APPENDIX V

Commercial Ships Serving Science and Technology

PAPER

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ABSTRACT

Perhaps 100 privately-owned vessels that fly the U.S. flag and range in overall length from -10 to -80 meters (m), work at least part of the time as platform for marine research and technical operations. These ships are the U.S. commercial research "fleet". The fleet has two parts-the first comprises generally newer, mission-focused, and equipped ships that collect seismic data, and a second group that consists of various hull forms, including fishing vessels, offshore supply boats, and ex-military craft, which are used for the full gamut of marine technical projects involving pure and applied science, research, and development. The first group serves the offshore energy resource industry, while the latter has provided ship support to a wide variety of commercial, academic, and governmental interests, with the federal government, until recently, being the most important client. The seismic data collection market has been stabilized by oil company decisions to stop owning ships, and to charter competitively, while the federal market for commercial ships has shrunk with declining budgets and more pressure to do work in-house. This shrinking market has not been fully sustained by commercial and local government work, and there is evidence that the fleet size is declining.

INTRODUCTION

The commercial, U.S. flag ships that are used to perform offshore technical work, some in connection with pure science programs and projects, are strikingly different from the research vessels owned by government agencies and academic institutions. Where public research ships are typically designed and built to committee-drawn specifications and requirements (such as the AGOR class vessels the U.S. Navy built and utilized, along with several universities, since the end of WWII), the privately owned research ships are, with rare exceptions, conversions or adaptations of vessels built for other purposes.

The differences in public and private platforms arise from several reasons. Commercial ships are not generally tasked to support pure research involving simultaneous activity in several scientific disciplines. Because customers can choose from an inventory of ships, appropriate matches between functional requirements and ship size and characteristics are more readily made. additionally, the impetus of competition motivates operators to own ships that are adaptable, and thus more fully, employed.

However, privately owned and operated research and technical ships have successfully performed the same kinds and classes of work done by the public sector ships, often more efficiently and at lower cost.

IN THE BEGINNING ...

Historically, the first flotilla of privately owned ships converted for technical work at sea was launched in 1959 by scientist-entrepreneur Stanford T. Crapo, who founded Marine Acoustical Services (later Tracor Marine) in Miami, Florida. By 1970, the company had converted three war surplus 41 m (136 feet) wooden-hulled YMS class minesweepers, a 20 m (65 feet) Army "T" boat, two 26 m (85 feet) U.S. Coast Guard cutters, a 56 m (185 feet) Army mine planter, three offshore supply boats, a 53 m (175 feet) ship

originally built for seismic work, and a 26 m (85 feet) hydrographic survey boat surpluses by the U.S. Coast and Geodetic Survey. These ships were used for benthic, bathymetric, and biological surveys; acoustical propagation studies; instrumentation arrays, and buoy implantments/recoveries as well as countless other purposes. The U.S. Navy's Oceanographic Office and Laboratories, the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the U.S. Army Corps of Engineers, and virtually every defense contractor with an ocean interest employed these vessels. Although the company's bread and butter came from federal activities-oil companies, engineer/architect/construction firms, and several universities contributed to its business.

Only one other commercial organization, Edison Chouest Offshore, has ever brought together as large a group of ships for the single purpose of general marine research and technology support. The future prognosis for such firms will be influenced, but not dominated, by long-term political decisions as to how much of the nation's ocean research will be done by government-owned ships and how much by private industry contracts.

MAKE UP OF THE PRESENT FLEET

The current private fleet of technical service ships is divided into two groups. There are at least twenty-eight ships under the U.S. flag that gather seismic and geophysical data worldwide, and a somewhat larger group of multipurpose ships that fluctuates in response to the dynamics of market opportunity.

The Seismic Ships ...

Seismic survey ships are generally newer, larger-up to 94 m (308 feet) length over all-and are outfitted by users or owners with a full complement of mission-appropriate equipment such as sound sources, hydrophone arrays, coring equipment, associated laboratory and deck gear, and even helicopters. Many of these ships were designed and built for seismic work, although some are adaptations of offshore supply boats. Several of the owning companies support geophysical exploration work to the exclusion of all else, while others cross over into tug, crew transport, and rig supply operations. It appears that substantially more-perhaps twice as many-American-owned seismic ships operate under foreign flags than sail under U.S. colors.

While the seismic ships are rarely involved in the work of pure science, its existence is significant for two reasons:

- Contribution to important advances in marine engineering and naval architecture, which have resulted in improved research ships. Features of modem AGORs like the *Thomas G. Thompson*, for example, were pioneered in *RN Shell America* in the 1970s.
- The flotilla, along with the ships' operating and technical crews, are a complete and ready-to-go national resource for precision mapping and charting in compliance with the most demanding international standards. Because the industrial sector is not restrained by agency and congressional budgeting and procurement processes, and is competition driven, it fits out with the latest, most advanced systems for navigation, data logging, and analysis.

The major U.S. flag seismic ship operators are listed in Table 1.

TABLE 1. Owners of U.S. Rag Seismic Vessels

Number of U.S. Size range

Location	Company	Flag Vessels	(Length)
Galliano, LA	Edison Chouest Offshore	6	185'-308'
Gibson, LA	Gulf Ocean Services, Inc.	1	112'
Prairieville, LA	Kinsella-Cook & Associates	2	132'
Houston, TX	SEACOR Marine, Inc.	2	217'

Houston, TX	Western Geophysical Co.	4	135'-180'
Layfayette, LA	John E. Chance & Co.	4	122'-155'
Galveston, TX	Seal Fleet Inc.	2	185'
Houston, TX	Sea Mar Management, Inc.	10	115'-180'

And All The Rest

The second subset of the commercial technical service fleet is an amorphous collection of perhaps thirty to fifty vessels, ranging in size from less than 10 m (33 feet) to more than 46 m (150 feet) in length that derive significant - but rarely all - income from scientific or technology-related projects. It is difficult to estimate the number of vessels in this category because many function as technical service vessels as well as in other commercial arenas: a vessel that is doing bathymetric surveying or coring today may be supporting offshore construction diving, deploying oil containment booms, or hauling freight next week.

Because of the competitive nature of the multidimensional market in which they operate, the entrepreneurs and companies that operate these vessels tend to be inventive in adapting their ships to different mission opportunities, and often do so on a "quick reaction" basis. Some of the ships that have reputations and experience in marine technical operations are listed in Table 2. Not listed, but discoverable by talking with local marine interests such as bait and dive shops, are scores of diving support and fishing boats, some of which are occasionally, but not regularly, mustered for research projects.

TABLE 2. Commercial Technical/Research Ships

Location	**Vessel**	**Length x Beam x Draft (feet)**	**Hull Type When Built**	**Owner**
Ft. Lauderdale, FL	*Brittany*	65 x 18 x 4.5	Navy Utility Boat	Doral Marine Services, Inc.
Ventura, CA	*Cavalier*	110 x 26 x 9	Utility Boat	Buccaneer Marine Ltd.
Lafayette, LA	*Coastal Surveyor*	40 x 12 x 4	Admiral's Barge	C & C Technology, Inc.
Walnut Creek, CA	*Cordell Explorer*	43 x 1 5 x 5		Cordell Explorations
Bainbridge Is., WA	*Discovery*	54 x 14 x 7	Tug	Sea-Lease, inc.
Camarillo, CA	*Glorita*	147 x 27 x 12	Seismic Survey	Geo3, Inc.
Miami, FL	*Moby Ruth*	110 x 30 x 7	Tug	Moby Marine Corp.
Miami, FL	*Moby I*	85 x 23 x 7	Workboat	Moby Marine Corp.
Chicago, IL	*Neptune*	67 x 18.5 x 6	Survey Boat	Hydrographic Survey Co.
R. Lauderdale, FL	*Offshore Venture*	158 x 30 x 9	Offshore Supply	General Offshore
San Diego, CA	*Recovery One*	151 x 35 x 12	Offshore Supply	Coast Enterprises
Miami, FL	*Seaward Explorer*	105 x 30 x 9	Offshore Supply	Seward Explorer, Inc.
Miami, FL	*Seismic Explorer*	165 x 36 x 12	Seismic Survey	Moby Marine Corp.
Santa Cruz, CA	*Shana Rae*	52 x 16.5 x 6.5	Trawler	Monterey Canyon Research Vessels, Inc.
Portsmouth, RI	*Sub Sig*	118 x 28 x 13	Acoustical Research	Raytheon Corporation
San Diego, CA	*Transquest*	106 x 39 x 7	Submersible Support	Lockheed Engineering & Science Co.
	Weatherbird	115 x 28 x 9		
Alameda, CA	*White Lightning*	75 x 20 x 6.5	Trawler	West Coast Seaworks, Inc.
Santa Barbara, CA	*Wm. A. McGraw*	106 x 26 x 10	Offshore Supply	Ocean Enterprises, Inc.

Most of the smaller craft-those under about 27 m (90 feet)-that are in service today were built as fishing trawlers or oil industry crew or utility boats. When trawlers are used for fisheries research, they are used

basically as built; used for other work, fish holds are converted into laboratory and additional berthing spaces. Few permanent modifications are needed to adapt crew and utility boats for research applications, although transducer wells and through hull fittings may be installed to allow easy installation and removal of special mission transducers and sensors. Navigational equipment (i.e., radar, gyrocompasses, Global Positioning System receivers) of better-than-average quality is a common feature in vessels that regularly engage in research and technical tasks even though they may not do this work exclusively.

To broaden its opportunities for finding work, and to respond quickly to search requirements, one ship owner now trucks a 40-foot, former navy admirals' barge equipped to do multibeam bathymetry to sites anywhere in the country. While most smaller vessels concentrate on inshore work, this one tackled survey work involving deployments to 225 km (140 sm) offshore.

The larger vessels, some of which have worked worldwide and a few of which work Arctic waters, are mostly conversions of the simple, efficient, no-frills supply and tug/supply work boats that were originally built to carry pipe, drilling mud, and provisions to offshore oil rigs. Like their smaller sisters, these ships have usually been fitted with first-class navigational gear. Again, internal configuration changes usually provide more berthing to accommodate scientific parties and to provide laboratory space.

The single most common characteristic of these larger ships is a large clear afterdeck with low freeboard, often with removable bulwarks to provide protection in heavier seas and easy overboard access in calmer seas. Large open decks make it possible to add portable laboratories and customer-supplied or rented deck handling equipment to configure these ships for almost any kind of mission. In fact, vessels in the quick reaction fleet usually depend on a variety of customers who do a mix of work that can include surveying (bathymetric, hydrographic, seismic), diving and submersible support, towing, cable laying, salvage, construction, and a spectrum of research, development, test, and evaluation activities connected to military weapons and sensors, environmental monitoring, and resource management. Over the course of two or three years, a given ship may find employment in nearly all of these jobs.

Other common features that are found in and on dedicated research vessels are hull stabilization systems; bow and stem thrusters and variable pitch propellers that permit precision stationkeeping; and "moon pools" that provide through-deck access to the sea for drill and coring equipment, larger-than-usual generators with stabilized output for laboratory use, and power (i.e., electrical, hydraulic, pneumatic) and utility connections distributed on deck to support add-on laboratory vans/modules.

Because commercial research ships tend to pick up mostly short term work (from a few days to a few months), they are fitted with basic project equipment, with quality navigation gear the most ubiquitous item. All other necessary equipment is installed as needed for specific projects or are included in client-owned drop-on vans or modules.

Most ships are equipped with a complement of cranes, winches, powered reels, and fixed or hydraulic "U" or "A" frames appropriate to the size of the vessel. This deck gear, which provides the ability to handle instrumentation packages, towbodies, nets, samplers, and other objects, is often used in concert with Zodiac or Boston Whaler small boats.

THE MARKET ... NOW AND TOMORROW

There are three parts to the customer base for quick reaction vessels. Like taxicabs, the ships only earn income when the flag is down and the meter is running-when they are under charter. Many expenses-such as insurance, depreciation, and dock charges-continue or are incurred even when a ship is idle, and the key to survival and success in the intensely laissez-faire business is to find enough work to stay above breakeven.

The first source of business for quick reaction research ships are the local and state governments and commercial clients such as utilities and architect/engineering firms that contract for pipeline, power, and telephone cable route surveys; pre- and post-dredging surveys; and sewer outfall monitoring. This market segment has been slowly increasing with rising demands for data not only sufficient for design purposes

but which also satisfy requirements for environmental impact statements and provide a measure of defense against future litigation. These customers provide from 20 to as much as 60 percent of the work for commercial ships, with the average somewhere around 35 percent and becoming a higher percentage of a shrinking total market.

The second, however small, part of the user base consists of the academic institutions. Most schools that conduct ocean science own their own ships or operate vessels furnished by the government, however, they charter ships on occasion. Most private owners reported doing little or no work for universities, and such work appears to account for well under 20 percent of the market.

The third and largest component of the customer base for at least three decades has been the federal government. The U.S. Corps of Engineers has been a consistent user of commercial vessels for inland water surveys. The U.S. Navy, once a major long-term and short-term user of commercial research ships has over the years acquired oceanographic, weapons test, instrumentation, acoustical research, and other ships of its own displacing their industrial counterparts. Notwithstanding, there remains enough total Navy work combined with that from the Corps of Engineers, National Science Foundation, NASA, and the Departments of Interior and Energy, to support a modest national commercial research fleet.

However, this national resource is declining. Three research ship sources listed in the 1992-1993 *Sea Technology* Marine Buyers Guide report having sold, and not replaced, their vessels; two suppliers could not be located; and another two did not return calls. One vessel introduced into service and three ships that have been in the business for years but did not appear in the Buyers Guide, are included in Table 1, reflecting a net loss of at least two and possibly as many as six vessels.

The situation is worst on the west coast, where one owner reported a decline from about 220 revenue days per year in the 1980s and early 1990s to 150 days in 1993 and a projected 125 days in 1994. Other owners say that results would have been similarly dire had they not found non-research work to keep their ships working. West coast owners attribute the downturn to the reduction charter work available from the Navy brought about by defense budget cutbacks, and also to environmental activism that has shut down California oil production and related charters. One owner commented that the practice of one federal agency of requiring ships to be used on short term (typically < 6 months) Alaskan charters to travel to Seattle for inspection before a contract selection is made creates unacceptably high bidding risk, and stifles competition and opportunity for California-based vessels. Only one owner, who is closely connected to the oil industry, anticipated buying or building another vessel of 100 feet or more in the next two years.

DISCUSSION

Nationally, there is strong sentiment among commercial research ship owners that they are in competition with highly subsidized, federally-owned ships, but none offered any specific plans for action to change this situation. Some owners expressed the hope that the Republican-controlled Congress, which took office in January 1995, will legislatively mandate more use of private vessels for federal research and technical work where it is shown that lower national costs will result.

Government use of leased or chartered commercial ships has been recommended as an efficient and economical alternative to federal ship ownership by a series of studies for NOAA that have examined the twenty-plus vessel research fleet owned and operated by NOAA and its $1.9 billion fleet modernization and replacement plan.

Notwithstanding some unusual perils that attend doing business with the government, it is clear that industry will risk major capital to build and convert ships for research or technical support work if there are reasonable odds that a profit can be made eventually. Marine Acoustical Services did it thirty-five years ago. And much more recently, by offering five year charters that offered hope of a payback if the program continued for a longer time, the U.S. Navy induced a commercial shipbuilder/ operator to make a competitive proposal and invest several million dollars to create east and west coast tenders for its Deep Submergence Research Vessel program. The National Science Foundation charters the 92 m (303 foot)

Nathaniel B. Palmer, which was built to its specifications. In each of these cases, the government benefited from quick delivery of ships precisely tailored to its mission without fronting the cost, and there is no question that similar bargains could be struck by other federal agencies. An August 1994 report by the General Accounting Office hints that more such deals, which would strengthen the national commercial technical fleet resource, could be in the offing.

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