



# ManTech

Implementing A Strategy  
to Deliver  
Weapon Systems  
Affordability



November 2010

| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                           | Form Approved<br>OMB No. 0704-0188                  |                                 |
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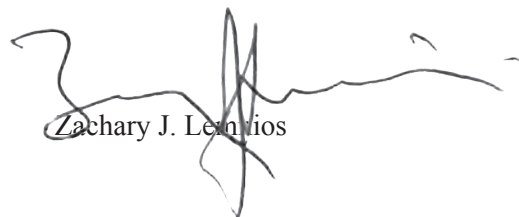
October 29, 2010

The future of our Nation's defense depends on our ability to respond to military challenges with innovation, speed, and agility. The Manufacturing Technology (ManTech) Program meets this challenge with its focus on affordable, timely, and low-risk development, production and sustainment of defense systems. ManTech helps strengthen our technology and industrial bases to maintain our technological edge in a dynamic, diverse, and evolving threat environment.

This brochure highlights the Warfighter impact of products implemented by the ManTech projects of the Office of the Secretary of Defense, Army, Navy, Air Force, Missile Defense Agency, and Defense Logistics Agency. The pages of the brochure show the ongoing benefits of the ManTech Program to provide cost savings, improve technology implementation with an early focus on manufacturing, reduce manufacturing lead time, provide faster surge capabilities, improve manufacturing processes for greater reliability, and rapidly respond to Warfighter requirements. The centerfold of the brochure highlights the Joint Defense Manufacturing Technology Panel's Advanced Manufacturing Enterprise (AME) Subpanel that was established in 2010 to respond to the thrusts identified in the 2009 DoD ManTech Strategic Plan.

ManTech works closely with Warfighters, PEOs, PMs, and sustainment and logistics experts who support and endorse the products implemented by the ManTech program. The products identified throughout this brochure include helicopter health monitoring, affordable shipbuilding processes, faster surge capabilities for critical parts, tagging, tracking, and locating, efficient batteries and space solar cells, lighter aircraft parts and soldier weaponry, improved aircraft maintenance, deployable force protection, and manufacturing workforce training.

ManTech's combination of top notch people and compelling ideas will continue to help drive our Department's innovative engine and ensure our Nation maintains its competitive edge on the battlefield. I am pleased that the ManTech team's approach is consistent with the DDR&E goals to accelerate delivery of technology capabilities to win the current fight, to build strategic relationships to prepare for an uncertain future, and to reduce cost, acquisition time and risk of major defense acquisition programs.



Zachary J. Lemnios





# MISSION STATEMENT

***The DoD Manufacturing Technology (ManTech) Program anticipates and closes gaps in manufacturing capabilities for affordable, timely, and low-risk development, production and sustainment of defense systems.***

## FOCUS

An important focus of ManTech is on the technologies, processes, and enabling manufacturing capabilities that reduce the acquisition and sustainment cost of weapon systems, and provide direct benefit to the Warfighter. Measures of effectiveness include improved mission capability, improved readiness, and reduced total ownership costs. Timely transition of the technology consistent with acquisition and operational requirements is essential.

## STRATEGY

The DoD Manufacturing Technology Program Strategic Plan prepared in 2009 by the Office of the Secretary of Defense in close collaboration with the JDMTP contains four strategic thrusts:

- Thrust 1: Effective management and delivery of processing and fabrication technology solutions
- Thrust 2: Active support for a highly connected and collaborative defense manufacturing enterprise
- Thrust 3: Active support for a strong institutional focus on manufacturability and manufacturing process maturity
- Thrust 4: Active support for a healthy, sufficient and effective defense manufacturing infrastructure and workforce

The ManTech Program strategy is to balance its traditional emphasis on processing and fabrication technology solutions with active support to meet broader defense manufacturing needs. 21st century defense manufacturing relies on a networked, collaborative, and increasingly global supply base, with capabilities that can be linked between and among all stakeholders – from developer to user to sustainer – to respond rapidly to dynamically changing defense needs.

The ManTech successes documented herein are categorized by the appropriate strategic thrust. The majority of ManTech projects are in Thrust 1. The center two pages of this document highlight the recently formed Advanced Manufacturing Enterprise (AME) Subpanel of the JDMTP focused on Thrusts 2, 3, and 4.

## VISION

In summary, the DoD ManTech Program vision is: “A responsive world-class manufacturing capability to affordably and rapidly meet Warfighter needs throughout the defense system life cycle.”

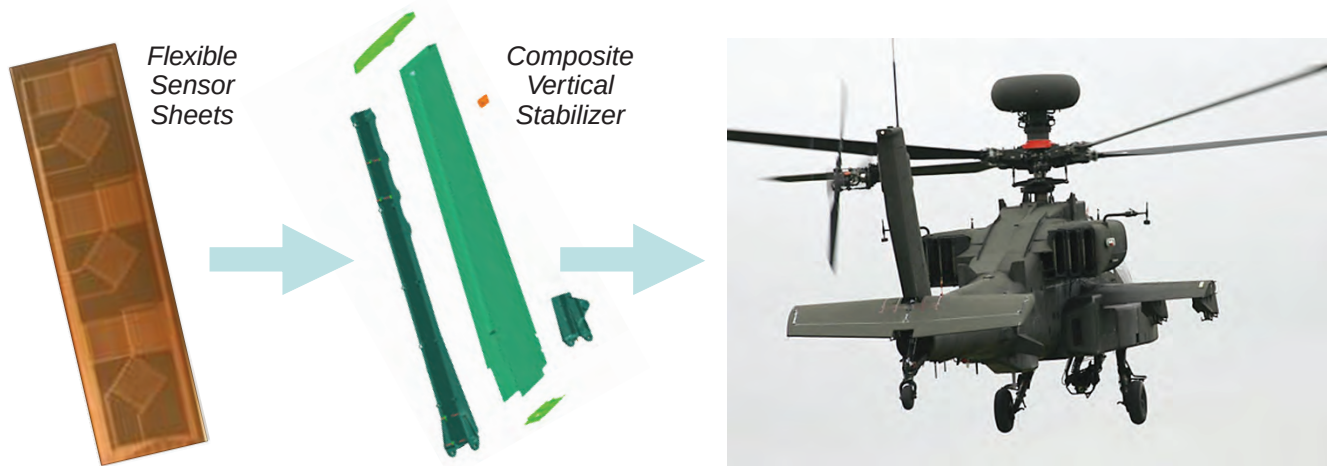


## THRUST ONE PROCESSING & FABRICATION

### ***ManTech Reduces Cost of Embedded Sensors for Aviation Composite Structures***

#### **The Challenge:**

Aircraft such as the AH-64 Apache have been in service for 20+ years, yet the airframes have limited sensing and diagnostic technology to reliably assess the structural health of the airframe. Pilots need to detect and assess structural damage in real-time when aircraft are hit by ground fire. Additionally, as new composite materials are integrated into aircraft structural components, airframe health monitoring is more critical than ever. Current manufacturing and installation processes for lightweight sensors are costly and lack military-grade reliability.



*Apache AH-64*

#### **ManTech Response:**

- An Army Manufacturing Technology project identified and integrated a sensor network to collect information on the effects of vibration, temperature, strain, and ballistic damage on the airframe
- Improved the manufacturing process of the sensor using direct print for sensor grid production
- Developed processes and selected optimum materials for sensor installation inside the composite skin of the aircraft
- Army ManTech investment of \$4.9M with Apache program funding of \$3.6M

#### **Impact:**

- Reduced unit cost of sensor sheet by >65% (from ~\$2000 per sheet to <\$700 per sheet)
- Increased performance and reliability of sensor system by reducing manufacturing variability
- Reduces direct operating costs for Apache airframes through sensor capability for structural health monitoring that enables increased time between overhaul
- Provides the Warfighter with affordable, real-time aircraft ballistic damage indication capability

**Enables lightweight sensor production for aircraft structural assessment**





## ***ManTech Reduces Labor Costs While Improving Safety for Weld Reinforcement Removal***

### **The Challenge:**

Butt welding exterior ship panels produces a weld protrusion that exceeds the DDG 1000 exterior surface fairness requirements. As a result, approximately 23,000 feet of weld reinforcement must be hand ground flush at 3 feet/hour causing increased shipbuilding costs, frequent injuries, and costly medical expenses.



*The commercially available track weld shaver (TWS91) increases removal speed by over 500%*

### **ManTech Response:**

- With an investment of \$1.3M, a Navy ManTech team developed a mechanized tool that removes 80% of the weld reinforcement at rates exceeding 20 feet/hour
- The tool operates continuously in a rugged shipyard environment in all orientations (flat, vertical, horizontal and overhead)
- Bath Iron Works implemented the technology on DDG 51 in June 2009 and on DDG 1000 in August 2009

### **Impact:**

- Increased removal speed over 500% from 3 feet/hour to 20 feet/hour
- Reduced direct labor by as much as 75%
- Cost reduction of \$924K per hull from reduced labor and decreased injury claims on DDG 1000 alone
- Lightweight, portable Track Weld Shaver is now commercially available
- Applicable to other ships including Landing Helicopter Assault, Amphibious Transport Dock and the National Security Cutter as well as for commercial vessel and windmill construction

**Total cost reduction of \$2.77M on DDG 1000**

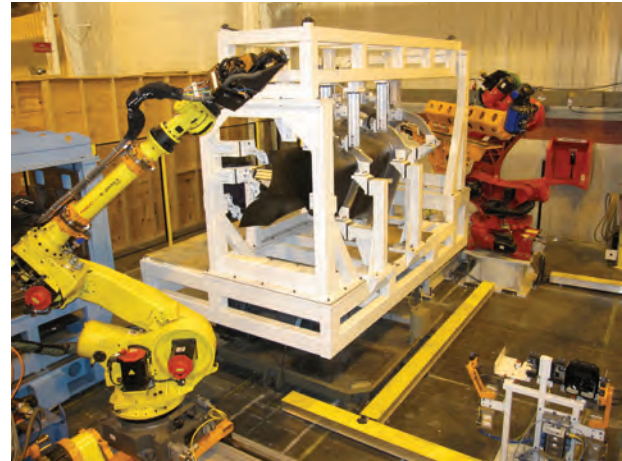


## THRUST ONE PROCESSING & FABRICATION

### ***ManTech Develops Revolutionary F-35 Inlet Duct Robotic Drilling (IDRD)***

#### **The Challenge:**

F-35 aircraft inlet ducts must be manually drilled from the inside in order to attach frames around the duct. This process is ergonomically difficult and requires excessive tooling, labor costs, and long cycle time (approximately 50 hours of drilling per duct).



#### **ManTech Response:**

- Air Force ManTech demonstrated automated hole drilling with a Phase-II Critical Small Business Innovation Research (SBIR) program team of primes, small businesses, system integrators, and the F-35 Joint Strike Fighter Joint Program Office (JPO)
- Improved maturity of production-ready automated hole drilling process to manufacturing readiness level (MRL) 8, pilot line demonstration
- Transitioned three production inlet duct robotic drilling cells to production line in Palmdale, CA
- Air Force ManTech, SBIR and F-35 JPO invested \$6.2M

#### **Impact:**

- Reduced tooling, floor space, and manpower cost
- Reduced drilling cycle time by 75% (from 50 to 12 hours per duct)
- Robotically drills F-35 inlet ducts to now meet full rate production targets of 1 aircraft per day
- Eliminated ergonomic work-related injuries

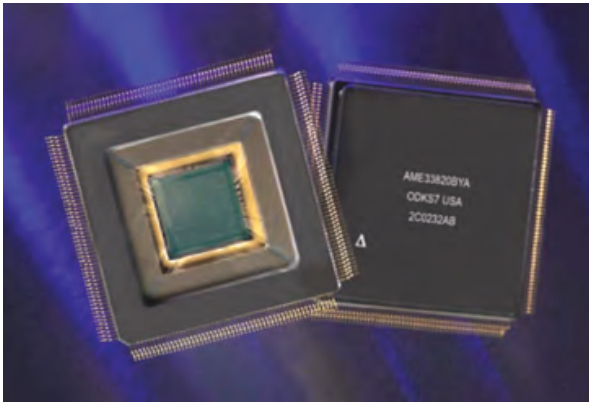
**Saves \$40M in JSF production cost**



## ***ManTech Improves Test Capability for Integrated Circuit Emulation***

### **The Challenge:**

The industrial base no longer supplies high performance, high reliability microcircuits required by DoD. Military system readiness and costs are adversely impacted by microcircuit obsolescence. The DLA Microcircuit Emulation Program (MEP) assures accurate and effective testing to qualify emulated microcircuits for military platforms and assures a continuing source of advanced digital microcircuits.



### **ManTech Response:**

- The DLA Microcircuit Emulation Program (MEP) provided Form, Fit, Function and Interface (F3I) integrated circuit replacements for military vehicles such as F-15, C-17, B-52, A-10, Joint STARS, Phalanx, Harrier, Apache, and the Bradley Fighting Vehicle
- Provides advanced non-procurable microcircuits for production, support and National Stock Requirements for F-18, MLRS, and Apache
- Improved the current emulation manufacturing test capability by reducing test cycle-time and extending the capability to address more complex microcircuits
- DLA ManTech partnered with the Industrial Base Innovation Fund (IBIF) to invest \$0.79M

### **Impact:**

- Supports greater than 350 registered weapon systems
- Reduces lead times by 20 weeks
- Increased benchmark device yield from 50% to 80%
- Increased test capacity for complex ICs
- Over 100,000 military-quality-emulated devices have been shipped

**Total cost avoidance of \$680M to include \$40M for F-15 Program**





## THRUST ONE PROCESSING & FABRICATION

### ***ManTech Develops New Production Method for Lighter Mission-Critical Batteries***

#### **The Challenge:**

Thermal batteries are used to power MDA weapons in-flight but often must be designed much larger and heavier than necessary because the current production method is incapable of “right size” fabrication. Use of these larger, heavier than necessary, mission-critical batteries degrades missile performance and capability.



#### **ManTech Response:**

- The MDA Producibility and Manufacturing Program worked with ENSER, the second largest US thermal battery manufacturer to develop a tapecast manufacturing process capable of producing very thin cells
- ENSER leveraged MDA ManTech and SBIR funding, prior development work and acquired cost-share funding from a prime contractor to adapt tapecast “thin-film” manufacturing for thermal batteries to implement in the Extended Area Protection System
- Technology transition agreements for program offices and prime contractors encompassed multiple DoD platforms for widest possible initial adoption in future: Ground Based Interceptor, PATRIOT PAC-3 Missile Segment Enhancement, STANDARD Missile 3, THAAD, Next Generation Aegis Missile Systems
- ManTech invested \$1.9M with industry cost share of \$350K

#### **Impact:**

- Reduced volume of high power thermal batteries by 20 to 40% depending on design
- Reduced weight of thermal batteries by 15 to 25% depending on design
- Enables MDA and other DoD applications that are severely size and weight constrained

**Reduces cell manufacturing costs by 70 – 80%**



## ***ManTech Decreases Inspection Time of 3-D Airfoils for Advanced Turbine Engines***

### **The Challenge:**

Engines have hundreds of airfoils that are made from organic matrix composites, ceramic matrix composites, or cast alloys. The current processes for inspecting complex airfoil designs for turbine engines are too slow, taking an average of 1 hour per airfoil, and cannot meet full rate/surge production or efficient maintenance operations of advanced turbine engines.



**Concept  
MRL 3**



**Reality  
MRL 6**

### **ManTech Response:**

- An Integrated Project Team (IPT) was formed of engineers from the Air Force Research Laboratory (AFRL), Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC), airfoil casting suppliers, sensor suppliers, and three turbine engine Original Equipment Manufacturers
- A “Three Dimensional Airfoil Inspection” (3DAI) system was prototyped in 17 months that provides an alternate dimensional inspection methodology for complex turbine engine airfoils
- The team demonstrated a method for high speed data collection and analysis of airfoil geometry, which leads to a significant reduction in cycle time

### **Impact:**

- Reduced airfoil dimensional inspection times from 1 hour to 2-4 minutes
- Reduced cost and man-hours of inspection
- Implemented on T700 platform as well as legacy engines

**Cost avoidance of \$26M for 1500 engines**



## THRUST ONE PROCESSING & FABRICATION

### ***ManTech Reduces Weight and Cost of Laser Designator Modules for Soldiers***

#### **The Challenge:**

Soldier-portable designators and markers provide accurate targeting for laser guided munitions. Current laser designators use legacy laser modules and electronics, resulting in large size, power, weight, and cost. A reduction in laser designator and marker weight and cost is required to decrease Soldier weight burden, increase the availability of these devices in the battlefield, and enable small UAS with designation/marketing capability.



#### **ManTech Response:**

- Army ManTech reduced the weight and cost of laser designator modules by simplifying laser construction, and reducing the weight of diode stack drivers through design optimization and use of low cost commercial off-the-shelf (COTS) electrolytic capacitors
- Laser module cost and weight was minimized by directly bonding laser components onto a light-weight composite-metal base to enable integration of the laser onto a Class I UAS
- Developed compact hand-held or rifle-mounted laser marker/designator for Soldier to transition to PM Soldiers, Sensors and Lasers (SS&L), Marines, Special Operation Forces (SOF), and Air Force (in field)
- Working with Joint Effects Targeting Systems and Laser Target Locator Module Programs to transition technology in 2012 and 2011 respectively
- \$4M Army ManTech Investment and \$1.5M from PM-SS&L

#### **Impact:**

- Reduced weight (<0.5 lb) of laser modules for rifle-mounted designator
- Reduced soldier weight by >10 pounds vs. current diode pumped Special Operation Forces Laser Acquisition Marker (SOFLAM)
- Ultra-low-weight (1.6 oz / 40 mJ) laser module and laser diode stack driver (2.5 oz) for UAS

**2x cost reduction of laser designators/markers from \$100K to \$50K**





## ***ManTech Reduces Cost and Improves Efficiency of Multi-Junction Space Solar Cells***

### **The Challenge:**

U.S. manufacturers of multi-junction space solar cells are facing international competition, as well as growing power, mass, and volume requirements for Warfighter-specific payloads. Due to shrinking budgets, spacecraft designers need to manufacture spacecraft subsystems with lower cost, weight, and volume.



### **ManTech Response:**

- Air Force ManTech and the Space and Missile Center (SMC) collaborated with solar cell manufacturers to mature manufacturing processes and accelerate insertion of space-qualified high efficiency multi-junction solar cells
- AFRL Space Vehicles Directorate developed materials and processing used for solar cells
- Team improved power, mass, and volume and reduced manufacturing costs of solar cells to retrofit into Warfighter-specific satellites
- AF ManTech invested \$2.4M

### **Impact:**

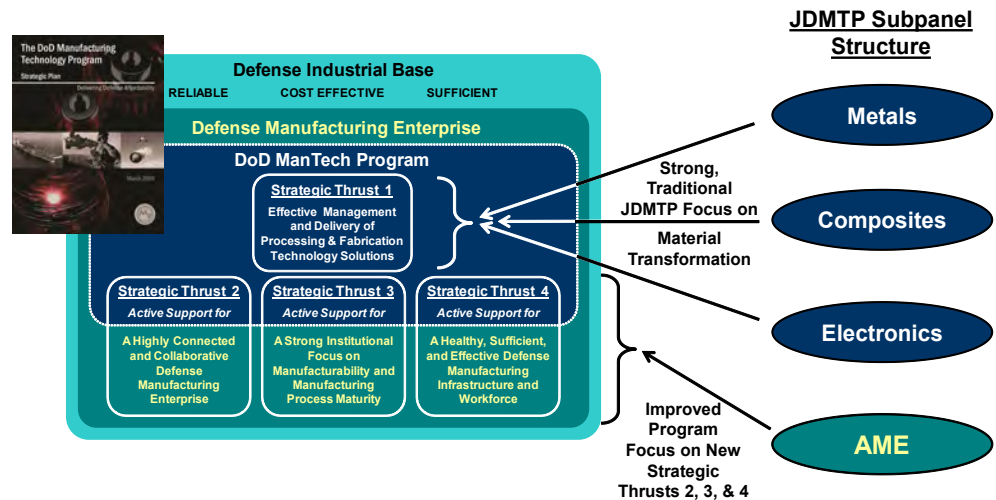
- Increased power level from <15kW system to 30kW system
- Significantly reduced solar array cost per watt by 15-20%
- Reduced solar array size and mass by 15-17%
- Benefits numerous satellites: Advanced Extremely High Frequency, Wideband Global SATCOM, Space Based Infrared Systems, Space Tracking and Surveillance System, and Next Generation Global Positioning System

**Reduces production costs by 20%**

## Advanced Manufacturing Enterprise (AME) Subpanel

### Summary

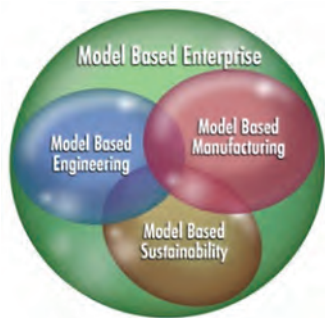
The Joint Defense Manufacturing Technology Panel's AME Subpanel was established in 2010 in response to needs identified in the 2009 DoD ManTech Program Strategic Plan. AME investments address "above the shop floor" technologies and intelligent business practices enabling new ways of doing business across an increasingly complex and networked manufacturing landscape. AME visualizes a highly connected and collaborative manufacturing environment among the multiple players in system development, production, and sustainment. For more information, go to <https://www.dodmantech.com>.



### AME Subpanel Scope

The Subpanel's investment activity encompasses the technologies, processes, and practices that foster rapid, superior execution of manufacturing enterprises across the life cycle of manufactured products and systems. This includes:

- **Model-based tools and approaches** that optimize producibility during early design and support standard data environments
- **Network centric manufacturing capabilities** to facilitate resilient and adaptable supply chains
- **Intelligent manufacturing planning and factory execution**
- **Modeling and simulation** capabilities advancing the above business practices
- Technologies and practices to fully realize government and industry-wide use of **manufacturing readiness tools and processes**
- Actions to assist in improving **defense manufacturing Infrastructure and workforce**



### Model Based Enterprise: “Building the Digital Thread”

**The Challenge:** Drive a continuous flow of integrated design, analysis, and manufacturing information throughout the product/system life cycle.

**The AME Response:**

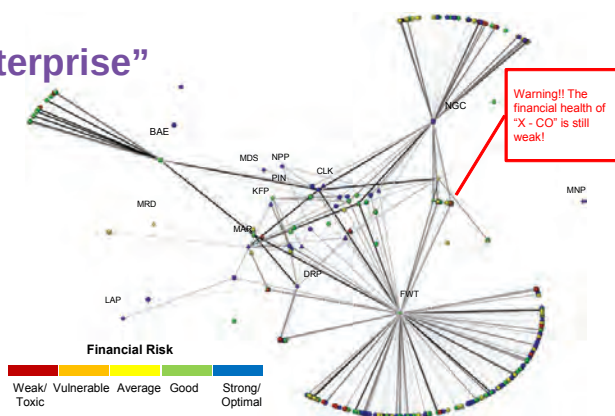
- Advanced Modeling and Simulation
- Design Optimization Tools
- Virtual Prototyping
- Data Standards Efforts

### Manufacturing Networks: “Connecting the Enterprise”

**The Challenge:** Enable seamless interoperability of data and processes across organizational boundaries.

**The AME Response:**

- Advanced Supply Chain Management Practices
- Enterprise Integration Technologies
- Tools to Enable Seamless Collaboration



### Intelligent Manufacturing Planning and Execution

**The Challenge:** Create agile and adaptive manufacturing capabilities that integrate factory floor resources to rapidly deliver advanced systems to the warfighter.

**The AME Response:**

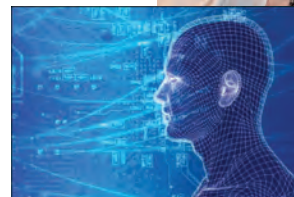
- Factory Integration for Autonomous Operations
- Advanced Production Planning and Scheduling

### Industrial Base Infrastructure and Readiness

**The Challenge:** Actively support initiatives and policies to ensure manufacturing infrastructure health and U.S. global manufacturing superiority.

**The AME Response:**

- Manufacturing Readiness Body of Knowledge Development
- Active collaboration to enable effective implementation and sustainment of manufacturing technologies







## THRUST ONE PROCESSING & FABRICATION

### ***ManTech Improves Silicon Carbide Tow Coating Process***

#### **The Challenge:**

Ceramic Matrix Composite (CMC) parts made with silicon carbide (SiC) are lighter than metal and provide improved acceleration, speed, and fuel efficiency in aircraft. However, the current machines used to manufacture CMCs require long start-up, cool-down, and maintenance cycles for each coating run which adds to the overall aircraft cost and reduces capacity.



#### **ManTech Response:**

- Air Force ManTech, Army Aviation and Missile Research, Development and Engineering Center (AMRDEC), and the Defense-Wide Manufacturing Science and Technology Programs teamed with General Electric Aviation (GEA) to reduce the manufacturing steps for SiC tow coating and to provide greater throughput with substantially lower costs
- The CMC multi-step batch process was converted into a single step process
- Manufacturing costs and engine weight are reduced to improve acceleration, speed, and fuel efficiency
- Composite materials were validated during CMC panel fabrication and mechanical property testing

#### **Impact:**

- Increased coating run length by 100% from 137 meters to 275 meters of fiber
- Reduced labor cost for coating process by 70%

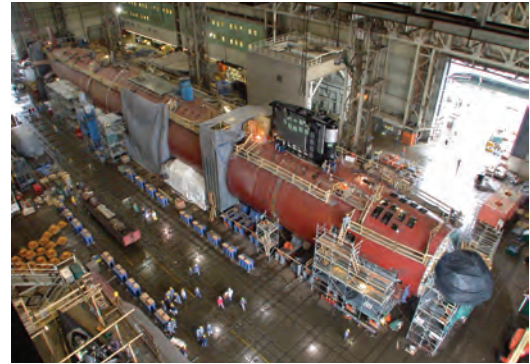
**Lighter CMC parts enable fuel savings of 1 million gallons/year**



## ***ManTech Enables Significant Cost Reduction for VIRGINIA Class Submarine Construction***

### **The Challenge:**

Reducing the acquisition cost of current and future platforms is critical to the Navy with the specific goal to build each VIRGINIA Class Submarine (VCS) for under \$2B.



*ManTech project implementations are resulting in significant cost savings for VCS*

### **ManTech Response:**

- Navy ManTech and its Centers of Excellence (COEs) worked closely with PEO Subs, the VCS Program Office, General Dynamics Electric Boat, and Northrop Grumman Shipbuilding – Newport News to focus ManTech resources on identifying and developing needed manufacturing technology
- A focused VIRGINIA Class submarine affordability initiative was established to develop and transition cost-reducing manufacturing technologies for implementation on the factory floor
- The current Navy ManTech VCS affordability portfolio includes approximately 60 projects with a total expended/planned investment of \$62M to address affordability improvements in manufacturing

### **Impact:**

- To date, technology from 18 of 60 Navy ManTech VCS affordability projects have been implemented on the factory floor
- The result is real acquisition cost savings of over \$20M per hull to date
  - Negotiated into the Block III VIRGINIA Class submarine procurement
- Future implementations from the Navy ManTech VCS affordability portfolio are projected to result in at least an additional \$12M/hull cost savings
- Now addressing Block IV and total ownership cost reduction

**Total cost savings estimated at over \$32M per VCS hull**



## THRUST TWO MANUFACTURING ENTERPRISE

### ***ManTech Implements Supply Chain Process Improvements for RFID Item Level Tagging for Apparel***

#### **The Challenge:**

Soldiers are at risk if they use protective clothing that is past the expiration date or equipment that has been recalled for quality problems. Tracking individual items such as helmets and chemical protective gear is critical in the event of shelf life expiration or recall.



#### **ManTech Response:**

- Implemented cost effective Radio Frequency Identification (RFID) item level tagging technology solutions at military apparel manufacturers
- Improved supply chain process meets military needs for asset visibility, accountability, disposal and shelf-life management of military clothing and equipment items
- As Defense Supply Center Philadelphia (DSCP) continues to expand RFID requirements, manufacturers will contract directly with commercial RFID service providers to implement the new cost effective technology solutions at their factories
- DLA ManTech and IBIF invested \$1.4M

#### **Impact:**

- Reduced clothing issue time to soldiers from 165 minutes to 45 minutes
- Inventory savings of \$148K at one location
- Reduced time/labor for receiving incoming shipments from 4 hours to 30 minutes

**46% improvement in inventory discrepancies**





## ***ManTech Improves Outfitting Processes for the VIRGINIA Class Submarine***

### **The Challenge:**

Outfitting activities consume 1.5M man-hours and over 30% of the total VIRGINIA Class Submarine (VCS) manufacturing time. One of the greatest opportunities for cost savings and cycle time reduction lies within the outfitting process.



*Accounting for over 30% of new construction costs, outfitting is fertile ground for cost and cycle time reductions*

### **ManTech Response:**

- Navy ManTech invested \$1.7M in a project to improve outfitting scheduling and work sequencing, improve material handling/control concepts, and optimize shop foreman time
- General Dynamics Electric Boat (GDEB) implementation of these process/tool improvements began in December 2008 in a phased approach considering:
  - the most significant opportunity
  - the time required for implementation, and
  - the cost/benefit
- Results of this project should be fully implemented during 2010

### **Impact:**

- The process/tool improvements from this effort have:
  - reduced manufacturing activities in the Outfitting Work Cell
  - increased efficiency in hand-offs of material, information, and work
  - improved trade/foreman productivity
- Resulted in a cost savings to date of \$2.0M per VCS hull and an expected cost savings of \$5M per hull when fully implemented

**Total cost reduction across VA Class of \$90M**



## THRUST FOUR MFG. INFRASTRUCTURE

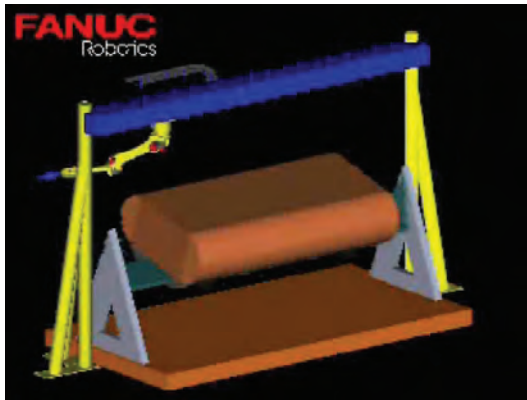
### ***ManTech Provides Ballistic Protection for Fuel Tanks***

#### **Background:**

The Industrial Base Innovation Fund (IBIF) ensures that investments are made to address defense industrial base shortfalls especially related to surge production requirements and diminishing sources of defense material.

#### **The Challenge:**

Since 2005, the BattleJacket™ fuel containment system has been used with great success to protect gasoline fuel tanks and fuel tanker trucks operating in Iraq and Afghanistan. BattleJacket™ is a self-sealing, external polyurethane elastomer that minimizes fuel leakage on fuel tankers due to penetration by bullets or other projectiles. Currently it is applied manually to the outside surface of tankers and typically requires 21 man-hours to complete on the 25,000 gallon capacity Heavy Expanded Mobility Tactical Truck (HEMTT M-978).



#### **ManTech Response:**

- Developed an automated spray application process utilizing commercially available robotic technology
- Fanuc M-16iB/10LT robot with a R-30iA controller used to apply the three layers of coating
- Automated coating process increases productivity, ensures quality, and reduces cost

#### **Impact:**

- 86% reduction in application time (from 21 hours to 3 hours)
- Implementation on the entire fleet of HEMMT M-978 trucks currently in production is expected to save \$2M in labor costs
- Improved health and safety through decreased operator exposure to hazardous chemicals

**IBIF/ManTech Investment - \$.3M**



## ***ManTech Improves Ultra High Power Li-ion Technology for the F-35 Joint Strike Fighter Aircraft***

### **The Challenge:**

Power requirements of the F-35 Joint Strike Fighter (JSF) demand more reliable power from the 270V emergency battery.



### **ManTech Response:**

- The Defense Logistics Agency's Industrial Base Innovation Fund (DLA IBIF) implemented ultra-high power (UHP) Li-ion technology in the F-35 270V system to sustain large currents and improve low temperature power and life cycle costs
- Industrialized the VL5U cell manufacturing process and associated cell design
- Army ManTech implemented lower cost (50% less at cell level), 75% improved power density Li-Ion batteries in the Improved Targeted Acquisition System (ITAS), Joint Light Tactical Vehicles, SEAL Delivery Vehicle, F-35, Hybrid Electric HMMWV XM1124 Vehicle, Autonomous Platform Demonstrator

### **Impact:**

- 25% reduction in components and processing steps
- New hardware design resulted in a 10% weight reduction of the cell
- Increase in total battery life from 2 years to 4 years, with higher performance requirements

**DLA IBIF/ManTech Investment of \$1.4M**





### ***ManTech Improves Welder Training with Virtual Reality***

#### **The Challenge:**

The training of skilled welders is critical to the affordable construction of Navy ships. An approach was needed that increased training effectiveness, improved workmanship for fewer defects, and reduced material and acquisition costs.



*Virtual reality approach to welding training increases effectiveness*

#### **ManTech Response:**

- A Navy ManTech project team consisting of the Navy Joining Center, General Dynamics Electric Boat (GDEB) and virtual reality developer VRSim, Inc., developed and demonstrated a prototype virtual-reality welder training system that simulates the gas metal arc welding process
- The 3D head-mounted display provides real-time feedback showing the welder how to accurately position the torch and the proper travel speed
- Navy ManTech investment of \$670K with industry cost share of \$625K

#### **Impact:**

- Virtual reality training results in more highly skilled welders producing higher quality welds with fewer workmanship defects
- The virtual reality approach to welder training increases effectiveness, reduces arc time required for training, and significantly reduces material preparation and acquisition costs associated with training
- The welding trainer is now commercially available as VRTEX™ 360 from Lincoln Electric Company, Cleveland, Ohio
- Purchasers have included Army Aberdeen Proving Grounds, South Dakota School of Mines and Technology, California State Penitentiary, Electric Power Research Institute, Training Systems Australia, Wellington Institute of Technology, and the Shaw Group

**Navy ManTech Investment: \$670,000**

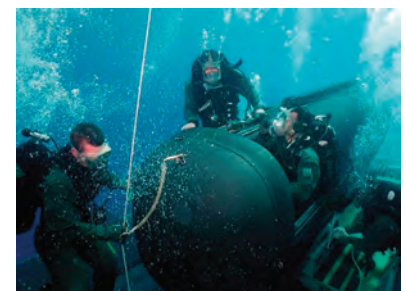
# DoD ManTech - Did You Know?

- DoD ManTech developed the original numerically controlled machine tool and the associated programming language, APT, in the 1950's to advance military aircraft manufacturing. Now used globally in countless manufacturing applications.
- The DoD ManTech program developed the technology that became the foundation for the current microelectronics industry in the 1960's.
- In the 1970's, DoD ManTech developed processes for the production of the forerunners of precision laser guided missiles and munitions.
- In the 1980's, DoD ManTech developed a process for reverse engineering thousands of obsolete microcircuits that support weapon systems still in service. Use and mission benefits continue to expand today.
- In the 1990's, the DoD ManTech program developed magneto-rheological finishing for advanced military optics. The process is now also used by all manufacturers of photolithographic optics.
- In the current decade, DoD ManTech:
  - Provided revolutionary electronics such as Micro Electro-Mechanical Systems (MEMS) for field artillery systems and Focal Plane Arrays (FPAs) for sensor systems
  - Enabled manufacturing of interceptor body armor currently used by our forces
  - Manufactured next generation of enhanced combat helmets to replace 30-year old technology
  - Developed automated processes for lighter, durable and more comfortable composite prosthetics
  - Provided improved combat rations with high quality, safer, and surge-capable production
  - Implemented higher power, longer duration batteries across weapon systems
  - Applied model-based manufacturing and CAD in aeronautical and maritime construction for greater affordability

# 2010 Defense ManTech Achievement Award Nominations

There were 12 nominations submitted through JDMTP Subpanels for the 2010 Defense ManTech Achievement Award. The awardees were announced at the Defense Manufacturing Conference. The JDMTP Principals would like to recognize these nominees for their efforts.

| <i><b>Project Title</b></i>                                                                                                                                  | <i><b>Service</b></i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 3D "Official" ESA Data Environment,<br>National MEP Network Pilot Chain Demonstration                                                                        | Army                  |
| Affordable Weapons Datalinks Insertion (AWDI)                                                                                                                | Air Force             |
| * High Power, High Energy Density Lithium-Ion Batteries                                                                                                      | Army                  |
| Strengthening Economic and Technological<br>Competitiveness of the U.S. Defense Industrial Base for<br>Traveling Wave Tube Amplifiers for Space Applications | Air Force             |
| Three Dimensional Airfoil Inspection (3DAI)                                                                                                                  | Air Force             |
| * Low Observable Maintainability-Seal Extrusion<br>Development and Demonstration (SEDD)                                                                      | Air Force             |
| HSLA-115 Evaluation and Implementation for CVN 78                                                                                                            | Navy                  |
| Predicting the Performance of Critical Cast Parts<br>on Weapons Systems                                                                                      | DLA                   |
| Collaboration Procurement Support for<br>Problematic Metalcasting Sustainment Parts                                                                          | DLA                   |
| * Weld Seam Facing and Back Gouging                                                                                                                          | Navy                  |
| Ballistic Protection for Gasoline Tanker Trucks                                                                                                              | Navy                  |
| DoD Power Sources Technology Roadmap                                                                                                                         | Army                  |



\* *Finalist*



The Joint Defense Manufacturing Technology Panel (JDMTP) seeks to recognize and honor those individuals most responsible for outstanding technical accomplishments in achieving the vision of the Department of Defense (DoD) ManTech Program.

That vision is to realize a:

*“Responsive world-class manufacturing capability to affordably meet the Warfighter’s needs throughout the defense system life cycle.”*

To this end, the Defense Manufacturing Technology Achievement Award was established in the Fall of 1999.

## AWARDEES

2009 – F-35 Inlet Duct  
Robotic Drilling

2009 – Low Cost Manufacturing  
of Materials for Improved  
Warfighter Protection

2008 – Laser-Welded  
Corrugated-Core  
(LASCOR) Panel  
Evaluation

2008 – Low Observable  
Paints for Aircraft

2007 – Lean Battery Initiative

2007 – Low Cost SiC-N Ceramic  
Tile

2007 – Translational Friction Stir  
Welding

2006 – Uncooled Focal Plane  
Array Producibility

2006 – Engine Rotor Life  
Extension

2005 – Large Aircraft Infrared  
Countermeasures

2005 – Large Marine  
Composite-to-Steel  
Adhesive Joints

2004 – Lean Depot Repair

2004 – Uniform Cannon Tube  
Reshaping

2003 – Laser Additive  
Manufacturing

2003 – Laser Shock Peening

2002 – Composites Affordability  
Initiative

2002 – Apparel Research  
Network

2001 – Enhanced Mfg. Processes  
for Body Armor

2000 – Advanced Optics  
Manufacturing

2000 – Flexible Manufacturing  
of Microwave Vacuum  
Devices

1999 – Advanced Fiber  
Placement



**For Further Information**  
**[www.dodmantech.com](http://www.dodmantech.com)**

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