# Benefits of Expanded Modularization
# For
# Ship Design & Construction

**EM-GD-010**

**January 2022**

SPAR
ASSOCIATES, INC.
410 SEVERN AVE, STE 209
ANNAPOLIS, MD 21403

*PERCEPTION*®
Trade Secrets and Proprietary Properties
Of
SPAR Associates, Inc.
Annapolis, MD 21403

## NOTICE

The information contained in this document is subject to change without notice.

SPAR ASSOCIATES, INC. MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

SPAR Associates, Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material.

# Contents

# 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 Productivity[1]***

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 document[2] 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.