



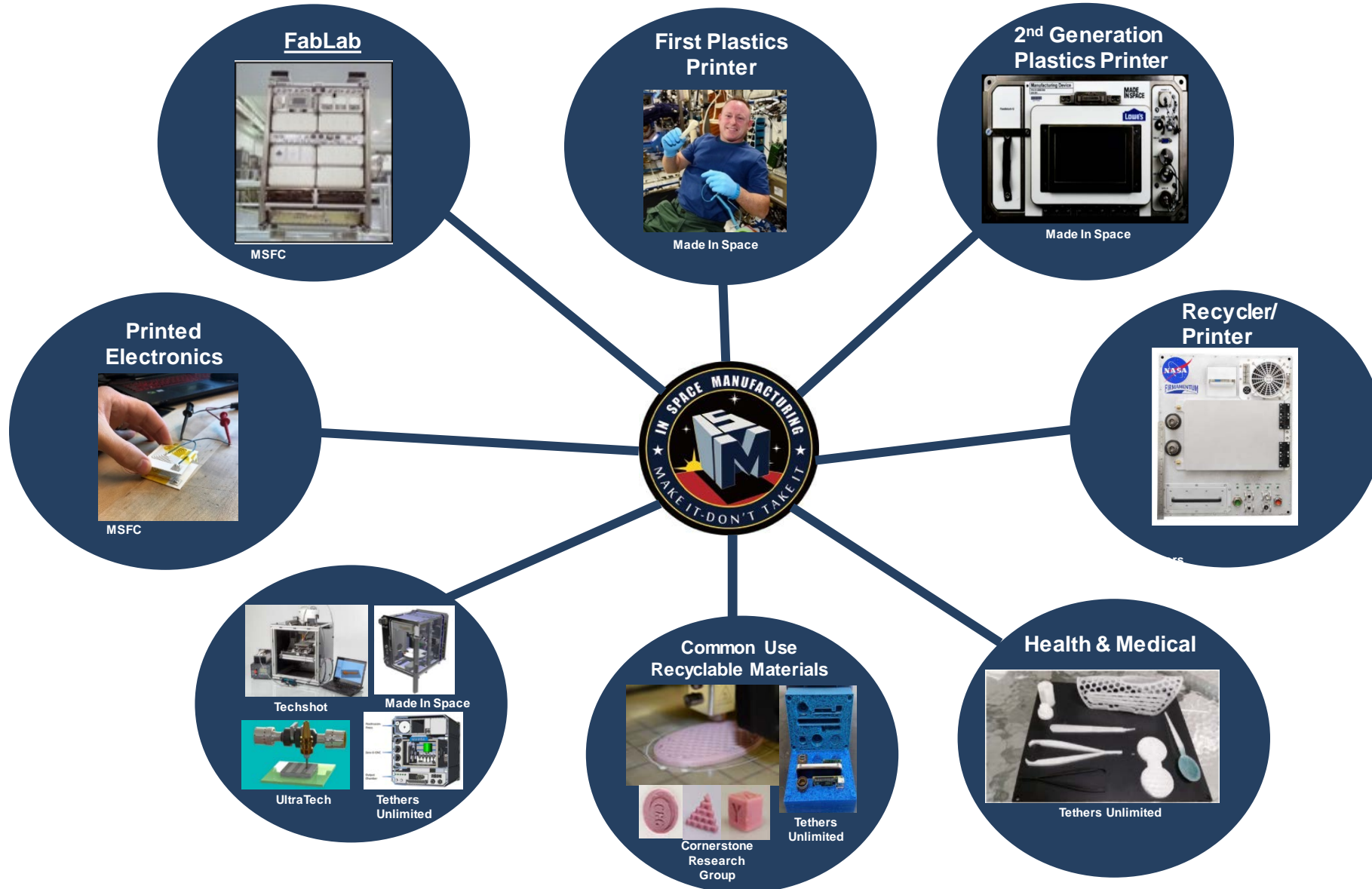
Materials and Manufacturing: In Space and For Space

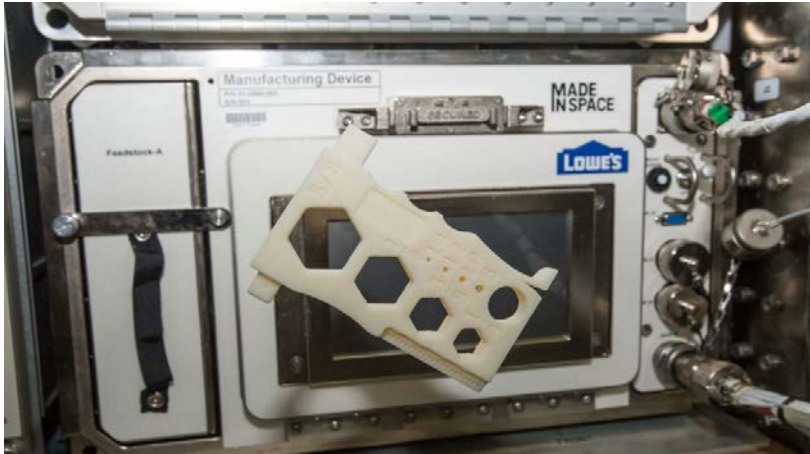
R.G. Clinton Jr., PhD
Associate Director
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NASA Marshall Space Flight Center

ISS R&D Conference
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Atlanta GA

In Space Manufacturing Path to Exploration

Key Thrust Areas



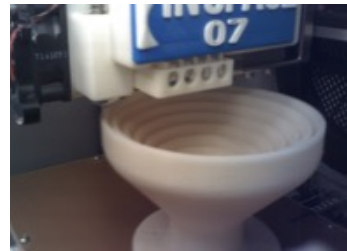


AMF on ISS with printed multi-purpose tool floating in front (photos courtesy of MIS)

- Additive Manufacturing Facility (AMF), the second generation printer, is a commercial, multi-user facility developed by Made in Space, Inc.
- Upgrades beyond 3DP include:
 - a) Print with multiple material (ABS, ULTEM 9085, and HDPE)
 - b) Integral cameras/sensors for automated monitoring
 - c) Maintenance procedures reduce crew time
 - d) Leveling and calibration with on-board systems
- Materials characterization task developing baseline mechanical properties on ABS (test matrix below)



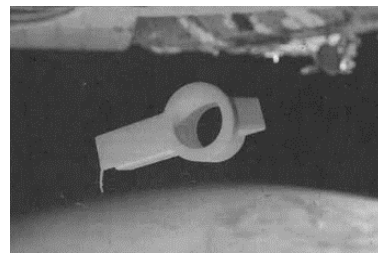
SPHERES Tow Hitch



Antenna Feed Horn



REM Shield Enclosure



OGS AAA Adapter

AMF Mechanical Property Test Matrix				
Type, Orientation	Qty (ground)	Quantity (flight)	ASTM #	Properties
Tension, 0	10	10	D638	Modulus, strength, strain, Poisson's
Tension, 90	10	10	D638	Modulus, strength, strain
Compression, 0	10	10	D695	Modulus, "strength," strain
Compression, 90	10	10	D695	Modulus, "strength," strain
Tension, +/-45 (shear)	10	10	D3518	Modulus, strength, strain, Poisson's
Flatwise tension	10	10	C297	z-direction (through-thickness) tensile strength
Range coupon	2	2	n/a	n/a
EMU fan cap	1	1	n/a	n/a
Total	63	63		



MIS CEO Andrew Rush with a demonstration of the ArchinautOne Solar array

Objectives:

- Continue success of ESAMM and GBMASH to build ArchinautOne
 - Small satellite with best in class power capability
 - Operate in LEO
 - ESAMM unit will produce 2x 10 m beams which support 10 m² flexible solar panels each
 - Robotic arm will position vital components
 - In-situ V&V ensures quality product

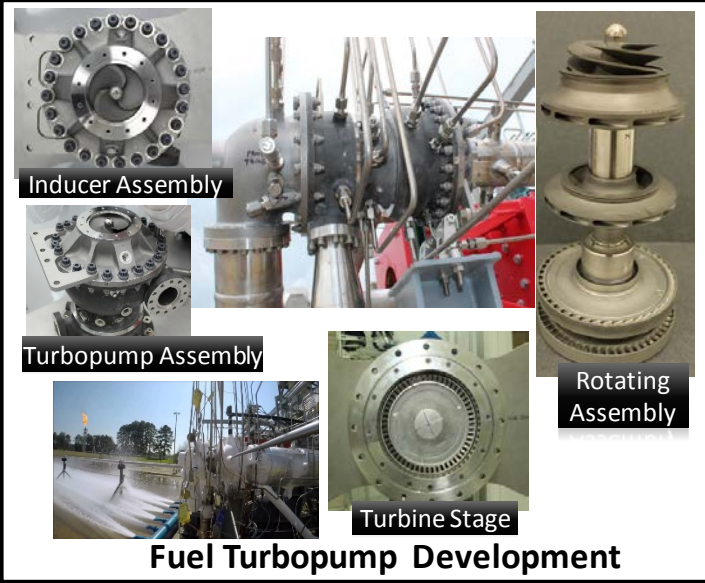
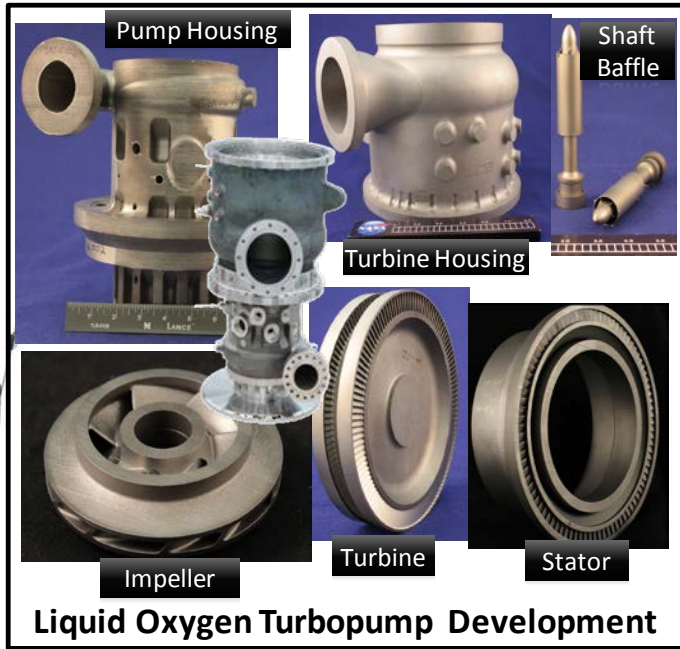
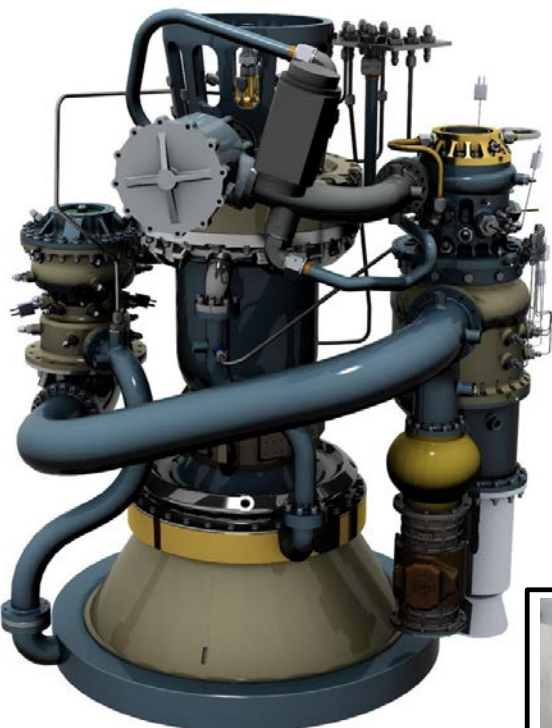
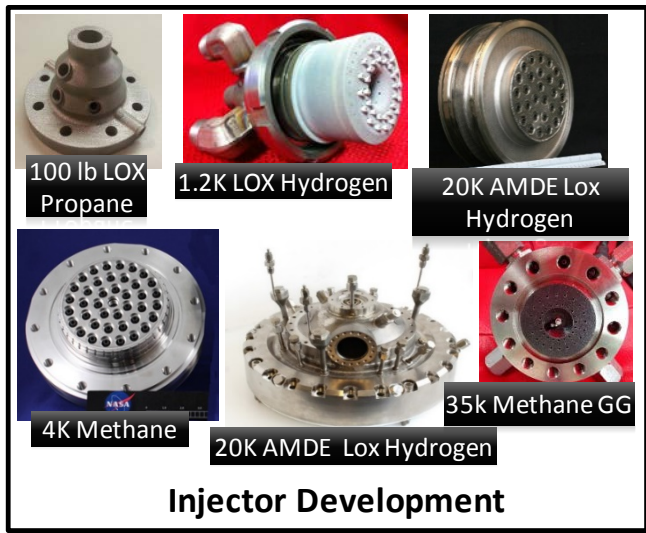
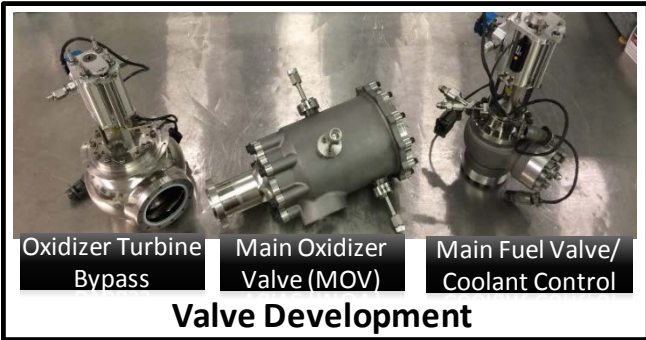


ArchinautOne Small Sat



ArchinautOne Small Sat with printed solar arrays

Demonstration of small satellite with >2kW power



Rapid Analysis and Manufacturing Propulsion Technology (RAMPT) Thrust Chamber Concept

