Technology for the Warfighter

Defense Manufacturing Conference

November 27, 2001

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Director, Defense Research & Engineering

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	11/27/2001	Briefing 11/27/2001

4. TITLE AND SUBTITLE
Technology for the Warfighter: Defense Manufacturing Conference

5. FUNDING NUMBERS

6. AUTHOR(S)
Sega, Dr. Ronald M.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Department of Defense

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; Distribution unlimited

12b. DISTRIBUTION CODE
A

13. ABSTRACT *(Maximum 200 Words)*

Briefing given by Dr. Ronald Sega about the direction for Defense research and engineering.

14. SUBJECT TERMS
IATAC Collection, warfighter, DoD, technology, readiness

15. NUMBER OF PAGES
19

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNLIMITED

Quadrennial Defense Review (QDR)
September 30, 2001

- Move From "Threat-Based" to "Capabilities-Based" Planning
- Key Military-Technical Trends of Adversaries
- Exploit R&D to Maintain Decisive lead in Technologies
- Develop & Exploit Technologies
- Reduce Cycle Time

"Protecting the American Homeland From Attack is the Foremost Responsibility of the U.S. Armed Forces…"

Under Secretary of Defense (Acquisition, Technology & Logistics)

Goals

- Achieve credibility and effectiveness in the acquisition and logistics support process
- Revitalize the quality and morale of the DoD Acquisition, Technology, and Logistics workforce
- Improve the health of the defense industrial base
- Rationalize the weapon systems and infrastructure with the defense strategy
- Initiate high leverage technologies to create the warfighting capabilities, systems, and strategies of the future

Direction for Defense Research and Engineering

- Enable future DoD capabilities through an integrated technology program
- Accelerate technology transition to the warfighter
- Enhance near term technical support
- Revitalize the DoD laboratories
- Develop, attract and retain a quality national security technical workforce

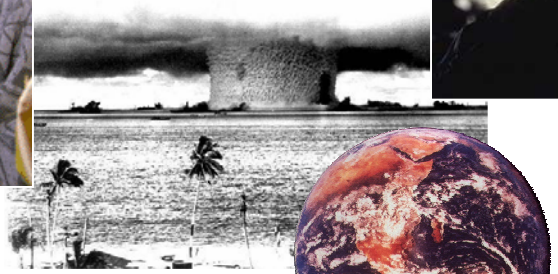
Strategic Environment

Global US Interests

Political - Economic - Humanitarian

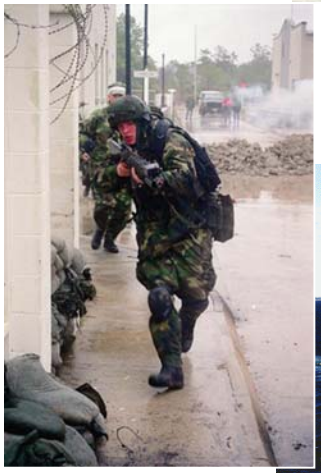


Globalization of Technology

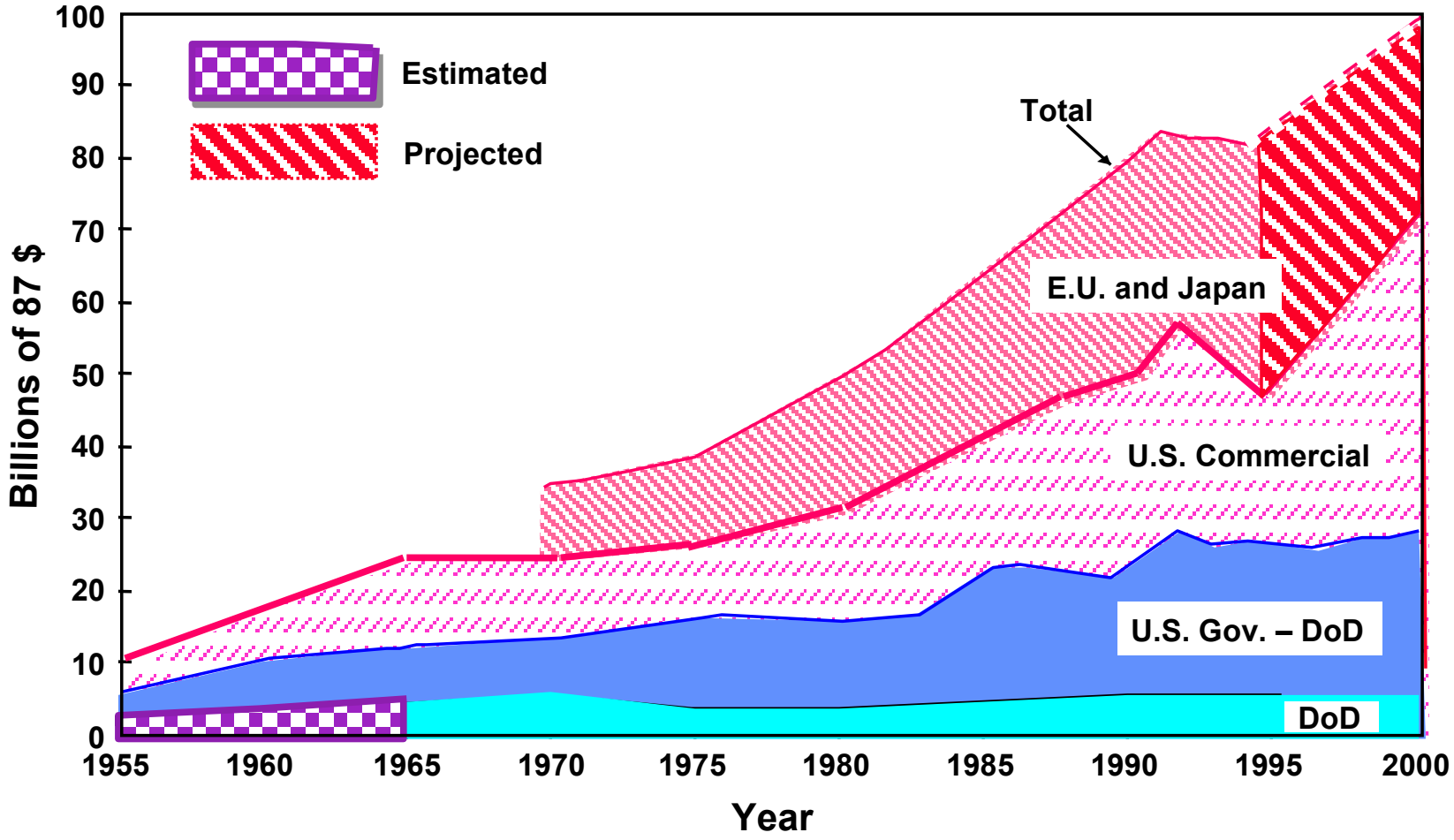



Asymmetric Threats

In any domain - Air, Land, Sea, Space or Information

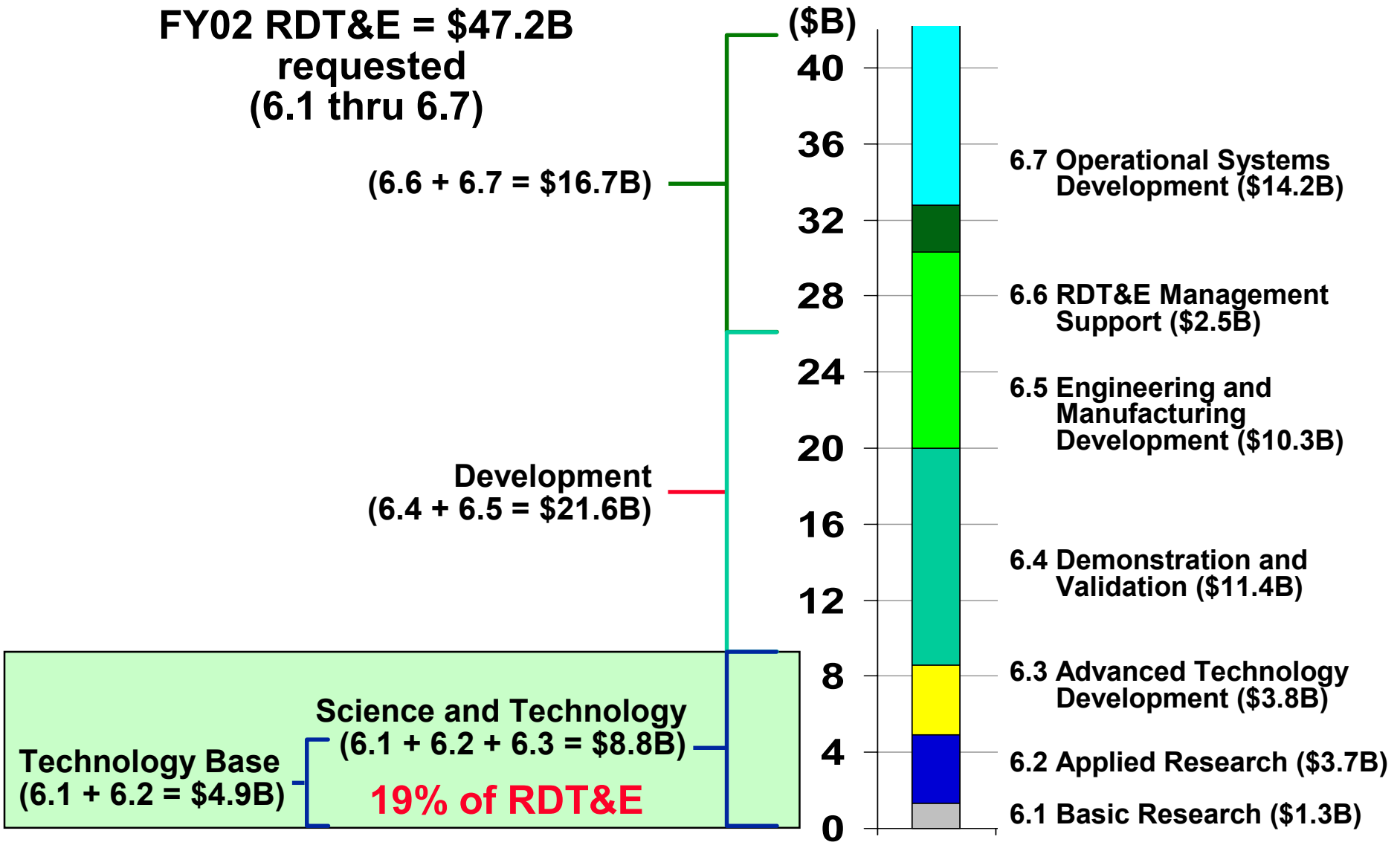



U.S. and Worldwide Research Base since WWII

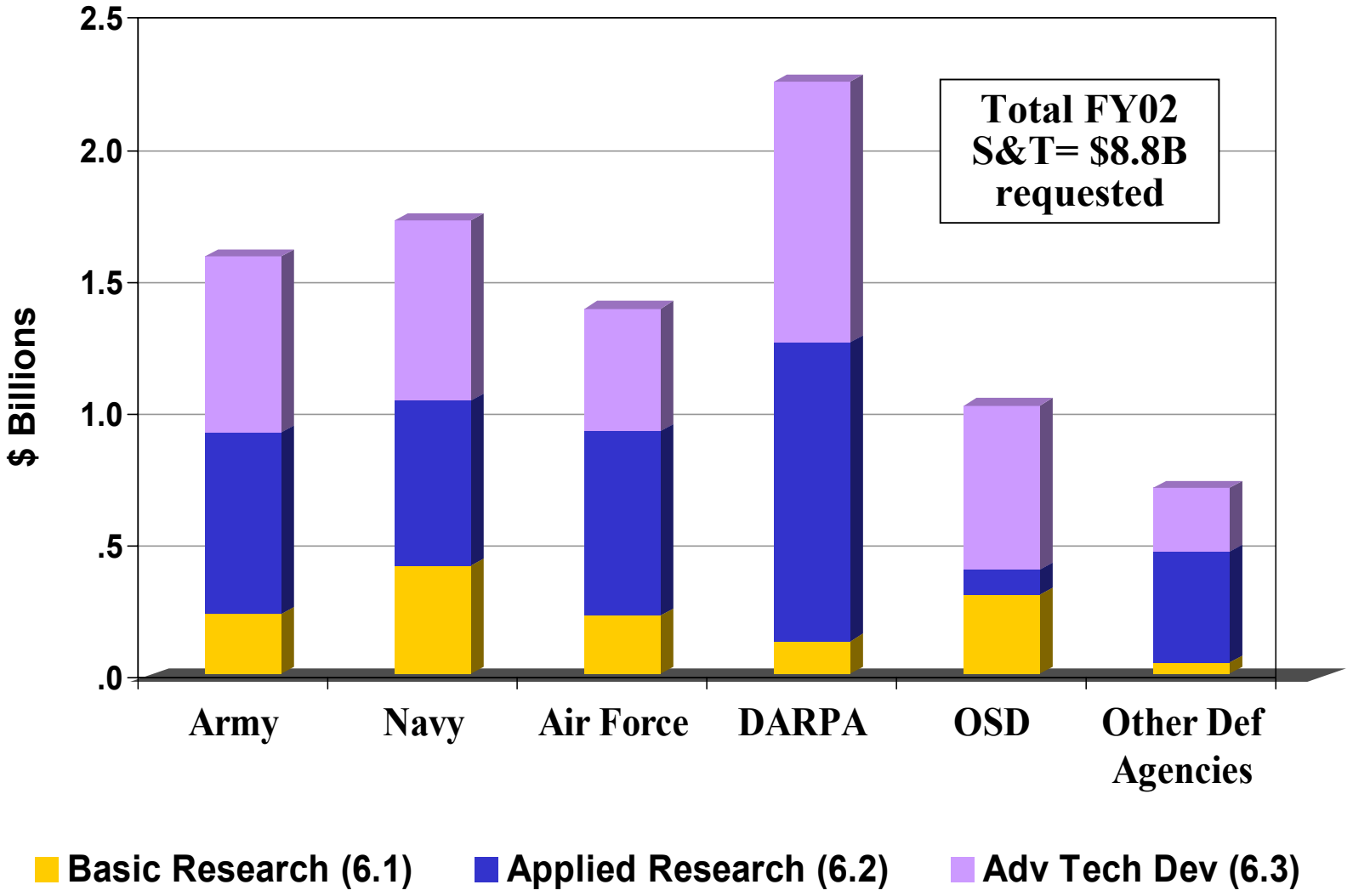


Source: Report of the Defense Science Board Task Force on the Technology Capabilities of Non-DoD Providers; June 2000; Data provided by the Organization for Economic Cooperation and Development & National Science Foundation

FY02 RDT&E Budget Request



FY02 Budget Request DoD S&T



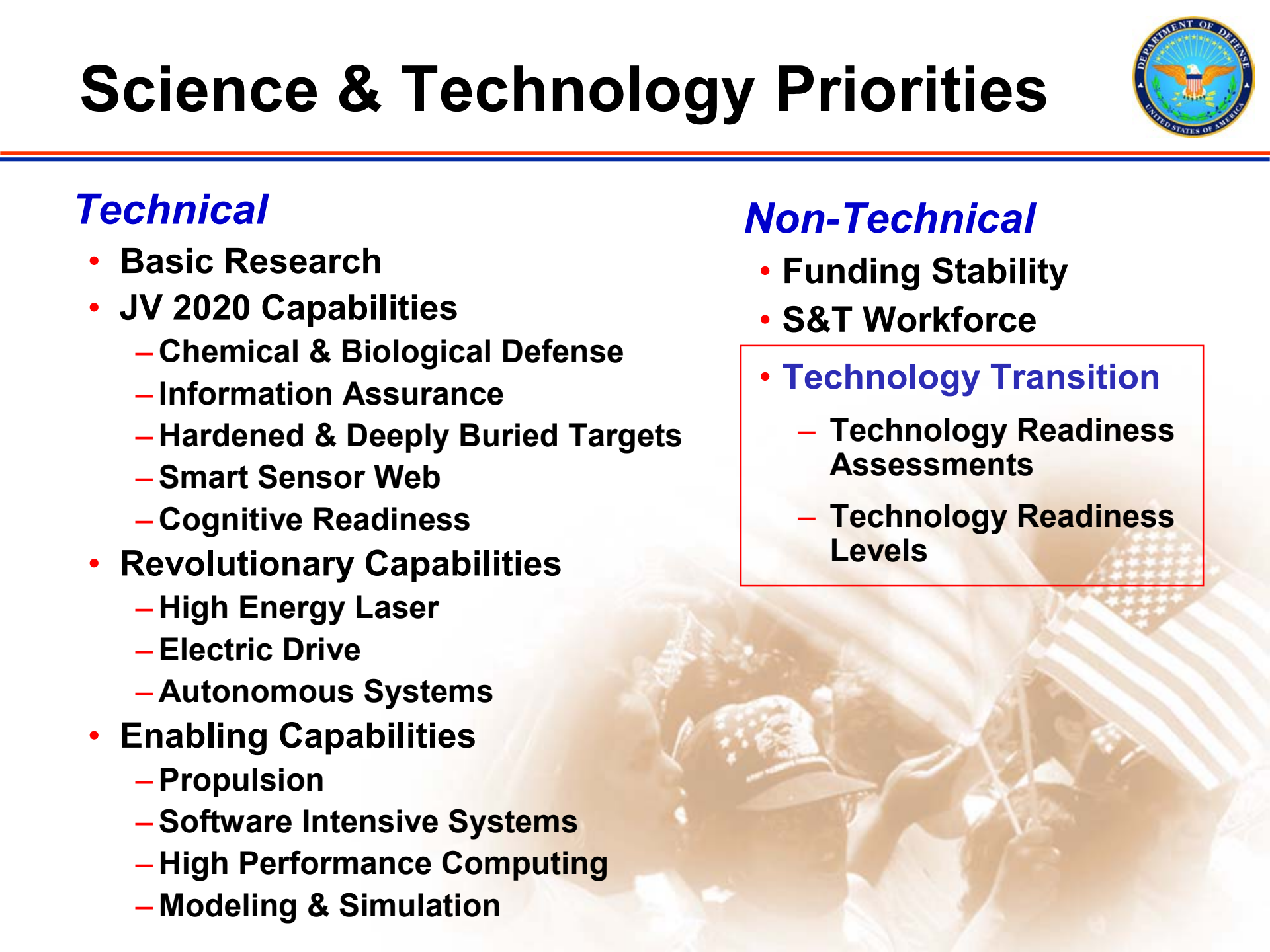
Science & Technology Priorities

Technical

- Basic Research
- JV 2020 Capabilities
  - Chemical & Biological Defense
  - Information Assurance
  - Hardened & Deeply Buried Targets
  - Smart Sensor Web
  - Cognitive Readiness
- Revolutionary Capabilities
  - High Energy Laser
  - Electric Drive
  - Autonomous Systems
- Enabling Capabilities
  - Propulsion
  - Software Intensive Systems
  - High Performance Computing
  - Modeling & Simulation

Non-Technical

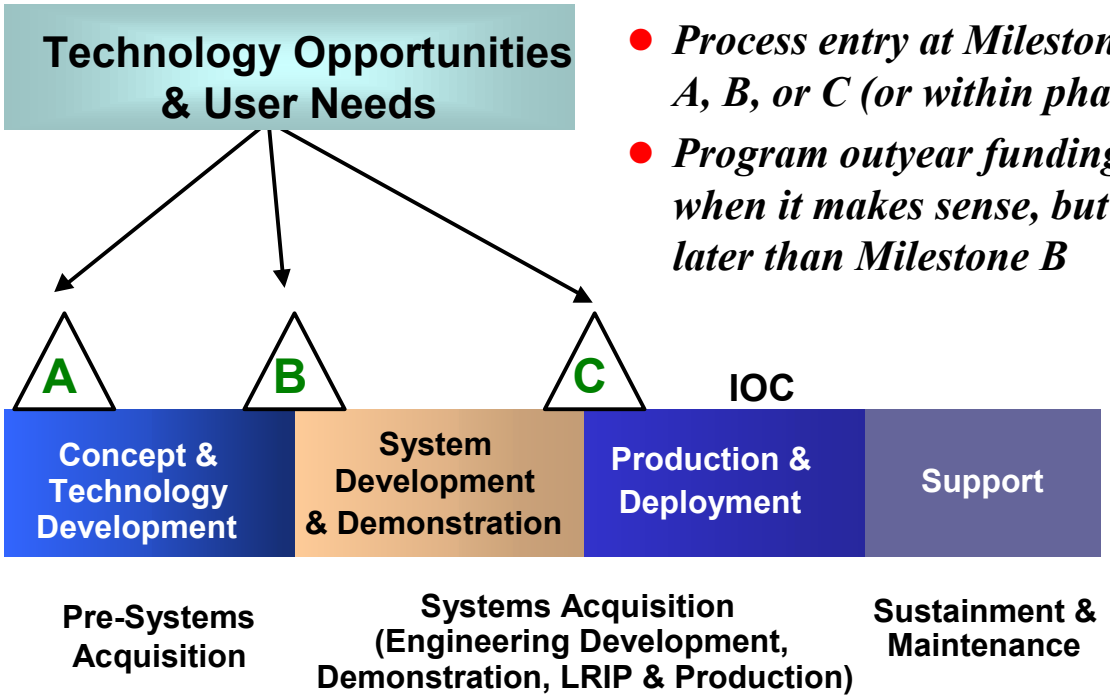
- Funding Stability
- S&T Workforce
- Technology Transition
  - Technology Readiness Assessments
  - Technology Readiness Levels



DoD 5000-Series
S&T Role in Evolutionary Acquisition

- **DoDD 5000.1**
  - Rapid Transition From S&T to Products
  - Emphasis on Affordability
- **DoDI 5000.2**
  - Focus on S&T Solutions in Pre-Acquisition
  - Use Mechanisms with User & Acquisition Customer to Ensure Transition
- **DoD 5000.2-R**
  - Conduct Technology Readiness Assessment for Critical Technologies

Defense Acquisition Management Framework



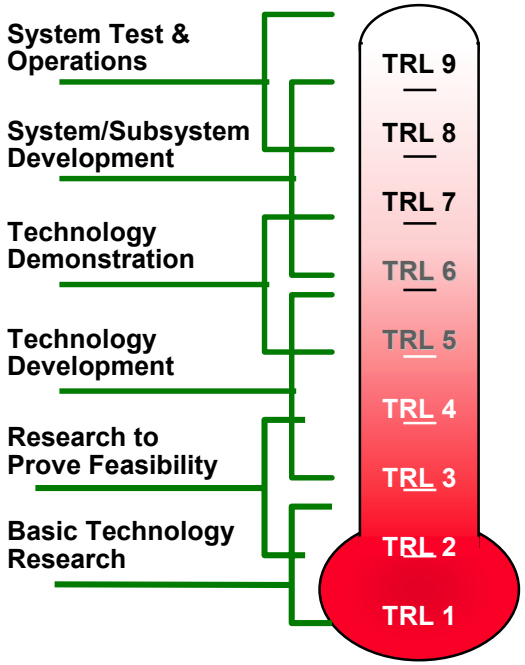
- *Process entry at Milestones A, B, or C (or within phases)*
- *Program outyear funding when it makes sense, but no later than Milestone B*

Documents Available At http://www.acq.osd.mil/ara/

DoD 5000.2-R
Assess Technology Maturity

- Technology Readiness Assessments (TRAs) for Critical Technologies
  - Use Technology Readiness Levels (TRLs), or Some Equivalent
- TRAs Conducted by the Services & Agencies (Except Joint Programs)
- Assessments Evaluated by the Dep Under Sec of Defense (S&T)
- Findings Forwarded to the Overarching IPT and Defense Acq. Board

Technology Readiness Levels (TRLs)



TRL 9	Actual system "flight proven" through successful mission operations
TRL 8	Actual system completed and "flight qualified" through test and demonstration
TRL 7	System prototype demonstration in a operational environment
TRL 6	System/subsystem model or prototype demonstration in a relevant environment
TRL 5	Component and/or breadboard validation in relevant environment
TRL 4	Component and/or breadboard validation in laboratory environment
TRL 3	Analytical and experimental critical function and/or characteristic proof-of-concept
TRL 2	Technology concept and/or application formulated
TRL 1	Basic principles observed and reported

Technology Readiness Assessment (TRA)

Example: Joint Strike Fighter (JSF)

MANUFACTURING/ PRODUCIBILITY

- *LEAN & COMMON TOOLING*
- *FLOW TIME EFFICIENCES*
- *3-D MODELING DESIGN TO FABRICATION*

STOVL IFPC

- FADEC SW
- VMS SW
- IFPC GND TESTS
- STOVL FLT CONTROL FLIGHT DEMONSTRATION

INTEGRATED SUPPORT

- AUTONOMIC LOGISTICS
- SUPPORTABLE LO

FLIGHT SYSTEMS

- INTEGRATED SUBSYSTEMS (J/IST)

MISSION SYSTEMS

- INTEGRATED RF SYSTEMS
- CORE PROCESSING (ICP) & SOFTWARE
- MISSION SYTEMS INTEGRATION

STRUCTURES & MATERIALS

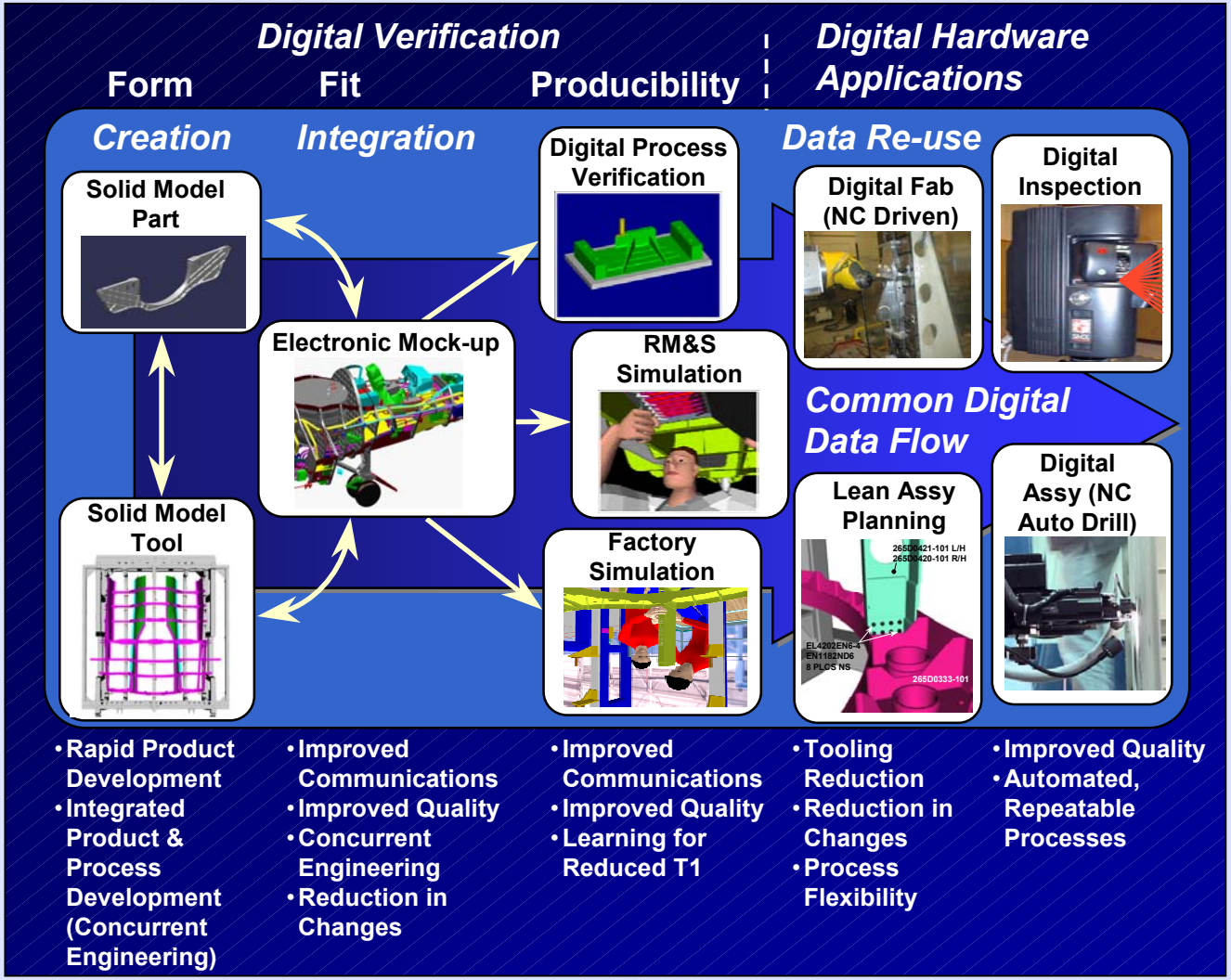
- UNITIZED COMPOSITES / METALLIC STRUCTURE

PROGNOSTICS & HEALTH MGMT

- REDUCED MAINTENANCE MANPOWER
- INCREASED SORTIE GENERATION RATE
- ENABLES AUTONOMIC LOGISTICS

JSF Digitally Driven Product Design & Manufacture

- ***Solid Model Data***
  - NC Ready Models
  - Reduced Span Time
- ***Data Re-Use***
  - Eliminates Interpretation Error
  - Reduce Task Span Times
- ***Digital Product/ Process Verification***
  - Form, Fit, & Producibility Verified Prior to Assembly
  - Improved Quality
  - Reduced Cost and Reduced Risk

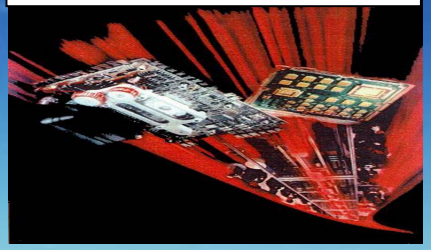


Digital Data Data Re-use Eliminates Errors, Drives Down Cost

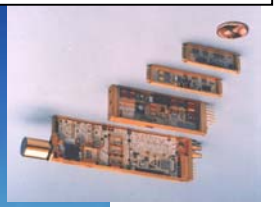
Air Force Manufacturing Technology (ManTech) Program: F-22 Impact

Integrally Bladed Rotors (IBR)
- Reduced Part Count From 87 to 1
- Reduced Weight 54lbs

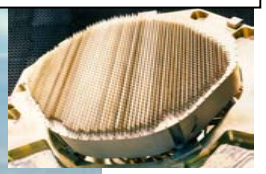
Comm/Nav Modules
- Potential $120M Cost Avoidance



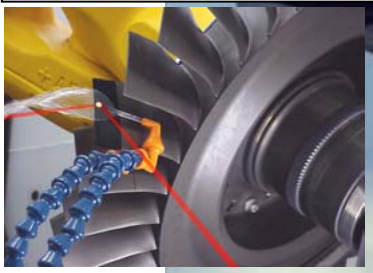
T/R Modules
- Reduced Cost 90%



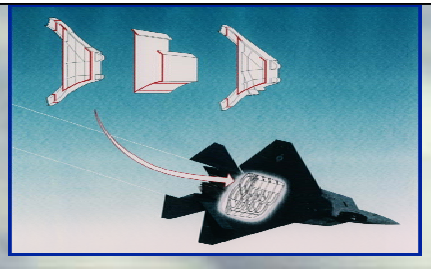
Subarray Interconnects
- $80M Cost Avoidance



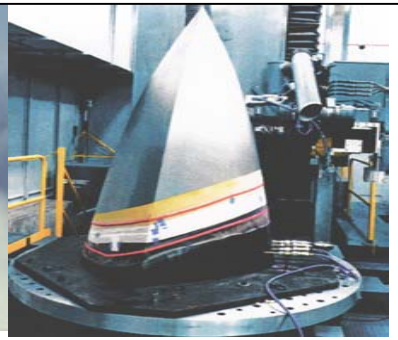
Laser Shock Peening
- Reduced Cost $10K / Blade
- Increased Throughput 6X



Welded Titanium Structure
- Potential $100M Cost Avoidance



Multi-Function Radome
- $50M Cost Avoidance
- Reduced Cycle Time 50%



Other ManTech Initiatives
- Lean Manufacturing
- Digital Product Models
- Ultra-thin Castings

Winner: 2001 Defense ManTech Achievement Award

Army ManTech
Enhanced Manufacturing Processes for Body Armor Materials

Plate Forming: Siliconized Silicon Carbide

Plate Forming: Boron Carbide

- ***Objective:*** **Develop & Implement Economical Production of Ceramic / Composite Small Arms Protective Plates for Personnel Protection**
- ***Participants:***
  - **Army Natick Soldier Center**
  - **PM, Soldier Systems**
  - **Marine Corps**
  - **Simula Safety Systems Inc.**
  - **CERCOM Inc.**

Interceptor Body Armor Jacket

- ***Benefits:***
  - **Stops Rifle / Machine Gun Fire**
  - **55% Lighter, 60% Lower Cost Compared to Armor Plates**
  - **Cost Avoidance (NPV): $193M**
- ***Implementation:***
  - **Over 50K Plates Delivered & Fielded; 140K Plates on Contract**
  - **Supports “Operation Enduring Freedom”**

Bottom Line: Warfighter Capability

Right Materiel, Right Place,
Right Time, at the Right Cost -

All The Time

BACKUPS

DDR&E Organization

Integrated Approach to Technology in DoD

CTO

Director, Defense Research & Engineering
Dr. Ronald M. Sega

- DoD Needs Focus (QDR)
- Resources
- Technology "Pull"

Technology Areas

- Planning
- Oversight
- Review Programs across Services and Agencies
- Technology "Push"

S&TS
Dr. George Schneiter

ARMY

NAVY

AIR FORCE

DUSD, Science & Technology
Dr. Charles J. Holland

Director, Plans & Programs
Mr. Alan R. Shaffer

Capabilities & Budget

ASD C3I
Dr. John Stenbit

BMDO
Lt Gen. Ron Kadish

ATSD, Nuclear, Chemical & Biological Defense Programs
Dr. Dale Klein (Nom)

DATSD, ChemBio Defense Programs
Dr. Anna Johnson-Winegar

DATSD, Nuclear Matters
Mr. Frederick Celec

Dir, Defense Threat Reduction Agency
Dr. Stephen M. Younger

DUSD, Laboratories and Basic Sciences
Dr. John Hopps

Dir, Defense Advanced Research Projects Agency
Dr. Anthony Tether

DUSD, Advanced Systems & Concepts
Ms. Sue Payton

Projects and Systems

- Efficient Technology Transition
- Synergy and Integration of S&T Efforts
- Mutual Support for Programs within DoD (and outside of DoD as appropriate)

Navy ManTech
Impact on V-22

ManTech Project	Benefit
Heat Treatment for High-Performance Transmissions	Increased Power Density and Loss of Lube Tolerance
Thermoplastic Bearing Cages	Reduced Weight by 60%
T406 Engine Vane Actuators Powder Injection Molding	Life-cycle Cost Avoidance up to $1.5M
Resin Impregnated Honeycomb Core Structures	Excellent Impact Resistance and Lighter Structure
Fiber Steering for Lightweight Composites	Improved Structural Efficiency
Gear Metrology & Performance Prediction	Reduced Vibration and Gear Wear
Hi-Speed Gear Inspection	Reduced Gear Inspection Time
Non-Contact Work Piece Positioning	Enhanced Precision Machining
Powder Metal Processing of T406 Turbine Disks	Life-cycle Cost Avoidance up to $19M
In-Situ Composites Fiber Placement	20% Reduction in Fabrication Costs
Smart Sensors/Actuators	Increased Operational Capabilities
Ausform Finished Gears	Increased Gear Durability
Superalloy Casting Technology:	Reduced Manufacturing Costs

Life-Cycle Cost Avoidance Exceeds $45M

Payoff

- Weight Reduction
- Increased Maintenance Cycle Time
- Improved Performance