Ask Me Anything Webinars- Session 5

TX12- Materials, Structures, Mechanical Systems, and Manufacturing and TX13 – Ground, Test, and Surface Systems

TX and Subtopic	Question	Answer
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	For Phase I hypothesis testing at TRL 1-2, what channels or processes exist for requesting small quantities of AVCOAT or PICA materials? If direct material access isn't feasible for Phase I, could you suggest alternative approaches for validating our thermal management concepts that would best position us for potential material access in Phase II?	Wouldn't consider Avcoat or PICA (or other ablators) reusable under this subtopic ("...capable of withstanding several high heat flux exposures associated with LEO reentry without severe degradation or deleterious changes to material properties"). There are some limited sources for properties on heritage reusable systems and some are included as references in the subtopic; further information on historical materials can be provided once under contract.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal	Are there specific TPS performance characteristics that would be particularly valuable for both LEO return and potential future lunar/Mars mission infusion?	LEO transportation is the near-term priority. However, any improvements to reusability (reducing refurbishment, increasing temperature capability, etc.) could potentially be of benefit to other missions.

Protection Systems (TPS)		
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	Some specific roles and capabilities would be difficult to expect from the research institution partner during Phase I is there an early pathway to thermal testing at NASA Ames Laser-Enhanced Arc Jet Facility, for example?	Research institution (RI) can provide valuable contributions in Phase I, such as fundamental materials research, basic material characterization (thermal and mechanical properties), and develop/refine manufacturing process. For high enthalpy testing in Phase I, consider looking into lower powered, inductively coupled, plasma torch facilities around the nation. Possible to test small-scale articles in relevant entry environments rapidly and at relatively low cost. For Phase II, could propose arc jet testing, though costs and schedule may still be challenging for the large ones. Smaller arc jets do exist (e.g. NASA Langley HyMETS facility) and plasma torch testing could still be a valuable alternative in Phase II.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	For Phase I validation, should testing protocols prioritize LEO reentry conditions, or should they include parameters relevant to broader mission profiles?	Prioritize LEO entry conditions. Of course, application to other missions/entries would be a bonus. But enabling transportation to and from LEO is arguably the greatest need now and in the near term.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - A1.03: Propulsion Efficiency - Propulsion Materials and Structures (SBIR)	The topic description emphasizes modeling, except (it seems) for the high temperature materials bullet items under technology areas of interest. Can you clarify high temperature bullet items interest is for modeling/design of such materials	Could take that either way. Whether that's the development of a specific material system or the development of modeling tools, both are applicable approaches to what is being requested in the subtopic.

	and processes, as opposed to the specific development of such materials and processes?	
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	The term TPS is often broadly applied to a range of component types (ablative tiles, load carrying aeroshell structures, underlying insulation, hot structures, etc.). Is there a specific TPS component, system, or approach of interest for this topic?	The subtopic was written to allow a broad range of potential solutions to meet the need from insulating tiles to hot structures to high temperature metals. The key things are that it should be reusable (capable of multiple flights without significant change), low cost, and with a clear path for manufacturing and integration (i.e. attachment) onto a vehicle.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	What are the key figures of merit for the TPS materials/components of interest? What can new materials and processes be bench-marked against?	Desired capabilities are outlined in the subtopic and comparisons are outlined in a paper referenced. Specific comparisons/benchmarking depends on the material/system proposed. For insulating tiles, current state-of-the-art derives from Space Shuttle Orbiter. Hot structure (RCC) was also used on Orbiter wing leading edge. Ultimately, we are seeking a holistic solution that is feasible to scale-up and implement on a vehicle. Any evidence you can provide to that end is beneficial.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.10 Low-Cost Manufacturing and	Is there an available spec (or estimations) for expected heat flux and other environmental conditions LEO reentry scenarios?	It depends. Environments vary based on windward vs. leeward side, where you are on the vehicle, vehicle geometry (leading edge, acreage, flaps) and other factors. All of these are fair game. Can use temperature capabilities of existing materials contained in the reference paper as a starting point for survivability in a LEO-type entry. Note also that a TPS will be exposed to high temperature dissociated oxygen and therefore oxidation must be considered.

Integration of Reusable Thermal Protection Systems (TPS)		
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H5.01 Modular, Multi-Use 50 kW Lunar Solar Array Structures	What are the current opportunities and scope for solar array development proposals - specifically, are you considering proposals from new companies without prior vertical array experience, improvements to existing first-generation developments, or entirely new conceptual approaches?	The answer to all three of your questions is "Yes." We are primarily looking for innovations beyond what has already been studied. But of course, "Experience, Qualifications and Facilities" are 25% of the proposal evaluations score so these are important.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01 In-Space Production Applications Flight Development and Demonstration on ISS	Is the flight on the ISS included in the scope of Phase II or will that need to be coordinated outside the proposal? What is considered superior performance and quality than is done on Earth?	An ISS Flight Demonstration is not mandatory during the SBIR Phase II period. If proposed, the resources can be provided by the ISS National Lab or via NASA. Proposals that include a flight demo are reviewed by the ISS National Lab to determine if they are willing to sponsor the flight. Proposers can contact the ISS National Lab to learn more about their process for sponsorship.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01 In-	Is there a time limit on the ISS experiment duration?	No; however, the extent of your resource needs will affect how your proposal is evaluated regarding ISS Feasibility and Operations Impact. Reference the Resource Utilization Evaluation Guideline for how impact is evaluated: Figure of Merit: Low Impact | Medium Impact | High Impact Mass (Kg): <10 | 10-25 | >25 Volume (Cubic Feet): <1.8 | 1.8-7.2 | >7.2

Space Production Applications Flight Development and Demonstration on ISS		Crew Time (Hours): <10 | 10-20 | >20 Power (W): <100 | 100-500 | >500 Conditioned Stowage (liters): <5L | 5-10L | >10L LSG/MSG Usage (Weeks): None | 2-3 | >3
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.11: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments (STTR)	Are planktonic culture communities excluded from this?	Not necessarily, if the entire process implicates benefit to using biofilms (whether wet or dry).
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H5.01	Are you looking for modularity within the support structure or the array itself or both?	Any type of modularity is of interest. We are primarily interested in how the system can be designed with two or more smaller units that can be deployed or possibly assembled robotically as a single, 50-kW unit to hopefully improve design, testing, handling, and redundancy.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H5.01	Should performers plan to design all components of the structure (ie. support, array, base) or are innovations in specific components sufficient?	All innovations are of interest, but innovations for individual components should be clearly linked to a proposed, overall, system design.
TX12 - Materials,	Is the modularity aspect the only	The two new areas of interest this year are modularity and multi-use capability. We also increased the lowest height of the

Structures, Mechanical Systems, and Manufacturing - H5.01	difference in this topic from previous solicitations or are you looking for other innovations as well?	solar array cells from 10m to 15m above the ground to allow higher illumination at more potential operating sites.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.11: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments (STTR)	Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments, is biomanufactured food of interest for this topic?	Yes, food production is within scope.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01 In-Space Production Applications Flight Development and Demonstration on ISS	Would a proposal for systems integration of existing terrestrial laser welding technologies be in scope? Is Wire Arc Additive manufacturing a possibility on ISS?	InSPA enables the development and demonstration of technologies that manufacture products that serve markets on Earth. A welding technology can be part of a system that develops a product for Earth. However, the materials that require welding (i.e. metals) are heavy and are not likely to have as strong a business case. Most uses for welding are for concepts that address manufacturing systems in-space, for-space, which is not in scope for InSPA.
TX12 - Materials, Structures, Mechanical Systems, and	New materials including carbides, nitrides, and boride ceramics are	Yes, AM methods are certainly of interest if they can deliver on the intent of the subtopic: low cost with a clear pathway for manufacturing and integration. High temperature coatings could also be relevant and would likely be necessary for certain materials.

Manufacturing - T12.10 Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)	referenced. Are commensurate additive manufacturing methods for bulk components (i.e. hot structure leading edges for glide bodies of interest), or is this generally geared towards CMCs or coatings on refractory metallics?	
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01	1 - Does InSPA support experiments focused on development / scale up of products instead of more fundamental research? 2 - Does InSPA support flight programs that are already under development?	1. InSPA invests solely in applied research that leads to development and demonstration of technologies used to scale up production of advanced materials and products that serve markets on Earth. InSPA does not invest in fundamental research. 2. Yes.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01	Can we propose projects such as studying vacuum outside the ISS that do not directly produce a product but provides beneficial information to those seeking to manufacture on ISS?	Typically, we don't support fundamental science that is not tied directly to an application. All of our awards go to projects that lead to direct product manufacturing.
TX12 - Materials, Structures, Mechanical Systems, and	Do components include systems structures such as spacecraft frames or panels?	Those topics are within the scope of this solicitation.

Manufacturing – Z13.05		
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - T12.11: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments (STTR)	Only focused on biofilm manufacturing? Are other methods of biomanufacturing of interest?	This topic focuses on harnessing the potential in biofilms for biomanufacturing. Depending on what other methods are proposed, there still needs to be a tie-in to the biofilm state of microorganisms.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01	Does NASA have an interest in injection molding on the ISS? Or would that type of manufacturing technology be more suited for the Moon or Mars facilities?	Injection Molding is likely more aligned with the use of regolith for building large structures and habitats on a lunar or Mars surface, so it is not likely to be of interest for InSPA.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing – A1.03	Does this include increasing in-space propulsion efficiency and instead of developing a new material can we propose the application of a licensed NASA developed material technology?	The subtopic does not focus on in space propulsion focuses it focuses on aeronautics and subsonic transport vehicles.
TX12 - Materials, Structures,	Kind of a stretch, but is space-based solar in	No, we are not looking for space-based solar power proposals under Subtopic H5.01.

Mechanical Systems, and Manufacturing - H5.01	consideration for this topic, or just surface-based arrays?	
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing – H8.01	I have not seen a business case for products manufactured in space and returned to earth. Are there examples of successful products that return on investment to manufacture in space and serve markets on earth?	NASA has received proposals that show a business case for production of biomedical products, pharmaceuticals, HMF glass fibers, and semiconductors. The H8.01 InSPA topic intends to support the development and maturation of the business case, as well as the science, to validate the sustainability of the work in LEO.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - H8.01	HB8.01 InSpa - is it only for return to earth markets? As I understand, for additive manufacturing of electronics (i.e. printed electronics), there are strong use cases for in space for space manufacturing. Can you clarify?	Our primary goal for InSPA is to enable technologies that serve markets on Earth because those large markets better support sustainability. However, we do take note of possible synergies with NASA-needs for exploration, and we do bring in other SMEs from within NASA to take advantage of those synergies. The NASA benefit cannot be primary for H8.01.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - A1.03	The topic indicates advanced propulsion. Can a technology be proposed for advanced/new electric propulsion for aerospace applications with far greater efficiency than is current?	The scope document for the subtopic indicates that any material system for subsonic air transport is appropriate.

TX13 - Ground, Test, and Surface Systems – A1.08	Can you clarify why you do not want solutions with additives in the water? Is this a hard-and-fast decision, or are you open to creative ways to work around this?	We have used a dye in the water in the past, but we had to set up a temporary spray bar rig, which is time consuming/higher cost. If the benefit is high enough, then we can use temporary spray bars. Ideally, we would prefer no additive. The additive cannot alter the properties of the droplets (surface tension, specific gravity...).
TX13 - Ground, Test, and Surface Systems – A1.08	By "dye," do you mean an additive that could measure temperature? If so, how well did that solution perform in your facility tests? Did these additives affect the droplet properties in your tests?	See this report for prior efforts in this area: https://ntrs.nasa.gov/api/citations/20070034950/downloads/20070034950.pdf. Section 5.4 in this report provides a description, and Figures 38a and 38b show the secondary spray bar system installed over the existing spray bars
TX13 - Ground, Test, and Surface Systems – H10.04	There are multiple gas types and process streams mentioned (propellant transfer, pressurants, ELCSS gasses, and ISRU gasses). Is there a priority to the process streams and/or gasses to monitor?	LOX is universally used for systems and processes, which would be one of the major streams we want to be able to sample and is one of the most stringent requirements. HCBs increases over time in LOX, which is a concern for long-term storage, as is the percentage of methane decrease. Another high priority is liquid methane/LNG and being able to accurately analyze all the impurities and understand the mixture. GH/LH is an important commodity to analyze as it is also a part of many processes. Nitrogen is used similarly across all systems for pressurerant, purging, and inerting making it a major process stream to analyze as well, primarily for dryness. ECLSS gap is in the habitats and is going to be breathing air for personnel on long-duration missions. The solicitation calls out specs for the actual contaminants of interest and those processes.
TX13 - Ground, Test, and Surface Systems – H10.04	Mentions the "Ability to detect hydrocarbons, moisture, and total impurities at trace levels per NASA MSFC-STD-3535". What kind of gasses do these impurities need	LOX/GOX, Liquid Methane/Gaseous Methane, LH/GH, GN. They're within the propellants and the pressurants streams. The intent is to sample directly from those process streams. Then isru production to create these propellants and commodities on surface systems. Similarly, within the process streams from ISRU production, within the hydrogen, methane, and oxygen streams. Called out within the solicitation and specifications. There are links in the in the solicitation in the subtopic for more detail.

	to be detected in? ECLSS gases within a habitat?	
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing - A1.03	Can we propose sending our propellants (oxidizer and/or fuel but definitely separately) to the ISS to study it's behavior in microgravity over extended periods or would this experiment be better suited for Flight Opportunities?	The focus for the subtopic is primarily for aeronautics, subsonic transport. If there is a specific case where it might be useful to study extended duration microgravity exposure, it can be submitted in the proposal.
TX13 - Ground, Test, and Surface Systems – T13.02	This is a transfer Pump-not a cryo motor drive or cooling pump. Interest in non-direct coupled pump but a standalone unit? Support centrifugal and reciprocating pumps? Is there a pump technology that would be a focus of this solicitation?	For the bulk transfer of cryogenic fluids, we use systems with direct coupled centrifugal and reciprocating pumps separately and in tandem. This topic area focuses on the efficiency and reliability of the electrical equipment that drives the pumps. A solution consisting of an electrical system that can be utilized either with existing pump technologies or coupled with a specific pump technology would be acceptable.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing	Is it ok for to use microbes to produce secondary organic chemicals and feedstock products with novel fermentation process but not targeting biofilms?	This topic focuses on the use of biofilms, not to target biofilms. The process and molecules can be novel or old as long as they are within the list of feedstock and products specified in the call.
TX13 - Ground, Test,	It appears that this topic heavily	Alternate diagnostic solutions will be considered.

and Surface Systems – A1.08	emphasizes both molecular tagging and particle-based scattering methods. Are alternative diagnostic solutions going to be considered?	
TX13 - Ground, Test, and Surface Systems – A1.08	Of the various flow parameters that the call requests to be measured by this technology (e.g., velocity, temperature, density, species concentration, water droplet sizes/concentrations, time-resolved, etc.), what are the higher priority flow parameters that the instrument should attempt to capture?	The emphasis should be on velocity, temperature, and density for just the regular air flows. When we have combustion, we would like to add species concentration, and the oil droplet or water droplet is covered in the second scope as well.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing – H8.01	Would high value novelty and art items created on ISS be a possibility? An open source platform where consumers have access to in space manufacturing for whatever they want for a price?	We have an opportunity through our commercial pricing strategy where we've tried to support production of “trinkets” or “chatsky's” that have some value, but it hasn't really shown to be sustainable economically. It would have to be an item with significantly high value to customers to outweigh the cost of access to and operations in LEO. Art isn't ruled out, but is unlikely to be competitive with other concepts.
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing	Does T12.11 rely exclusively on in-mission byproducts, or are additional materials (e.g.,	Mission by-products and waste are preferred because of the lack of re-supply and spares.

	nutrients) can be employed?	
TX12 - Materials, Structures, Mechanical Systems, and Manufacturing	TX12/T12.10 could this include cryogenic fluid storage tanks?	No, the intent is to protect the outer mold line (OML) of a vehicle during entry.