The mapping tool of the future

An ocean of possibilities

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1. Australia’s seafloor mapping problem
2. About DriX
3. Case study in DriX operation
4. Cost benefits of DriX
Australia’s area of charting responsibility

~ 50 million km²
Australia's EEZ

Mainland 9.3 m km²

Antarctica 4.8 m km²
Shallow (2-100m) requires 10.04 million line miles of survey. 93% of total line miles.
Deep (>100m) requires 785,000 line miles of survey even though it equates to 75% of EEZ by area.
How long will it take to survey Australia’s EEZ?

4.79 million km²
Survey task too long and too expensive

How does industry increase output and reduce cost?

- **Major cost drivers for survey work:**
  - Expertise/Personnel
  - Equipment
  - Vessels
  - Risk – Weather, sea-state, unknown bathymetric complexity

- Automating the vessel (and everything onboard) provides the biggest cost-saving

**Conclusion:**

- Using multiple autonomous vessels from a single host vessel offers significant efficiencies if allowed to operate for long periods of time
Evolution of iXblue’s USV interest

Tried several USVs but remained unsatisfied

• Some were “good” but none were “perfect” for offshore use. All had some combination of:
  • Insufficient speed
  • Insufficient endurance
  • Poor sea-keeping
  • Bad acoustic sensor conditions
  • Insufficient payload

• iXblue had a shipyard, mechatronics and automation engineers, inertial navigation and acoustic systems engineers and surveyors – So we created our own USV... DriX.
About DriX
Designed for offshore survey

High speed, high endurance and versatile payload support

**Speed:** 14+ knots

**Endurance:**
- 14 days @ 4 knots
- 5 days @ 8 knots
- 2 days @ 14 knots

**Sea keeping:**
- Operational - Sea state 5
- Survival – unknown, unable to test (likely exceeds mothership capability)

**Payload:** INS, USBL, MBES, GNSS, SVP, Radio broadband/UHF/Wifi/Satcom

**Navigation/Safety:** Panoramic visible/IR cameras, AI object recognition, adaptive path planning, AIS, COLREG compliant lights and whistle, hi-vis colour scheme and wide/high mast, radar reflectors, watertight bulkhead with crash box.
Designed for offshore survey

Stability for optimal coverage and sensor performance

**Planing V-hulls** roll. The steeper the deadrise, the more the vessel will roll in response to wave action.

**DriX is a ballasted round-bilge.** DriX remains upright even in high sea states with very little lateral roll.

**Planing V-hulls** pitch and ‘slam’. This produces high bubble-sweepdown (aeration) around the hull which reduces acoustic performance.

**DriX is a wavepiercer design.** It pitches much less than a traditional V-hull. Instead, it cuts a smooth trajectory through the sea.
Acoustic Performance
Designed for offshore survey
Silence for optimal sensor range and accuracy

DriX
Other USV
5m length
Elaine
Tranquil Image

Low noise optimises acoustic sensor performance by increasing the SNR
DriX Case Study
Large offshore survey – Tonga 2018
DriX Case Study

Project location: Kingdom of Tonga
Client: Land Information New Zealand

Specifications: Improve navigational safety in wide corridors of over 200km in length.

Vessels (MV Silent Wings and DriX) to cover 694km² (over 7,500 planned linear km).

MV Silent Wings Fitted-out as Mothership and as survey ship.
DriX Case Study

24/7 Operations

- DriX and MV Silent Wings operated within 3.5km of one-another
- DriX remained deployed for 24/7 operations
- Majority of data captured up to sea-state 4 with both vessels able to operate simultaneously in these conditions
- Single operator for DriX and MV Silent Wings survey systems
DriX Case Study

Lower cost per NM, improved environmental footprint

- Efficiencies realised by use of DriX
  - 33% project duration decrease
  - 20% overall cost decrease
  - **34% reduction in project carbon footprint**

### Tonga Project Metrics

<table>
<thead>
<tr>
<th>Parameters</th>
<th>DriX</th>
<th>Mother Ship</th>
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<tbody>
<tr>
<td>Overall Line km</td>
<td>7,450</td>
<td></td>
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<tr>
<td>Line km</td>
<td>2,360</td>
<td>5,090</td>
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<tr>
<td>Effective survey time (hours)</td>
<td>166</td>
<td>358</td>
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<tr>
<td>% of total line km</td>
<td>32</td>
<td>68</td>
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<tr>
<td>Total use (days)</td>
<td>19</td>
<td>37</td>
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<tr>
<td>Average survey speed (knots)</td>
<td>7.6</td>
<td>7.6</td>
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<tr>
<td>Average transit speed</td>
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<td>10</td>
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<tr>
<td>Autonomy (days)</td>
<td>4-5</td>
<td>7</td>
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<tr>
<td>Surveying fuel consumption (l/hr)</td>
<td>2.4</td>
<td>66</td>
</tr>
</tbody>
</table>
DriX launch and recovery

EX OF DEPLOYMENT FROM A
DAVIT

Modifications of the davit
NOAA Ship Thomas Jefferson
Enormous Challenge

~ 50 million km²
Final thoughts:

• Unmanned survey vessels have the potential to significantly increase the rate of effort of EEZ seabed survey

• USV have the potential to significantly reduce the cost of seabed survey

• The degree to which USV technology delivers cost effective seabed survey under the HIPP is now a function of the contracting model

• Industry can deliver survey at $250/line mile if given sufficient budget to operate USV efficiently and on a large scale

• Assuming a budget of $100M per annum, there exists the possibility to have Australia’s EEZ fully surveyed within 50 years