

Methods to Reduce Backlogged Maintenance of Los Angeles Class Submarines

by

Steven Andrew Musselwhite

Submitted to the Department of Mechanical Engineering
on April 30, 2021, in partial fulfillment of the
requirements for the degrees of
Naval Engineer
and
Master of Science in Mechanical Engineering

Abstract

The United States Navy's submarine fleet operates independently in high-risk situations around the globe. These missions are of vital importance to the nation's national security, requiring the vessels to maintain very high standards of material condition and readiness. However, increased operational needs, personnel shortages in the civilian workforce, and other factors have resulted in a significant backlog in submarine maintenance. Submarines are governed by stricter standards than other naval assets, preventing them from deploying until required preventive maintenance items and inspections have been completed. This thesis investigates historical performance data to build predictive models for component failures that could be used to shift periodicities for preventive items and reduce the existing backlog.

Test components from the Los Angeles class of attack submarines were chosen for this investigation. Non-parametric and parametric models are fitted to these components, providing quantitative methods to manage the risks associated with periodicity shifts. This process can identify components that consistently fail within the existing periodicity as well as those that have successfully operated beyond that point due to previous deferrals. This presents an opportunity to improve the efficiency of submarine maintenance, although the quality of the Navy's records was identified as a limiting factor.

Thesis Supervisor: Themistoklis Sapsis

Title: Associate Professor of Mechanical Engineering