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2. SHIP DESCRIPTION

2.1. Features and Characteristics

The NS Savannah is a single-screw, all-steel, nine-compartment, cargo ship, with raked bow and modified cruiser stern. The ship has three complete decks and three upper decks in the superstructure. The NS Savannah's principal characteristics are shown in the Booklet of Plans (see Drawing IA 310-J-365) and in Table 2-1.

2.2. Compartmentation, Decks and Space Arrangement

2.2.1. Compartmentation

The hull is subdivided by 10 watertight transverse bulkheads extending to the freeboard deck (B-deck). The ship is designed to a two-compartment standard of subdivision (i.e., the ship will remain afloat with any two compartments totally flooded at the vessel's full load draft of 29 feet 6 inches with the margin line 3 inches below B-deck), which meets the requirements of the USCG. Tonnage openings have been closed to convert the NS Savannah from a sheltered deck to a full scantling vessel resulting in additional damaged stability.

Beginning at the bow, the compartments and spaces between transverse bulkheads are as shown in Table 2-2.

The hull is built on a transverse framing system except for the inner bottom, which is a combination of transverse and longitudinal framing specially stiffened below the reactor compartment. The inner bottom is also subdivided into tanks for carrying liquid ballast, diesel oil, boiler feedwater, fresh water, and low-level radioactive liquid wastes.

2.2.2. Deck Arrangements

The ship has three complete decks (A,B, and C) with platform decks at various levels. A promenade deck extends over the A-deck for about one-third of the ship's length.

Table 2-1. Principal Characteristics of the NS Savannah

Dimensions

Length overall	595 ft 6 in.
Length forepost to rudder-post	545 ft 0 in.
Beam, molded	78 ft 0 in.
Height, baseline to weather deck (A-deck)	50 ft 0 in.
Height, baseline to top of house	85 ft 0 in.
Draft, design	29 ft 6 in.
Draft, light ship (approximate)	18 ft 4 in.

Displacement and Tonnage in Long Tons

Net carrying capacity, total deadweight tons	9,656
Full load displacement, tons	21,990
Light ship, tons	12,334

Officers and Crew

68

Standard of Subdivision

2 compartment

Power and Speed

Normal power	20,000 shp
Maximum power	22,000 shp
Trial speed at normal power and draft	21 knots
Speed with emergency propulsion motor	5.5 knots

Machinery

Nuclear steam generating system	UO ₂ - fueled reactor, cooled and moderated with pressurized water.
Propulsion system	High and low pressure saturated steam turbines with reduction gear; 3-stage feedwater heating.
Propeller	One; 5-blade, 22 feet diameter, solid high strength nickel manganese bronze.

Table 2-1. (Cont'd)

Machinery (Cont'd)

Auxiliary propulsion power	750 shp
Auxiliary steam generation	7,500 lb/hr
Evaporator capacity	32,000 gallons/day

<u>Electrical Generation</u>	<u>Number</u>	<u>Total Power (kw)</u>
Turbine generators	2	3,000
Auxiliary diesel generators	2	1,500
Emergency diesel generators	1	300

Cargo Capacity

General cargo, bale cubic feet	652,010
Refrigerated cargo	None
Cargo oil	None

Table 2-2. Compartment Utilization

<u>Spaces</u>	<u>Length</u>		<u>Assignment</u>
	<u>ft</u>	<u>in.</u>	
Fore peak	28	0	Tank and stores
Hold 1	50	0	General cargo and deep tank
Hold 2	55	0	General cargo
Hold 3	55	0	General cargo
Hold 4	55	0	General cargo
Reactor space	60	0	Reactor, stores, and stabilizers
Machinery space	55	0	Machinery and control room
Hold 5	50	0	Storerooms
Hold 6	57	6	General cargo
Hold 7	47	6	General cargo
Aft peak	32	0	Tank, steering gear, and stores

Drawing IA 310-J-365 shows the A-, B-, and C-deck arrangements and an inboard profile.

The NS Savannah's streamlined superstructure is set sufficiently aft to permit access to the reactor system containment vessel through the forward promenade deck for refueling. The forward weather deck accommodates the hatches for cargo holds 1, 2, 3, and 4. Each hold is served by two cargo booms. Holds 1 and 2 are served by 8-ton cargo booms, and holds 3 and 4 by 10-ton cargo booms. The eight booms are operated in groups of four from two A-frame supporting structures with outriggers.

Aft of the superstructure a third cargo gear A-frame accommodates four 10-ton booms serving holds 6 and 7. Cargo hatch covers are set in coamings on A-deck and are hydraulically operated from local stations at each hatch.

The uppermost or navigation bridge deck serves a dual purpose. The pilothouse is located on the forward end and the radio room is slightly aft to the starboard. The chart room is on the port side outboard of the gyrocompass room. The balance of the navigation bridge deck provides berthing space for the radio operator and is the location of two fan rooms, a battery room, and the emergency generating room.

The NS Savannah's pilothouse and navigation bridge were laid out to obtain the maximum visibility through the widest possible angle (almost 180 degrees). The pilothouse, shown in Figures 2-1 and 2-2, is equipped with the latest available navigation and communication equipment. The navigation control console, housing all normal pilothouse instrumentation, is situated near the forward end of the house and on the centerline. The magnetic compass is of the reflecting type and is the first of this type to be manufactured in the United States. The pilothouse also houses the control console for the anti-roll stabilizers which are installed on and above the inner bottom tank top level amidships.

The boat deck, just below the bridge, is almost entirely occupied with officers' accommodations. An officers'

lounge located on the after end of the deck affords observation on either side of the ship.

Various public rooms and other spaces are located on the promenade deck. The forward portion is a weather deck containing the main hatch over the reactor compartment. Between the sloped front of the deckhouse and the main lounge, there is an enclosed passageway extending outboard athwartship from the centerline. This passageway also extends along both sides of the ship outboard of the inner house and is called the promenade.

2.2.3. Space Arrangement

As seen in Drawing IA 310-J-365, the ship's power plant is located in the two amidships compartments (reactor space and machinery space) which lie between frames 99 and 148. The ship's capacity plan is shown in Drawing RC 04-J-757.

Components of the reactor system are located in the reactor space. Most of the components are inside the containment vessel. The machinery space contains all of the propulsion system equipment by which high pressure steam is converted to power. The machinery space also contains the main and auxiliary electrical generating systems and most of the other auxiliary systems.

The central control room for the entire power plant is located on the 20-foot flat at the after end of the machinery space. All operations for starting and controlling the power plant are executed from the main console in this room. Almost all measurements, conditions, and events in the reactor and propulsion systems are monitored and logged in this room, and all power plant maintenance operations are supervised from it.

2.3. Navigation and Steering Equipment

2.3.1. Navigation Equipment

The navigation equipment on the NS Savannah embodies the latest technology and complies with all the requirements of the USCG, the Federal Communications Commission

and all international agreements to which the United States is signatory, including the 1960 SOLAS Convention.

Two magnetic compasses are installed, each complete with lighted commercial binnacle, compensating equipment including quadrantal globes, Flinders bar equipment, and correcting magnets. An azimuth circle complete with ring vanes, prism lens, level and mirror is also included. The magnetic compass located on top of the pilothouse is of the reflection type and thus eliminates the necessity of a magnetic compass in the pilothouse. The compass aft on the docking bridge is a standard 7.5-inch naval-type magnetic compass.

The navigation equipment also includes an automatic course recorder of the gyrocompass repeater type, an echo depth sounder with both recording and indicating instruments, and two surface-search radar units with 16-inch scopes. These radar units are located on each side of the steering stand. They have wave lengths of 3 and 10 centimeters respectively, and present the relative and true motion image. There is also a Loran receiver-indicator, a Decca Navigator, a fixed loop radio direction finder with receiver indicator, and a complete gyrocompass system with magnetic amplifier in the binnacle and repeaters at nine different locations.

A combination electric steering control and gyro pilot system is provided to handle the ship. The steering gear pumps are remotely controlled from a dual electric steering stand on the bridge, as well as from an aft steering stand on the docking bridge. The dual control unit mounted in the pilothouse controls the rudder through either port or starboard systems automatically by means of the gyro system, manually by means of the handwheel, and manually by means of a separate control lever. This dual bridge control with dual steering gear pumps may be switched to any combination from the bridge, giving the ship two independent rudder control systems. The bridge control console also includes a rudder angle indicator.

2.3.2. Steering Gear

The steering gear is of the four cylinder, electric-hydraulic type. The rams drive the crosshead through a Rapson slide with a maximum hydraulic pressure of 2000 psig. The gear has two independent power plants and two independent hydraulic systems capable of handling the rudder in any combination under the following conditions:

1. Moving the rudder from 35 degrees hard over on one side to 35 degrees on the other side at not less than 2.3 degrees per second against the propeller-induced torque of 4,391,000 inch-pounds at 20.25 knots and design draft.

2. Moving the rudder at the same rate with the ship at light draft and 22,000 shaft horsepower against a torque of 5,914,000 inch-pounds.

3. Moving the rudder against a torque of 6,961,000 inch-pounds with the ship traveling astern at full draft and maximum astern power.

The steering gear is also equipped with a followup springless storage motion differential control so that mechanical interference will not occur even when the steering wheel and rudder are out of phase by 76 degrees.

2.4. Fire Detection and Control System

The various indicating and control units of this system are located in the chart room. These are the smoke-detecting cabinet, emergency-stop control for cargo hold and personnel quarters ventilation fans, control for releasing fire doors, and a manual alarm and fire detecting system. The fire detecting system has manual fire alarm boxes, thermostats, and its own power supply consisting of two batteries. One battery is used while the other is charging. This system is divided into zones and registers visually and audibly on the annunciator panel in the chart room the zone in which the fire occurs.

The fire extinguishing system actuated by local or remote release switches can smother a fire with carbon dioxide from bottle banks. This system protects the engine room, all

cargo holds, the reactor compartment including the interior of the containment vessel, emergency diesel generator room, and various paint lockers. There are 54 portable extinguishers and 64 fixed carbon dioxide cylinders on board the ship. The NS Savannah fire control plan is shown in Drawing FC-J-339, and the Fire Extinguishing System is shown in Figure 2-3. The Fire Mains are shown in Figure 2-4.

2.5. Lifesaving Equipment

The NS Savannah is provided with the latest available lifesaving equipment in compliance with the present regulations of the USCG and the 1960 SOLAS Convention. Lifesaving equipment aboard the NS Savannah is listed on the current Certificate of Inspection issued by the USCG.

2.6. Radio Equipment

The radio installation is designed and constructed to insure maximum safety to the ship and crew and to provide reliable communications. It complies with the requirements of the SOLAS Convention, the Federal Communications Commission and all international conferences and treaties to which the United States is a party. All except the fixed lifeboat equipment is installed in the radio room located on the navigating bridge deck. The installation consists of the following:

1. Intermediate-frequency radiotelegraph-transmitter.
2. Emergency radiotelegraph-transmitter with emergency power supply obtained from batteries and from the emergency switchboard.
3. Low- and intermediate-frequency receiver.
4. High-frequency receiver.
5. Twenty-channel low-frequency radiotelephone.
6. Fifty-channel single side band high seas radiotelephone.
7. Lifeboat radio equipment fixed in the motor-driven lifeboat.
8. High-frequency radiotelegraph-transmitter.
9. Lifeboat portable radio equipment.

The portable radio equipment for the lifeboat is a compact, completely self-contained radio receiver-transmitter constructed and designed to be used by personnel not trained in communications.

Batteries, spares, alarms, and testing equipment complete the installation. A 36-channel VHF radio is located in the wheelhouse for navigation assistance and port operations.

A radio facsimile receiver is installed in the radio room to provide the Master with the latest weather analyses and forecasts. This permits the reception of printed material such as surface analyses and forecasts, 5-day forecasts, upper air analyses and forecasts, sea-condition charts and ice-condition charts by means of radio. These can be received 2 to 4 times per day depending on the transmission schedules of the many weather centers throughout the world.

2.7. Deck Machinery

The principal deck machinery includes the capstans, anchor windlasses and boat winches. Two capstans complete with vertical shafts are provided aft on A-deck port and starboard. Each capstan is capable of handling an 8.5-inch rope hawser with a maximum line pull of 30,000 pounds and a light line speed of 140 feet per minute.

Each set of lifeboat davits is equipped with its own electric boat winch of such capacity, that when fully loaded, it can be safely hoisted at 20 feet per minute and lowered no faster than 120 feet per minute. The gravity davits for lowering the lifeboats do not require electricity.

Key to Figure 2-1. Wheelhouse Console Detail

1. Sound-Powered Telephone Ringer
2. Sound-Powered Telephone Ringer
3. Rudder Angle Indicator
4. Gyro Repeater
5. Shaft Revolution Indicator
6. Engine Order Telegraph
7. VHF Radio Control
8. Two Sound-Powered Handsets - 2JV, 3JV
9. Scram Alarm Switch
10. General Alarm Switch - Entire Ship
11. General Alarm Switch - Crew
12. Sound-Powered Telephone Ringer
13. Bow Telephone Switch
14. Docking Bridge Whistle Selector
15. Whistle Control - Electric
16. Radiophones for Harbor Phone
17. Radiotelephone Handset
18. Selector Switch - Air and Steam Whistle
19. Sound-Powered Handset - 1JV
20. Docking Phone - Handset
21. Radiotelephone Handset
22. Radiotelephone Handset

Figure 2-1. Wheelhouse Console Detail

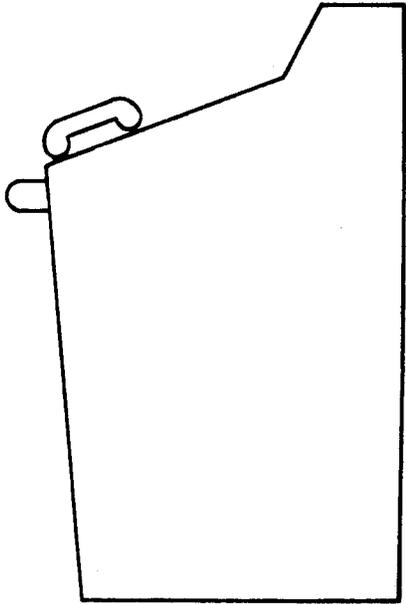
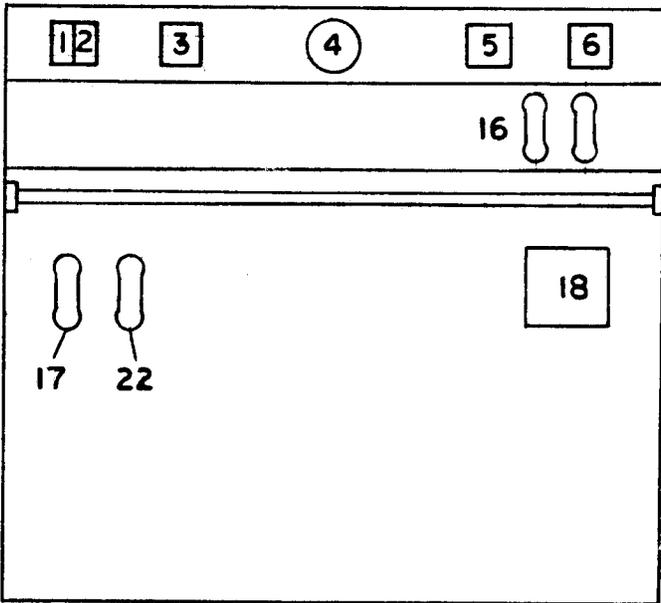
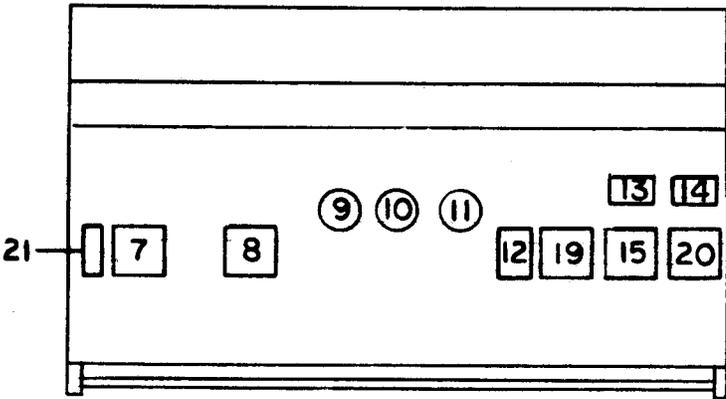
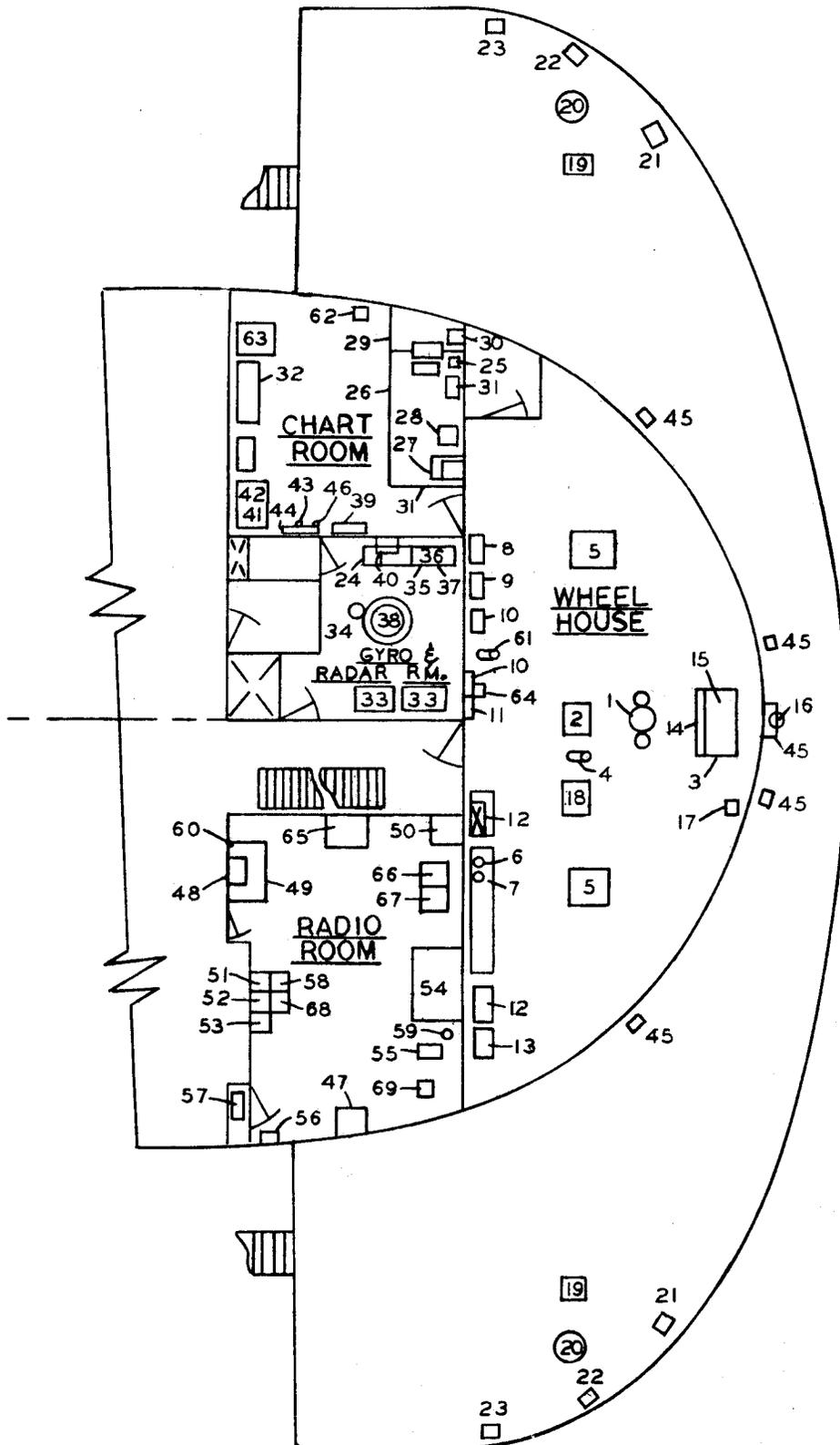


Figure 2-2. NS Savannah Bridge



Key to Figure 2-2. NS Savannah Bridge

1. Reflector From Standard Compass
2. Combined Steering Control and Gyro Pilot With Steering Repeater
3. Wheelhouse Console
4. Voice Tube to Top of House
5. Radar Viewing Console
6. Voice Tube to Radio Room
7. Voice Tube to Captain's Stateroom
8. Running Lights Panel
9. Lifeboat Floodlight Panel
10. Emergency Lighting System
11. Public Address and Docking System Control Panel
12. Wheelhouse Alarm Panel
13. Emergency Breathing Apparatus
14. Wheelhouse Control Console
15. Clinometer
16. Watch Bell
17. Whistle Control, Mechanical
18. Stabilizer Fin Control Console
19. Engine Order Telegraph
20. Gyro Repeater
21. Electric Whistle Control
22. Receptacle for Daylight Signalling Light
23. Receptacle for Public Address and Docking System
24. Motor Generator Set for Gyrocompass
25. Loran Power Supply
26. Chart Table With Chronometer Box
27. Course Recorder
28. Fathometer
29. Instrument Locker and Bookrack
30. Radio Direction Finder
31. Loran
32. Public Address and Docking System Amplifier
33. Radar Transmitter - Receiver

Key to Figure 2-2. (Cont'd)

34. Voice Tube to Wheelhouse
35. Gyro Battery Transfer Panel
36. Gyro Repeater Switch Panels
37. Gyro Relay Transmitter Panel
38. Master Gyrocompass
39. Electronic Power Panel (115 v)
40. Motor Generator Set Starter
41. Smoke Detecting Repeater
42. Fire Alarm Panel
43. Fire Door Release Switch
44. Fire Alarm Chart
45. Window Wipers
46. Master Control for Ventilation System
47. Spare Parts Cabinet
48. Bookrack
49. Desk
50. File Cabinet
51. Harbor Radiotelephone Transmitter - Receiver
52. VHF Radiotelephone Transmitter - Receiver
53. VHF Radiotelephone Auxiliary - Receiver
54. Radio Console
55. Pneumatic Tube Terminal
56. Battery Charging Panel
57. Emergency Radio Batteries
58. Emergency Lifeboat Radio
59. Voice Tube to Wheelhouse
60. Sound Powered Telephone
61. Voice Tube to Gyro Room
62. Decca Navigator, Mark XII
63. Meteorological Instrument Panel
64. Fathometer Indicator
65. Seafax Receiver
66. Independent Sideband Transmitter
67. Radiotelephone Console
68. Power Panel
69. Intercom

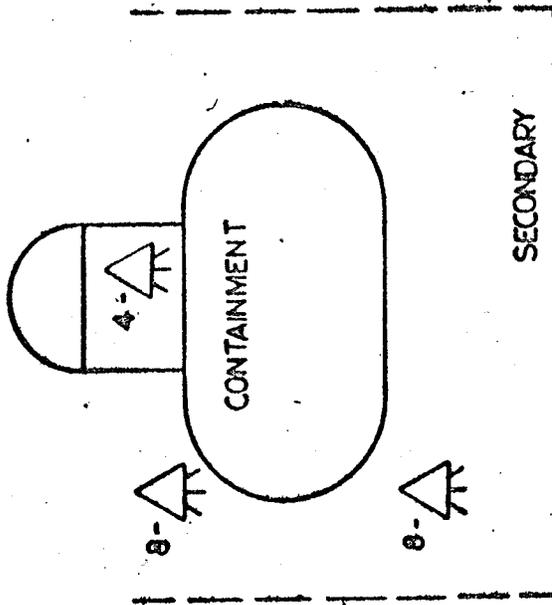
4-CO₂ BTLS.
FIXED

SMOKE DETECTOR
REPEATER CABINET

NAVIGATION
BRIDGE DECK

2 - EMERGENCY
GENERATOR
ROOM

CHART ROOM



5

2 - PAINT ROOM

CO₂ ROOM
60-100#
CO₂ BTLS
FIXED

6

1 - CARPENTER SHOP

1

6 -

FWD

BOS'N STORES

2

8 -

FWD

BOS'N STORES

3

8 -

FWD

BOS'N STORES

4

8 -

FWD

BOS'N STORES

5

11 -

FWD

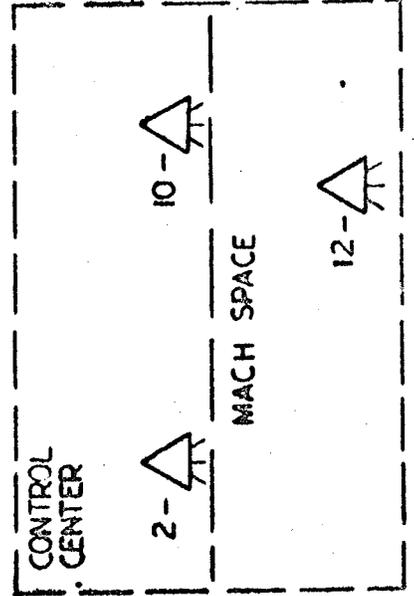
BOS'N STORES

7

4 -

FWD

BOS'N STORES



- SMOKE ACCUMULATOR
& GAS OUTLET

- MULTI JET NOZZLES

FIRE EXTINGUISHING SYSTEM

FIG. 23

HOUSE TOP

FIRE PLUG

NAV. BR. DECK
A
FS #1

BOAT DECK
A #2 C #2A C 3

PROM DECK
B 4 B 5 A 6 B 7 B 8 B 9

'A' DECK
B 10 B 11 B 12 B 13 A 14 A 15 A 16 A 17 C 17A B 18
WEATHER DECK FWD. QTRS WEATHER DECK AFT

'B' DECK
A 19 A 19A A 20 A 21 A 21A A 22 A 23
QTRS STEERING AFT.

'C' DECK
A 24 A 25 A 26 A 27 A 28 A 29
QTRS

'D' DECK
A 30 A 31
FR 110 P/S

14' FLAT
A 32 A 33
FR 117 P/S

TANK TOP
A 34 A 35
STAB. AREA

A-INTERIOR CABINET
B-EXTERIOR CABINET
C-EXTERIOR CABINET

LOCATIONS OF FIRE STATIONS

FIGURE 2.4