



National Aeronautics and
Space Administration



On-orbit Servicing Assembly and Manufacturing (OSAM) Technology Transfer Workshop

Journeying Longer and Seeing Farther

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Surface Construction

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This document has been approved for public release.



Why Surface Construction on the Moon & Mars?



- Mission Planners continue to stress the need for infrastructure that ensures safety of crew and critical systems [point to Safe Site presentation by Arney]
- Some infrastructure of current interest includes:
 - Durable Landing Pads for reusable landers to prevent ejecta of rocks and sand
 - Blast Berms around lander refueling operations and fission reactors
 - Meters thick of shielding around crew habitats to protect against high-energy Galactic Cosmic Ray radiation, micrometeoroid impacts, thermal swings, and other environmental conditions
 - Smooth roadways that reduce wear and tear on vehicles and other mobility systems
 - Trenching for building foundations and burying cables
- This infrastructure is too massive to bring from Earth
- Resources on the Moon and Mars vastly differ from construction materials used routinely on Earth

Current Understanding & Capabilities



- Resources on the Moon and Mars must be moved, reshaped, and in some cases heated to high temperature to apply them to the mission needs mentioned earlier
- NASA has begun developing some systems that can conduct these tasks
- Melting and 3D printing with regolith requires power levels that are currently beyond NASA's capabilities
- On the Moon, focusing sunlight may offer a near-term solution to explore further and to allow us to demonstrate construction of these important infrastructure elements before heading to Mars...

System Concepts (Highlighted in Video)



- To heat and 3D print with regolith, a large autonomous mobile **Cassegrain Solar Collector** focuses sunlight to melt regolith that is deposited onto the lunar surface to construct a landing pad
- An **Excavator** concept (developed at Kennedy Space Center) refills the regolith bin on the Cassegrain Solar Collector
- A **Bulldozer** concept (developed at Kennedy Space Center) smooths and compacts driving and other surfaces made of regolith
- A **Crane** concept lifts beams and panels into place
- A **Trencher** concept buries electrical conduits, cables, and possibly water lines to protect them from the harsh environment