U.S. ACADEMIC RESEARCH FLEET (ARF) $119,110,000
+$19,570,000 / 19.7%

Academic Research Fleet Funding

(Dollars in Millions)

FY 2021 Actual	FY 2022 (TBD)	FY 2023 Request	Change over FY 2021 Actual Amount	Percent
$99.54	-	$119.11	$19.57	19.7%

Brief Description

The U.S. Academic Research Fleet currently consists of 18 oceanographic vessels and various submersibles/autonomous vehicles owned by NSF, the Office of Naval Research (ONR), and U.S. universities and laboratories. All of the ARF ships and vehicles are operated by research universities and laboratories. The ARF is a subset of the U.S. Federal Oceanographic Fleet, with collaboration under the Interagency Working Group on Facilities and Infrastructure (IWG-FI). Coordination to access the ARF vessels and vehicles is accomplished through collaboration with the University-National Oceanographic Laboratory System (UNOLS) organization. Universities and laboratories that operate ARF vessels are designated as UNOLS operators, and as such adhere to the UNOLS Research Vessel Safety Standards, as well as other applicable U.S. Coast Guard Code of Federal Regulations and International Maritime regulations. All ARF vessels are U.S.-flagged vessels and are tracked by the U.S. Department of Transportation Maritime Administration.

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, the Great Lakes, and in the remote polar regions. ARF vessels collect observational data on Earth systems that provides 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 has continued successful operations despite being under strict COVID-19 risk mitigation protocols. In 2020, ARF experienced an initial stand-down, 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 and has been updated as pandemic conditions change.

Summary of COVID-19 Impacts

Although many planned cruises were deferred in 2020 and 2021 because of COVID-19 travel restrictions, ARF was able to safely accomplish approximately 95 percent of normal operations in 2021. In addition, crucial activities such as the mid-life refit of R/V *Atlantis* and bi-annual shipyard and dry-docking work were completed. The overhaul of the submersible DSV *Alvin*, including an upgrade to 6,500-meter depth capability, was also conducted under strict COVID-19 protocols.

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

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 substantial 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.

Governance Structure and Partnerships

NSF Governance Structure

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, Business Systems Reviews (BSRs) and participation at UNOLS Council/Committee meetings. NSF is the Cognizant Federal Agency that negotiates annual ship and technician rates. Several program directors within the Division of Ocean Sciences (OCE) at NSF, the National Oceanic and Atmospheric Administration (NOAA), and ONR are involved in the ARF activities and overall oversight. Additional oversight is provided by the ARF Integrated Project Team consisting of program directors and staff from GEO, BFA's Large Facility Office, the Cooperative Services Branch in the Division of Acquisition and Contract Support, as well as representatives from the Office of Legislative and Public Affairs and the Office of General Council.

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.

External Governance Structure

There is no formal external governance structure for the ARF. 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 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 up-to-date. Additionally, the material condition of the vessels, which is determined through the NSF Ship 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 2021	FY 2022	FY 2023	ESTIMATES[1]				
	Actual	(TBD)	Request	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Operations & Maintenance	$99.54	-	$119.11	$119.11	$119.11	$119.11	$119.11	$119.11

[1] Outyear estimates will include O&M costs for new RCRVs as they become operational.

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 OCE. The increase in FY 2023 reflects lingering impacts on ship demand and scheduling of work deferred due to the COVID-19 pandemic as well as increased operations in support of research on climate change. In addition, there is an expected increase in the cost of ship operations due to the rising cost of fuel.

NSF funds approximately 70 percent of the total cost of the ARF. NSF-specific missions represent roughly 60 percent of the ARF cruises in any given year and the remainder funds the facilities such as the Winch & Wire Pool and the Van Pool which support all the cruises requiring these services.

Reviews

Each NSF cooperative agreement with a ship-operating institution is reviewed by an external panel every five years. The current cycle of cooperative agreements ends in FY 2022. A BSR of the University of Washington, operator of R/V *Thomas G. Thompson* and R/V *Rachel Carson*, is underway. In FY 2020, a BSR of the Bermuda Institute for Ocean Sciences, operator of R/V *Atlantic Explorer*, was conducted. In FY 2021, a BSR was started with the University of Minnesota, Duluth, for operations of R/V *Blue Heron*. The scope of this review was tailored given the small award size and the ship's status as a non-NSF-owned asset.

Renewal/Recompetition/Termination

NSF owns three vessels in the ARF, but relies on all ships to support NSF-funded research at sea, requiring an operations award with each of the ship-operating institutions. All operating institutions received new five-year awards in 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. A decision was made to request a 5-year renewal proposal from the University of Alaska Fairbanks for continued operations of the NSF-owned ship, R/V *Sikuliaq*. The proposal will undergo external panel review for a possible award in 2023. Of the remaining two NSF-owned ships, R/V *Oceanus* is anticipated to be retired in FY 2022 and replaced by the new RCRV R/V *Taani* in late FY 2024 and R/V *Endeavor* is anticipated to be retired in FY 2023 and replaced by R/V *Narragansett Dawn* in early FY 2025. The third new RCRV, R/V *Gilbert R. Mason,* will replace R/V *Pelican* (owned by LUMCON) in late FY 2025 after retirement of R/V *Pelican* in FY 2024. Operators for the vessels were chosen through a competitive process.

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.