



AUVs in Archaeology:

The Current State-of-the-Art and a Vision for the Future

Justin Manley
Massachusetts Institute of Technology
Sea Grant College Program



Introduction



- Summarize Current AUV Technology
 - Existing Survey Vehicles
 - Archaeological Uses
- Propose Future Developments
 - Precision Survey AUV
 - Inspection Class AUV

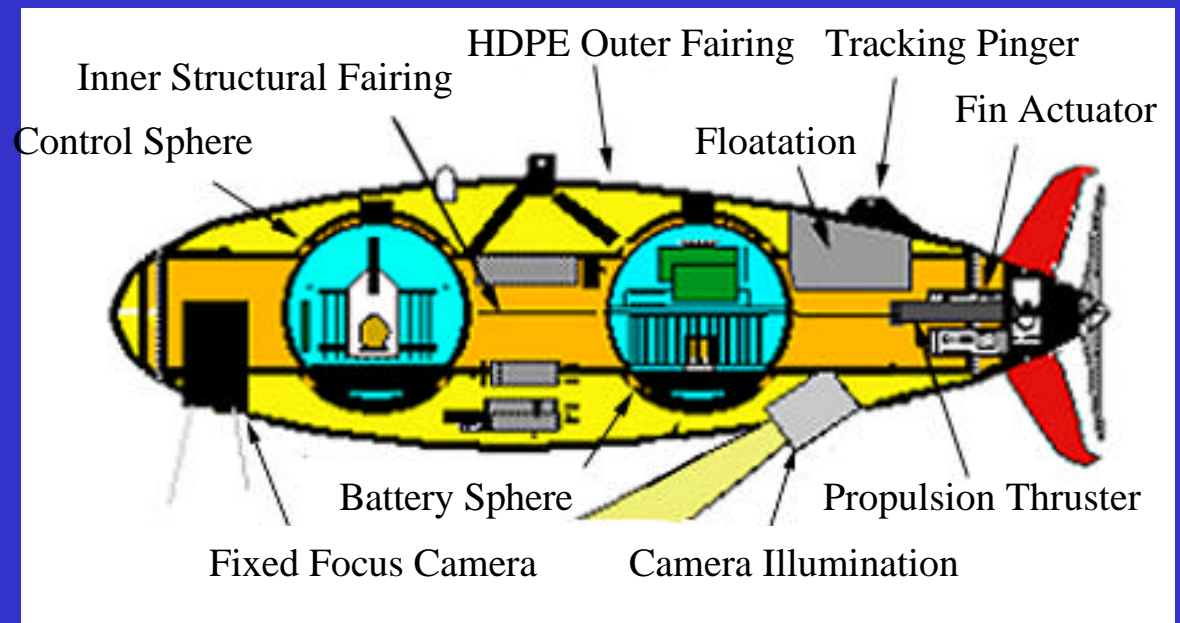


Current AUV Technology



- Survey Class AUVs
 - Reliable “lawnmowers”
 - Repeatable straight lines
 - Potent sensor platforms
 - side-scan, SBP, camera, multi-beam
 - High quality data
 - eliminate “fish” motions and improved tracking
 - Cost effective
 - versus deep tows/ROVs/submersibles
 - Commercial commodity
 - Rent or buy one today!

- MIT's Odyssey IId, *Xanthos*
 - 3000 m rated
 - 3-6 hrs endurance
 - Video system
- Over 500 dives
 - Giant Squid
 - Oceanography
 - Archaeology



Odyssey III, *Caribou*

- Bluefin built
- Edgetech Sonar
 - SSS & SBP
 - Digital CHIRP
- Modular Design
 - Cameras
 - Magnetometer
 - and others



Learning at Sea





AUV for Archaeology

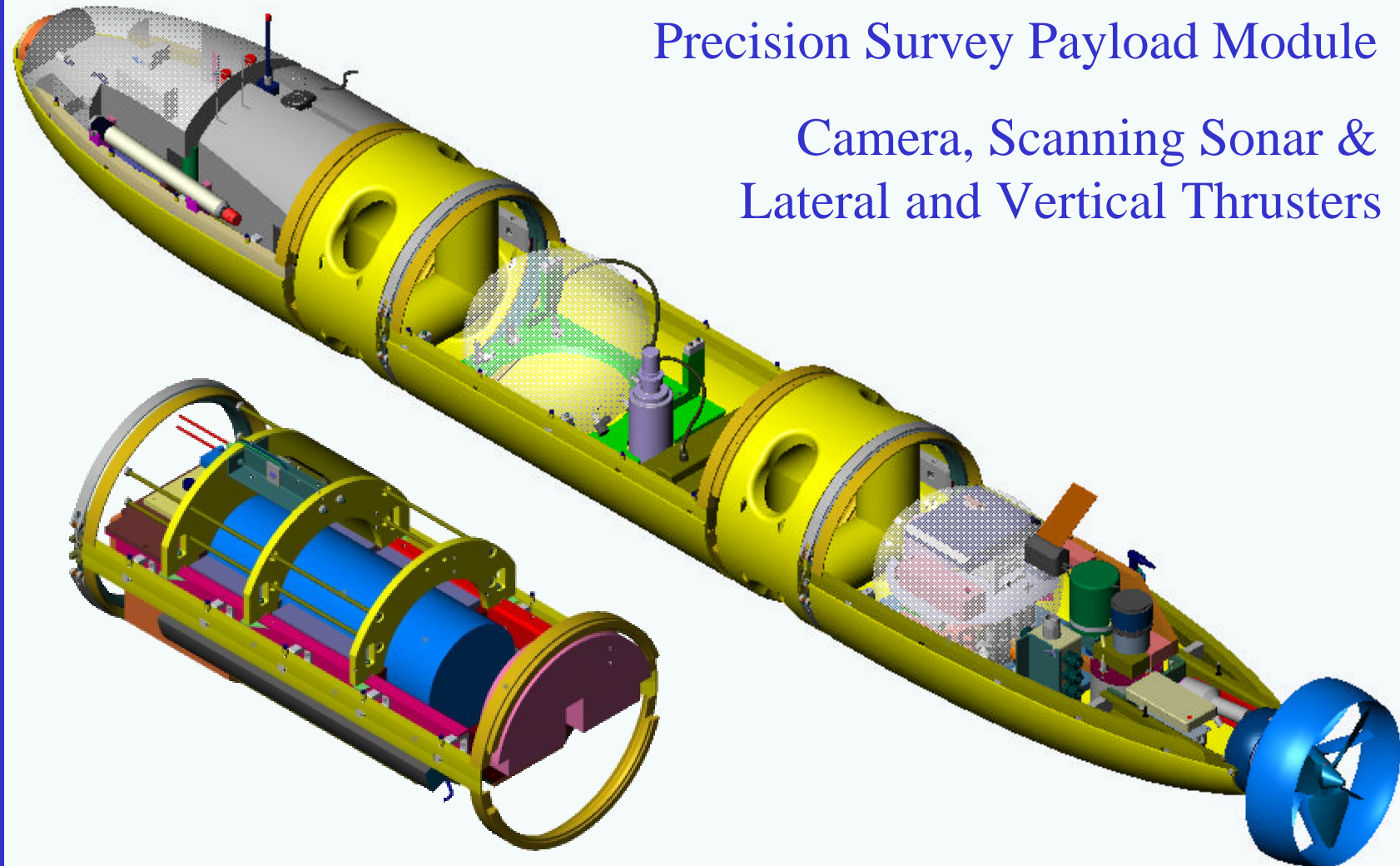
As specified by Mindell/Bingham



Functional Requirements	Design Parameters
Precision navigation	~1 cm precision (x,y,z) @ 1Hz update w/i 100m cube Measure pitch/roll < 0.1? Hold heading < 0.5?
Hover and move at very low speeds	Omni-directional, 3-D controllability, down to ~10cm/sec.
Operate in deep water	>diver depth (100m) < full ocean depth goal ~1000m
Endurance sufficient to thoroughly survey a archaeological site	~10km linear survey

- Precision Survey Vehicle
 - Navigation ~ 1 m
 - Overlap lines for 100% coverage
 - Slow moving
- Inspection Class Vehicle
 - Navigation ~ 1 cm
 - Highly Maneuverable
 - Real-time supervisory control

Odyssey III Precision Survey

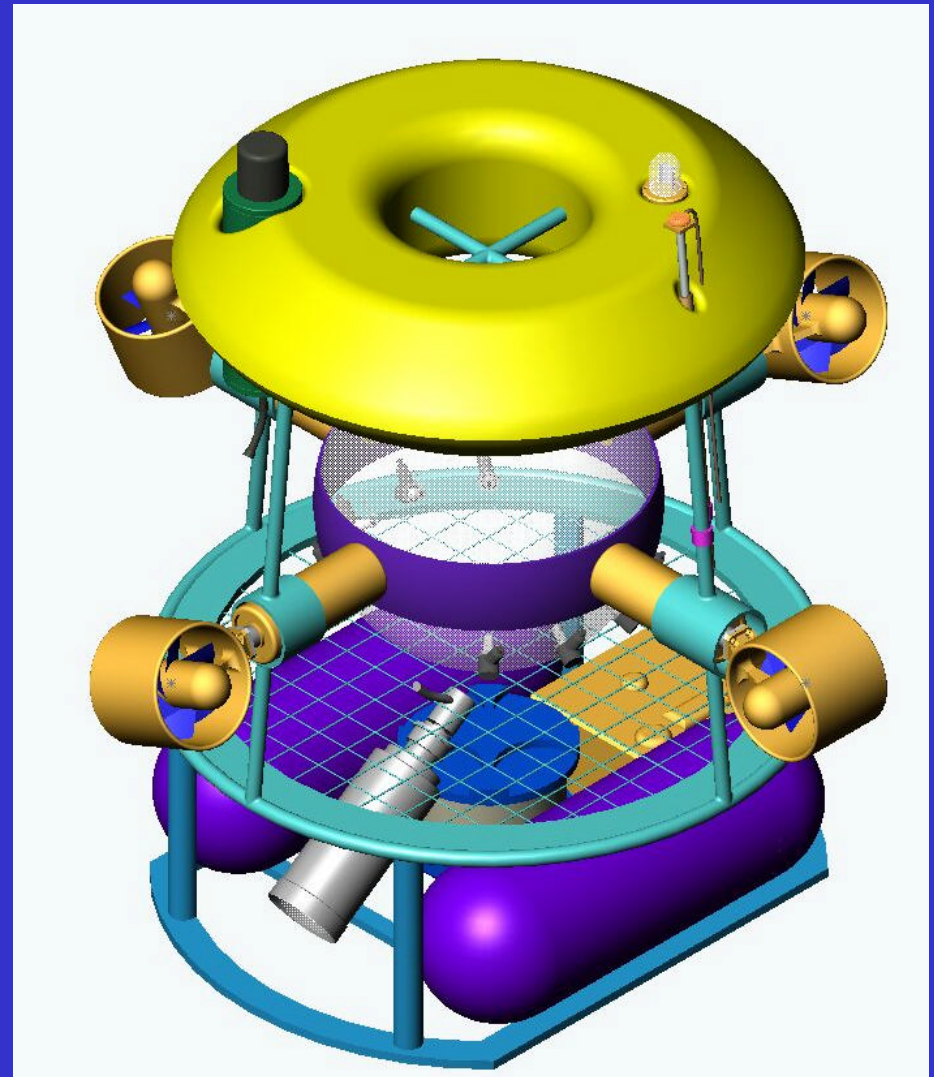


Precision Survey Payload Module

Camera, Scanning Sonar &
Lateral and Vertical Thrusters

Odyssey X Inspection Class

- Range of motion: equivalent to ROV
- Payload: camera & scanning sonar
- Endurance: 2+ hours
- Navigation: ~ 1 cm
- Control: supervisory via acoustic modem





Conclusions



- Search and survey
 - AUVs are mature and capable
 - Rent or buy one today!
- Precision survey AUV
 - 9-12 months & ~\$250k away
- Inspection AUV
 - 18-24 months & ~\$500k away