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  6500m Upgrade

Stage 1  Stage 2
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
Pressure Hull Comparison

Existing hull = 144 ft³

New hull = 171 ft³
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

<table>
<thead>
<tr>
<th></th>
<th><strong>Alvin</strong></th>
<th><strong>Alvin Stage I</strong></th>
<th><strong>Alvin Stage II</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depth Rating</strong></td>
<td>4,500 m</td>
<td>4,500 m</td>
<td>6,500 m</td>
</tr>
<tr>
<td><strong>Sphere Volume</strong></td>
<td>144 ft³</td>
<td>171 ft³</td>
<td>171 ft³</td>
</tr>
<tr>
<td><strong>External Science Payload</strong></td>
<td>200 lbs</td>
<td>400 lbs</td>
<td>400 lbs</td>
</tr>
<tr>
<td><strong>Internal Science Payload</strong></td>
<td>6,630 in³ of 19&quot; rack space</td>
<td>12,300 in³ of 19&quot; rack space</td>
<td>12,300 in³ of 19&quot; rack space</td>
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<tr>
<td><strong>Energy</strong></td>
<td>120v lead acid</td>
<td>120v lead acid</td>
<td>240v lithium ion</td>
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<tr>
<td><strong>Max Speed (fwd)</strong></td>
<td>2 kts</td>
<td>2 kts</td>
<td>2 kts</td>
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<tr>
<td><strong>Max Speed (vertical)</strong></td>
<td>30 m/min</td>
<td>30 m/min</td>
<td>40 m/min</td>
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<tr>
<td><strong>Trim Angle</strong></td>
<td>+/- 7.5 deg</td>
<td>+/- 7.5 deg</td>
<td>+/- 15 deg</td>
</tr>
<tr>
<td><strong>Positioning control</strong></td>
<td>Manual w/ auto heading</td>
<td>Auto heading, DP, track and following control</td>
<td>Auto heading, DP, track and following control</td>
</tr>
</tbody>
</table>
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DSV Alvin

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