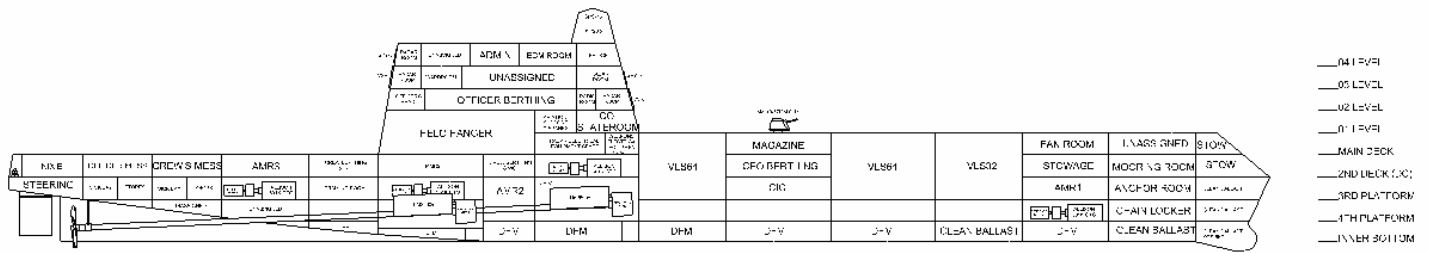


EXECUTIVE SUMMARY



This report describes the Concept Exploration and Development of an Air Superiority Cruiser (CG(X)) for the United States Navy. This concept design was completed in a two-semester ship design course at Virginia Tech.

The CG(X) requirement is based on a Virginia Tech CG(X) Mission Need Statement (MNS), and Virginia Tech CG(X) Acquisition Decision Memorandum (ADM). A design space exploration is accomplished using a Multi-Objective Genetic Optimization (MOGO) after significant technology research and definition. Objective attributes for this optimization are cost, risk (technology, cost, schedule and performance) and military effectiveness. The product of this optimization is a series of cost-risk-effectiveness frontiers which are used to select alternative designs and define an Operational Requirement (ORD1) based on the customer’s preference for cost, risk and effectiveness. The design selected and assigned to Team 2 was CG(X) Variant 2-102.

CG(X) 2-102 is a medium risk, medium-to-high cost, highly effective design on the non-dominated frontier. It is a monohull design with an initial 10 degree flare transitioning at a chine to flat or single curvature minus 10 degree sides giving it a lower RCS similar to that of tumblehome hulls without the lesser seakeeping capabilities of a full tumblehome design. Included on the ship are 4xLM2500+ engines giving 104,000 kW of power. The ship has an exceptional sustained speed of 32.6 knots, endurance speed of 20 knots and endurance range of 4,600 nm.

Concept Development included hull form development, structural finite element analysis, propulsion and power system development and arrangement, general arrangements, machinery arrangements, combat system definition and arrangement, analysis for intact and damage stability, cost, producibility, and risk analysis. The final concept

design satisfies technical performance measures specified in the ORD, cost and risk constraints.

Ship Characteristic	Value	
LWL	180 m	
Beam	21.0 m	
Draft	7.90 m	
D10	15.7 m	
Lightship weight	11,400 MT	
Full load weight	13,680 MT	
Sustained Speed	32.6 knots	
Endurance Speed	20 knots	
Endurance Range	4,600 nm	
Propulsion and Power	2 Shaft, Mechanical Drive, CPP (6.4 m Dia.), 4xLM2500+, 4xAllison 501K34 (3500kW GTG)	
BHP	104,000 kW	
Personnel	343	
OMOE (Effectiveness)	0.791	
OMOR (Risk)	0.179	
Ship Acquisition Cost	\$2,670 M	
Life-Cycle Cost	\$2,570 M	
Combat Systems (Modular and Core)	AAW	4xSPY-3, AEGIS MK 99 FCS, VSR
	ASUW	SPS-73(V) 12, MK 160/34 GFCS
	ASW	SQS-56, MK116 UWFCs, 2xMK32 Triple Tubes, SQR-19 TACTAS
	NSFS	2xMK 110 57 mm gun
	CCC	Enhanced CCC
	LAMPS	2x Embarked LAMPS w/Hangar
	GMLS	224 cells, MK 41 and/or MK 57 PVLS