

ACADEMIC RESEARCH FLEET (ARF)

\$117,880,000
+\$10,500,000 / 9.8%

Academic Research Fleet Funding

(Dollars in Millions)

FY 2020	FY 2021	FY 2022	Change over	
			FY 2021 Estimate	Percent
Actual	Estimate	Request	Amount	
\$106.17	\$107.38	\$117.88	\$10.50	9.8%

Brief Description

ARF currently consists of 18 vessels and various submersibles/autonomous vehicles owned by the National Science Foundation, the Office of Naval Research, and U.S. universities. All the ARF ships and vehicles are operated by research universities and laboratories. The ARF is a subset of the Federal Oceanographic Fleet, with interagency collaboration under the Interagency Working Group on Facilities and Infrastructure (IWG-FI). Coordination of access to and operations of the ARF vessels and vehicles is accomplished through collaboration with the University-National Oceanographic Laboratory System (UNOLS).

Scientific Purpose

The ARF consists of technologically advanced ships and submersibles/autonomous vehicles that enable scientists to conduct research on the complex ocean, seafloor, and sub-seafloor environment, as well as the remote polar regions. ARF vessels collect observational data on Earth systems that provide a foundation for understanding how these systems interact and for improved modeling. Through at-sea sampling and observing, researchers have begun to understand, model, and predict the responses of marine populations to both long-term and episodic changes in ocean conditions.

Status of the Facility

Much of the ARF continues successful operations despite being under strict COVID-19 risk mitigation protocols. In CY 2020, ARF experienced an initial standdown, from March 17—June 30, during which the ships returned to port and crews conducted work that could be accomplished either remotely or under social distancing requirements. UNOLS, working with its medical advisory team, developed a risk-based decision-making process for returning the fleet to service. A strict protocol, including extensive testing and isolation requirements for the crews and science parties, was adopted. Although many planned cruises were necessarily deferred because of COVID-19 travel restrictions; ARF was able to safely accomplish approximately 50% of the originally planned work. In addition, crucial activities such as the mid-life refit of the R/V *Atlantis* and bi-annual shipyard and dry docking work were completed. The overhaul of



The R/V *Sikuliaq*. Credit- Mark Teckenbrock, crewmember on R/V *Sikuliaq*.

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the submersible DSV *Alvin*, including an upgrade to 6,500-meter depth capability, was also continued under very strict COVID-19 protocols.

Meeting Intellectual Community Needs

The National Research Council's Committee Report, *Sea Change 2015-2025 Decadal Survey of Ocean Sciences*, documented that ships provide invaluable access to the sea and are an essential component of the ocean research infrastructure. The Committee found that the ARF was a critical asset in addressing each of the eight decadal science priorities of highest importance to the Nation in the decade of 2015-2025.

Users of ARF vessels collect data during a cruise both at sea and onshore, via tele-presence/data-presence. Users are involved in pre-cruise development of instrumentation, the maintenance of vessels, post-cruise use of the data collected, and data management. The number of "onshore users" is not quantifiable, but is estimated to be large, based on published papers, the number of personnel involved in shore support of the vessels, and the number of university laboratories involved with instrument development.

NSF missions represent approximately 60 percent of cruises in any given year, varying by five percent, but NSF funds about 70 percent of the total cost. In calendar year 2020, these percentages increased due to COVID-19 cruise cancellations by other agencies, causing increases in the day rate and the total cost paid by NSF. In 2019, NSF carried out approximately 1,993 days at sea and 173 cruises across all classes of ships. By contrast, in 2020, NSF carried out approximately 1,168 days at sea across all classes of vessels by the end of the calendar year. Although there were several cruises postponed or canceled due to COVID cases discovered before boarding, the strict quarantine protocols, testing, cleaning, and drastic reductions in the size of science parties coupled with the use of telepresence and satellite communication enabled high-priority work to be carried out.

Governance Structure and Partnerships

NSF Governance Structure

Oversight: NSF oversees the ARF through awards to each ship-operating institution and separately to the UNOLS Office. NSF also oversees the Fleet through site visits, ship inspections, NSF Business Systems Reviews and participation at UNOLS Council/Committee meetings. NSF is the Cognizant Federal Agency that negotiates annual ship and technician rates. Several program directors within OCE at NSF, the National Oceanic and Atmospheric Administration (NOAA), and the Office of Naval Research (ONR) are involved in ARF activities and overall oversight.

Annual reports submitted to NSF include a description of the work performed in the prior year, the final costs, and the proposed work for the following year, along with the provisional costs. These costs divided by the number of operational days determine the ship's day rate, which is charged to all users. The annual reports address crew training and ship safety, as well as the detailed Major Overhaul Stabilization Account plan, which serves to spread the high cost of shipyard overhaul and drydocking activities over several budget years.

Management

Management of a ship operating institution's facilities varies with the scale of the operation, but the core responsibility typically resides with the Director of the institution, the Marine Superintendent, who is responsible for all aspects of the facility, and the ship's Captain, who is responsible 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.

External Governance Structure

There is no formal external governance structure for the Academic Research Fleet. As stated above, the Fleet is overseen through a variety of activities conducted by the federal agencies and by the coordination of the activities of the ARF stakeholders through the UNOLS Council and Committees. For example, the UNOLS Ship Scheduling Committee is the mechanism used by stakeholders to develop the annual operating schedule for the ARF ships to maximize the efficient support for the funded science work. Through the UNOLS Fleet Improvement Committee the stakeholders update documents identifying the capabilities needed by each class of ship to support the science missions which then helps determine funding needs to keep the vessels from becoming obsolete. Additionally, the material condition of the vessels, which is determined through the NSF Inspection Program, helps inform future Fleet modernization needs. This process resulted in the development of the Regional Class Research Vessel (RCRV) Project (see MREFC chapter on RCRV). The three vessels that the RCRVs will replace are planned for retirement from the Fleet as the new vessels are integrated into the ARF.

Partnerships and Other Funding Sources

The ARF is supported through an interagency partnership, principally with ONR and NOAA. The Fleet’s operating costs are divided proportionally among the vessel users based on usage. NSF supports approximately 70 percent of the total, which includes the Ocean Observatories Initiative’s (OOI) use of the ARF for servicing of OOI sensors and equipment.

Funding

Total Obligations for ARF

(Dollars in Millions)

	FY 2020	FY 2021	FY 2022	ESTIMATES ¹				
	Actual	Estimate	Request	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Operations & Maintenance	\$106.17	\$107.38	\$117.88	\$119.11	\$128.91	\$132.58	\$132.58	\$132.58

¹ Outyear estimates are for planning purposes only.

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. The increase in FY 2022 reflects lingering impacts on ship demand from the COVID-19 pandemic and increased operations in support of research on climate change. Outyear estimates include O&M costs for new RCRVs as they become operational.

Reviews

The NSF cooperative agreement awards with each ship-operating institution are reviewed by an external panel every five years. The current cycle of cooperative agreements ends in FY 2022. A Business Systems Review of the University of Washington, operator of R/V *Thomas G. Thompson* and R/V *Rachel Carson*, was conducted in early FY 2020. Also in FY 2020, a Business Systems Review of the Bermuda Institute for Ocean Sciences, operator of R/V *Atlantic Explorer*, commenced virtually due to COVID-19.

Renewal/Recompetition/Termination

NSF owns three of the ships in the ARF and uses all ships to conduct science work at sea, which requires NSF to have a ship operations award with each of the ship operating institutions. All ships received new five-year operational awards in CY 2018. NSF funded year four of the five-year awards for all of the ships in FY 2021. For the ships not owned by NSF, the operating awards will be renewed in FY 2022; discussion

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is in progress on a Renew/Compete decision for the R/V *Sikuliaq* operations award. Of the remaining two NSF-owned ships, R/V *Oceanus* will be retired in FY 2022 and replaced by the new RCRV R/V *Taani* in FY 2023 and R/V *Endeavor* will be retired in FY 2023 and replaced by RCRV#2 in early FY 2024. Operators for those vessels have already been chosen through a competitive process. The third new RCRV, R/V *Gilbert R. Mason*, will replace R/V *Pelican* (owned by LUMCON) in late FY 2024 after retirement of R/V *Pelican* in FY 2023.

During the last five years various activities have continued in the efforts to modernization the ARF. In FY 2018, NSF's research vessel *Clifford A. Barnes* was retired and replaced by R/V *Rachel Carson*, a ship purchased and owned by the University of Washington. In FY 2017, ONR completed a mid-life refit of R/V *Thomas G. Thompson*, and they commissioned their second new Ocean Class vessel, R/V *Sally Ride*. In FY 2020, ONR completed a mid-life refit of R/V *Roger Revelle* and commenced a mid-life refit for R/V *Atlantis* which is expected to be completed in FY 2021. In FY 2018, NSF announced the decision to begin a process to divest NSF ownership and retire the seismic research vessel R/V *Marcus G. Langseth*. The process included opportunities for an interested academic institution to assume ownership and continue operating the ship as part of the ARF to support seismic research. In FY 2020 NSF accepted a proposal from Columbia University-Lamont Doherty Earth Observatory to purchase R/V *Langseth* and continue operating the ship through 2024.



R/V Endeavor at the pier. Credit: Veronica Berounsky