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Long Term Impact of Ship Concepts on Operating and Support (O&S) Cost Affordability

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Agenda

- Introduction
- Background on O&S and Affordability
- Analysis and Results
- Management Applicability and Limitations

Introduction

- According to GAO's 2015 High Risk Report, there are an increasing number of weapon system acquisition programs experiencing unanticipated cost overruns
  - Understanding your total life cycle costs and total ownership costs (TOC) is much more critical to program affordability and long term success
- Budget Control Act of 2011 (BCA) instituted "Sequestration" or automatic spending reductions of $1.2 trillion from FY2013 to FY2021 for the Department of Defense (DoD), Department of Homeland Security (DHS), and other government agencies
  - Today's austere budget environment acts as a forcing function for decision makers to consider total life cycle costs during early stages of the program

Affordability as a Mandate

- The DoD Better Buying Power (BBP) includes a focus on "Achieving Affordable Programs" which mandates affordability as a requirement
  - Programs must provide affordability caps for unit production cost and sustainment costs

- BBP includes a focus area of "Control Costs Throughout the Product Lifecycle" which is designed to implement a cost culture

- BBP and other future affordability initiatives will become a part of DoD culture due to sequestration

Operating and Support (O&S) costs are key to achieving affordability

Overview of Operating and Support (O&S) costs

- O&S costs have six defined cost elements per the Secretary of Defense (OSD) Director of Cost Assessment and Program Evaluation (CAPE) O&S Guidebook:
  - 1.0 Unit Level Manpower
  - 2.0 Unit Operations
  - 3.0 Maintenance
  - 4.0 Sustaining Support
  - 5.0 Continuing System Improvement
  - 6.0 Indirect Support
- 1.0 Manpower and 3.0 Maintenance are the largest O&S cost elements for ships (supported by historical data)
- 2.0 Unit Operations can be a large cost driver, but it is highly dependent on frequency of use (i.e. Concept of Operations)
- Majority of 5.0 Continuing System Improvements costs occur during the investment period for half-life modernization

Role of Operating and Support (O&S) Costs in Program Affordability

- Defense Acquisition University (DAU) online training resources states that approximately 60% to 70% of Total Ownership Costs are in O&S for most weapon system programs
- Per the OSD CAPE O&S Guidebook:
  - Decisions on program requirements, performance, and configuration made early in the acquisition process will generally help to determine a system's O&S costs;
  - the opportunities to reduce O&S costs diminish as a program advances through the phases of the acquisition process.
- Decision makers must understand the risks and impacts early requirements and acquisition decisions have on long term O&S costs
- Program managers need to focus on the O&S costs to achieve long term programmatic affordability

Analysis to be Presented

- Presenting different operational concepts that program managers should considered when completing new ship acquisitions
  - Additional insight into O&S costs supports program managers to make a better quality decision that can help the program achieve long term affordability

- Analysis will compare the traditional ship concept vs. non-traditional ship concepts (minimally manned crew and crew swaps)

- Presenting characteristics of the traditional ship concept as the baseline and cost impacts of each non-traditional concept to O&S cost elements

Traditional Ship Concept

- Traditional ship concept is established as the baseline as it is the most widely utilized concept by U.S. Navy and U.S. Coast Guard

- Risks to Program Affordability
  - Manpower related costs (Direct and Indirect) are the single largest cost driver of O&S costs

- Current ship platforms with traditional concept includes Arleigh Burke class destroyers (DDG-51), Frigates (FFG-7), Cruisers (CGs), and all of U.S. Coast Guard ship fleet

Traditional Ship Concept Baseline of O&S cost elements

Traditional Ship - Baseline	
Cost Element	**Baseline Traditional Concept**
1.0 Unit Level Manpower - Ship Crew	Large manned crew
1.0 Unit Level Manpower - Shore Support	Limited shore support personnel
2.0 Unit Operations	Single crewing concept with 6-month deployments
3.0 Maintenance - Organization Level	Large amounts of onboard maintenance (Organizational Level)
3.0 Maintenance – Depot Level	Scheduled minor/major Depot Level Activities
4.0 Sustaining Support	Training mostly performed onboard the ship
5.0 Continuing System Improvement	Half-Life or other single major modernization period during service life
6.0 Indirect Support	Large cost driver due to large manned crew

Non Traditional Ship Concepts – Minimally Manned Crew

- The goal of the Minimally Manned Crew ship concept is to decrease lifecycle operating and support costs in 1.0 Unit Level Manpower
  - Lower manning concept directly lowers costs related to ship manpower but increases costs related to shore support and infrastructure
- Risks to Program Affordability
  - Unscheduled and deferred ashore maintenance (expensive due to contractor supported)
  - Reliance on automation requires expensive hardware and software support and upgrades and more extensive ashore training requirements
- Current ship platforms with minimally manned crew concepts include Zumwalt class destroyers (DDG-1000) and Littoral Combat Ship (LCS)

Minimal Manning Crew may impact O&S cost elements (notional)

Minimal Manning		
Cost Element	**Effect on Cost Element from Traditional Concept**	**Effect on O&S costs**
1.0 Unit Level Manpower – Ship Crew	Decrease in Crew Personnel	Decrease
1.0 Unit Level Manpower – Shore Support	Increase in ashore support personnel	Increase
2.0 Unit Operations	Assuming single crewing concept	No Significant Change
3.0 Maintenance – Organizational	Decrease in Onboard maintenance (Organizational Level)	Decrease
3.0 Maintenance – Intermediate and Depot	Increase in Ashore deferred maintenance (contractor supported)	Increase
4.0 Sustaining Support	Increase in ashore Training due to highly automated systems	Increase
5.0 Continuing System Improvement	Advanced Automation of systems may require more consistent technology refresh	Increase
6.0 Indirect Support	Decrease in support functions due to smaller crew	Decrease

Non Traditional Ship Concepts – Crew Swaps or Rotations

- Goal of crew swaps is to have operational readiness at a higher level with potential savings coming from a lesser need to acquire additional ships
  - Fewer transoceanic trips saves operational fuel costs
  - These savings are partially offset by the costs of flying the rotational crews overseas and incurring other travel related expenses
- Risks to Program Affordability
  - Increased costs related to crew manpower, training, and infrastructure
  - Constant operational readiness causes increased onboard and ashore maintenance activities through wear and tear
- Crew swaps are being utilized by ballistic missile submarines (SSBNs), Littoral Combat Ship (LCS), and have been tested on Arleigh Burke class destroyers (DDG-51)

Crew Swaps or Rotations may impact O&S cost elements (notional)

Crew Swaps/Rotations		
Cost Element	**Effect on Cost Element from Traditional Concept**	**Effect on O&S costs**
1.0 Unit Level Manpower – Ship Crew	Increase in Crew Personnel	Increase
1.0 Unit Level Manpower – Support Shore	Increase in ashore support personnel	Increase
2.0 Unit Operations	Concept of Operations require continuous use of ships, but less transit	Decrease
3.0 Maintenance - Organizational	Increase in Onboard maintenance (Organizational Level)	Increase
3.0 Maintenance – Intermediate and Depot	Increase in Ashore maintenance (contractor supported)	Increase
4.0 Sustaining Support	Increase in Training and Infrastructure	Increase
5.0 Continuing System Improvement	Half Life or other single major modernization period during service life	No significant change
6.0 Indirect Support	Decrease in support functions due to smaller crew	Decrease

Cost Trade Offs (notional) Results and Takeaways

- Minimally Manned Crew
  - Reduces manpower costs on that particular program but in order for actual savings to be achieved, the force size needs to be reduced
  - Increased costs compared to the traditional baseline are observed in the other O&S cost elements
  - Further detailed cost data and analysis would be needed to demonstrate viability of savings from minimally manned crew ship concept
- Crew Swaps/Rotations
  - Increased costs compared to the traditional baseline are observed in the O&S cost elements
  - Possible major cost impact not accounted for is the service life may be greatly reduced (10 or more years) if not properly maintenance due to overexertion of ships
  - Conclusion is that the operator (fleet) is paying increased cost to obtain the same or higher levels of readiness

Management Applicability and Limitations

Management Applicability:

- Realizing ship concepts impact on O&S costs allow Program Managers to obtain enhanced visibility of O&S key cost drivers earlier
  - Program manages can start identifying alternatives to unintended cost ramifications of early decisions
- Upfront efforts to reduce costs during the Pre-Milestone A phase can significantly reduce total ownership cost (TOC) over the lifecycle of the program

Limitations:

- Further analysis still needs to completed on the detailed cost impacts of each ship concept and trade offs discussed in the briefing

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Abstract

- Achieving affordability can be challenging especially once a program enters full rate production. Developing accurate Operating and Support (O&S) cost estimates that reveal tradeoff impacts and sustainment risks provides decision makers with affordability analysis during key acquisition events. We intend to demonstrate through analysis the impact of legacy and new ship concepts on O&S costs and program affordability. We will examine the cost tradeoffs for each ship concept in each O&S cost element.