Staged Approach

This project is possible through a grant provided by the

National Science Foundation

Objectives:

- Develop a vehicle for the new personnel sphere
- Satisfy as many original replacement HOV design goals as possible
- Leverage replacement HOV design efforts previously undertaken
- Control project risk and costs
- Plan for an upgrade to full 6500m vehicle at a later date

Phase I - Sphere

4500m *Alvin* Upgrade

Stage 1

6500m Upgrade

Stage 2

Vehicle Design

WHOI is designing and will build a vehicle in a 2-Phased approach.

Phase I (4500m)

- Install new sphere
- Cross deck key systems to reduce cost
- Upgrade vehicle Command and Control System
- Replace majority of syntactic foam

Phase II (6500M)

- Replace all 4500 meter components for 6500 meter operation
- Upgrade battery with higher energy density option (possibly lithium)
- Upgrade propulsion system (add forward lateral thruster)
- Reclassify vehicle for 6500 meter operations

Double Classification

- **ABS** Classification

Rules for Building and Classing Underwater Vehicles, Systems and Hyperbaric Facilities, 2010

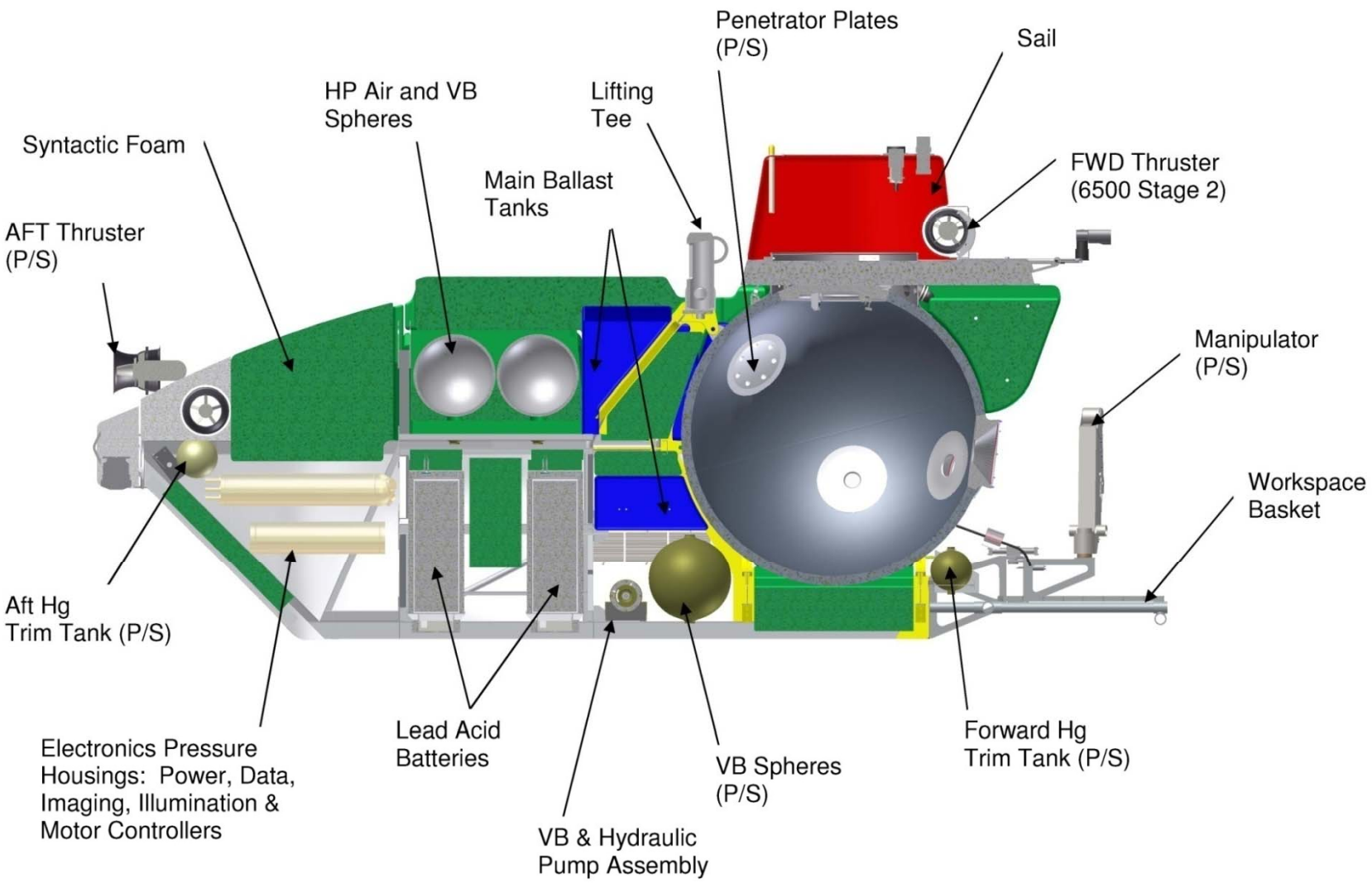
- **NAVSEA** Certification (Added Requirement)

P9290 System Certification Procedures and Criteria Manual for Deep Submergence Systems

Vehicle Milestones

✓ Preliminary Design Review	December 2009
✓ Final Design Review	September 2010
✓ Finish Disassembly	April 2011
• Begin Assembly	December 2011
• Sea Trials	May 2012

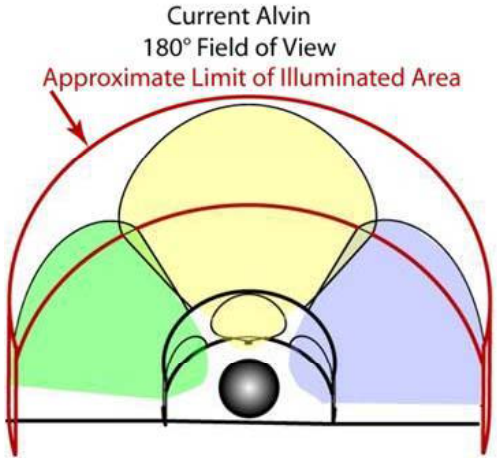
General Arrangement

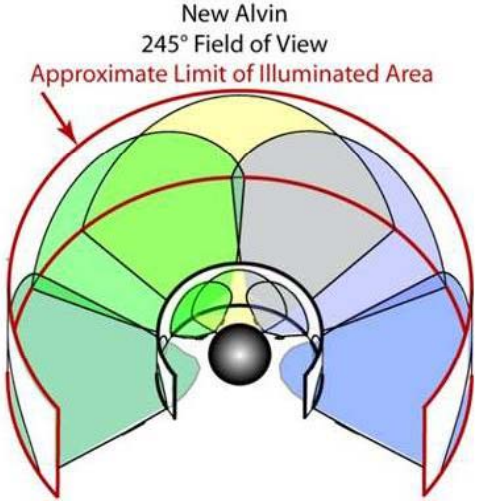


Pressure Hull Comparison

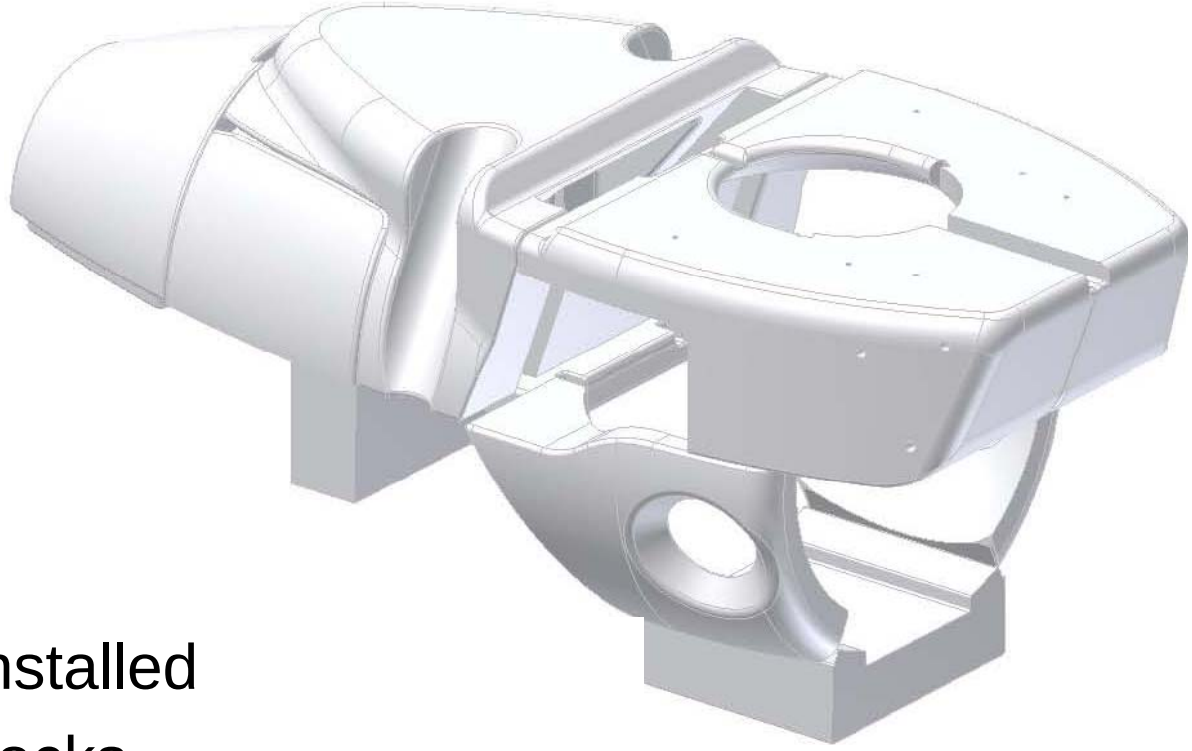
Existing hull = 144 ft^3

New hull = 171 ft^3





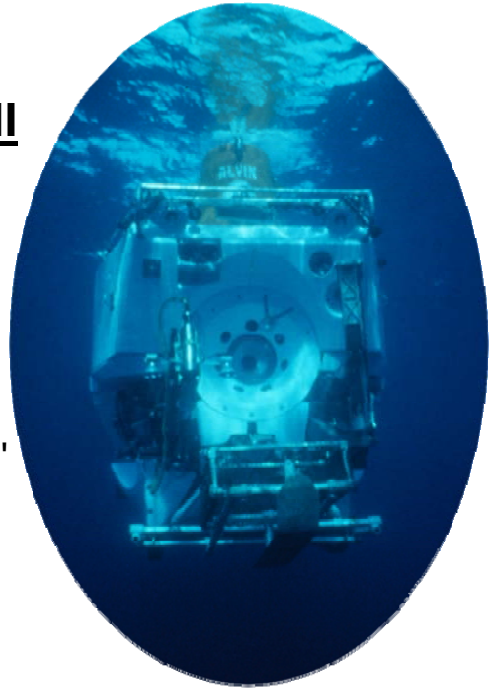
Buoyancy – 6500m Syntactic Foam



- Over 350 cubic feet installed
- More than 25 large blocks
- 36 pounds per cubic foot density
- NAVSEA approved purchase spec.
- ABS reviewed

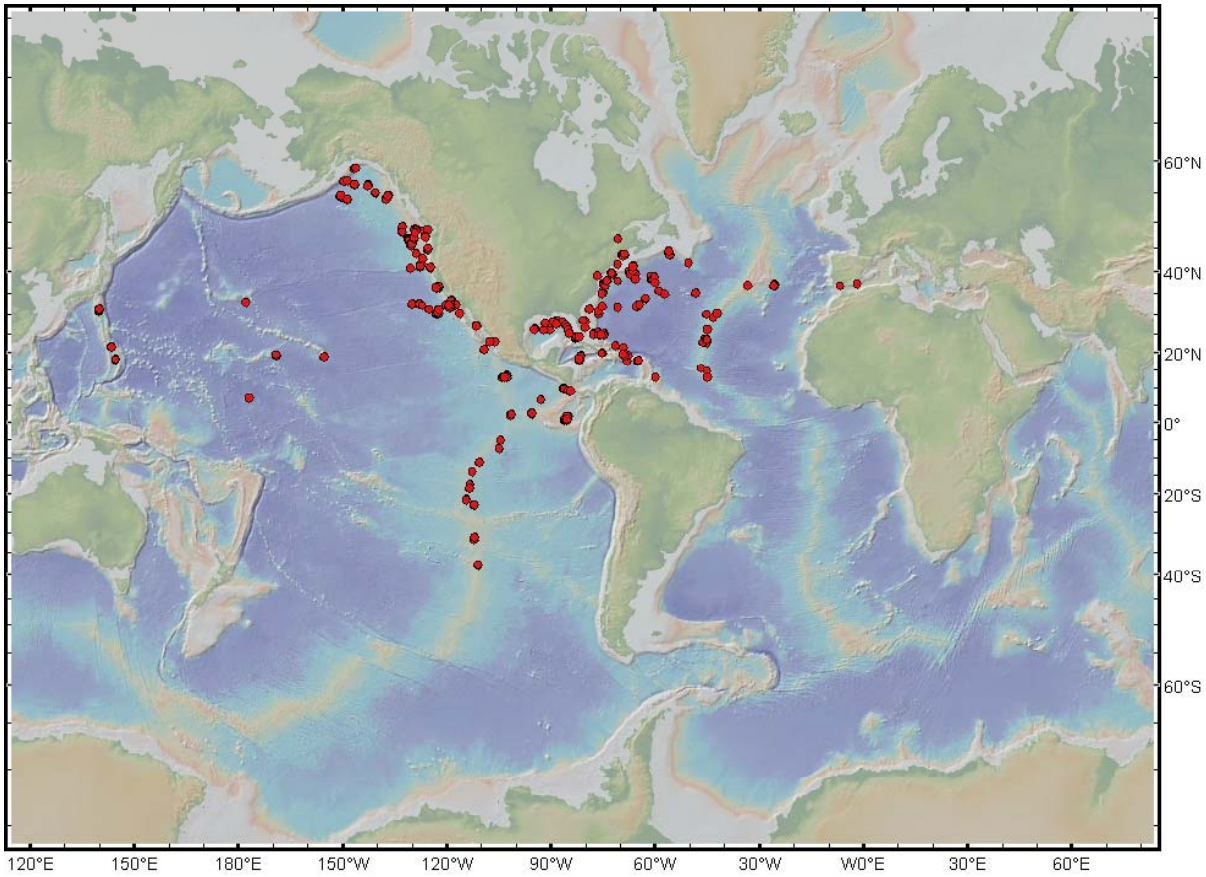
Underwater Intervention 2011
Next Steps

	Alvin	***Alvin* Stage I**	***Alvin* Stage II**
Depth Rating	4,500 m	4,500 m	6,500 m
Sphere Volume	144 ft^3	171 ft^3	171 ft^3
External Science Payload	200 lbs	400 lbs	400 lbs
Internal Science Payload	6,630 in^3 of 19" rack space	12,300 in^3 of 19" rack space	12,300 in^3 of 19" rack space
Energy	120v lead acid	120v lead acid	240v lithium ion
Max Speed (fwd)	2 kts	2 kts	2 kts
Max Speed (vertical)	30 m/min	30 m/min	40 m/min
Trim Angle	+/- 7.5 deg	+/- 7.5 deg	+/- 15 deg
Positioning control	Manual w/ auto heading	Auto heading, DP, track and following control	Auto heading, DP, track and following control



Alvin **Dedication Ceremony June 5 , 1964**

Underwater Intervention 2011
DSV *Alvin*



- **>4600 Dives**
- **>31,500 Hrs. Submerged**