

T-AGS 60 Class Oceanographic Survey Ships

In 1989 the Oceanographer of the Navy approved the construction of a new class of multimission oceanographic survey ship for the Naval Oceanographic Office, the T-AGS 60 class. The initial focus of the survey mission was primarily blue water oceanography. In the intervening years mission focus has shifted toward the littoral. This article presents the class mission capability and discusses the mission evolution to the littoral and the incorporation of a hydrographic survey capability which meets International Hydrographic Office requirements.

It has been 13 years since the Oceanographer of the Navy established the requirements for the T-AGS 60 class oceanographic survey ships for the Naval Oceanographic Office (NAVOCEANO). These ships were envisioned to have a multimission survey role and be adaptable to changing mission requirements. They have met every challenge.

The Ships

A total of six T-AGS 60 class ships are currently in service or under construction. The USNS PATHFINDER (T-AGS 60) became operational in July 1996, followed by USNS SUMNER (T-AGS 61) in January 1997, USNS BOWDITCH (T-AGS 62) in September 1997, USNS HENSON (T-AGS 63) in July 1999, and USNS BRUCE C. HEEZEN (T-AGS 64) in July 2001. The sixth ship of the class, USNS MARY SEARS (T-AGS 65) was delivered in December 2001 and is currently undergoing mission system trials with initial operational deployment planned for July 2003.

Basic Design

The ships were designed to operate in deep ocean and coastal areas with the following general capabilities:

- Physical, chemical, and biological oceanography
- Multidiscipline environmental investigations
- Ocean engineering and marine acoustics
- Marine geology and geophysics
- Surveys (bathymetry, gravimetry, and magnetometry)
- Shipboard oceanographic data processing and sample analyses
- Precise navigation, trackline maneuvering, and station keeping

Specific requirements to meet these design and operational goals were developed by the Naval Sea Systems Command in conjunction with NAVOCEANO and the Military Sealift Command. The ships were constructed to commercial standards in accordance with the American Bureau of Shipbuilding and US Coast Guard (USCG) requirements and carry a Class C ice-strength rating.

Basic Ship Characteristics

The T-AGS 60 class ships are 329 feet long with a 58-ft beam. They have a 19-ft draft with a full load displacement of 5,000 tons. Propulsion and power are supplied by four diesel-electric generators. The ship is driven by two 4,000-hp azimuthing z-drives. Sustained speed is 16 knots with a nominal survey speed of 12 knots. T-AGS 60 class ships have a 3,500-sq ft working deck. Flexibility in mounting equipment on the fantail is provided through a 2-ft bolt-down grid pattern mounted on the working deck. Fifty-five berths are provided for 27 mission personnel and 28 crew.

Mission Capability

To accomplish its multimission role, the T-AGS 60 class ships are equipped with a variety of underway, towed, and over-the-side systems supporting bathymetry, hydrography, physical oceanography, and navigation. The following paragraphs will explore the basic configuration of the mission systems and the additional systems that have been added to provide the hydro-graphic mission capability.

A. Integrated Survey System

The heart of the mission capability of the T-AGS 60 class ships is the Integrated Survey System (ISS-60). The ISS-60 acquires, stores, displays, and processes the data collected by the various mission systems using a fibre-optic network configuration. It allows a single operator to monitor and control survey operations. The software design uses menu-driven programs with a common graphical user interface to make the system user friendly. In addition, the ISS-60 configuration is maintained at the same version level across all platforms to provide users with a familiar setting as they move from ship to ship.

B. Navigation

Navigation is provided by the Global Positioning System (GPS). World-wide differential capability is provided by a satellite-based, Wide-Area Differential GPS (WADGPS) receiver. The T-AGS 60 class ships are also equipped with a Dynamic Positioning System (DPS) which provides automated control of the stern z-drives and a retractable bow thruster. The DPS is used as an autopilot for normal ship operations and also provides station keeping and trackline-following capability for survey operations. The DPS can be operated from the bridge or the main laboratory via ISS-60 control. Under ISS-60 control, the DPS can maintain the ship within ± 3 m of a programmed trackline, execute

a turn to acquire the next trackline, and follow the new trackline. The DPS can execute these maneuvers without operator intervention while underway at 12 knots.

C. Bathymetry

The T-AGS 60 class ships were originally equipped to support general bathymetric survey requirements with more emphasis placed on deep-water accuracy. As a result, the primary system for bathymetric surveys is a 12-kHz multibeam echo-sounding system. This system has 121 beams that can provide 1-degree resolution with a swath width of 120 degrees to depths of 600m and 90 degrees to depths of 11,000m. A hull-mounted surface sound velocimeter provides indication of changes in water mass and corrects for the initial beam angle. Sound speed profiles are obtained from CTD measurements or from expendable probes.

D. Hydrographic Mission

As previously mentioned, the T-AGS 60 class ships were originally equipped to primarily support bathymetric requirements in "blue water" areas. By 1995 Navy data requirements began to shift to the littoral areas and a more hydrographic mission orientation. At that time the Oceanographer of the Navy requested that the mission capability of the T-AGS 60 class ships be upgraded to perform high-resolution shallow-water surveys. As a result of this request, T-AGS 60 class ships were to be delivered with or retrofitted with a shallow-water multibeam system to augment the 12-kHz multibeam system. In addition, the T-AGS 63/64/65 ships were outfitted with two Hydrographic Survey Launches (HSLs) equipped to perform harbour and coastal surveys.

Ship Shallow-water Multibeam System

The primary shallow-water system is a 95-kHz multibeam system with 111 beams. This system provides a swath width ranging from 150 degrees at 200m to 70 degrees at 1,000m. The system provides both bathymetry and imagery data. This system also uses underway sound-speed data to provide corrections for the initial beam angle of incidence between the arrays and the seawater. A DGPS-based system provides heading, pitch, and roll correction factors to the system to support International Hydrographic Organisation (IHO) survey requirements.

Hydrographic Survey Launches

The T-AGS 60 class ships can carry up to two 34-ft HSLs mounted on the fantail. They are deployed from removable davits mounted to the deck bolt-down grid on intermediate foundations. The ships will carry one HSL, two HSLs, or none, depending on the assigned mission. HSLs are used to meet near-shore and harbour survey requirements in areas inaccessible to the ships. The usual depth range of operation is from 1 to 100m at survey speeds from 3 to 10 knots. They are essentially "mini-T-AGS" with regard to their survey capabilities. Data are acquired from the various measurement systems via a subset of ISS-60 to maintain a consistent user interface with the ship.

HSL Multibeam System

The primary HSL survey system is a 300-kHz shallow-water multibeam system providing swath widths of 140 degrees in very shallow depths to 60 degrees at the maximum depth range of 150 m. The system operates in two resolution modes. A wide coverage mode provides total area coverage at 10 knots for high-speed surveying and target location. A high-resolution mode can pinpoint target locations on the bottom. The system also collects backscatter data for imagery and bottom classification. A DGPS-based system provides heading, pitch, roll, and heave correction factors for sonar beam orientation. Sound velocity profiles are obtained using a profiling CTD. A hull-mounted surface sound velocimeter provides indication of changes in water mass and corrects for the initial beam angle.

HSL Single-beam System

The HSLs are also equipped with a dual-frequency, shallow-water single-beam echo sounder. This system operates at acoustic frequencies of 24 kHz and 200 kHz. It provides a back-up and independent calibration check of the multibeam system and also allows single-beam surveying of areas too deep for the multibeam system.

HSL Side-scan Sonar System

For very high-resolution bottom imaging the HSLs deploy a 100-kHz digital side-scan sonar from a towing davit. The side-scan sonar provides high-resolution, high-quality images for use in identifying and classifying targets pinpointed by the multibeam system. Typical tow speeds are 3 to 6 knots.

Conclusion

The T-AGS 60 class ships have proven themselves capable of performing a variety of survey missions and have readily been adapted to meet hydrographic survey requirements. They are truly multimission platforms. The key factors for this are the basic mission systems installed, the ability to rapidly reconfigure a portion of the main lab to support various roll-on/roll-off systems, and the flexible fantail design and deck equipment which allow multiple configurations. Good configuration control of the mission systems, spaces, and deck allows a user to easily move from ship to ship with few surprises.

References

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