2019-12

Total Ownership with Lifecycle Cost Model Under Uncertainty

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NAVAL RESEARCH PROGRAM
NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

TOTAL OWNERSHIP WITH LIFECYCLE COST MODEL UNDER UNCERTAINTY

Report Type: Final Report
Period of Performance: 10/01/2018–10/15/2019

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Prepared for:
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EXECUTIVE SUMMARY

Project Summary

In this research, we look at answering the following primary question: Would an advanced analytical model be a more effective metric to estimate total ownership cost (TOC) with life-cycle cost under uncertainty and risk than the current method of life-cycle cost estimates for Surface EO/IR Sensors? To accomplish this, the research developed and analyzed a computational model for Total Ownership with Life-Cycle Cost Model Under Uncertainty for Surface Electro-Optical Infrared Sensors. During the development of the model, we identified the required data and examined the current Department of Defense (DoD) method for determining system life-cycle costs for defense systems and determined that the proposed model is a useful alternative to the current method of determining the life-cycle costs for EO/IR Sensors on surface ships. Finally, we concluded that the developed model can be applied to cost estimating in other sectors of DoD cost projections.

Keywords: *total ownership cost, simulation, risk analysis, ROI, return on investment, cost modeling, cost estimation*

Background

The purpose of this research was to develop a model to estimate total ownership with life-cycle costs under uncertainty associated with Surface Electro-Optic Infrared (EO/IR) sensors. We will examine the basics of Total Ownership Cost modeling over the life cycle of the EO/IR sensors, including the inception phase of Acquisition Costs, followed by annual Operations and Maintenance (O&M) expenses, along with a final set of Disposition Costs at the end of life of the sensor. This model will allow managers to have better decision analytics of the costs of the sensors for use in subsequent cost comparisons across sensor platforms, return on investment analysis, portfolio allocation of resources, and analysis of alternatives.

Findings and Conclusions

The final deliverables of the research included a detailed report, computational Excel model with risk-based simulation assumptions and forecasts, a training video, and research poster. These deliverables were meant to get the user of the model started with applying the basics of TOC modeling over the life cycle of the EO/IR, including the inception phase of Acquisition Costs, followed by annual Operations and Maintenance (O&M) expenses, and a final set of Disposition Costs at the end of life of the sensor. This research was not meant as guidance on design specifications, but, rather, as a guide to the decision analytics modeling of the costs of the sensors for the purposes of use in subsequent cost comparisons across sensor platforms, return on investment analysis, portfolio allocation of resources, and analysis of alternatives. The methodology and model will allow decision makers to have better decision analytics of the costs of the sensors for use in subsequent cost comparisons across sensor platforms, return on investment analysis, portfolio allocation of resources, and analysis of alternatives.

The accurate calculations of these costs were not as straightforward as their descriptions imply. To accurately incorporate cost factors, it was essential to consider economic theory. The elements of time valuation of money were critical in the analysis of alternatives. Economic growth, the annual discount rate, inflation, and opportunity cost of investing in a specific system were essential to our study. Other factors include budgetary cutbacks and changes in technology. The model will allow the user to input these changes to manually adjust for each of these. Utilizing this model will serve as a proof of concept to understand how this approach could be used to reduce cost overflow and prevent budget overruns. It will provide greater insight into the true nature of the cost of cash outflow and the life cycle of the product and its associated costs. These results would give leaders a more effective metric to analyze total ownership cost under uncertainty, therefore allowing leadership to make more informed decisions in the DoD acquisition process.

Recommendations for Further Research

There are several goals that may be pursued as future work on this project. Firstly, additional data may be collected and run through the prescribed model and methodology. The current research only utilized nominal and rough order magnitude estimations. Secondly, multiple systems can be run through the same methodology to test its robustness as well as ability to handle cross-platform technologies. Finally, analysis of alternatives can be added to the existing methodology to further enhance its applicability throughout the DoD.

Acronyms

DoD	Department of Defense
EO/IR	surface electro-optic infrared sensors
MCS	Monte Carlo simulation
O&M	operations and maintenance cost
ROI	return on investment
TOC	total ownership cost