

# **Risk Based Decision Making for the Deferment of U.S. Navy Submarine Maintenance**

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Maintenance of United States Navy submarines is a complex set of operations comprised of scheduling, budgeting, and executing a continuous stream of work across multiple vessels in the same maintenance facility year after year. Local personnel are involved in the details of the day to day operations and focus deeply on today and tomorrow, with little bandwidth to focus on larger, systemic issues with impacts far removed from today. The addition of fluctuating annual funding levels, a younger workforce, and the pressures to meet national defense requirements add complexity and compound the pressure to mortgage tomorrow for today by deferring work without regards to its later impact. Recently, the maintenance community has begun to invest time and resources in these larger, systemic issues. This thesis investigates the impacts of deferred maintenance actions on the timely completion of submarine maintenance periods by analyzing data from 50 refits executed over a decade at Trident Refit Facility in King's Bay, Georgia.

The results of this thesis are best understood in three parts: the impact of deferred maintenance actions on submarine refit on-time completions, the development of a technical, risk-based deferment decision tool, and the possible application of deferring or canceling certain maintenance items as a way to reduce the maintenance workload across the fleet. The first part shows the quantitative analysis of the data demonstrating that deferred maintenance actions are not having any negative impacts to on-time schedule execution. The second part shows how through technical analysis and application of a probability and consequence risk framework, deferment decisions can be analyzed to ensure that only low-risk work is being deferred. And finally, an application of that same framework can be made across the fleet to reduce the maintenance backlog.

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