High Speed Sealift Technology Workshop Brief Out
Wednesday, 25 March, 1998

Meeting Minutes

Introduction

The meeting was opened by Mr. Richard Metrey Technical Director of NSWC Carderock. Mr. Metrey welcomed the attendees back to Carderock and thanked them for all the hard work done during the October workshop and afterwards. Mr. Metrey's welcome was followed by opening comments from each of the workshop sponsors.

Workshop sponsor RADM David Sargent of PEO CLA remarked that a primary goal of the workshop was to determine the latest technology available throughout the world which could be utilized to accomplish High Speed Sealift. He also mentioned that the conference served as an initial step towards building budget justification for High Speed Sealift.

USTRANSCOM was represented by RADM Richard Naughton. RADM Naughton noted that the conference identified where we need to go in technology in order to accomplish High Speed Sealift. He further pointed out that although we have less bases around the world we have become involved in more actions; therefore, looking at how we get to the actions has become increasingly important.

COL Clark Hall from the Department of the Army recognized the value of the workshop attendees; in that, they were from a wide variety of areas such as academia, industry, government, etc. He remarked that this workshop on high speed sealift is one of the first steps towards moving our forces around the world in a shorter period of time.

Next, Keith Seaman of USTRANSCOM gave an overview of the workshop and brief out. Mr. Seaman talked about the origin of the high speed sealift workshop. He stated that the conference's focus on technology was in response to the need to go beyond view graphs to identify implementable technology. He emphasized that the end to end transportation process must be considered. The goal of the high speed sealift should be to enhance the DoD's ability to deploy, and looking at current technology identifies where to invest money. Finally, Mr. Seaman remarked that it is imperative that we keep the consortia together that developed from this effort to ensure that we are all working in the same direction.

Results and Conclusions from Post-Workshop Analysis Brief

This brief was given by Dr. C Kennell of NSWC Carderock and Mr. D.R. Lavis of Band, Lavis & Associates. Dr. Kennell began the brief with an overview of the process. He stated that the October workshop was an opportunity for specialists to give input on technology assessments and performance predictions for high speed sealift. The workshop made projections and recommendations in the following seven areas: Hullforms & Propulsors, Propulsion Machinery Technology, Materials & Ship Structures, Onload / Offload Technologies, Shipbuilding & Manufacturing, and Ship Systems / Concepts.

The objective of the overall technical process was to quantify the speed, range, and payload projections in order to ratify and strengthen the workshop findings. The possibilities offered by technology for HSS where considered in near and far terms. Near-term technology is technology that will be available in five years and far-term refers to technology will be available in ten years.

The technical process for post-workshop analysis utilized two assessment approaches; a quantitative approach and a qualitative approach. The quantitative used a design synthesis tool which has extensive use and correlation with real ships. The transport curves developed by this tool represent how we move weight across water. The analysis found that the state of the art curve, developed before the workshop in October, over-perdicted performance particularly in the middle speed range. The quantitative analysis was used to identify the outer envelopes of what can be achieved. The synthesis tool showed that size and, therefore, payload must be sacrificed in order to achieve high speed. In addition, it identified that there is a tradeoff between range and payload. Existing technology was included in the analysis for comparison to the notional designs, however, the fast vessels that exist today are much smaller than the notional designs.

The qualitative analysis used an interactive spreadsheet to consider other attributes of the ship important to the sealift mission. This tool assessed the effects of changing mission requirements. This analysis was conducted with assumed mission priorities. The next step in the process should be to exercise the tool with real mission priorities.

In summary, the initial analysis showed that there already is significant technology available for high speed sealift. At this point, the near term solutions may not be cost effective for military applications, but technology projections indicate that expanded transport capability may be available in the future.

Closing Statements from Sponsors

The morning session of the Brief-out was closed with summary statements from each of the workshop sponsors. Each sponsor reiterated that we must look at the end to end process and focus on commercially viable platforms. They emphasized that the goal of the workshop was to provide a feasible technology roadmap for high speed sealift.

Technical Brief

The afternoon session was a technical explanation of the tools used for the quantitative and qualitative assessments. The discussion focused on two computer programs developed and/or applied in the period between the workshop and the debriefing of 25

March, 1998. These programs were used to evaluate the technological risk and potential benefit of given technologies based on ship speed, range and payload characteristics.

The qualitative assessment tool was developed as a spreadsheet application using Microsoft Excel and will be available on the workshop web site for individual use. It is a tool for screening potential new ships and technologies, preliminary risk assessment, and for performing sensitivity analyses to explore the effect of varying mission priorities. It is intended assess the ability of given hull forms to perform a specified mission. Risk and consequence are addressed in program output.

Howard Chatterton (BLA) demonstrated an application of the features incorporated into the program. The mission parameters were defined as: (1) Speed: 40 to 100 knots; (2) Range: 500 to 10,000 Nautical miles; (3) Cargo: 500 to 5,000 short tons occupying between 10,000 and 150,000 square feet. An additional mission parameter included a shallow draft capability. Twelve ship types were investigated in the trial application of the spreadsheet. These included displacement, planing and slender monohulls, displacement and planing catamarans, trimarans, monohull and catamaran hydrofoils, SWATH, Semi–SWATH, HYSWAS and SES's. Thirty-eight attributes were identified to define performance. These attributes could be grouped into 7 broad categories including payload capacity, hydrodynamic performance, loading interface, ship survivability, feasibility, ability to manufacture and cost. The user must weight each of the attributes according to his view of the relative necessity of the attribute to the mission. This weighting factor is then multiplied by a ship type capability assessment determined by the user to obtain the rating that is mission priority dependent and ship type specific. If a ship is incapable of performing the mission then that ship is not considered in the analysis. The spreadsheet includes values for the user defined input, but these values can be changed. Members of the audience expressed concern over lack of hybrid hull form representation. There also appeared to be interest in performing additional analyses to determine the sensitivity of the results to varying mission priorities.

The second program discussed determines Transport Factors (TF). Much of the work since the fall workshop has been devoted to developing TF values and curves to determine the effect of emerging technologies on ship speed, range and payload (with ultimately payload becoming a dependant variable). Specialists in six working groups including hullforms and propulsors, propulsion machinery, materials and ship structures, cargo shipbuilding and manufacturing and ship systems/concepts identified the emerging technologies. It was noted that the algorithms used to determine TF factors are largely empirically based, but have been extensively tested on both existing ships and relatively mature designs of ships yet to be built. Empirical curves were developed to relate propulsion power and ship displacement so that rational limits could be defined for packaging power into different hull form applications.

There was concern that at ship speeds approaching and exceeding 100 knots many hydro and aerodynamic properties were not defined or understood. Due to the limited emperical data, the transportation factor approach was inappropriate for evaluating hull forms operating at those high speeds. However, the consensus appeared to be that the transportation factor approach as implemented for this workshop was consistent for all hull forms.   It was inappropriate to allow ship designs exhibiting TF values that do not conform to established trends and with insufficient empirical or physical justification to influence TF trend lines. These hull forms were included on TF plots as individual data points and defined as “outliers”.

There was also a concern that technologies such as fuel cells were not included in the TF analysis and therefore were out of the equation for near and far term ship applications. This was not intended. The individual workshops identified technologies that could be important in improving ship speed, range and payload properties. All of these technologies were included in the work group reports. However, in the subsequent analysis, the TF factors were calculated using the most optimistic projections for power, weight, etc., without regard to the technologies needed to achieve these goals.

The goal of the High Speed Sealift Technology Workshop was to identify technologies that could improve speed, range and payload performance in near and far term sealift applications. The tools following the workshop were developed to aid in determining which technologies had the most potential for significantly enhancing sealift capabilities. These tools are not intended for design purposes.