OFFICE OF THE
CHIEF INSPECTOR OF AIR ACCIDENTS
MINISTRY OF TRANSPORT
MALAYSIA

MH 370 PRELIMINARY REPORT *SERIAL 03/2014*

Aircraft Type & Registration:	Boeing 777-2H6ER, 9M-MRO
Year of Manufacture:	29th May 2002
State of Registration:	Malaysian
No & Type of Engines:	2 Rolls Royce RB211 Trent 892B17
Location:	Unknown (Last known Secondary Surveillance Radar (SSR) return, Waypoint IGARI)
Date & Time (Local Time)	8 March 2014 & Unknown (last known SSR return at 01:21:13 hours)
Operator:	Malaysian Airlines (MAS)
Call-sign:	MH 370
Type of Flight	Scheduled (Commercial Air Transport), IFR
Persons on Board	227 passengers + 12 crew

The investigation

At 01:38 hours Malaysian Time[1] (MYT) on 8 March 2014 (Saturday), a Boeing 777-2H6ER, registration 9M-MRO,and call-sign MH 370 with 227 passengers and 12 crew on board, was reported missing after passing waypoint IGARI[2] while en-route from Kuala Lumpur, Malaysia to Beijing, China.

[1]Malaysian time (MYT) is Universal Coordinated Time (UTC) + 8 hours.
[2]Waypoint IGARI is located at N6°56.87' E103°34.63' (Latitude/Longitude).

The Department of Civil Aviation (DCA) Malaysia was informed that flight MH370 was missing and an investigation was launched.

In accordance with International Civil Aviation Organisation (ICAO) Annex 13 *Aircraft Accident and Incident Investigation*, and Malaysian Civil Aviation Regulation 1996 Part XII *Investigation of Accidents* and with established international arrangements, the National Transportation Safety Board (NTSB) of the USA, representing the State of Design and Manufacture of the aircraft, has appointed an Accredited Representative to participate fully in the investigation. The Air Accidents Investigation Branch (AAIB) of the United Kingdom, representing the State of Design and Manufacture for the engines, has also appointed an Accredited Representative.

The NTSB Accredited Representative is supported by a team of technical advisers from the US Federal Aviation Administration (FAA) and Boeing.

The AAIB Accredited Representative is supported by technical advisers from Rolls-Royce and Inmarsat the operator of a Satellite which was in communication contact with the aircraft during the flight.

The Australian and Chinese Governments have also appointed Accredited Representatives in accordance with ICAO Annex 13, Para 5.23.

Malaysian Airlines (MAS) the operator, is cooperating with the investigation and providing expertise as required and the DCA Malaysia are being kept informed of developments.

History of the flight

At 00:41:43 MYT on 8 March 2014 (Saturday), MH 370 took off from Runway 32R at Kuala Lumpur International Airport (KLIA) on a scheduled flight to Beijing, China.

At 00:42:07 MYT, MH 370 was cleared to climb to Flight Level (FL) 180[3] and was issued a direct track by LUMPUR APPROACH at Kuala Lumpur Air Traffic Control Centre (KLATCC) to waypoint IGARI. MH 370 was transferred to LUMPUR RADAR at KLATCC at 00:42:52 MYT. The flight was then cleared to climb to FL 250 at 00:46:51 MYT and subsequently to FL 350 at 00:50:06 MYT. MH 370 reported maintaining FL 350 at 01:01:16 MYT and reported maintaining FL 350 again at 01:07:55 MYT.

At 01:19:24 MYT LUMPUR RADAR at KLATCC instructed MH370 to contact HO CHI MINH Air Traffic Control Centre (HCMATCC) on radio frequency 120.9 MHz. MH 370 acknowledged with "*good night Malaysian Three Seven Zero*".

At 01:21:04 MYT, MH370 was observed on the radar screen at KLATCC as it passed over waypoint IGARI. At 01:21:13 MYT the radar label for MH 370 disappeared from the radar screen at LUMPUR RADAR KLATCC.

At 01:38 MYT HCMATCC made a query to KLATCC on the whereabouts of MH 370. Thereafter KLATCC initiated efforts involving MAS OPS Center, Singapore ACC, Hong Kong ACC and Phnom Penh ACC to establish the location of MH 370. No contact had been established by any ATC units and thus the Rescue Coordination Centre (RCC) was activated at 05:30 MYT.

It was later established that the transmissions from the Aircraft Communication and Reporting System (ACARS) through satellite communication system occurred at regular intervals starting before MH 370 departed Kuala Lumpur, Malaysia at time 12:56:08 MYT and with the last communication occurred at 01:07:49 MYT.

Search and Rescue (SAR)

Kuala Lumpur Rescue Coordination Centre (KL RCC) was activated at 05:30 LT after all effort to communicate and locate the aircraft failed. Search and Rescue

[3]At altitude above 11,000 feet in Malaysia, an aircraft altitude above sea level is referred to as a Flight Level (FL).FL 180 equals to 18,000 feet.

(SAR) operations were conducted in the South China Sea where the aircraft position was last known.

A playback of a recording from military primary radar revealed that an aircraft with a possibility of MH 370 had made an air-turn back onto a Westerly heading crossing Peninsular Malaysia. The search area was then extended to the Straits of Malacca.

After ACARS stopped transmitting the satellite communication system automatically transmitted seven messages that confirmed that the system was still logged onto the network. The last message was received by the satellite ground station at 08:19 MYT. With the primary radar data, analysis of the satellite data and aircraft performance data, the Investigation established that flight MH 370 flew along either a Northern or Southern Corridor. The last transmission occurred when the aircraft was on an arc of 40 degrees from the satellite. Based on this new development the search area was moved from the South China Sea and the Straits of Malacca to the Northern and Southern Corridors.

On 24 March 2014 further analysis of the Inmarsat satellite data, using the changes in the satellites communication signal frequency (signal using the Doppler Effect), indicated that MH 370 flew the southern corridor and ended its flight in the southern part of the Indian Ocean. The investigation continues to analyse the satellite data and aircraft performance in order to further refine the area where the flight ended.

To date, a total of 26 countries have participated in the search for MH 370 comprising of 82 aircraft and 84 vessels.

SAR operations are on-going.

Safety recommendations

While the aircraft had the necessary communication equipment to provide information on its location, the last ACARS message occurred at 1:07:29 MYT, the last secondary radar detection at 1:21:13 MYT and the last satellite communication

at 08:19 MYT on March 8th. Over a month after the aircraft departed Kuala Lumpur International Airport, its location is still unknown.

While commercial air transport aircraft spend considerable amounts of time operating over remote areas, there is currently no requirement for real time tracking of these aircraft. There have now been two occasions during the last five years when large commercial air transport aircraft have gone missing and their last position was not accurately known. This uncertainty resulted in significant difficulty in locating the aircraft in a timely manner. Therefore, the Malaysian Air Accident Investigation Bureau makes the following safety recommendation to ICAO:

It is recommended that the International Civil Aviation Organisation examine the safety benefits of introducing a standard for real time tracking of commercial air transport aircraft.

Note

The information contained in this preliminary report is correct at the time of issue and is intended to inform the aviation industry and the public of the general circumstances of the event. Readers are cautioned that there is the possibility that new information may become available that alters this Preliminary Report.

This report has been written in accordance with the ICAO Doc 9756 AN/965 Manual of Aircraft Accident and Incident Investigation – Part IV Reporting.

The Chief Inspector of Air Accidents
Ministry of Transport
Malaysia

9 April 2014