



western australian  
marine science institution

# Uses of LiDAR in the Kimberley

## KIMBERLEY MARINE RESEARCH PROGRAM

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JORG HACKER – AIRBORNE RESEARCH AUSTRALIA, SCHOOL  
OF THE ENVIRONMENT, FLINDERS UNIVERSITY, ADELAIDE

\*MICK O'LEARY — DEPT. ENVIRONMENT AND AGRICULTURE,  
CURTIN UNIVERSITY



# The motivation for this presentation

Jorg Hacker, *Airborne Research Australia*, will be conducting research flights out Broome in August/September 2015

- Undertaking a LIDAR survey of the dinosaur footprints along Roebuck Bay and Dampierland

The Aircraft will be available for additional survey flights out of Broome

- Opportunity for WAMSI partners to take advantage of this survey capability at reduced cost
- Bring together interested researchers organise a Kimberley LIDAR survey planning meeting (can we combine resources?)

# What is LIDAR (light detection and Ranging)

Uses a scanning laser to measure range and bearing to terrain from a moving airborne platform

Generate precise, three-dimensional information about the shape of the Earth and its surface characteristics

- Topographic LIDAR typically uses a near-infrared laser to map the land
- Bathymetric LIDAR uses water-penetrating green light to measure seafloor elevations

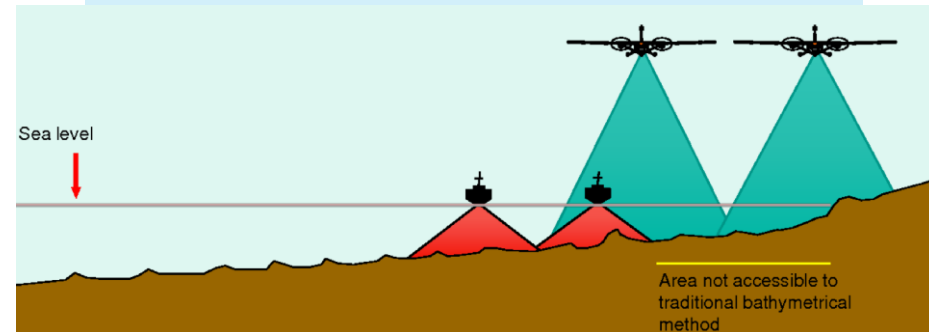
# Airborne Lidar vs Multibeam Mapping

## Advantages

- V. high point density
- V. high vertical precision (25 mm)
- Wide swath width (200-400 m)
- Extended line coverage (600 km)
- Capture interface of terrestrial and marine environments
- Ease of platform mobilisation
- Minimal crew to operate

## Disadvantages

- Bathymetric Lidar limited to shallow water <30 m
- Suspended sediments can further impede penetration <5 m



# Applications

Digital elevation surveys of reef flats, intertidal and shallow subtidal waters (areas inaccessible to larger vessels)

- Habitat mapping
- Topographic (rugosity) and geomorphological investigations
- Coastal Hydrodynamics? — sea surface height, coastal current modeling

Marine Mammal Surveys?

- Bathymetry over whales quantify size, volume estimates
- Population studies of whales, dolphins, dugongs and crocodiles

# PLATFORM SPECIFICATIONS

**Platform:** Diamond Aircraft HK36TTC

**Instrumentation payload:** Up to 150 kg in four underwing pods and pylons and in the cockpit

**Typical cruising speed:** 20-60 m/s (75 – 200km/h)

**Operating altitude:** from 5 m to 7,000 m

**Typical range:** up to 1,000 km

**Typical endurance:** 6 hours

**Crew:** 2, pilot/scientist and scientist/systems operator



# SENSOR PACKAGES

- **Hi-res still and video cameras**
- **Thermal Infrared Imagers**
- **Tri-spectral scanner (2048 pixels per line for ndvi)**
- **Hyper-spectral scanner**
  - SPECIM EAGLE (VNIR 400–970nm, up to 488 bands, 1024 pix per line)
  - SPECIM HAWK (SWIR 970–2450nm, up to 254 bands, 320 pix per line)
- **Full waveform scanning LiDAR**
  - Riegl Q560/240kHz/1550nm
  - Riegl Q680i-S/400kHz/1064nm
  - Riegl VQ-820G/red/green (Bathymetric)
- **Passive microwave**
  - L-, P-, Ka-, Ku-Band radiometry (soil moisture, sea surface / river salinity)
- **Active microwave**
  - L-Band SAR, InSAR (high-res soil moisture, salinity, vegetation)

# Typical Funding Requirements

1 days flying = \$8,000 to 10,000 (includes reprocessing of data into usable form)

- Typical Coverage
  - 4 hours of active survey
  - 150 km/h (80 knots)
  - 600 km survey
  - LIDAR Swath Width 200 to 400 m



# Survey Range

Operate out of Broome, Kununurra, or smaller strips with fuel dump  
Nowhere in the Kimberley is out of reach.