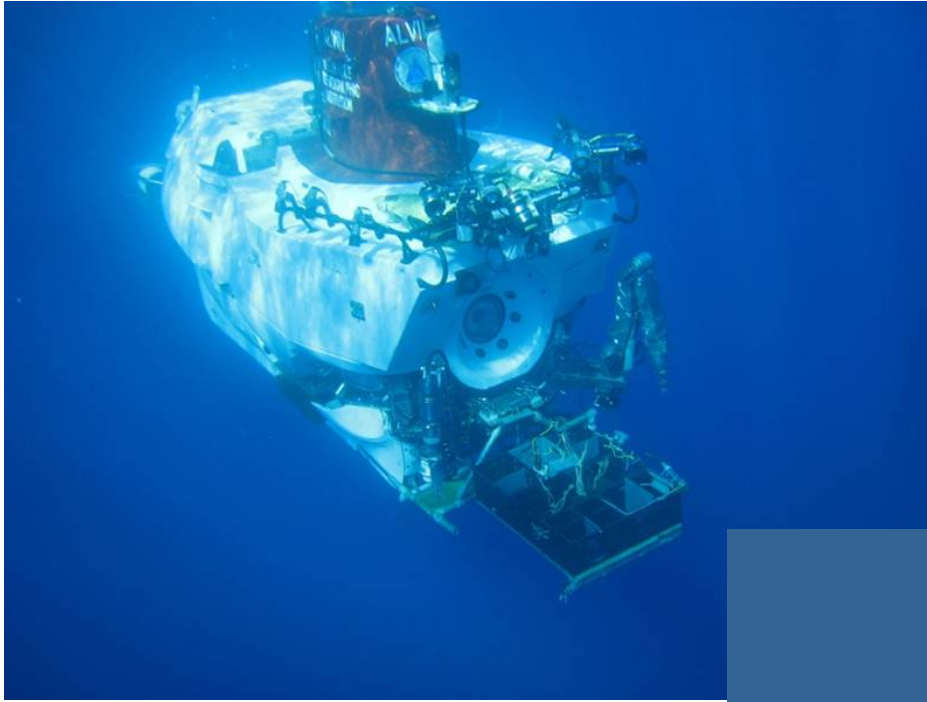
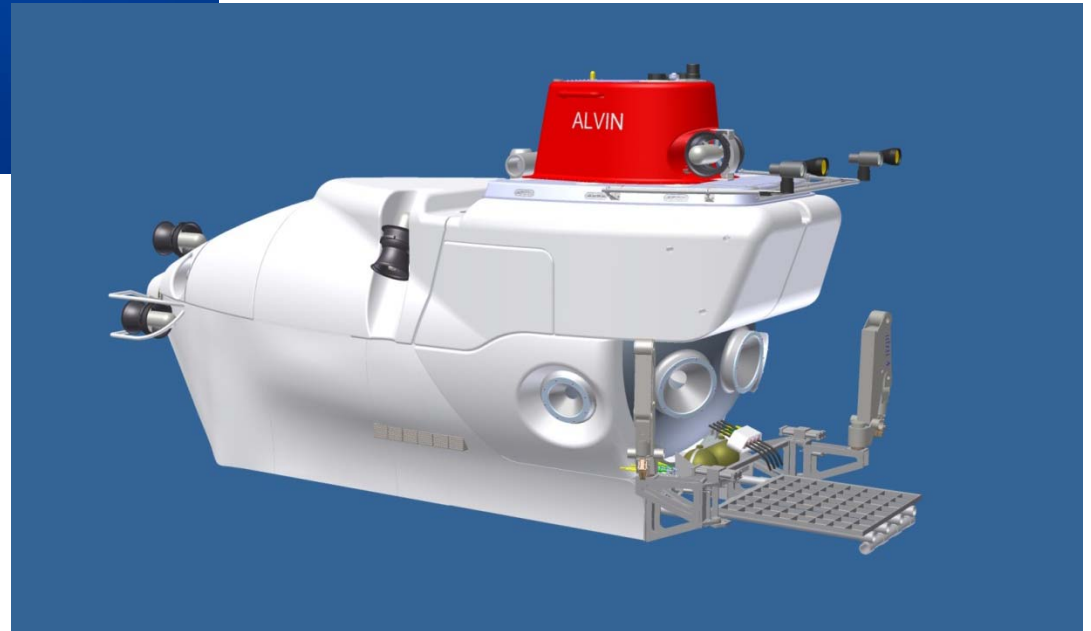




# Alvin Upgrade Project



**Susan Humphris**  
*Principal Investigator*



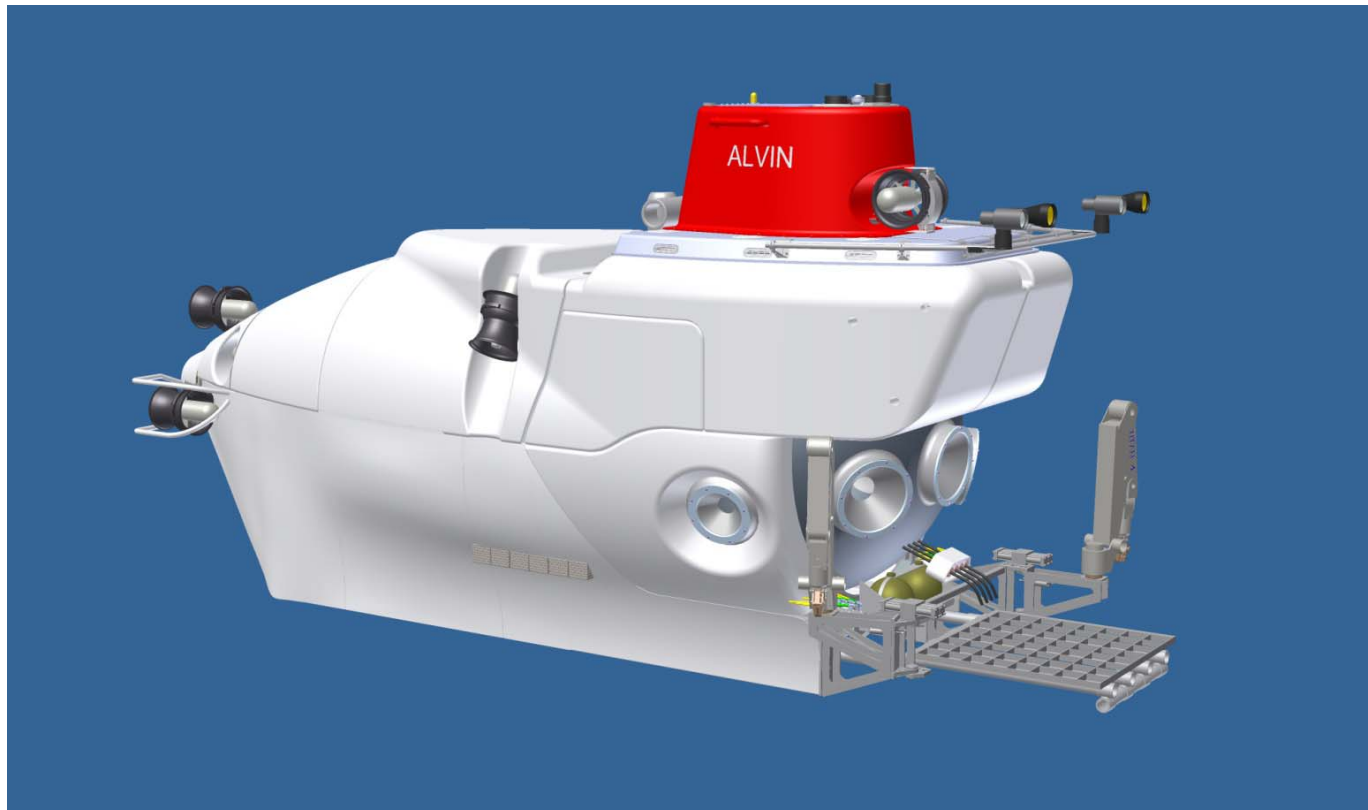


# Project Objectives



A significantly enhanced submersible for the scientific community built in two stages:

- Stage 1 4,500 m *Alvin* Upgrade: 2013
- Stage 2 6,500 m *Alvin* Upgrade: future scheduling





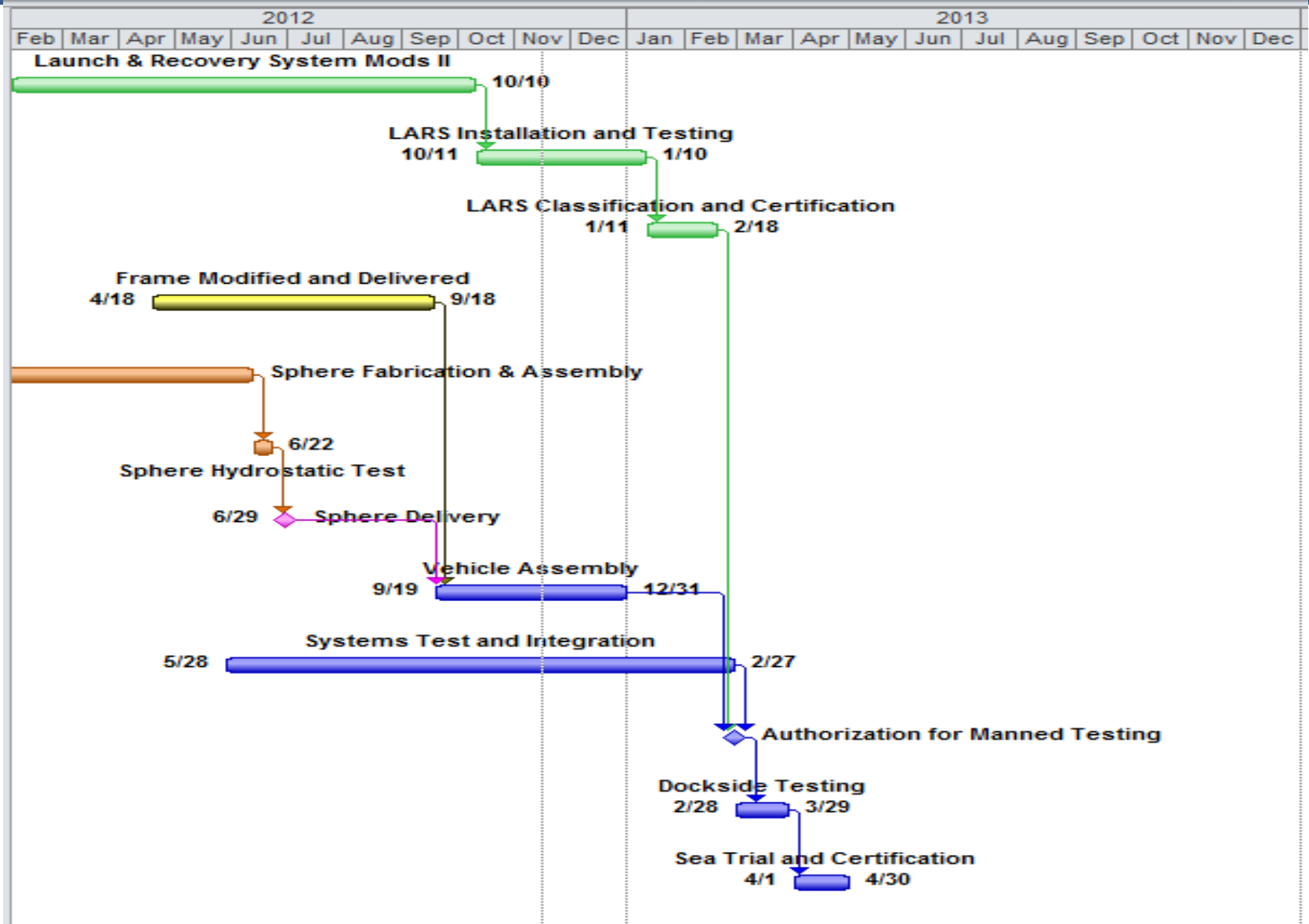
# Vehicle Characteristics



Project Objective	Stage 1 Vehicle	Stage 2 Vehicle	Remarks
6,500 meter depth capability		X	Stage 1 designs and fabricates select 6,500 meter components (sphere, penetrators, syntactic foam)
Larger personnel sphere, improved interior ergonomics	X		18% increase in interior volume; redesign of observer and pilot seating
Better visibility and overlapping views	X		Three 7" forward viewports with overlapping fields of view; two 5" side port
Improved interior electronics	X		Fiber optic network, touch screen controls, and upgraded observer monitors
Increased science payload	X		Double the vehicle payload to 400 pounds as well as expand the manipulator work area
Improved lighting and imaging	X		HD video, publication quality still imaging, and increased lighting output (LED)
Improved data collection, logging, and science interface	X		A fiber optic network and upgrades to the data recording and logging systems
Increased bottom time; mid-water capability		X	Requires increased battery capacity
Increased thruster horsepower		X	Requires increased battery capacity
Increased hydraulic plant capacity		X	Requires increased battery capacity
Automatic station keeping		X	Stage 1 includes auto-heading control
Vehicle Certification: NAVSEA	X		Potential double classification with ABS in Stage 2



# Timeline





# Major Milestones to Operational Status



## Expected Status as of 31 December 2012:

### •Vehicle Assembly Substantially Complete

- ✓ Major fabrication complete
- ✓ Major components tested and installed
- ✓ Integration and testing well underway

### •Certification

- ✓ All Scope of Certification ECAs submitted to NAVSEA

## 2013 Milestones

- Sea Trials Agenda Approved 25 January
- Vehicle Material Survey 28 January-1 February
- Unmanned Testing Begins 01 March
- Approved for Manned Testing 16 March
- Depart for Sea Trials 01 April
- Science Verification Cruise 07 May



# Personnel Sphere



**From This**

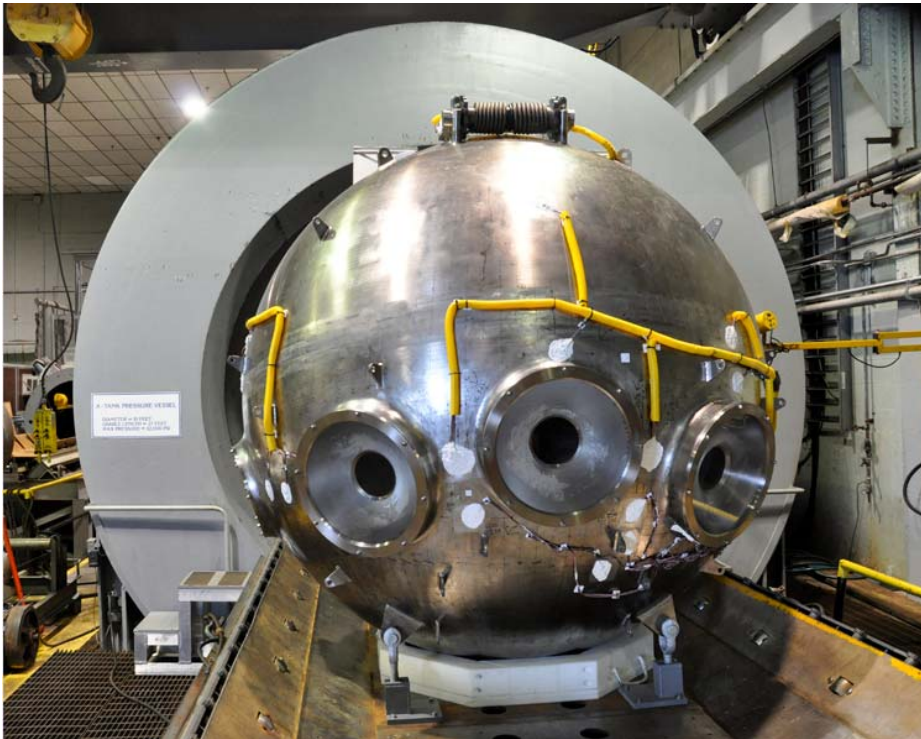


**To This**





# Hydrostatic Testing of the Sphere

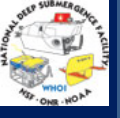


**Northrop Grumman  
June 2012**





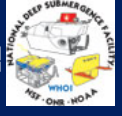
# The Old and the New



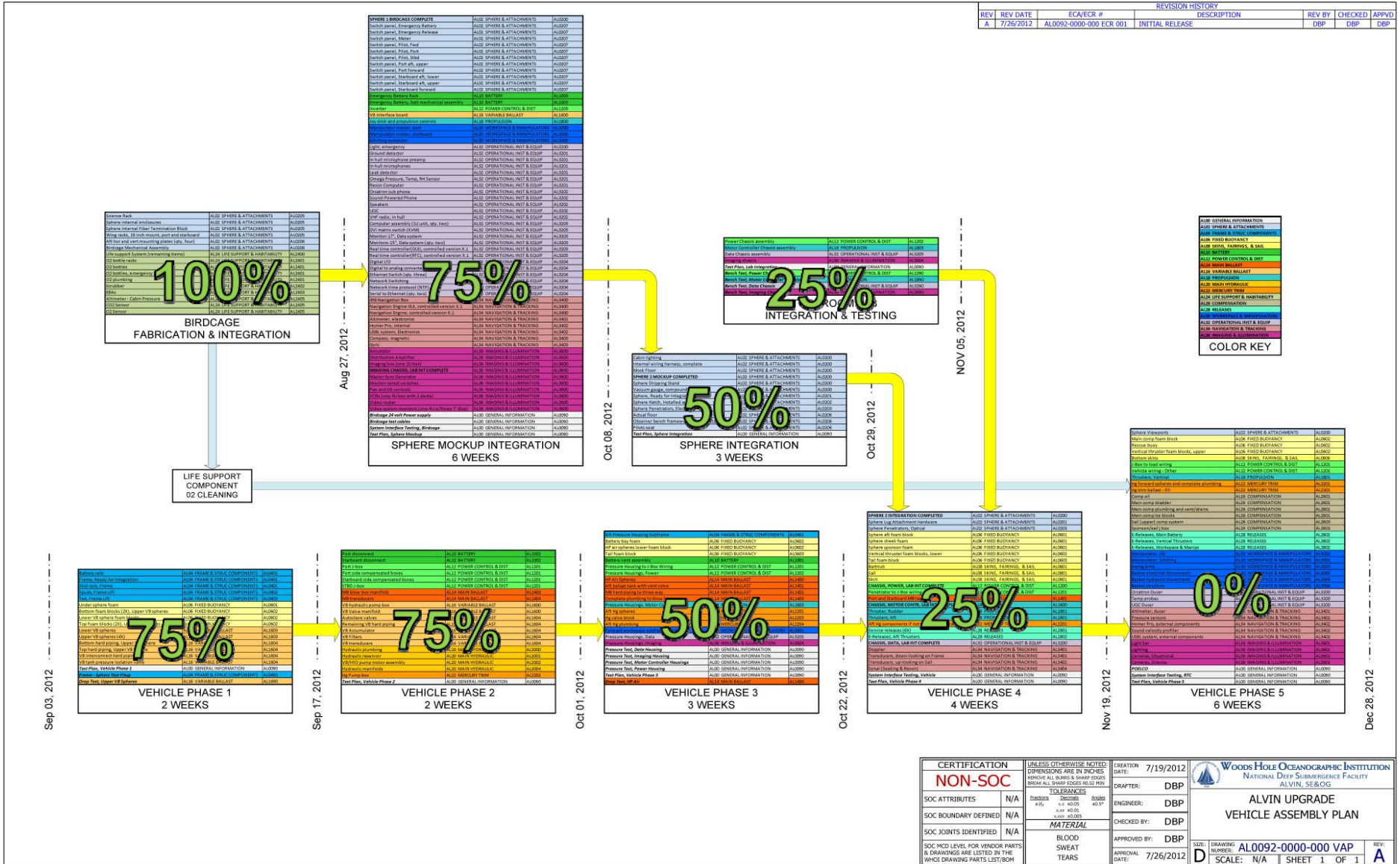




# Status of the Vehicle Assembly Plan



REV	REV DATE	ECA/ECR #	REVISION HISTORY	DESCRIPTION	REV BY	CHECKED	APPROV
A	7/26/2012	AL0992-0000-000 ECR 001	INITIAL RELEASE		DBP	DBP	DBP





# Vehicle Frame



- Fabrication complete
- NAVSEA survey conducted Sept. 11/12
- Delivered to WHOI Sept 18
- Sphere installed November 7





# Penetrators



A pressure test program was developed with the goal of having a full complement (14 electrical and 2 optical) of penetrators ready to install by the end of November

- Test Program

- Initial dimensional checks
- Prep and assemble for pressure testing
- Pressure testing to 1.5 MOP
- Post pressure test: dimensional/functional

- All electrical and optical penetrator testing is complete

- Installation underway

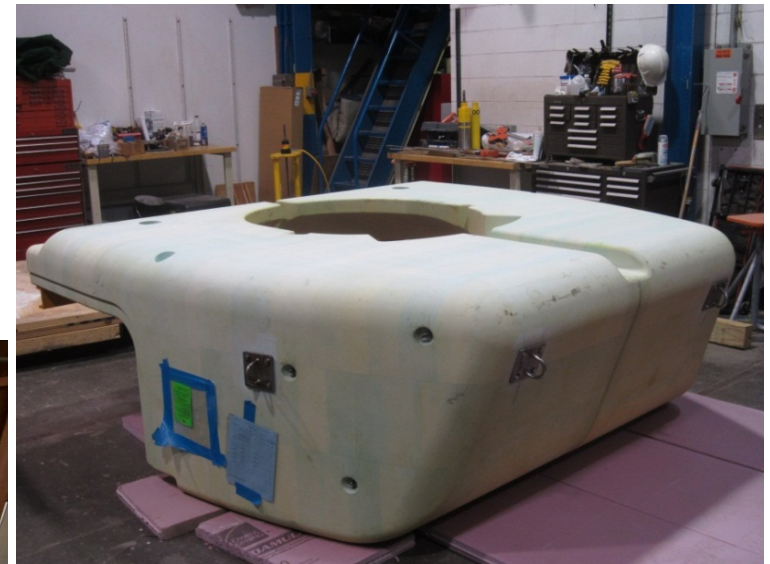




# Fixed Buoyancy

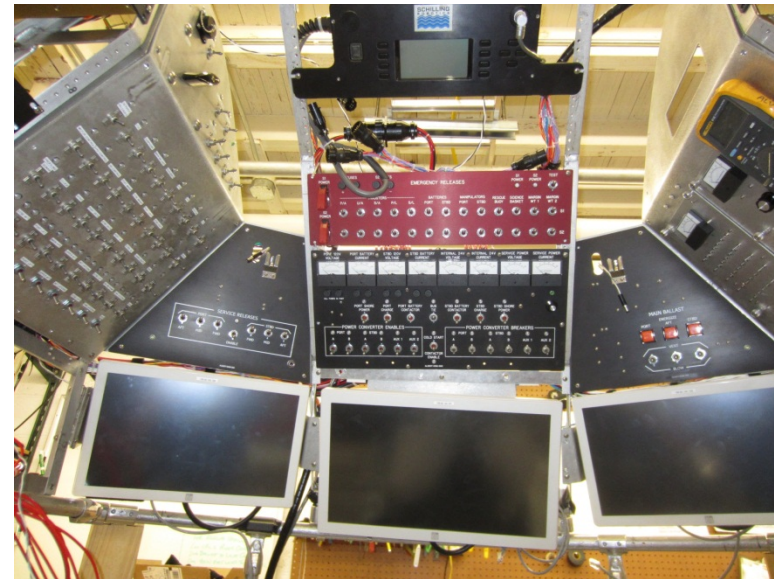
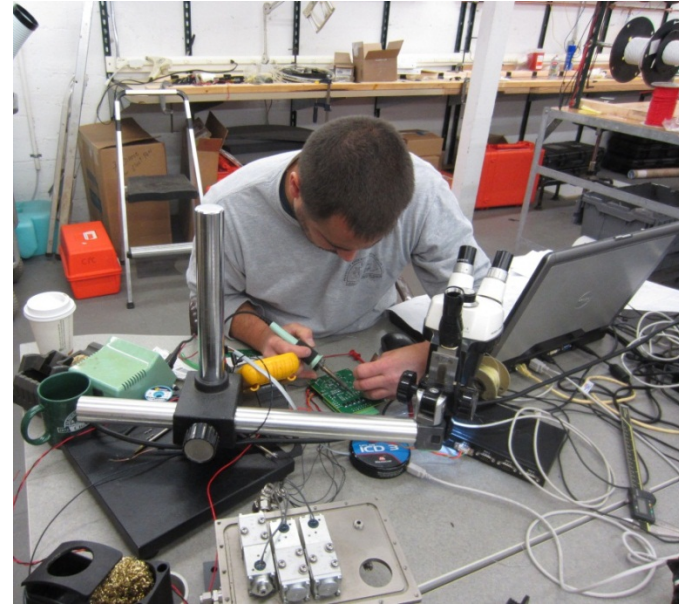
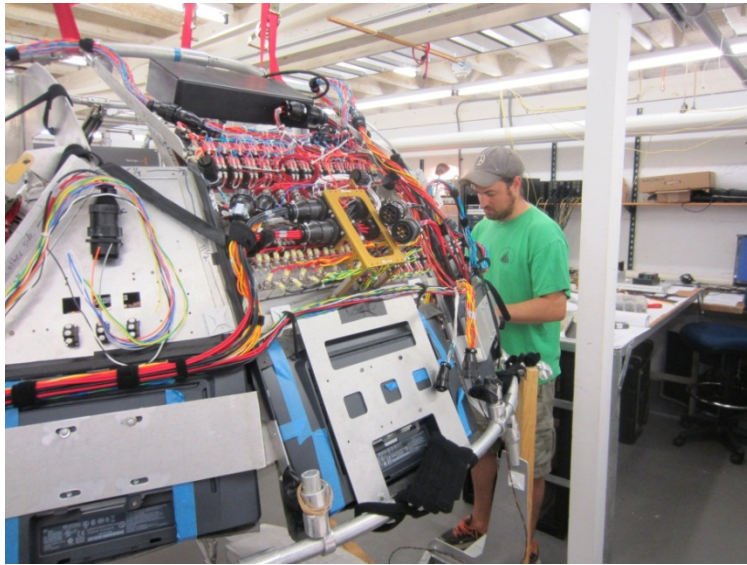


- Shaping complete on 33 of 39 blocks
- New block fit-up 80% complete, coating and painting underway
- 6 simple shapes remain for fabrication





# Sphere Mockup Integration

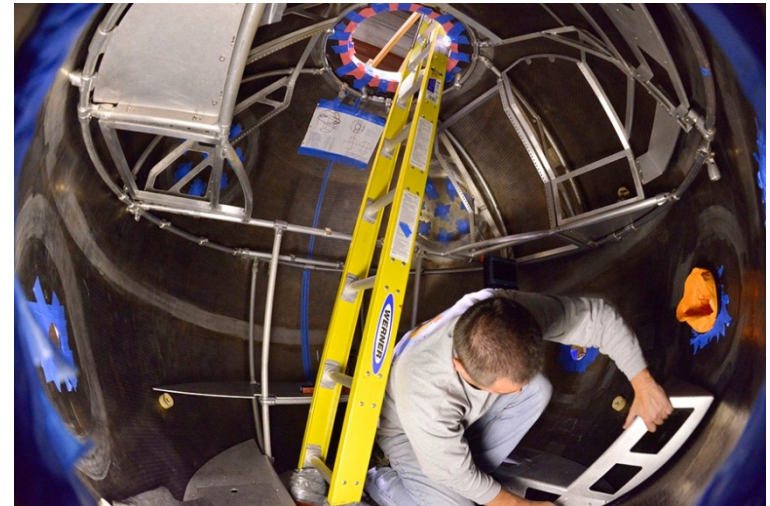




# Status of Other Components



- Command and control system
  - Operations simulation underway
- Cross-decked components
  - Serviced and installation underway
- Sphere interior
  - Birdcage installed
  - Component transfer begins 12/8/12
- Pressure housings
  - Fabrication complete mid-December
- Imaging and illumination
  - Chassis assembled, tested
  - LED lights and most cameras delivered
- Power and data chassis
  - Assembly complete
- Sail, skirt and bathtub
  - Completed initial fit-up with the forebody foam shapes



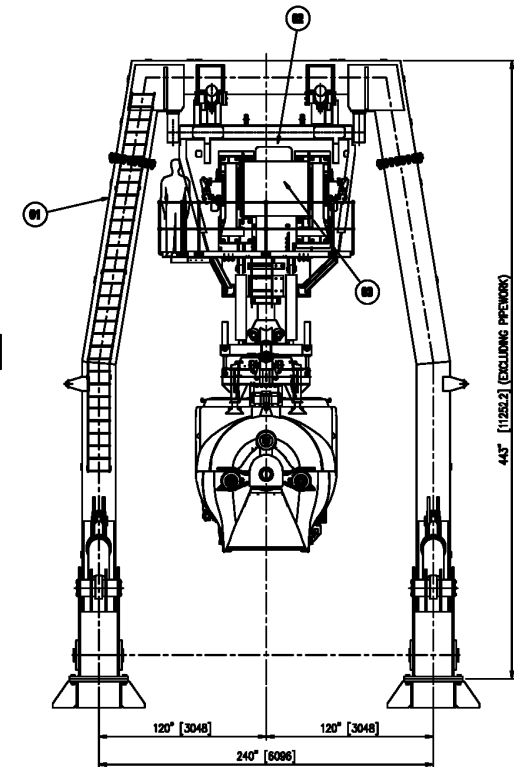


# Launch & Recovery System



## Work Completed:

- A-Frame upgraded
- Deck reinforced under tracks
- Swinging beam upgraded and delivered
- A-Frame & swinging beam tested for 50,000 lb load



## Actions to Complete:

- Dec 2012 - Install swinging beam
- Jan 2013 - Test LARS in shipyard
- Feb 2013 - Complete NAVSEA/ABS surveys



# Science Verification Cruise – May 2013

