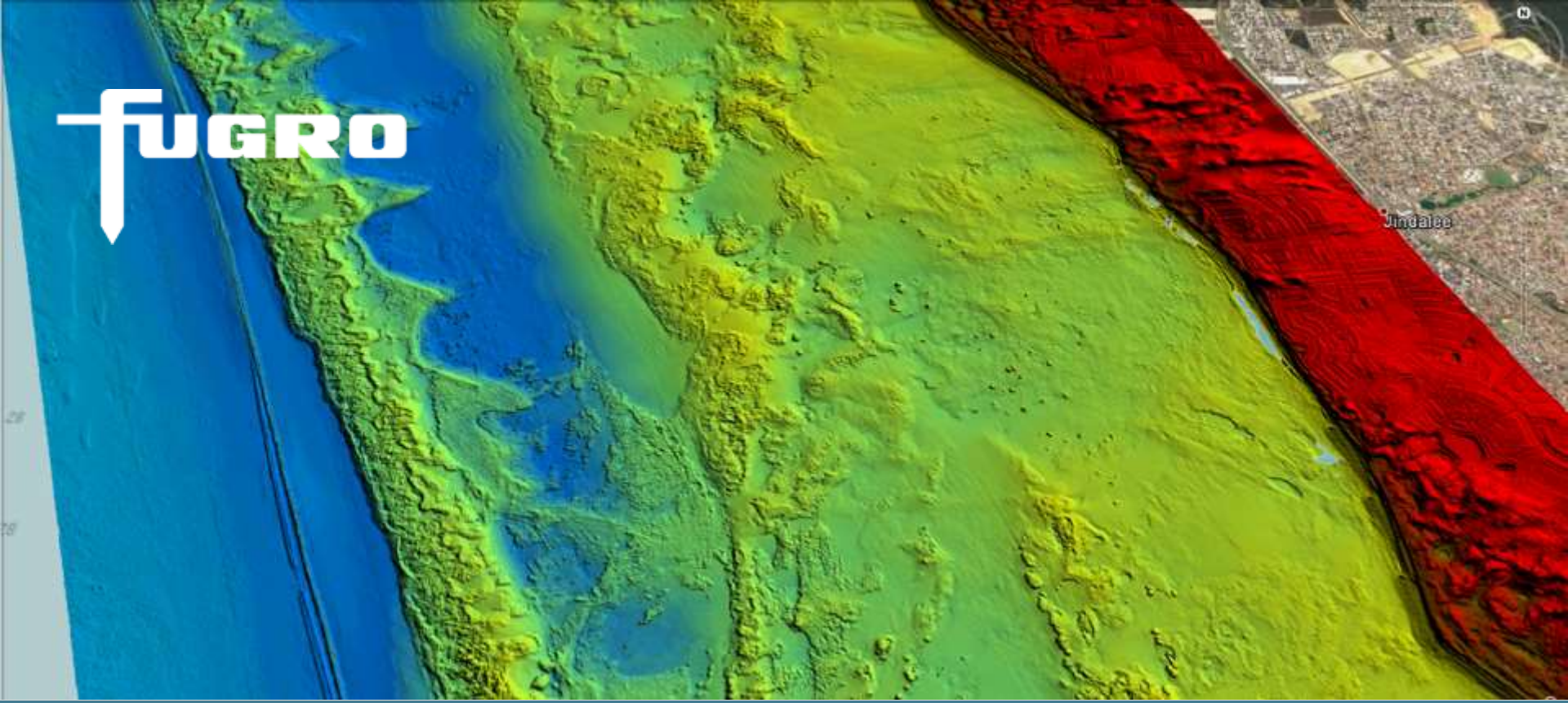


SAIHC16 – Cape Town, South Africa (2-5 September 2019)

Gavin Armstrong, Fugro Survey Africa (Pty) Ltd

Hydrographic charting to IHO standards using conventional acoustic and airborne Lidar technology

to provide maps and charts that characterise the ground surface from land, across the land-water boundary, and to full ocean depth.

Marine Site Characterisation

Regional Survey Capability - Locations

- **Local Offices**: Cape Town:
  - 40+ staff supporting marine operations;
  - Vessels: 1 (operating in Africa)
  - Marine Site Characterisation (Geophysical Survey and Hydrographic survey services)

- **Other Offices within Europe-Africa Region**
  - Ghana
  - Nigeria
  - Cameroon
  - Gabon
  - Congo
  - Angola
  - Mozambique
  - Netherlands
  - United Kingdom
  - Ireland
  - Spain
  - Belgium
  - Italy
  - Germany
  - Luxemburg
  - Hungary
  - Albania
  - Denmark
  - Norway
  - Turkey
  - Lithuania

Regional Survey Capability - Vessels

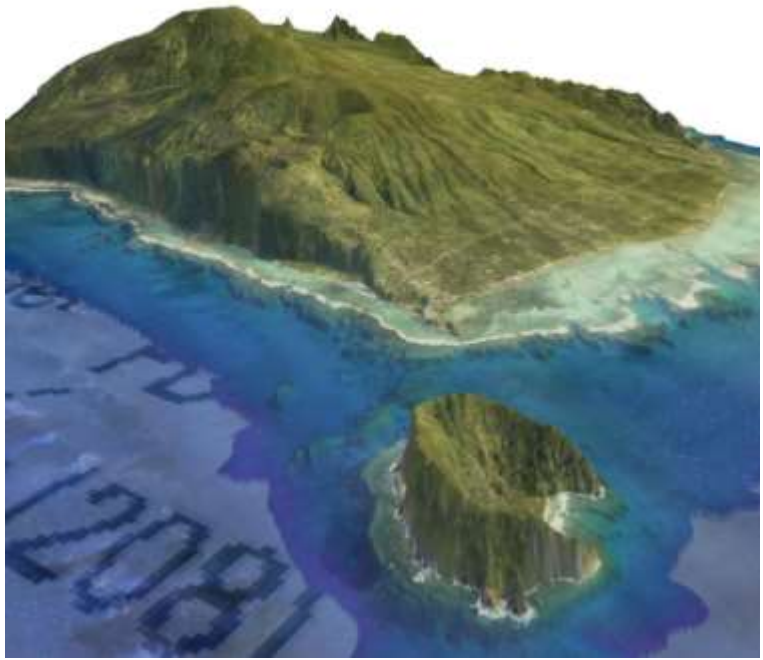
- **Fugro Frontier**
  - LoA 54m;
  - R2Sonic 2026/Reson 7160 MBES
  - Edgetech 4200 SSS
  - Edgetech 3200 SBP

- **Fugro Pioneer**
  - LoA 54m;
  - Kongsberg EM2040 MBES
  - Edgetech 4200 SSS
  - Hull-mounted SBP (Boomer, Sparker)

- **Fugro Helmert**
  - LoA 42m;
  - Kongsberg EM710 & EM2040 MBES
  - Edgetech 4200 SSS
  - Innomar SES 2000 Medium SBP

Main achievements during the year

- Accredited Category B hydrographic surveying training course (S-5B).
- Involvement in IHO HSPT S-44 6th Edition (HSSC Working Group)
- Active involvement in GEBCO “Seabed 2030”
- Technology Developments into SDB, USV, ALB and Data Processing…



Contributions to GEBCO “Seabed2030” Project

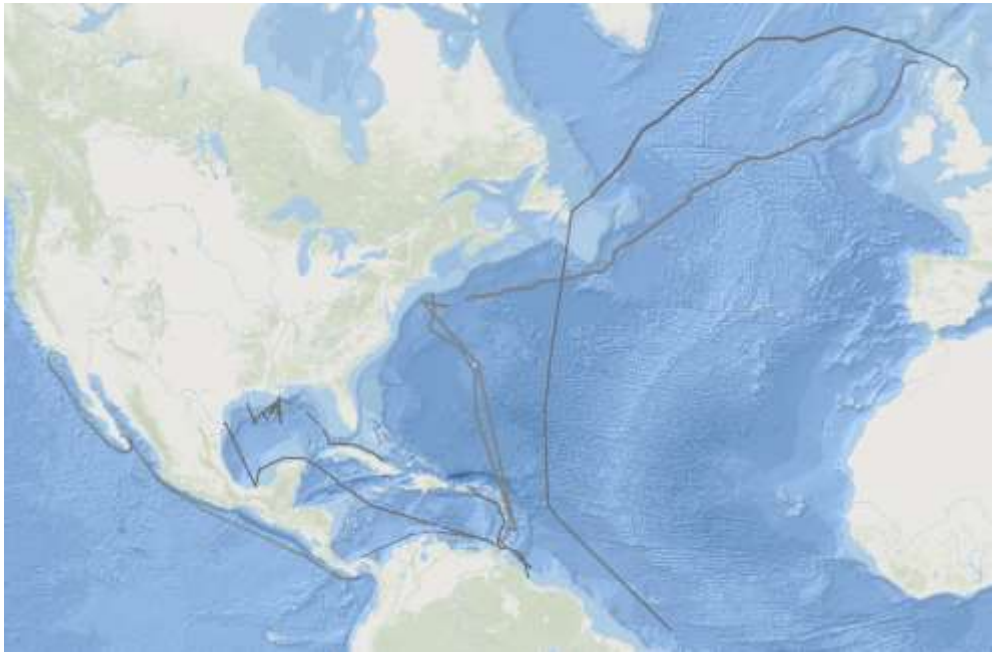
In-transit data collection. Data are collected from Fugro survey vessels as they transit between projects

Remote technology solution. Fugro OARS® enables safe and efficient data acquisition without survey staff on board

7 vessels currently involved. Fugro intends to incorporate the approach across its entire global survey fleet

~450,000 km^2 of high resolution bathymetry contributed to date.

Some datasets also include backscatter and water column data



Capacity Building / Success Stories to Share

Fugro Academy - Applied Hydrographic Survey Programme

- Accredited Category B hydrographic surveying training course (S-5B).
- Located in Plymouth, UK at permanently based facility
- dedicated computer suites, lecture rooms, workshops, equipment, and vessels
- 24-Week duration
- Open to all who meet course prerequisites

Recent Developments / Innovations

Fugro OARS
(Office Assisted Remote Services)

- centralised command centres throughout the world
- direct access to offshore survey projects
- allows for optimisation of survey crew size
- client engagement
- access to Fugro's subject matter experts around the world

Back2Base

- survey data compression enabling transmission of mega-data sets for onshore processing and evaluation

Recent Developments / Innovations

Satellite Derived Bathymetry capability for:

- Desktop study support
- Reconnaissance and background data for line planning and identifying where high resolution surveys should be focused

Autonomous Surface Vessel (with L3 Technologies - UK)

- designed for medium to large-scale hydrographic survey applications,

ALB Sensor Developments

- LADS HD upgrade to 7 KHz
  - Without any loss of power
  - Max Depth Measurement still 80m capable;
- New RAMMS Sensor (with Arete Associates - US)
  - Airborne multibeam lidar via a push-broom laser scanner with beam forming at the receiver
  - Low power consumption/high resolution
  - Adapted technology from an airborne mine detection system.

Implementation of **Machine Learning and Cloud Processing** for MBES and ALB datasets

Example – Application of ALB - Australia

Chart NZ 864
(Apolima Strait)

NOTE: Chart Updated with New Data

Thankyou

Any Questions?

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