

OSD RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

Date: February 2007

APPROPRIATION/ BUDGET ACTIVITY
RDT&E/ Defense Wide BA# 3

PE NUMBER AND TITLE

0603680D8Z – Defense-Wide Manufacturing Science and Technology Program

Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total Program Element (PE) Cost	0.000	0.000	10.000	10.000	10.000	15.000	15.000	20.000
P680 Manufacturing Science and Technology Program	0.000	0.000	10.000	10.000	10.000	15.000	15.000	20.000

A. Mission Description and Budget Item Justification: The Manufacturing Science and Technology (S&T) Program was mandated by Congress in Section 241 of the National Defense Authorization Act of 2006, under the authority of Section 2521 of Title 10, to identify and transition advanced manufacturing processes and technologies that would achieve significant productivity and efficiency gains in the defense manufacturing base. A March 2005 GAO study cites immature technology and unstable manufacturing processes and readiness as major drivers in cost, schedule, and technical overruns of acquisition program. The challenge of designing and producing affordable weapon systems is long-standing. A robust manufacturing technology (ManTech) program is critical to developing and delivering affordable capabilities. The Manufacturing S&T Program budget provides DoD with the ability to invest and advance pervasive joint manufacturing issues that are currently driving the high cost of advanced weapon systems.

The Manufacturing S&T program provides investments that focus on cross-cutting military manufacturing needs for critical enabling technologies in the areas of specialty materials, electronics, and manufacturing processes that require maturation to expedite transition across multiple platforms, are deployable in 3-10 years, and can provide game-changing capability or faster and affordable production of DoD weapon systems. This program compliments the Service ManTech programs, which are generally focused on more near term (1-3 year) technology maturation for service specific requirements. Investment opportunities identified through roadmapping activities, conducted in concert with industry, data calls, and service/agency technologies that can be transferred across multiple platforms with additional ManTech assistance, are considered for investment.

In anticipation of the establishment of the ManTech S&T Program, the JDMTP, using seed funds provided by the Component ManTech programs, launched and funded road-mapping activities for power and energy and Radio Frequency (RF) modules, and initiated a data call through the sub-panels for candidate technology initiatives and projects. The JDMTP received more than 60 proposals in response to the call that will be used as the initial candidate pool for selection and funding execution. Areas of interest included a low observable initiative, a propulsion initiative for advanced turbine engines to included advanced machining and advanced material development, an RF module initiative, system-on-chip electronic investments, composite investments for prosthetics, and directed energy technology.

<u>B. Program Change Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)				
Current BES/President's Budget (FY 2008/2009)	0.000	0.000	10.000	10.000
Total Adjustments	0.000	0.000	10.000	10.000
Congressional Program Reductions				
Congressional Rescissions				

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Congressional Increases				
Reprogrammings				
SBIR/STTR Transfer				
Other			10.000	10.000

C. Other Program Funding Summary: Not Applicable.**D. Acquisition Strategy:** Not Applicable.**E. Performance Metrics:** Not Applicable.

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Cost (\$ in Millions)	FY 2006 Actual	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	
P680 Manufacturing Science and Technology Program	0.000	0.000	10.000	10.000	10.000	15.000	15.000	20.000	
<u>A. Mission Description and Project Justification:</u> The ManTech S&T program has a two-pronged approach: 1) technology initiatives and 2) single specific projects. Technology initiatives, in collaboration with industry, identify and develop investment strategies, to advance the manufacturing processes and technologies needed to support the technology development in the area identified. Single specific projects address investment opportunities not associated with selected technology initiatives. Single projects enable the program to respond to urgent, compelling manufacturing needs and provide seed funding to more high risk-high payoff technologies. Data calls will be launched annually by the Joint Defense Manufacturing Technology Panel (JDMTP) to identify technology initiatives and single specific issues requiring investment. The JDMTP is comprised of the ManTech Directors from the Services, Defense Logistics Agency, Missile Defense Agency (MDA) and Office of Secretary of Defense (OSD). The call will be distributed through the JDMTP sub panels and Broad Agency Announcements (BAAs) as required. Potential candidates will be evaluated by the JDMTP based on criteria set forth in the call and announcements and down-selected for further development prior to final selection. Priority will be given to those initiatives and single projects that support affordability and producibility of critical enabling manufacturing technologies that cut across multiple platforms. Investments will also balance defense priorities in specialty materials, electronics, propulsion and power, and manufacturing processes including "above the shop floor" (lean and business technologies facilitating interoperable manufacturing). Final projects are selected by the OSD ManTech Director in collaboration with the JDMTP and in consultation with the Director, Defense Research & Engineering. Technology initiatives and projects will be executed at the Component level. Industry Wide Propulsion - Turbine engines are the main propulsion system for virtually all DoD aircraft and helicopters and also power an array of ships and tanks. Improvements in manufacturing process technology must be achieved with each new generation of engines for these challenging new designs to be manufactured with acceptable quality, cost, and delivery rate to meet the warfighter needs. This initiative seeks to advance and establish the manufacturing technologies and US industrial base capabilities needed to support the development, production and sustainment of advanced gas turbine engines. \$5-7 billion projected life cycle cost avoidance could be realized with successful maturation. Manufacturing Readiness Level (MRL) Assist: Tool Development - A March 2005 GAO report cited immature manufacturing processes and the lack of knowledge regarding the maturity of those processes as major drives in cost and schedule overruns. "MRL Assist" is a web based knowledge management tool that can be used from the shop floor to executive level leadership to understand manufacturing readiness and risk within a program This project will complete the development of "MRL Assist," a knowledge-based manufacturing risk assessment tool for use by industry and government programs. "MRL Assist" provides a rigorous set of questions within the ten major cross threads for each MRL. A composite overview of the responses provides a quick visual feedback as to where risks are located within the process. System-On-Chip (SOC)- ManTech investments will provide leap ahead communication and sensor capability by maturing technologies that move heavy, high volume/power demand systems to small, power efficient SOC packaging technology.									

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Affordable Manufacturing and Rapid Prototyping for Custom Composite Orthotics and Prosthetics - New manufacturing technologies are required for the development of custom composite orthotics and prosthetics for injured men and women of the armed services. Orthotics and prosthetics present a two-fold challenge in that they contain a high degree of customization in design and a labor intensive means of manufacturing. Recent advances in solid modelling, reconfigurable tooling, room temperature resin chemistry, automated fabrication of custom fiber architectures, and novel resin infusion methods have created the potential to develop a highly integrated, low cost, custom orthotic and prosthetic technology to address the unique requirements and needs of the armed services. Rapid prototyping technologies and new composite manufacturing solutions have shown the potential to provide a 24-hour turn around time for component fabrication. The current state of the art for orthotics is to thermoform plastic materials such as polypropylene to create a custom fit orthotic. New manufacturing techniques integrated with advanced polymer composite technologies have allowed for initial prototyping work using woven glass reinforced Adiprene. These new materials are compliant, but sufficiently rigid for use with prosthetics. The integration of composite materials could provide up to a 20% weight savings and an approximate 40% reduction in skin contact over current thermoform plastic solutions.																								
<u>B. Accomplishments/Planned Program:</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 60%;">Accomplishment/Planned Program Title</th> <th style="width: 10%;">FY 2006</th> <th style="width: 10%;">FY 2007</th> <th style="width: 10%;">FY 2008</th> <th style="width: 10%;">FY 2009</th> </tr> <tr> <td>Industry Wide Propulsion Initiative</td> <td style="text-align: center;">0.000</td> <td style="text-align: center;">0.000</td> <td style="text-align: center;">5.000</td> <td style="text-align: center;">5.000</td> </tr> </table> Demonstrate the advancement of manufacturing technologies for advanced turbine engines that result in: 1) percentage increase in reduced weight, 2) percentage increase in engine performance, 3) percentage decrease in maintenance, 4) increasing production flow through, 5) increased non destructive evaluation (NDE) techniques, and 6) increased safety. Advanced manufacturing processes materials will reduce re-work, increase production capacity, and enable production rate requirements for engine components. Projected LCC avoidance for this initiative is projected between \$5-12 billion, with technology maturity within 3-5 years. FY 2008 Plan - Initiate Phase 1 for optimizing and validating manufacturing, machining, and non-destructive inspection techniques for Organic Matrix Composites (OMC) and Ceramic Metal Matrix Composites (CMC). Initiate Phase 1 for processing and Non-Destructive Evaluation (NDE) of Ceramic Hybrid Bearing to mature reliability and repeatability of manufacturing processes. FY 2009 Plan - Continue Phase 1 for CMC activity. Advance technologies to increase production rate for CMC by 50% of end-point goals. Advance Phase Ceramic Hybrid Bearing manufacturing processes by 25% of end-point goals. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 60%;">Accomplishment/Planned Program Title</th> <th style="width: 10%;">FY 2006</th> <th style="width: 10%;">FY 2007</th> <th style="width: 10%;">FY 2008</th> <th style="width: 10%;">FY 2009</th> </tr> <tr> <td>Manufacturing Readiness Level (MRL) Assist: Tool Development</td> <td style="text-align: center;">0.000</td> <td style="text-align: center;">0.000</td> <td style="text-align: center;">0.850</td> <td style="text-align: center;">0.250</td> </tr> </table> Three key areas: 1) increased knowledge of manufacturing risks related to acquisition programs and technology transition, 2) disciplined process for determining risk, and 3) program that will be made available to public and private industry. FY 2008 Plan- Complete beta testing. Launch final Version 1.0 of tool on website and maintained by BMPCOE					Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009	Industry Wide Propulsion Initiative	0.000	0.000	5.000	5.000	Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009	Manufacturing Readiness Level (MRL) Assist: Tool Development	0.000	0.000	0.850	0.250
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009																				
Industry Wide Propulsion Initiative	0.000	0.000	5.000	5.000																				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009																				
Manufacturing Readiness Level (MRL) Assist: Tool Development	0.000	0.000	0.850	0.250																				

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FY 2009 Plan - Complete field testing of Version 1.0 and make final improvements				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Manufacturing Scale-up for Low Observable Materials and Platforms	0.000	0.000	1.500	1.500
Three key areas: 1) precision component fabrication (no gaps and seams), 2) multi-spectral LO integration, and 3) minimize sustainment cost and cycle time drivers. Investment in the three key areas are projected to have a payback of \$90 million within the FYDP and billions over 2-3 FYDPs. Technology is expected to mature beginning in 2-3 years.				
FY 2008 Plan - Conduct and complete BAA and proposal solicitation. Establish technology teams and associated technology metrics for new-start Low Observable (LO) projects. Initiate selected material projects for advancement of precision component fabrication. Measured increase in component fabrication for scale up processes.				
FY 2009 Plan - Measured increase in component fabrication processes approaching 50% of target end point				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
System-On-Chip (SOC)	0.000	0.000	1.500	1.500
ManTech will move the basic packaging technology from Technology Readiness Level (TRL) 3 to qualification for application in on-board SATCOM capable platforms. ManTech investments will refine the fabrication process, develop design rules for complex integration of non optimized mixed devices on same silicon, and accelerate the development and integration of the transmit and receive module.				
FY 2008 Plan - Baseline technical milestones. Advance manufacturing processes for fabrication processes by 15% of technical goals. Conduct Phase 0 study on the requirements integration of mixed, non-optimized components				
FY 2009 Plan - Advance manufacturing fabrication processes by 30% of technical goals.				
Accomplishment/Planned Program Title	FY 2006	FY 2007	FY 2008	FY 2009
Affordable Manufacturing and Rapid Prototyping for Custom Composite Orthotics and Prosthetics	0.000	0.000	1.150	1.750
New rapid prototyping and affordable manufacturing processes resulting in 20% weight savings and 40% reduction in skin contact. Improved reliability of new composite prosthetics.				
FY 2008- Plan - Coordinate with the National Naval Medical Center (NNMC) and Walter Reed Hospital (WRH) to establish a team to develop manufacturing technologies. Conduct Phase 1 - Integration of fiber performs with new fabrication prototyping of prosthetics and orthotics and conduct proof-of-concept of rapid custom composite prosthetics.				
FY 2009 Plan - Full-scale manufacturing capability for custom composite orthotics and prosthetics. Train NNMC and WRH on prototyping technology.				

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Program**

PROJECT

P680

<u>C. Other Program Funding Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	To Compl	Total Cost
Air Force ManTech (BA7)	57.498	66.373	27.559	27.667	28.068	28.227	28.919	29.633	0.000	293.944
Army ManTech (BA7)	112.405	113.475	68.639	69.603	70.081	70.635	72.189	73.777	0.000	650.804
Navy ManTech (BA7)	57.745	61.048	56.127	56.235	58.420	59.372	60.018	60.659	0.000	469.624
DLA ManTech (BA7)	35.867	21.748	20.114	20.627	20.978	21.475	21.880	22.207	0.000	184.896

Comment:

D. Acquisition Strategy: Not Applicable.**E. Major Performers** Not Applicable.