

**Benefits of Expanded Modularization
For
Ship Design & Construction**
EM-GD-010

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Contents

| | |
|--|----|
| Contents | 4 |
| 1.0 Introduction..... | 6 |
| 2.0 Modern Shipbuilding Build Strategies..... | 8 |
| 3.0 Modular Construction | 10 |
| 4.0 Outfitted Hull Block Construction..... | 11 |
| 5.0 Shipbuilding Modules..... | 14 |
| 5.1 New Construction Benefits: | 17 |
| 5.2 Ship Maintenance Benefits: | 17 |
| 5.3 Ship Operations Benefits: | 17 |
| 6.0 SPAR Cost Model..... | 19 |
| 6.1 Flexible Hull Structures Modeling..... | 19 |
| 6.2 Flexible Powering Options | 19 |
| 6.3 Automated Cost Adjustments | 20 |
| 6.4 Cost Estimating Relationships | 20 |
| 6.5 Shipyard Productivity Factors..... | 21 |
| 6.6 Costing & Pricing | 21 |
| 6.7 Transport Factor..... | 22 |
| 6.8 Cost Risk..... | 23 |
| 6.9 Estimated Manpower Requirements..... | 23 |
| 6.10 Design Trade-Off Studies | 23 |
| 7.0 Baseline Corvette | 24 |
| 7.1 Baseline Corvette Build Strategy Scenarios | 26 |
| 7.2 Baseline Cost Year..... | 27 |
| 7.3 Labor Pricing | 28 |
| 7.4 Profit | 28 |
| 7.5 G&A Costs..... | 28 |
| 7.6 Non-Recurring & Support Services | 28 |
| 7.6.1 Non-Recurring Costs | 29 |
| 7.6.2 SWBS 800 Recurring Technical Support | 31 |
| 7.6.3 SWBS 900 Recurring Production Services..... | 32 |
| 7.7 Shipbuilding Productivity | 32 |
| 7.8 Module Builders..... | 38 |
| 7.9 Series Ship Production Estimates | 38 |
| 7.9.1 Labor Cost Learning | 38 |
| 7.9.2 Material Cost Learning | 39 |
| 7.10 Schedules | 39 |
| 7.11 Estimated Freight Costs | 45 |
| 7.12 Margin..... | 46 |
| 7.13 Change Orders | 46 |
| 7.14 Program Cost | 46 |
| 8.0 Cost & Schedule Savings from Modular Construction..... | 47 |
| 9.0 Cost & Schedule Savings from Modularized Weapons Systems | 60 |
| 10.0 Reduced Cost Risk? | 65 |

| | |
|--|----|
| 10.1 Production Schedule Risk..... | 68 |
| 10.2 Engineering Performance Risk..... | 69 |
| 10.3 Shipyard Experience Risk..... | 69 |
| 10.4 Engineering/Production Overlap Rework Risk..... | 69 |
| 10.5 Estimate CER Cost Risk..... | 70 |
| 10.6 Cost Risk Allocations to Series Ship Programs..... | 70 |
| 11.0 Conclusions..... | 73 |
| 11.1 Focus on Engineering Reform/Revival..... | 73 |
| 11.2 Focus on Rebuilding Shipbuilding Worker and Management Skills..... | 74 |
| 11.3 Focus on Minimizing Change Design Changes after Production Has Begun..... | 74 |
| 11.4 Focus on Sharing Cost Risk..... | 75 |
| 11.5 Reasons for Outsourcing Cost Efficiencies..... | 75 |
| 11.6 Focus on Improving Planning & Project Management Skills..... | 76 |
| 11.7 Measure Performance..... | 76 |
| Appendix I: Cost Estimate Summaries..... | 78 |
| Appendix II: Cost Risk..... | 83 |
| III.1 Cost Risk of the Production Estimate Data..... | 84 |
| III.2 Predicting Production Overlap Rework Costs..... | 86 |
| III.3 Estimating Cost Risk of Overlap Rework..... | 88 |
| III.4 Estimating Cost Risk of Shipbuilder Inexperience..... | 90 |
| III.5 Estimating Cost Risk of Engineering Quality..... | 93 |
| III.6 Estimating Cost Risk Due to Tight Production Schedule..... | 96 |
| III.7 Cost Risk on Follow Ship Programs..... | 97 |

1.0 Introduction

Cost and schedule benefits from modular construction are nothing new, and these manufacturing and assembly approaches are being successfully implemented not only by foreign shipbuilders, but also by aircraft, automobile and home appliance industries. There have been many different studies made within and without the U.S. that predict significant cost and schedule savings. The Maritech Modular Tanker Consortium is but one research project that focused on developing a variety of equipment modules such as for the main propulsion plant. Other areas of successful modularization have been achieved with modular accommodations cabin units extensively used in the cruise ship building process. The U.S. Navy also portrayed savings from its “Affordability through Commonality” program.

Modular construction allows what is called early stage construction benefits. Examples of early stage construction in shipbuilding include on-unit and on-block outfitting. As opposed to on-board work, these on-shore stages allow workers direct and easy access to the work site (the block or unit) and the convenience of working under cover and where tools, equipment and material requirements are more readily available.

There are a number of rules of thumb that have been applied to estimate the savings. Labor costs on board can be 3-5 times higher than equivalent work done in the shop or on the platen. The figure below approximates further these savings across a variety of manufacturing and assembly stages of construction.

| Stage | MHRS per Unit of Work |
|--------------|-----------------------|
| Panel | 1 |
| Sub-Assembly | 1 |
| Module | 1 |
| Unit | 2 |
| Block | 4 |
| Paint Cell | 4 |
| Mega-Block | 6 |
| Berth | 8 |
| Quay | 12 |

Figure 1-1: Potential Levels of Productivity¹

Actual shipbuilding production data clearly reveals how these savings affect the costs of various ship systems such as piping, HVAC, and others. Insight from this information was used to assist RAND Corp document² for the British Ministry of Defence the potential savings from using these methods of construction.

¹ “More Effective Planning of Early Ship Outfitting,” G.J. Bruce & T. Nielsen, presented to The Society of Naval Architects and Marine Engineers.

² “Productivity in Shipbuilding,” L.C. Deschamps, SPAR Associates, Inc. as reported to RAND Corporation, April 2003.