Transitioning Technology to Naval Ships

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Agenda

- Technology Transition
- NGIPS Technology Development Roadmap
- Metrics
- Technology Transition Examples
- Recommendations

Technology

"The practical application of knowledge especially in a particular area"

Merriam-Webster Dictionary

Technology Transition

"Transfer of knowledge from those people that create it, to those people that require the knowledge to impact a change on a ship."

- People have to be paid
- People generally are in different organizations

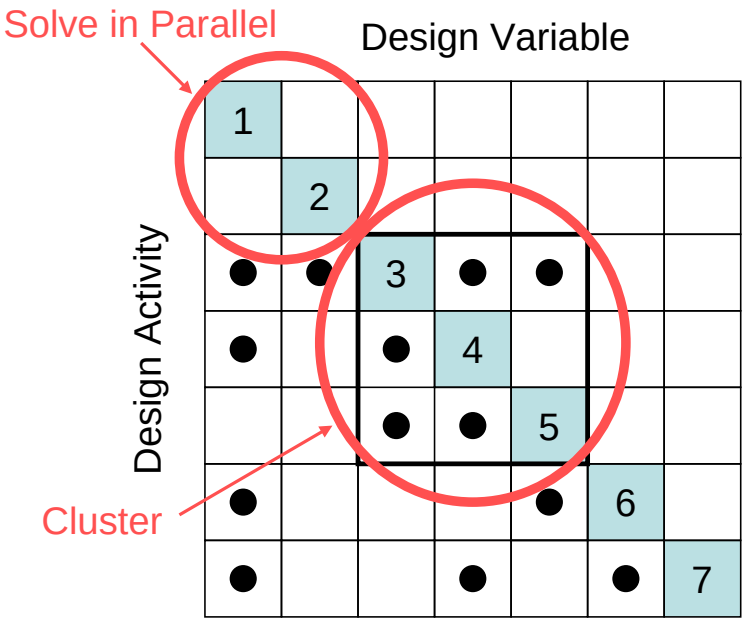
- Two aspects of Technology Transition
  - Transfer of Knowledge from one organization to another
  - Transfer of Fiscal Responsibility from one organization to another

Getting a new technology Component / System on a ship

- New Construction
  - Written into Ship Specifications
  - Engineering Change Proposal
  - Written into Component Specification / Standard
- In Service
  - Ship Change Document (Planned configuration change)
  - Alteration equivalent to Repair (AER)
  - Fit Form Function replacement of a repair part
    - Via Stock System
  - Alteration during Depot Maintenance
  - “requirements” for consumables (MRCs, TMs, etc.)

Getting a new Process / Tool Invoked

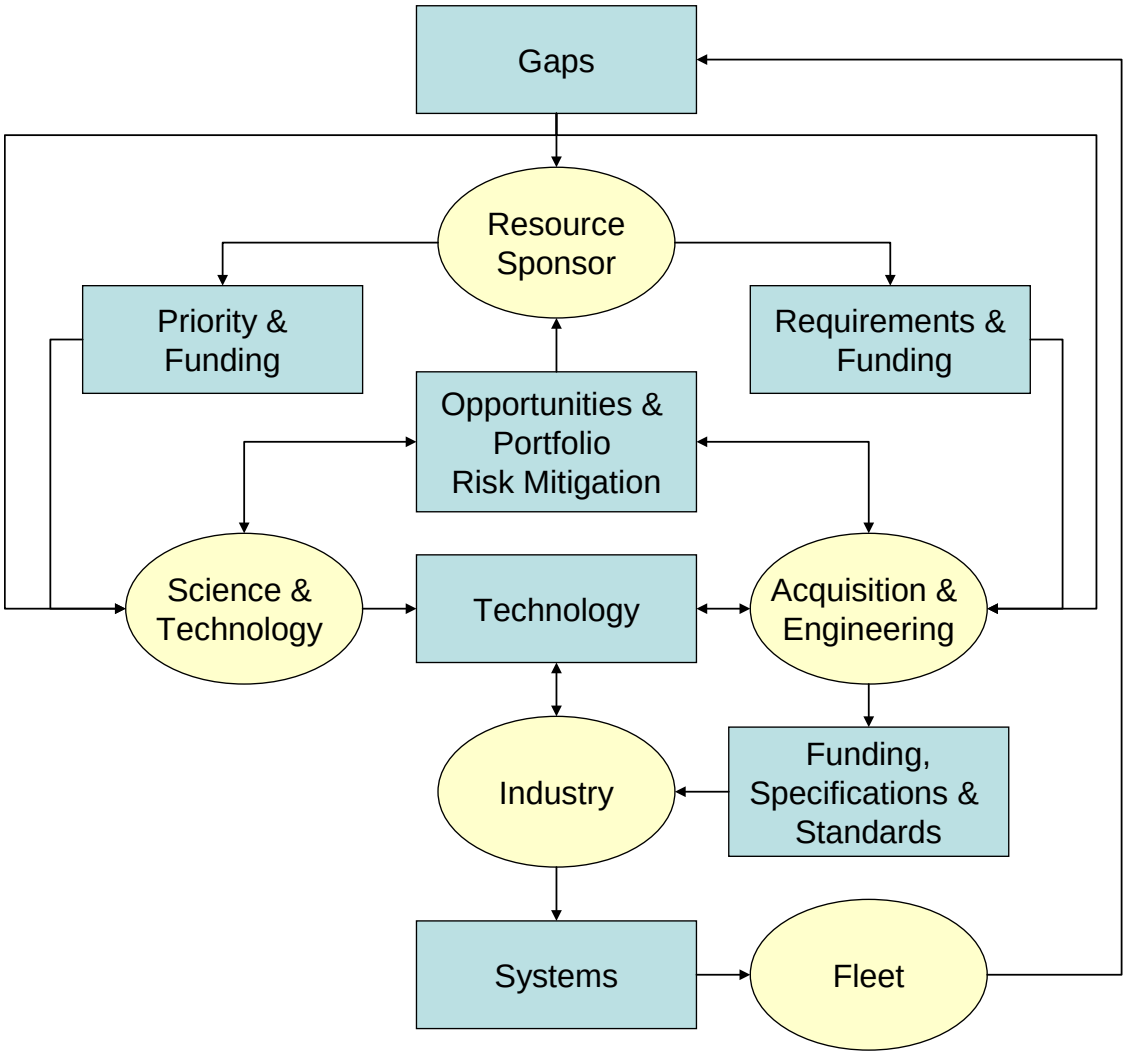
- Modify Process Documentation
  - Standards and Handbooks
  - Work Instructions and Standard Practices
  - Modify SOWs and specs
- Modify infrastructure
  - Tools
  - Software
  - Workspace layout
- Train Workforce
- Monitor and act on relevant metrics



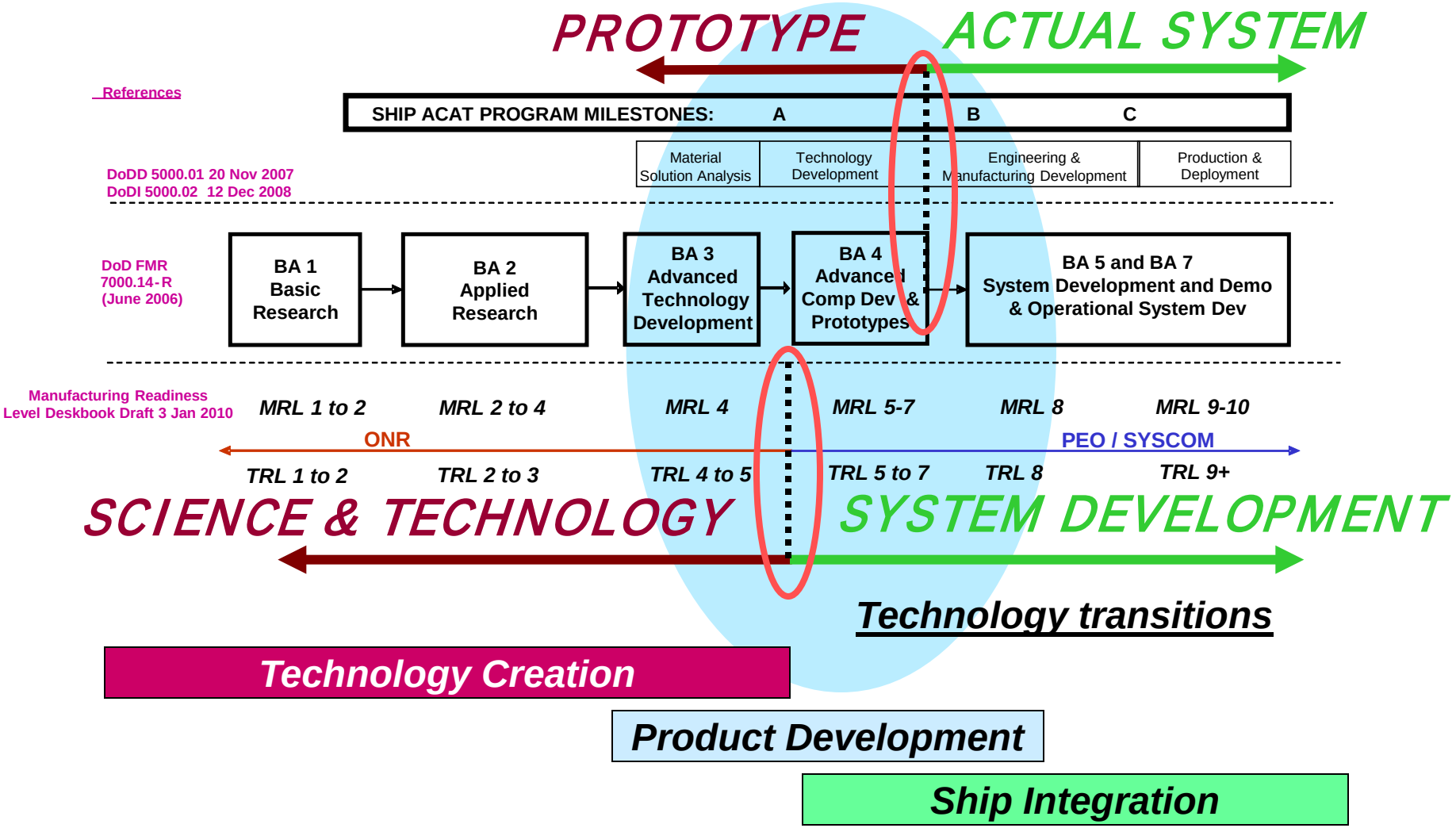
Reasons to Adopt a new Technology

- **Gap (Best way to fulfill an unmet operational requirement)**
  - Advances in adversary capabilities
  - Changes in CONOPS
  - Changes in law and regulations
  - Loss of industrial base to reproduce existing system
- **Opportunity (Perceived benefits outweigh the risks)**
  - Acquisition Cost Reduction
  - Total Ownership Cost Reduction
  - Enable new CONOPS
- **Risk Management**
  - Improve Flexibility to react to potential future gaps (Requirements Risks)
  - Mitigate risk of disappearing Industrial Base or source of raw materials
  - Mitigate risk of a technology for another more critical program

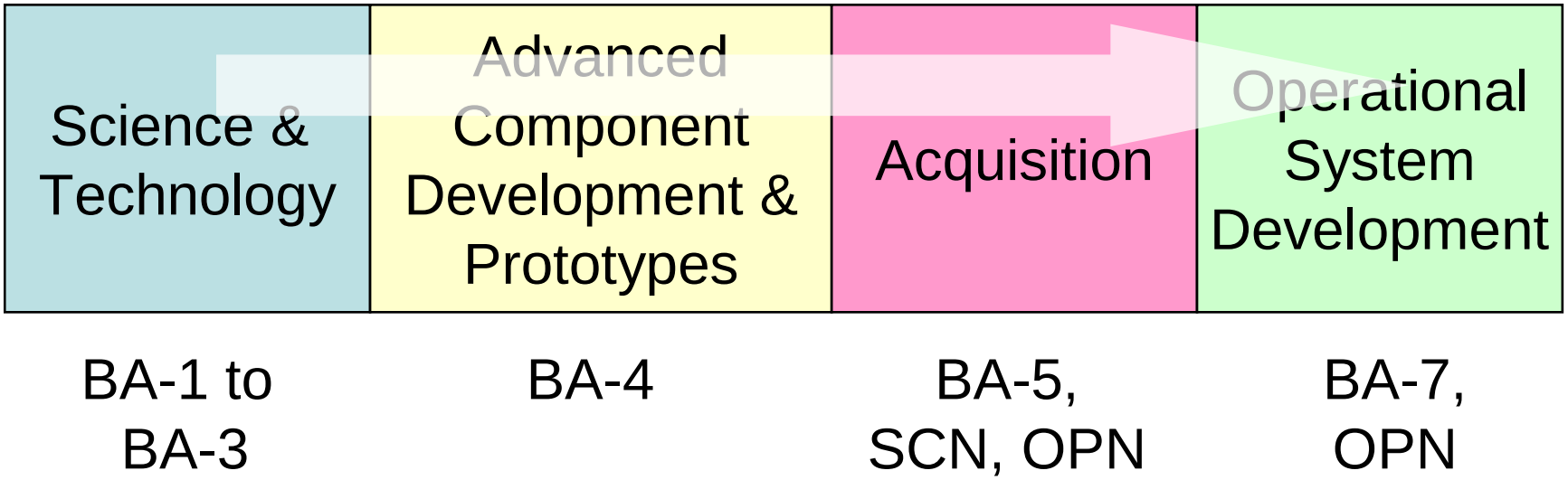
Technology Transition Interactions



Technology Transition

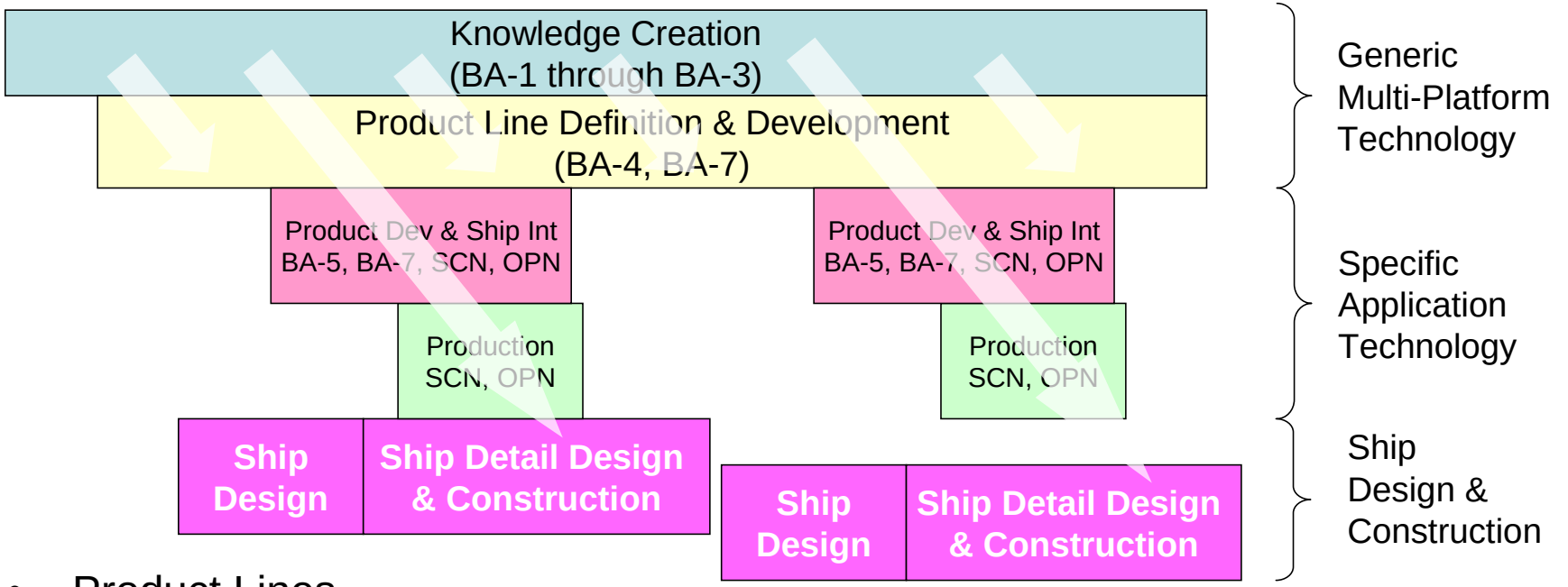


Traditional Technology Transition Model



- Observations
  - Serial (long) Process
  - Does not promote commonality across platforms

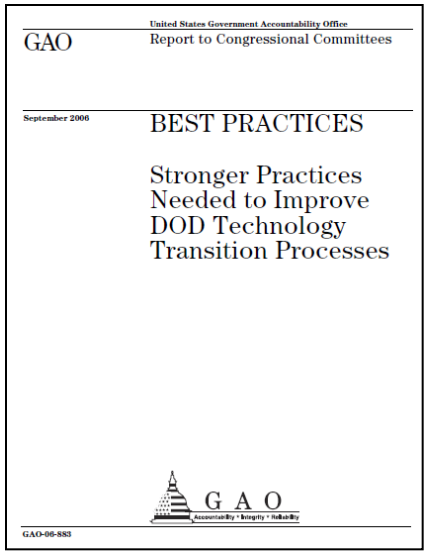
Alternate Technology Transition Model



- Product Lines
  - Provide capability to create and produce specific applications when needed.
  - Promote Commonality across Ship classes.
  - Decouple S&T from specific ship applications
    - Eliminate churn in aligning S&T and ship acquisition programs.
  - Capture knowledge in Specifications, Standards, Handbooks, Design Data Sheets, Rules, etc.
- Technology Development Roadmaps facilitate communication

Technology Transition Enablers

- Technology Transition Agreements
- Relationship Managers
- Metrics


United States Government Accountability Office
GAO
Report to Congressional Committees
September 2006
BEST PRACTICES
Stronger Practices Needed to Improve DOD Technology Transition Processes
GAO
GAO-06-883

GAO, "Stronger Practices Needed to Improve DOD Technology Transition Processes," GAO-06-883, September 2006

Technology Transition Agreements

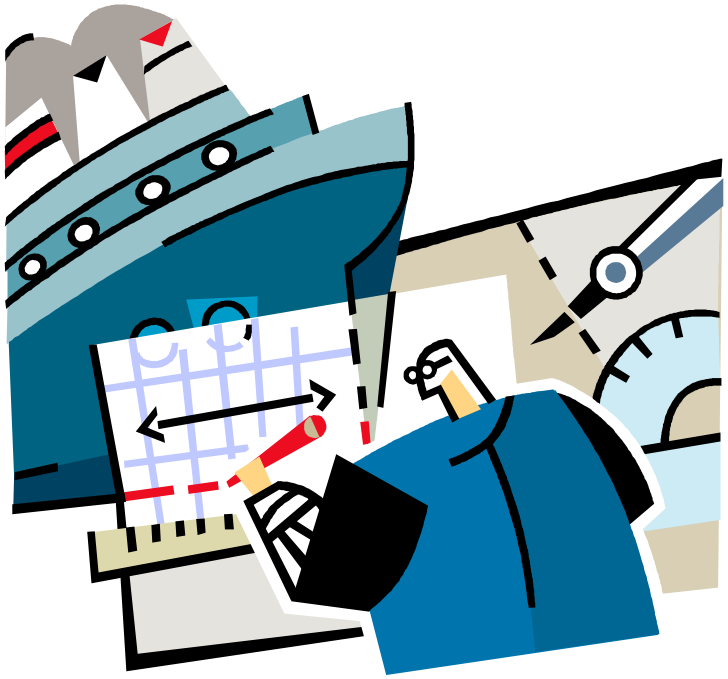
- "The agreements put in writing the technology and business-related expectations, such as specific cost, schedule, and performance characteristics that labs must demonstrate."
- "The agreements also may require documenting manufacturing costs or specifying whether certain lab scientists will be loaned to the product line to provide continuity in technical knowledge."

DEFINES A RELATIONSHIP BETWEEN
TECHNOLOGY CREATION AND PRODUCT LINE DEVELOPMENT

SHOULD INCLUDE MUCH MORE THAN A COMMITMENT
TO FUND FURTHER DEVELOPMENT

Relationship Managers

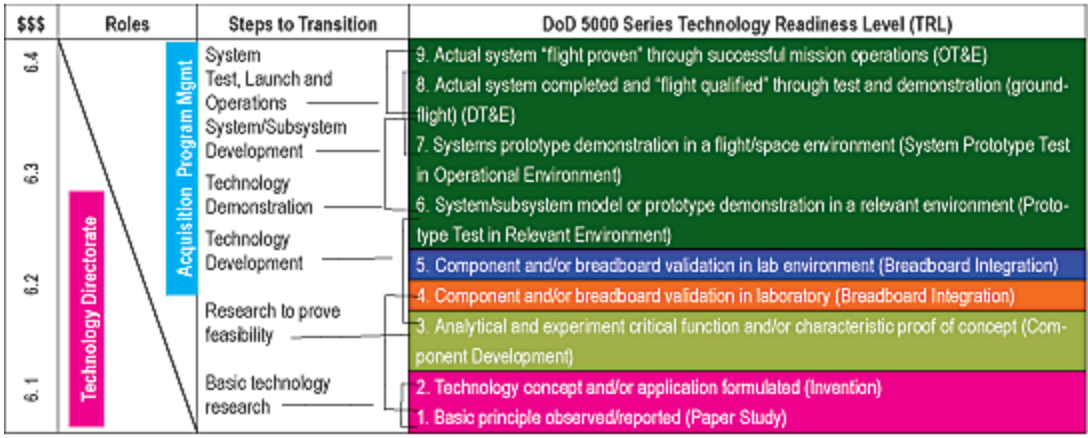
- Communicate across the labs and product lines to address transition issues.
- Ensure the right knowledge gets to the right person to make the final product a success.
- Facilitate feedback from the product development back to the technology developers to guide the creation of new technology.



Metrics

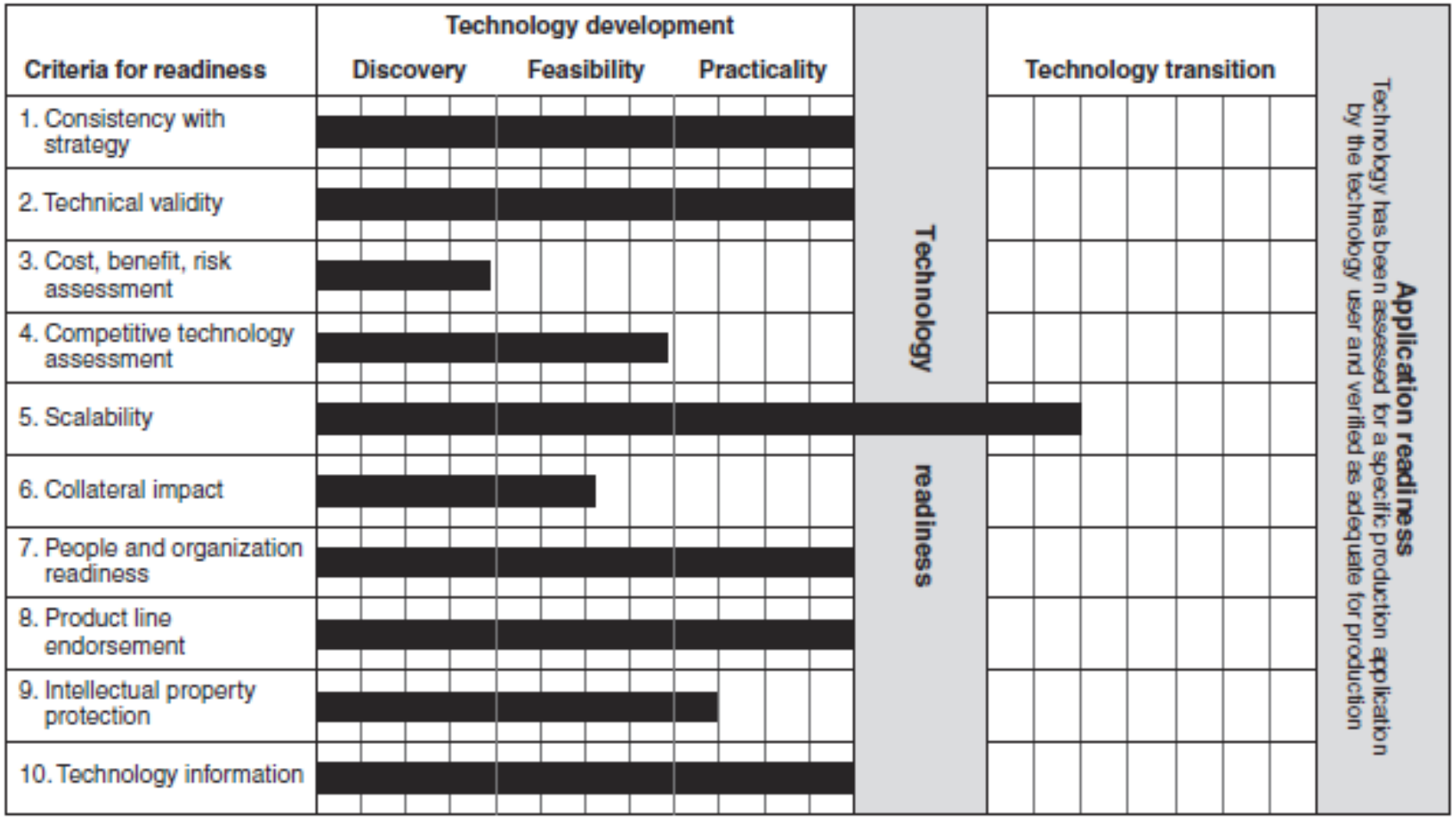
- DOD Metrics
  - Technology Readiness Level
  - Manufacturing Readiness Levels
- Commercial Industry Metrics
  - More Inclusive of all aspects of Technology Transition

Figure 2. Technology Readiness Levels (TRL).



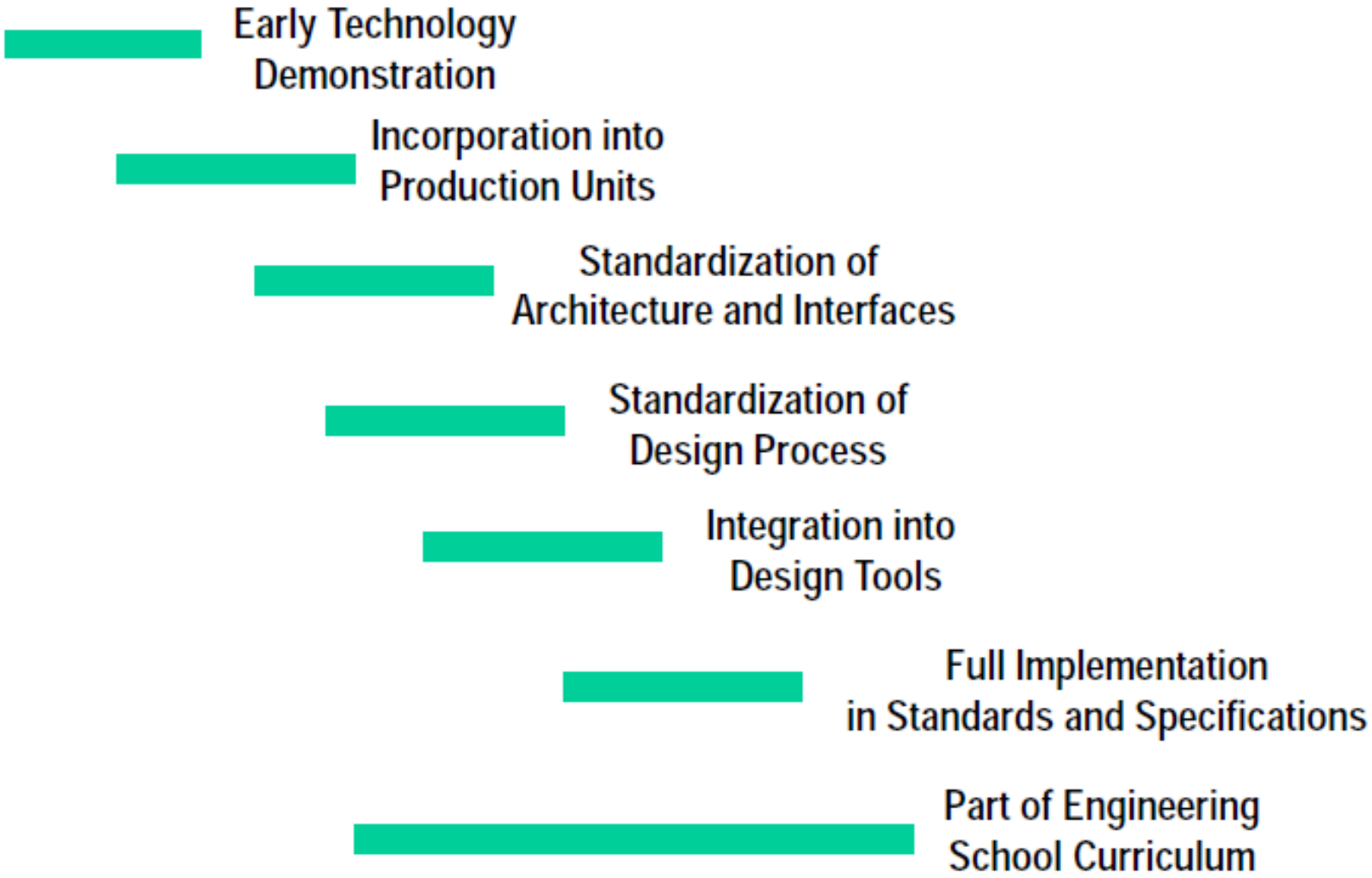
MRL	Definition	Phase	BA
1	Basic Manufacturing Implications Identified	Pre Materiel Solution Analysis	1
2	Manufacturing Concepts Identified	Pre Materiel Solution Analysis	2
3	Manufacturing Proof of Concept Developed	Pre Materiel Solution Analysis	2-3
4	Capability to produce the technology in a laboratory environment.	Materiel Solution Analysis(MSA)leading to a Milestone A decision.	2-3
5	Capability to produce prototype components in a production relevant environment.	Early Technology Development Phase	4
6	Capability to produce a prototype system or subsystem in a production relevant environment.	Prior to completion of Preliminary Design and the start of Contract Design	4
7	Capability to produce systems, subsystems or components in a production representative environment.	Late Technology Development Phase leading to Milestone B	4
8	Pilot line capability demonstrated. Ready to begin low rate production.	Engineering & Manufacturing Development (EMD) leading to a Milestone C decision.	5 - SCN
9	Low Rate Production demonstrated. Capability in place to begin Full Rate Production.	Production & Deployment leading to a Full Rate Production (FRP) decision.	5 - SCN
10	Full Rate Production demonstrated and lean production practices in place.	Full Rate Production/ Sustainment	SCN

Boeing Technology Maturity Scoreboard



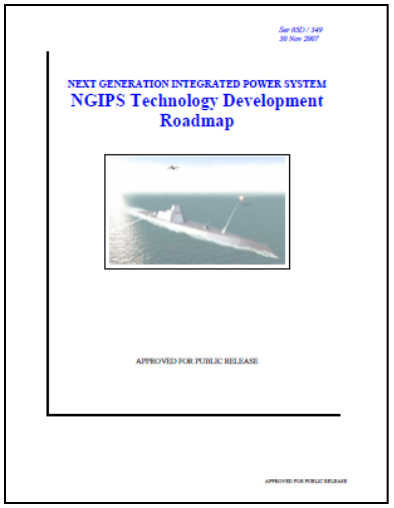
Source: GAO analysis based on The Boeing Company's scorecard.

Institutionalizing Technology



NGIPS Technology Development Roadmap

- Developed in 2007
  - Coincident with establishing the Electric Ships Office
- What it Did
  - Defined the state of the technology
  - Defined the Need
  - Defined Architectures
  - Listed technology developments needed
  - Proposed a Business Mode
- What it Did Not Do
  - Define an Execution Plan



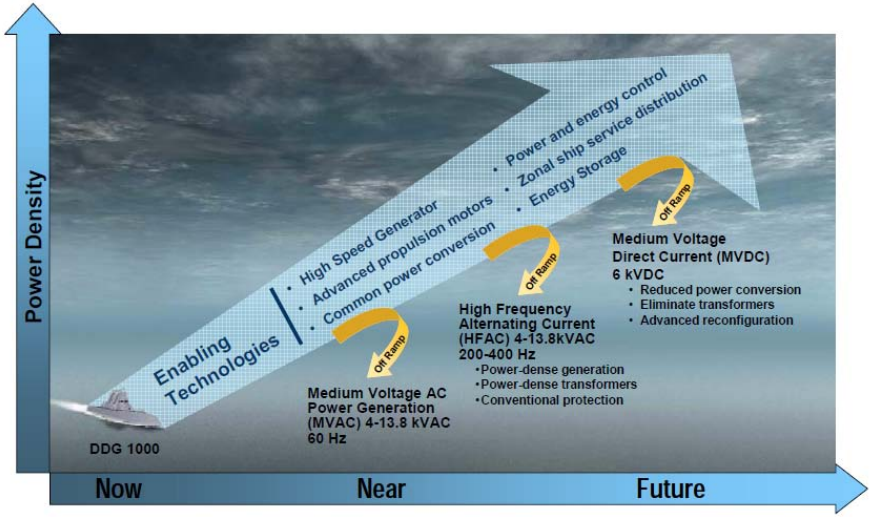
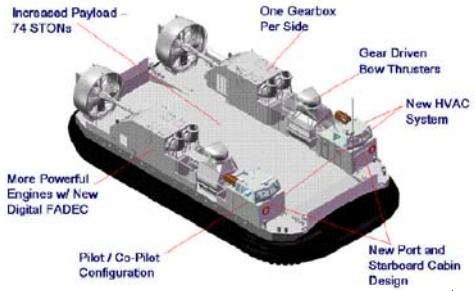
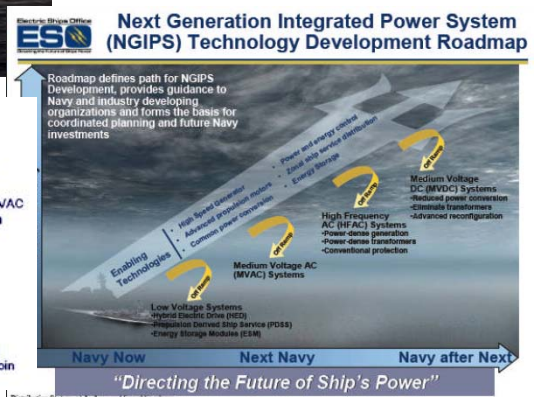


Figure 1: NGIPS Technology Development Roadmap

Examples

- Advanced Enclosed Mast / Sensor System on LPD 17
  - Classic ONR to Ship technology transition
  - Technology not fully institutionalized
- Hybrid Electric Drive on LHD 8
  - Technology demonstrated in U.K. Navy, and developed by industry
  - Technology not fully institutionalized
- Integrated Power System on DDG 1000
  - Started as a product line approach developed by NAVSEA
  - Morphed into ship specific systems
- Next Generation Integrated Power System
  - Implement Product Line Approach
  - Not yet transitioned to a ship program
- Set Based Design on Ship to Shore Connector
  - Process transitioned from Toyota via University
  - Basic Process codified in Ship Design Manager Manual





Recommendations

- Promote the use of Product Lines and Associated Technology Development Roadmaps
- Employ more Robust Metrics
- Improve Technology Transition Agreements
- Fully Implement Relationship Managers
- Modify the DOD Financial Management Regulation (DODFMR) to include Technology Transition Activities in BA-3.
- Modify DODFMR to split BA4 into Product Line Development and Advanced Component Development and Prototypes
- Assign OPNAV N091 as the resource sponsor for Product Line Development in addition to S&T.