U. S. COAST AND GEODETIC SURVEY SHIPS "McARTHUR" and "DAVIDSON"

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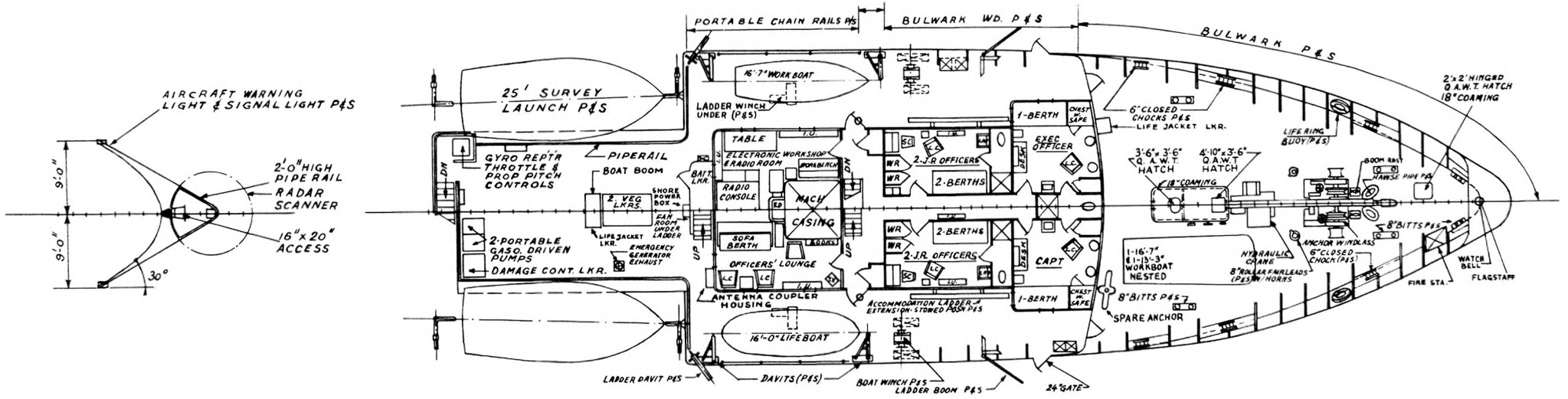
Two new hydrographic survey ships have recently joined the ESSA Coast and Geodetic Survey fleet. The USC&GSS *McArthur*, CSS-30, was commissioned on 15 December, 1966, and the USC&GSS *Davidson*, CSS-31, on 10 March, 1967, at ceremonies held in Norfolk, Virginia. The *McArthur* and *Davidson* are identical in construction and will be used in both hydrographic and oceanographic work along the Pacific Coast of the United States and Alaska and in the Hawaiian Islands. The ships were constructed by the Norfolk Shipbuilding and Drydock Corporation Norfolk, Virginia, under the contract administration and construction supervision of the Maritime Administration, U.S. Department of Commerce. Monitoring of the hydrographic and oceanographic features of the ships for compliance with the specifications and plans in addition to the regulatory body requirements was accomplished by the Ship Construction Group, Executive and Technical Services Staff, Coast and Geodetic Survey. In addition, specifications for the procurement of the special Government furnished equipments peculiar to these ships were initiated by this Group for ultimate installation aboard the ships. Coast and Geodetic Survey personnel also assisted as part of the construction staff at the shipyard. The keel for the *McArthur* was laid on 15 July, 1965, and the ship was launched on 15 November, 1965. The keel for the *Davidson* was laid on 22 November, 1965, and the ship was launched on 7 May, 1966.

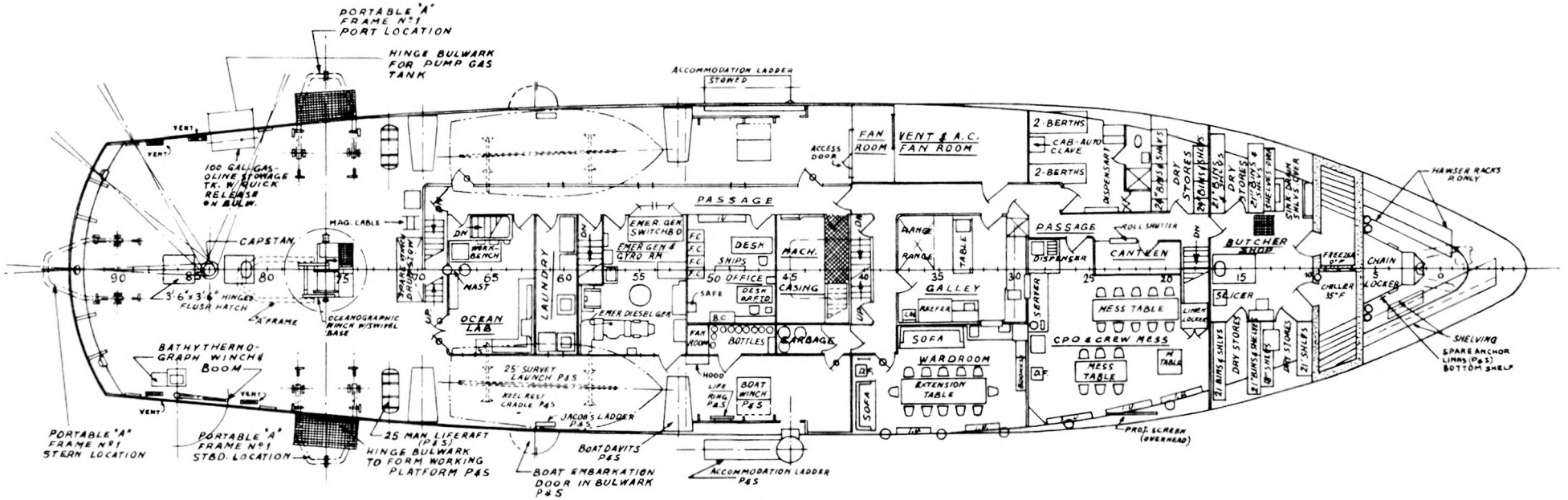
Specifically designed for combined hydrographic survey operations with oceanographic capabilities, the ships are of steel construction. The main propulsion consists of two General Motors, Electro-Motive division Model 567C diesel engines of 800 SHP each, with KA-ME-WA controllable pitch propellers that can be controlled from a pilothouse, engine room and aft control console. The steel hull is ice-strengthened to permit use in Alaska and the ice covered waters of the Arctic. The ships have an overall length of 175 feet, beam of 38 feet, and displacement under full load of 995 tons. The full load draft of the ships is 11 feet 6 inches. Scantlings are designed for a limited draft of 13 feet.

The ships are fitted with an anti-roll tank using diesel fuel for the stabilizing liquid. The anti-roll tank is located aft of the machinery space at the tank top level. The sustained sea speed at design draft is 13.5 knots



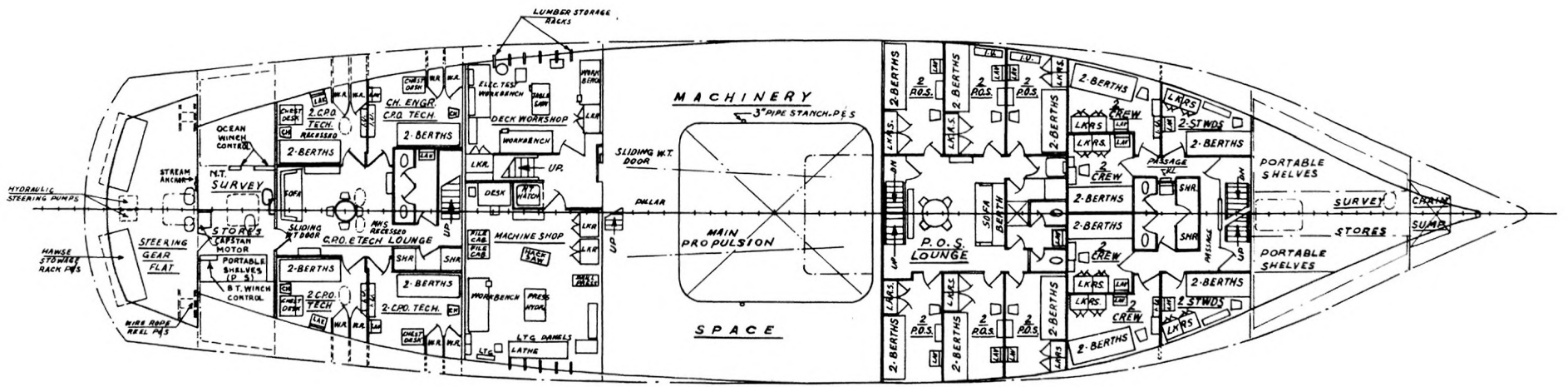
SUPERSTRUCTURE DECK & RADAR PLATFORM

FIG. 1



MAIN DECK-"D"

FIG. 2



SECOND DECK "C"

FIG. 3

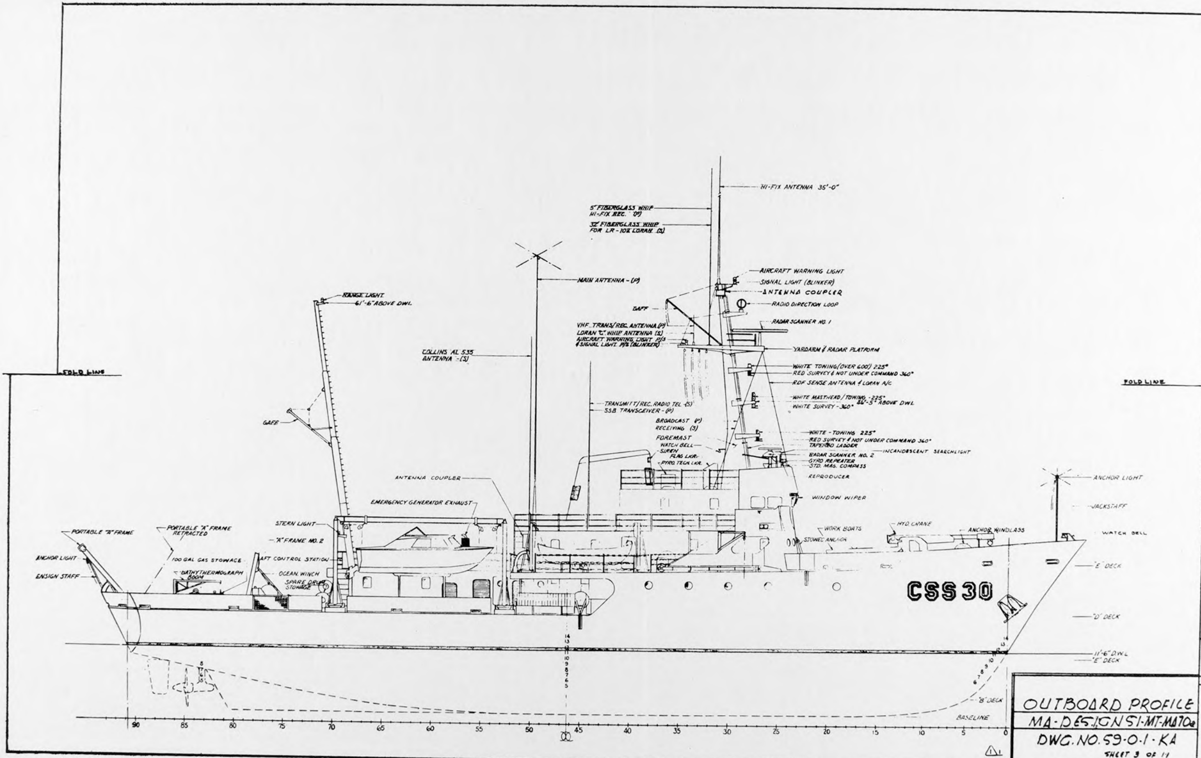

HI-FIX ANTENNA 35'-0"
5' FIBERGLASS WHIP
HI-FIX REC. (P)
32' FIBERGLASS WHIP
FOR LR-10E LORAN (S)
MAIN ANTENNA - (P)
AIRCRAFT WARNING LIGHT
SIGNAL LIGHT (BLINKER)
ANTENNA COUPLER
RADIO DIRECTION LOOP
GAFF
RADAR SCANNER NO. 1
VHF TRANS/REC. ANTENNA (P)
LORAN "C" WHIP ANTENNA (S)
AIRCRAFT WARNING LIGHT P/S
& SIGNAL LIGHT P/S (BLINKER)
YARDARM & RADAR PLATFORM
RANGE LIGHT
61'-6" ABOVE DWL
COLLINS AL 535
ANTENNA - (S)
FOLD LINE
WHITE TOWING (OVER 600') 225°
RED SURVEY & NOT UNDER COMMAND 360°
RDF SENSE ANTENNA & LORAN A/C
FOLD LINE
GAFF
TRANSMITT/REC. RADIO TEL (S)
SSB TRANSCEIVER - (P)
WHITE MASTHEAD/TOWING - 225°
46'-5" ABOVE DWL
WHITE SURVEY - 360°
BROADCAST (P)
RECEIVING (S)
FOREMAST
WATCH BELL
SIREN
FLAG LKR.
PYRO TECH LKR.
WHITE - TOWING 225°
RED SURVEY & NOT UNDER COMMAND 360°
TAPERED LADDER
INCANDESCENT SEARCHLIGHT
RADAR SCANNER NO. 2
GYRO REPEATER
STD. MAG. COMPASS
REPRODUCER
ANTENNA COUPLER
ANCHOR LIGHT
EMERGENCY GENERATOR EXHAUST
WINDOW WIPER
JACKSTAFF
STERN LIGHT
PORTABLE "A" FRAME
PORTABLE "A" FRAME
RETRACTED
"A" FRAME NO. 2
WORK BOATS
HYD. CRANE
ANCHOR WINDLASS
WATCH BELL
STOWED ANCHOR
ANCHOR LIGHT
100 GAL GAS STOWAGE
AFT CONTROL STATION
"E" DECK
ENSIGN STAFF
BATHYTHERMOGRAPH
BOOM
OCEAN WINCH
SPARE DRUM
STOWAGE
CSS 30
"D" DECK
11'-6" DWL
"E" DECK
"B" DECK
BASELINE
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
OUTBOARD PROFILE
MA-DESIGN S1-MT-MA70a
DWG. NO. 59-0-1-KA
SHEET 3 OF 11

Fig. 4

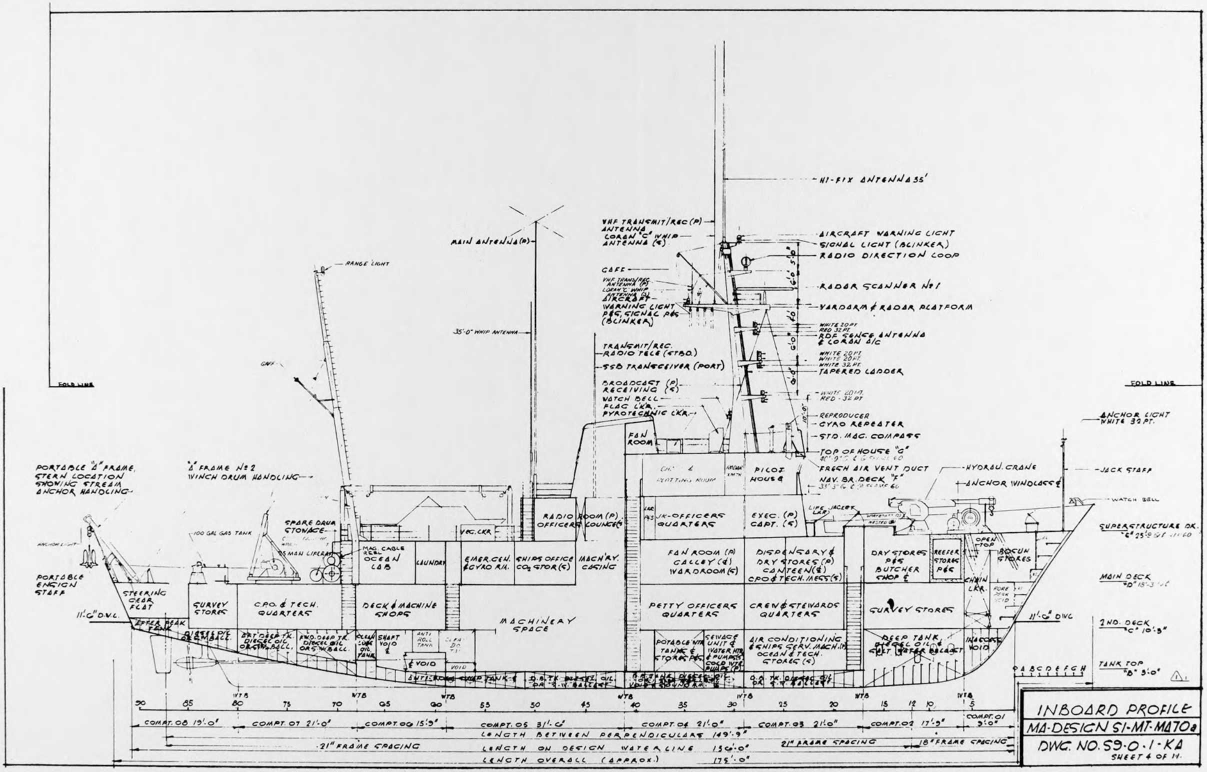

INBOARD PROFILE
MA-DESIGN S1-MT-MA70a
DWG. NO. S9-0-1-KA
SHEET 4 OF 14.
HI-FIX ANTENNA 35'
AIRCRAFT WARNING LIGHT
SIGNAL LIGHT (BLINKER)
RADIO DIRECTION COOP
RADAR SCANNER No 1
YARDARM & RADAR PLATFORM
TAPERED LADDER
REPRODUCER
GYRO REPEATER
STD. MAG. COMPASS
FRESH AIR VENT DUCT
HYDRAU. CRANE
ANCHOR WINDLASS
JACK STAFF
ANCHOR LIGHT WHITE 32 PT.
MAIN ANTENNA (P)
35'-0" WHIP ANTENNA
TRANSMIT/REC. RADIO TELE (STBD.)
SSB TRANSCEIVER (PORT)
BROADCAST (P) RECEIVING (S)
WATCH BELL
FLAG LKR.
PYROTECHNIC LKR.
FAN ROOM
PILOT HOUSE
JR.-OFFICERS QUARTERS
EXEC. (P) CAPT. (S)
RADIO ROOM (P) OFFICERS LOUNGE (S)
PORTABLE "A" FRAME, STERN LOCATION SHOWING STREAM ANCHOR HANDLING
"A" FRAME No 2 WINCH DRUM HANDLING
SPARE DRUM STOWAGE
PORTABLE ENSIGN STAFF
STEERING GEAR FLAT
SURVEY STORES
C.P.O. & TECH. QUARTERS
OCEAN LAB
LAUNDRY
EMER. GEN. & GYRO RM.
SHIPS OFFICE CO2 STOR (S)
MACH'RY. CASING
DECK & MACHINE SHOPS
MACHINERY SPACE
FAN ROOM (P) GALLEY (¢) WARDROOM (S)
DISPENSARY & DRY STORES (P) CANTEEN (¢) CPO & TECH. MESS (S)
DRY STORES P&S BUTCHER SHOP ¢
BOSUN STORES
PETTY OFFICERS QUARTERS
CREW & STEWARDS QUARTERS
SURVEY STORES
AIR CONDITIONING & SHIPS SERV. MACH. (P) OCEAN & TECH. STORES (S)
DEEP TANK DIESEL OIL & SALT WATER BALLAST
VOID
AFTER PEAK TANK
SUPERSTRUCTURE DK.
MAIN DECK
2ND. DECK
TANK TOP
COMPT. 08 19'-0"
COMPT. 07 21'-0"
COMPT. 06 15'-9"
COMPT. 05 31'-6"
COMPT. 04 21'-0"
COMPT. 03 21'-0"
COMPT. 02 17'-9"
COMPT. 01 5'-0"
LENGTH BETWEEN PERPENDICULARS 149'-9"
21" FRAME SPACING
LENGTH ON DESIGN WATERLINE 156'-0"
18" FRAME SPACING
LENGTH OVERALL (APPROX.) 175'-0"
FOLD LINE

FIG. 5

with a range of 4 500 miles and endurance of 15 days. The latest in habitability has been incorporated in the air conditioned spaces for berthing and messing of the 6 officers and 30 crew members. In addition, the chartroom, radio room, oceanographic laboratory and the ship's office are air conditioned to make ideal working areas.

Electrical power is supplied by two diesel driven ship service generators of the drip-proof, self-ventilated, brushless type 450 volt, 3 phase, 60 cycle, A.C., having a rated continuous capacity of not less than 220 KW each at 0.8 power factor lagging complete with all appurtenances.,

The generators are arranged for parallel operation and either unit is capable of carrying the maximum normal sea or port load of the ship. The emergency generator is of the brushless type and has a continuous capacity of not less than 60 KW. The emergency generator is also capable of providing the necessary power for cold ship starting. Ships service power is 115 volt A.C., 60 cycle single phase; 115 volt A.C., 60 cycle single phase regulated power; and 115 volt A.C., 60 cycle single phase controlled frequency power is also available for certain electronics and scientific equipments.

Special winches have been installed for hydrographic and oceanographic operations. The bathythermograph winch is electro-hydraulic controlled with a drum capacity for 4 000 feet of 3/32 inch diameter 7×7 aircraft cord, stainless steel wire rope. The bathythermograph boom is of the swing-out type, pulley guyed fore and aft. It will be used primarily for bathythermograph observations and shallow water oceanographic work.

The oceanographic winch is a self-contained hydraulically operated unit, complete with electric motor, hydraulic pump and motor controls. The winch is mounted on a rotating base and the area swept by such rotation is that of a circle 12 feet in diameter. The winch is arranged to accommodate any one of three drums. One drum having a capacity of 12 000 feet of 0.298 inch diameter electrical double armored cable, 6 conductors. The second drum having a capacity of 30 000 feet of 3/16 inch diameter cable 3×19 sealed construction, improved plow steel and the third drum having a capacity of 6 000 feet of 3/8 inch diameter cable 6×19 sealed construction, improved plow steel. The boom for the oceanographic winch is an A-frame which is extended and retracted by sheath screws operated by an air-motor. The A-frame is portable for easy location at three operating areas, one each port and starboard and one aft at the fantail.

Oceanographic equipment on the *McArthur* and *Davidson* includes devices for measuring currents and water temperatures and obtaining water samples at various depths and samples of bottom sediments. The current-measuring equipment includes radio current meters and buoys, the latter being equipped with receiver-transmitters and selector-switch for sending coded data relative 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. Nansen-bottle equipment with attached reversing protected and unprotected deep-sea thermometers for recording temperatures at various depths.

FIG. 6. — USC&GSS *Davidson* underway during sea trials February 2, 1967.
Top right, the launching ceremonies, *McArthur*, November 15, 1965.
From left to right : Miss Mary McArthur, Mrs. Jack K. Bennett, Mr. David Baldwin, Assistant Secretary for Administration, Department of Commerce, RADM James C. Tison, Jr., Director, C&GS, Rev. Walton W. Davis, Mr. John Roper II, President NSBDD.

Shallow, medium and deep bathythermographs furnish continuous traces of the vertical temperature gradient to depths of 900 feet. The ships will be able to make magnetic observations using a towed proton precision magnetometer with all recording instruments located in the oceanographic laboratory.

The ships have the latest electronic navigational and communication equipments installed including gyro and auto-pilot, surface search radar, radio direction finder, Loran A/C indicator system, Loran C microcircuit receiver, Hi-Fix positioning system, and an electromagnetic underwater log. In addition to the above, standard navigation equipment such as magnetic compass, whistle, rudder angle indicator and gyro repeaters are installed.

For hydrography the ships are equipped with one deep water depth recorder Model AN/UQN-1F, one precision depth recorder and two shoal water depth recorders (DE-723). Two special hydrographic survey launches of plastic construction are carried aboard. The launches are equipped with a portable depth recorder and electronic positioning equipment. Extra heavy generating equipment has been included to power the above launch equipment.

Good communication is necessary for efficient hydrographic operations as well as the ships needs. For the ships traffic a Collins 1 000 Watt MF and HF Transceiver (URG) was installed with one high frequency single sideband transceiver. The single sideband method of communication is best suited for shipboard use because of its reception under noisy conditions and better communications with the two launches and shore stations. An RCA CRM-P7A/150 is also provided for intership and emergency communications, with a remote operating position in the pilothouse. In addition to the above equipment, one main radio telegraph console, RCA-CRM-C1A, one HF SSB Collins 32MS-1A, one narrow Band VHF Radiotelephone RCA-ET-8058, four Narrow Band VHF two channel frequency modulated (FM) Radio-telephones RCA-AR-8516, one narrow Band VHF, Motorola " Compa-Station " base station and two HF Collins Model 515-1 receivers are installed in the radio room.

The *McArthur* is named to commemorate Lt. William P. McArthur who began his career in the Coast and Geodetic Survey in 1840 aboard the brig *Consort*, engaged in surveys of the Gulf Coast. In 1848 he was appointed to command the hydrographic party sent to make the first major survey of the Pacific Coast. On arriving along the California Coast, he selected Mare Island as the most suitable location for a Navy Yard and sailed northward along the coast in the schooner *Ewing*. His pioneer work on the Pacific Coast, including a preliminary survey and a successful reconnaissance of the coast from Monterey to the Columbia River was published in 1851 in "Notices of the Western Coast of the United States". Lt. McArthur died in 1850 as the ship *Oregon* was entering Panama Harbor on the return voyage from the West Coast.

The *Davidson* is named to commemorate George Davidson who has often been referred to as the " Father of Pacific Coast Geography ". He was a renowned geodesist, geographer and astronomer. His services in the Coast and Geodetic Survey began in 1845 and ended with his retirement in 1895. His work along the California Coast began in 1850 when he was

assigned the task of making an accurate survey of the Pacific Coast to meet the needs of navigation. In 1866, he made a survey of the coast of Alaska. His official report ultimately was issued with revisions and enlargements as the 1869 Coast Pilot of Alaska.

He was President of the California Academy of Sciences for many years, and of the Geographical Society of the Pacific. He was a renowned authority on the history of the Pacific Coast. He served as a Regent of the University of California from 1877 to 1884, and later was appointed honorary professor of geodesy and astronomy in the University.

NOTE

More detailed information on these two ships may be obtained by writing to :

The Director,
Environmental Science Services Administration,
U.S. Coast and Geodetic Survey,
Rockville,
Maryland 20852, *U.S.A.*