

ACADEMIC RESEARCH FLEET (ARF)	\$80,000,000
	-\$5,320,000 / -6.2%

Academic Research Fleet Funding				
(Dollars in Millions)				
FY 2019	FY 2020	FY 2021	Change over FY 2019 Actual	
Actual ¹	(TBD)	Request	Amount	Percent
\$85.32	-	\$80.00	-\$5.32	-6.2%

¹ FY 2019 Actual obligations include \$3.0 million for continuity of operations into FY 2020.

The U.S. Academic Research Fleet included 18 vessels in calendar year 2019. 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 the ARF includes investments in ship operations; shipboard scientific support equipment; oceanographic instrumentation and technical services; and submersible support. Funding levels reported here reflect investments by the Division of Ocean Sciences (OCE) within GEO. In addition to operations, OCE has undertaken construction projects based on inter-agency planning and coordination as discussed in the *Federal Oceanographic Fleet Status Report*¹ published in May 2013. Details on these construction activities are contained in the Fleet Modernization section.

Total Obligations for ARF							
(Dollars in Millions)							
FY 2019	FY 2020	FY 2021	ESTIMATES ²				
Actual ¹	(TBD)	Request	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
\$85.32	-	\$80.00	\$80.00	\$87.17	\$88.80	\$88.80	\$88.80

¹ FY 2019 Actual obligations include \$3.0 million for continuity of operations into FY 2020.

² Outyear estimates are for planning purposes only.

For information on continuity of operations funding, see the opening narrative of this chapter.

The ARF serves as the main platform for the collection of data and testing of hypotheses about the structure and dynamics of the ocean, as well as 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.

The ARF is financially 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 over the past several years, including 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.

Funding for scientists using the Fleet is provided by NSF and other federal and state agencies. Within NSF, science is funded through competitive peer-reviewed proposals, most typically funded within OCE and

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

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through selected programs in the Division of Earth Sciences, Division of Atmospheric and Geospace Sciences, OPP, and 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 ARF, and science funded by other agencies.

The FY 2021 funding level of \$74.10 million will support approximately 1750 ship operating days. During FY 2020 the ONR-owned Global Class R/V *Revelle* will re-enter the Fleet after a one-year mid-life refit and the ONR-owned Global Class R/V *Atlantis* will enter her mid-life refit period which will have a one-year duration. In addition to being a general purpose research vessel, R/V *Atlantis* also serves as the support ship for the Deep Submergence Vehicle (DSV) *Alvin*, which is scheduled to undergo a major refit during the same period R/V *Atlantis* will be out of service. Additional details are included in the Fleet Modernization section below.

Fleet Operations/Management and Oversight

- Oversight: NSF provides oversight of the ARF through mechanisms defined in 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 the ARF, regardless of owner. In addition, NSF oversees the Fleet through Business Systems Reviews, site visits, ship inspections, 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 ARF.
- After an in-depth review of the application of rate structures on ARF ship-related activities, NSF and ONR have transitioned 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 *Final Recommendations of the Interagency Ocean Policy Task Force*² 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*³ published in 2009, and *Critical Infrastructure for Ocean Research and Societal Needs in 2030*⁴ 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*⁵ 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 2016.⁶ 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 closest match between current infrastructure and the decadal science priorities" and emphasized the overall importance of ships in all of the NAS-identified ocean

² www.obamawhitehouse.archives.gov/files/documents/OPTF_FinalRecs.pdf

³ www.nap.edu/catalog/12775/science-at-sea-meeting-future-oceanographic-goals-with-a-robust

⁴ www.nap.edu/catalog/13081/critical-infrastructure-for-ocean-research-and-societal-needs-in-2030

⁵ www.nopp.org/wp-content/uploads/2010/03/federal_oceanographic_fleet_status_report.pdf

⁶ www.nopp.org/wp-content/uploads/2016/06/federal_fleet_status_report_final_03.2016.pdf

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

science and technology priorities. Ship operations and technical services proposals undergo external review by the research community 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.

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.
- Ocean Class Research Vessels: ONR funded the design and construction of two new Ocean Class Research Vessels which have now been fully integrated into the ARF operating schedule. R/V *Neil Armstrong* operated by the Woods Hole Oceanographic Institution replaced the Global Class R/V *Knorr* and R/V *Sally Ride* operated by Scripps Institution of Oceanography replaced Global Class R/V *Melville*.
- Regional Class Research Vessels (RCRV): In March 2012, NSF leadership approved the request to advance the RCRV to the Conceptual Design Review (CDR) phase as a candidate MREFC project. Funds to initiate construction were requested and appropriated in FY 2017. Keel-laying for the first RCRV, which will be operated by Oregon State University and is named R/V *Taani*, was completed in November 2018. Keel-laying for the second RCRV, which will be operated by the East Coast Oceanographic Consortium and is named R/V *Resolution*, was completed in May 2019. The third RCRV is named R/V *Gilbert R. Mason* and will be operated by the Gulf-Caribbean Oceanographic Consortium. Keel-laying for RV *Mason* is planned for Spring 2020. The RCRV will address requirements across government agencies for research vessels in support of ocean science research as discussed in the Fleet Status Report Update of 2016. For additional information on RCRV please refer to the MREFC chapter.
- DSV *Alvin*: The *Alvin* upgrade project consists of two phases:
 - Phase One, completed in 2014, consisted of a major overhaul of all vehicle systems and incorporation of a new titanium personnel sphere, which resulted in continued operation of the submersible at its historic depth rating of 4,500 meters.
 - Phase Two, funded in 2018, with \$6.0 million, will enable operations to 6,500 meters water depth and thus expand the accessible area of operations for *Alvin* from approximately 60 percent of the seafloor to more than 95 percent. It will also enable relatively shallow, mid-water work in places where the water depth currently prohibits operations. The *Alvin* Upgrade Project Team at Woods Hole Oceanographic Institution is working with the Naval Sea Systems Command to design, fabricate, test, and certify all components necessary to complete the upgrade. The primary long-lead item remaining in the schedule is the variable ballast system, which will require design, fabrication, testing and certification of new pressure spheres. This system, as well as new foam floatation and other improvements, will be ready for incorporation into *Alvin* during the overhaul in 2020, concurrent with the mid-life refit of the support ship R/V *Atlantis*.

Renewal/Recompetition/Termination

Ships supported by NSF are operated by academic institutions, each having a cooperative agreement with NSF. All ship cooperative agreements were renewed in CY 2018 using a process including external panel review. All future cooperative agreements for ship operator awards for NSF-owned ships will undergo an open competition every ten years. Awardees are subject to additional oversight measures, including quarterly safety and financial reporting, the use of NSF Business System Reviews, and site visit inspections. In 2018, NSF retired R/V *Clifford A. Barnes*, operated by the University of Washington, which was replaced

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by the R/V *Rachel Carson* purchased by the University of Washington. In 2019, NSF extended the planned retirement date of R/V *Marcus G. Langseth* by one year to September 30, 2021 in order to avoid a hiatus in seismic research opportunities while shifting to a new model of providing access to capabilities comparable to those available via R/V *Langseth*. The focus of the additional period of operations is on providing opportunities for early career scientists to develop their skills, particularly as Principal Investigators.