



The NASA MMPACT Project – Autonomous Construction of Infrastructure for a Sustainable Presence on the Lunar Surface

R. G. Clinton, Jr., PI
LSIC Spring Workshop
May 12, 2021

Moon-to Mars Planetary Autonomous Construction Technologies (MMPACT) Overview



GOAL

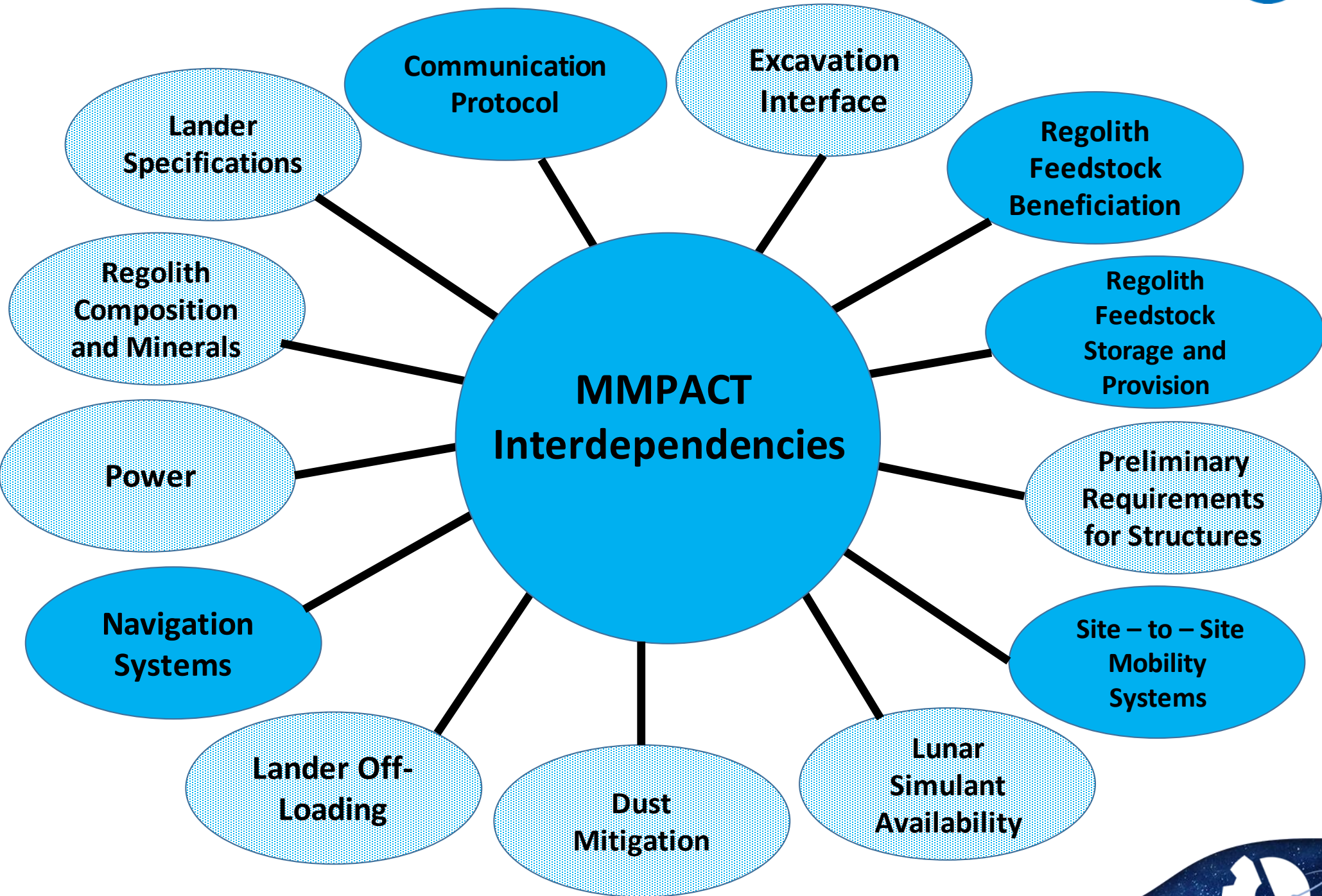
Develop, deliver, and demonstrate on-demand capabilities to protect astronauts and create infrastructure on the lunar surface via construction of landing pads, habitats, shelters, roadways, berms and blast shields using lunar regolith-based materials.

APPROACH

- MMPACT is comprised of 3 interrelated elements
 - Olympus – Autonomous Construction System
 - Construction Feedstock Materials Development
 - Microwave Structure Construction Capability (MSCC)
- High Level Capability Gaps (including those identified by the LSII Formulation Guidance for Lunar Surface Construction):
 - Deposition processes and associated materials
 - Increased autonomy of operations
 - Hardware operation and manufacturing under lunar environmental conditions
 - Long-duration operation of mechanisms and parts
 - Scale of construction activities
 - Material and construction requirements and standards



MMPACT Interdependencies



Demonstration Mission -1 (DM-1) Objective :

Demonstrate Viable ISRU-based Structural Capabilities

- In order to thrive on the lunar surface, we must "live off the land".
- Is it possible to work with what we have on the lunar surface?
- *Our primary objective is to create structural components while minimizing the amount of materials brought from Earth.*



Lunar Construction Capability Development Roadmap

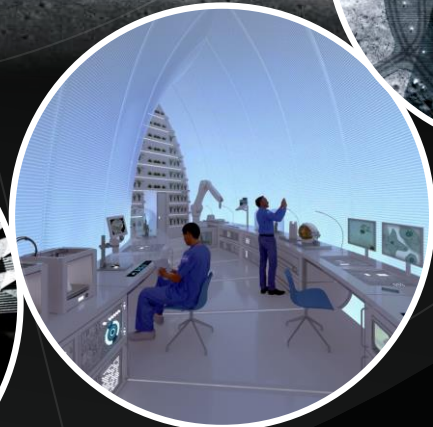


Phase 1:

Develop & demonstrate excavation & construction capabilities for on-demand fabrication of critical lunar infrastructure such as landing pads, structures, habitats, roadways, blast walls, etc.



Phase 2: Establish lunar infrastructure construction capability with the initial base habitat design structures.



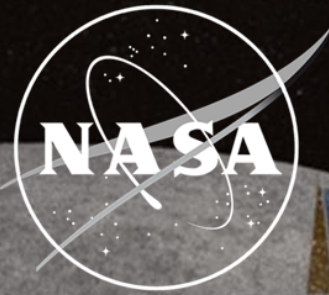
Phase 3:

Build the lunar base according to master plan to support the planned population size of the first permanent settlement (lunar outpost).



Phase 4: Complete build-out of the lunar base per the master plan and add additional structures as strategic expansion needs change over time.





Technology Drives Exploration

