FUTURE LARGE RESEARCH VESSEL NEEDS

A general purpose station ship vs. an underway geology and geophysics ship?

STATION SHIP (270'+)	UNDERWAY SHIP (220'+)
DECK SPACE GALORE	HI PRESSURE AIR (1500 SCFM)
SUBMERSIBLE / ROV'S	SOURCE TOWING FACILITIES
ROCK/CORE/HYDRO LABS	GLORIA / SEAMARC II CAP.
DYNAMIC POSITIONING	LARGE COMPUTER LAB
INSTRUMENT LAB	LARGE INSTRUMENT LAB
SEAKEEPING PRIORITY	ENDURANCE PRIORITY
MOON POOL	ABUNDANT CLEAN POWER
25-35 PEOPLE	15-25 PEOPLE

COMMON FEATURES:

EM WINCH AND CABLE
SUITE OF UNDERWAY GEOPHYSICS
PRECISION NAVIGATION (GPS)
SEABEAM
TRAWL WINCH
LIGHT (HYDRO) WINCHES

It is impossible to generalize about the success of past conversions whether early or late. About the most that can be said is that they did carry out the bulk of research from the beginnings of oceanography until within recent memory. While it was often done with some discomfort and trouble, this seems in perspective to have been more inconvenience than than serious and basic limitations. Some would be good-riding hulls; some had good accomodations; some were excellent for overside work; some had good lab space. It was seldom if ever that any, even in the glow of nostalgia, combined all that was desirable. These hulls were seldom picked at random; one was chosen which had many of the desired qualities to start with, and it was modified as well as possible from that point. What was important was that they were readily available when needed, usually at very low cost, and managed to carry out most of the science which was being done at that time.

If one were to go through the same procedure now, the same process would still be valid. Low cost, both for acquisition and conversion, is a first consideration, especially since construction costs are becoming large enough to constitute a major budgetary stumbling block. Operational costs are equally important, since they will be large, over the life of the ship, compared to the initial investment. One would want a hull with seakeeping qualities adequate to permit doing the planned work in at least moderately rough weather, and this often implies a fairly large size and draft. Low freeboard for ease of overside handling is desirable, though not so low as to give a wet deck. Space should be available both on deck and inboard for the scientific work, which has become much larger and more complex with the advent of multidisciplinary cruises. Accomodations for the larger scientific parties which staff these cruises are also required. But, if a cheap or free hull can be found which provides the basis for a reasonably-priced modification, there is no reason why conversions cannot still serve a purpose in oceanographic research.

T. K. Treadwell

typical of this assortment. Notable were CHAIN and ARGO at WHOI and SIO; these converted Navy salvage ships are fondly recalled as fine, easy-riding, productive vessels, with plenty of deck space aft and lab areas inside. About all that can be said as a generality is that they were better than nothing, and often surprisingly good for the work demanded of them. VEMA in particular is remembered as a reliable workhorse, which Lamont was reluctant to give up even when Navy provided the specially-built CONRAD as replacement.

Two classes of conversions used extensively during this period at universities deserve special mention: The Army "T-Boat" and "FS" -- freight and supply ships. In the 60s and early 70s these two hull types were pervasive, variously modified to meet local needs. T-Boats were found at Washington, NYU, SIO and Wisconsin; FS hulls at Texas A&M, Rhode Island, Miami, Oregon State, SIO, and WHOI. The smaller, 65' T-Boats were usually operated nearshore, since they had relatively short range. However, they were a comfortable hull with adequate lab space, although housekeeping facilities were somewhat limited. Their low freeboard and adequate deck space made for easy gear handling, and they could operate with only two in the crew.

The 180' FS hulls, used by many oceanographers who are still active, are also recalled as good basic ships, although they were frequently let run down materially since replacements were in sight via the government building program. They required a sizeable crew due to their engine, housekeeping, and communications layout, but could typically carry about a dozen to 15 scientific party. Their large hold and below-deck areas permitted good lab and storage spaces, and even large equipment such as the heavy trawl winch could be put below-decks out of the weather. Wet-labs were usually placed on the main deck in close proximity to the overside handling locations, but other labs were one or two decks below, which was inconvenient. One drawback was that their main working area was forward; work could be done over the stern only with some difficulty, which made it inconvenient for towing large dredges or trawls. The general recollection seems to be that this class was a reasonably successful conversion in most of the configurations developed.

extraction will become economically worthwhile.

In 1932 the Navy assigned the submarine S-48 to marine gravity work with Vening Meinesz of Holland and Harry Hess of Princeton. Even with S-48's relatively shallow depth limitation of about 200', they would be below the reach of even long-period waves, and thus provide a stable platform for his pendulum meters. (S-48 was my first ship in the Navy; when I went on board in 1942 it was conducting acoustics research with the Columbia Underwater Sound Laboratory of New London, thus giving me my first taste of "oceanography". The crew, three of whom had been on board for the gravity cruises, were still proud of their part in this early research!)

Academic research in oceanography did not really get underway until the late '20s. A Committee on Oceanography of the National Academy of Sciences recommended a university research program in 1927, and a series of grants from the Carnegie and Rockefeller Foundations were used to establish the Woods Hole Oceanographic Institution and the Oceanographic Laboratory of the University of Washington, and expand the existing Scripps Institution. In 1931 ATLANTIS went into service at WHOI becoming the third U. S. ship built for research. Washington and SIO used the CATALYST (ex-fishing) and SCRIPPS (ex-yacht). It is difficult at this point to distinguish between nostalgia and reality concerning the capabilities of these ships. Certainly the verbal consensus is that they were pleasant, efficient, and productive. Probably ATLANTIS and SCRIPPS, being sailing hulls, were really confortable in a seaway, and being of low freeboard handling overside gear was convenient. Space, both deck and lab, was limited, but apparently adequate for the work then being done. CATALYST, to the contrary, is recalled as being a wet-decked rough rider which would "pitch you out of your bunk", but was adequate for the nearshore and inshore work which predominated.

The use of conversions for institutional research continued until the 1960s, when both Navy and the National Science Foundation embarked on programs of building research ships. In fact, only ATLANTIS at WHOI and VELERO IV at USC were purpose-built, and VELERO was really a barely-modified tuna clipper hull. The tugs BAIRD and HORIZON, ~~and~~ minesweeper, CREST at SIO; yachts STRANGER (SIO), VEMA (Lamont), ACTION (NYU); fishing boats PAOLINA-T and SMITH (SIO), GERDA and ONCORHYNCHUS (Miami); CG hulls ORCA (SIO) and CRAWFORD (WHOI); freighters BEAR (WHOI) and BROWN BEAR (Washington) were

The advent of multi-beam echosounders and good marine gravity and magnetics equipment in the '60s led to the last series of Navy conversions. These were the three BOWDITCH class converted Victory ships, and the two SHOUP class ex-troop transports. The former carried multibeam echosunders and related gear, and the latter primarily gravity equipment, both in support of missile-launching submarines. The goal in both cases was high stability, which at that time meant large size and deep draft. Since the scientific equipment was microscopic compared to the size of the hull, scientific space and living quarters for the science party of about 10 was more than adequate, and the hulls had a long and highly productive life.

For fisheries research, things had reverted to conversions since the building of the first ALBATROSS. ALBATROSS II and III were ex-trawlers, but since much of what was done on them was closely related, operationally, to fishing, they were reported to be quite good for that purpose. The ALBATROSS IV, put in service in 1963, was again (after a century lapse) a specifically-built fisheries research vessel. It should be noted, though, that it was basically a trawler hull, including stern trawl frames, with a few labs added.

In the late 1800s and early 1900s there were a number of other oceangoing science ships, most of which had some true research competence. There was such a variety that it is hard to generalize as to their suitability. These included the Carnegie Institute's GALILEE (sailing cargo, 1905-8), a general-purpose research ship. This was succeeded in 1909 by the non-magnetic hull CARNEGIE, designed almost entirely for marine magnetic observations, thus making her the second purpose-designed research ship (after ALBATROSS). The Navy cruisers BIRMINGHAM and CHESTER were detailed to the International Ice Patrol in 1912, which at that time involved little more than tracking bergs and observing sea surface temperature.

The Germans in 1925 fielded the METEOR (ex-gunboat) primarily for chemical research, to evaluate the extraction of gold from sea water to pay off their WW-I war debts. It's interesting to note that this was not economically feasible then, due to the low controlled price of gold, but industrial chemists believe that when gold hits $600 per ounce, seawater

both wooden-hulled minesweeps (HARKNESS class) and steel-hulled ones (SHELDRAKE class), as well as tugs (ALLEGHENY class). These continued in operation until the late '60s. In general, these were quite satisfactory for hydrographic work, which required only facilities for an echosounder, positioning, and plotting, plus the capability to field shore surveying parties. Associated oceanography was limited to BTs, shallow bottom sampling, current and tide measurements, and occasional biological nets and dredges, and this was easily done via specially-installed winches and A-frames. Little or no sample processing was done on board; most samples were preserved and returned to the Hydrographic Office for work-up, so lab requirements were minimal. Scientific parties (in addition to warm-body assistance from the Naval personnel) consisted of from one man on the small ships to a dozen or more on the large tenders. While there were the inevitable frictions between the military crew and the scientific detachment, there was usually very good cooperation and productivity. Perhaps the major drawback was that these ships were never high on the list of Navy priorities for personnel or equipment, and consequently were often short-handed and poorly maintained.

In 1949 the Navy fielded its first true oceanographic research ships, the converted seaplane tenders SAN PABLO and REHOBOTH, which remained in service until 1970. They had oceanographic labs which were primarily aimed at physical and chemical oceanography, and acoustics, in support of the Navy's ASW problems. Since the crew was not involved except as ship-drivers and assistants for the overside work, a party of civil service oceanographers was assigned. These hulls are remembered by those who sailed on them as being rather comfortable and productive for the work they were designed to carry out. They had good sea-keeping qualities, being beamy and of fairly deep draft.

The Navy also had during this period quasi-oceanographic ships which were used in support of acoustics and related research. These included such as MARYSVILLE (escort ship), HUNTING (LSM), GIBBS (seaplane tender), MISSION CAPISTRANO (tanker) and MIZAR (cargo ship). Most had special capabilities for lowering or towing large, heavy acoustics arrays and associated oceanographic equipment. Since they were primarily single-purpose ships, they were reported to be quite adequate for what they were required to do.

that anything would be better than the usual naval exercises. Somewhat surprisingly, CHALLENGER did no further expeditionary research, but was returned to Naval service.

By the end of the century hydrographic surveying and coastal oceanography by the Coast Survey was being done mostly from purpose-built ships such as BLAKE and HASSLER, and this continued to the present day with famous names such as SURVEYOR, EXPLORER, and HYDROGRAPHER. Indeed, the Coast Survey has been quite successful in justifying new construction, though their life spans tended to be very long and the ships very run-down. PATHFINDER, for example, was built in 1899, and served until the second World War. Less fortunately, at the turn of the century congress removed the Navy crews and officer-scientists from Coast Survey duty, and it took almost a generation for them to be replaced with the present cadre of NOAA officers plus civilian crews and scientists. Also, about the same time the present division of responsibility for charting was established, with the Navy Hydrographic Office responsible for the entire world (including the U. S., if they desired), and the Coast Survey being limited to U. S. territory. This led to administrative hassles in the 1950-70 period when NOAA tried to expand its oceanographic research into global scope, and ran into resistance both from congress and the Navy.

The Navy, on the other hand, maintained a strong personnel capability in hydrography and oceanography, but had almost no success in justifying specially-built survey and research ships. This was because there were always surplus military hulls laying around, and usually cheap military crews to man them. These were combined with a technical work-force which was increasingly civil service in composition. Not until after WW-II was an attempt made to revive the concept of scientifically qualified officers and sailors. Early conversions used were ENTERPRISE (corvette, 1877-92); HANNIBAL (collier, 1898-1944); NOKOMIS (yacht, 1917-34); GANNETT (minesweeper, 1919-42); RAMAPO (tanker, 1919-46); and SUMNER (submarine tender, 1915-46).

Even after WW-II, as "modern" techniques in oceanography and electronic hydrographic surveying developed, Navy continued this pattern of using conversions. Their two major hydrographic ships were converted from troop transports (TANNER and MAURY), plus accompanying smaller surveying ships from

first ships built for scientific purposes. Unfortunately, they were too slow, and the expedition sailed from 1838 to 1842 with VINCENNES as their flagship (at 127', about the same size as Delaware's CAPE HENLOPEN!). She, and all the others, were standard Navy or commercial hulls, with minimal lab spaces. But in addition to a host of miscellaneous oceanographic and natural history data, the expedition produced 106 nautical charts, about 30 of which were, at the start of WW-II, still the only chart available for the various areas.

The NAUTILUS, an 80' schooner built for coastal surveying in 1838 was the first of its kind, and was assisted by a variety of Navy and commercial ships in doing hydrography. At that time, and for many years after, hydrographic surveying included many things which we would now call oceanography such as tides and currents, surface temperature, winds and waves, bottom sediments, and biological observations. The establishment of the Navy Hydrographic Office just after the civil war increased our national capability to do science at sea far beyond that of the infant Coast Survey. And in 1871 the creation of the Fish Commission led to the new fields of fisheries and general marine biology. All of these operations initially used Navy, cargo, and fishing hulls. The Fish Commission achieved notoriety by identifying where the fish had gone (gross overfishing) and by constructing the first true oceanographic research ship, ALBATROSS, in 1882. This has been followed by the way over the last century by a succession of the same name, the current one being ALBATROSS IV.

These few specially-built scientific ships were always in the miniscule minority; most, both in the U. S. and overseas were conversions of varying capability. HMS CHALLENGER, the first true global research ship, was a converted warship and apparently well fitted out for science. The best available lab equipment was installed, plus a "state of the art" overside handling system based on steam engines. There were many innovations; the use of rubber shock absorbers, for example, to minimize surge loads while dredging. It's surprising how many of the mechanical sampling devices such as nets, dredges, and coring tubes are almost the same as those used today. Cooperation from the crew was reported to be excellent; they had been intensively briefed on the importance of the research, and probably felt also

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

FLEET IMPROVEMENT COMMITTTEE

Department of Oceanography
Texas A&M University
College Station, Tx. 77843

4 May 1987

"CONVERSIONS" AS A SOURCE OF OCEANOGRAPHIC RESEARCH PLATFORMS

During the last twenty years, converting various hulls into oceanographic research ships has gotten a bad reputation, since predictably any ship not built for the purpose will likely have some shortcomings. It has been noticed, though, that many ships which were built for the purpose also turned out to be less than optimum, and with the skyrocketing cost of shipbuilding, the question has been raised as to whether some existing government hulls could be converted to oceanographic use. Here are some thoughts on conversions, based on history, my own use of several of them, and the reminiscences of about a dozen others.

A couple of things need to be remembered to put this in context. The first is that until the 1950s, practically all scientific ships were conversions. Second, the cost of any conversion will always be very low, compared to the cost of new construction -- typically, 10% to 30% of the cost of a purpose-built hull. And third, if a good candidate hull is chosen, and adequate funds put into the job, it is possible to come up with something which is probably as good as the average newly-built ship, and better than many of the poorer designs.

Conversions have a long tradition; all of the early work on "oceanography", including exploration and hydrographic surveying, was done on conversions, and some of them were very little changed from their original form. One of the first was the CONSTITUTION, "Old Ironsides", which did a survey of New London harbor in 1811. The forerunner of the Coast Survey, using the coastal freighters JERSEY and EXPERIMENT did surveys of the entrance to New York in 1834 and of Georges Bank with the schooner MARIA in 1837.

One of the largest field programs of this era was the U. S. Exploring Expedition under Lt. Charles Wilkes. Two ships, CONSORT and PIONEER, built as "exploring vessels" for this voyage were, as far as I know, the

File: FIC 1987

Agenda
UNOLS Fleet Improvement Committee Meeting
11-12 May 1987
Rm 352 Joseph Henry Bldg.
Washington, D.C.

Fleet Plan Considerations
- Case histories of alternatives to federal funding - Gorsline
- Conversions - Document by Treadwell
- Science plans and future fleet requirements - Murray
- Academic use of non-UNOLS vessels and non-academic use of UNOLS vessels - Documents by Treadwell
- Requirements for G and G capable vessels - Langseth & Gorsline

Advanced Designs
- Glosten design monohull - Spiess
- Swath designs - Dinsmore

Science Mission Requirements
- Stable, Deep-Ocean platform - Spiess
- General purpose, small - Robison
- Ice capable, small - Dinsmore
- Should we be considering a submarine? - Robison
- Polar Research Vessel

Status of KNORR/MELVILLE refits - Dinsmore

Status of AGOR-23 procurement - Kaulum

Refits and Improvements
- Survey of Cape Class users/operators for suggested improvements - Treadwell's report
- Survey of Intermediate users for suggested improvements - Treadwell's report
- Surplus federal vessels - Nowlin

Operating Proposal for FIC - Nowlin

Miscellaneous
- ONR funding for UNOLS vessels - Kaulum
- Computer Assisted Scheduling - Langseth & Spiess
- Future Meetings