Balancing National Security with Fiscal Realities
The Department of Defense (DoD) Manufacturing Technology (ManTech) Program is a primary investment mechanism for enabling affordable defense-essential manufacturing capability for our Warfighters. In an environment of challenging budget realities, the ManTech programs within the Office of the Secretary of Defense (OSD), Army, Navy, Air Force, Defense Logistics Agency (DLA), and Missile Defense Agency (MDA) continue to address the affordability and producibility of key technologies with high impact to the DoD. The projects within the Program are valuable demonstrations of increased affordability, greater reliability and predictability of performance, decreased cycle time, and enabled improved technology implementation for our weapons systems.

Joint Planning continues to be an area of increased emphasis within the Joint Defense Manufacturing Technology Panel (JDMTP). Through partnerships across the DoD, with other government agencies such as the Departments of Energy and Commerce and with Industry, the JDMTP seeks to address the mission-driven needs of the Services and Agencies while leveraging the Defense-Wide Manufacturing Science and Technology program for joint efforts.

The JDMTP has also been active in supporting efforts to establish and manage the DoD-led Institutes for Manufacturing Innovation. By providing seed funding, providing subject matter experts to support Institute project execution, and by leveraging the products developed within the Institutes, the JDMTP serves as both a contributor and a consumer of the Institutes. The ManTech Program will continue to look to the Institutes for subject matter expertise, to be a provider of process and product development solutions and as a partner in ManTech efforts as the Institutes mature and become self-sufficient.

The DoD ManTech Program continues to deliver manufacturing process solutions to increase the affordability and producibility of technologies that ensure the U.S. maintains its competitive edge on the battlefield. We are pleased to be part of this very effective ManTech team and look forward to continuing to work with you, our partners within the U.S. Government and Industry, as we support our Warfighters.

Ms. A. Adele Ratcliff
Director
Manufacturing Technology
ODASD (MIBP)

Andrew M. Davis
Chairman, JDMTP
Program Manager
U.S. Army ManTech Program
U.S. Army RDECOM
A responsive world-class manufacturing capability to affordably and rapidly meet Warfighter needs throughout the defense system life cycle.

FOCUS

An important focus of ManTech is on the processes, and enabling production 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 2012 DoD Strategic Plan prepared by the Office of the Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy (MIBP), in close collaboration with the Joint Defense Manufacturing Technology Panel (JDMTP), contains four strategic thrusts:

• Thrust 1: A responsive and balanced manufacturing technology investment portfolio to meet DoD requirements
• 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 supports the broader defense industrial base to deliver maximum value to the warfighter and the nation. The strategy is executed by the Component ManTech programs within the Army, Navy, Air Force, Defense Logistic Agency (DLA), Office of the Secretary of Defense (OSD) (e.g., Defense-Wide Manufacturing Science and Technology (DMS&T)) and Missile Defense Agency (MDA). The complete DoD ManTech Program Strategic Plan (that is in the process of being updated in order to be published in 2015) can be downloaded at www.dodmantech.com.

This brochure highlights thirteen ManTech Program successes of the Component ManTech programs and DMS&T. The center two pages of this brochure focus on the return of MDA to active participation in JDMTP as a result of its new Industrial Manufacturing and Technology organization established to improve manufacturing efficiencies and technology readiness across all elements in the Ballistic Missile Defense System (BMDS) for the defense of our country and allies. Finally, a two-page update is provided on the activities of the three current Presidential National Institutes for Manufacturing Innovation, namely America Makes, the Lightweight and Modern Metals Manufacturing Innovation (LM3I), and the Digital Manufacturing and Design Innovation Institute (DMDI).
Army ManTech Enables Affordable Low Light Level Sensor for Weapon Systems

The Challenge:
Current digital image-intensified (I2) sensors are too expensive, not available in the quantities needed and fail to meet all performance requirements. Low light level devices provide the same or better performance as I2 sensors, but sensor manufacturing maturity, capacity and reliability were too low for new sensor transition across multiple weapon system platforms.

ManTech Response:
• Army ManTech improved manufacturing processes of a high performance digital low light level sensor that increased operability and yield resulting in manufacturing readiness level (MRL) improvement from MRL 5 to MRL 8
• Photocathode was optimized for better photo-response and reliability which demonstrated improved operational life from 1200 hours to greater than 10,000 hours
• Army ManTech investment of $7M with over $15M in industry cost share and PM-leveraged funding

Impact:
• Reduced cost from $24.6K to $5.6K /unit
• Increased performance and reliability of sensor system resulted in user acceptance and multiple transition paths (Soldier Sensors, Apache, F-35 Joint Strike Fighter)
• Improved production capacity from 5 per month to over 400 per month
• Transitioned Special Operations Command (SOCOM) to Digital Fusion Binocular Goggle and PM Apache for Low Rate Initial Production which began in FY14
• Cost Benefit of $907M with Return On Investment (ROI) of 85:1

77% cost avoidance per system
The Challenge:
Propulsion system components are limited in their design and the materials with current manufacturing methods. Additive manufacturing (AM) would enable more advanced designs, however, AM-built components need to be demonstrated and their manufacturing processes qualified for acceptance in propulsion systems.

ManTech Response:
• An AF ManTech program used Additive Manufacturing (Direct Metal Laser Melting) to successfully produce thin walled recuperator segments for a small turbine engine
• Recuperator segments were assembled and brazed together to fit into a small turbine engine
• The assembled recuperator was engine tested where it was able to achieve promising heat recovery effectiveness and horsepower
• AF ManTech investment of $1.1M

Impact:
• Improved small turbine engine efficiency by 2-4 times
• Increased the supplier base by demonstrating alternative designs
• Cut maintenance costs by lengthening engine overhaul intervals by 3-10 times

50% improvement in fuel economy on small engines
The Challenge:
The submarine sail is the tower-like structure found on the topside surface of the hull that serves as an observation platform when above water, provides an entrance and exit point, and acts as a vertical stabilizer when underwater. Its doubly-curved steel sections are difficult to fabricate and corrode frequently in the harsh underwater environment. To reduce acquisition and maintenance costs, the VIRGINIA Class Submarine (VCS) program wanted to replace these sections with composite materials.

ManTech Response:
• Navy ManTech initiated five sequential projects for developing new and novel manufacturing techniques to enable composites sections on the VCS sail
• Developed, demonstrated and tested corrosion free components and techniques meeting all performance requirements including:
  – Composite pultruded fiberglass reinforced urethane resin cableways
  – Thick monocoque composite cap and doors with double curvature that can be machined to 3D geometry for fit up to steel cage structure, greatly improving installation alignment
  – Very cost effective one piece composite flood ports that are 5-axis machined to final geometry and require minimal tooling to achieve 8 unique geometries
  – Inexpensive, thick poured urethane fairings reducing a large amount of welding, painting, and fairing issues
  – Reduced weight and increased strength of Special Operations Forces bin doors
• Total Navy Investment of $2.5M

Impact:
• Implemented on VCS with acquisition cost savings of $1.8M per hull and maintenance cost savings of $1.7M per hull
• Anticipate implementation on Ohio Class Submarine replacement program (ORP)

Estimated cost savings of $3.5M / VCS hull
The Challenge:
Hundreds of weapon systems across the Department of Defense employ microcircuit technologies that industry has long since ceased to produce. The supply of these microcircuit spare parts for repair is eventually depleted, and the Military Services have no means to repair the electronic systems and subsystems that are essential to meeting mission requirements.

ManTech Response:
• Defense Logistics Agency (DLA) ManTech developed the capability to emulate dozens of microcircuit part types originally produced using Dielectrically Isolated Transistor-to-Transistor Logic (DI-TTL) technology
• Established design and manufacturing processes to ensure that 100% form, fit and function interchangeable microcircuits can be manufactured
• Demonstrated small-quantity, on-demand production of fully-qualified microcircuits and transitioned to full-scale production in a trusted U.S.-based, MIL-PRF-38535-qualified facility (SRI International, Princeton, NJ)
• DLA ManTech investment of $12.5M

Impact:
• Re-established a source of supply for DI-TTL microcircuits to provide the Services with a cost effective way to maintain existing configurations without an impact to readiness
• Avoided the life-cycle costs of implementing alternate means for achieving mission requirements (redesign, replacement)
• Delivered demonstration part types to DLA stock to support 23 weapon systems
• Has potential to emulate dozens of additional part types to include National Stock Number (NSN) and weapon systems

23 weapon systems supported at cost avoidance of $1M per system
The Challenge:
The current energy storage system for the Long Range Advanced Scout Surveillance System (LRAS3) uses two lead acid and twelve other rechargeable batteries. During a silent watch mission, these batteries cannot be directly charged by the vehicle and must be changed multiple times during the mission. Therefore, the Warfighter must carry multiple sets of replacement batteries in which the battery power source system weighs more than 200 pounds.

ManTech Response:
• DMS&T, the Army, and DLA formed a production team to integrate newly developed, proven cell technology and battery electronics into the production design of an advanced lithium-ion power source for the LRAS3
• Modified the tooling and processes from another power source design to leverage manufacturing capability and achieve economic viability
• Coordinated with the U.S Army PM Ground Sensors office, the requiring activity for the LRAS3, to demonstrate low rate initial production of the Li-Ion power source
• Total ManTech investment of $1.2M

Impact:
• New auxiliary charging capability supports handheld devices and eliminates the need for additional charging equipment
• Reduced number of LRAS3 system batteries from 14 to 1
• Reduced total system battery weight by more than 150 pounds
• Extended system run time and silent watch mission capability by a factor of three
• Flexible power source serves the needs of other systems that require tactical energy storage
• Life cycle and logistics cost savings of $12.5M

75% Reduction in Battery System Weight and $12.5M cost savings

PARTICIPANTS
DMS&T, DLA, U.S. Army Communications and Electronics Research and Development Command (CERDEC), U.S. Army PM Ground Sensors, Saft America
**Air Force ManTech Manufacturing Readiness Assessments Helps Programs Identify and Reduce Risk of Developing Next Generation Turbine Engines**

**The Challenge:**
The Adaptive Engine Technology Development (AETD) program is a high profile Air Force Research Laboratory (AFRL) program that is developing turbine engine technologies for multiple future aircraft to provide sizable cost-savings through reduced fuel consumption and lower maintenance needs. Advanced materials and manufacturing processes will be required to meet program objectives for fuel efficiency. These critical turbine engine technologies must be matured to Technology Readiness Level (TRL) 6 / Manufacturing Readiness Level (MRL) 6 for low risk insertion into any future turbine engine program of record.

**ManTech Response:**
- The AFRL Manufacturing and Industrial Technologies Division is providing subject matter expertise to lead and conduct manufacturing readiness assessments on all AETD critical technologies – 32 MRAs have been completed as of September 2014
- Aiding in the development of manufacturing maturity plans for critical technologies to reach MRL 6 by the end of AETD
- Managing the execution of manufacturing maturity plans to a successful MRL 6 demo

**Impact:**
- Identifying and mitigating manufacturing risk early in a critical Air Force S&T development program
- Elimination of high risk technologies not likely to reach MRL 6 by programs end
- Reduced possibility of late engine redesigns due to immature manufacturing processes for critical technologies
- Reduced risk of transitioning advanced technologies into a notional follow-on program
- Immeasurable fuel savings by enabling low risk application of these advanced materials and manufacturing processes

---

“There will be $1 billion invested into bringing an advanced engine into production.”
- Secretary of Defense Chuck Hagel
The Challenge:
C4ISR systems derive critical synchronization from GPS. While the previous DARPA-developed Chip Scale Atomic Clock (CSAC) provided precision timing and frequency, it was not feasible to manufacture on a large-scale basis. The objective of this ManTech project was to automate a significant portion of the CSAC manufacturing processes to enhance production capabilities, increase yields, and subsequently reduce unit costs, escalating the number of potential applications.

ManTech Response:
• DMS&T, Army ManTech, and GPS Directorate program offices collaborated with industry to automate key manufacturing processes of the physics package (the most important element of the CSAC):
  – Batch processes for atomic cell filling and vacuum sealing
  – Robotic assembly of the physics package components/subassemblies
• Expanded the practical CSAC usage markets by lowering the unit cost:
  – Redesigned key processes, using less expensive (saved over 50%) and fewer (reduced count by 20%) parts while maintaining peak performance
  – Streamlined the physics package, enabling automatic pick-and-place assembly for better manufacturability (reduced assembly and test labor time by 50%)
  – Improved yields of the Vertical Cavity Surface Emitting Laser (the heart of the physics package) by 10X
• Fostered competing manufacturing technologies to ensure more effective solutions
• DMS&T and Army ManTech joint investment of $10.7M (DMS&T) and $13.2M (Army) with an additional $2.2M provided by the user at Air Force GPS Directorate

Impact:
• Improved manufacturing processes and affordability to enable critical communication capabilities
• Maintained the integrity of the network (per TRADOC Pamphlet 525-66 Section 4-9. FOC-01-06: An Agile, Ubiquitous Network)
• Plan to integrate CSAC with GPS into next-generation Positioning, Navigation, and Timing (PNT) systems
• Achieved a manufacturing cost reduction to less than $200/unit (original price: approximately $8,700/unit)
• Increased manufacturability to over 40K units/year (original total: ~ 100 units/year)
• Project vendor validated TRL 7 and MRL 7

42:1 Return on Investment for Critical Communication Capability

PARTICIPANTS
Defense-Wide Manufacturing S&T, Army ManTech, GPS Directorate, Army CERDEC, Teledyne Reynolds, Honeywell and Microsemi
The Challenge:
High Pressure Turbine (HPT) airfoil core dies (for blades and vanes) have a long manufacturing lead time, adding 3-12 months time to a new product launch, upgrade or part replacement. This sizable lead time in addition to the outdated tooling technology, makes it extremely difficult to replace legacy parts such as the turbine blades of the Auxiliary Power Unit (APU) of the B-2 Bomber in which its tooling was scrapped 10 years ago.

ManTech Response:
• The DLA Casting R&D program staff teamed with Honeywell and TA&T to leverage metal casting work done in 2009 by the Air Force Research Lab (AFRL) and the Office of Naval Research
• Optimized a ceramic additive manufacturing process and refined the use of Ceramic StereoLithography (CSL) to directly print the casting cores for blades and vanes used in HPT engines
• Demonstrated improved manufacturing processes on the engine for the MQ-9 Predator UAV (pictured above)
• DLA ManTech investment of $0.892M with $0.157M in direct contributions and in-kind support by Honeywell

Impact:
• Raised the Technology Readiness Level (TRL) of CSL from a 4 to 6
• Faster affordable upgrades and legacy and obsolete part replacement
• Future significant cost savings ($13-$18M) for DLA’s $37M annual sales in engine airfoils
• Reduced tooling lead time and cost:
  – Reduced production lead times by three months
  – Eliminated time and cost of core tooling
  – Potential savings passed on to upgrades & legacy and obsolete part replacement

33-50% Cost Savings for Casting Core Tooling
Overview:
The Missile Defense Agency’s (MDA) mission is to develop, test, and field an integrated, layered, ballistic missile defense system (BMDS) to defend the United States, its deployed forces, allies, and friends against all ranges of enemy ballistic missiles in all phases of flight.

The Director for Engineering formally stood-up the Industrial Manufacturing and Technology Directorate in December 2012 to accomplish Industrial Base and ManTech objectives. Responsibilities include:

- Improve manufacturing of MDA product lines over entire life cycle
- Ensure an available, reliable, sufficient, and cost effective industrial base for the BMDS development
  - Provide Industrial capability assessments, risks, and DoD investment recommendations.
  - Facilitate and manage manufacturing efficiencies, technology readiness and investments
- Identify/mitigate critical manufacturing technology risks
Proposed New Project For A Digital Propulsion Factory

The Challenge:
Solid rocket motor production for propulsion systems is directly impacted by an order of magnitude increase in product demand rate. Technology investments have outpaced factory improvement investments due to increasingly complex product requirements.

ManTech Response:
- Missile Defense Agency (MDA) Aegis Ballistic Missile Defense (BMD), Defense-wide Manufacturing Science & Technology (DMS&T) ManTech, and Defense Production Act (DPA) Title III joint investment with an additional investment by Aerojet Rocketdyne to implement a Digital Propulsion Factory (DPF) initiative for Throttling Divert and Attitude Control Systems (TDACS) as well as other energetic systems.
- Developing the software backbone to support a digital factory environment from design through production.
- Integrating design, manufacturing and delivery process requirements in addition to digitally integrating key elements of the supply chain.

Impact:
- Increases factory efficiency and throughput to meet current and forecasted programmatic demands for propulsion systems.
- Reduces program costs (by 15-30%) and improves schedule performance (10%-20% reduction in cycle time) for more affordable products.
- Enhances capability for lifecycle configuration management and the prevention of non-conformance materials and parts from entering the manufactured product.
Navy ManTech Improves Affordability of VIRGINIA Class Submarine With Welder Productivity Initiative

The Challenge:
At the beginning of each work shift, shipyard welders must complete time-consuming startup tasks such as work assignment, ensuring the correct materials are on hand and verifying welder qualifications. These necessary tasks limit actual welder “arc time” and reduce the welders’ per-shift productivity. In addition, failure of a welder to comply with strict regulations for all weld specifications can result in costly rework.

ManTech Response:
• A Navy ManTech welder productivity initiative identified and implemented numerous process improvements across all welding production levels, successfully reducing pre-work start-up delays for over 400 welders, and installed efficient welder production support equipment
• Developed and piloted a “Smart Welder” System concept; created electronic checkpoints in the welding machine to be met before welder can begin welding (e.g., right welder, right joint, right weld wire, right technique)
• Prototyped Production Monitoring Software to monitor and record specific welding information on 54 unique weld attributes to provide real-time, efficiency-focused welding assistance
• Developed and validated a mechanized welder training process, targeting productivity improvements in “green welders” – paired novice welders with experienced welding tradesmen to improve weld quality and optimize welder work assignments
• Navy ManTech investment of $768K

Impact:
• Reduced average pre-weld task startup times by 50% (30 minutes per welder)
• Demonstrated 20% productivity improvement through real-time welder feedback of Production Monitoring System data
• “Smart Welder System” eliminates 65% of wrong weld wire occurrences/year
• “Green Welder” process enabled faster qualification of novice welders in mechanized system operations; achieved nearly 100% increase in manual welding production rates and improved weld quality for novice welders

Estimated Cost Savings of $2.5M/VCS Hull

PARTICIPANTS
ONR Navy ManTech, Center for Naval Shipbuilding Technology,
General Dynamics Electric Boat, ARL/Penn State, PEO Submarines
**Army ManTech Demonstrates First-Ever Single Piece Underbody Combat Vehicle Lower Hull**

**The Challenge:**
Advanced structure and armor solutions for ground combat vehicles require multiple approaches for threat management. Underbody protection requirements are especially challenging as threats levels escalate. Shown is a potential new solution using a new forged underbody manufacturing process.

**ManTech Response:**
- Army ManTech formed a team to design, model, cast, and forge thick section, single piece underbody structures for ground combat vehicles
- Used a new advanced Al 7020 to successfully forge one full size single piece underbody with plans to forge a second underbody
- Designed a notional upper body structure to be integrated with the Al 7020 underbody to form a ballistic hull and turret (BHT) test structure
- Collaborated with DARPA Soldier Protection Systems Program to outfit the BHT with a floating floor and ballistic seats to complete the test structure
- Total investment for underbody and BHT effort was $6.4M which includes $1.8M cost share from Alcoa and $1M leveraged funding from DARPA

**Impact:**
- Reduced cost of single piece underbody and kits to less than $30/lb
- Improved underbody blast protection
- Provided a non-traditional approach to underbody design and manufacturing

First-ever single piece underbody hull produced at less than $30/lb

**PARTICIPANTS**
Army Research, Development and Engineering Command (RDECOM) Army Research Lab (ARL), Tank-Automotive Research, Development and Engineering Center (TARDEC), Alcoa
Navy

**Navy ManTech Brings High Speed, High Reliability and High Maintainability to Critical Control Systems**

**The Challenge:**
The Gigabit Ethernet Data Multiplex System (GEDMS) is a DDG 51 mission-critical, ship-wide control data transfer network. To accommodate the gigabit input/output signaling rates, the flex cable assemblies needed revision to meet three conflicting requirements: moderate current carrying capacity, controlled impedance circuits for high data rates, and cost-effective assembly and packaging.

**ManTech Response:**
- A Navy ManTech team utilized impedance modeling software to optimize the competing design requirements and constraints of GEDMS
- A rigid-flex circuit structure was selected to provide the required performance at the lowest cost using easily repeatable and transportable processes and reduced touch labor
- The optimum trace width, height, and separation were determined for a new rigid-flex circuit
- Prototypes were verified for fit and performance in an actual GEDMS Input Output Unit (IOU)
- The GEDMS IOU technical data package (TDP) was updated with the new designs that are now included as part of the DDG 51 Class Modernization Program
- Manufacturing Best-Practices were documented for rigid-flex circuit design
- Navy ManTech investment of $938K

**Impact:**
- Increased link speed from 100 Mbit/sec to 1,000 Mbit/sec
- Lowered acquisition costs by:
  - Reducing touch labor using automated soldering processes instead of hand soldering
  - Reducing mechanical parts count for each cable assembly by 40% (from 20 to 12)
  - Replacing several custom parts with lower cost standard parts
  - Eliminating vendor digitization costs by providing Gerber datasets for each rigid-flex cable
- Replaced over 100 sheets of Mylar artwork with a digital TDP
- Increased reliability of 11% using a one-piece rigid-flex construction to replace three (3) separate flex circuits (MTBF improved from 708,587 hours to 789,416 hours)
- Potential implementation on amphibious warfare ships such as the LPH, LHA, LHD, LPD, and LSD types

**Total Estimated Cost Savings of $4.95M**

**ONR Navy ManTech, Electronics Manufacturing Productivity Facility (EMPF), The Boeing Company, NAVSEA 05H5 IC division, Naval Surface Warfare Center Dahlgren Division W 64, PMS 400D & 400F**
Air Force ManTech Reduces Cost of VCSEL Illuminators for Unmanned Aerial Systems

The Challenge:
For laser illumination applications, high power vertical-Cavity, Surface-Emitting Lasers (VCSELs) – laser diodes emitting the near infrared wavelengths – offer the Warfighter a tactical advantage over incumbent edge emitter lasers. VCSELs enable long-range imaging with unparalleled uniformity and low-noise properties where edge-emitter lasers fall short, however, high-power VCSELs are too costly for wide deployment.

ManTech Response:
• An AF ManTech contract team developed volume manufacturing processes for high-power VCSELs, including epitaxial growth, wafer processing, testing, packaging, and assembly
• Developed product line of VCSEL illuminator products and miniature laser rangefinders for the immediate platform of unmanned aerial systems (UAS)
• Implemented fabless model that leverages the installed commercial semiconductor capital base needed to realize low cost production
• AF ManTech investment of $3.4M

Impact:
• Reduced production costs of VCSEL illuminators by >10x with implementation of volume manufacturing practices
• Increased yields from 50% to 90%
• Advanced VCSEL technology enables future platforms and applications: weapon mount illumination, low cost security and gesture recognition, laser welding, solid-state laser pumping
• Provides the Warfighter with affordable, tactical advantage for laser illumination and target identification

>10x Cost Reduction of High-Power VCSELs
The Challenge:
Modern commercial and military airframes have tens of thousands of drilled holes for fasteners. Holes are drilled in components made from a variety of materials, such as thermoplastics, thermosets, fiber reinforced composites, aluminum, steel, titanium, and mixed stack-ups of these kinds of materials. Drilling composites can result in rapid tool wear and degradation of hole quality. Drilling composite/metallic stack-ups presents additional challenges.

ManTech Response:
• DLA’s SBIR program identified and developed advanced drilling processes for boring holes in metal composites and providing a viable approach for affordable drilling of various aerospace materials
• This innovation provides a validated-modeling software product for production-level drilling of composite/metal stack-ups
• Enabled users to analyze machining processes in 2D and 3D environments
• DLA SBIR investment of $1.1M

Impact:
• The benefits will directly influence new and existing DoD programs, and provide a positive impact on commercial programs including airliner manufacturing. They will reduce the cost of milling, grooving, boring, sawing, broaching, drilling, resulting in:
  – Increased production on an equal quality part, in half the production time
  – Extended tool life 100% (doubled the current tooling service life)
  – Increased material removal rates (consistent increases with multiple materials)

75% Reduction (per hole) in Production Costs
DoD ManTech developed the original numerically controlled machine tool and the associated programming language (APT) 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.

DoD ManTech developed processes for the production of the forerunners of precision laser guided missiles and munitions.

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.

DoD ManTech program developed magneto-rheological finishing for advanced military optics. The process is now also used by all manufacturers of photolithographic optics.

**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
**America Makes** is the National Additive Manufacturing Innovation Institute located in Youngstown, OH. In Year 2 of operations, America Makes ramped up its core activities and continued to grow to 116 members, including over 30 large businesses, 25 small businesses, and 47 Universities, Community Colleges, and Non-Profit Organizations. Encouraging small business participation is a priority, and they are capitalizing on the opportunity. As an example, rp+m in Cleveland, OH, is collaborating with very large potential customers, strengthening relationships, and receiving mentorship in doing business with large defense contractors.

America Makes has completed two project calls, awarding 22 projects with 138 team members, with $13.6M of public funding matched by $15.3M of private cost share funding for a total portfolio value of $28.9M. The first wave of projects is nearing completion, and additional future projects will be guided by the industry-led technology roadmap that is undergoing its second iteration using a systems engineering approach.

America Makes is also conducting R&D projects that are directed by the DoD services, government agencies, members, and outside organizations. The Air Force, DARPA, NIST, and NASA have asked America Makes and its members to perform 11 agency-driven projects funded at over $13.3M. One entirely member-funded project is underway, and America Makes is developing processes to facilitate members in their efforts to identify common research interests and co-fund and execute projects to address those interests.

America Makes has a very active Workforce & Education Program, led by a full-time deputy director. Early emphasis has been on STEM activities such as participation at two national-level First Robotics Competitions, and jump-starting the “3D Printer in Every School” initiative that has seen over 1,000 desktop printers donated by private funding to K-12 schools across the U.S. In addition, every applied research project has an education and workforce deliverable in its statement of work. Workforce & Education Roadmap workshops are conducted to set priorities for future initiatives.

For more information, go to [AmericaMakes.us](http://AmericaMakes.us) or contact the DoD lead, Dr. Jennifer Fielding, jennifer.fielding@us.af.mil.
The **Digital Manufacturing and Design Innovation Institute** (DMDII) was announced by the President February 25th, 2014. DMDII will focus on enterprise-wide utilization of the digital thread, enabling highly integrated design and manufacturing of complex products. This will lead to reduced time and cost, as well as accelerate the pace of new products coming to market. Processes developed within DMDII that create an open and collaborative environment will help retain supply chain knowledge and improve the capability to produce low volume complex systems.

Three main areas of emphasis are Advanced Manufacturing Enterprise, Intelligent Machines, and Advanced Analysis. Development in these areas will enable a digital link between design and fabrication allowing companies to leverage data analytics and networks to do more with the resources currently in operation.

DMDII is headquartered in Chicago, Illinois and is led by UI Labs. Pledged members include 42 companies, 23 universities and labs, as well as nine other organizations all of which span across 13 states. Since its inception the institute has acquired key operational staff, developed a technical roadmap and strategic plan, and circulated a membership agreement for signature. Additionally, DMDII has had their first successful customer requested project call with funds to be awarded in the coming months.

For more information please contact the DoD lead, Dr. Greg Harris, gregory.a.harris81.civ@mail.mil.
2014 Defense ManTech Achievement Award Nominations

The Defense Manufacturing Technology Achievement Award (DMTAA) is awarded to ManTech teams who demonstrate outstanding performance in executing and delivering ManTech solutions for DoD. This year, 16 teams were nominated for their work on the projects listed below. The Joint Defense Manufacturing Technology Panel would like to recognize these teams for their hard work and congratulates the winners of this year’s DMTAA, to be announced at the Defense Manufacturing Conference.

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Service</th>
<th>Subpanel</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Low Light Level Sensor</td>
<td>Army</td>
<td>Electronics</td>
</tr>
<tr>
<td>* F-35 Canopy Thermoforming Automation</td>
<td>Navy</td>
<td>Composites</td>
</tr>
<tr>
<td>(featured in the 2013 ManTech Brochure downloadable from <a href="http://www.dodmantech.com">www.dodmantech.com</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Novel Composite &amp; Non-Metallic Technologies for Submarine Sail Cost Savings</td>
<td>Navy</td>
<td>Composites</td>
</tr>
<tr>
<td>* Chip-Scale Atomic Clock (CSAC)</td>
<td>Army &amp; DMS&amp;T</td>
<td>Electronics</td>
</tr>
<tr>
<td>* Establishing the Production Capability for Lighter, Higher Energy Soldier Batteries</td>
<td>DLA</td>
<td>Electronics</td>
</tr>
<tr>
<td>* Vertical Cavity Surface Emitting Lasers (VCSELs)</td>
<td>AF</td>
<td>Electronics</td>
</tr>
<tr>
<td>SHT Debond Detector</td>
<td>Navy</td>
<td>Metals</td>
</tr>
<tr>
<td>* Large Affordable CdZnTe Substrates (LAS)</td>
<td>Army &amp; DMS&amp;T</td>
<td>Electronics</td>
</tr>
<tr>
<td>Common Datalink Affordability Program (CDAP)</td>
<td>AF</td>
<td>Electronics</td>
</tr>
<tr>
<td>Lead Installation Process Improvement</td>
<td>Navy</td>
<td>Metals</td>
</tr>
<tr>
<td>Casting and Forging Assistance Teams</td>
<td>DLA</td>
<td>Metals</td>
</tr>
<tr>
<td>High Performance Flexible Display and Electronics Manufacturing</td>
<td>Army</td>
<td>Electronics</td>
</tr>
<tr>
<td>Improved Welder Productivity</td>
<td>Navy</td>
<td>Metals</td>
</tr>
<tr>
<td>Net-Centric Model Based Enterprise (MBE) Data to Support Integrated Weapon System Life Cycle</td>
<td>Army</td>
<td>Advanced Manufacturing Enterprise</td>
</tr>
<tr>
<td>CH-47 Composite Tunnel Cover for Aviation Composite Structures Program</td>
<td>Army</td>
<td>Composites</td>
</tr>
<tr>
<td>Manufacturing Engineering Support for Anti-Personnel Weapon Systems (Flechette)</td>
<td>Army</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Finalist
Defense Manufacturing Technology Achievement Award

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 and rapidly meet Warfighter needs throughout the defense system life cycle.”

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

AWARDEES

2013 – Advanced Body Armor
2013 – Plate Edge Preparation Improvements (PEPI)
2013 – Restoration of Aerospace Parts by Cold Spray
2012 – Fastener Insertion Live Link System (FILLS)
2012 – Customer/Supplier Interoperability During Collaborative Design
2012 – 3D Technical Data Package and Certification
2011 – Use of Digital Radiography for Final Part Acceptance of Aerospace Casting
2011 – Prosthetics & Orthotics Manufacturing Initiative (POMI)
2011 – Automated Fiber Placement of Carbon Fiber Bismaleimide Materials
2010 – High Power, High Energy Density Lithium-Ion Batteries
2010 – Seal Extrusion Development and Demonstration (SEDD)
2010 – Weld Seam Facing and Back gouging
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 Manufacturing Processes for Body Armor
2000 – Advanced Optics Manufacturing
2000 – Flexible Manufacturing of Microwave Vacuum Devices
1999 – Advanced Fiber Placement