



MPA
SINGAPORE

The Search for AirAsia QZ8501

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Hydrographic Department / Port Services
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MPA Hydrographic Department

MPA Emergency Response Team

- 2 Surveyors on 24 hrs standby rotation with
 - Survey launch with multibeam and sidescan survey systems
 - Response time
 - 2 hours within office hours
 - 4 hours outside office hours
 - ROV can be deployed if necessary
- Bouy Tender on standby
 - Isolated danger buoy ready to be deployed at all times



MPA Hydrographic Department

MPA Vessels

- **Lita Discovery and Lita Investigator**
 - Survey launches with multibeam survey system and sidescan survey systems
- **Panduan**
 - Buoy Tender
- **Mata Ikan**
 - Hydrographic Vessel with multibeam survey system
 - Also ready for sidescan survey and remote operated vehicle (ROV)



MPA Hydrographic Department

MPA Survey Equipment

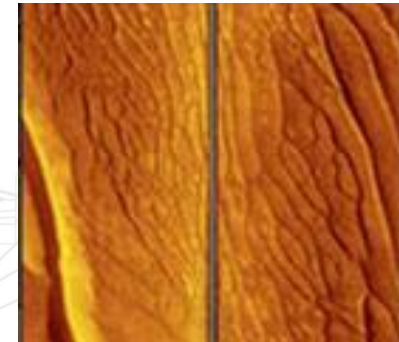
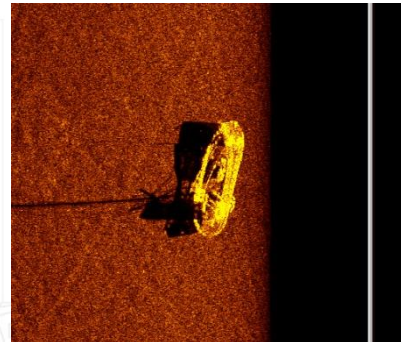
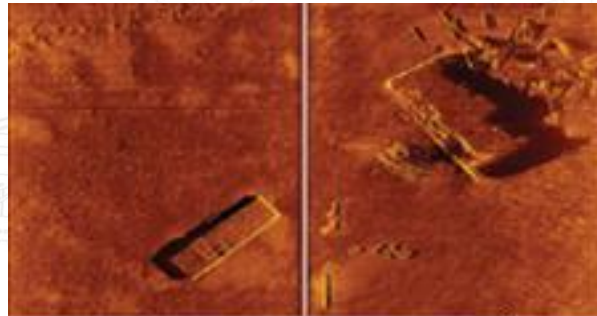
- **Multibeam survey systems**
 - Reson 7125
 - R2sonic Sonic 2022
- **Positioning System**
 - PosMV 320 V4 with RTK corrections
 - Trimble NetR9 with RTX corrections
- **Side Scan System**
 - Edgetech 4200 High Speed Side scan System
 - Edgetech 4125 High Resolution High Speed Side Scan System
- **Remote Operated Vehicle**
 - Seabotix LBV150SE-5



SideScan Survey System (SSS)



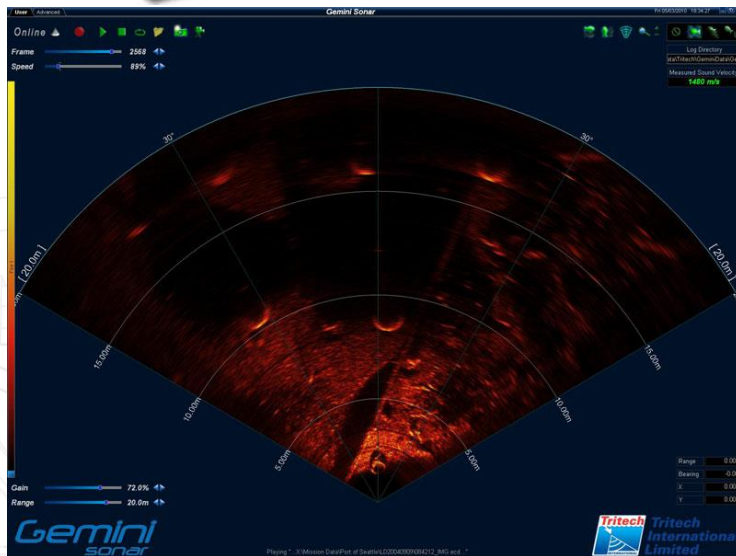
- Seabed imaging system
- Quick search for seabed obstructions & hazards to navigation
- Commissioned in 2007
- Latest Hi-resolution unit purchased in 2015



Remote Operated Vehicle



- Identification & verification of underwater contacts detected by MBSS and SSS
- Video camera capabilities
- Underwater inspection of beacon structures
- Commissioned in 2010



Objectives

Assist Indonesia authorities to locate QZ8501 crash site and to retrieve aircraft's cockpit voice recorder and flight data recorder (AKA Black Boxes) with the Aircraft Accident Investigation Bureau (AAIB)



MPA Team

- **Team Leader : Jamie Chen, Deputy Chief Hydrographer**
- **Assistant Team Leader : Lee Weng Choy, Senior Assistant Hydrographer**
 - **Team Members:**
 - **Wong Tuck Meng, Senior Technical Executive**
 - **Thomas Tan, Senior Technical Officer**
 - **Edwyn Ang , Technical Officer**
 - **Peter Huang, Assistant Technical Officer**



AAIB Team

- **Team Leader : Chong Chow Wah, Senior Investigator**
- **Members :**
 - **Steven Teo Guan Kiat, Senior Investigator**
 - **Bryan Siow, Air Accident Investigator**
 - **Ng Junsheng, Air Accident Investigator**



Survey Equipment

- 2 x Side Scan Sonar Systems
- 3 x Armoured Cables
- 1 x Remote Operated Vehicle System
- 3 x Omnistar DGPS System
- 7 x Laptops with Survey Acquisition and Processing Software
- 2 x Display Monitors
- 1 x Power Regulator

In Total 16 Boxes, 350kg of Equipment



Survey Platform

- Vessel provided by Directorate General Sea Transportation of Indonesia
- Buoy Tender – Jadayat & Andromeda



- **Jadayat**
 - Team Leader : Jamie Chen (Deputy Chief Hydrographer)
 - Wong Tuck Meng (Senior Technical Executive)
 - Thomas Tan (Senior Technical Officer)
 - AAIB Team
- **Andromeda**
 - Asst Team Leader : Lee Weng Choy (Senior Assistant Hydrographer)
 - Edwyn Ang (Technical Officer)
 - Peter Huang (Asst Technical Officer)

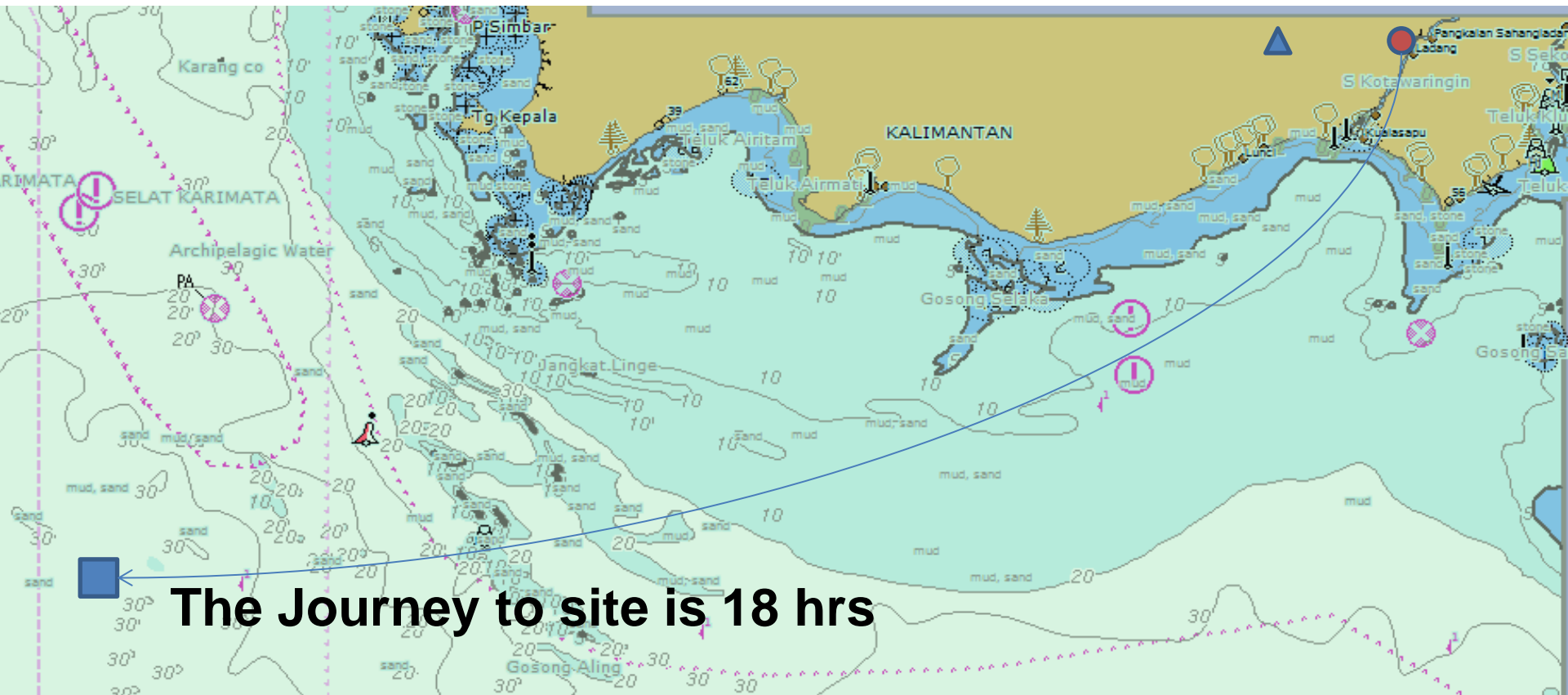
The Survey Site

6km x 6km: Centred on last known radar contact provided by AAIB

Pangalan Bun Airport - ▲

Kumai Port - ●

Survey Area - ■

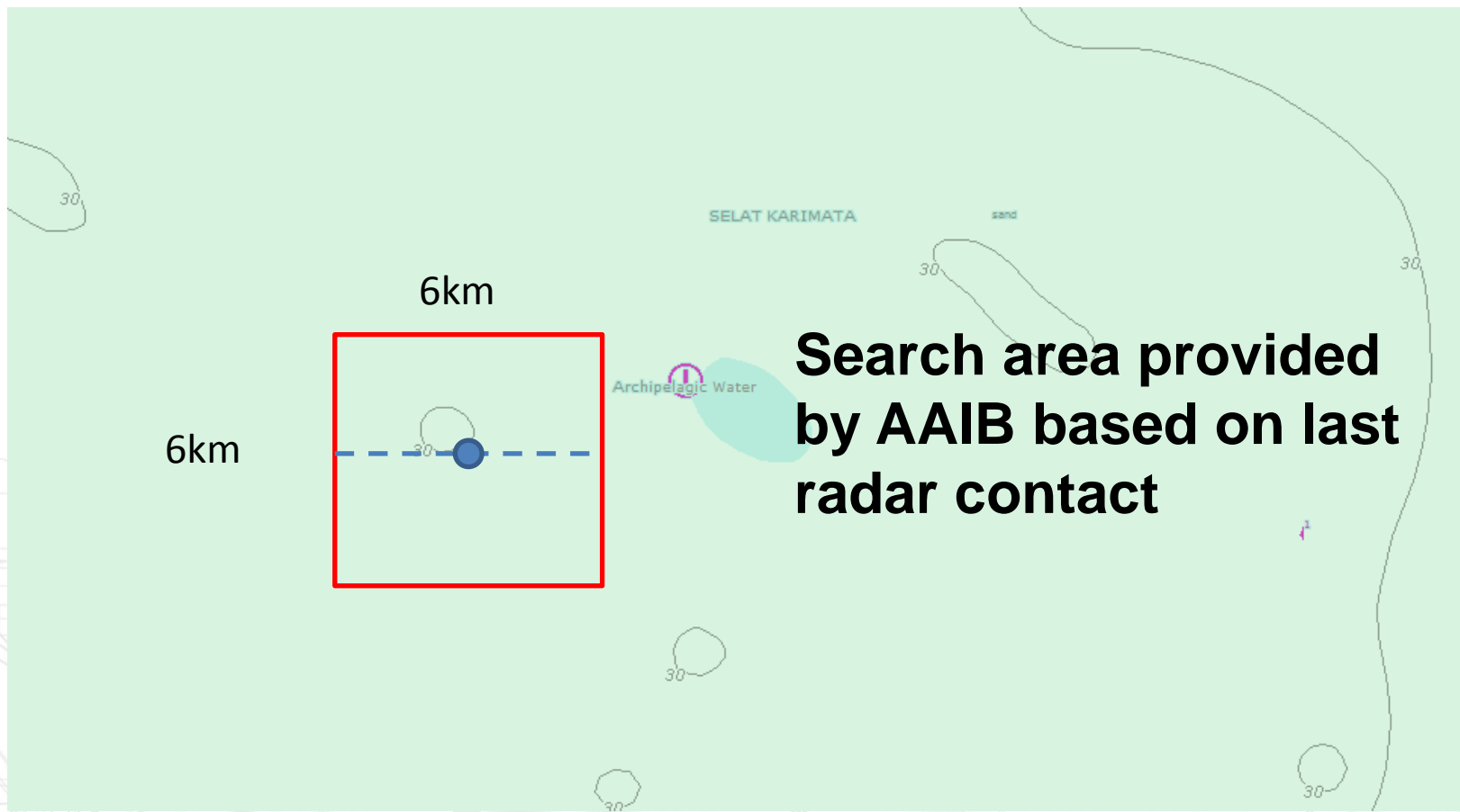


The Journey to site is 18 hrs

The Search Area

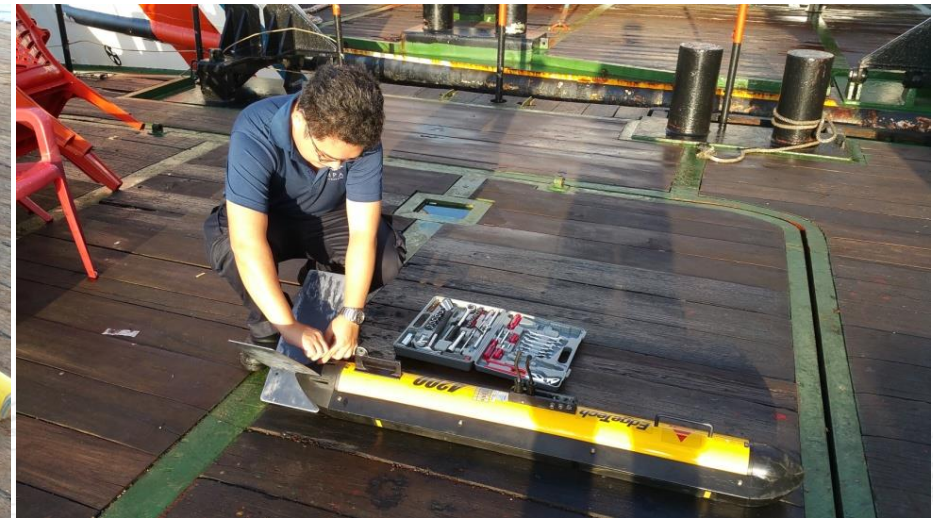
6km x 6km

- Jadayat (North) 3 x 6km
- Andromeda (South) 3 x 6km



Search Method

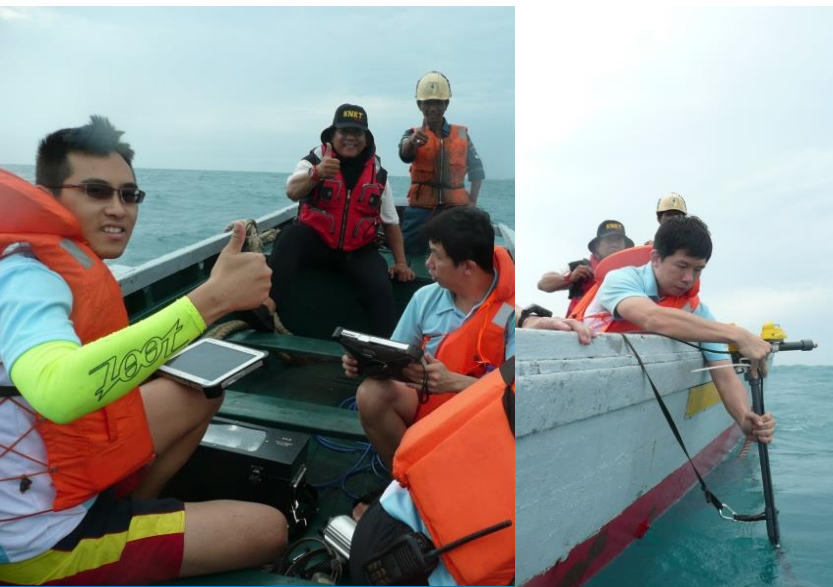
- **Hydrophones combined with side scan survey**
 - Hydrophones were used to triangulate the position of the crash site
 - Once a possible site is identified, side scan sonars were deployed to conduct a survey of the area



Hydrophone Triangulation

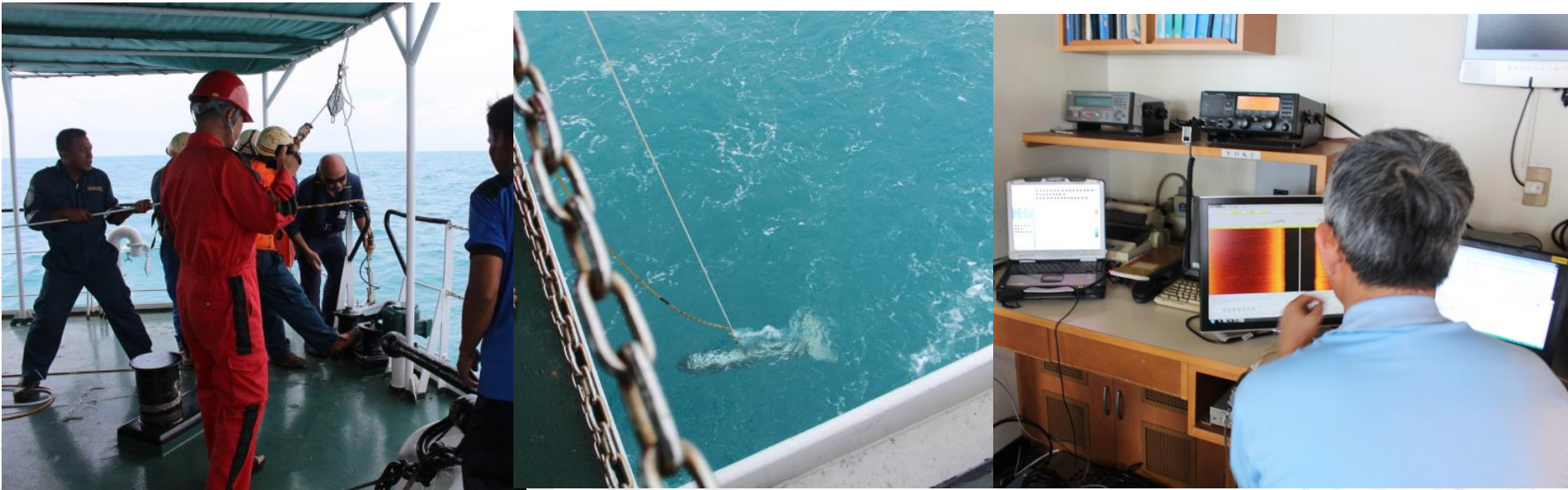
- **Hydrophones**

- Hydrophones were used to detect the acoustic ping transmitted from the black boxes underwater locator beacon
- Triangulation of this acoustic ping allowed us to narrow down search area
- Time was critical as locator beacon has a battery life of estimated at 30days



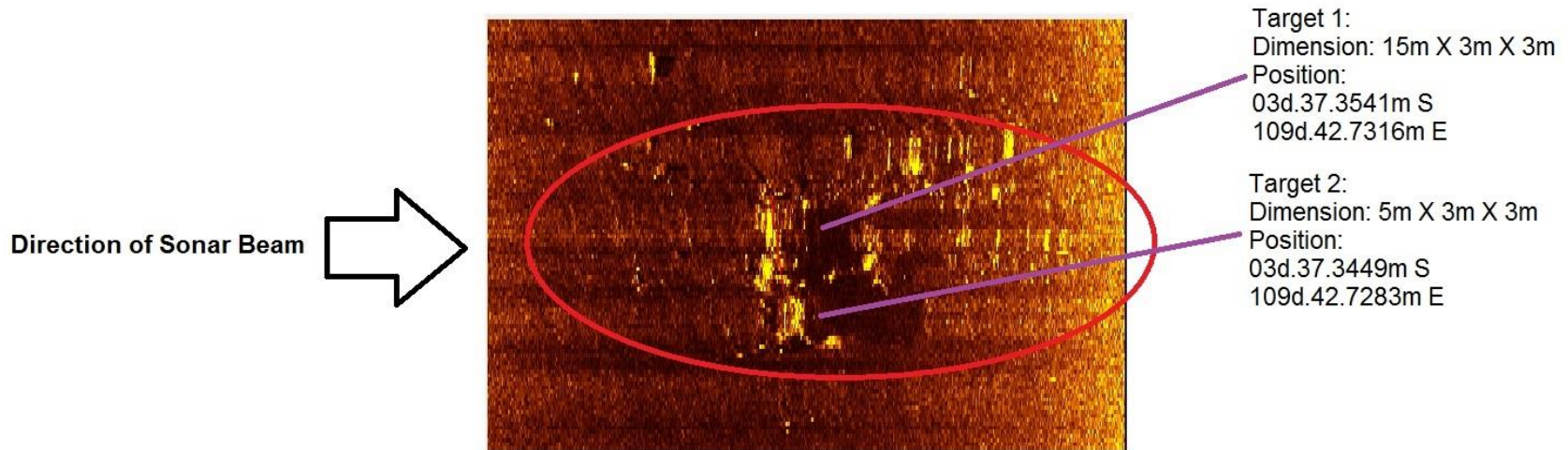
SideScan Sonar Survey

- **Sidescan Sonar**
 - Easy to setup for deployment
 - Deployed when survey area was established
 - Provides a visual image of the seabed
 - Provides a wide search area



Side Scan Contact

SIDE SCAN SONAR IMAGE of DEBRIS FIELD



REMARKS:

- 1) Model of Side Scan Sonar: Edgetech 4200 @ 100kHz and/or 400kHz.
- 2) Positioning: SeaSTAR-HP 8200 HP DGPS
- 3) Size of Debris Field at 100m X 40m.

Search Verification

Verify Suspicious Contact

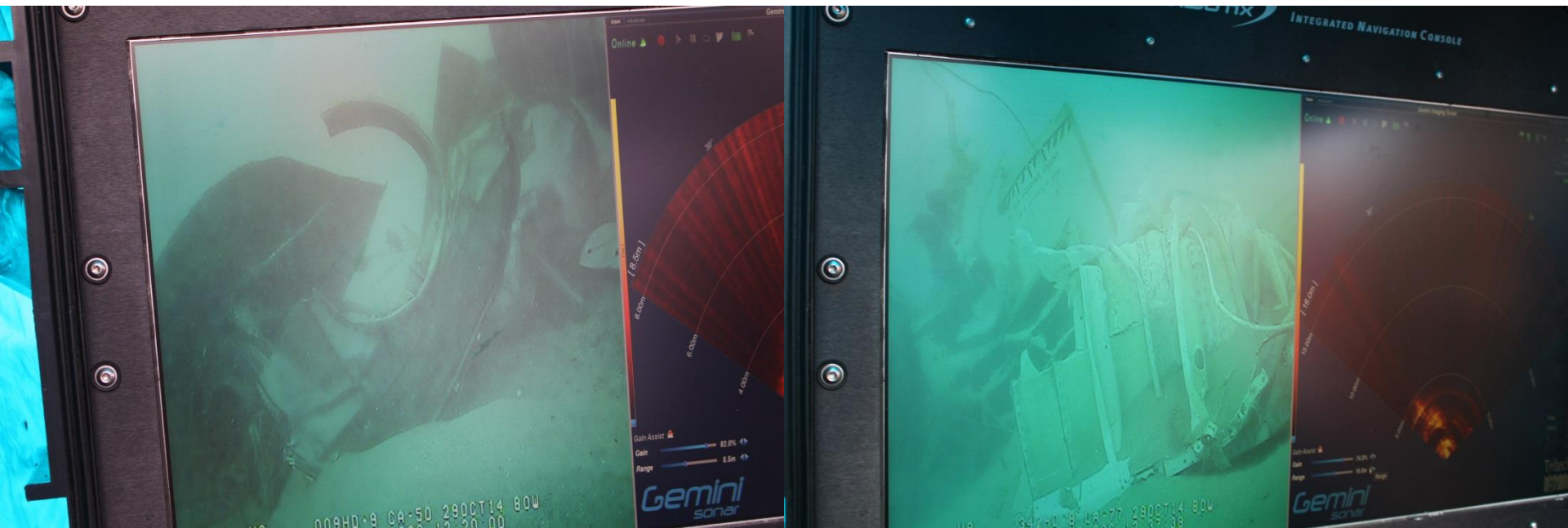
- Remote Operated Vehicle (ROV)
- Indonesia Naval Divers



Remote Operated Vehicle

- **ROV**

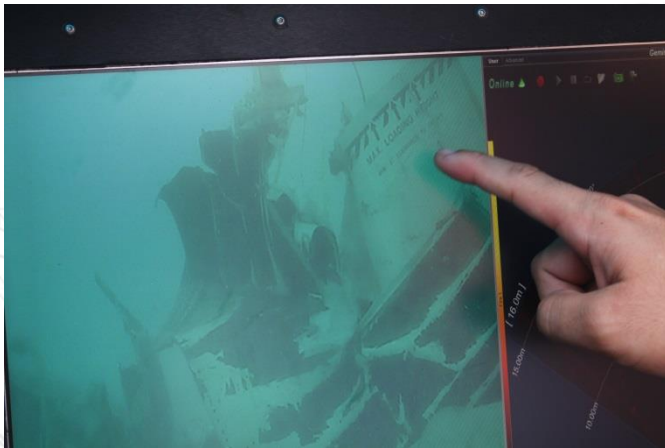
- Provides video image of the object on the seabed
- Maximizes dive time of divers which is limited
- Provides images for divers warning them of any danger before diving



Search for the Black Boxes

Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR)

- Divers with handheld hydrophones to pinpoint the location within the debris field
- Experienced AAIB officials confirms visual images from ROV is the part of the tail of the wreckage containing the blackboxes



Recovery of the Black Boxes



Mission accomplished

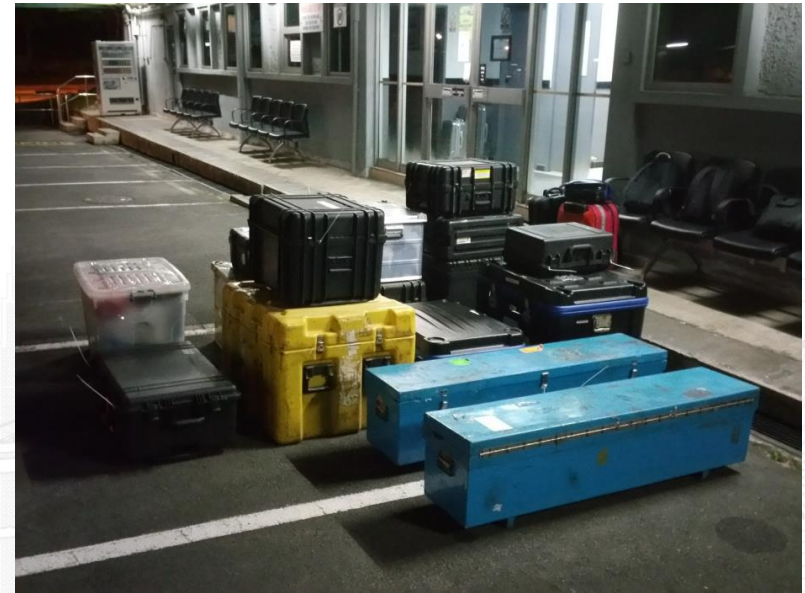
A Celebration of our joint efforts



Challenges Faced

Preparation of Equipment

- Short time to gather all the equipment
 - Location and conditions of our own equipment
 - Rental companies with different hydrographic equipment
- Transportation of equipment (transit cases)
- Miscellaneous equipment e.g. ropes, power extensions and power supply



Key Takeaways

Preparation of Equipment

- Proper management of own equipment with location and service dates
- Spares are a must
- Have good relationships with equipment suppliers, important when there is a urgent need for equipment
- Transit cases should be prepared for all equipment, allows for easy movement of equipment.
- Bring as much miscellaneous equipment and tools as possible e.g. tapes, cable ties and ropes etc.
- Personal protective equipment (PPE) Safety first



Challenges Faced

Challenges on Site

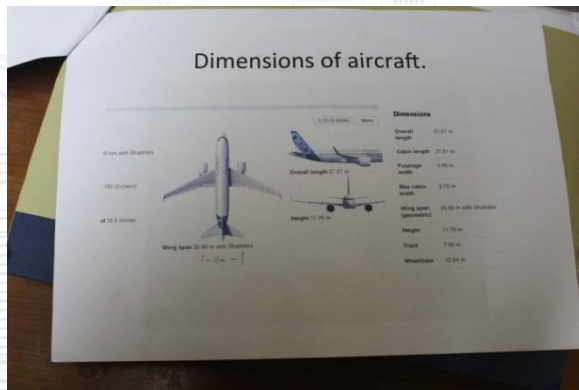
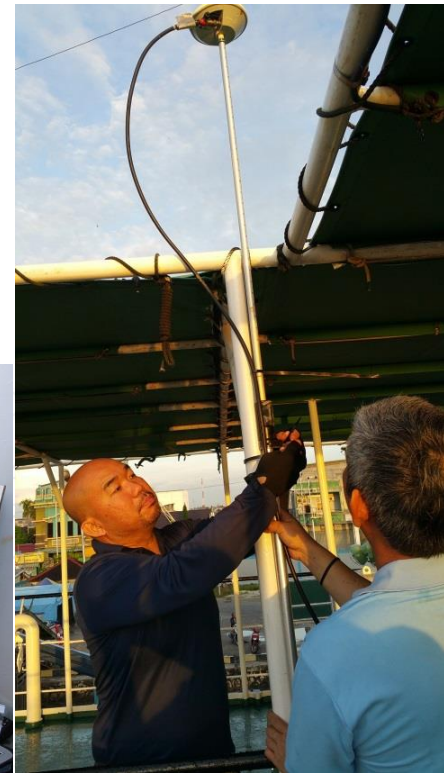
- Troubleshooting of equipment
- Setting up of equipment on different platforms
- Availability of survey platform
- Understanding knowledge of different team members
- Communication with base is limited to satellite phone
- No internet available



Key Takeaways

Challenges on Site

- Surveyors must know their equipment and be able to perform troubleshooting
- Equipment should be useable on different platforms
- Ensure sufficient spares of vulnerable equipment e.g. Sidescan cable
- Work as a team, every input is useful
- Get as much information as possible before heading out to sea



Challenges Faced

Challenges During the Search

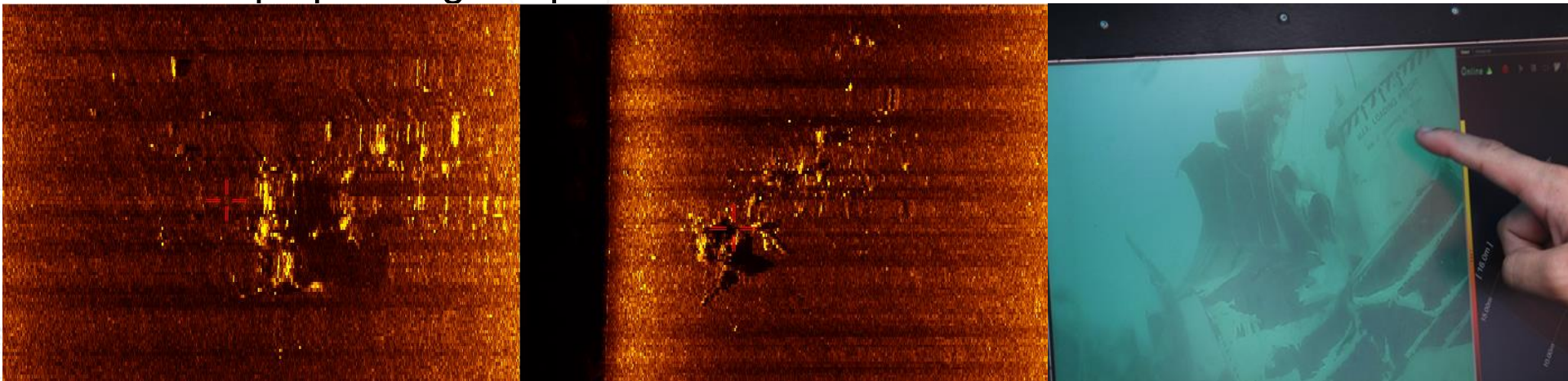
- Limited time
 - Bad weather deters deployment
 - Battery life of pinger from blackboxes
- Effective survey methods
- Experience of surveyor is critical
- Identification of debris field is not easy
- Risk of diving
- Limited time for ROV and Diving Operations



Key Takeaways

Challenges During the Search

- Be flexible and creative in planning the most efficient survey methods
- Sidescan images may not show a ‘beautiful wreckage’
 - Experience of surveyor critical in analyzing images
 - Unlike sunken vessels, sidescan images of a plane crash could be much more difficult to identify
- Proper planning of ROV and diving operation; ROV can compliment the divers very well, saving them precious diving time
- Information from AAIB was critical in identifying the debris field and in pinpointing the position of the black boxes.



Mapping of Seabed Below the Flight Path

Establishment of seabed classification and backscatter

- The database of the sea area around the flight paths are constantly updated with survey data containing backscatter and seabed classification information
- AirAsia experience reaffirms usefulness of seabed classification information
- Allows surveyor to identify new objects easily





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Questions?