FUTURE PLANS FOR RESEARCH SHIPS IN GLOBAL OCEAN OBSERVATIONS

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1 - OCEAN OBSERVING SYSYTEM FOR CLIMATE (OOSC) AND RESEARCH VESSELS (R/VS)

There is general recognition (see, for example [NOPP, 1999]) that ocean observing programs such as OOSC will require use of R/Vs to accomplish some of their objectives for the foreseeable future. Servicing ocean moorings, (re)making deep hydrographic/CDT sections including biogeochemical sampling (oceanic carbon system), or deploying expendable and autonomous sampling devices in remote regions are tasks ill-suited to spaceborne, airborne, remotely-sensed, or volunteer-ship-based approaches. Fortunately, such tasks are quite feasible, given R/V support and current technology. There is no need to await new technology in order to start or sustain such series of observations, many of which are key to detecting important changes in the ocean and climate system.

However, beyond a general recognition of some R/V use in OOSC and related programs, there has been little definition of the extent or particulars (ship capabilities) of that need. It is dangerous to assume that suitable R/Vs will naturally be available when, where and as needed.

2 - R/V LIFETIMES

Research vessels have useful lifetimes of only a few decades. Wear and tear, obsolescence of space arrangements or ship and scientific systems, increased maintenance costs and similar factors combine to make continued research service untenable, even if basic hull integrity, propulsion and safety features remain viable. Of the current 22 large, intermediate and regional ships in the U.S. University-National Oceanographic Laboratory System (UNOLS) academic fleet, a lifetime beyond 50 years is projected for only one ship (*Sea Diver*), and beyond 40 years for only two others (*Knorr, Melville*) [NSF, 1999]. Most lifetimes are in the 20-40 year range. By the close of 2015 only the two new general-purpose ships *Thomas Thompson* and *Roger Revelle*, the new submersible support ship *Atlantis*, and the geophysical ship *Maurice Ewing* will remain in UNOLS service from this group, plus the Navy's planned but yet-unbuilt AGOR26. At approximately the same time both of the two current Australian research ships relevant to open-ocean observations, *Franklin* and *Southern Surveyor*, will go out of service. The average retirement rate exceeds one ship per year. The rate is not uniform; the Australian case is an extreme counterexample, in which the simultaneous retirements pose an obvious and important national planning and budgeting problem.

3 - PLANNING AND CONSTRUCTION TIMESCALES

Research vessels cannot be mass-produced. Small retirement rates and widely different ship sizes and capabilities make it unwise to build significant numbers of identical vessels under a "one size fits all" approach. Each ship, or small group of ships, must result from its own unique planning and construction cycle, preferably rooted in the best available projections of functional requirements. A corollary is that the definition of future requirements should be an ongoing process. Another corollary is that the planning/construction cycle is longer than in a mass-production setting.

The most recent such U.S. cycle provided the three new Navy-built R/Vs*Thomas Thompson, Roger Revelle* and *Atlantis* as well as major Navy-funded upgrades of *Knorr* and *Melville*. In 1982-1984 several U.S. federal and advisory bodies including UNOLS recognized that many UNOLS R/Vs of that era, especially the larger ones, would soon be obsolescent. The UNOLS Fleet Replacement Committee instigated a series of reports on this problem. It drew up science mission requirements keyed to projections of functional requirements, and it fostered several preliminary designs for different kinds of ships that could renew different sectors of the fleet. Federal agencies supported this work strongly. The Navy began to program R/V constructions in its overall shipbuilding plans and budgets, effectively using the Cold War goal of a 600-ship Navy. The National Science Foundation forecast a major increase in its budget, supported the Navy plans, and indeed projected a five-ship shortfall of R/V capacity over and above those plans.

In subsequent years the Cold War and the 600-ship Navy ended, and sharp budget cuts to trim the federal deficit began. However, the set of R/V constructions and improvements survived, despite delays and setbacks, thanks to the persistence of the scientific community and several key officials in federal agencies. The *Knorr/Melville* upgrades were completed by mid-1992. The three new R/Vs entered the fleet in 1991, 1996 and 1997. Choosing 1983 as the somewhat imprecise start of the planning effort, nearly 9 years elapsed before delivery of the first new ship, and nearly 15 years before completion of all the constructions. While the federal funding climate was less favorable toward the end of the cycle than at the beginning, there was no clear overall bias for or against the effort. There is no compelling reason to suppose that a new cycle, if begun now, would be faster.

The Australian experience is broadly similar. Government approval for *Franklin* was sought beginning in the early 1970s, but obtained in 1980. Design and construction timetables finally led to commissioning in 1985.

4 - ADVANCE PLANNING AND BUDGETING

Neither Australia nor the U.S. has a coherent federal plan for a new cycle of R/V renewal in place today. Yet given these planning/construction and ship retirement timelines, the need for such planning is upon us now. It is heightened by the costs involved; these must be spread out in time.

In the U.S. case a rough cost to replace each of the UNOLS ships slated to retire by 2015 is $500 million in today's dollars. Whether this number is in error by $100 million or the replacement target should be a few ships higher or lower than one-for-one are questions beside the point. The sum is still so large that it cannot conceivably be provided in one or a few years. Only a multi-year phased funding plan will be achievable. Fortunately, many of the earliest-retiring UNOLS ships are smaller ones, and for these it should be possible, with good planning and cooperation, to compress the 10-to-15-year timeline somewhat.

The primary use of R/Vs is for focused scientific research projects and presumably will remain so. Yet ships are mobile and many R/Vs are versatile, capable of aspects of military surveys, fisheries work and operational observations as well as pure research. Including these multiple constituencies and agencies, some facing their own fleet renewal issues, will undoubtedly complicate planning, but eventually should yield more efficient plans with broader support. In such multi-dimensional planning it will be all the more important for OOSC to define its needs sooner rather than later.

5 - CONCLUSION

It is high time to start planning the future R/V fleets in the U.S., Australia, and probably other nations. Operational observations like those of OOSC should be represented in this planning where pertinent. A necessary first step, largely undone as yet, is the definition of R/V needs by OOSC.

REFERENCES:

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