



AUTONOMOUS UNMANNED SURFACE VESSELS (USVs)

EDTAS UNSW DSTO 16th July 2015

**Robert Dane CEO
Ninan Mathew CTO
Ocius Technology**



Youtube type in
“Blue Nemo compilation”
or
www.ocius.com.au

What is a USV?

Unmanned surface vessel – Marine! (not UAV nor a UGV)

- not an Unmanned Underwater Vehicle (UUV) nor Autonomous underwater vehicle (AUV)

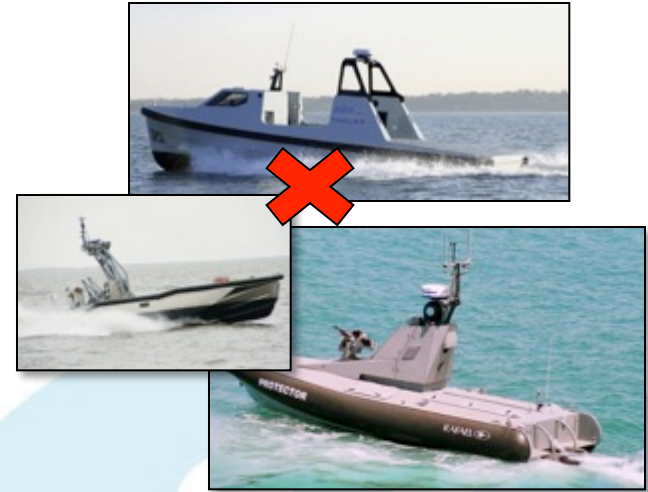
Advantages compared to buoys, ships, planes, satellites

- CAPEX
- OPEX
- Operations of long duration
- Error rates not related to fatigue
- Remove people and expensive assets from harms way

Current USV technologies

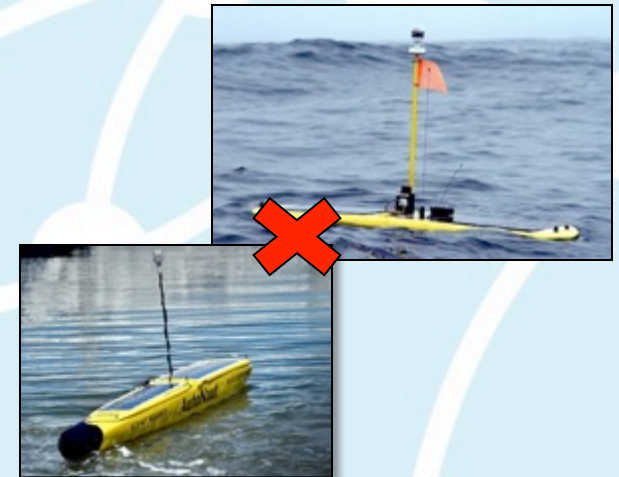
A) Remote control USVs

Generally heavy, large remote controlled vessels of around 12m length, with maximum “on water” operations counted in hours or perhaps days. Expensive.



B) Self-sustaining USVs powered by solar or wave energy

Very low speed and manoeuvrability, low power and low space available for sonar payloads, not able to have meaningful speed of advance in all conditions - OK for oceanography but largely ineffective as platforms for hydrography/defence/ASW.



USV MARKET

- nascent industry, growing rapidly
- market size proportional to all the ISR / data required by governments, authorities, defence
- above the water, in the water and under the water
- 'gateway' comms

1. OCEANOGRAPHY – cost/byte data

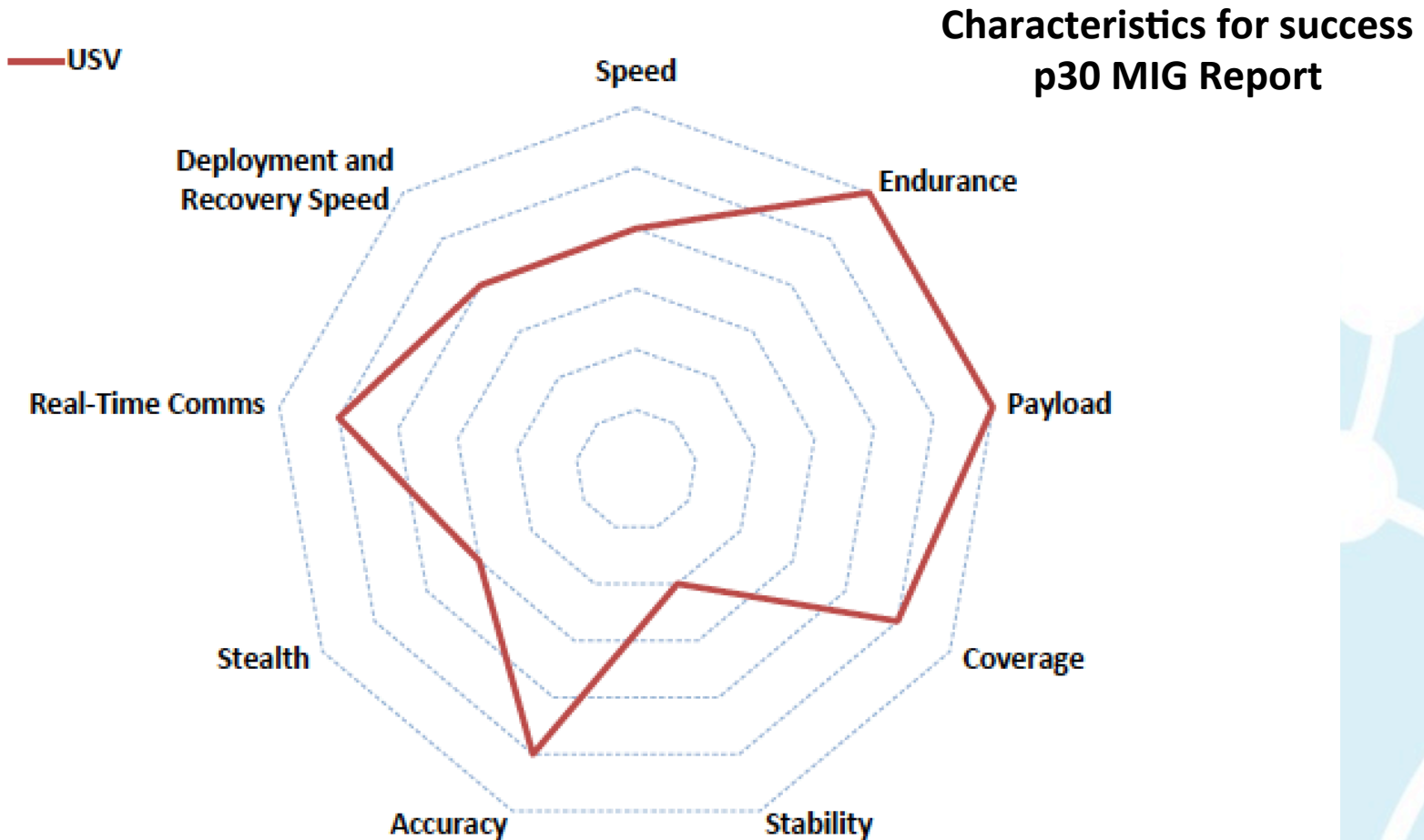
2. OIL AND GAS – environment and hydrography

3. DEFENCE AND SECURITY

Defence and Security Market

Summary Market Info Group (MIG) 2013 Outlook Report

- **Global USV forecast predicted**
USV Market size 2013 -2020 total is US\$3.8B (p31, p111, p166).
- Surge in interest in USVs - Maritime security is on increase and changing, budget pressures, unmanned aerial vehicle systems proven
- Unmanned Maritime Market is still emerging, today where UAS were in mid-nineties. (p24)
- Budget pressures to maintain current capability at lower cost, asymmetrical challenges (p25)
- Predicted surge in procurement from 2017 (p25), USV versatility (p194)
- “Persistent USV (months or years endurance) are disruptive” (p28)
- for “dull, dirty or dangerous” functions too risky for humans and expensive equipment (p63)
- EEZ –oil and gas, fisheries, environmental monitoring “prevent, protect, predict” (p181)



Source: Rob McHenry of US Navy, modified by analyst

**Power for payloads, payload space, endurance, coverage, comms/accuracy
“such a USV disruptive”**

	Who are we?
1997	Won Solar boat race in Canberra
1999	Solar Sailor Holdings Limited founded
2000	First hybrid marine power ferry launched
2001	Won Australian Design Award of the Year
2006	Research commenced into unmanned surface vehicles
2008	First Hong Kong ferry delivered
2010	Fourth Hong Kong ferry delivered
2010	Shanghai ferry delivered
2013	Prototype military USV shown at defence exhibition
2013	Name change to Ocius Technology Limited
2014	Collaboration Agreement with Thales for ASW USV
2015	Sailing trials of prototype oceanographic USV
2015	Hydrography trials Jervis Bay

1997





Winner Australian Design Award of the Year

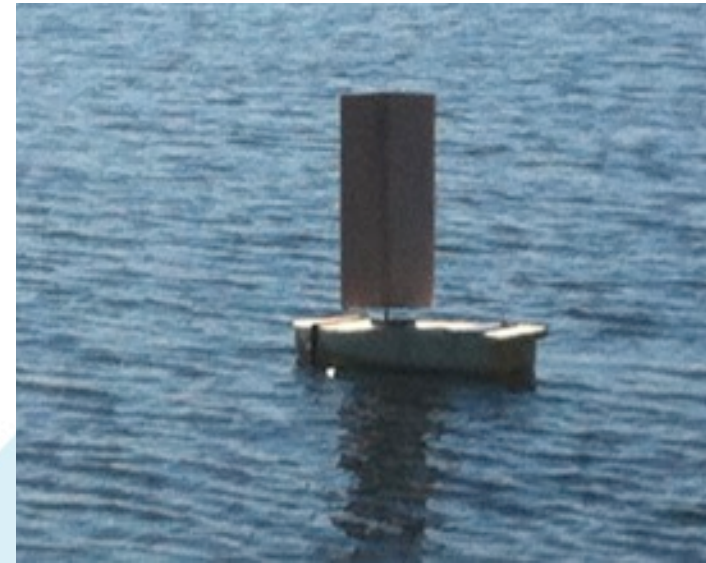
Hybrid Power Ferries



Hong Kong
four ferries delivered
2008 - 2010

Shanghai – World Expo

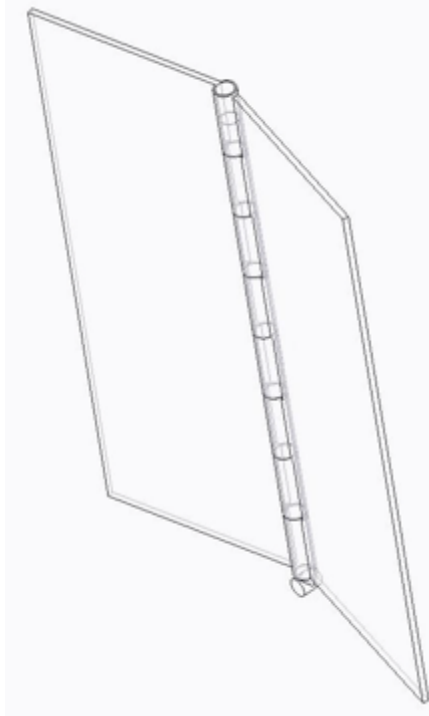




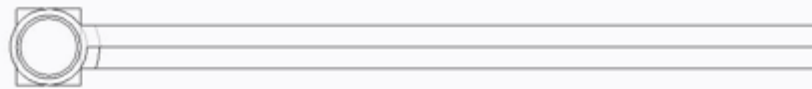
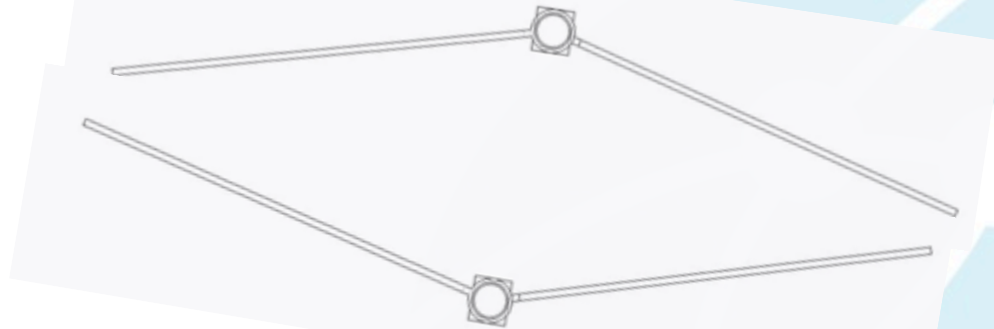
Research is turning \$ into ideas.
Development is turning ideas into \$

Rigid Opening Sail - 2 FLAT PLATES make a sail which changes area and camber

2 flat plates and hinge



Can open from zero to >180 degrees



Stows flat, raises and opens, simple

Relationships



- Established highly regarded fibreglass boat builder
- Industry partner for initial testing, building and marketing of USVs



- Fibre optic towed array technology for anti-submarine warfare a unique fit with Ocius USV technology



- Enterprise Connect Agreement with UoW Department of Oceanographic Research
- Facility at UoW with access to wave tank test, 3D modelling, materials
- UoW Research Fellow, Ninan Mathew has become Ocius Chief Technical Officer



Australian Government
Department of Defence
Defence Science and
Technology Organisation

- Defence, Science & Technology Organisation
- Ocius/Thales ASW/USV in final of Round 19 of Capability Technology Demonstrator

BlueBottles range of USVs

- live at sea (named after Aust marine animal)
- use energy of the sea
- Self sustaining
- Wide applications
- Stay at sea for months in all weather conditions
- Roam widely or
- stay on station
- self deploying/ retrieving buoy
- “Meaningful speed of advance” under all conditions



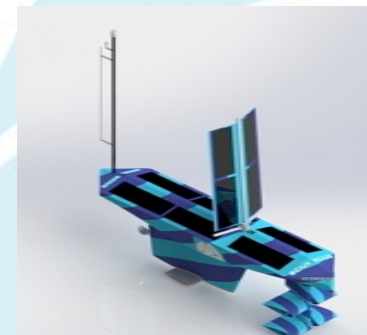
	Ocius "Blue Nemo"	Ocius "Blue Buoy"	Ocius "Blue Stinger"	Wave Glider Series
Speed	2-3 knots	3-4 knots	5-6 knots	Speed 0.4-1 knot
Power	2x	5x	25x	Low power & Low energy
Energy & payload	2x	5x	25x	Small
Solar not shaded	2x more	5x	25x	Small
Collision Avoidance	Yes	Yes	Yes	No
Roll Dampened	Yes	Yes	Yes	No
Others	<ul style="list-style-type: none"> Can take photos and do hydrography Inmarsat 	<ul style="list-style-type: none"> Roll dampened mast with radar high above water 	<ul style="list-style-type: none"> Can tow an array 	No



2.8m oceanographic
'Blue Nemo'



3.5m
'Blue Buoy'



5.9m Defence and
security 'Blue Stinger'



Wave Glider (USA)

- Oceanography Competitor
- Est. 2007.
- **Raised US\$85M equity incl US\$45M in 2013**
- Validates Oceanography market

Plus – cost and meaningful speed of advance in all conditions

ASW

Demonstration of a technology capability conceived, designed and manufactured in Australia through local industry partnerships

- ◆ Ocius Technology
 - USV design and build
- ◆ Thales Australia
 - Towed Array Sensor and processing
 - Towed array
 - Inboard sonar processing system
 - Receiver system/communication system
 - Remote sonar base station
 - Project support package
 - Project Management support
 - Systems Engineering process support
 - Trials & demonstration planning



2016 -2017

A) USV 'Stingers '
For ASW and Hydrography
(? Add back up methanol fuel cell)?

B) 'Nemos'
LOA 2.8m Beam 0.78
Oceanography
and sensor testing
(small cheap)

BlueBottle Stinger - LOA 5.46 m Beam 0.78m



What does “Autonomous” mean in 2015?

- individual USV does a mission and looks after itself.

In 2035?

- not 200 men on one ship...
one man controls 200 ships

Ocius/Australia has the best USV platform
*“only game in town for ASW
and hydrography”*

State of Autonomous system Devel

- Mission plan
- 4 - 5 sensor inputs
- 5 motors

BlueBottle Stinger - LOA 5.46 m Beam 0.78m

