

Arsenal Ship (AFG)

**LCDR Chris Wing, USN; LCDR Johnathan Walker, USN;
LCDR(s) Roxane Powers, USN, LT Chris Wilkins, USN**

Evolving strategies for Air Warfare and Ballistic Missile Defense require changing our force structure as it pertains to the types of missiles carried onboard ships, specifically against threats using Anti-Access Area Denial (A2AD) tactics. The retiring Guided Missile Submarines (SSGN) and Guided Missile Cruisers (CG) present a capability gap in strike warfare. The AFG Class is designed to close this gap by providing a VLS cell inventory to independently launch Tomahawk Land Attack Missiles (TLAMs) and a remote launch magazine for escort surface combatants.

The AFG Concept of Operations (CONOPS) has 2 modes: independent and joint. In Independent Mode the AFG is fully manned and launches TLAMs to support strike operations. In Joint Mode the AFG becomes a Drone Ship and allows its escorting surface combatant to remote launch the missiles stored on the AFG. In Joint Mode, the AFG crew can be removed and the AFG remotely piloted by a surface combatant escort.

The AFG hull-form is a modified National Security Cutter hull that has traditional negative angles at the waterline but transitions to positive angles at a certain height above the waterline. Therefore, the AFG has a Battle Ballast System included which positions the knee of the hull to the water line, drastically reducing the negative angle cross sectional area and reducing the AFG's susceptibility.

AFG has 184 VLS cells. It is capable of carrying a combination of TLAMs, Standard Missiles (SMs), and Evolved Sea Sparrow Missiles (ESSMs). The 184-cell total is comprised of two 64-cell Mk 41 VLS and fourteen 4-cell Mk 57 PVLS modules. ESSM, two 25mm deck guns, and countermeasure torpedo systems are included for self-defense.

The AFG uses a Total Ship Computing Environment (TSCE) that includes a fully integrated combat system. The AFG also includes high levels of automation to aid in situational awareness, evolutions, coordination, damage detection and containment. This degree of automation allows for a small 48-person crew to operate the AFG and for drone operations when the crew is removed. The ship has the capability to land an MV-22 helicopter for crew transfer.

Power and propulsion is provided through an Integrated Propulsion System (IPS) with two Rolls Royce 6.4MW gas turbines, and one 26MW LM2500+ gas turbine. To allow for future missile growth without shaft interference, the AFG uses two 19MW podded propulsors and has a forward Auxiliary Propulsion Unit for casualty situations.

A minimum survivability baseline was determined in accordance with the Navy's survivability instruction. The required capability after damage is to retain minimal propulsion in order to leave the battle space with no mission systems in operation. Based on this, the ship's CONOPS, and the ability to

operate the ship unmanned, key design specifications were reduced from the full combatant standard. Most notably, ship primary structure is designed to commercial standards, watertight compartmentation uses a two-compartment flooding standard instead of a 15% length standard, and only systems related to propulsion machinery, command & control, navigation, and ship and propulsion control systems are shock isolated. This set of tailored specifications results in a 22% cost reduction from full combatant standards.

The Initial Concept Design of the AFG illustrates that it is capable of maintaining the VLS missile cell capacity and increasing the precision strike capabilities of the US Navy.

Ship Characteristics	
Parameter	Value
LBP	110.07 m
Beam	14.88 m
Draft	5.8 m
Depth (Station 10)	10.16 m
Prismatic Coefficient	0.685
Lightship Displacement	4,212 MT
Full Load Displacement	5,800 MT
GM _T	1.29 m
Range	4,000 nm
Maximum Speed	25.2 knots
Sustained Speed	23.7 knots
Lead Ship Cost	\$1.14B
Follow Ship Cost	\$885M
Crew	48

