

NDSF Facility Update

NDSF NATIONAL
DEEP SUBMERGENCE
FACILITY



NDSF Data Updates:

- **Sealog** - devoting significant effort to modifying Sealog to improve usability and to streamline back-end components to help make future changes easier to achieve.
 - Specific focus on addressing user requests with Sealog interface improvements.
- **NDSF Data Policy** - updated policy to clarify and streamline language.
 - Will be circulated to DeSSC committee members for comment before going public.
- **Data Distributions** - review is well underway and we are working towards a consistent directory structure.
- **Standardization of Data Products** - reviewing across all vehicles and planning to report on at next meeting.
- **Questions? Please get in touch**
ndsf_info@whoi.edu

Sealog

RR2102 > J2-1322 > Replay

FREE_FORM possibly three orifices present on the top of this chimney

guest @ 2021-04-19T00:08:17.134Z

SciCam BrowCam PilotCam IP-SeaCam

Navigation **Replay**

| | | | | | | | | | |
|-------------|--------------------------|-----------|------------------|------------|-------------------|---------------------------|---------------------|---------------------|--------------|
| Time (UTC): | 2021-04-18T19:01:57.192Z | Depth: | -2546.553 meters | Latitude: | 9.9055820 ddeg | Vehicle Temperature Probe | Probe1 Temperature: | 1.86 degC | |
| Latitude: | 9.89690661 ddeg | Altitude: | 3.3 meters | Longitude: | -104.2947872 ddeg | Probe2 Temperature: | -999.99 degC | Probe3 Temperature: | -999.99 degC |
| Longitude: | -104.30033526 ddeg | Heading: | 260.422 deg | Heading: | 98.77 deg | Probe4 Temperature: | -999.99 degC | | |
| | | Pitch: | -8.4 deg | Depth: | 2555.30 meters | | | | |
| | | Roll: | 0.1 deg | Altitude: | 5.94 meters | | | | |

Original Nav Data

Vehicle Temperature Probe

00:00:00 21:28:00

Filtered Events

2021-04-19T00:07:16.419Z <guest>: Imaging Highlights -> highlights: "4K-highlights-start", free_text: "southern chimney group black smoker orifice"

2021-04-19T00:07:31.000Z <jason>: SulisCam -> filename: "/J2-1322/SulisCam/SulisCam.20210419_000731000.jpg"

2021-04-19T00:08:10.000Z <jason>: SulisCam -> filename: "/J2-1322/SulisCam/SulisCam.20210419_000810000.jpg"

2021-04-19T00:08:17.134Z <guest>: FREE_FORM -> free_text: "possibly three orifices present on the top of this chimney"

2021-04-19T00:08:32.000Z <jason>: SulisCam -> filename: "/J2-1322/SulisCam/SulisCam.20210419_000832000.jpg"

2021-04-19T00:08:44.000Z <jason>: SulisCam -> filename: "/J2-1322/SulisCam/SulisCam.20210419_000844000.jpg"

2021-04-19T00:09:17.000Z <jason>: SulisCam -> filename: "/J2-1322/SulisCam/SulisCam.20210419_000917000.jpg"

2021-04-19T00:09:31.934Z <guest>: FREE_FORM -> free_text: "readjusting position so that cameras dont get smoked out"

Event Filter

Text

e.g., SAMPLE

Start Date/Time (UTC)

Stop Date/Time (UTC)

Reset Filter

ASNAAP: Off

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Hardware Upgrades



Cradle replacement

Sidescan Sonar replaced with Edgetech 2205 system

Chassis complete redesign

Datapod Camera hardware upgrade (Done)

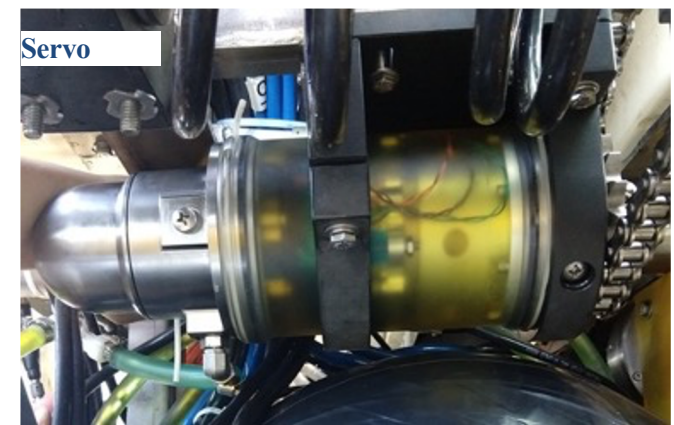
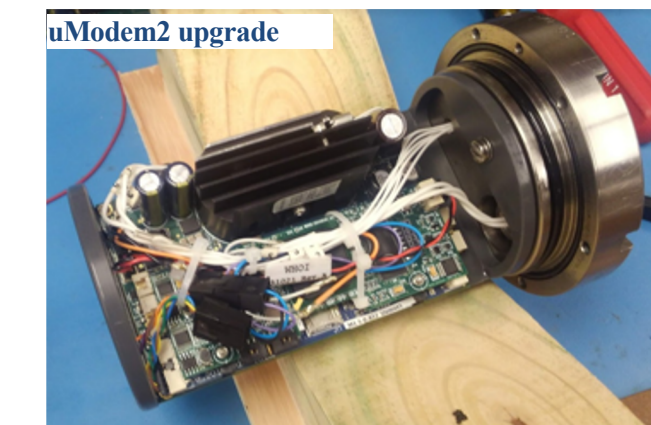
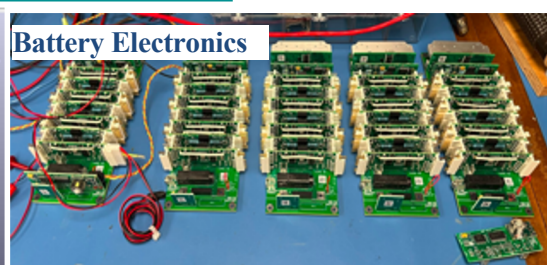
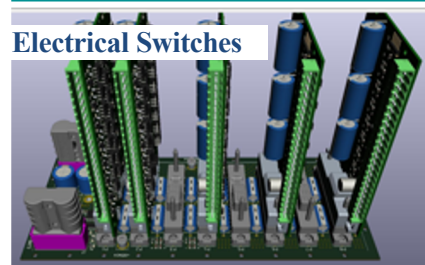
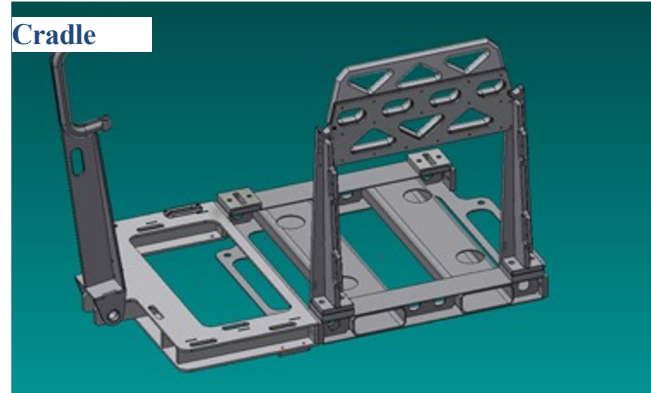
WHOI micromodem upgrade to version 2

SyPRID Electronics upgrades (Done)

Battery replacement - including electronics

DVL integration of Nortek

XR replacement hardware



Software Upgrades



Mission Controller Development (In Progress)

ROS - Based software drivers -Trigger board

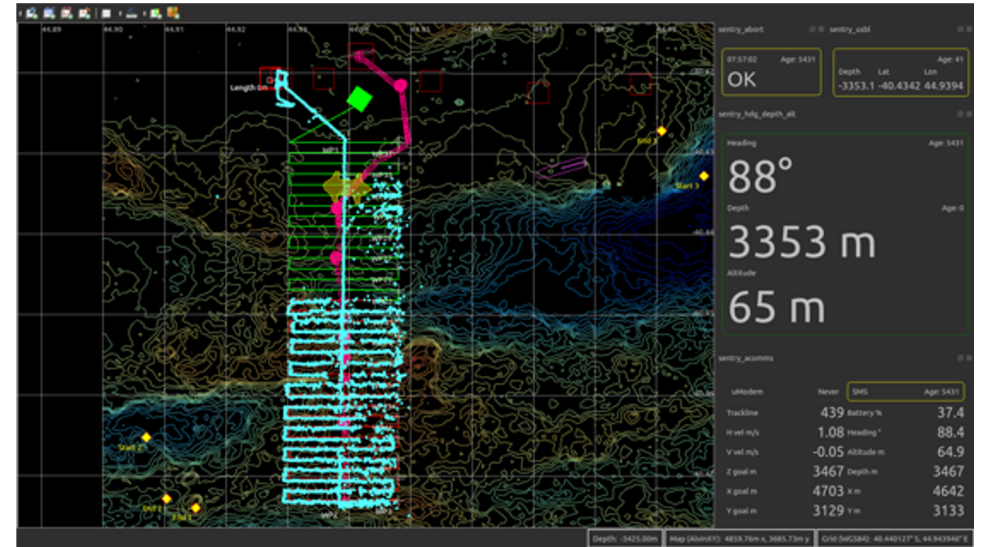
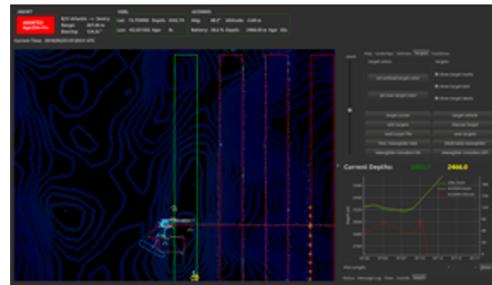
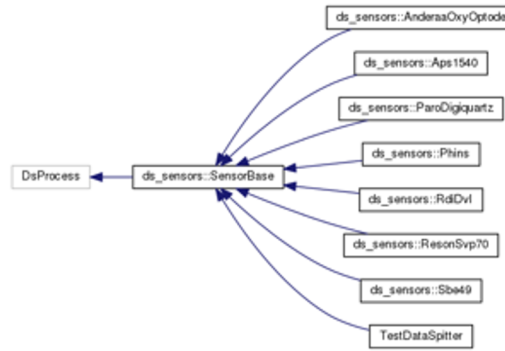
NavG bug fixes and upgrades

ROS Based SyPRID driver

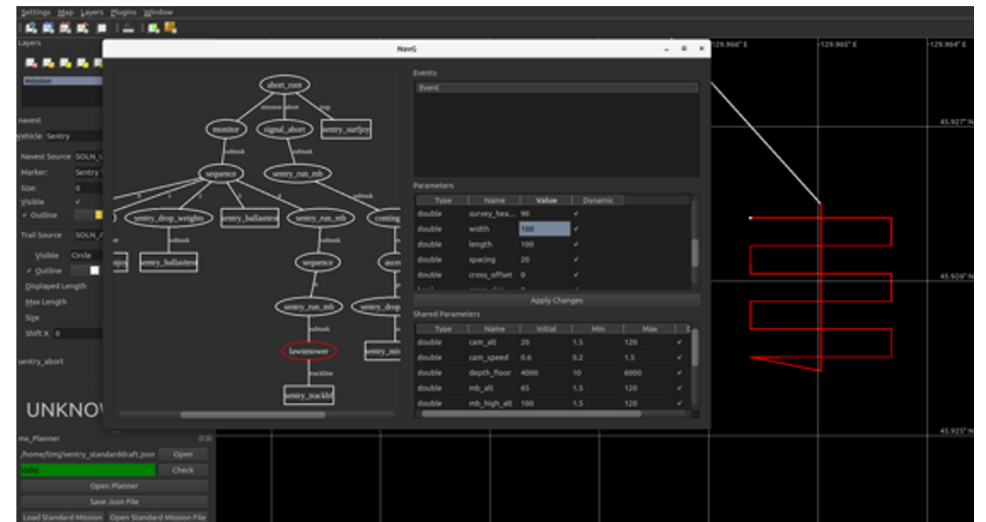
INS development

ROS2 distribution upgrade

COEX NOAA funded project tested at sea (real time data)



ROS

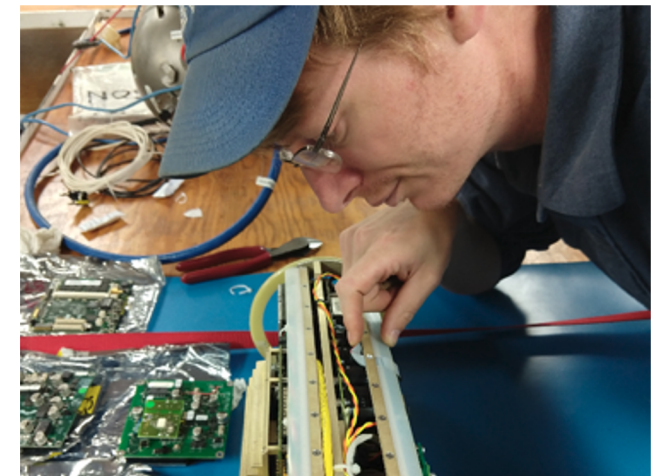


Sentry Staffing Update



Team Members

Sean Kelley - program manager
Justin Fujii - Completed first cruise as EL
Zac Berkowitz - At sea electrical support/EL
Stefano Suman - At sea software support
Mike Skowronski - At sea and on shore EE support
Isaac Vandor - continued software support Software engineer
Matt Silvia - Mechanical Engineer
Amanda Sutherland - Mechanical Engineer
Joe Garcia - Software Engineer
Renee Gruner-Mitchell - Summer 2021 Intern



Jason update: Staffing

- Lost participants to COVID and retirement
- Added 2021
 - Jeremy Paulus, contractor prior WHOI engineer, mechanical
 - Peter Hall, ProteQ contracting firm, mechanical
 - Gabby Inglis, OET, electrical/Nav
 - Tom Lanagan, WHOI engineer, mechanical
 - Ronnie Whimms, move from WHOI Marine dept., mechanical
- Several new participants for 2022
 - Megan Bechant, WHOI facilities
 - Stephen Murray, WHOI facilities
 - Brian Kelley WHOI OOI
 - Isaac Vandor WHOI Sentry
 - Amanda Sutherland WHOI Sentry
 - Tom Trudel Contractor
 - 2x Mate interns
 - UH ROV ops member TBD
 - Proteq
- Alvin participants not available in 2021/22
- Section leads assigned for each expedition **pcar 2018**

Jason LARS Maintenance at NQSF

- WHOI built new maintenance and storage facility for Jason LARS equipment
- Numerous hardware and software upgrades in the Rapp power van



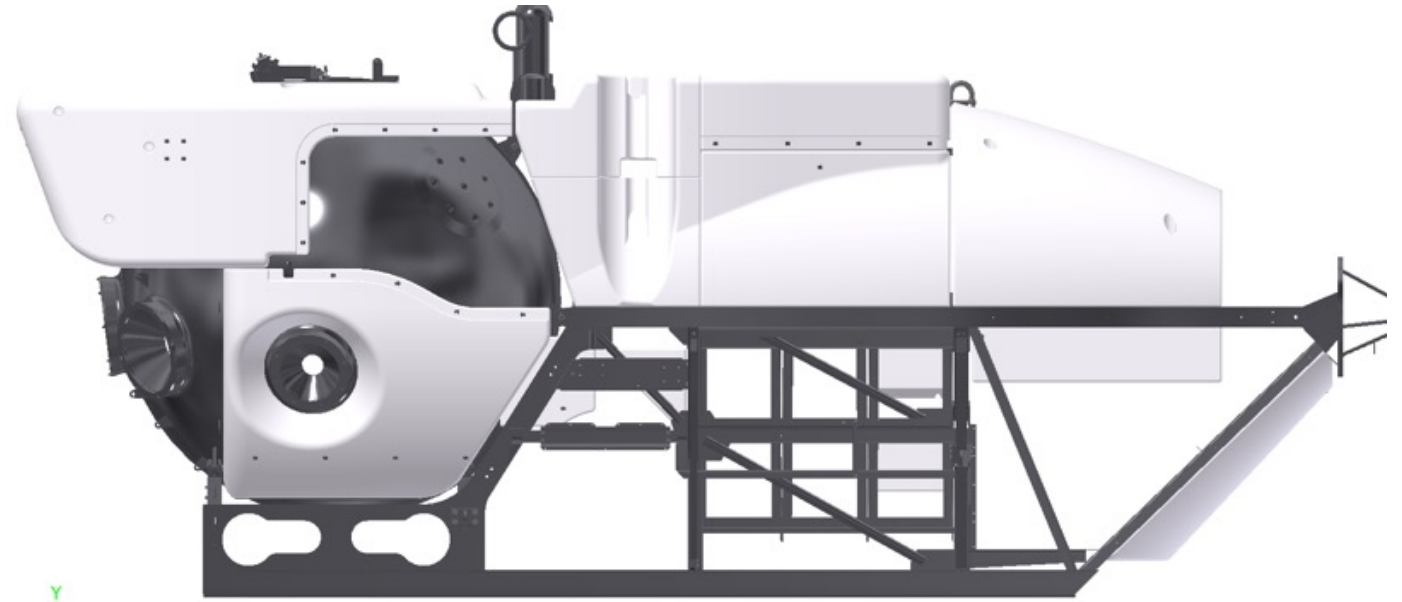
DSV Alvin



2021 Sea Trial Events

| | |
|----------------------------|--|
| 10/28/21 – 10/31/21 | Tethered Trim Dives (Dives 5066-5068) |
| 11/1/21 | Inclining Experiments (Dive 5069) |
| 11/2/21 | Harbor Dives (Dive 5070) |
| 11/3/21 – 11/13/21 | Ocean Trials (Dives 5071-5075) |
| 11/11/21 | First foam crack identified (Dive 5074) |
| 11/12/21 | DFS 025-21 Approved resuming manned operations |
| 11/13/21 | Additional foam cracks identified (Dive 5075) |
| 11/14/21 | Sea Trials Suspended |
| 11/22/21 | Incident Report 005-21 provided to NAVSEA |
| 11/29/21 | DSV ALVIN returns to Woods Hole, MA |

- 20 individual pieces
- 10 pieces are either new or modified during most recent overhaul
- 1/3 of the total weight of Alvin is syntactic foam
- 332 cubic feet



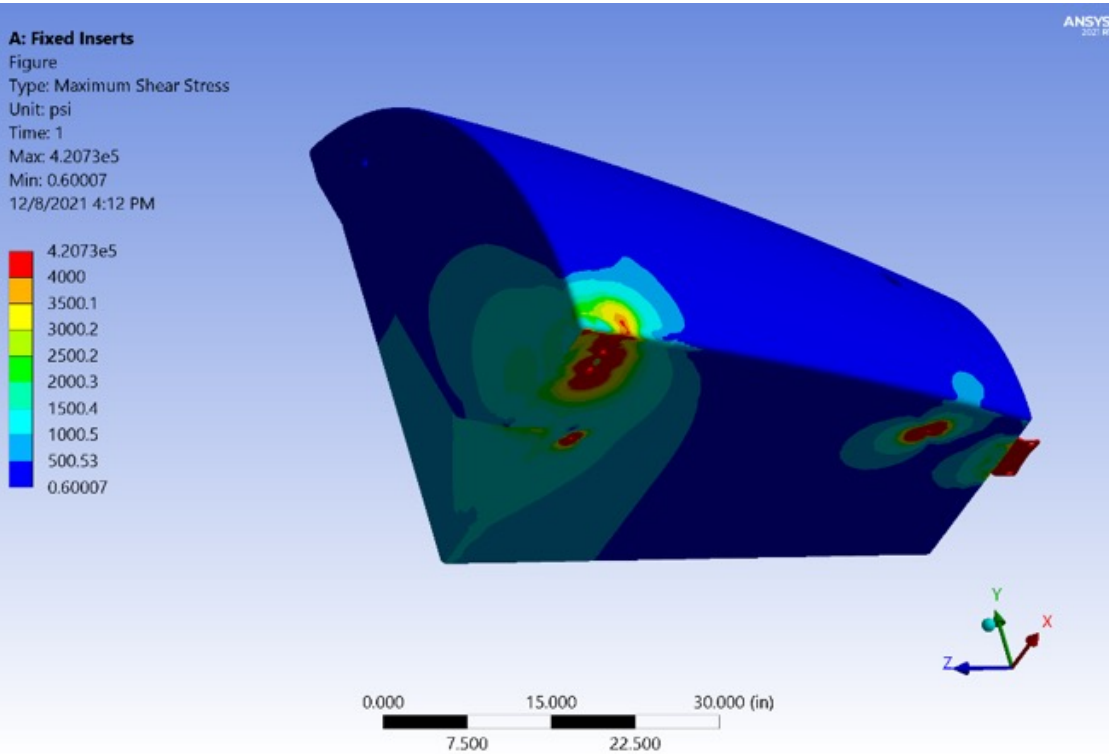
Root Cause Evaluation

Non-uniform Loading of Syntactic Foam Material

Multiple fixed mounting points introduces shear stresses
Syntactic foam has limited tolerance for shear stress

Action: New formal requirement to allow foam dimensional change at depth

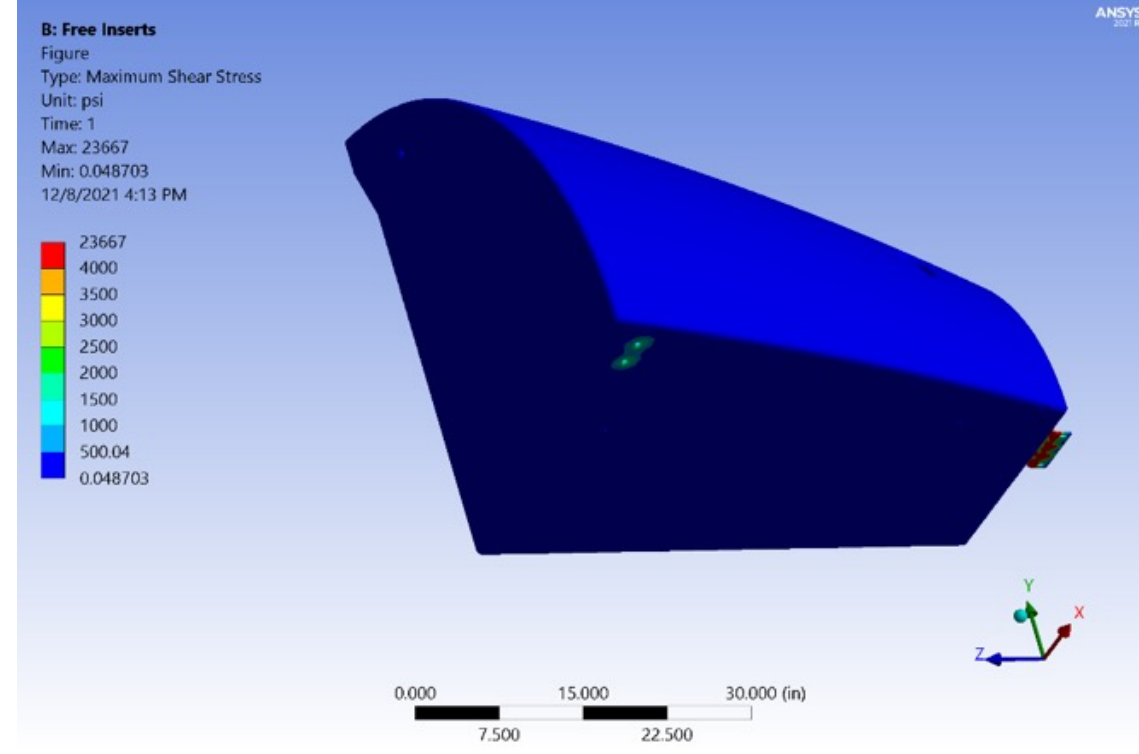
Major Upper Aft FEA Summary Report



Shear Stress, existing

- Shear >4000 psi at forward inserts extends around block corner
- Shear >2000 psi seen in extended area

High stresses are indicated in area where damage has occurred



Shear Stress, modified

- Areas of high shear stress eliminated

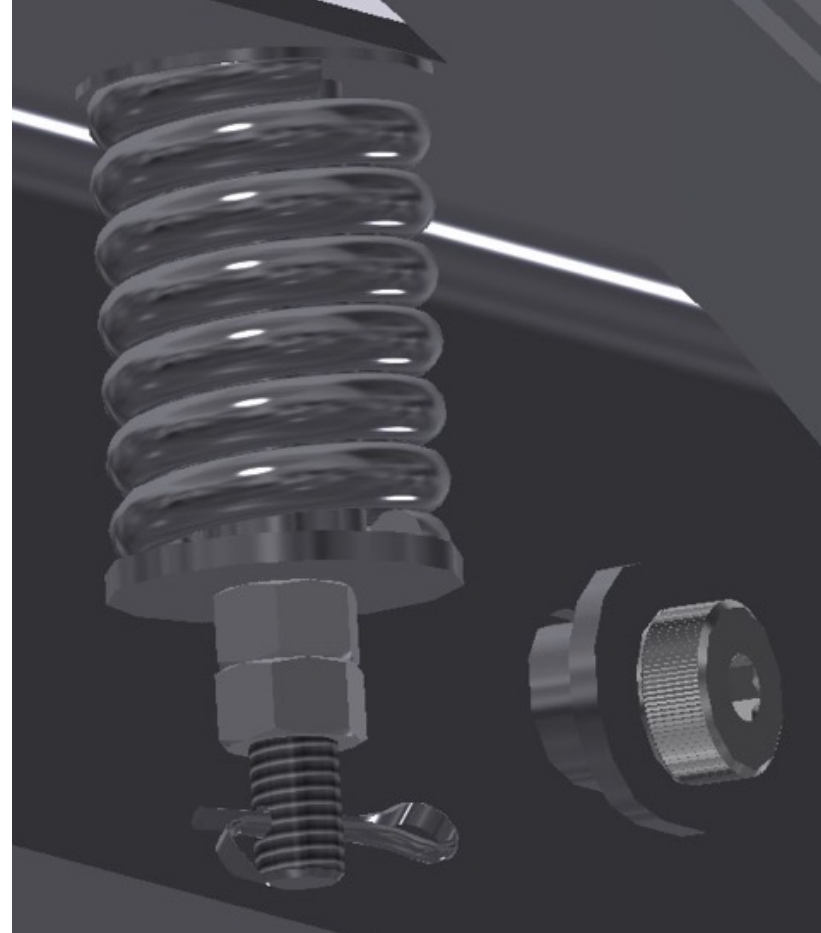
Corrective Actions

- Choose fixed point for blocks to “shrink” towards and modify all other attachment locations to provide necessary D.O.F
- Similar design concepts used in most locations
 - ✓ Slide bearings
 - ✓ Tie-Rod springs/counterbores
 - ✓ Removing redundant fasteners

Syntactic Mounting Modifications

Tie Rod w/Spring

- Reduces tie-rod 'slack' and overloading at attachment points
- Transfers buoyancy forces and accelerations to the frame



Shoulder Bolt w/Bearing

- Combines slot and shoulder bolt for 1-2 degree of freedom)
- Reduces stress to acceptable levels

Steps to complete

- ~~• Determine Root Cause~~
- ~~• Develop Concept designs~~
- ~~• Detailed Designs~~
- ~~• Perform Attachment Calculations and Revise designs accordingly~~
- ~~• repair~~
- Submit designs for NAVSEA Review
- Modify/fabricate/order parts
- ~~• Assemble~~-----

Return to Service

| | |
|-------------------|----------------------------------|
| 11/29/21 - 4/1/22 | Foam Repair at ESS |
| 2/11/22 | Foam Analysis Complete |
| 2/11/22 - 4/15/22 | ECAs submitted to NAVSEA |
| 2/14/22 - 5/6/22 | ALVIN Reassembly |
| 5/20/22 | NAVSEA Survey |
| 5/27/22 | Authorization for Crewed Testing |
| 6/21/22 | Load on RV Atlantis |
| 7/5/22 | Depart for Sea Trials |
| 7/24/22 | Science Verification Cruise |

Questions?

Jason system upgrades: 4K Camera

- Subsea Sulis Z70 4 k (highest quality subsea cam available at time of purchase) [pcar 2019](#)
- Provides both stills and video in one camera [pcar 2018](#)
 - Faster still storage in still mode
 - Possible to capture stills in video mode with delay
- Full res 4 k recorded in highlights and HD 24/7
- Stills in full res to separate hard drive
- Sulis H264 recorder image color was off in post processing. Adding post dive check performed by science party. Also testing (current cruise) a prototype recorder which would eliminate splitters. [pcar 2020](#)
- Redesigned GUI with P&T control integral [pcar 2018](#)
- Replaced Super Scorpio [pcar 2017](#)
- Connector oil leak on demo unit replaced by Jason connector on final unit [pcar 2018](#)

Jason system upgrades

- Addressing ICL and temp probe reliability issues [pcar feb 2022](#)
- Providing more manipulator training and practice with ODI connectors to assure ease of connections [pcar 2018](#)
 - Purchased topside controller and built HPU for at WHOI manip training [pcar 2018](#)
 - ODI connector problems have been identified in other industries
 - Working with RCA personnel to assure implementation of all possible solutions (from industry) to avoid ODI issues
- Rapp winch and NPC crane had annual maintenance to address level wind and general upkeep concerns [pcar 2019](#)
- Implemented elevator tracking to prevent loss if weather prevents immediate recovery [pcar 2018](#)
- Weather limits have been reviewed with Els, must consider personnel, equip safety, PIs have strong driver to maximize dive time, Els are trained to make a safe weather call. These are at odds. [pcar 2019](#)
- MRU data and Commanders weather being used to assist EL in weather call. [pcar 2019](#)
- Used Vessel MRU on one cruise for Active Heave and weather
- Successful 12/12 ops on RCA cruises, pursuing 12/12 on other cruises [pcar 2019](#)

ALVIN Syntactic Floatation Timeline

- **11/11/21 Dive 5074 (3550m)**

Post-dives revealed cracking on Lower Aft Block

DFS 025-21 approved allowing resumption of dive operations

- **11/13/21 Dive 5075 (5338m)**

Post-dive inspections revealed cracking on 6 of 20 foam blocks

Lower Aft Block

Mid-Ship Mid-Forward Block

Major Aft Block

Mid-Aft Block

Tail Block

Starboard Major Mid-Ship Block