

ACADEMIC RESEARCH FLEET**\$77,800,000**
-\$8,080,000 / -9.4%**Academic Research Fleet**

(Dollars in Millions)

FY 2016 Actual	FY 2017 (TBD)	FY 2018 Request	Change over FY 2016 Actual	
			Amount	Percent
\$85.88	-	\$77.80	-\$8.08	-9.4%

The U.S. Academic Research Fleet (ARF) included 18 vessels in calendar year 2016 with the Office of Naval Research (ONR) delivering two new ocean class vessels into the fleet. The vessels in the ARF range in size, endurance, and capabilities, enabling NSF and other federally and state-funded scientists to conduct ocean science and technology research with a diverse fleet capable of operating in coastal and open ocean waters. Funding for ARF includes investments in ship operations; shipboard scientific support equipment; oceanographic instrumentation and technical services; and submersible support. Funding levels reported here reflect investments in the Directorate for Geosciences (GEO) by the Division of Ocean Sciences (OCE). In addition to operations, OCE has undertaken selected construction projects based on inter-agency planning and coordination as discussed in the *Federal Oceanographic Fleet Status Report*¹ published in May 2013.

Total Obligations for the Academic Research Fleet

(Dollars in Millions)

	FY 2016 Actual	FY 2017 (TBD)	FY 2018 Request	ESTIMATES ¹				
				FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Operations & Maintenance	\$82.79	-	\$77.80	\$77.80	\$77.80	\$77.80	\$77.80	\$77.80
Fleet Modernization								
Regional Class Research Vessel	3.09	-	-	-	-	-	-	-
Total, Academic Research Fleet	\$85.88	-	\$77.80	\$77.80	\$77.80	\$77.80	\$77.80	\$77.80

¹ Outyear funding estimates are for planning purposes only.

ARF serves as the main platform for the collection of data, testing of hypotheses about the structure and dynamics of the ocean, and the development and testing of novel technological instrumentation. Scientists contribute to advances in many areas including climate variability, marine ecosystems, fisheries, and ocean-related natural hazards, such as tsunamis, through use of these facilities. Participating graduate and undergraduate students interact with scientists and marine technicians, enabling them to gain first-hand exposure to ocean science field research. Increasingly, technological innovations allow research conducted at sea to be transmitted via satellite back to the classroom, broadening the educational impact of the vessels.

ARF is supported through an interagency partnership, principally with the Office of Naval Research (ONR) and the National Oceanic and Atmospheric Administration (NOAA). The operating costs for the fleet are divided proportionally among the vessel users based on usage; in CY 2016 NSF supported approximately 64 percent of the total, which includes the Ocean Observatories Initiative's use of the fleet. NSF coordinates with ship-operating and ship-user academic institutions both directly and through the University-National Oceanographic Laboratory System (UNOLS) organizational structure.

Support for scientists using the fleet is provided by NSF and other federal and state agencies. Within NSF,

¹ www.nopp.org/wp-content/uploads/2010/03/federal_oceanographic_fleet_status_report.pdf

science is funded through competitive peer-reviewed proposals, most typically funded within OCE and through selected programs in the Division of Earth Sciences (EAR), the Division of Atmospheric and Geospace Sciences (AGS), the Office of Polar Programs (OPP), and the Directorate for Biological Sciences (BIO). Approximately 25 percent of OCE proposals request ship time. Not reflected in this number is the science that utilizes samples or data collected on prior cruises, scientists piggy-backing on scheduled cruises to accomplish additional science, international scientists sailing with the U.S. Academic Research Fleet, and science funded by other agencies.

The FY 2018 funding level will support approximately 1,675 ship operating days, which reflects the entry of R/V *Neil Armstrong* and R/V *Sally Ride*, the two new vessels delivered by ONR in 2016, into the fleet.

Fleet Operations/Management and Oversight

- Oversight: NSF provides oversight to the Academic Research Fleet through cooperative agreements with each ship-operating institution and through a separate cooperative agreement with the UNOLS Office. NSF is the cognizant agency for ship day-rate negotiations for ARF, regardless of owner. In addition, NSF oversees the fleet through Business Systems Reviews, site visits, ship inspections, and participation at the UNOLS Council and various Committee meetings by NSF program directors. Several program directors within OCE at NSF, at NOAA, and at ONR are involved in the activities and oversight of the Academic Research Fleet.
- After an in-depth review of the application of rate structures on ARF ship-related activities, NSF and ONR are in the process of transitioning the accounting of Fleet activities into a Specialized Service Facility in accordance with OMB's Uniform Guidance for Federal Awards 2 CFR 200.468.
- Management: Management of an institution's ship-operating facilities varies with the scale of the operation, but the core responsibility typically resides with the Director of the Institution, the Marine Superintendent (for all aspects of the facility), and the ship's Captain (for at-sea operations). For larger multi-ship-operating institutions, a Chief of Marine Technicians, schedulers, and finance administrators may also be involved in facility management.
- Reviews: Based on projected science requirements identified in recent reports and workshops, a fleet of vessels supporting ocean science and technological research will be needed far into the future. Documents supporting this need include the *National Ocean Policy*² and the *Final Recommendations of the Interagency Ocean Policy Task Force*³ of July 19, 2010. Two applicable reports by the National Research Council (NRC) include *Science at Sea: Meeting Future Oceanographic Goals with a Robust Academic Research Fleet*⁴ published in 2009, and *Critical Infrastructure for Ocean Research and Societal Needs in 2030*⁵ published in 2011. In coordination with UNOLS and the other federal agencies that invest in ocean research, the Interagency Working Group on Facilities and Infrastructure (IWG-FI) published a *Federal Oceanographic Fleet Status Report*⁶ in May 2013, reviewing the status and describing plans for modernizing the Federal Oceanographic Fleet, which includes both the Academic Research Fleet and the survey ships. This report was updated in March of 2016 (http://www.nopp.org/wp-content/uploads/2016/06/federal_fleet_status_report_final_03.2016.pdf). In January 2015, the National Academy of Sciences Report *Sea Change 2015-2025 Decadal Survey of Ocean Sciences*⁷ identified the U.S. Academic Research Fleet as having "the strongest match between current infrastructure and the decadal science priorities" and emphasized the overall importance of

² https://obamawhitehouse.archives.gov/sites/default/files/national_ocean_policy_implementation_plan.pdf

³ https://obamawhitehouse.archives.gov/files/documents/OPTF_FinalRecs.pdf

⁴ www.nap.edu/catalog/12775/science-at-sea-meeting-future-oceanographic-goals-with-a-robust

⁵ www.nap.edu/catalog/13081/critical-infrastructure-for-ocean-research-and-societal-needs-in-2030

⁶ www.nopp.org/wp-content/uploads/2010/03/federal_oceanographic_fleet_status_report.pdf

⁷ www.nap.edu/catalog/21655/sea-change-2015-2025-decadal-survey-of-ocean-sciences

ships in all of the NAS-identified ocean science and technology priorities. Ship operations and technical services proposals undergo external review by peers every five years. Detailed annual reports describing activities accomplished are provided by the operating institutions and budgets are negotiated yearly since they are dependent on the number of days the ships will be at sea in support of NSF-funded research programs. A Business Systems Review of one Academic Research Fleet operating institution was conducted in 2016.

Fleet Modernization

- Oversight: The NSF coordinator for fleet modernization activities is the Program Director for Ship and Submersible Support, within the Integrative Programs Section (IPS) in OCE, with additional IPS staff providing project management assistance as required.
- Regional Class Research Vessel (RCRV): In March 2012, NSF leadership approved the request to advance the RCRV to the Conceptual Design Review (CDR) phase as a candidate Major Research Equipment and Facilities Construction (MREFC) project. On February 1, 2013, NSF made an award to Oregon State University (OSU) as the lead institution for advancement to CDR. Funds for CDR were provided from the Research and Related Activities (R&RA) account. In December 2013, OSU successfully completed all CDR requirements in accordance with NSF's Large Facilities Manual.⁸ Approval for advancement to the Preliminary Design Phase was provided in March 2014. The Preliminary Design Review (PDR) was held in August 2014. The PDR Panel recommended the project be approved to advance to the Final Design Phase. Initial funds to initiate construction were requested in FY 2017, contingent on continued satisfactory progress by the awardee, the project's consistency with overall NSF goals and strategic direction, and the availability of funds. Personnel from the NOAA Office of Marine and Aviation Operations, as well as ONR, continue to participate in the review of the RCRV design and project management. In addition, NSF is an active participant in the IWG-FI Ship Subcommittee, which developed the 2016 update to the 2013 *Federal Oceanographic Fleet Status Report*. The RCRV would address requirements across government agencies for research vessels in support of ocean science research as discussed in the Fleet Status Report Update of 2016. Decisions on proceeding to further development stages will be based upon NSF, National Science Board (NSB), and interagency reviews. For additional information on RCRV please refer to the MREFC chapter.
- R/V *Sikuliaq*, formerly the Alaska Region Research Vessel (ARRV): The R/V *Sikuliaq* represents NSF's first major contribution to fleet renewal in over twenty years. Construction of the *Sikuliaq* was funded through the MREFC account, partially with American Recovery and Reinvestment Act (ARRA) funds. The project is led by the University of Alaska, Fairbanks (UAF) with engineering support from design through construction provided by UAF's naval architect, The Glosten Associates, Inc. Shipyard construction began in early 2011 and the vessel was successfully launched in October 2012. Delivery of the *Sikuliaq* to UAF took place in June 2014. This was followed by a period of final outfitting, science trials, and transit to the first science operational area. Initial science operations began in late 2014. *Sikuliaq* successfully completed ice trials in the Bering Sea and three science cruises in the Arctic Ocean. All final MREFC project activities were closed out under budget by March 31, 2016.
- Research in the Arctic is needed on topics ranging from natural resources, climate change, ocean circulation, ecosystem studies, and fisheries research, to natural hazards, and cultural anthropology. The *Sikuliaq* provides a sophisticated and significantly larger platform for scientists, as well as graduate and undergraduate students, to participate in complex multidisciplinary research activities and enables the training of the next generation of scientists with the latest equipment and technology. The *Sikuliaq* greatly expands research and technology capabilities in the Arctic, providing up to 270-300 science days at sea annually. The ice-strengthened hull allows the vessel to operate in seasonal ice up to one

⁸ www.nsf.gov/pubs/2015/nsf15089/nsf15089.pdf

meter thick and an anti-roll tank permits it to operate effectively in the open waters of the Bering Sea, Gulf of Alaska, and North Atlantic.

Other Ongoing Activities

Major overhaul and upgrade to the submersible Human Occupied Vehicle *ALVIN* was completed in FY 2013. The *ALVIN* Upgrade project was scoped in two phases. Phase I was the integration of a new titanium 6,500-meter-capable personnel sphere with existing *ALVIN* vehicle components. Phase I completion provided a maximum depth capability of 4,500 meters, the limit of the legacy *ALVIN* components retained during Phase I. Phase II would provide upgrades to permit operations to a depth of 6,500 meters, but there has been no implicit or explicit commitment to proceed with Phase II at this time. Sea trials for operation of the Phase I vehicle in November 2013 supported certification for operations to 3,800 meters, and approximately 100 dives in support of science were made in 2014. Further sea trials to support certification to 4,500 meters were successfully completed in January 2015. *ALVIN* continues to support science missions with approximately 100 dives per year.

Renewal/Re-competition/Termination

Ships supported by NSF are operated by academic institutions, each having a cooperative agreement with NSF. All ship cooperative agreements were renewed in FY 2012 using the NSB-approved criteria and review by an external panel, with upcoming renewals planned for FY 2018. Awardees are subject to additional oversight measures, including quarterly safety and financial reporting, the use of NSF Business System Reviews (BSR), and site inspections. In 2013, NSF retired *R/V Cape Hatteras*, operated by a consortium of Duke University and the University of North Carolina from its homeport at the Duke University Marine Laboratory. In 2014, NSF retired *R/V Point Sur*, operated by Moss Landing Marine Laboratories, San Jose State University. For *R/V Sikuliaq*, a re-compete clause in ten years (2024) was included in the initial cooperative agreement for operations. This clause will be added to all renewals of NSF owned vessels.