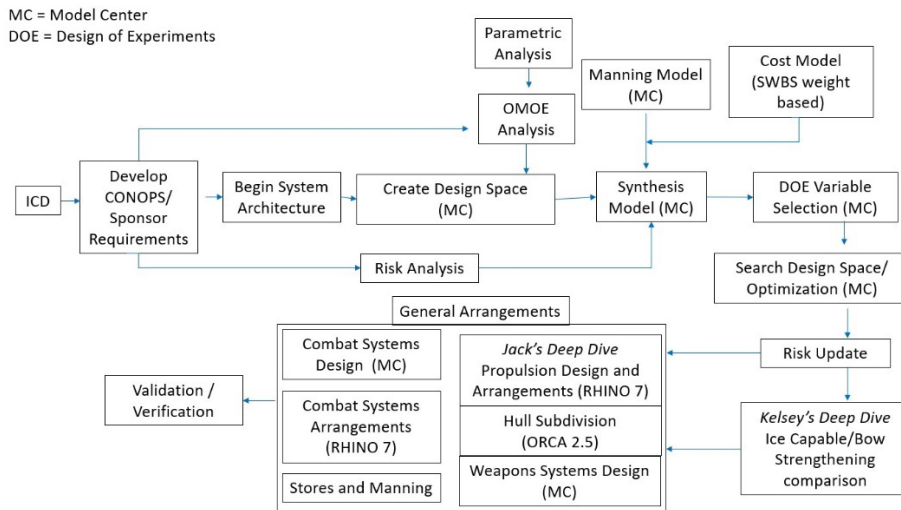


# Gray Zone Combatant Executive Summary

LT John Cathcart, USN & LT Kelsey Cathcart, USN

The Gray Zone Combatant (GZC) was designed to provide long-term presence and intelligence gathering capabilities to the US fleet as an independent operator in “gray zones”. A gray zone is defined as a maritime region that is remote, separated from traditional logistical pathways, and subject to extreme or unpredictable weather conditions to include first year ice. This vessel class will contribute to the US Navy’s strong defensive posture in all global waters while simultaneously providing surveillance and support to the US Navy and all allies.

The GZC was designed with a total ship synthesis approach utilizing design tools intended to replace ASSET in the 2N program fostered by collaborative research between 2N and Virginia Tech under the mentorship of Dr. Alan Brown. The Naval Concept and Requirements Exploration Tools (C&RE) allowed the team to execute the design of the GZC in stages which ensured that the final design was able to meet all operational requirements stated in the initial capabilities document (ICD). To ensure all important parameters of warship design were considered a work flow was created to allow the design team to work on separate portions of the design simultaneously. This work flow also provides a clear breakdown of how the CR&E tool functions throughout an entire design phase.

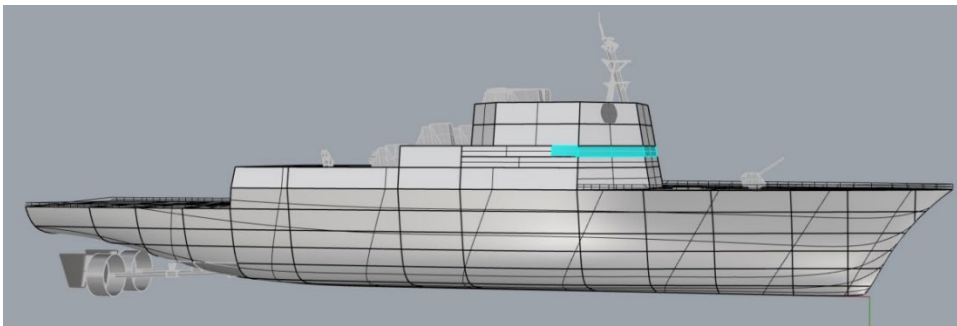


A design of experiments was completed in order to create response surface operators representing all hull design parameters. A multi objective optimization utilizing the total ship synthesis model embedded in the C&RE tool was then completed, which yielded the final hull design of the GZC and included all installed combat systems. These include an embarked LAMPS helicopter, UXV (small and medium size), and many offensive and defensive weapon capabilities such as a 32 VLS cell, RAM, 57mm, and the Naval Strike Missile. The GZC is powered by a hybrid electric plant similar to FFG-62 which includes one LM2500 G4+ prime mover on the ship’s centerline for achieving sustained speed, and one electric motor installed on each shaft for

normal operations up to cruise speed. Two Fairbanks Morse secondary power generation modules, and two ship service generators provide all required electrical power to support all propulsion, hotel, and combat systems loads. The endurance speed for the GZC is 16 knots and maximum speed is 25 knots. Due to the GZC large fuel capacity the endurance range is estimated to be just over 3 times the range of DDG-51 and 2 times greater than FFG-62.

The Gray Zone Combatant is designed to provide the Navy with a surface ship with an increased endurance range capable of operating for extended periods of time without the typical logistics support found in a CSG. This goal caused the hull to be optimized for maximum endurance range rather than high speeds needed to operate within a CSG. To utilize these combatants in these regions the GZC was designed with a reinforced bow to withstand first year ice common in arctic regions. As an Arctic nation it is important the US has the capability to operate combatants in areas of the world that are becoming increasingly more accessible to both civilian and military traffic. The GZC was designed to provide early ISR capabilities and be able to both defend itself and provide offensive posturing if need be while awaiting backup from larger surface combatants if conflict arises.

Upon completion of this project the design team recommends pursuing the next stages of design for the Gray Zone Combatant. This ship met all sponsor requirements, is within reasonable monetary standards for a new surface combatant and would provide the US the resources needed to build and maintain a presence in regions that US naval surface combatants don't typically operate.



Design Variables	Value	Design Variables	Value
Length overall (ft)	401.9	Endurance Speed (kts)	16
Beam (ft)	71.5	Sustained Speed (kts)	23.75
Draft (ft)	22.3	Max Speed (kts)	25
L to B ratio	5.62	Displacement (MT)	8389
B to T ratio	3.21	Endurance Range (NM)	13999
Design Waterline (ft)	370.4		