Autosub 2000 Under Ice

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So what is Autosub 2000 under ice?

Autosub 3

7m long, 3600 kg
60 hour (400 km) endurance
5000 D cell batteries
1600 m depth limit
0.1% Navigation Accuracy
What did Autosub3 do?

**Mission 431 24/01/2009:**
55km leg under the ice Shelf
34.5 Hours
183km total track

**Paper:**
Observations beneath Pine Island Glacier in West Antarctica and implications for its retreat
Ice-shelf basal morphology from an upward-looking multibeam system
Antarctic Krill Under Sea Ice

**Equipped with:**
SideScan Sonar
Multibeam
CTD
What did Autosub3 do?
What Couldn’t it do?

- Limited abilities to get close to the sea ice – to study fresh water melt & salt water mixing
- Limited abilities to get near the carving point
Why build a new submarine when we could buy one?

BioCam Credit: https://ocean.soton.ac.uk/biocam
Reliability?

• Key to our current design ethos is reliability and making sure the data comes back.
• Damage to the nose of Autosub3 after a collision
• Pink – Rothera Research Base
• Green – Halley Research Base
• Yellow – Autosub 2 Loss Location
• Red – Commercial AUV Loss Location

Making sure the submarine & importantly the data comes back are key
Other considerations

- Extreme Weather
- Launch & Recovery Systems
- Different ship based operations
So what are we building?

Hardware Redundancy

Payload tubes complex including brains & connections to all the sensors

Power tube simple, no brains primarily for routing power

60kWhrs of Batteries

Thruster

Batteries

Actuator

Batteries

Batteries

Batteries

Batteries

Batteries

Batteries

Batteries

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Communications

Payload Tube

Long Range Homing System
Iridium
GPS
Wifi

Power Tube

Acoustic Control
Iridium
GPS
Wifi

Acoustic Beacon
1 x Light Flasher
Iridium Beacon

AIS
2 x Light Flasher
Iridium Beacon
Key Components – Obstacle Avoidance System

- Sea Surface
- Seabed
Key Components - Battery

- Original Autosub 3 used 5000 non-rechargable D-Cells to achieve 400km range
- New pressure Tolerant Battery Design 5kWhrs
- 4 x modules each 1.25kWhrs
- 12 Batteries in the submarine gives ~58kWhrs @0°C
- Improve reliability
- Keep the weight down ~8kg in water
- Optimize space
- 30A current output <- investment for the future
Key Components – Payload Tube

- End Cap PCBs – Serial Communications, Ethernet Switches & Power routing
- Wifi, GPS & Iridium
- Front Seat & Back Seat Computers
- Critical & Non-Critical Power Supplies – 12V, 24V, 48V – 600W per channel (1.5kW total max for tube)
- 2 x Spare Slots
The Specification

• 5.5m Length – 0.9m Diameter
• 2200kg
• 58kWhrs @0°C Batteries ~80hrs with 300km Science Range + 100km Contingency
• 1.2 - 1.4 m/s Cruise Speed
• Cross form Actuators & Dual Thrusters
• Navigation Accuracy <0.01% = <0.1m per km
In water Trials

- In water trials late summer 2020
- Sensor & Deep Sea trials winter 2020/spring 2021
- Under Ice Trails 2021
Thank You

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