INNOVATION & OPPORTUNITY CONFERENCE

ADVANCING AEROSPACE AND DEFENSE
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Advanced Materials and Manufacturing Technology Focus Areas

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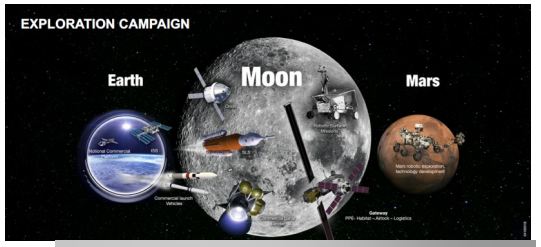
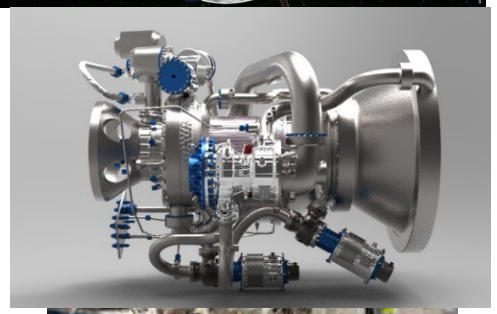
Advanced Manufacturing and In-Space Manufacturing

Develop critical technologies needed to enable scientific and commercial exploration missions for a sustainable low-earth orbit capability and to expand our presence to destinations such as cislunar space, the moon, and Mars. Develop cross-cutting space technologies of significant benefit to NASA, industry and other government agencies. NASA has an immediate need for more affordable and more capable materials and processes across its unique missions, systems, and platforms.





- **Goal: Additive Manufacturing (AM) has begun to dramatically change much of the aerospace design and manufacturing paradigm and can significantly reduce the time and cost of the traditional aerospace hardware development cycle. In space, the constraints of our current paradigm have limited our potential for space exploration. The ability to conduct in-space manufacturing (ISM) is integral to achieving our goals for exploration and enable more resilient, affordable, and capable space systems.**

- **Challenge: This technology area is aimed at innovative technical approaches that offer promise for accelerated infusion of additively manufactured parts and new methodologies for production of spaceflight hardware. The ability to manufacture parts in space rather than launch them from Earth, "In-space manufacturing" technologies and capabilities are critical for new space missions, operations, and infrastructure.**

- **Innovation: Research and development of additive manufacturing technologies for their potential to increase capability and affordability of engines, vehicles and space systems. There is a substantial difference in the ability to manufacture parts on the earth vs. in space. New technologies as well as the ability to certify processes for ISM are needed.**

National Space Strategy 2018 - (U) On-orbit Servicing and Manufacturing.
Explore new capabilities to service, manufacture, and assemble space systems

Mass Reduction for Orbital, Cis-Lunar and Lunar surface Infrastructure

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- **Goal: Today's technology limits the mass and cost savings available for systems and structures used for deep space exploration. Long-duration, cis-lunar and surface missions require human-rated, light-weight, space habitat and laboratory infrastructure certified to meet demanding environmental and life requirements.**

- **Challenge: This technology area is aimed at driving technological advancements to provide provide additional functionality, reduce the mass, and reduce cost for human rated composite structures. Multidisciplinary advanced materials, manufacturing and structures innovations are required to enable the use of advanced composite materials with health monitoring to achieve significant mass savings. Immature capabilities limit use and rate of innovation.**

- **Innovation: The use of advanced multifunctional (e.g. structural, thermal, radiation shielding) composite materials especially smart structures (e.g. self-sensing) can offer >30% mass savings, >20% cost savings and increased capability, safety margin, and life. Reliability is an enabling consideration for deep space travel and though composites can offer significant weight and cost benefits there are still technical and cultural challenges to their implementation in some space applications.**

"The lighter you travel, the more space vehicles, rovers, habitats, science instruments and so forth that you're able to bring with you."