

An Analysis of Critical Material Failures of the Close-In-Weapons-System Onboard U.S. Guided Missile Destroyers



NAVAL
POSTGRADUATE
SCHOOL

Abstract

To analyze the current state of the CIWS weapon system and decide what improvements can be used to improve system operational readiness and life cycle support. Currently CIWS is supported by a Readiness Based Sparing Model that has drawn criticism from senior naval leaders for the operational availability (Ao) that it provides. We will analyze data to derive a list of five "key offenders" parts that heavily impact operational availability of CIWS. We will also analyze how improving the sparing of these "key offenders" can potentially improve operational availability. Additionally, we will analyze the timing of actual failures in the fleet. This research addresses CIWS operational readiness and lifecycle support while exploring whether other processes can be used to improve the operational readiness of US Guided Missile destroyer's CIWS Systems.

Methods

- Gather historical demand data for CIWS material requirements is to establish a group of "key offenders" that we could use for further research and modeling. Key offenders were identified based primarily on the NSWC's top 20 reliability drivers and were analyzed considering Customer Wait Times (CWT) of more than 14 days, the total number of orders, and the total number of CASREP orders.

Research Summary

- Our analysis is based on three key processes. First, using the NAVSUP WSS FY17 and FY18 data, we revealed the amount of downtime each DDG unit's CIWS had over the two-year period, the potential worst-case scenario, and the percentage of time the ship's CIWS was operational. Second, using a combination of the three data sources, we identified five key offenders that are negatively affecting the operational readiness of CIWS and show a likelihood that greater spares funding and allowancing could improve operational readiness. Third, we analyzed the operational downtime related specifically to our key offenders and how related spares allowancing may potentially improve overall CIWS operational readiness.

Results

- Timing "Luck" of failures accounted for a 7 percent difference between the worst-case scenario downtime and actual downtime.
- NSCW's FY18Q4 report identifies an Ao between .70 and .74 for the system depending on system mode. This Ao is the predicted probability that the system is capable of performing its function when called upon. Our project calculated that the system was operationally available 86% of calendar days over fiscal years '17 and '18, showing that the CIWS actual performance exceeded the forecast by between 12% and 16% during those calendar years.
- Better allowancing for only the key offenders could potentially result in a 3 percent improvement to operational availability and/or 751 more CIWS operational days per year.
- 10 of the 67 ships showed no downtime associated with CIWS which could be a result of operational schedules or maintenance periods that could potentially mask CIWS metrics.



CIWS on the USS Wasp. Source: Adapted from U.S. Navy (2019).

Recommendations

- A simulation tool, like NAVARM be developed for use in the Navy Surface community.
- Adjust the next sustainment contract for the CIWS and try to adapt an incentivized contract.
- Ensure the system is being used as intended and Naval leadership should begin to research a possible replacement system