PRESENTATION MATERIALS

COMMERCIAL/MILITARY STAKEHOLDER OUTREACH

Submitted to:

Office of Naval Research
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Agile Port and High Speed Ship Technologies

FY04 Project 9
Advanced Technology Military Sealift//Commercial Express Pentamaran Design

Classification: Unclassified

Prepared and submitted by:

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March 3, 2006

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FY 04 Project 9, Program Element 2.31
Advanced Technology Military Sealift//Commercial Express Pentamaran Design

Task 9.2 *Commercial and Military Stakeholder Outreach*
Deliverable 9.2 *Technical Presentation and Meeting Documentation*

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March 3, 2006

ADVANCED TECHNOLOGY MILITARY SEALIFT / COMMERCIAL EXPRESS PENTAMARAN SHIP DESIGN

TASK 2 REPORT

BMT SYNTEK Technologies, Inc.
BMT Nigel Gee and Associates, Ltd.

Task 2 - Commercial and Military Stakeholder Outreach

Subtask 2.1 – Commercial Outreach

During the month of August 2005, discussions related to the Lo/Lo Containership were conducted with Mr. David Heller and Mr. Richard Voelker of the Maritime Administration in their offices at DOT HQ in Washington, D.C. Additionally, Mr. Eugene Pentimonti of Maersk was briefed on the design concept, along with a review of the model test program conducted at Marintek in Trondheim, Norway. Both MARAD and Maersk expressed an interest in the CCDOTT project and it was agreed that updates would be provided periodically as appropriate. In November, at the IMPACT 2005 CCDOTT Conference aboard the Queen Mary in Long Beach, California, Mr. Jordan Truchan of American Ship Management was in attendance at the presentation (see attached) and received additional materials at his request after the meeting. In December, attendees at the SNAME Sealift Panel meeting were briefed at the N42 office in Crystal City, Virginia, including Mr. Robert Nevel of the Maritime Administration, Mr. Edward Kelley of the American Maritime Officers (AMO) and Mr. David Helgerson of CSC-AME.

Subtask 2.2 – Military Outreach

During the month of September 2005, Mr. Jonathan Kaskin of the U.S. Navy's Sealift Office (N42) was personally briefed in his office in Crystal City, Virginia on the pentamaran ship design concept and its potential role in the Sea Basing Concept of Operations (CONOPS). In October, RADM Marc Purcell and the staff (including CAPT (sel) Rodney Clark and CDR John Gosebrink) of the U.S. Transportation Command's (USTRANSCOM's) Requirements Office (J5) were similarly briefed in their offices at Scott Air Force Base in Illinois, just outside of St. Louis, Missouri. In November at the IMPACT 2005 CCDOTT Conference aboard the Queen Mary in Long Beach, California, LTGEN (USA-ret) Kenneth Wykle and RADM (USN-ret) Albert Herberger were in attendance at the presentation (see attached) and reviewed additional materials at their request after the meeting. In December, attendees at the SNAME Sealift Panel meeting were briefed on the further development of the Military Ro/Ro version at the N42 office in Crystal City, Virginia, including RADM (USN-ret) Carl Seiberlich, RADM Herberger and Mr. Kaskin. RADM Purcell's staff was sent updated information as well.

Attachment: Presentation given at various briefings including IMPACT 2005.

MILITARY SEALIFT PENTAMARAN SHIP DESIGN

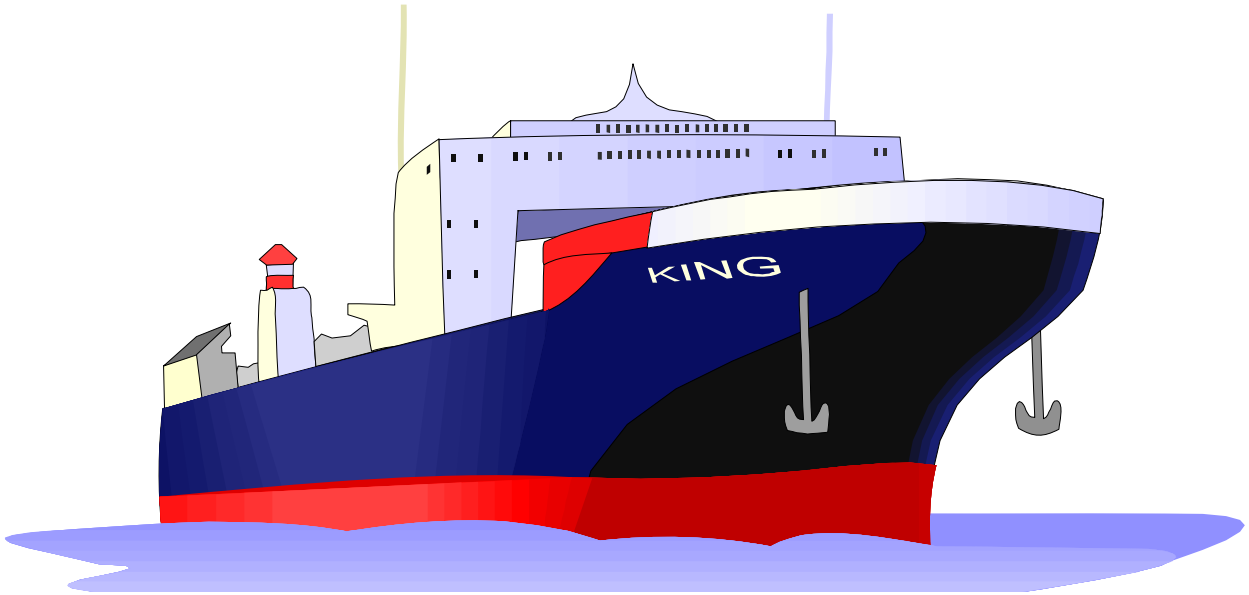
Paul B. Mentz

BMT SYNTEK Technologies, Inc.

Sealift Mission

- **Provide for the Expeditionary Logistics of U.S. Joint Forces in any Theater**
- **Provide for High Speed Surge and Medium Speed Sustainment as Required**
- **Provide for Long Range Inter-Theater and Medium Range Intra-Theater Moves**
- **Provide for the Specific Needs of the Army, Navy, Air Force and Marines**

Sealift Ships



Objective

- **Payload – the more the better**
- **Speed – the higher the better**
- **Range – the greater the better**

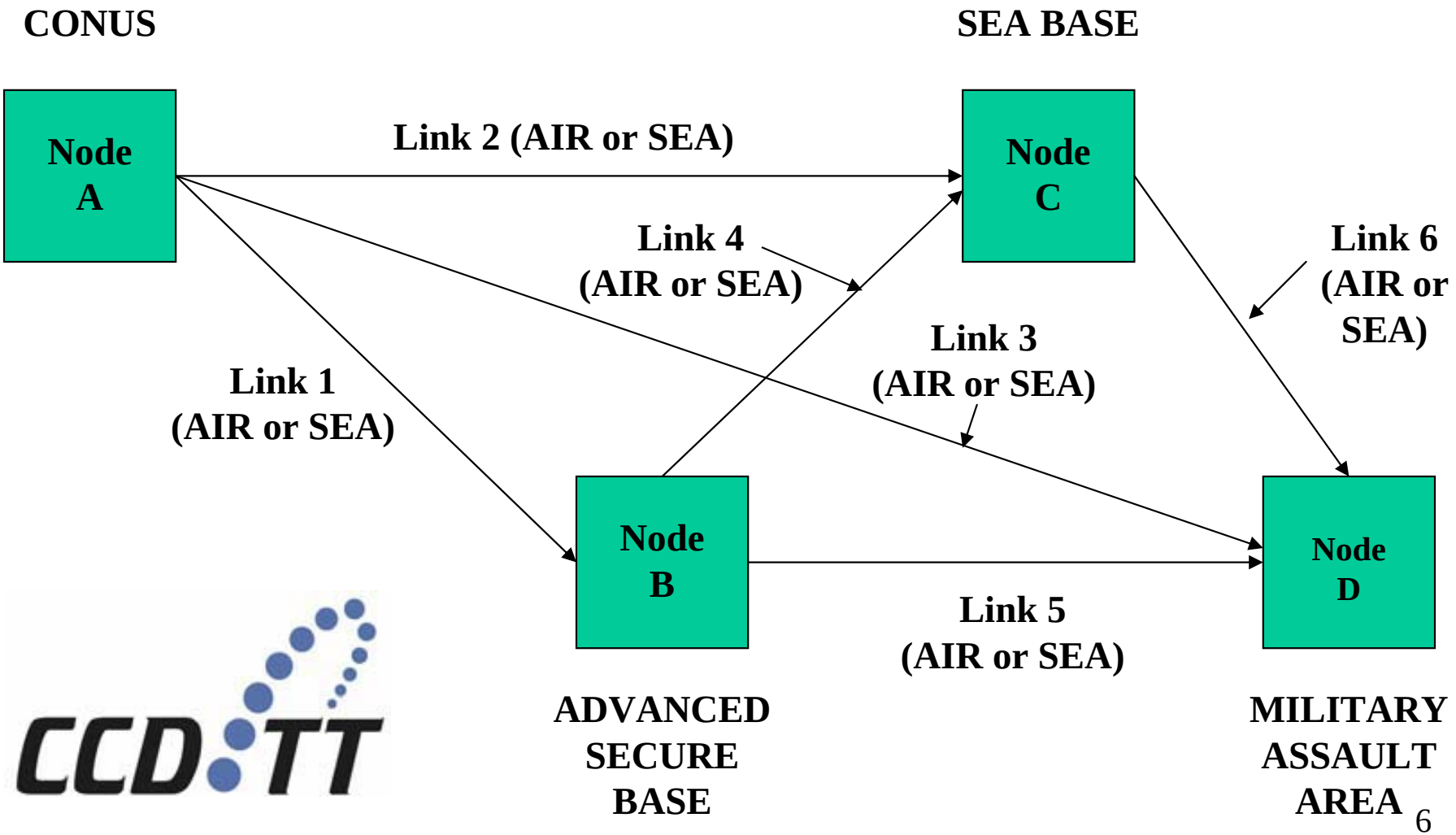
The goal should clearly be to maximize these performance parameters relative to the total ownership cost for the ship or craft over its useful life.

Metrics

- **Payload Delivery Rate (PDR) - Link**
- **Payload Flow Rate (PFR) - Node**

Payload Delivery Rate (PDR) is defined as Payload multiplied by Speed (load times distance per unit time). Payload Flow Rate (PFR) is defined as Payload Delivery Rate (PDR) divided by Distance (load per unit time).

Sea Basing Conceptual Model



Characteristics of Links

- **D Distance in Nautical Miles**
- **L% Percentage of Flow**
- **MS% Modal Split (AIR or SEA)**
- **PDR Payload Delivery Rate in ST-NM/HR**
- **V Platform Speed in Knots**
- **P Platform Payload in Short Tons**
- **T Platform Transit Time in Hours**
- **N Number of Platforms Required (One Way)**

Characteristics of Nodes

- **PFR Payload Flow Rate in ST/DAY**
- **H Handling Rate in ST/HR by Mode (*)**
- **W Waiting (Dwell) Time in Hours**
- **T Processing Time in Hours**
- **S Storage Capacity in Short Tons**

(*) Varies inversely with severity of environmental conditions.

Characteristics of Systems

- **N-A Total Number of Aircraft by Type (Pay-load/Speed/Range) Required**
- **N-S Total Number of Ships by Type (Payload Speed/Range) Required**
- **TT Total Time from Node A to Node D by Route and Modal Sequence**
- **CA Total Acquisition Cost Estimate $**
- **CO Total Operational Cost Estimate $/Year**

Final Report

FAST SHIP

PERFORMANCE ASSESSMENT

A Parametric Analysis

SYNTEK Technologies, Inc.
4301 N. Fairfax Drive
Arlington, Virginia 22203

August 31, 2000

Submitted to: Advanced Technology Office (ATO)
Defense Advanced Research Projects Agency (DARPA)

Definition

Define Ship Technical Effectiveness (STE):

$$STE = LDR * OPC * DDR - SFC * (1 + MF / 100) * DI$$

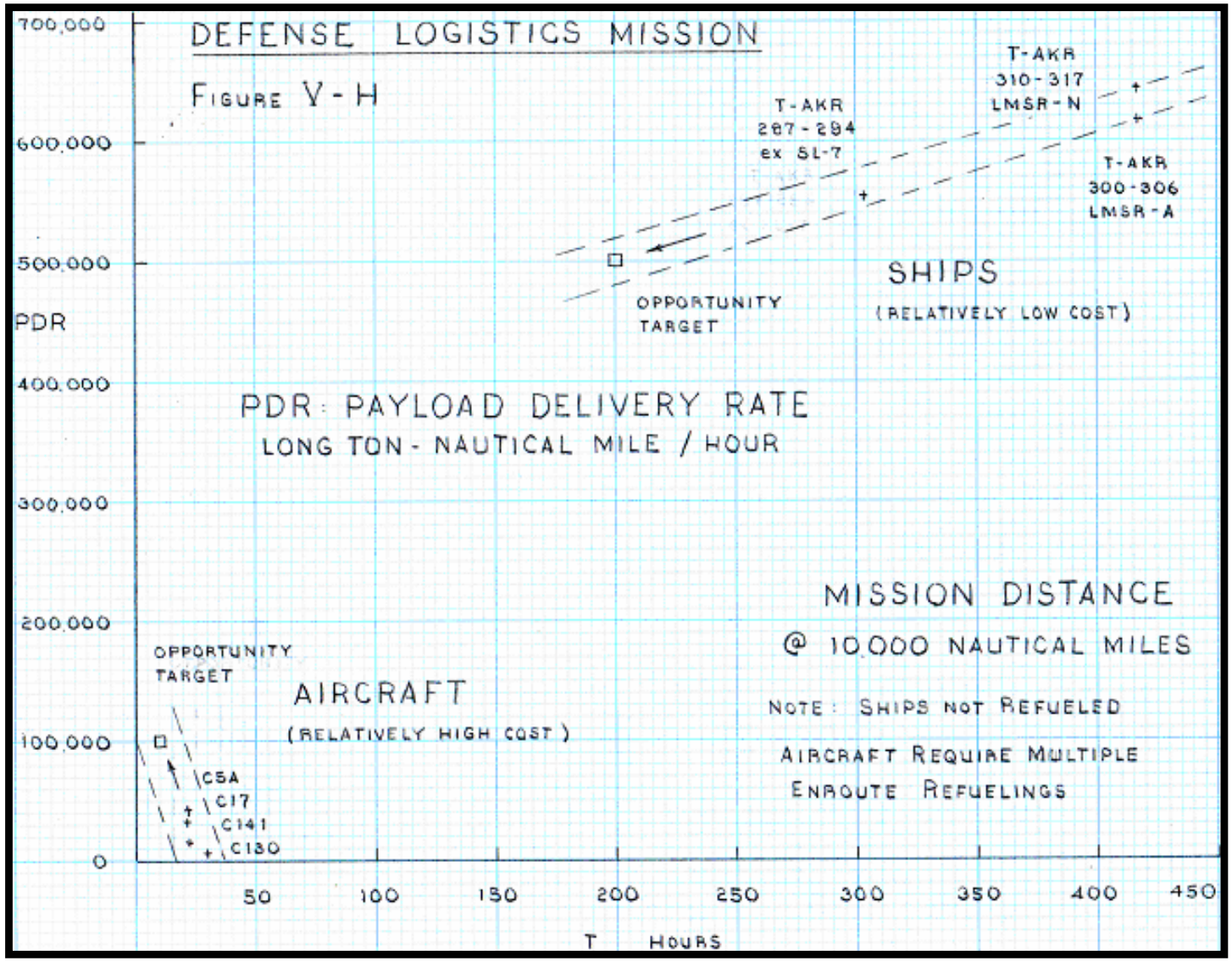
$$PDR = STE * BPI$$

$$PFR = STE * BPI / DI$$

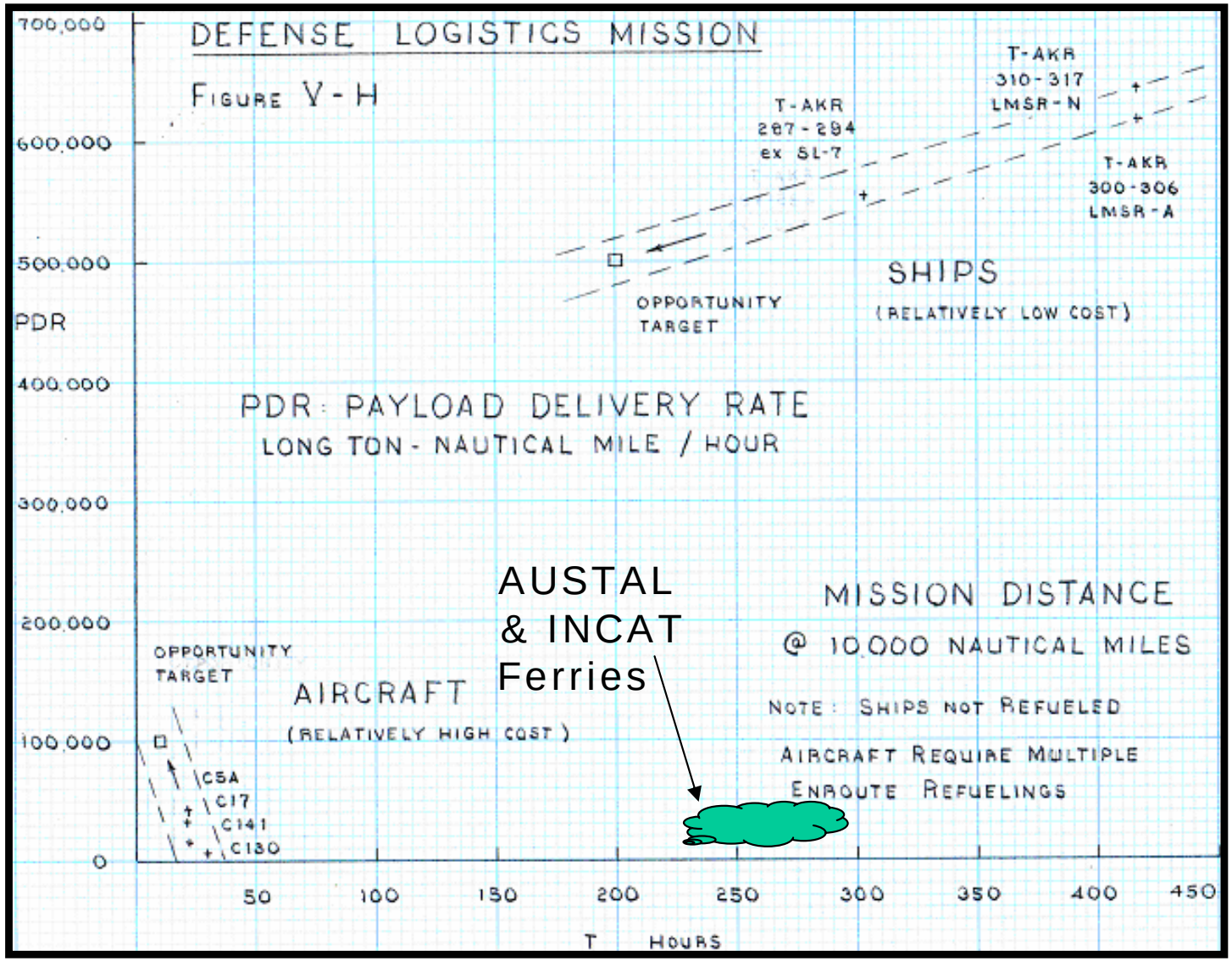
Key Parameters

- **Lift / Drag Ratio (LDR) is a measure of the hydrodynamic efficiency of the hull form at any given speed and displacement.**
- **Overall Propulsive Coefficient (OPC) is a measure of the efficiency of the engine/transmission/propulsor system at any given power and speed.**
- **Deadweight / Displacement Ratio (DDR) is a measure of the efficiency of the ship design to provide for payload and fuel carrying capacity.**
- **Specific Fuel Consumption (SFC) is a measure of the efficiency of converting the energy of the fuel into engine power at any given rating.**

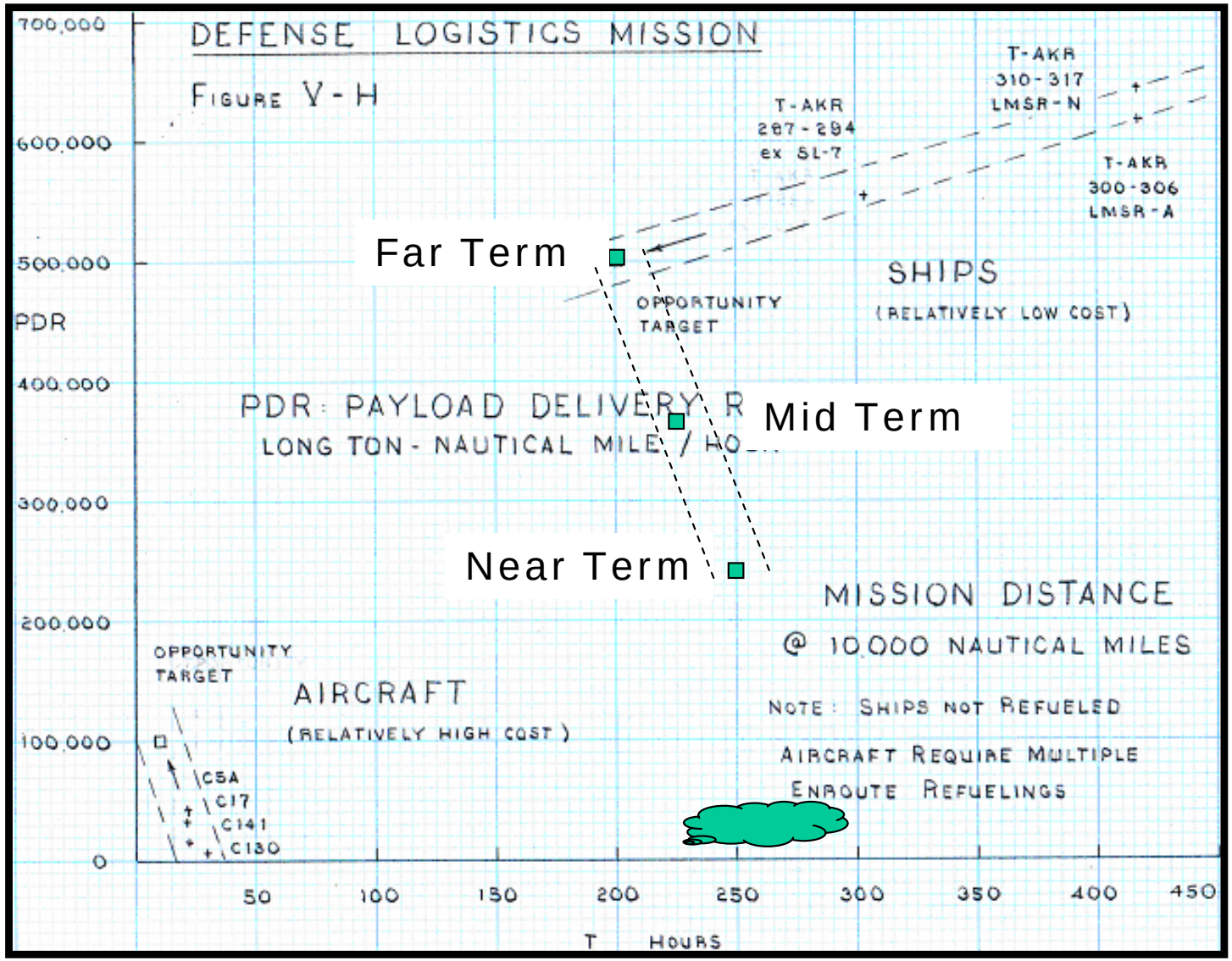
Expeditionary Logistics



Expeditionary Logistics



Expeditionary Logistics



Opportunity Targets

- **Far Term (Difficult) (DARPA)**
  - **Payload: 10,000 metric tons**
  - **Speed: 50 knots**
  - **Range: 10,000 nautical miles**
- **Mid Term (Challenging) (ONR)**
  - **Payload: 8,000 metric tons**
  - **Speed: 45 knots**
  - **Range: 7,000 nautical miles**

Opportunity Targets

- **Near Term (Achievable) (USTRANSCOM)**
  - **Payload: 6,000 metric tons**
  - **Speed: 40 knots**
  - **Range: 4,000 nautical miles**

Conclusions

- **There are challenging objectives to be achieved in high speed ships/craft for U.S. defense interests.**
- **There are innovative ship system technologies that can contribute to achieving these objectives.**
- **Multi-hull ship configurations of many varying types offer unique creative approaches.**
- **Advanced hull structure, engines, transmissions and propulsors are also part of the solution.**

ADVANCED TECHNOLOGY
MILITARY SEALIFT / COMMERCIAL EXPRESS
PENTAMARAN SHIP DESIGN

DEFENSE
LOGISTICS
MISSIONS

USMC MEU
USWC – NAHA
USEC - MERSIN

LINER
CONTAINER
MARKETS

TRANSATLANTIC
TRANSPACIFIC
NORTH-SOUTH

PAYLOAD: 4000 – 6000 TONS

SPEED: 40 KNOTS @ 95.6 MW

RANGE: 4000 – 6000 N. MILES

CCD TT

BMT Syntek

Idea

Implementation

BMT

NGA ADX Pentamaran

- The pentamaran containership design has the following characteristics:
  - Length – 279 meters (oa); 274 meters (wl)
  - Beam – 45.5 meters; Draft – 7.9 meters
  - Speed – 40.8 knots (trial condition)
  - Deadweight – 7,900 metric tons
  - Displacement – 19,000 metric tons
  - Propulsion – 4 Pielstick 18PC4.2B diesels
  - Propulsors – 4 KaMeWa 225 SII waterjets

Pentamaran Example

- **At 19,000 metric tons displacement and 40.8 knots (100% MCR) in calm water:**
  - **LDR = 19000*9.8/3316 = 56**
  - **OPC = 0.73**
  - **DDR = 7900/19000 = 0.416**
  - **SFC = 184 g/kw-hr**
- **At 1,897 metric tons fuel capacity and 10% fuel margin :**
  - **Range = 1897*(10**6)*40.8/1.10*95600*184 = 4000 nm**

Pentamaran Metrics

- **Payload Delivery Rate (PDR)**
  - **PDR = 6000*40.8 = 244,800 mt-nm/hr**
- **Payload Flow Rate (PFR)**
  - **PFR = 244800/4000 = 61.2 mt/hr**
- **Ship Technical Effectiveness (STE)**
  - **STE = 244800*5.046/95600 = 12.92**
  - **STE = 56*0.73*0.416 - 184*1.10*4000/198184**
  - **STE = 17.01 – 4.09 = 12.92**

SYNTEK Background

Founded in 1994 in the United States, BMT SYNTEK Technologies, Inc. is a high level technical and engineering professional services firm. Based in Arlington, Virginia, SYNTEK supports a variety of clients ranging from the United States government to an impressive roster of major domestic and international corporations.

SYNTEK Business

SYNTEK's goal is to help clients maximize the potential of their organizations in the competitive global market. We provide strategic guidelines to structure and implement solutions to complex system-level problems to achieve our clients' business objectives. SYNTEK is a wholly-owned subsidiary of British Maritime Technology (BMT).

SYNTEK Capabilities

- Unique Corporate Experience
  - **Understand DOD Mission Requirements**
  - **Analysis of Alternatives and Prioritization**
  - **Acquisition Strategy and Implementation**
  - **Assessment of Key Operational Issues**
  - **Knowledge of Integrated Logistics Systems**
  - **Evaluate High Performance Ship Technologies**
  - **Challenge of Achieving Sea Basing for USN**

BMT

Sea Power 21 Goals and Objectives

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BMT Syntek
Idea
Implementation