Flight IIA DDG to ASW Destroyer (DD(A)) Design Conversion

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The Arleigh Burke class guided missile destroyer (DDG) is a highly capable destroyer that was originally designed to conduct Anti-Air Warfare (AAW), Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASuW), and Strike Warfare (STW) missions. Throughout the life of the class, both the expenses of maintaining the ships and the amount of missions undertaken have increased in response to the evolution of the battlespace since its introduction to the fleet. Additional stress is being placed on the US Navy due to near-peer competitors, such as Russia and China, developing and deploying increasingly advanced submarines. This study evaluated creating an ASW focused destroyer (DD(A)) design, based on the Flight IIA version of the Arleigh Burke class, that would be more capable at ASW and cheaper per hull than a Flight IIA DDG. ASW capability was defined as a measure of a ship's ability to find, track, and destroy an enemy submarine.

The primary requirements for development of the DD(A) design was a reduction in cost and improvement in ASW capability compared to the baseline Flight IIA DDG, as well as use of currently existing ASW systems. This last requirement was included to reduce the technical risk of the DD(A) design by removing any connection to an unproven system. To reduce cost, combat systems related to AAW, ASuW, and STW, such as the Vertical Launch System (VLS), Mk-99 Fire Control System (FCS), SPY-1D radar, Mk-45 Gun Weapon System (GWS), M242 Bushmaster, and Close In Weapon System (CIWS), were all considered for reduction or removal. Some of these systems would need to remain in the DD(A) design in order to retain some form of self-defense for the ship. Additionally, minimal changes to the hull were made in order to keep the detailed design of the DD(A) as close as possible to the baseline Flight IIA DDG. As information about available ASW systems was collected, it became clear that the baseline Flight IIA DDG already had the best available ASW systems onboard. The only way the DD(A) design could have improved ASW capability would be through the inclusion of either unmanned vehicles (UXVs) or additional air platforms to supplement the two MH-60 ASW helicopters carried onboard baseline Flight IIA DDGs.

Based on the information collected about the baseline Flight IIA DDG and available ASW systems, feasible DD(A) design concepts included an unmanned aerial vehicle (UAV), removal of all VLS cells in the aft portion of the ship, and AAW self-defense provided by some combination of CIWS, Evolved Sea Sparrow Missiles (ESSMs), and SeaRAM (Rolling Airframe Missile). The Mk-45 GWS and Bushmaster would be retained for ASuW self-defense. Further exploration of the tradespace determined that the MQ-8B Fire Scout would be the least technical risky UAV to include in the DD(A) design, and that elimination of the ESSM from consideration would enable significant cost savings by replacing the SPY-1D radar with the SPQ-9B radar and removing the Mk-99 FCS. These decisions further reduced the tradespace to two decisions: how to store the UAV and what AAW self-defense system would be used. The study determined that the best place to store the UAV was centerline between the existing helicopter hangars. The compartments located in that space on the baseline Flight IIA DDG were relocated into the space vacated by the removal of the aft VLS cells. The CIWS was selected as the AAW self-defense system over the SeaRAM due to the ability of the CIWS to be used for both AAW and ASuW self-defense.

The final DD(A) design removed the SPY-1D radar, Mk-99 FCS, STW Consoles, and all aft VLS cells from the baseline Flight IIA DDG. It added the SQP-9B radar and MQ-8B UAV and support

systems, and replaced the loadout of the forward VLS cells from Tomahawk Land Attack Missiles (TLAMs) and ESSMs to only Vertically-Launched Anti-Submarine Rockets (VLAs). Figures 1 and 2 show forward and aft perspective views of the final DD(A) design.

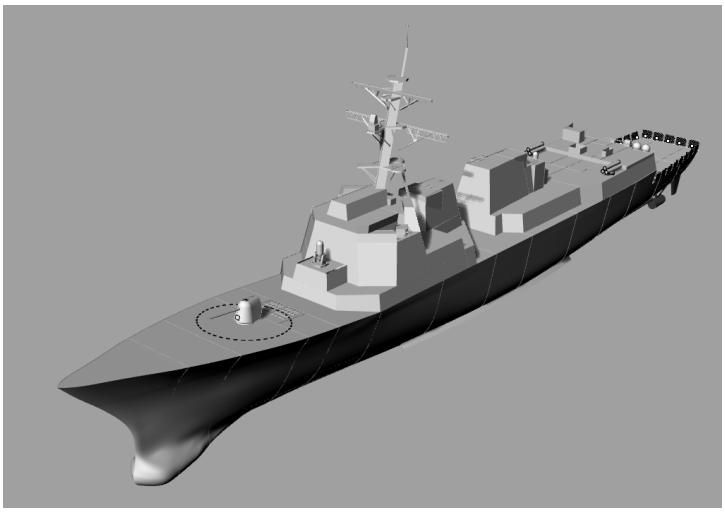

Figure 1: DD(A) Forward Perspective View

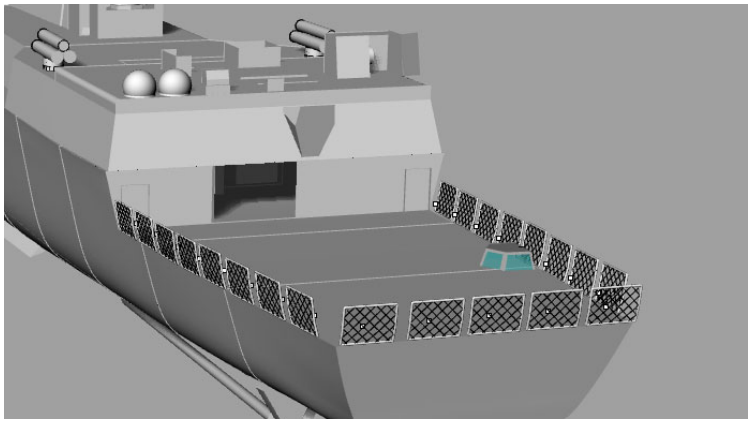

Figure 2: DD(A) Aft Perspective View featuring MQ-8B Hangar

Based on the systems removed and added from the baseline Flight IIA DDG, the study determined that the DD(A) design would save approximately $389 million per hull in acquisition costs and $598 million per hull in total life cycle costs. The study concluded that this proposed solution, while successful in reducing the cost per hull and having improved ASW capability over the baseline Flight IIA DDG, was not the optimal way to create a dedicated ASW platform. The study recommends either using a smaller platform as the basis of conversion, or to allow more substantial modifications to the baseline Flight IIA DDG to accommodate more aviation assets or a different type of ASW operational profile, such as acting as a command center for a fleet of unmanned surface vehicles.