SURVEYING AND ITS ROLE

IN THE SEARCH FOR A MISSING AIRPLANE

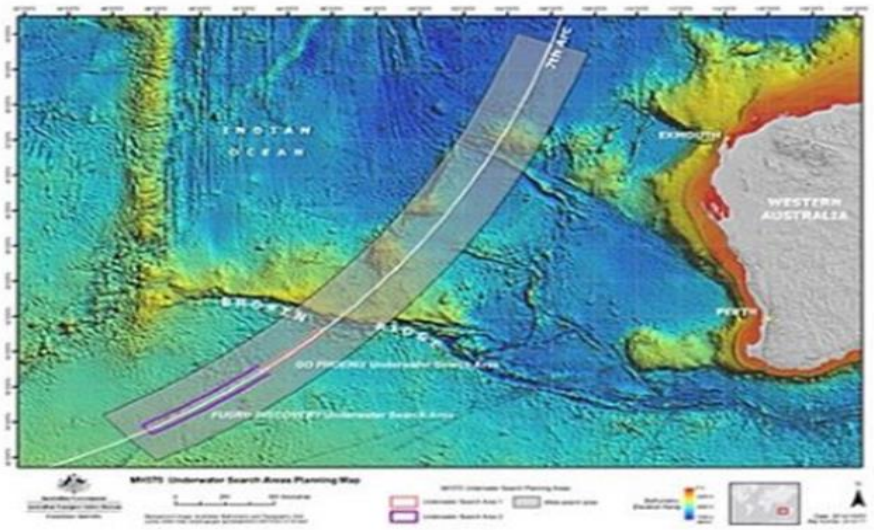
(BY SM NDLOVU- 2018)

FLIGHT MH 370: On 8 March 2014, flight MH370, a Boeing 777, lost contact with air traffic control at 01:19 MYT during a transition of airspace between Malaysia and Vietnam. The airplane disappeared while flying from Kuala Lumpur International Airport, Malaysia, to its destination, Beijing Capital International Airport, China. The aircraft has not been recovered, and the cause for the disappearance remains unknown.

The aircraft was carrying 12 Malaysian crew members and 227 passengers from 15 nations. The multinational search effort for the aircraft was and still is the most expensive aviation search in history.

The search began in the Gulf of Thailand and the South China Sea, where the aircraft's signal was last detected on secondary surveillance radar. Analysis of satellite communication between the aircraft and Inmarsat's satellite communications network concluded that the flight continued until at least 08:19 and flew south into the southern Indian Ocean, although the precise location cannot be determined.

Australia took charge of the search on 17 March when the search moved to the southern Indian Ocean. A comprehensive survey of 120,000 km2 of sea floor in an area about 1,800 km south-west of Perth, Western Australia was then carried out. The search yielded no evidence of the aircraft.



Several pieces of marine debris found on the coast of Africa and on Indian Ocean islands off the coast of Africa - the first discovered on 29 July 2015 on Reunion Island - have been confirmed as pieces of Flight MH370, however the bulk of the aircraft has not been located.

The piece of debris found in Saint-Andre de la Reunion (EPA)

Before the underwater search for MH370 could begin, it was necessary to accurately map the seafloor of the search area to ensure the search is undertaken safely and effectively. Very little was known about the sea floor in the MH370 search area itself with the best data of the seafloor morphology in the search area derived from satellite gravity measurements with data of over 1000meters per pixel in resolution at best.

What was known was that the dominant features in the search area was the Broken Ridge, an extensive linear, mountainous sea floor structure that once formed the margin between two geological plates. This lack of information began to matter when the Royal Australian Navy deployed an unmanned underwater vehicle from its support vessel in the immediate aftermath of the crash.

Without maps operators had to guess how far down to send the sub. Missions were aborted and on some occasions the submarine went below its design depth.

BATHYMETRIC SURVEY: The term bathymetry originally referred to the ocean's depth relative to sea level, although it has now come to mean submarine topography or the shape and depths of underwater terrain. In the same way that topographic maps represent the three dimensional features of overland terrain, bathymetric maps illustrate the land that lies underwater.

Variations in sea-floor relief may be depicted by colour or contour lines called depth contours or isobaths. A bathymetric survey was then conducted in the search area for the missing MH370 and provided a map of the underwater search zone, charting the contours, depth and hardness of the ocean floor.

The information received from the bathymetric survey gave crucial data to plan and conduct an intensified underwater search. Before the survey, very limited knowledge of the underwater terrain was available except that the depth was between 1000m to 6000m.

The search for the plane was conducted in two phases, a bathymetric survey followed by a high definition search. Bathymetric survey vessels spent months at sea in late 2014 and early 2015 scanning the ocean floor with multi-beam sonar, gathering detailed high resolution data.

THE RESULTS: Ships collected data over 200 000 square kilometres. That data was later processed into detailed maps and three dimensional fly through(s) at Geoscience Australia.

Subsequent mapping generated with a definition of 40 to 110 metres per pixel which was sufficient for deep diving underwater vehicles. The mapping effort resulted in the largest sea floor coverage acquired for the Indian Ocean, approximately equivalent to the size of France or Texas.

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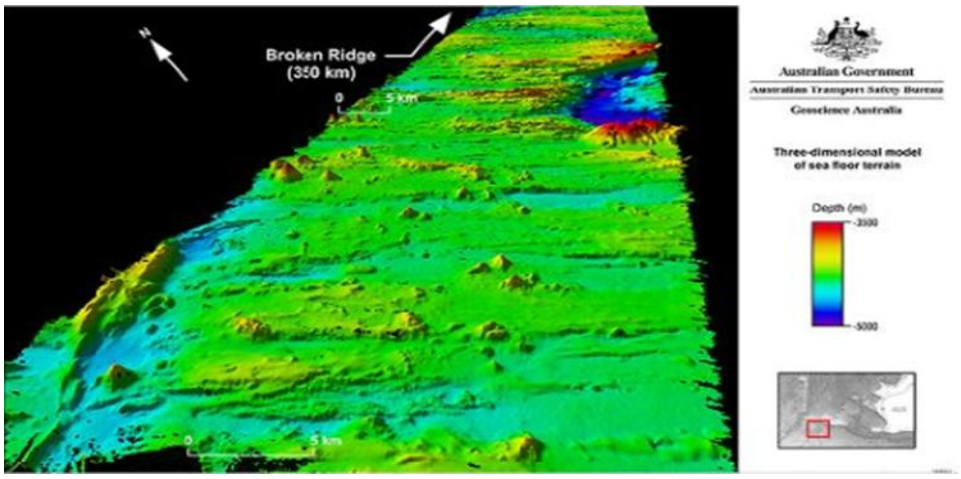

The new multibeam surveyed data revealed the seafloor in unprecedented detail while also confirming that the satellite derived bathymetry model is, for the most part, within its accuracy limits and useful for resolving broad scale seafloor features.

However the difference between the two models highlights the necessity in pursuing high resolution mapping to provide a better understanding of deep seafloor environments and insight to the geological evolution and processes of this poorly known region of the world's oceans.

Detailed bathymetric information of the ocean floor will indeed "Empower the world to make policy decisions, use the ocean sustainable and undertake scientific research" (Nippon Foundation).

The Nippon Foundation, Seabed 2030 Project, aims to ultimately 'leave no feature of the world ocean floor larger than 100m unmapped'. This will be a considerable challenge especially in regions such as the MH370 search area and the southern oceans, where the least amount of high-resolution data is available.

Mapping the MH370 search and transit area was only 1% of the Indian Ocean floor area and took over 2 years with the effort of one survey vessel. If we consider mapping the entire Indian ocean using the same pace and technology, it would take over 100 years to map. Collective effort and new technology will definitely be key to succeed on such venture. Even though the search for the missing airline wasn't a success, the lessons learnt shows it was all worth it – from a sea floor mapping perspective.