OFFICE OF THE UNDER SECRETARY OF DEFENSE
3030 DEFENSE PENTAGON
WASHINGTON, DC 20301-3030

RESEARCH
AND ENGINEERING

MEMORANDUM FOR PRINCIPALS, JOINT DEFENSE MANUFACTURING TECHNOLOGY PANEL

SUBJECT: Call for Fiscal Year 2023 and 2024 Office of the Under Secretary of Defense Manufacturing Technology Projects

The Office of the Secretary of Defense (OSD) Manufacturing Technology (ManTech) Program is issuing a call for proposals for the combined fiscal years (FY) 2023 and FY 2024 Manufacturing Science and Technology Program (MSTP) project portfolio. The MSTP invests in cross-cutting defense manufacturing needs, including those that are beyond the ability of a single Service to address, and works to stimulate the early development of manufacturing processes and enterprise business practices concurrent with Science and Technology (S&T) development to achieve the largest cost-effective impact. The MSTP advances specific manufacturing technologies that support multiple component services. The program works in collaboration with the Joint Defense Manufacturing Technology Panel (JDMTP) to identify and develop investment strategies.

Investments will be prioritized toward efforts that enhance efficient, affordable manufacturing for current and future defense systems. While not a prerequisite for submission, proposals should align with the following Focused Investment Areas (FIAs), which are based on Joint Technology Pursuit Areas (JTPAs) developed by JDMTP Subpanels and are aligned with Modernization Priorities (MP):

- Fermented Food Alternatives for Warfighter Performance & Resiliency (MP: BioTech)
- Electronics for Harsh Environments (MP: Hypersonics)
- Digital Engineering in Sustainment Phase
- Portable Solid State (SS) and Mechanical Joining
- Reducing Supply Chain Risks for Energy Storage Devices
- DoD Access to Integrated Photonic Circuits (MP: Quantum/MicroElectronics)

Evaluation Criteria: Nominations will be evaluated against the following criteria:

- Alignment with Requirements
- Technology Benefits
- Cross Cutting Impact (effort affects multiple Services)
- Return on Investment and Cost Benefits
- Cost Benefit Basis of Estimate
- Transition Planning

The MSTP will be utilizing a web-based software portal that will provide a streamlined process to the proposal submission cycle. All parties interested in participating in this proposal cycle are requested to notify the MSTP with their intent to submit a proposal by sending an email to the MSTP mailbox via osd.mc-alex.ousd-atl.mbx.osd-mantech@mail.mil no later than January 14, 2022. By submitting your information, you will be directed by email to the portal to submit a proposal white paper. It is encouraged to utilize the portal for submission of the proposal white paper and quad chart. However, the MSTP will still accept submissions through the legacy submission process (i.e., sending the package directly to the MSTP mailbox at osd.mc-alex.ousd-atl.mbx.osd-mantech@mail.mil). Submit a FY 2023/2024 proposal white paper and quad chart (enclosure 1) to the MSTP program office no later than February 9, 2022. The MSTP evaluation team will conduct a pre-screening of each nomination to ensure it meets the requirements of the MSTP and conduct a down select for approval into Phase 2.

Phase I white paper authors will be notified via email of a selection or non-selection to submit a Phase 2 proposal. The Phase 2 proposal must be submitted to the MSTP via the portal and include an update to the selected white paper based on evaluators' comments, a completed set of New Start charts (using the New Start Template to be provided at notice of selection), and any letters of endorsement. Submitters will be required to present their project nominations in-person to the evaluators to answer questions and provide clarification

A tentative timeline for the FY 2023/2024 MSTP decision cycle is enclosed. The point of contact for this memorandum is Mr. Keith DeVries, keith.a.devries2.civ@mail.mil, 517-216-2766.

Tracy Frost

Tracy G. Frost
Director, Department of Defense Manufacturing
Technology Program

Attachments:
1. FY 2023/2024 MSTP FIAs
2. Tentative Timeline for FY 2023/2024 MSTP ManTech Decision Cycle
3. FY 2023/2024 MSTP Selection Criteria
4. FY 2023/2024 MSTP Proposal Whitepaper with Quad Chart Submission Template
5. FY 2023/2024 MSTP Proposal Quad Chart Template

cc:
AFRL RXM (Mr. Robert Wittman)
ARMY CCDC AvM (Mr. J. White)
NSWCCR (Mr. K. Bryan Mitsdarffer)
DLA (Mr. Arul Senthil)

a) Fermented Food Alternatives for Warfighter Performance & Resiliency

Problem and Scope:

Nutrition is vital to the performance and resilience of the warfighter. The modern warfighter is met with unique demands in training and missions requiring sustained strength and increased endurance—both physical and mental—to succeed. Mental and physical performance contribute directly to mission success, which can be modulated by nutrition. Military service stresses the warfighter, and this can lead to damaged tissues or other musculoskeletal injuries. Nutrient-rich foods, along with adequate exercise and recovery, can help optimize the long-term health and performance of the warfighter.

Historically, military rations have been the cornerstone of combat feeding. Rations are typically prepared dependent on the type and location of mission, as well as availability of resources. Military rations are designed to meet and exceed the nutritional standards in AR 40-25, OPNAVINST 10110.1/MCO 10110.49, and AFI 44-141: *Nutrition and Menu Standards for Human Performance Optimization*. Warfighters must consume the rations provided due to the special formulations designed for optimal fuel consumption and performance.

However, military rations present a massive logistical burden and are not renewable resources in contested environments. The advent of modern biotechnology has seen success in providing alternative food items, often with more nutritional value than can be found in common military rations. Within DoD, there exists an opportunity to advance the state-of-the-art food technology with modern fermentation and downstream processing to provide in theater solutions to food and supply chain resiliency for enhanced warfighter performance.

Technical Challenges:

- While a number alternative food platforms exist, significant challenges to domestic and future deployed production scenarios remain. First, feedstock availability and utilization are key drivers in the economic viability of alternative food products. Technologies to address feedstock alternatives are required for production of nutrient rich alternative foods both domestically and in resource poor settings across the globe.
- Investments should be made to convert biomass of varying availability into fermentable feedstocks by well-characterized, safe microorganisms. Technologies to scale organisms in existing or mobile infrastructure would allow for forward operating production of key nutrients. Fermentation should operate with reduced power, energy, and water requirements.
- Beyond scale up production, food alternatives must be separated efficiently with additional streams created for secondary products of military relevance. It is crucial that food items are safe for consumption and waste is minimized and repurposed for operations. Critical advancements in downstream processing will ensure optimal resource allocation.
- Fermented food alternatives that enhance warfighter function and resiliency in resource poor settings will also require stringent safety testing and validation. Reduced resource production will require innovation to ensure the highest quality food alternatives are produced efficiently and safely.

Goals:
To enable deployable food resiliency for sustained warfighter performance applications, the following goals much be achieved:

- Flexible feedstock conversion: Design 3 feedstock conversion solutions for alternative foods for warfighter performance and resilience. Provide economic viability analysis for each feedstock conversion path. Demonstrate one feedstock conversion with a target of less than $10/kg food alternative.
- Sustainable scale up technologies: Develop a scale up fermentation process to minimize resource consumption. Demonstrate viability and resource consumption metrics. Develop fermentation processes of less than 5 days.
- Efficient downstream processing: Develop a manufacturing process to minimize downstream processing and provide secondary military relevant product streams at meaningful production titers. Demonstrate feasibility of approach at scale.
- Safety profile & acceptance: Demonstrate GRAS or FDA approval. Alternative foods will be non-allergenic, composed of acceptable human nutritional value, and shelf stable for at least 1 month. Alternative foods will demonstrate safety profiles in animal models before human consumption and testing.
- Enhanced warfighter performance: Deliver 100 kg for performance testing. Target warfighter enhancement in at least one of the following testable traits: cognitive, behavioral, or physical.

Transition Targets:
Tri-service Warfighter Performance working group. The U.S. Army, Navy, and Air Force will all benefit from a comprehensive food resiliency program**.** DEVCOM SC and AFRL have active programs for testing. SOCOM, NASA, and other interagency partners are ideal transition partners.

Benefits:
Complete end-to-end manufacturing processes of food alternatives and secondary products for warfighter performance will lead to modular, deployable solutions in resource poor and heavily contested environments.

b) Electronics for Harsh Environments (MP: Hypersonics)

Problem and Scope:
DoD weapon platforms depend on the commercial electronics supply chain, which is increasingly composed of foreign companies. For many DoD missions, the weapon platforms must perform at more extreme environmental conditions than required for commercial applications. To date, these DoD systems are designed and packaged so that commercial electronics survive harsh environments, often at the expense of additional weight, volume, and complexity to the overall system platform. In addition, DoD platforms typically do not require quantities adequate to influence electronic manufacturing to inherently meet harsh environmental conditions; examples of these platforms include hypersonic missile with temperature requirements exceed 600° C and mechanical environments in excess of 20k g-forces due to spin or launch. The DoD has an increased need for weapon platforms to operate at low temperatures in the artic conditions and space that include rapid changes in temperature, radiation, and high-mechanical g-forces. The problem statement for this investment area shall focus on electronic sub-systems for hypersonic applications. The DoD challenge for electronics to meet reliability standards of harsh environments drives manufacturing investments. The manufacturing development shall be demonstrated in electronic sub-system platforms relevant to hypersonic applications with temperature requirements exceed 600° C and greater than 20k g-force. The manufacturing performance specifications and reliability standards are expected to be guided by hypersonic system design requirements.

This investment area seeks to augment many electronics initiatives ongoing within the U.S. Government. This program will develop electronic manufacturing and underlying materials uniquely suited to meet reliability in harsh environments. The program shall develop the electronic manufacturing within hypersonic relevant sub-systems (e.g., navigation, GPS, communications, electronic sub-systems for motion control, safe and arm fuzing, sensors for targeting and initiation). The manufacturing developments under consideration will not be limited to antenna radiating elements, but may also include system level designs (e.g., heat transfer, mechanical isolation, radiation isolation). These designs must also include innovation in the electronics manufacturing processes and supply chain for materials. The investment area shall address materials Coefficient of Thermal Expansion (CTE) matching to substrates and materials, interconnects, integration of high-temperature electronics, and sensor elements. The final deliverables shall be the demonstration of manufacturing processes in a functional sub-system representative of hypersonic applications. Actual sub-system applications are not required. Importantly, proposed manufacturing development must demonstrate a path to scalability to meet DoD requirements and quantities.

Technical Challenges:
Current methods of manufacturing advanced electronic packages and electronic circuit boards rely on materials and methods that meet commercial product reliability standards. DoD must develop platforms operating in high-temperature and high-g-force environments must be developed to meet the harsh environment reliability standards. Typically, reliability tests are done at one environmental condition; however, DoD platforms operate simultaneously at multiple harsh environments. The manufacturing development under multi-environmental conditions in a representative hypersonic sub-systems is an underlying technical challenge to be addressed.

Currently, the electronic manufacturing processes and supply chain for materials are limited to laboratory demonstrations or early stage prototyping. The technical challenges to be addressed include advanced electronic packages and/or electronic assembly (printed circuit boards) with circuit materials, device interconnects, and related manufacturing requirements. The challenges may include device-level or die-level development. However, the program shall also include the integration of die into packages or circuits to validate performance and reliability at hypersonic environmental conditions. All manufacturing process shall be demonstrated manufacturing readiness level (MRL) 4 or higher at the initiation of the program. The program challenge shall include reliability testing in two or more environmental conditions. The program shall have a path to scalable manufacturing in DoD relevant quantities. The manufacturing development must lead to documented reliability results based on yield towards future manufacturing product standards. Often, manufacturing solutions fail to address these necessary outcomes to scale and use the manufacturing solutions.

Goals:

- *Electronics manufacturing processes under hypersonic application environmental conditions:* This goal aims to mature the electronic manufacturing processes for advanced packages and/or electronic assembly using materials and approaches to meet hypersonic operating temperatures above 600° C and mechanical g-forces above 20k g-force, as approximate ranges. The program shall address hypersonic representative applications. The program may include antenna radiating elements; however, the overall program must also include the electronic sub-systems. The manufacturing processes shall have a demonstrated path to scalable manufacturing to meet DoD quantities.
- *Reliability testing for electronics manufacturing processes under hypersonic application environmental conditions:* The program shall test the manufacturing processes in a representative hypersonic system under two or more environmental conditions. The reliability testing shall guide the manufacturing development. The outcome shall be documented reliability against manufacturing processes and yield. The program is not necessarily intended to finalize and deliver a system; however, the technical progress shall document these outcomes to provide future guidance towards standards.
- *Expanded Supply Chain*: This goal will provide materials, process solutions, process tools, and software designs necessary to deliver the sub-system performance proposed. The program may include development of the supply chain elements, provided those materials or devices meet a minimum MRL 4 at the start of the program.
- *Integrated Vertical Supply Chain:* Within a representative hypersonic sub-system, the program shall demonstrate the manufacturing process, supply chain materials, devices, tools, and software design. The hypersonic sub-systems may include, but not limited to, navigation, GPS, communications, electronic sub-systems for motion control, and/or sensors for targeting.

It is recognized that the actual hypersonic sub-system may be sensitive. The program is not intended to deliver specific hypersonic solutions that deem the project classified.

Transition Targets:

The U.S. Army, Navy, and Air Force all stand to benefit from manufacturing processes to meet electronics for harsh environments, an integrated supply chain, and demonstrated progress towards reliability standards to meet hypersonic application requirements.

Benefits:
Rapid, affordable manufacturing and domestic production and supply chain are critical to meet electronics for harsh environments for DoD hypersonic applications. The program outcomes likely will benefit a broader range of DoD applications as well as commercial solutions.

c) Digital Engineering in Sustainment Phase

Problem Statement

The Military Services and Tier #1 suppliers are ahead in building model-based engineering (MBE) in the Research and Development (R&D) phase of acquisition; however, there are disconnects in the sustainment phase. Most older weapons systems do not have 3D technical data, and many do not have any technical data at all. The DoD infrastructure (i.e., Navy shipyards, Army arsenals, Air Force depots) that supports the sustainment of weapon systems does not possess the technologies necessary to operate within a Digital Engineering ecosystem. These inefficiencies can lead to incompatibility across DoD, hampering long-term archiving of technical data as well as joint service operations.

Scope

- *Digital thread across Legacy weapon system sustainment:* The Advanced Manufacturing Enterprise (AME) subpanel portfolio reviews have revealed that extensive efforts are underway and planned within the Military Services to establish and improve the capability to synthesize, author, revise, and manage the 3D model-based definition and related digital technologies in the depots, shipyards, maintenance facilities, and arsenals so that decision support and analysis tools can be utilized during the product lifecycle. The Military Services and the Defense Logistics Agency (DLA) could identify the appropriate advanced manufacturing processes and tools, modernize the 339, 202 and 107 processes across all the Military Services and DLA through harmonized information technology (IT) applications, establish a single repository for information, and improve workforce training and education.
- *Inspection using digital technologies:* Recently, on-site working has been scaled up significantly, and the Military Services have increased investment in Augmented Reality (AR)/Mixed Reality (MR) technologies. By combining remote working technologies with AR/Virtual Reality (VR) technologies and near real time access to the 3D model-based definition and associated technical data, the DoD could perform inspections to approve parts quality and first article testing. This could dramatically reduce the time to delivery of key weapon system components. Not only will this technology vastly improve first article acceptance and inspection, but will also be directly applicable to field troubleshooting, maintenance, and repair. DLA would identify a lead Service, facilitate joint investment, and deploy the concept.

Technical Challenges:

- *Digital thread across Legacy weapon system sustainment:* There are unique circumstances at each of the depots, shipyards, maintenance facilities, and arsenals that create different processes to accomplish the tasks at hand. However, DoD needs to create a common “Digital Thread for Sustainment” that hosts sustainment analysis and guides for decision making that can be used for asset visibility across the enterprise. For example, the U.S. Army has a project to create a digital manufacturing catalog for subtractive manufacturing processes, which could be used across all Military Services and contractors. Similarly, the U.S. Navy has a project to track the production status of assets in the shop floor, which could be transitioned to all Military Services. Finally, the U.S. Air Force is developing an Artificial Intelligence/Machine Learning (AI/ML) tool to search Change Request Forms (Form 202) to identify prior work and avoid duplication that could be transitioned to all other Military Services.

- *Inspection using digital technologies:* AR/MR technologies are changing rapidly and DoD needs a centralized effort across the enterprise to bring the correct software and hardware to implementation. Since there is cost to contractors to build proper IT/operational technology (OT) systems with cybersecurity to implement AR/VR at their facilities, DoD needs to develop a business case that makes sense for the contractors as well as DoD.

Goals:

- Provide a harmonized Digital Thread across the extended DoD Digital Engineering ecosystem including the most sophisticated engineering laboratories and manufacturing facilities, as well as remote locations and small manufacturers with minimal capabilities
- Provide the necessary technical data to the correct location at a lower cost during any phase of the products lifecycle
- Provide the tools, processes, and workforce necessary in order to provide the technical data that does not exist for a vast amount of parts managed by the DLA for the Military Services

Transition Targets:

The Military Services and DLA all stand to benefit from a digital sustainment enterprise by building common IT systems. Based on prior work, the Air Force's KC135 platform, Army's Paladin platform, and Navy's UH-53K platform could be ideal choices for transition.

Benefits:

Technical data is vital for the DoD; without it, the U.S. military cannot perform their duties. There are several benefits for DoD, from producing a digital-leads-physical model to the sustainment phase of acquisition, including:

- Increased speed of delivery for replacement components to operate weapon systems
- Reduced costs of procurement by introducing more competition; today, many suppliers are not participating because DoD is using 2D technical data for competitive procurements and resorting to sole sourcing for many components
- On demand manufacturing to further reduce inventory levels that would allow DoD to leverage new digital technologies (e.g. additive manufacturing) to produce items and use inspection via AR to inspect first articles faster
- Validated technical data that currently does not exist, the digital twin, and advanced manufacturing processes throughout the supply chain

d) Portable Solid State (SS) and Mechanical Joining

Problem and Scope:
Solid State Joining (SSJ) is a manufacturing technology used in the industry to open the design space opportunities and component capabilities, relative to those that can be produced by more conventional manufacturing approaches. Advantages of using SSJ to the present state of the art include lightweighting, enhanced local mechanical and environmental behaviors, reduction in number of components in a system, and lower costs. Widespread adoption of SSJ has been limited by the need for field repair. Risks of SSJ present restrictions to full use and advantage and are associated with insufficient detailed knowledge and understanding of how SSJ components may be formed, inspected, and behave due to unknown transient material flow behaviors, material anisotropy, and heterogeneity introduced by the weld interface (i.e., joining of dissimilar materials, identifying potential defects at and about the weld interface).

It is the interest of this focus investment area (FIA) to provide the means to resolve these technical barriers for achieving full use of SSJ by developing new physical and computational devices, tools, and methods that remove risks associated with design, manufacturing, inspection, and use of SSJ components. Intended impacts are envisioned to influence opportunities for use of SSJ components in original equipment manufacturing (OEM) as well as sustainment and repair of legacy weapons systems.

Technical Challenges:
- Development of physical and computational devices, methods, approaches that enhance knowledge for support of new design, manufacturing methods, inspection techniques, and use scenarios of SSJ components
- Development of improved materials for use during SSJ manufacture of components, including identification of transient material behaviors that contribute to in-process formation of unstable microstructures, mixed alloys, unique textures, and challenging residual stresses and distortions; development of improved post joining manufacturing methods to manage the above issues, leading to higher yield
- Development of Integrated Computational Materials Engineering ICME methods that provide detailed understanding of composition-processing-microstructure-defect-behavior relationships and computational models; application of these methods to enable forecasting and evaluation of design, manufacturing, inspection, and component behaviors
- Development of an autogenous (i.e., no filler metal) SSJ process, a lockable joint with plastically flowing material into a locking feature of the joint, and the ability to automate as much as possible the joining processes
- Development of the processes and resultant properties for SSJ that can be used by designers to specify a joint, which now include only properties for arc weldments, adequate for the application
- Development of the ballistic database for solid state weldments/joints of metals
- Expansion of the joining process to make it portable for use in field level maintenance

- Development of the joining process and specifications required to qualify the process for both initial manufacture and field level maintenance
- Development of design process control and automation to enable the joining under varying fit-up and out-of-position conditions

Categories of Manufacturing Technology to Enable Solid State and Mechanical Joining:
Industrial processes include, but not limited to, friction stir welding, inertia friction, translation-assisted low-force friction (e.g., linear, rotary) welding, augmented heating friction welding, resistance welding (e.g., spot, projection), capacitive discharge, and toggle lock.

Goals:

- Attainment to a minimum of technology readiness level (TRL) 6 of the joining of dissimilar materials using a metallurgical bond/mechanical joint that would vary by the material combination and identify the limitations there of
- Enable the use of SSJ in more military applications
- Enable the joining repair processes in theater
- Reduce the cost of weld preparation by relaxed fit-up and tolerance limits
- Introduce more automated processes for solid state and mechanical joints to reduce the need for joint preparation and reduce cost
- Reduce the cost and/or increase mission availability of military assets by expanding the use of available material choices
- Optimize the cost and weight of military structures by enabling the selection of dissimilar materials for different areas based on performance requirements (e.g., a steel underbody for an aluminum hull)

Transition Target(s):
This investment area will apply to nearly all new or existing acquisition programs as well as in field repairs where there are differing performance requirements for military structure and equipment where lightweighting can enhance mission effectiveness. Broad use interest relates to military equipment and weapons systems (e.g., conventional gas turbine, rocket engines, aircraft, satellite, rocket, munitions) but expanding into emerging new propulsion systems (e.g., ramjet, scramjet, hypersonics, ramps, hatches, doors, interior bulkheads, armor, airplane fuselages, wings, ship hulls).

Benefits:
This investment area will help to reduce weapon system assembly time, cost, and weight while improving performance by enabling the use of alloys and combinations currently unavailable to the designer and field repair maintenance crew on or off the field. The U.S. Army, Navy, Air Force, and Space Force all stand to benefit from this technology.

e) Reducing Supply Chain Risks for Energy Storage Devices

Problem and Scope:
The DoD acquires and uses systems that rely on vast collection items including components, chemicals, materials, and subassemblies. In some cases, sources for these items present risks for future availability that could unacceptably limit the DoD's ability to acquire these necessary items. Various types of risks can affect any of these items, most prominently are specialty materials that are DoD unique, produced by a single supplier, or sourced by a foreign company that may not be accessible in war-time and certain economic conditions.

This investment area seeks solutions for a select set of priority risks associated to high-level consequences that can be mitigated for the DoD. Focus areas for this investment area align to critical, specialty materials, and manufacturing processes used in DoD-interest batteries and related pyrotechnic devices. Approaches may develop technologies for innovative mitigations of these risks; these approaches include:

- Utilizing vertical integration
- Developing a domestic joint venture
- Achieving domestic or second sourcing where the business case is amenable
- Enabling capabilities to achieve longer shelf-life and stockpiling where able to do so
- Adapting commercial products that do not have the associated risks
- Enabling common usage by achieving interchangeable items

Technical Challenges:
The DoD uses battery materials and associated components that are usually optimized for the specific use conditions and system in which they are contained. With few exceptions, specialty batteries are acquired in quantities unfavorable for long-term sustainable chemical, component, and material sourcing. Cost minimization efforts further pressure specialty suppliers' business cases and eventually lead to single sources of supply and reliance on least cost foreign suppliers.

The optimizations of these batteries results in chemicals and materials that are highly specific, and thus not interchangeable with more readily available substitutes. When a specialty material or process becomes unavailable, the effort required to find or develop a substitute can take unacceptably long periods and can cost an unfavorable amount to attempt to accelerate the effort.

Goals:

- *Alternate material solutions at scale*: This goal provides for properly-sized manufacturing solutions that provide alternate sources of the necessary items.
- *Expanded supply chain*: This goal enables use of other items as substitutes, replacements, and adaptations of non-risk materials and items for use in DoD batteries.
- *Integrated vertical supply chain:* Where economical and possible to do so, vertical integration of the specialty materials and subcomponents within DoD battery manufacturer allows future availability without reliance on an unacceptable risky supply chain.

Transition Targets:

The U.S. Army, Air Force, Marine Corps, Navy, Missile Defense Agency, and Space Force will all benefit from the comprehensive risk mitigations to the DoD energy storage devices supply chain. Examples of specific families of weapon systems that are transitions targets covered by these risk mitigations include aircraft, missiles, and munitions. Each Service, as well as multiple battery systems, use Li-ion cells and batteries.

Benefits:
These trusted, domestic sources would provide for long-term business-stable production of DoD specialty materials.

f) DoD Access to Integrated Photonic Circuits (MP: Quantum/MicroElectronics)

Problem:
Integrated photonic circuits (commonly referred to as chips) are an emerging technology with the potential to advance many DoD-specific applications. The design and fabrication of these chips utilize established microelectronics infrastructure, including processing equipment and techniques, to create photonic circuits using light rather than electrons in order to convey/process information and/or sense the environment. Multiple DoD-specific applications would benefit from these capabilities that are only possible in state-of-the-art foundries requiring designers to use electronic-photonic design automation (EPDA) software. Access to U.S.-based foundries is expensive and, along with low-volume needs, has served as a barrier that has kept many DoD laboratories from participating in this ecosystem.

Technical Challenges:
The development of low-volume integrated photonic systems requires advanced foundries where costs can be beyond the reach of many DoD laboratories and programs. While some users have emerged in government laboratories, they have limited access to most foundries. Existing efforts have primarily focused on creating and fabricating designs. Packaging challenges for fabricated chips have limited the demonstration of their capabilities for end-use transition.

Finally, the pool of U.S. citizens capable of performing research and engineering in this field needs to grow to meet DoD needs. This investment area seeks to allow existing DoD designers greater access to integrated photonic fabrication and packaging while also seeking to grow the overall DoD end use. Efforts would therefore focus on design, fabrication, packaging, testing, and demonstrations of functional prototypes and systems.

Goals:
- *Leverage state-of-the-art integrated photonics foundries:* While DoD investment has resulted in the creation of low-loss, high-performance integrated photonics offerings (e.g. via AIM Photonics), fabrication costs are still relatively expensive, particularly when factoring in the costs of EPDA software. This goal seeks to aid would-be designers in defraying the costs associated with reducing design ideas into EPDA-based designs and obtaining hardware for additional work.
- *Leverage advanced packaging capabilities:* Designers must package integrated photonic circuits to further identify the DoD utility. Work shall explore the packaging of integrated photonic circuits using state-of-the-art tools in order to advance the technical readiness level of the overall capabilities being developed.
- *System integration, testing, and demonstration:* This goal aims to provide support for development and demonstration of DoD-relevant components and systems using integrated photonics. This support would include new concepts and integrated photonics component whose creation seeks to replace non-traditional photonics components/devices.

Scope:
The scope of the proposed activity relates to DoD access to and use of integrated photonic circuits. Proposals seeking to design, fabricate, package, and test integrated photonic circuits are all within

scope. Efforts that seek to explore integration with electronics will result in more advanced capabilities and are encouraged.

Transition Targets:
The U.S. Army, Navy, Air Force, and Space Force all stand to benefit from the capabilities offered by integrated photonic circuits. Specially, microwave photonics, quantum applications, precision navigation and timing, artificial intelligence, and chemical sensing are all representative areas that will benefit. Once integrated photonic circuit-based sub-systems are realized, the DoD community can better explore their insertion into programs of record.

Benefits:

Increased accessibility to fabrication and packaging for DoD projects will enable new capabilities by lowering the barriers that often challenge new programs. In addition, this work will increase the pool of U.S. designers and enable the DoD to continue to develop in-house capabilities that can be used to explore new integrated photonic circuit systems into the future.

Task Name	Start	Finish
OSD ManTech FY23/24 Proposal Timeline	**Wednesday 11/24/2021**	**Monday 07/18/2022**
- Phase 1	**Wednesday 11/24/2021**	**Friday 03/25/2022**
Release Call for Proposals	Wednesday 11/24/2021	Wednesday 11/24/2021
Proposers Prepare Packages	Wednesday 11/24/2021	Wednesday 02/09/2022
Proposers' Day Teleconference	Thursday 12/09/2021	Thursday 12/09/2021
Phase 1 Submissions Due	Wednesday 02/09/2022	Wednesday 02/09/2022
Evaluator Reviews	Wednesday 02/09/2022	Friday 03/11/2022
JDMTP/SME Review	Wednesday 02/09/2022	Friday 03/04/2022
Phase 1 " 1-N" List	Friday 03/11/2022	Friday 03/25/2022
- Phase 2	**Monday 03/28/2022**	**Tuesday 07/05/2022**
Phase 2 Selection Notifications	Monday 03/28/2022	Monday 03/28/2022
Proposers Prepare Phase 2 Packages	Monday 03/28/2022	Friday 05/27/2022
JDMTP Sub-Panel Review of Phase 2 Selections	Monday 03/28/2022	Monday 04/11/2022
Phase 2 Submissions Due	Friday 05/27/2022	Friday 05/27/2022
Evaluator Reviews	Monday 05/30/2022	Friday 06/03/2022
Phase 2 In-Person Briefs	Tuesday 06/07/2022	Friday 06/10/2022
Evaluator Decision Discussions	Monday 06/13/2022	Tuesday 07/05/2022
- Planning	**Tuesday 07/05/2022**	**Monday 07/18/2022**
Obtain Approval by TMIB	Tuesday 07/05/2022	Monday 07/18/2022
Inform Selectees	Monday 07/18/2022	Monday 07/18/2022

FY23/24 OSD ManTech MSTP Project Proposal
Selection Criteria

1. Introduction:

Evaluators will evaluate nominations against the criteria listed below. When reviewing each criterion, evaluators will answer a series of questions based upon your submission.

2. Alignment with Requirements:

- Does the proposal being evaluated align with the MSTP ManTech Program?
- Does the proposal being evaluated align with a current or previous Focus Investment Area (FIA)?
- How many FIAs do you think the proposal being evaluated aligns with?
- How well does the proposal support Department of Defense Science & Technology priorities?

3. Technology Benefits:

- Does this technology represent a new enabling capability or incremental improvement for existing systems?
- How well does the project significantly enhance manufacturability of the item or material?
- What is the manufacturing readiness level at start and expected upon conclusion?
- How likely will this manufacturing technology or process significantly benefit a broad range of defense initiatives?

4. Cross Cutting Impact:

- Does this project benefit more than one component or agency through multi-service, multi-system application?
- What level does the proposal/topic realize the applications potential?
- What is the cost share amongst DoD/Government programs? Industry?
- How does the project align with other programs, and are there any in-kind benefits provided to the other programs?

5. Cost Savings & Benefits:

- What is the value proposition (payback period, costs savings, improved efficiency, technology enabler, etc.)?
- How realistic is the cost benefit analysis?

6. Transition Planning:

- What does the proposal address? (Urgent Need Statement, Program of Record, or Other)
- Does the project have a technical data plan? (Where the data will be held, who will own the data at project completion?)

FY23/24 MSTP Project Proposal Full Template & Instructions for Phase I Submission Process

Submission of a proposal to the MSTP Project Data Call is a two phase process. These instructions and template apply only to the first phase.

The template (beginning on the following page) is the format model that authors must use to prepare the White Paper**. Do not include the instructions on this page or any bracketed [ ] guidance in the template**.

Format. The following MUST BE MET or the proposal will be deemed noncompliant and will be REJECTED.

- Single column format, single-spaced typed lines
- Standard 8 ½" x 11" paper
- Page margins one-inch on all sides. A header and footer may be included in the one-inch margin.
- Font style of Times New Roman
- No font size smaller than 10-point*

**For headers, footers, imbedded tables, figures, images, or graphics that include text that is smaller than 10-pointa font size of smaller than 10-point is allowable, though proposers are cautioned that the text may be unreadable by evaluators.*

All fields are **REQUIRED** unless otherwise noted.

Additional Content. The submission of a white paper should include, in a SEPARATE FILE, any endorsement letters for the Project.

Section Length Guidance. Each section in the template may include a suggested length and a required limit for that section.

Saving This File. Please save this file with the following naming convention:

PH1_FY23_24_"Project Title"_"Submission Date" with the Date in the format of YYYYMMDD

For example, a project entitled "Improved Chewing Gum for Government" would look like:
PH1_FY23_24_ Improved_Chewing_Gum_for_Government_20200106.pdf

All files must be submitted in .pdf format.

The template for the Phase I White Paper begins on the following page. Delete this instruction page and begin the White Paper with the following page.

[Template]
Cover Page

Project Title:

MSTP ManTech Focused Investment Area Supported:
[Please select one of the following Areas]

Choice	FIA Title
	Fermented Food Alternatives for Warfighter Performance & Resiliency (MP: BioTech)
	Electronics for Harsh Environments (MP: Hypersonics)
	Digital Engineering in Sustainment Phase
	Portable Solid State (SS) and Mechanical Joining
	Reducing Supply Chain Risks for Energy Storage Devices
	DoD Access to Integrated Photonic Circuits (MP: Quantum/MicroElectronics)

Project Engineer:

First Name:	
Last Name:	
Email:	
Telephone:	
Organization:	

[If this White Paper is being submitted by someone other than the Project Engineer, please repeat the table above for information on the Submitter]

What Service(s) will be impacted by the outcome of this Project?

Choice	Service
	Army
	Navy
	Air Force
	Missile Defense Agency (MDA)
	Defense Logistics Agency (DLA)
	Other Government Agency (OGA)

Project Approach:

Expected Start Date:		*[YYYYMMDD]*
Period of Performance:		*[In Years, no more than 6]*
Starting Manufacturing Readiness Level (MRL):		*[From 1 to 10]*
Ending MRL:		*[From 1 to 10]*

[Template]
White Paper

1. Executive Summary [limited to 1,000 characters]
[Use this section to summarize your proposal.]

2. Problem Statement [limited to 1,000 characters]
[Provide a short description of the material, operational, and manufacturing deficiencies to be addressed by the ManTech proposal. Identify key technical and manufacturing barriers to success.]

3. Project Approach
[A short description of how the technology proposed for advancement overcomes those barriers and provides the needed capability. Describe in summary level fashion the technical approach.]

4. Project Deliverables
[Provide a clear description of the product or outcome of the ManTech Proposal effort (e.g., demonstration of technology, computer code, simulation, technical data package - what you plan to deliver to your customer(s).]

5. Impact Statement
[Provide a clear statement about the benefits, and the importance of the work. Relate to the current baseline capability and state what will be achieved by this effort.]

6. Transition Planning
[Identify the Project Managers, Program Executive Officers, programs, operational organizations, or other beneficiaries. Explain how the technology will be transitioned to and implemented by the transition partner.]

7. Leveraging Other Programs
[Provide a description of programs from other services or agencies (e.g., Small Business Innovation Research, International, Joint, OGAs) that relate to the proposed ManTech Proposal. What other sources of funding will be used in conjunction with this effort? Describe collaboration with other Science and Technology (S&T) and Program Executive Office (PEO) community organizations involved in or resulting from this effort?]

8. Endorsements

*[For each Endorsement of this Proposal, please provide the following information. Add an additional Table for **each** individual Endorser. In addition, if you have material from an Endorser such as a letter of support, please attach it in .pdf format with your submission.]*

First Name:	
Last Name:	
Title:	
Organization:	
Email:	
Type:	Please select 1 (one) of the following to describe what type of Endorsement this individual is providing: 1) Component 2) Program Office 3) Command 4) Transition Partner 5) Other

9. Financial Plan

[The initial financial plan submission for this proposal includes requested funding from the Office of the Secretary of Defense (OSD) ManTech and the cost sharing contributions from other organizations. "Prior" includes any funding directly related to the current state of the Technology. Please expand the number of columns in the table in the event that you anticipate a length of more than three years; six is the maximum.]

	Prior Invested	**Year 1**	**Year 2**	**Year 3**	**Total**
OSD Request					
Cost Share					
Total					

Total Number of Organizations Contributing to the Cost Share:

Anticipated Cost Savings: *[A single dollar amount]*

Cost Savings Basis of Estimate:
[Include a dollar amount as well as please summarize how the cost savings was derived, including assumptions of usage and adoption of developed technology.]

10. Team Members

[Identify all known Team Members in the table below. Add rows as needed.]

[For "Type", include one of the following for each individual: Industry Partner, Cost Share, subject matter expert (SME), Tech Authority, Teammate or Support. Please expand the Table as necessary.]

First Name	Last Name	Type	Email	Organization

Quad Chart

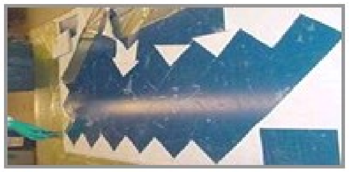
[PASTE A FULL-SIZE PICTURE OF THE QUAD CHART YOU HAVE CREATED ON THIS PAGE IN LANDSCAPE ORIENTATION.

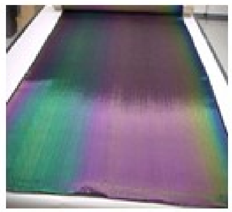
When finished with preparation of your quad chart;

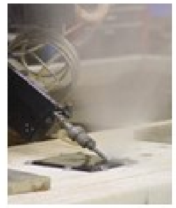
- Select “Save As” from the file menu.
- Click the location where you want the file to be saved.
- On the bottom of the dialogue box that appears, select “JPEG File Interchange Format” from the “Save as type” drop down.
- Click “Save.” This will create and image of the slide that you can insert into this document.
- On this page click Insert>Pictures>locate and select the image you just created and click “Insert.”]

MT for Ceramic Matrix Composites

OSD ManTech MSTP







ManTech for CMCs	FY07	FY08	FY09	FY10	
Machining					
Fabric Coating					
Resin & Fabric Optimization					
Matrix Densification					
Non-Destructive Inspection					
3D Airfoil Inspection					
SiC Tow Coating					
Leveraged SBIRs					
Dollars in ($K)	**FY07**	**FY08**	**FY09**	**FY10**	**Total**
AF ManTech 7.8	1306	2479	2505	600	6890
OSD MS&T MT	0	5000	5000	0	10000
SBIR	2546	2000	749	0	5295
Total	1306	7479	7505	600	22185

John Doe, jonathan.doe@service.mil

DoD Problem

- Advanced designs which enable improved engine performance are outpacing manufacturing capability
- Cost, cycle time and scrap too high for full-rate production
- Reducing specific fuel consumption is critical

Approach

- Team with OEMs, key suppliers, other Services
- Identify high pay-off opportunities
- Develop a coordinated technology maturation strategy
- Infuse adv. mfg. technology directly into the supplier base to enable cost effective applications of CMC's for advanced performance

Warfighter Benefits

System/Command:
- Initial Beneficiary: JSF (F135 and F136)
- Secondary Beneficiary: legacy engines/ACC, Army, Navy, Marines

Example Impacts:
- Increased Speed
- Increased Range
- Reduced Life Cycle Costs ($6B+)
  - Maintenance, fuel, etc.
- Reduced Weight (300+lbs)

Project XYZ

Org/Email/Phone

- Pictures/diagrams (use .gif format)
- Meaningful picture/diagram relating to the Problem, Approach, or Benefits
- The picture of ManTech product/process, if possible
- No gratuitous weapon system pictures!

Pgm Title	FY22	FY23	FY24	FY25	Total
Task / Milestones					

Contract Dollars in ($M)	FY22	FY23	FY24	FY25	Total
OSD MSTP	0	0	0	0	0
Other Govt. (give name)	0	0	0	0	0
Industry Cost Share	0	0	0	0	0

DoD Problem

- What is the warfighter capability requirement that DoD can't meet right now – capability deficiency and/or cost unaffordable?
- Warfighter relevance – Convey why it is important/painful

Approach

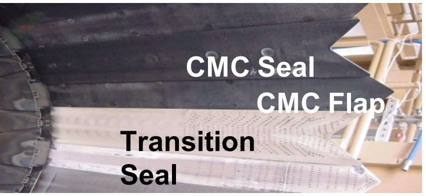
- What manufacturing technology are we applying to resolve the "long pole" deficiency above?
- Convey why ManTech? (e.g., ManTech uniqueness, multiple systems/Enterprises, high risk)

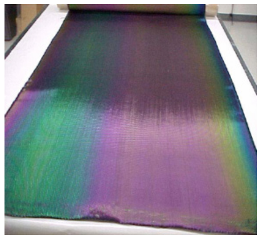
Warfighter Benefits/Impacts

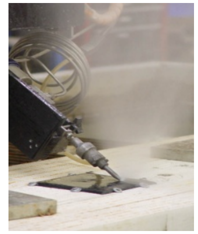
- List systems impacted (include first transition and all other main systems)
- Quantify the capability and affordability impacts (expected or actual) that resolve the problem: warfighter terms, system-level impacts
- Treat in order of importance
- Ensure cost avoidance or savings are defendable – avoid ROI unless irrefutable

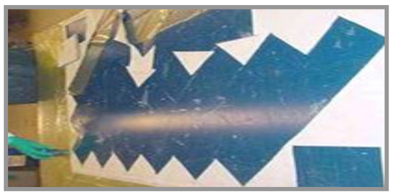
MT for Ceramic Matrix Composites

OSD ManTech MSTP









John Doe, jonathan.doe@service.mil

ManTech for CMCs	FY07	FY08	FY09	FY10	
Machining					
Fabric Coating					
Resin & Fabric Optimization					
Matrix Densification					
Non-Destructive Inspection					
3D Airfoil Inspection					
SiC Tow Coating					
Leveraged SBIRs					

Dollars in ($K)	FY07	FY08	FY09	FY10	Total
AF ManTech 7.8	1306	2479	2505	600	6890
OSD MS&T MT	0	5000	5000	0	10000
SBIR	2546	2000	749	0	5295
Total	1306	7479	7505	600	22185

DoD Problem

- Advanced designs which enable improved engine performance are outpacing manufacturing capability
- Cost, cycle time and scrap too high for full-rate production
- Reducing specific fuel consumption is critical

Approach

- Team with OEMs, key suppliers, other Services
- Identify high pay-off opportunities
- Develop a coordinated technology maturation strategy
- Infuse adv. mfg. technology directly into the supplier base to enable cost effective applications of CMC's for advanced performance

Warfighter Benefits

System/Command:

- Initial Beneficiary: JSF (F135 and F136)
- Secondary Beneficiary: legacy engines/ACC, Army, Navy, Marines

Example Impacts:

- Increased Speed
- Increased Range
- Reduced Life Cycle Costs ($6B+)
    - Maintenance, fuel, etc.
- Reduced Weight (300+lbs)