at Ratmalana and Bandaranaike International Airport, Katunayake. The Unit at Ratmalana designated the Colombo Area Control Centre provides the following services :

- a) Flight Information Service.
- b) Air Traffic Advisory Service.
- c) Air Traffic Control Service.
- d) Aeronautical Information Service.
- e) Search and Rescue Service.

The Unit at Bandaranaike International Airport, designated the Colombo Approach Control Unit provides:

- a) Approach Control Service.
- b) Aerodrome Control Service.
- c) Pre-flight Briefing Service.
- d) Alerting Service.

890

Aircraft entering Colombo FIR come under the jurisdiction of the Colombo Area Control Centre with which communications are carried out initially on HFRT and subsequently on VHF. The communications on HFRT channelled to the aircraft by the controller via the HFRT communicator, are transferred when the aircraft is around 100 to 150 miles from the Area Control Station, onto VHF communications directly between the controller and aircraft. The transfer of the control of the aircraft from Colombo Area Control Centre to the Approach Control Unit at Bandaranaike International Airport, is normally effected at an altitude of 5,000 feet or above depending on traffic conditions. From the point of release the Approach Control Unit at Bandaranaike International Airport, is responsible for the control of the aircraft.

Upto within 50 NM of Bandaranaike International Airport, the minimum sector altitude is 10,000 feet, from 50 NM out to 25 NM out, it is 3,000 feet above ground level. Within 25 NM of NDB, KAT, in the South East Sector it is 3,500 feet above mean sea level.

2.7 **Aerodrome Ground Facilities**

This is not a factor contributory to the accident.

2.8 **Facts pertaining to Flight**

PH-MBH had departed Surabaya on 4 December 1974 at 1203 hours for Colombo. The flight plan was not received in Colombo prior to the accident. From flight plan information received after special request for supplementary flight plan information, the following data were extracted :—

Aircraft Identification — MP 138 type DC 8.
FTD Surabaya WRRD — 1200 hours.
EST Colombo Fir — 1458 hours.
True Air Speed — 470 kts.
Proposed flight level — 350
Route — ATS route 'White 17' to Djakarta and thence direct to Bandaranaike International Airport.
Alternate Airport — Madras.
Registration — PH-MBH.
Endurance — 7 hours 10 minutes
Personnel on Board — Crew + 191 (This number of crew + 191 in the supplementary flight plan is incorrect. The correct number is Crew of 9 + 182).

The Aircraft had departed Surabaya at 1203 hours and had passed over N.D.B, Semarang at 1227 hours at FL 260 and estimated arrival over NDB, Jerabon at 1241 hours. The aircraft reported over NDB Jerabon at 1241 hours and estimated over Halim Beacon at 1254 hours.

At 1251 hours before arrival over Halim Beacon the aircraft had reported leaving FL 260 for FL 350. The aircraft was over Halim Beacon at the estimated time 1254 hours and reported estimating over NDB, Tanjungkarang at 1309 hours. At 1305 hours the aircraft had reported reaching FL 350. At 1309 hours it had passed over NDB, Tanjungkarang at the estimated time and gave an estimate for NDB Bengkulu as 1334 hours. The aircraft passed over Bengkulu as estimated. Bengkulu was the last navigational fix the aircraft passed over on this flight.

After passing over Bengkulu the next reporting point was the entry point to Colombo Flight Information Region (F.I.R.) at 01° 10'N, 92°E which is 692 NM from Bengkulu.

The aircraft reported over Bengkulu at 1334 hours at FL 350 gave the estimate for Colombo FIR boundary 92°E as 1503 hours.

The aircraft, however, reported over the boundary at 1457 hours in 1 hour 23 minutes.

The next reported position was at 85°E also over the sea and 467 NM from the 92°E position. The aircraft reported over 85°E at 1557 hours, 1 hour after the 92°E position.

From this position the aircraft gave an estimate for the coast at 1627 hours.

After reporting over 85°E at 1557 hours air/ground High Frequency Radio Telephony (HFRT) operator's log indicates that the aircraft was changing over to VHF communication with Colombo Control. This call on HFRT was at 1605 hours.

At 1622 hours the aircraft contacted Approach Control on VHF on the Approach Control Frequency and the pilot reported that he was 130 NM out at 35,000 feet.

At about 1625 hours the aircraft had contacted Colombo Control on 119.1 MHz and reported 120 miles out at FL 350 estimating the coast at 1630 hours and Bandaranaike International Airport at 1645 hours.

Colombo Area Control cleared the aircraft to commence descent when ready to FL 150 and to report 50 NM out. At about 1635 hours the pilot reported 50 NM out at FL 160. The aircraft was cleared to descend to 5,000 feet and to report approaching 8,000 feet.

An inbound release was given to Approach Control Bandaranaike International Airport "Inbound release Mike Papa 138 estimating your field at four five, five by eight."

At about 1638 hours the aircraft had reported approaching 8,000 feet and was instructed to contact Approach Control on 119.7 MHz.

At 1638.10 hours the aircraft had called Approach Control on the tower frequency of 118.7 MHz. The Approach Controller answered the call on 119.7 MHz, the approach frequency, but the aircraft did not apparently respond as he was calling on 118.7 MHz. On the second call however the approach controller realized the aircraft was calling on 118.7 MHz (tower frequency) and answered on that frequency and communication was established.

At 1639.48 hours the aircraft reported "We are out of seven thousand for six thousand and we are one four miles out." The Controller replied at 1639.55 hours "One three eight, Roger descend to two thousand feet, QNH one zero one zero temperature two six runway zero four wind is zero six zero degrees one zero report Kilo Alpha Tango or field in sight."

This was acknowledged by the aircraft at 1640 hours in the manner "Roger we are cleared to two thousand feet one zero one zero for runway zero four Kilo Alpha Tango or field in sight."

This was confirmed by the controller at 1640 hours by repeating "One three eight."

2.9 Flight Data Recorder

The Flight Data Recorder had disintegrated as a result of the impact. After an intensive search approximately 130 feet of foil were recovered in small fragments. The foil was despatched to the National Transportation Safety Board of the United States of America for readout and analysis. The foil did not reveal any useful data since it was from the supply spool.

2.10 Location of Accident and Description of Impact Area

2.10.1 Geographic Location of the accident site

Lat.	6°53'	32.22" N
Long.	80°29'	25.30" E

2.10.2 Description of Impact Area

Altitude above mean sea level of the beginning and end of the initial graze on the face of the rock.

4309 feet — Beginning of graze

4302 feet — End of graze

Altitude above mean sea level of the centre of the second graze.

4290 feet

Altitude above mean sea level of the centre of the main impact area

4355 feet

The total length of the initial graze on the rock.

35.5 meters, 1.76 Chains, on an average true heading of 312° 30'

The total distance between the beginning of the initial graze and the centre of the second graze.

83.0 meters (4.12 Chains)

The total distance from the beginning of the initial graze to the centre of the final impact area.

288.0 meters

Height of the five mountains above mean sea level in the impact area.

(I) 5160 feet.

(II) 5160 feet.

(III) 4991 feet.

(IV) 4800 feet.

(V) 4640 feet.

2.11 Examination of wreckage and Technical Investigation

The impact of the aircraft against the granite rock reduced the aircraft into minute fragments which were scattered over an area of approximately 4 square miles in extent on mostly inaccessible terrain.

The inaccessibility of the terrain coupled with the difficulty in cordoning off the site of the wreckage made the task of recovering all the wreckage difficult. However examination at the site of the accident and detailed examination of the parts recovered did not reveal any malfunctioning of the aircraft or any of its major systems prior to impact. The initial graze of the port wing on the fourth mountain and the statements of eye witnesses along the flight path indicate that the aircraft was in a descending attitude presumably on a true heading of 296° immediately prior to impact.

2.12

Pathological Report

Owing to the difficulty of the terrain at the site of accident only a little of the remains of the passengers and crew were recovered at the foot of the mountain range.

In keeping with the religious customs of the Moslems the remains at site of crash were interred by a team of volunteers.

A Post Mortem examination was conducted on such remains as were recovered at the foot of the mountain and these did not reveal any indication of toxication. It was not possible to identify any human remains as belonging to the Cockpit Crew.

The Report of the Judicial Medical Officer is annexed *vide* annex 1.

PART III

3. Discussion of Evidence

3.1 Flight Data Recorder

After an intensive search launched by the Sri Lanka Army and volunteers from Theberton Estate, approximately 130 feet of foil were recovered in small fragments off the Flight Data Recorder. The foil recovered was despatched to the National Transportation Safety Board of the United States of America for read-out and analysis, but this proved futile as all the foil recovered was from the supply spool, the recordings on it being not relevant to the flight in question. The only other part recovered of the Flight Data Recorder was a portion of its outer cover in a badly damaged condition.

3.1.2 Examination of Wreckage at Site

Having regard to the substance of the communication between the aircraft and Approach Control Bandaranaike International Airport, a major failure of the aircraft or its systems prior to impact is highly improbable.

The initial graze of the port wing on the fourth mountain and the statements of eye witnesses along the flight path indicate that the aircraft was in a descending attitude immediately prior to impact. The initial graze resulted in dislodging approximately 1/3 of the port wing which was found at the foot of the mountain.

Just before final impact on the 5th mountain the aircraft appears to have banked 30° to port, in a yaw of 15° to port and in a nose up pitch of approximately 25°. This was deduced from the damage to foliage at site of final impact. This bank and yaw were induced by the initial graze. On final impact the starboard wing had separated from the fuselage and had been thrown a distance of approximately 200 feet to the right. The ensuing fuel spillage had initiated a fire which consumed wreckage blown in that area. The initial graze and fuel spillage on the 4th mountain had brought about a fire on the 4th mountain. There was no indication of fire in the area of fuselage impact and it could be reasonably assumed that there was no fire on board the aircraft prior to impact.

This impact was the final phase in the accident the real causes of which have to be traced to the factors which led the aircraft to arrive at this place.

Under the circumstances this investigation has been directed towards the examination of the following points in detail.

3.1.3 Route

The route selected by Martinair was the former ATS route GREEN 62 Surabaya/Djakarta/Colombo.

During the first few flights of this series conducted by Martinair, it was observed that crew reported at 92°E, 85°E and 'Over the Coast.' In view

of the fact that there were other routes crossing this route, and the reporting points on these being 88°E and 84°E, the Air Traffic Control Units of Djakarta and Surabaya were requested to brief operating crew of Martinair to report at 88°E and 84°E. This request was complied with. Consequently certain crew reported as requested while others continued to report 92°E and 85°E. When conflicting traffic was anticipated, crew which reported 92°E and 85°E were requested to provide estimated times for 88°E and 84°E. These requests were complied with.

In respect of this flight although the information on the reporting points requested was available at Surabaya the crew reported at 92°E and 85°E and although they failed to comply with the requested reporting points (88°E and 84°E) there was no request from Air Traffic Control of Sri Lanka for the additional reporting points as there was no conflicting traffic. However, this investigation is of the view that the said deviation had no bearing on the cause of the accident.

This flight of the PH-MBH was the 56th operated by Martinair on this route and was the 19th flight of PH-MBH. Martinair continued to fly on this route after the accident. There were many flights before and after this accident on this route.

3.1.4 Approach Control

On a perusal of the 'Extract of Radio Telephony Recording of Pilot to Controller Communications on VHF', *vide* annex 2, it is observed that Approach Control cleared the aircraft to 2,000 feet on the aircraft's statement that "We are out of 7,000 for 6,000 and we are One Four Miles out." The procedure is to clear an aircraft to 3,500 feet over the beacon or report visual. In this instance the aircraft was cleared to 2,000 feet or report 'Airfield in Sight,' which is a deviation from the laid down procedure. However, this investigation is of the view that the said deviation had no bearing on the cause of the accident.

3.1.5 Public representations

In response to the notification in the Government Gazette and the Newspapers, several representations were received, most of which were not relevant to the investigation.

This investigation has to consider the hypothesis adduced by certain members of the public that the aircrew mistook the lights of Adam's Peak or of the Hydro-electric Scheme at Norton Bridge for the runway lights at the Bandaranaike International Airport. This has to be discounted since in the last conversation of the co-pilot with Approach Control he did not state that he had the airfield in sight. Further, confirmation was received from the Ceylon Electricity Board that the lights on Adam's Peak were not switched on till the end of December 1974, it being the practice to light the path to the Peak during the pilgrim season which goes on from the end of December till May the following year.

3.1.6 Reconstruction of Flight Path

The aircraft had departed Surabaya at 1203 hours and had passed over Semarang Non Directional Beacon (NDB) at 1227 hours at flight level (FL) 260 and estimated arrival over Jerabon NDB at 1241 hours. The aircraft reported

over Jerabon NDB at 1241 hours and estimated over Halim beacon at 1254 hours. At 1251 hours before arrival over Halim beacon the aircraft had reported leaving FL 260 for FL 350. The aircraft was over Halim beacon at the estimated time, (average ground speed — 465 knots) estimating over Tanjungkarang NDB at 1309 hours. The average ground speed on this sector was 442 kts. This reduction in ground speed was probably due to the climb from FL 260 to FL 350 within this sector. At 1305 hours the aircraft had reported reaching FL 350. At 1309 hours it had passed over Tanjungkarang and gave an estimate for Bengkulen NDB as 1334 hours. The aircraft passed over Bengkulen as estimated. Bengkulen was the last navigational fix the aircraft passed over on this flight. The average ground speed of the aircraft from Tanjungkarang to Bengkulen was 460 kts.

After passing over Bengkulen the next reporting point was the entry point to Colombo Flight Information Region (FIR) at 01° 10' N 92°E which is 692 nautical miles from Bengkulen.

The aircraft reported over Bengkulen at 1334 hours at FL 350, gave the estimate for Colombo FIR boundary 92°E as 1503 hours. This works out to a Ground Speed of 466 kts.

The aircraft, however, reported over the boundary at 1457 hours in 1 hour 23 minutes, six minutes earlier than estimated. This works out to an average Ground Speed of 500 kts for this sector. This is 34 kts faster than that estimated. The position report, however, is probably a deduced position and being over the sea, could have been in error.

The next position was at 85°E also over the sea and 467 nautical miles from the 92°E position. The aircraft reported over 85°E at 1557 hours, one hour after the 92°E position. This works out to a Ground Speed of 467 kts. From this position the aircraft gave an estimate for the coast at 1627 hours expecting to recover the distance of 233 nautical miles in 30 minutes i.e. at a Ground Speed of 466 kts.

From these reports it appears that the aircraft had averaged a Ground Speed of around 465 to 470 kts. for most of the route, while for the stretch from Bengkulen to 92°E (Colombo FIR boundary) its time over the reporting points suggests a Ground Speed of 500 kts.

After reporting over 85°E at 1557 hours air/ground high frequency radio telephony (HFRT) Operator's log indicates that the aircraft was changing over to VHF communication with Colombo Control. This call on HFRT was at 1605 hours.

The first call by the aircraft on VHF to Colombo was on 119.7 MHz to Colombo Approach, instead of on 119.1 MHz to Colombo Control. At 1622 hours the aircraft contacted on Approach Control Frequency and the pilot reported that he was 130 NM out at 35,000 feet. Colombo Approach after passing the weather to the aircraft directed it to contact Colombo Control on 119.1 MHz for descent.

FROM THIS STAGE THE RECONSTRUCTION OF THE FLIGHT PATH IS BASED ON THE ASSUMPTION THAT THE AIRCRAFT DESCENDED ON A STANDARD DESCENT SCHEDULE. THE STANDARD RATE OF DESCENT ABOVE 10,000 FEET IS 2,500 FEET PER MINUTE AND BELOW 10,000 FEET IS 2,000 FEET PER MINUTE.

The aircraft descended from 35,000 feet to 4,355 feet, the elevation of the scene of the final impact. At no stage during the descent had there been any restriction imposed on the descent and it can be assumed that it would have been a continuous descent.

Assuming an average descent speed of 370 kts. True Air Speed (T.A.S.) down to 10,000 feet and an average speed of 280 knots T.A.S. below 10,000 feet it would have covered a distance of 94 nautical miles at an average ground speed of 5.84 NM per minute. The crash site is 40 nautical miles away from the terminal airport on a true bearing of 116° (The bearing gives an indication that the aircraft was within reasonable tolerance of the required track). The distance covered during the descent added to the distance of the crash site from the airport, gives a distance of 134 NM as the actual distance at which the aircraft would probably have commenced its descent. The precrash position report was made from an altitude around 7,000/6,750 feet and the aircraft would have taken 1 minute 12 seconds approximately to reach 4,355 feet the elevation of the crash site.

According to the timings on the tape recording this last communication commenced at 1639.48 hours. The crash would thus have occurred at approximately 1641 hours. This would take the time of commencement of the descent to approximately 1628 hours.

A TABLE OF THE FLIGHT PATH RECONSTRUCTION APPEARS AS ANNEX 3.

3.1.7 Crew Familiarisation

According to the documentation made available this flight is the first made by Captain Lamme and his co-pilot Blomsma on the route Surabaya/Colombo.

Captain Lamme's most recent flight into Colombo had been on 16 January 1972 from Bangkok and on 17 January 1972 he flew the sector Colombo/Djakarta.

His most recent flight in the Far Eastern Region was in April 1974, when he flew as co-pilot on the route Amsterdam-Abadan/Abadan-Kuala Lumpur/Bangkok-Dubai/Dubai-Istanbul/Istanbul-Amsterdam.

It is the practice of Martinair to detail captains in command of new operations after adequate preflight briefing in respect of the route and facilities. In this instance Captain Andriess had orally briefed Captain Lamme on 1 December 1974, as seen from his statement of 11 June 1975, *vide* annex 4. Captain Lamme also inquired from Captain Corsmitt a couple of hours before departure about the route, flight preparation, ground services, hotels etc., as given in Captain Corsmitt's statement of 8 December 1974, *vide* annex 5.

Captain Andriess states that such inquiries are usual and are not indicative of lack of familiarity with the route. It is further stated by Captain Andriess that this type of briefing is a normal practice amongst airline pilots.

In view of the fact that Captain Lamme sought further information from Captain Corsmitt this investigation is unable to arrive at a definite conclusion as to whether Captain Lamme has had sufficient familiarity with the route.

290

The co-pilot Blomsma whose normal position is in the right hand seat was observed in the right hand seat prior to departure. As such he would have carried out radio communication and navigation under the supervision of the Captain.

As for co-pilot Blomsma, this was his first flight on this route and in this region and he had only a very limited number of hours of experience on the type. It is relevant to note that of his total of 2,240 flying hours as co-pilot, 47 hours were on the DC 8, and of the 47 hours on the DC 8, 24 hours 05 minutes had been flown by him in the capacity of supernumerary crew. His co-pilot endorsement on the DC 8 had a restriction for crosswind landing which according to Mr. Fournier is the normal procedure adopted in granting a new type rating in the Netherlands. His lack of familiarity with the route is supported by the fact that he failed to comply with the requested reporting points. On this flight the crew reported at 92°E/85°E/Over the Coast, whereas the requested reporting points since 20 November 1974 were 92°E/88°E/84°E/Over the Coast.

It is relevant to note here that the failure on the part of Captain Lamme to correct co-pilot Blomsma as regards the reporting points, leads to the conclusion that the Captain was unaware of the correct reporting points. The Colombo HFRT Control requested the aircraft to call Area Control on VHF giving the correct frequency (119.1 MHz). This message was received by the aircraft and the co-pilot contacted Approach Control on a different frequency (119.7 MHz) whereon Approach Control having passed on the weather requested the aircraft to contact Area Control for descent clearance on the frequency 119.1 MHz. By way of confirmation the co-pilot repeated the wrong frequency (119.7 MHz) and once again Colombo Approach Control had to repeat the correct frequency.

3.1.8 Crew Fatigue

During the 24 hours preceding the accident the crew had flown approximately five hours. Crew fatigue has no bearing on the cause of the accident.

3.1.9 Operational Requirements

It is customary to conduct route checks on aircrew who are due to fly on routes new to them prior to their being detailed as crew as per Annex 6 to the Convention on International Civil Aviation. It is observed that procedures set out in Annex 6 to the Convention had not been strictly adhered to. Martinair adopted procedures of employing free-lance Captains who have world wide experience by ascertaining their proficiency on the simulator and by flying captains as co-pilots on regular flights. However, it is worthy of note that even in these instances no written records have been maintained by Martinair, "when no problems or deficiencies were apparent." It is also of interest to note that subsequent to this accident a new system has been adopted wherein route reports and route checks are carried out and records maintained by Martinair. In this connection particular reference is invited to extract of Martinair letter of 13 February 1975 bearing reference HF/MF/4931 *vide* annex 6.

3.1.10 Operation and Maintenance at Surabaya

3.1.10.1 Maintenance

Maintenance at Surabaya was carried out by Garuda ground engineers holding KLM licences. The statement of Mr. J. B. van Zanten of the

Operations Division of the Netherlands Civil Aviation dated 21.1.75 states 'inter alia' that "The technical servicing at Surabaya did not lead to complaints from the side of most pilots and Flight Engineers, although some critical remarks have been made." Mr. Fournier is of the view that the words 'technical servicing' were the subject matter of the critical remarks made, and that he would interpret this as a reference to the delay in the supply of spare parts to rectify defects which would not make it essential to ground the aircraft. Some of the Technical Log slips were examined which indicated that certain defects had not been put right prior to subsequent flights due to lack of spare parts. These defects according to the Aircraft Operations Manual (A.O.M.) are items which could be allowed to remain unrectified after consultation between Crew and Ground Engineer. Statements of Captain Bombeek of 10.12.74, Flight Engineer Mr. Koel of 10.12.74 and of Captain K. van der Eerden of 11.12.74 indicate that they have no remarks to make in respect of technical servicing at Surabaya.

3.1.10.2 Operations

A few points worthy of record are the lapses regarding Flight Preparation Documentation and Maintenance Documentation. The Golden Copy of the Technical Log and all copies of the Loadsheet and Navigational Flight Plan have been destroyed with the aircraft due to the failure to retain copies as required at the base at Surabaya.

The fact that no Maintenance Records after 1.12.74 and no Navigational Documentation relevant to this flight are available as the officers concerned failed to carry out this part of their duties points in the direction of negligence on the part of officers responsible for the organisation at Surabaya prior to this flight.

3.1.11 Peculiarities of PH-MBH

3.1.11.1 Doppler System

Martinair took delivery of PH-MBH and in keeping with their maintenance practice the aircraft was handed over to K.L.M. for maintenance and standardisation in conformity with the KLM fleet. On the information made available to this investigation the following facts could be established. PH-MBH on delivery to Martinair was equipped with a Bendix Doppler System which was off-standard to the KLM DC 8 fleet.

To meet the operational requirements a KLM Standard Marconi Doppler Computer Indicator had to be built in. This had been accomplished. Mr. Hoonhout, Aeronautical Inspector of the Department of Civil Aviation of the Netherlands investigated the Doppler System on PH-MBH. As per extract of translation of his report, reproduced below, the system functions as follows :—

"During cockpit standardization of the PH-MBH, the Doppler controlpanels—Doppler computer controlpanels and the groundspeed and drift indicators are relocated by means of modification order No. 34-153B. to standardize the PH-MBH cockpit to the KLM configuration. The Dopplersystem, originally installed in the PH-MBH has been manufactured by the Bendix Corporation, while the KLM aircraft are equipped with Dopplersystems of Canadian Marconi. Because the different presentation between the two systems, operational difficulties arise.

890

An operational requirement was the installation of a doppler computer indicator. To meet this requirement, a KLM standard Canadian Marconi doppler computer indicator has been built in. This indicator, connected into a Bendix doppler computer system, does not give a correct indication on the "distance to go" counter as a result of technical differences between the Canadian Marconi and Bendix systems. Now the "distance to go" counter of the Canadian Marconi indicator counts in steps of 100 Nautical Miles instead of the normal steps of one Nautical Mile.

In the aircraft operations manual, it is noted that the "distance to go" counter of the doppler computer indicator is not active.

As can be seen also that the distance to go must be read on the computer controller panel, on the counter labeled "Miles to go."

To avoid misunderstanding, Miles stated for Nautical Miles.

In this connection a translation of a letter from Mr. G. Kronenburg, Chief, Electrical and Electronic Systems Group of KLM Central Engineering Department, is also reproduced below:—

"With reference to your letter of 5th April, 1974, I inform you that as yet a Doppler Computer Indicator has been installed in the RH-MBH. Because the D.C. I. is from another make, he does not function fully in the Bendix Doppler system. As a result of this the "Distance to Go" presentation on the indicator cannot function properly. The three-disks-counter of the indicator is directed by the 100-miles counterdisk of the computer. Therefore only the 100-miles indication is correct ; the positions of the ten and one miles indicator disks are more or less arbitrarily.

The choice between disconnection of this counter and the present incomplete indication has been determined by the consideration that with the configuration chosen now the chance of misinterpretation is the smallest.

The deviation from the normal indicator presentation has been reported on the aircraft's "list of special items," and the crews have been informed by means of the A.O.M. (aircraft operations manual)."

According to the above statement of Mr. Kronenburg the chance of misinterpretation is the smallest. The corrective action in respect of this anomaly has been the inclusion of item 7 in the Cockpit Briefing Card which document is not available. Special instructions in this regard pertaining to PH-MBH had also been incorporated in Volume I of the Aircraft Operations Manual in the form of yellow pages IA and 2A in part 1.15.5. On page IA under the illustration of the Doppler Computer Indicator the following remark is made "Distance-to-go not active."

On two occasions the aircrew have observed in the extracts of the Tech Log Slips made available to this investigation that the 'distance-to-go' counter on the Doppler Computer Indicator was faulty. The subsequent corrective action the engineers took was to refer them back to the Briefing Card. This leads us to the conclusion that these aircrew were ignorant of the deviation in the Doppler System.

It is observed that 42 Tech Log slips within the period 1 August 1974 to 1 December 1974 are missing. It is possible that in these extracts there may have been references to deficiencies in the Doppler System.

In view of the foregoing it is the opinion of this investigation that it would have been more appropriate to have the 'Distance-to-go Digital Indicator,' on the Doppler Computer System on PH-MBH masked out so that the chances of aircrew misinterpretation would have been completely eliminated.

In the flight in question, the confirmation of the co-pilot of his distance in no uncertain terms as "One Three Zero" and "One Four" points in the direction of his having relied for the greater part on the 'distance-to-go' digital counter.

Having regard to the above facts this investigation rejects the opinion of Mr. Kronenburg that "the chance of misinterpretation is the smallest" and concludes that the 'distance-to-go' presentation on the Doppler Computer Indicator was confusing and consequently the chances of misinterpretation were the greatest.

3.1.11.2 Weather Radar

The aircrew had the alternative of checking their distance by the use of the Weather Radar on board the aircraft. This would mean that the indication they obtained would have been more or less confined within a limit depending on the range selected on the Weather Radar.

It would have been possible for the aircrew to have cross checked their Doppler 'Miles-to-go' Indicator by use of the Weather Radar to interpret the coastline. Here too, the possibility of misinterpretation of an overlapping cloud giving an advanced simulation of the coastline cannot be discounted.

The report of Mr. C. B. Hoonhout, Aeronautical Inspector of the Department of Civil Aviation of the Netherlands, which sets out the peculiarities of the Weather Radar System on the PH-MBH is reproduced below :—

"During the cockpit standardization program of the PH-MBH to the K.L.M. standard configuration, the weather radar system has been modified so, that the existing P.P.I. indicator has been relocated from the forward pedestal to the L.H. gussetpanel, the controlpanel from the forward pedestal to the aft pedestal and an additional P.P.I. indicator has been installed on the R.H. gussetpanel. This modification: is described in modification order M.O. 34-151B. rev. 1.

The modified system now consists of the following units :—

One transceiver type R.D.R.—1E Bendix	P.N. 2067 157—0101
One control panel	— Cable P.N. G. 2424
Two P.P.I indicators type I.G.T. Bendix	P.N. 2085268—0108
One antenna	type 1P—B Bendix P.N. 2087181—0501

This type of transceiver includes synchroniser and power supply which can be a separate unit in other systems.

Despite of standardization, there are still some operational differences between the standard KLM DC-8-50 series installations and the

PH-MBH, which mainly lies in the application of the P.P.I. indicator type I.G.T., because there are more controls on the P.P.I. type I.G.T. and also the range markers are different.

The Aircraft Operations Manual describes exactly how the system can be switched on.

No remarks are given in the A.O.M. with respect to differences in range markings. The KLM DC-8-50 series is normally equipped with P.P.I. indicators type I.D. The differences between the two types of indicators with respect to range markings are summarized in the following table :

K.L.M. standard DC-8-50 series P.P.I. — ID			PH-MBH P.P.I.—I.G.T.		
range naut. miles	number of range mark.	naut. miles per range mark.	range naut. miles	number of range marks.	naut. miles per range mark
20	4	5	30	3	10
50	5	10	80	4	20
150	6	25	180	6	30

With the value of the selected range and associated range mark increments in mind (both are indicated on the range selector switch) no difficulties can be expected with respect to distance interpretation of a displayed object. When, as a result of a lot of experience with the K.L.M. standard system operation, selections are made on the basis of the number of range marks displayed, the supposed distance can be in error by a factor 4 of the selected value in the case of selection of a 4 range mark display.

With respect to weather radar complaints only four aircraft maintenance logs are written from the date of installation till October 22, 1974. The nature of the technical troubles as well as the number of these troubles do not enable us to discover a specific trend of the malfunctions.

Conclusions

No difficulties can be expected in the operation of this off-standard system when the crew is familiar with the instructions given in the A.O.M. Additional remarks in the A.O.M. with respect to differences, in range marks and range selection is recommended.

Captain Andriesse made the following statement on the operational details of the Weather Radar System on PH-MBH "The Bendix Radar on this aircraft was fitted out with a Plan Position Indicator (P.P.I.) of the day light type which gives a much clearer picture than the Marconi P.P.I. The mapping feature of this Radar Set is very effective and in this connection prominent terrain features such as lakes, rivers, mountains and coastlines may also be monitored as navigational aids."

The possibility of the Captain having cross-checked the reading on the ' Miles-to-go ' indicated in the Doppler System with the presentation on the Weather Radar Screen was considered. In view of the fact that —

- (a) the Weather Radar System was off-standard,
- (b) No instructions had been laid down in the Aircraft Operations Manual with respect to differences in the range markings from the standard, This investigation concludes that such a cross-check, if done, would have been misleading. In the event of his having been aware of the deviation from the standard, there is the possibility that the Captain and the co-pilot misinterpreted the range markings on the Weather Radar Screen.

This investigation assumes that the Weather Radar System was fully serviceable at the commencement of this flight since in the opinion of Captain Andreiess serviceable Radar is essential on this route.

3.1.12 Possibilities of position determination

On this flight there were in theory two possibilities available to the crew to determine their position in relation to the Bandaranaike International Airport after the initiation of the descent. One was taking ADF bearings on two Radio Beacons, and the other was a reading from the Doppler system combined with an interpretation of the presentation on the Weather Radar Screen.

With regard to the first possibility, the pilot could have taken an ADF bearing from the Katunayake and China Bay Non Directional Beacons. If the crew relied on these beacons, in spite of the beacons being serviceable the bearings thus obtained would not prove accurate on account of the prevailing meteorological conditions and terrain. Moreover at this stage of the flight it is not the practice nor is it practicable to do so.

Therefore this investigation concludes that the crew would have relied for the greater part on the second possibility.

3.2 Conclusions

This investigation concludes that —

- (1) The Captain held a valid licence with a valid type rating. He had considerable experience on the type in general and sufficient experience on the PH-MBH in particular.
- (2) The Captain had no recent experience on this route.
- (3) The Captain had been briefed on this route prior to departure.
- (4) No proper route check had been carried out prior to permitting the Captain to fly on this route ; certain provisions of Chapter 9 Section 4 of Annex 6 to the Convention on International Civil Aviation had not been strictly complied with.
- (5) The co-pilot held a valid licence with a valid type rating subject to a restriction for crosswind landing which is usual in the Netherlands.
- (6) The Co-pilot had little experience on the type in general and no experience on PH-MBH in particular.
- (7) The Co-pilot had no previous experience on the route.

- (8) The Doppler Computer System was off-standard to the Martinair DC 8 fleet and left room for misinterpretation of the 'distance-to-go' presentation by the crew.
- (9) The Weather Radar System was off-standard to the Martinair DC 8 fleet and no instructions had been included regarding this in the Aircraft Operations Manual, thus leaving room for misinterpretation of the range-markings on the screen by the crew.
- (10) There are indications that the crew relied for the greater part on the Doppler System to determine their 'distance-to-go.'
- (11) There were shortcomings on the part of Martinair in the maintenance of Technical Records pertaining to aircraft, and to cockpit personnel in respect of route qualification.
- (12) The officers responsible for the organisation at Surabaya pertaining to this flight displayed a certain degree of negligence in that they failed to retain copies of maintenance records and navigational documentation relevant to this flight.
- (13) The Captain/Co-pilot were unaware of the correct reporting points in the Colombo Flight Information Region.
- (14) There are no indications of a major pre-crash failure of the aircraft or of its systems, nor of any pre-crash fire.

3.3 Probable Causes

This accident occurred following collision with rising terrain as the crew descended the aircraft below safe altitude owing to incorrect identification of their position vis-a-vis the Airport. This investigation is of the opinion that this was the result of dependence on Doppler and Weather Radar Systems on board PH-MBH which left room for misinterpretation.

3.4 Recommendations

This investigation recommends that --

- (i) indicators which are not fully accurate be masked ;
- (ii) cockpit crew be briefed in detail about all off-standard instrumentation;
- (iii) regardless of experience of cockpit crew, charter operators ensure that route checks are carried out prior to detailing cockpit crew on sustained operations on a new route;
- (iv) charter operators ensure that operating cockpit crew demonstrate an adequate knowledge of the route to be flown and aerodromes which are to be used in terms of Chapter 9 paragraph 9.4.3.2 of Annex 6 to the Convention ;
- (v) ground operations personnel of operators be adequately briefed regarding their responsibilities.

(Signed)

*Director of Civil Aviation/
Chief Inspector of Accidents.*

Ministry of Transport,
Department of Civil Aviation,
Republic of Sri Lanka.
Monday, 16 June, 1975.

Position		Distance	Time	Time	G/S	FL
From	To		Over	Taken		
Surabaya		145	1203	24	362	climb
	OC		1227			
OC		109	1227	14	465	260
	CA		1241			
CA		96	1241	13	442	260 350 climb
	AL		1254			
AL		119	1254	15	475	350
	TF		1309			
TF		191	1309	25	460	350
	PB		1334			
PB		692	1334	83	500	350
	92°E FIR		1457			
92°E FIR		467	1457	60	467	350
	85°E		1557			
85°E		233	1557	30	466	350
	Coast		1627			
Coast		63	1627	10	390	Descent
	Crash site		1641			

Total Dist. to crash 2,115

Total Dist. to BIA 2,158

Dist. from Last Fix to
Crash 1,455

**Summary of the Martinair route qualification procedure as quoted
from a Martinair letter of 13th February, 1975 nr. HF/MF/4931**

In non-scheduled air transport it is not necessary and not practicable to check every pilot-in-command on every route and every destination.

In the Martinair system a captain on a new type of aircraft gets a general route check by specially assigned route-instructors during about 100 flying hours (slightly dependent of short or long routes).

A co-pilot, after some "look-see" flights, is assigned to route check-captains during at least 50 flying hours.

From both captains and co-pilots route reports are compiled and filed.

The procedure with free lance captains, who have built up a world wide experience with KLM during 20 to 30 years, was until recently as follows. After he had proved his proficiency on the simulator and the actual aircraft the captain was to fly as a co-pilot on several flights. When during these flights no problems or deficiencies were apparent, no written report was compiled and the man could be assigned to fly as a pilot-in-command. Because the free lance pilots regularly are assigned as a co-pilot, there is a constant check on their performances.

The system has been changed recently in that way, that now also written route reports of the route check flights are compiled and filed of the free lance pilots.

Because this change of system was made after the accident, there are no route reports of Captain Lamme.

Schiphol, 28 February 1975.

LIST OF PASSENGERS

<i>Surname and Initials</i>	<i>Surname and Initials</i>
ALIMAN B. MUH. YASIR	ABDUL LATIEF BIN KAHA
KASAN MUNAWI BIN UMAR	BAKRI B. BADRUN
ABUNAHIR B. NOYODIKROMO	SANIYAH BT. M. TOYIB
SAHID SALAM	MISDAR B. MUNIRAN
NGUKEL B. H. GHOZALI	ASIR P. KASTURI
ABU. KOHAR B. PONCOMEJO	BANGUN
IMAN ROKHAWI B. ABD. K.	RASMINI BT. H. HASIM
MARWA-I B. KASAN P.	SUPANGAT B. SURATMAN
KARTINAH BT. SUMURI	ASIYAM B. H. MUHTAR
MASHURI B. SOMOPRAWIRO	H. ABD RAKHIM B ABD KARIM
NAWAWI B. H. IBRAHIM	ASPAR B. H. WAHAB
MUNIRAH BT. H. KABIT	MINAH BT. MUJARI
AMAT SAHAL B. K.	SUPANGATUN BT. H. RAIS
ROBINGAH MOH MARJUKI	SITI NASIKAH
FADIL B. MUSTARI	MARYONO B. WAHID
IKUL BT. MUSTARAM	KARTISAH BT. H. M. NUR
IMAYUNAH BT. KASAN M.	IMAM JAZULI B H. ANSORI
ABD. MANAN B. SAMURI	MARSINAH BT. H. MARJUKI
AHMAD SARPAN B. A. S.	MARSUP B. KASANREJO
MARDIYAH BT. ABD. GHOFUR	MIFTAHUL MAKNA B. H. RAIS
MURTINAH BT. H. ABD. G.	ROMELAH DIMYATI
ABD. RASYID B. H. DURIYAT	WAGINTEN
HAJI IKHSAN S. B. H. S.	ASRIYAH MUSTAFA
SAMSIKIN BT. SAFAWI	SAPURAH
SITI AMINAH BT. IMAN T.	KARMILAH
HASAN BASRI B. H. NUR	H. IKSAN B. MUSIRAN
IMAM MUSLIM B. KASAN. I.	H. ST. NGAISAH
MUHAMAD BIN TAJWIT	MURTI BT. KASAN
ALFIAH BT. MUAWAN	SAHLAN B. T. ALI SALAM
ZAINUSI B. KARTONADI	MUSRIFAH BH ADNAN
MASKUR B. MUH. BASRI	DANURI B. H. SULAIMAN
OZUL AINI B. IMAM S.	YUSUP B. ZAKARIAH
AHMAD ZAINAL A. B. H. S.	AHMAD SAUDI
AHMAD SURYAN B. IMRONI	SRINGATUN KASANREJO
MUSRIATUN BT. KASANMARDI	UMAR SIBAWAIH
ABUSUHAD BIN KASANMUKTI	MURTINAH KROMODIMEJO
MUSTAWI BIN KASANTUPAN	MUALIM SARIJAN
SUALTIAMINI BT. H. A.	SOLAKAN MAD KARJAN
IKHWANUDI B. H. A.	H. ABDUL RAHMAN
MUKARI BIN MUKAROM	MUJIYAH ABU BAKAR
SUPINAH BT. KASAN M.	MASRUKIN
PAIJATUN	RAKAI ADAM
SURYADI	NURDIN MILO
SAINAH SURODIKROMO	BANRANGGAU BIN DUA
MUSIARAH	BODDI BINTI SAGUNI
TUKAYAT KARS NAWI	DOLLAH BN. ABDULLAH
MUKARI DIYOKARSO	BAPAI BN. SADO
MUKISAH SETRODIKROMO	RASIDE BN HARUNA
SUPINAH WONGSOREDJO	LATIEF
JAMINI HADIKASAN	MUAH
HAJIGOZALI	DULKARIM
HAJI SITIHALIMAH	SADI PAK MUSTAJAB

Surname and Initials

KARIMUN ACHMAD JASIR
SAPIRIN MURADJI
SAHIDI SAHID
AMAT KIBAT
BAUDIN TOHIR
RUBIAH
JAJURI HAJI NUR
KABIT BIN ARTO
KAMSINAH MUCHAMAD SAJUN
MOCHAMAD YASIR
MARSAM JEMAIN
HARJOKAMIL
MARZUKI SUKROMO
ASTINAH SULAIMAN
JOJO WARONGAN
MAEMUNAH ABDULLAH
SALEH ABDULLAH
RUSMINAH IRSAN
RAHMAD SUJUDI
SITIFATIMAH
ANWAR
MUSA AMAH ANWAR
HAJI ABDUL KARIM
SAMIN
ALIM SHOLAMAH
RIAN PUAH
JAIMAH
MUSA BIN ACHMAD
BIDA BIN MADO
RAI BIN GAGONG
SUREANG MATTO
MAHOLAH POTO

Surname and Initials

NAPPA BN HAJI RODDO
RUPI BT. PALAWA
NAHIRA BT. ENCING
JUMRAH BT. SAHIDE
PATTO BIN LANNE
HAMLING BIN BALLA
SARANEA BT. BASONG
HAMMA BIN SORONG
HAJI DJAFAR SIDIQ
NURAIZAH BT. SALIM NAPIS
GALUH MARSUM BINTI HAJI ZAMZAM
MOCH ABDUL GANI
TARFIAH
KAMARIAH

Surname and Initials

KATENIM
USMAN BN. HANURE
KURNIA ET. SAID
MANNYEREANG BN. JAMALUDDIN
JARINAH BT. JAMALUDDIN
HAJULA BT. AZIN
RUKIJAH BT. RACHMAN
MARIANA BT. SAHA
ABDULWAHAB BN. SEHA
JANONG BN. MILING
MOCH. HAMZAH NYANGKA
SITIHATIJAH BT. SULTAN
ANDI RAYA PATA NYONRI
HAMBALI BN. KAMA
ADJONG DAENG LIMPO
AMI DAENG ALANG
HAUANG JON JONG
SUGI DAENG TAINNE
HANAJA DAENG MALINO
DJOKO
IDRIS
KARAWANTING IDRIS
SALEHU
SALERE BN. BARE
YAHYA BT. LATUNE
SAWEANE BT. SINGKE
SAHAKA BN. GALLO
ABDULAZIZ BN. LAIWUNG
HAJI SAHARI BT. HAJI HUSAIN
SIDJO
DIPIN
HANISA BT. SEWA

C R E W

Flight Crew

Captain Hendrik Lamme
 F/O Robert Blomsma
 F/E Johannes Gijsbertus Wijnands

Cabin Crew

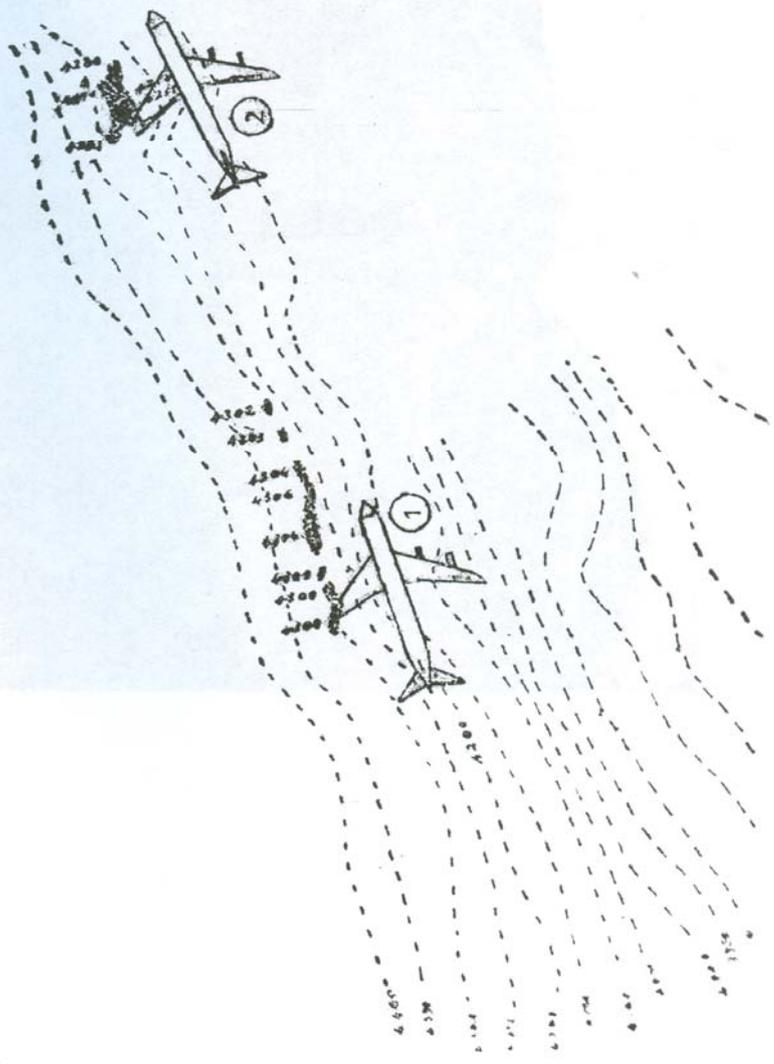
A/H Ingrid Fransisca Paula Maria van der Vliet
 A/H Henrietta Maria Paulina Borghols
 A/H Titia Anetta van Dijkum
 A/H Hendrika van Hamburg
 A/H Lilik Herawati
 Stwd Abdul Hamid Usman

ROBINSON
 PADIL B. MUSTARI
 IKUL BT. MUSTARAM
 IMAYUNANTON
 ABD. MANAN B. SAMUEL
 AHMAD SARTAS DAMA
 MARDIYAH
 MURTI
 ABD. RASYID
 ABDULLAH
 SITI AMINAH BT. IMAN
 HASAN BASRI B. H. NUR
 IMAM MUSLIM
 MUHAMMAD BIN TAJWIT
 ALFIAH BT. MUAWAN
 ZAINULI B. KARTONADI
 MASKUR B. MUEL BASRI
 OZUL AINI B. IMAM S.
 AHMAD ZAINAL A. B. H. S.
 AHMAD SURYAN B. IMRONI
 MUSRIATUN BT. KASANMARTI
 ABUSUHAD BIN KASANMURTI
 MUSTAWT BIN KASANTUPAN
 SUALTIAMINI BT. H. A.
 IKHWANUDI B. H. A.
 MUKARI BIN MUKAROM
 SUPINAH BT. KASAN M.
 PAULATUN
 SURYADI
 SAINAH SURODIKROMO
 MUSIARAH
 TUKAYAT KARS NAWI
 MUKARI DIYUKARSO
 MUKISAH SETRODIKROMO
 SUPINAH WONGSOREDJO
 JAMINI HADIKASAN
 HAJIGOZALI
 HAJI SITHALIMAH

ABDUL LATIF BIN
 BAKRI B. BARRAN
 SANYAH BT. HAYATI
 ASH. KARIM
 BANGUN
 RASMINI BT. H. HA
 SUPANGAS
 ASIYAH
 H. ABD. BAKRI
 ASPAR
 MINAH BT. MA
 SUPANGATUN
 SITI NASIKAH
 MARYONO B. WAGI
 KARTISAH BT. H. M
 IMAM JAEFFA
 MARSINAH
 MARSUP B. KASAN
 MIPTAHUL MA
 KOMELAH DIMYATI
 WAGINTEN
 ASRIYAH
 SAPURAH
 KARMILAH
 H. IKSAN B.
 H. ST. NGAI
 MURTI BT. KASAN
 SAHLAN B. T.
 MUSRIYAH BH ADNI
 DANUR
 YUSUP B. ZAKI
 AHMAD SAMPUNG
 BRINGATUN
 UMAR SIBAYAH
 MURTI
 MUALIM
 SOLAKA
 H. ABDUL BAKRI
 MURTI
 MASMA
 RAKAI ADAM
 NURDIN MILO
 BANRANGGAU BIN
 BODDI BINTI SAGU
 DOLLAH BN. ABDUL
 BAPAI BN. SADO
 RASIDE BN. HARUN
 LATIEF
 MUAH
 DULKARIM
 SADI PAK MUSTAJA

PROBABLE SEQUENCE OF FINAL IMPACT

- ① INITIAL GRAZE.
- ② SECONDARY GRAZE.
- ③ DEDUCED ATTITUDE OF AIRCRAFT IMMEDIATELY PRIOR TO FINAL IMPACT
- ④ SITE OF FINAL IMPACT



Flight Crew
Captain Hendrik
F/O Robert
F/S Johannes



VIEW OF FOURTH AND FIFTH MOUNTAINS OF THE RANGE "ANJIMALAI"

- A - Wing graze marks
- B - Point of final impact

① 1011000 000000
② 2000000 000000
③ 3000000 000000

LIST OF ABBREVIATIONS

ADF	...	Automatic Direction Finding
ATPL	...	Airline Transport Pilots Licence
AOM	...	Aircraft Operations Manual
A/H	...	Air Hostess
BIA	...	Bandaranaike International Airport
Cb	...	Cumulonimbus
DCI	...	Doppler Computer Indicator
FL	...	Flight Level
FIR	...	Flight Information Region
F/O	...	First Officer
F/E	...	Flight Engineer
GMT	...	Greenwich Mean Time
HFRT	...	High Frequency Radio Telephony
KTS	...	Knots
KLM	...	Koninklijke Luchtvaart Maatschappij
KM	...	Kilometres
KAT	...	Katunayake
LH	...	Left Hand
MHz	...	Megahertz
M	...	Metres
mb	...	Millibars
MP 138	...	Number of the Flight
MO	...	Modification Order
mts	...	Minutes
NOTAM	...	Notice to Airmen
NDB	...	Non-Directional Beacon
nm	...	Nautical Miles
PL	...	Puttalam
PPI	...	Plan Position Indicator
QNH	...	Airfield Pressure Altitude in Millibars
RH	...	Right Hand
STWD	...	Steward
VOR	...	Very High Frequency Omnidirectional Radio Range
VHF	...	Very High Frequency

Note: Publication of the Appendices 1, 2, 4, and 5 withheld in compliance with Chapter 5 Paragraph 5.12 of ICAO Annex 13 to the convention.