Office of Naval Research

Report to the UNOLS Annual Meeting
November 30, 2016
Arlington, VA

New Chief of Naval Research (CNR)

Rear Admiral David J. Hahn
Chief of Naval Research
Director, Innovation Technology Requirements, and Test and Evaluation

http://www.onr.navy.mil/en/About-ONR/Leadership/Chief-Naval-Research.aspx

THE ONR RESEARCH FLEET

Retired 2014 – Transferred to Mexico May 2016

R/V Knorr (AGOR-15)
Woods Hole Oceanographic Institution
To be relieved by R/V Neil Armstrong

Delivered Sept 2015

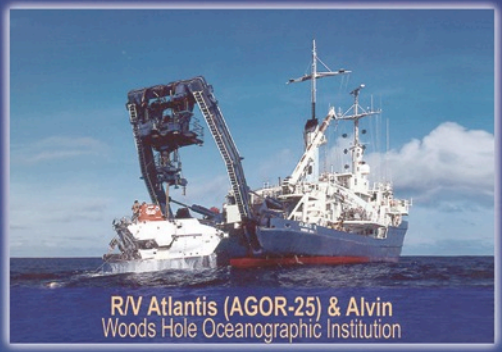
R/V Neil Armstrong (AGOR-27)
Woods Hole Oceanographic Institution
Christening 29 Mar 2014
Delivery Jan 2015

Delivered Jul 2016

R/V Sally Ride (AGOR-28)
Scripps Institution of Oceanography
Christening 9 Aug 2014
Delivery 2015

Retired 2014- Transferred to Philippines May 2016

R/V Melville (AGOR-14)
Scripps Institution of Oceanography
To be relieved by R/V Sally Ride



R/V Atlantis (AGOR-25) & Alvin
Woods Hole Oceanographic Institution

2016 Operations:

- ***Atlantis : 279 days; 45 Navy; Feb Shipyard***
- ***Revelle: 303 days; 110 Navy; Nov-Jan Shipyard***
- ***Thompson: 126 days; 20 Navy; June-Dec Mid-Life***
- ***Kilo Moana: 183 days; May-Nov Propulsion upgrade***
- ***Armstrong: 187 days: 72 Navy; 2 Shipyards & SVC***
- ***Ride: Delivery July; 105 days; 88 Navy; SVC***
- ***Flip: 15 days Navy***

2017 Operations (preliminary estimates):

- ***Atlantis 299 days; Revelle 293; Thompson 114; Kilo Moana 244; Armstrong 243 ; Ride 198; Flip 76***

Propulsion Control System Upgrade 2016

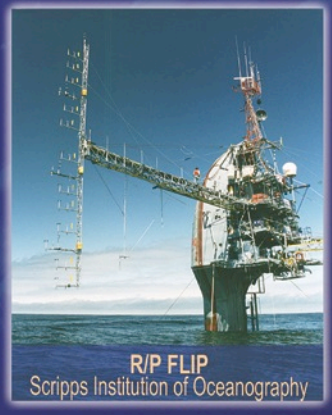
R/V Kilo Moana (AGOR-26)
University of Hawaii

Mid-Life Refit 2017-2018

R/V Thomas G Thompson (AGOR-23)
University of Washington

Mid-Life Refit 2018-2019

R/V Roger Revelle (AGOR-24)
Scripps Institution of Oceanography



R/P FLIP
Scripps Institution of Oceanography

New Ocean Class Research Vessels

AGOR 27 Neil Armstrong (Woods Hole) – AGOR 28 Sally Ride (Scripps)

Transition to Full Operations

- After Delivery both ships conducted shakedown cruises, deep water winch testing, sea acceptance testing (SAT) of acoustic systems and Science Verification cruises.
- Science Verification cruises (SVC) are "dress rehearsals" with experienced sea-going scientists conducting normal science operations and providing feedback.
- *Neil Armstrong* started normal science operations in May 2016 including an expedition to the North Atlantic and Iceland.
- SVC cruise u/w now to verify operations with the *Jason* ROV system and next year for Jumbo Piston Coring.
- *Sally Ride* completed JMS Inspection and designation as a UNOLS vessel. First Science Cruise (CALCOFI) successfully completed.

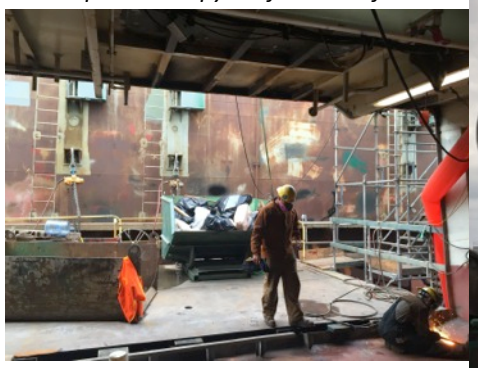
Neil Armstrong Winch Testing

Sally Ride Testing Main Crane

AGOR-23 Class Mid-life Refit - Overhaul

- AGOR-23 Class R/Vs (*Thompson, Revelle, Atlantis*) are beyond the mid-point of their 30 year service lives
- Mid-life overhauls will address regulatory requirements, obsolescence, upgrade/ replace problematic systems, and to extend the service lives of the vessels beyond 30 years
- Design work completed Jul 14 for *Thompson*; shipyard selected Aug 15; *Thompson* overhaul June 2016- July 2017 in Seattle at the Vigor shipyard
- Planning for 2018 overhaul of AGOR 24/*Roger Revelle* has begun.
- Funds permitting, we are anticipating a late 2019 overhaul project for *Atlantis.*
- Overhauls should extend the service life of these ships by 10-15 years.

Thompson in Shipyard for Mid-Life



Kilo Moana Upgrades

- Replace outdated and un-supportable Propulsion Control and Generator Control Systems
  - New Switchboard Components
  - New Bow Thruster Drive
  - Update to Propulsion Drives
  - New Filters
  - New Automation and Alarm System
  - Upgrade to DP system
  - New ECDIS System

Technical Enhancement on ONR Vessels

- New Vessels (Armstrong & Ride)
  - Deep and Shallow Water Multi-beams
  - Multiple ADCP frequencies (38, 75, 300 kHz)
  - EK80: 5 frequencies – a lot of interest in this
  - HiPaP and multiple, additional transducer wells
  - Multiple Ship/Shore Comm paths
    - Ride: Multiple Hi Seas Net antennae, FBB
    - Armstrong: Hi Seas Net, FBB, Fleet Express
- Older Vessels (as part of Mid-Life refit)
  - Thompson: EM302, Labs, OTS gear, Instrument well
  - Revelle: planning new EM712, HDSS upgrade, Gondola for improved Multi-beam performance, and TBD
  - Atlantis: TBD
  - Kilo Moana: improvements to CTD handling system?

Neil Armstrong – North Atlantic

Sally Ride off San Diego

Science Verification Cruises (SVC)

- ONR provided support for a thorough preparation of R/V *Neil Armstrong* and R/V *Sally Ride* prior to the commencement of funded science operations.
  - *Neil Armstrong*
    - *Phase III shipyard installation of Mission Equipment – funded by NAVSEA and ONR*
    - *Two Shakedown/Sea Acceptance Test Cruises involving the UNOLS MAC, UHDAS support, Kongsberg and Radiated Noise Testing at the Navy Range in the Bahamas. 15 days at sea.*
    - *Six separate Science Verification Cruises led by Tammi Richardson, Reide Corbett, Andy Armstrong, Tim Shank, Rob Evans and Gareth Lawson. Total of 45 days at Sea.*
    - *Inspection by JMS with participation by ONR and NAVSEA/PMS325*
  - *Sally Ride*
    - *Phase III shipyard before delivery with support by ONR and NAVSEA*
    - *Four shakedown cruises (includes transit to San Diego) 21 sea days.*
    - *Five SVC cruises led by Bill Hodgkiss, James Wilkinson, Bruce Appelgate, Sophia Merrifield & Madeleine Hamann. 31 sea days.*
    - *JPC SVC scheduled for next year led by Mitch Lyle – 9 days.*
    - *Other SVC and SONAR Characterization potentially scheduled.*

Feedback from Science Verification Cruises (SVC)

- CTD Handling System
  - *RIDE: "Heavy winds and seas shook us up mid week. All deployments were cancelled during this time except for CTD deployments with the handling system, which functioned VERY well in the heavy seas, (40 knot winds, 15-20 seas).* ***CTD Handling system/Arm:*** *Going very smoothly. In very rough weather with high seas the arm performed well and deployed CTD Rosette easily in an otherwise "cancelled" deployment situation by any other means."*
  - *ARMSTRONG: "The automated Launch And Recovery System improves safety but limits the height of the CTD rosette and required a re-design of the deployment strategy for the NSF shared-use Digital Auto Video Plankton Recorder system. This arrangement worked well for the present cruise but the height issue could be a limitation for other instruments."*
- *Work Deck and A-Frame/Crane*
  - *Work Deck was larger than expected and worked well with the crane and A-Frame for mooring deployments and recoveries on OOI cruises from ARMSTRONG and for acoustic moorings from RIDE.*
  - *ROV and AUV deployments were successfully carried out on ARMSTRONG using the UCONN KRAKEN ROV and various AUVs. Further tests including with JASON are scheduled on RIDE this week and later this year.*

Feedback from Science Verification Cruises (SVC)

- Acoustic Systems
  - *PI's are enthusiastic about the wide range of systems available: 2 Multi-beams (EM122 & EM712); 3 ADCPs (38, 75 or 150, & 300 kHz); Knudsen 12 kHz Single Beam and 3.5 kHz Chirp sub-bottom profiler; EK 80 five frequency fisheries SONAR (18, 38, 70, 120, 200 kHz); HiPAP through hull unit with HiPAP transducer on RIDE and SONARDYNE transducer on ARMSTRONG for acoustic navigation and tracking.*
  - *Some interference between these systems and with the bridge systems has been recorded. In some cases the installed K-Sync system can make it possible to use more than one system at a time, however there are some systems that require extra care to synchronize or are just not capable of synchronization (Such as the bridge systems).*
  - *Some issues with bubble sweep down has been reported, particularly when headed into any seas at all. (this might be mitigated by increasing the draft with the fixed ballast plan (see later slide).*
  - *Propeller cavitation inception occurs around 7-8 knots and may have some negative impact at deeper depths.*
  - *Overall, SONAR self noise and radiated noise is excellent in calm seas. Testing of ARMSTRONG on Navy Range shows the ship meets ICES radiated noise curve at 8 knots and meets the OCEAN CLASS specification at 10 knots.*

Feedback from Science Verification Cruises (SVC)

- Ship is too light
  - ARMSTRONG and RIDE were delivered with an unconsumed weight estimate margins of about 140 long tons along with a science payload capacity of 250 long tons and service life margin of 146 long tons.
  - In other words, for a more typical science load of 40 to 75 tons, the ship would be over 300 tons lighter than designed, not counting the service life margin of 146 tons
  - Because of this the vessels are not able to operate at the design draft of 15'-0" with a typical science payload. This has resulted in the current operational practice of maintaining pressed ballast tanks at all times. This does not allow for voyage management of trim and draft as fuel is burned.
  - The vessels have reported problems with dry seawater intakes, crew comfort, trim management, and transducer performance due to inadequate draft.
  - During the current Post Shakedown Availability (PSA) ARMSTRONG will have 310 long tons of fixed ballast installed which will allow for operating at or near design draft without starting a cruise with fully pressed up ballast tanks. This will allow for better draft and trim management over the course of a cruise.
  - Desired outcomes beside better ballast, draft and trim management include:
    - Better bubble sweep down performance
    - Better seakeeping (less ship movement in light seas)
    - Possible improvement in cavitation issue
    - No loss of sea-suction by the science seawater system.
  - Testing after the PSA shipyard will verify effectiveness prior to implementing on RIDE.

Feedback from Science Verification Cruises (SVC)

- Telecommunications:
  - Both ships are equipped with the necessary hardware for excellent data and voice communications including telepresence. Results from SVC cruises are mixed as the software and network protocols are worked out to make the best use of these systems.
- Various other issues being addressed
  - Slight modification to anchor handling system.
  - Labs were subject to water intrusion from wet decks when boarding seas. PSA work on ARMSTRONG and Pre-Delivery work on RIDE undertaken to mitigate these issues, including closing off roller door to Wet Lab, better seals for water barriers and doors on ARMSTRONG, Water tight door from Hanger Bay to Wet Lab on RIDE, increased deck drains on ARMSTRONG, closing off large openings in bulwarks adjacent to Wet Lab and Hanger Bay.
  - Sheltered space for CTD servicing and water sampling: Originally conceived as inside the Wet Lab, but in-sufficient clearance and space prevents this from being acceptable. ARMRSTONG PSA includes building a CTD Hanger Bay just forward of the CTD overboarding station. Depending on effectiveness this could be implemented on RIDE or CTD station could be shifted to aft starboard side handling arm using Hanger Bay as CTD hanger.
  - Heavy Lift on the Starboard (or Port Side): The only capability for this provided by the construction yard was using the large crane with a crutch, which has proved to be un-workable. Examining alternatives such as a re-moveable A-Frame to be used with the Traction Winch wires and Cables. For now, Piston Coring and larger towed vehicles will use the stern A-Frame.

Other Issues to Discuss/Consider

All aspects of our new ships are computer, PLC, PLU driven

- Upgrades of older ships are resulting in similar configurations and challenges/demands!
- Are we (Feds, institutions and UNOLS) adequately supporting both ship and science technical requirements?