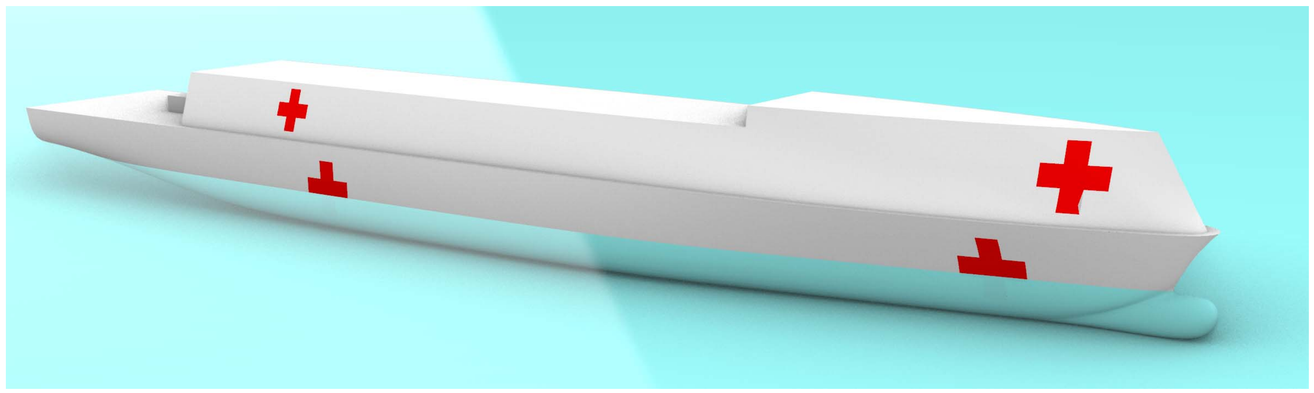
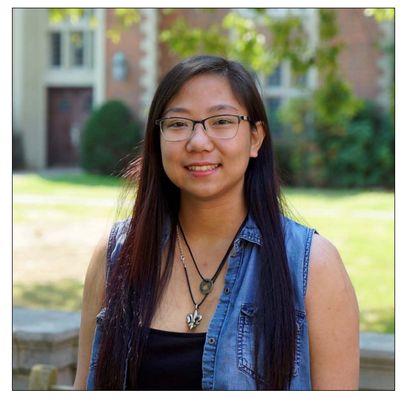
A Preliminary Design of a Low-Budget Hospital Ship for Epidemic/Pandemic Rapid Response



Author Bio

Shannon Liu is a member of the Webb Institute Class of 2021. Born and raised in the Greater Phoenix Area of Arizona, her education at Webb has introduced her to the maritime industry. She is planning on relocating to a consulting engineering firm in the Seattle-Vancouver Area.



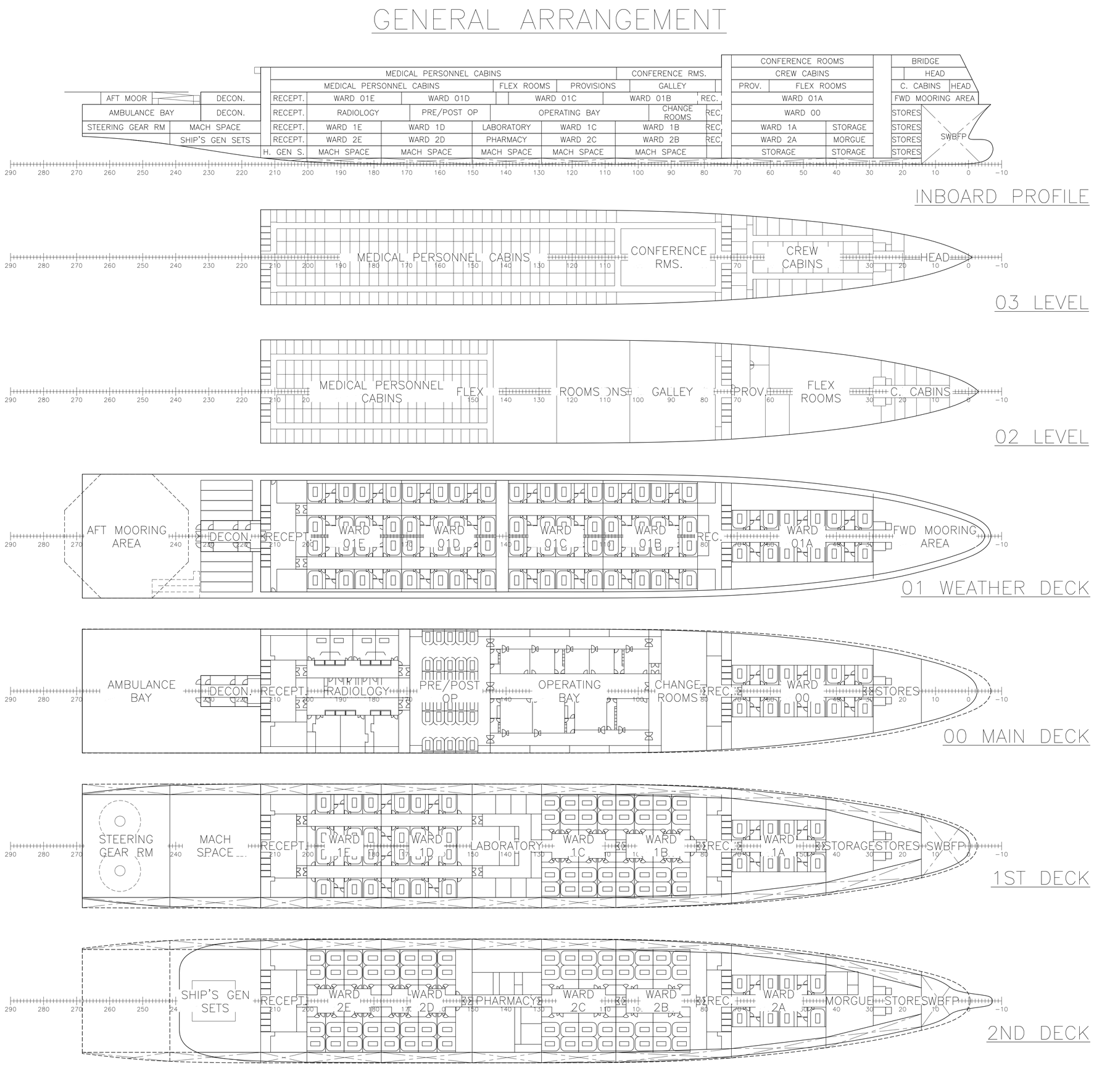
Abstract

With the recent COVID-19 pandemic, a shortage of ICU beds and medical equipment in the United States became evident. To combat this deficiency, the government utilized the US Navy's two hospital ships, the *USNS Mercy* and *USNS Comfort*, to temporarily alleviate the shortage. The use of the hospital ships to treat infectious diseases exposed several shortcomings in the four-decade-old ships. This thesis evaluates the requirements of a replacement fleet for the current hospital ships and provides a concept design of such a vessel and its medical facilities. The new design will encompass all existing capabilities of the hospital ships, while adding the capability to treat infectious diseases both in conjunction with other missions and as a stand-alone mission. To support such a mission, the design of the medical facilities will utilize a more modular-based hospital arrangement design rather than the current ward-based hospital arrangement.

Ship's Operating Modes

A Naval replacement vessel will need to meet four different operating modes: military aid, humanitarian aid, disaster response, and pandemic response. The final design represents these different modes through a module based design that accommodates different types of patient rooms for different patient capacities and types.

	Military Aid	Humanitarian Aid	Disaster Response	Pandemic Response
Access	Helicopter and boat	Shore and ramp	Shore, ramp, and helicopter	Shore and ramp
Patient Types	Burn and trauma	Smaller procedures and surgeries	Burn and trauma; smaller procedures	ICU supervision
Treatment Length	Short-term inpatients	Short-term outpatients	Long-term inpatients; Short-term outpatients	Long-term inpatients
Patient Flow	Large flow	Large outpatient flow	Large inpatient and outpatient flow	Minimal flow
ICU Beds	88	12	12	165
Inpatient Beds	128	72	128	0
Outpatient Beds	0	76	76	0
Surgery Suites	9	9	9	5



Vessel Requirements

- Accommodations for 50 crew and 300 hospital staff
- Cargo Crane
- Helicopter Landing Area
- Loading Ramp

Medical Facilities

Units:

- Blood Bank
- Decontamination
- Operating Rooms
- Pathology
- Patient Rooms
- Pharmacy
- Radiology

Services:

- Burn Treatment
- Critical Care
- Dental Care
- Isolation
- Procedures
- Surgeries

Systems:

- Clean Air Supply to Operating Rooms
- Fire Suppression
- Medical Gases
- Oxygen Cylinder Banks
- Specimen Transportation System
- Telecommunications

Principal Particulars	
LOA	220 m
LBP	205.5 m
Beam	30 m
Draft	5.7 m
Depth	10.5 m
Displacement	25068 MT
Speed	18 knots
Block Coeff	0.656