

## THE NEW SURVEYOR

by Rear Admiral H. Arnold KARO  
Director, U. S. Coast and Geodetic Survey

---

The U. S. Coast and Geodetic Survey Ship *Surveyor* was commissioned on 30 April 1960 at San Diego, California, where she has been under construction for the past two years. This modern ship is among the finest of the specially built survey ships in the world. She will now become the backbone of the Coast and Geodetic Survey fleet, joining other units operating in the 2½ million square miles of United States continental margins extending from the icy waters of Alaska to the tropical regions of the Caribbean and the Pacific Ocean.

This newest addition to the Coast and Geodetic Survey fleet is a twin-masted, single-screw, steel ship with an overall length of 292 feet 2 inches, beam of 46 feet, displacement under full load of 3 130 tons, standard displacement of 2 600 tons, and light displacement of 2 070 tons. The full-load draft of the ship is 16 feet. Scantlings are designed for a limiting draft of 21 feet. The main propulsion unit, weighing 82 500 pounds, was designed and manufactured by De Laval Steam Turbine Company, Trenton, New Jersey. The unit consists of high- and low-pressure turbines capable of delivering 3 520 maximum continuous shaft horsepower. The turbines are equipped with double helical and double reduction gears. The exhaust casing of the low-pressure turbine has a built-in, high-pressure element for astern operation.

Steam power is furnished by two sectional header marine boilers with total normal steaming rate of 35 000 pounds per hour with a maximum rating of 52 500 pounds per hour. These two *Combustion Engineering* boilers are equipped with economizers and steam air heaters. Auxiliary functions of the ship are provided by about 100 Westinghouse motors ranging up to 50 horsepower each. The Westinghouse Company also supplied the electrical control equipment for auxiliary installations. The ship carries a No. 7 Hyde electro-hydraulic, vertical-type windlass and a 21-inch Hyde electric warping capstan. Rotary gear-type pumps are used for fuel-oil transfer and also for transfer of diesel and lube oil. Rotary screw-type pumps are employed for fuel-oil service. Special-type distillation equipment is included. The ship is humidity controlled and air conditioned.

Special winches have been installed for hydrographic and oceanographic operations. The hydrographic winch is a modified standard Navy bathythermograph winch, electro-hydraulic controlled. This winch drum has a capacity to take 3 000 feet of 5/32-inch-diameter wire rope. It is located on the port wing of the bridge. The boom is of the swing-out type, with a traverse adjustable trolley and pulley guyed fore and aft and with

topping stay. It will be used primarily for bathythermograph observations and shallow-water oceanographic work.

The oceanographic winch incorporates a 15-inch-diameter drum, 31 inches long, running free on the main shaft by which it is driven through planetary gearing. Helical gears connect the main shaft to a pinion which is driven by a hydraulic transmission and a 15-horsepower electric motor. The drum will carry 30 000 feet of 5/32-inch-diameter wire rope. The main drum is fitted with a hand brake which, when used coincident with release of the friction band, permits direct control of the free drum. A spooling device is geared to the drum and insures level winding of the cable. The winch will handle a 12 000-pound load at 350 feet per minute and an automatic relieving device limits the pull to not more than 1 500 pounds at any time to prevent excessive strain on cable. The boom for the oceanographic winch is an A-frame which is extended and retracted by a hydraulic ram operating off the winch hydraulic system. A Nansen-bottle rack is located adjacent to the winch and a complete oceanographic laboratory is located on the deck below.

The *Surveyor* carries the latest electronic navigational and hydrographic equipment, including gyro and auto-pilot, Main Ship Radar, Loran Receiver, Dead-Reckoning Analyzer, Radio Direction Finder, Auxiliary Ship Radar, and an Electromagnetic Log. The Dead-Reckoning Analyzer is particularly useful when in areas of doubtful Loran reception to eliminate any improper fixes. The Electromagnetic Log operates under the principle of the distortion of the electromagnetic waves by the water current. The range of this instrument is 0 to 40 knots in increments of 0.01 knot.

For hydrography, the hydrographic officer can use EPI for offshore surveys to 400 miles, the DM 100-watt Raydist for accurate control up to 175 miles, and Shoran for inshore charting. For launch surveys, the Shoran or the DM 10-watt transistorized Raydist will be used. The ship carries three hydrographic launches equipped with portable depth recorder, Shoran, and transistorized Raydist, and single-sideband communication equipment. Extra-heavy generating equipment has been included to power the above equipment.

Three portable depth recorders are used to obtain detailed sounding of 0 to 1 500 feet in expanded scales of 55 feet. For deep work to 36 000 feet an EDO type UQN-1D in conjunction with a Precision Depth Recorder (PDR) is used for detailed echo sounding. The PDR has an expanded scale of 400 fathoms for 18 inches of chart paper.

All of the echo sounders mentioned above are connected to a 60-cycle-frequency power supply with tuning-fork precision for accurate speed control.

Good communication is necessary for efficient hydrographic operations as well as the ship's general needs. For the ship's traffic, a Mackey communication consol was installed which incorporated the low-frequency communication equipment together with the auto-alarm and emergency equipment. For better usage of the frequencies assigned to the ship, single-sideband equipment has been purchased. The single-sideband method of communication is better suited for shipboard use because of its better reception under noise, duplex operation on the same frequency, ability to

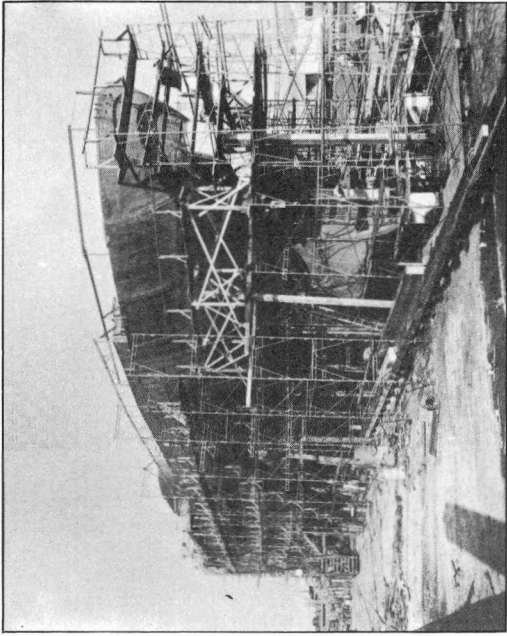


Figure 2.

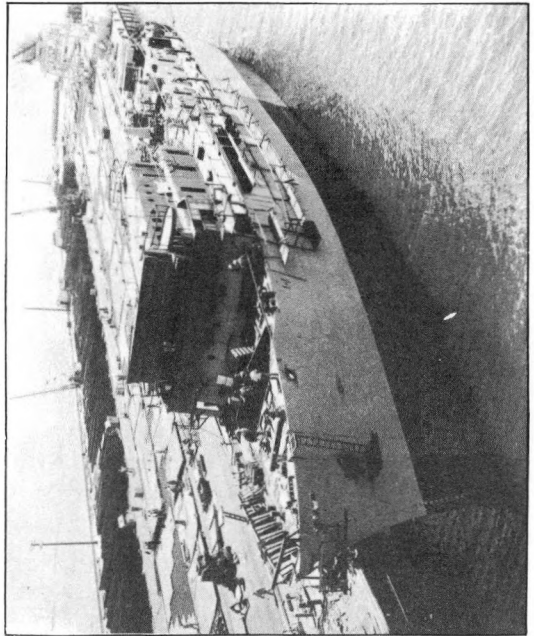


Figure 4.

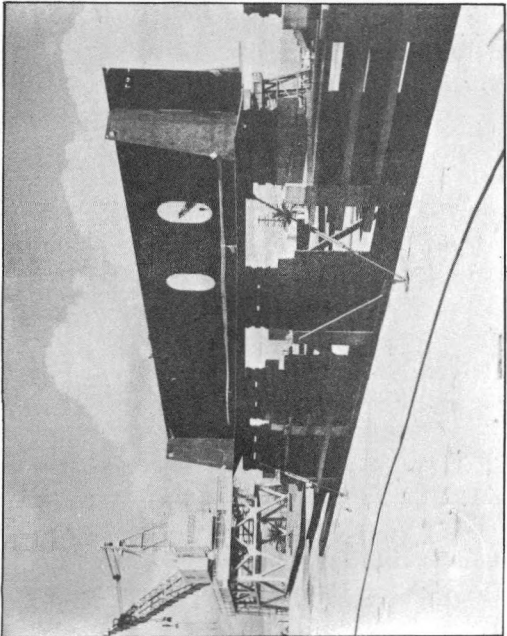


Figure 1.

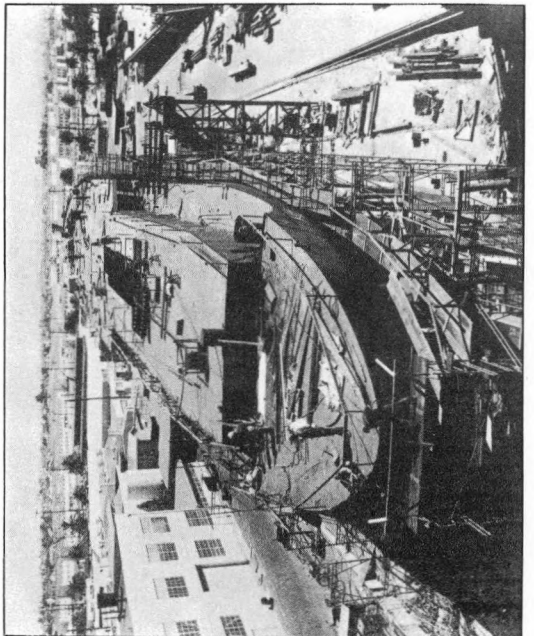


Figure 3.

Various building stages of USC&GS Ship Surveyor  
National Steel and Shipbuilding Corp.

handle two separate messages on the same frequency by using the upper and lower sidebands, and no heterodyne interference with adjacent services. The ship has a Collins KWT transmitter and a 51J4 receiver for communicating with its shore-based stations and launches. The latter units have RCA type SSB-1 single-sideband sets. For short-range communications, VHF FM equipment is used. A radio teletypewriter is used to receive weather and military communications.

Oceanographic equipment on the *Surveyor* includes devices for measuring currents and water temperatures; for obtaining water samples at various depths and samples of bottom sediments. The current-measuring equipment includes Roberts radio current meters and buoys, the latter being equipped with receiver-transmitters and selector switches for sending coded data relative to velocity and direction at multiple depths upon request from the ship or shore station. The velocity and direction signals for each depth are transmitted on separate frequency-modulation channels and are recorded with reference to time by a three-stylus chronograph. The ship also has Price current meters and poles for near-surface current measurements. Nansen-bottle equipment with attached reversing protected and unprotected deep-sea thermometers provides water samples and water temperatures at various depths. Shallow, medium, and deep bathythermographs furnish continuous traces of the vertical temperature gradient to depths of 900 feet. Metallic-coated slides used in the bathythermographs are a decided improvement over the smoked slides previously used. Phleger corers are used for obtaining samples of bottom sediments.

It is planned to augment appreciably the oceanographic equipment on the *Surveyor*. The additions will include a heavy-duty winch for dredging, heavy coring and deep-sea anchoring; a salinity bridge, a bottom dredge, a sound-velocity meter, and equipment for following neutrally buoyant submerged floats (pingers) used in connection with deep-current measurements.

The *Surveyor* has a service speed of 15 knots and a cruising endurance of 10 500 miles. In addition to the three 36-foot hydrographic launches, the ship also carries a 36-foot landing craft and four 26-foot motor whaleboats. The *Surveyor* has a crew of 21 officers and 90 men.

The keel for the new ship was laid at San Diego during February 1958 by the National Steel and Shipbuilding Corporation. Built on a strong and sound keel, this rugged ship is well equipped to explore uncharted waters while facing nature's most violent storms. The *Surveyor* was launched at the National Steel and Shipbuilding Corporation's shipyard at San Diego on 25 April 1959.

The new, modern six-million-dollar ship is one of the most elaborately outfitted research ships in the world. In addition to the most advanced electronic surveying equipment, she is also equipped with photographic and oceanographic laboratories. Facilities will eventually be included for preliminary reproduction of field-survey sheets to provide advance information on areas of particular importance.

Commissioning of the new ship is especially timely in view of national attention being given oceanographic investigations and developments. The *Surveyor* will be used effectively in furthering the modern oceanographic



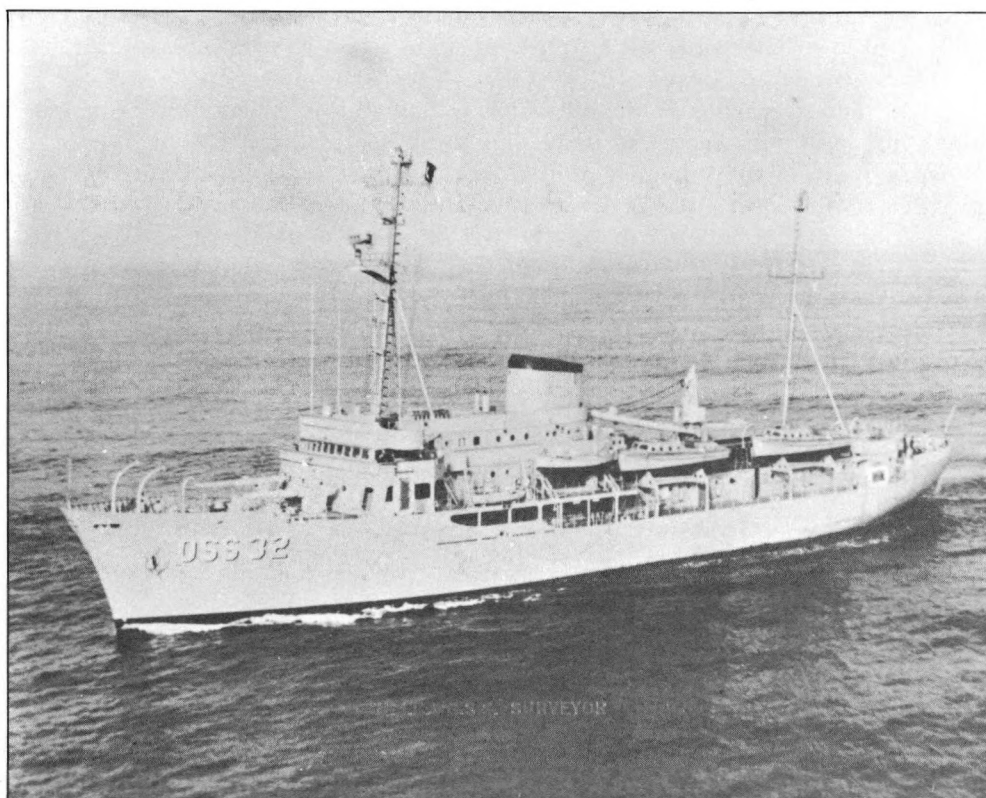


Figure 5. — USC&GS Ship *Surveyor*

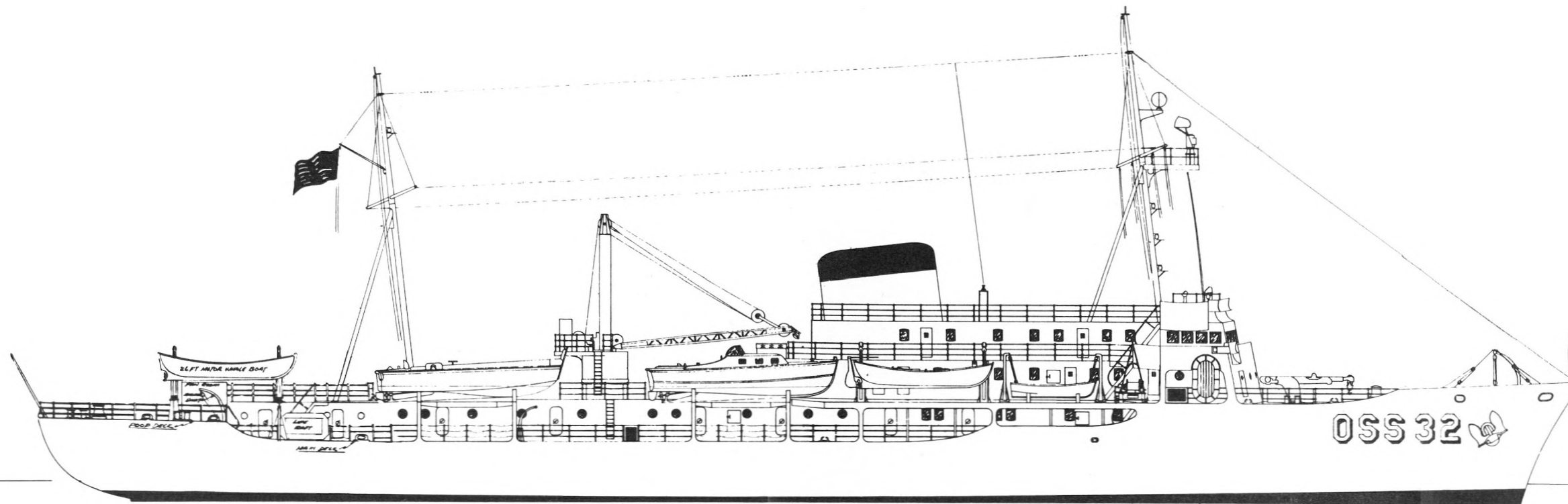
studies that are being programmed by the Coast and Geodetic Survey. This new component of the surveying fleet will accept the challenging tasks that lie ahead as the nation's oceanographic program gathers momentum.

The *Surveyor* bears the proud name and perpetuates the honorable record of the earlier ship of the same name which was retired from service about five years ago. The former *Surveyor* achieved an enviable record of surveying the coastal areas of the United States and possessions for more than forty years, including extensive service during World War I. Peacetime work executed by the earlier ship was largely in Alaska and the Aleutians. During World War II she continued to perform critical surveys in the Aleutians area. Her most spectacular peacetime experience came during May 1929 when she rescued 150 persons from the steamer *Aleutian* as she was sinking off Kodiak Island. The bell was retained from the old ship and has been installed on the new *Surveyor*.

Effective use will be made of the new *Surveyor* in surveying the enormous stretch of the seaward margins of the United States, involving an area greater than the entire continental land area of the nation. The vast coastlines of the United States represent many thousands of miles of tidal shoreline. The Atlantic coast has over 28 000 statute miles of tidal shoreline, the Gulf coast some 17 000 miles, and the Pacific coast almost 8 000 miles. To this seemingly endless zone of demarcation between land and sea which

must be surveyed by the Coast and Geodetic Survey are added the 34 000 statute miles of the state of Alaska and, more recently, the coastal waters of the new state of Hawaii.

The new *Surveyor* is the latest of a long line of Coast Survey ships, beginning with the *Jersey* in 1834 and the *Experiment* in 1835. The brig *Washington* and the schooner *Matchless* made historic contributions to the prestige of the Coast and Geodetic Survey in surveying the coastal waters of the nation. The *Washington* was the first Coast Survey vessel used extensively in oceanography, more than 100 years ago. The *Matchless* was among the last of the sailing ships used in Coast Survey work about the turn of the century. The modern survey ships of the Bureau, fully equipped with the latest surveying instruments, make possible the more critical modern surveys needed to produce up-to-date nautical charts to meet our present-day maritime demands.



GUIDANCE PLAN

C/G.S. PLAN NO. 505

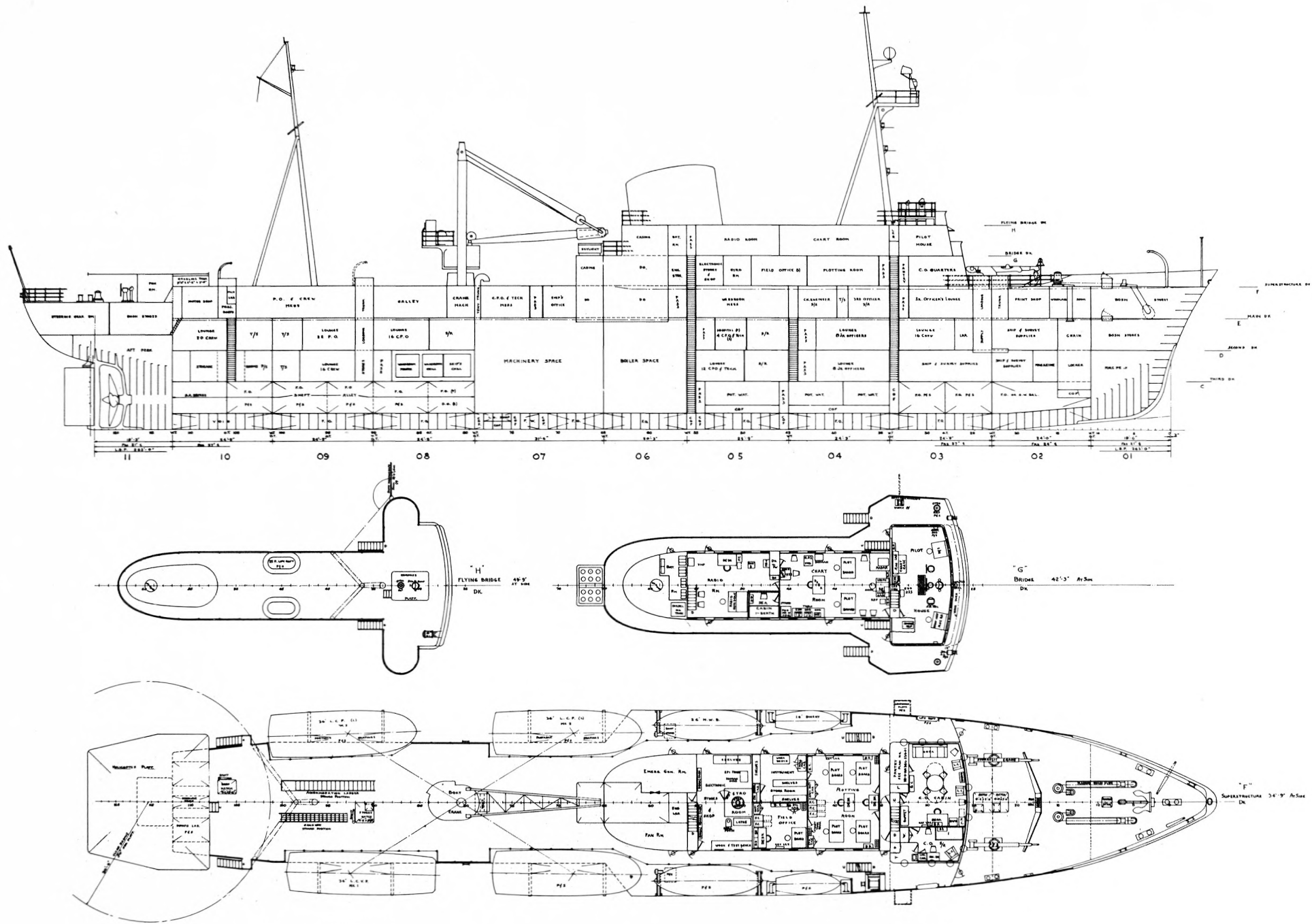
DESIGN: S2-S-RM28a

U. S. DEPARTMENT OF COMMERCE  
MARITIME ADMINISTRATION  
WASHINGTON 25, D. C.

TITLE: OUTBOARD PROFILE

NO. 101107 APPROVED BY \_\_\_\_\_  
 DATE 25 JAN 1957 APPROVED BY \_\_\_\_\_  
 BY T. L. PABET APPROVED BY \_\_\_\_\_  
 APPROVED BY \_\_\_\_\_  
 P. J. [Signature]  
 NO. 52-S-RM28a-512-6-1

Figure 6. -- USC&GS Ship Surveyor



**DIMENSIONS**

LENGTH OVERALL	200'-0"
LENGTH BEHIND W.L.	262'-0"
LENGTH BETWEEN PERP.	263'-0"
BEAM MOULDED	42'-0"
DEPTH MOULDED (MAIN DECK)	17'-0"
DEPTH BEATING	21'-0"
DRAFT (M.W.L.)	18'-0"

**COMPLEMENT**

1. COMMANDING OFFICER
4. SENIOR OFFICERS
6. JUNIOR OFFICERS
33. CPO / TECHNICIANS
35. SQUAD OFFICERS
34. CREW
16. STEWARDESSES
127 TOTAL

CONTRACT PLAN

C/65 PLAN N° D2
DESIGN S2-S-RM28a
U. S. DEPARTMENT OF COMMERCE MARITIME ADMINISTRATION WASHINGTON 25, D. C.
TITLE GENERAL ARRANGEMENT & INBOARD PROFILE
SCALE 1/8" = 1'-0"
DATE SEP-1967
DESIGNED BY J. H. F.
CHECKED BY J. H. F.
APPROVED BY J. H. F.
CONTRACT NO. 32-S-RM28a-59-0-2

Figure 7. — USC&GS Ship Surveyor

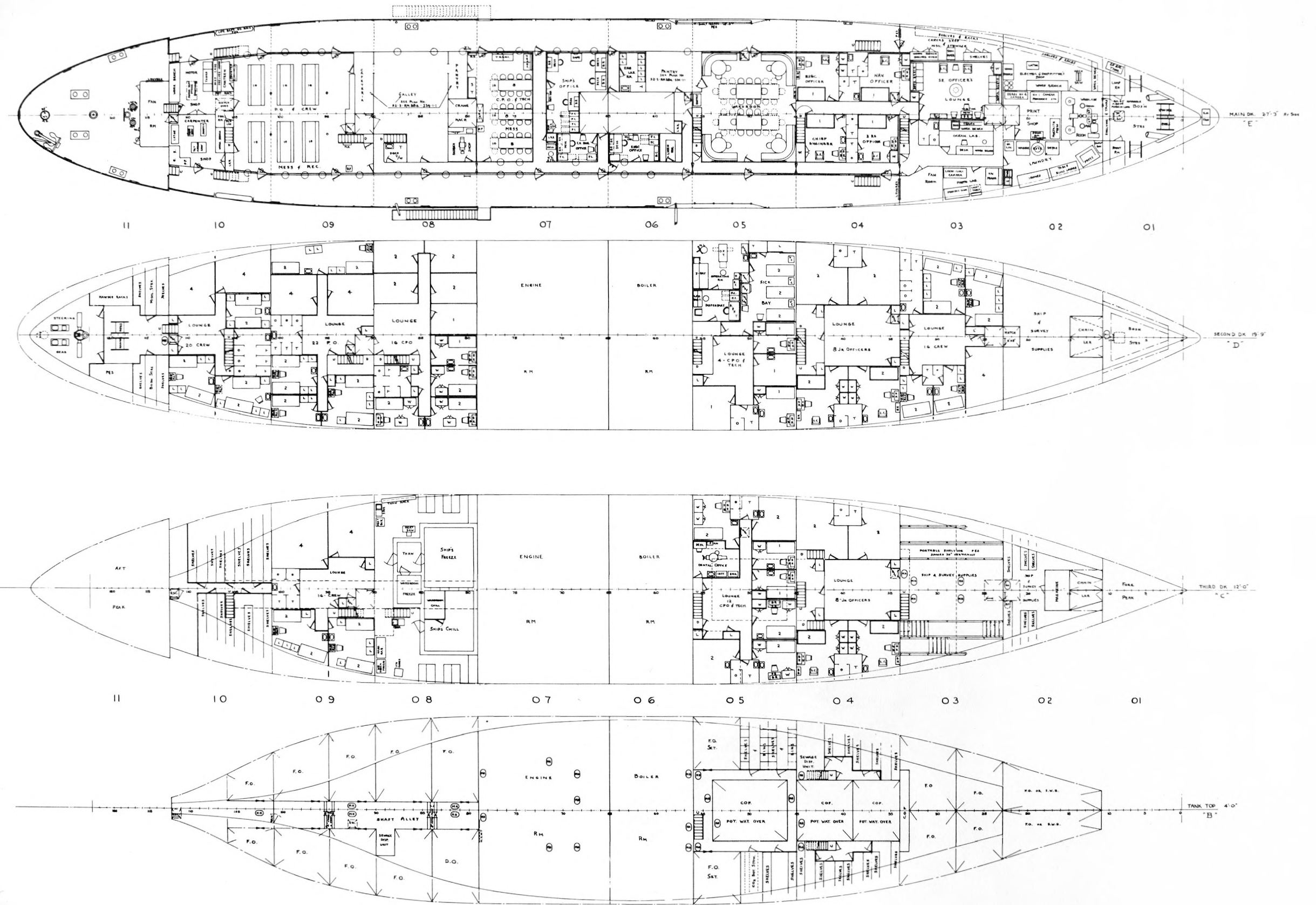


Figure 8. — USC&GS Ship Surveyor