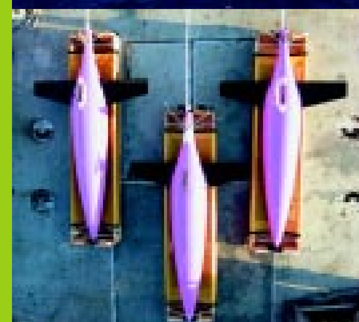
Charting the Future for the

National Academic Research Fleet

Summary



Overview

“Charting the Future for the National Academic Research Fleet” (“the Plan”) defines a federal interagency strategy for renewals, retirements, and technology upgrades for vessels within the fleet that are over 40 m long. The renewal strategy is based on projected operational life spans for existing vessels and a nominal 30-year life span for new vessels. The fleet’s geographical distribution will be consistent with the anticipated future demand for federally funded academic research. Federal funds for ship construction and operation will be awarded on the basis of open competition.

The SWATH ship, R/V *Kilo Moana*, under construction. This new Ocean Class vessel will join the academic research fleet in 2002. Photo courtesy of R. Hinton.

This is a summary of the report from the Federal Oceanographic Facilities Committee (FOFC) of the National Oceanographic Partnership Program (NOPP) to the National Ocean Research Leadership Council (NORLC).

The baseline assumption for the Plan is to maintain fleet capacity (expressed as total operational days averaged over the most recent five years) at current use levels while increasing capability over the next 20 years and beyond. The growing trend towards larger, interdisciplinary, seagoing science teams using increasingly sophisticated research tools demands greater capability.

Over the next two decades, at least ten new ships, including one Global Class ship, six Ocean Class ships (one of which enters service in 2002), and three Regional Class ships are required to maintain capacity and reinvigorate the fleet as aging and less-capable ships retire. If optimistic budget scenarios permit new scientific programs to go forward, fleet size and composition might need to increase up to 13 new ships.

Ships will undergo continuous and significant technological upgrades over their lifetime to ensure that technological innovations are available in the fleet. Building a portfolio of ship concept designs and identifying science mission requirements will also be important functions undertaken to maintain a modern, technologically viable fleet capable of supporting evolving science needs.

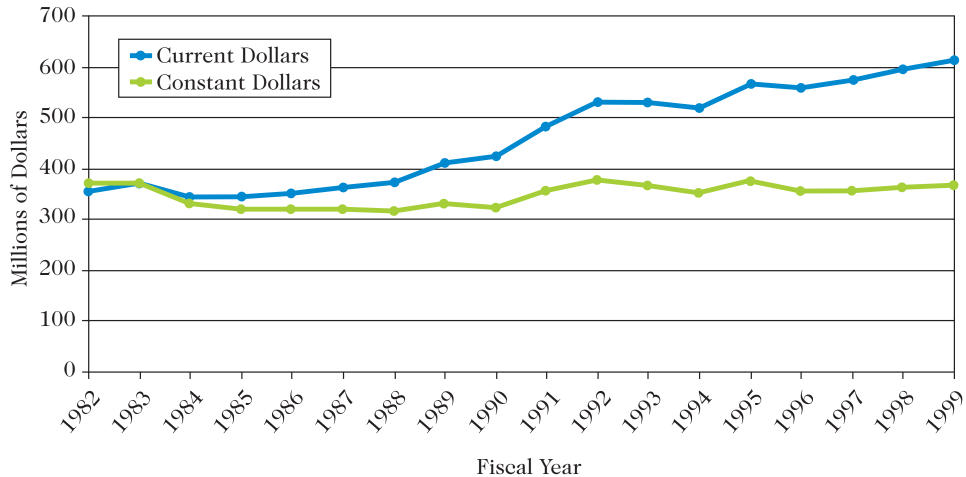
The Plan will be reviewed and updated by the Federal Oceanographic Facilities Committee (FOFC) at least every five years, based on evolving science requirements and funding trends, to determine whether additional ships will be required before the end of the second decade, and to plan their timely introduction where necessary.

History of Ship Acquisition

To obtain a copy of the full report, *Charting the Future for the National Academic Research Fleet: A Long-Range Plan for Renewal*, go to www.geo.nsf.gov/oce/ocepubs.htm or write to Division of Ocean Sciences, National Science Foundation, 4201 Wilson Blvd., Room 725, Arlington, VA 22230.

Oceanography in the United States grew rapidly after World War II, largely guided by the Office of Naval Research (ONR), which was established in 1946. The National Science Foundation (NSF) was established in 1950, and the 1957-58 International Geophysical Year marked the first major NSF involvement in oceanography. During the 1950s, academic oceanographic ships either belonged to the institutions themselves, or were provided by the Navy. NSF-funded researchers usually gained access to ships through ONR omnibus contracts.

By the early 1960s, NSF support for academic ocean research had become a significant fraction of the total research budget. This resulted in NSF funding the construction of three ships during that decade. At about the same time, the Navy funded the construction of several AGOR-3 Class research vessels, three of which were operated as part of the national academic research fleet. In addition, during the 1960s several WWII-vintage and newer freighters were converted to research vessels with funding from various institutions and federal agencies.



Total funding for ocean sciences in current and constant 1983 dollars for fiscal years 1982-1999. Overall, the proportion of the budget allocated for ship operations has progressively fallen both at NSF and Navy, traditionally the two largest federal funders of University-National Oceanographic Laboratory System (UNOLS) vessels. Compiled by the Ocean Studies Board, National Research Council.

The R/V *Atlantis* being launched. This Global Class ship, built in 1997, operates the deep-submergence vehicle, *Alvin*. Photo courtesy of Woods Hole Oceanographic Institution.

Towards the end of the 1960s, the Navy built two new Global Class vessels for the Fleet. In the 1970s, NSF funded six ships over 40 m. These included four Intermediate Class ships, all in service by 1978, and two Regional or Cape Class ships, in service by 1981.

Global Class ships constructed in the 1960s began reaching the end of their design life during the 1980s. The Navy thus initiated a major program to re-engine, stretch, and upgrade two Global Class vessels and construct three new vessels, which entered service during the last decade. The last ship funded by NSF was purchased from the oil industry in 1990 and outfitted to perform general oceanographic and seismic work for the fleet.

Science Trends

Advances in understanding the ocean environment have nearly always been preceded by observations. The national academic research fleet is the primary tool by which such observations have traditionally been obtained, and it will continue to be central. The ocean sciences are entering an era of new needs and new capabilities. The direction for both research and operational oceanography over the next two decades will be towards using new technology to make continuous, long-term observations and gather increasingly large data sets. Researchers require data that permit exploration of the time domain. Operational predictive capability, which enables various kinds of publicly useful forecasts of oceanic conditions, likewise requires such continuous, long-term information. These dual requirements of "continuous" and "long-term" cannot be met using conventional ships alone, but require unattended, automated observing systems. Rapid advances in technology, including speed and miniaturization, are revolutionizing data collection and these trends will continue at an ever-increasing pace.

While continuous observations of all aspects of the ocean will increasingly be made from nontraditional platforms, ships will still be needed to deploy and service observing systems. Ships will become more important in supporting focused experiments in the context of ongoing observations, as well as in the early development and testing of sensing systems and observatories.

Fleet Renewal and Retirement

Terminology

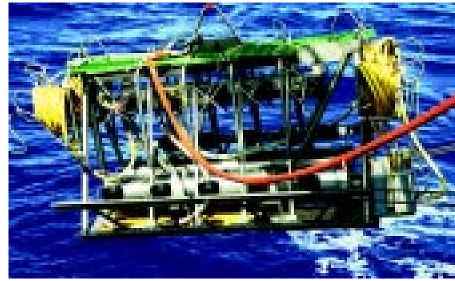
The Plan defines four basic vessel classes for the current and future fleet:

- **Global Class** ships will continue to be high-endurance vessels, operating worldwide in ice-free waters. They have extended deck space and equipment, as well as a broad and diverse complement of laboratory space and outfitting.

- **Ocean Class** ships will fulfill a critical need in fleet modernization by replacing the aging "Intermediate" ships with vessels of increased endurance, technological capability, and number of science berths. These will be ocean-going vessels, though not globally ranging, and will be able to operate sophisticated instrumentation such as ROVs and AUVs.

- **Regional Class** ships will continue to work in and near the continental margins and coastal zone, but with improved technology and more science berths than in current, comparably sized vessels. Laboratory space and instrumentation should permit significant multidisciplinary programs.

- **Local Class** ships will fulfill nearshore needs that do not require larger or higher-endurance ships. These vessels will be built primarily using non-federal dollars but will continue to receive federal operational and outfitting support.



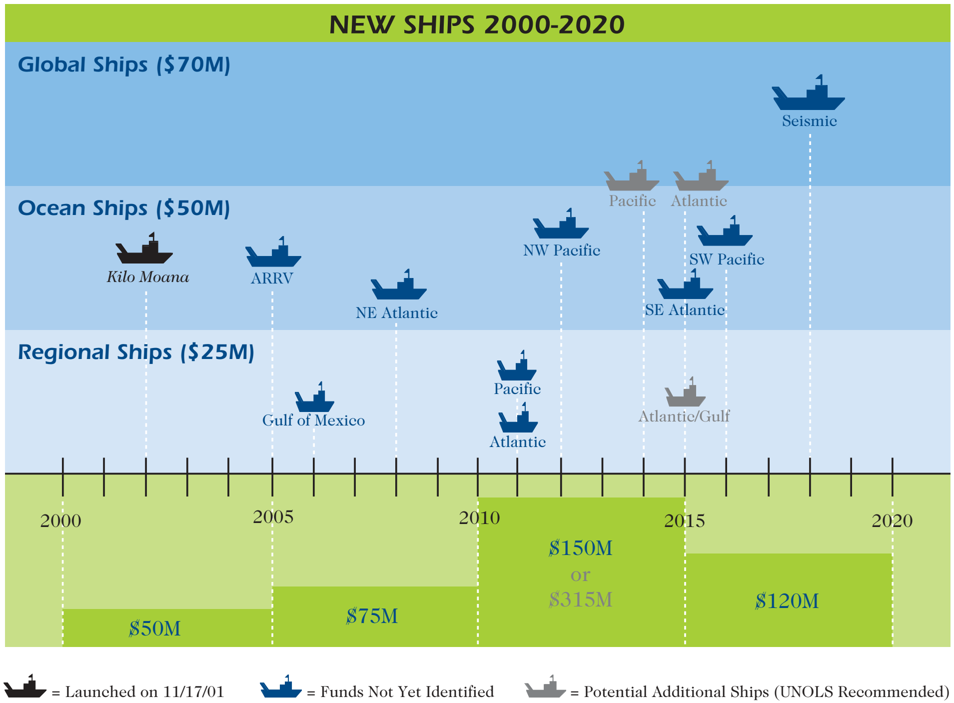
In September 1998, a permanent, deep-ocean scientific research facility—the Hawaii-2 Observatory, or H2O—was installed on a retired AT&T submarine telephone cable that runs between Oahu, Hawaii and the California coast. Shown here is the seafloor junction box being deployed from the R/V *Thompson*. Photo courtesy of F. Duennebier.

General Characteristics of New Vessel Classifications

Ship Performance	Global Class	Ocean Class	Regional Class	Local Class
Endurance	50 days	40 days	30 days	20 days
Range	25,000 km	20,000 km	15,000 km	10,000 km
Length	70-90 m	55-70 m	40-55 m	< 40 m
Science berths	30-35	20-25	15-20	15 or less

Ship Construction and Retirements

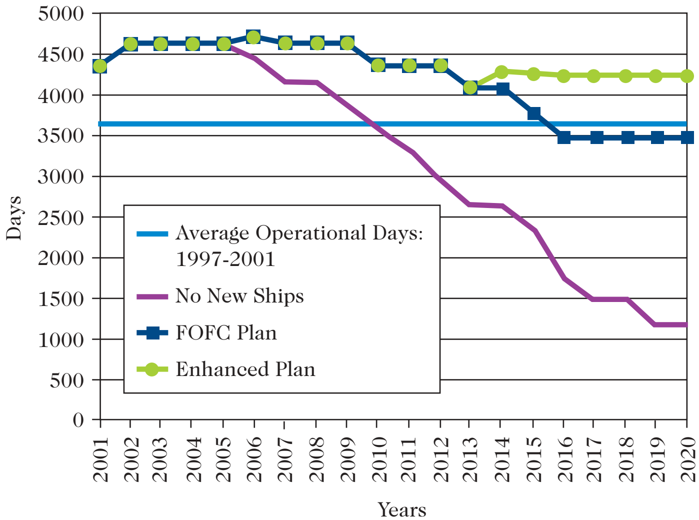
The proposed construction schedule calls for 10 new ships, based on science needs and fleet retirements. The great potential for new research is also recognized and accommodated. The combination of new ships will maintain capacity at approximately current use levels for at least the next 20 years. If federal agency budgets increase significantly, demands for greater capacity might increase the requirement for new ships up to 13 by 2020.



Some year-to-year variability in required ship-time is expected, which can be handled by short-term increases in a ship's annual operating days or temporary lay-ups. Longer-term trends can be modulated by delaying or advancing retirement dates or construction dates. These adjustments will provide flexibility to maintain a fleet adequate to meet core demands, and capacity to permit scheduling flexibility, peak demand, and event-response capability. More capable Local Class vessels will contribute to this scheduling flexibility.

Science missions will evolve and ship and facility designs must evolve to accommodate them. Towards that end, developing complete science mission requirements and a range of well-thought-out concept designs will improve the ability to plan future research

***The R/V *Kilo Moana* costs are not included in the figure (left) because funds have already been appropriated by Congress.**



Future ship capacity, expressed as ship operation days. The flat blue line projects the number of days needed based on the most recent five-year average. The purple line represents the progressive reduction of available days as older ships in the fleet are retired over the next 20 years, assuming no new ships are built after R/V *Kilo Moana*. The dark blue line projects available days assuming additions to the fleet proceed as proposed here. The green line beyond 2013 shows available days based on an expanded fleet, as recommended by UNOLS.

vessels and their science infrastructure. The process must begin as early as possible, seeking community input through UNOLS, ship operations and ship design committees, and other forums.

As a result of impending retirements, identifying funds for the construction of new ships is an issue that must be addressed now to meet fleet needs for the next two decades. In addition to new ships, it will be important to identify incremental funds for the costly new shared-use instrumentation required to meet ocean sciences' needs, as well as the training and support for personnel to maintain and operate these increasingly complex systems.

Current Vessels in the National Academic Research Fleet

Vessels > 40 m	Length (m/f)	Projected Retirement*
Alpha Helix	41/133	2005
Gyre	55/182	2006
Endeavor	56/184	2008
Oceanus	54/177	2009
Wecoma	56/185	2010
Point Sur	41/135	2011
Cape Hatteras	41/135	2011
Seward Johnson II	51/161	2012
Melville	85/279	2014
Knorr	85/279	2015
Seward Johnson	63/204	2015
New Horizon	52/170	2016
Maurice Ewing	73/239	2018
Thomas G. Thompson	84/274	2021
Roger Revelle	84/274	2026
Atlantis	84/274	2027
Kilo Moana	57/186	2032
Vessels < 40 m		
Edwin Link	34/113	2002
Clifford Barnes	20/66	2005
Cape Henlopen	37/120	2005
Longhorn	32/105	2011
Weatherbird II	35/115	2013
Pelican	32/105	2013
Robert Gordon Sproul	38/125	2015
Blue Heron	26/86	2015
Urraca	30/96	2016
Walton Smith	30/96	2031
Savannah	28/91	2032

*UNOLS Operator Estimates




Front cover photos from top to bottom.
(1) R/V *Kilo Moana* immediately after launching in November 2001, M. Reeve. (2) The Absolute Velocity Profiler being deployed from the R/V *Wecoma*, J. Nash. (3) The Global Class vessel R/V *Roger Revelle*, Scripps Institution of Oceanography. (4) The Seaglider autonomous underwater vehicle, C. Eriksen.

Back cover photos from top to bottom.
(1) R/V *Maurice Ewing* shooting multichannel seismic profiles, Lamont-Doherty Earth Observatory. (2) A Conductivity, Temperature, Depth instrument being deployed from the R/V *Oceanus*, C.A. Linder. (3) MARLIN, a sophisticated towed body, being deployed from the R/V *Wecoma*, http://mixing.oce.orst.edu/Photogallery. (4) The Global Class vessel R/V *Melville.*

Sponsored by the National Science Foundation through an award to the University Corporation for Atmospheric Research Joint Office for Science Support.

Editing and design by Geosciences Professional Services, Inc.

January 2002