

Fused Deposition Modeling (FDM) Technology Demo Concept for MSG

- **Objective: Determine Microgravity Effects on Materials Behavior**
 - How surface tension affects fusion zone as layers are successively built-up
 - How lack of thermal convection affects solidification within fusion zone
 - How process velocity and temperature setpoints are affected
 - How support of overhang features are affected
- **Processing Heads Exchangeable for Multi-material Support**
 - Contains Fusion Head & Replacement Feed Materials
 - Feed Material On Spools & Preloaded Into Fusion Head
 - Multiple Materials Supported Via Replacement Modules
- **Utilize PFMI/SUBSA Components Aboard ISS Where Possible**
 - 2 Video Cameras, 1 DaqPad & 1 Process Control Module (PCM)
 - Smart Motors w/Integrated Communications, Pulse Driver & Controller
 - Add Linear Position Encoders for Precision of 1-3 Microns Resolution
- **Process Control & Video Subsystem**
 - Supervisor Laptop Interfaces to MSG RS422 for Remote Commands
 - PC104 System Controls Motors on Fusion Head & XYZ Stage
 - Firmware Controllers in PCM Maintain Temperatures
 - Remote Downlink From MSG Video System to Ground
 - 2 MSG Video Screens Available for Crew Observation
 - Temps, Velocity, etc... Data Overlaid on Video Images

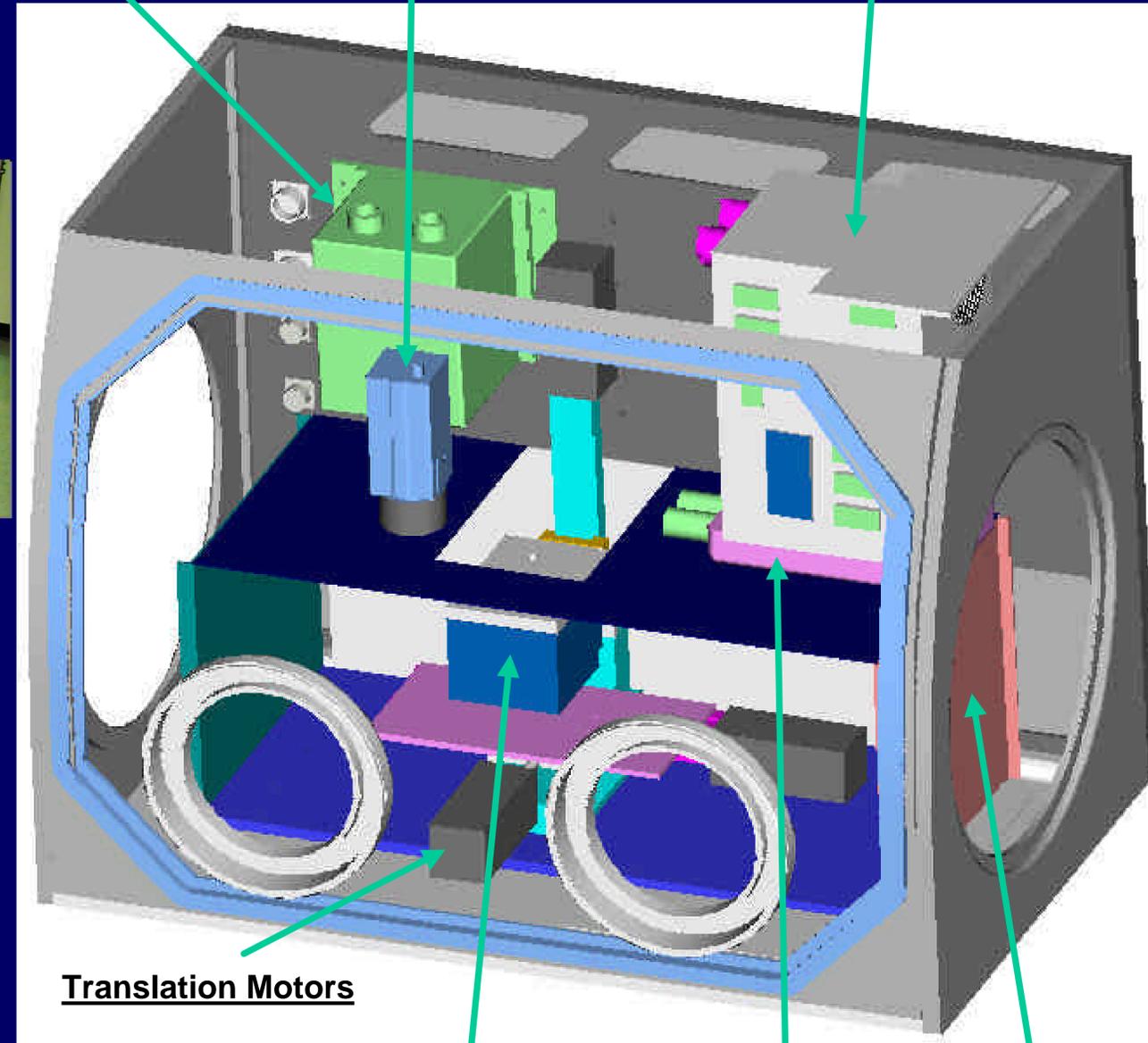
PC104 Computer
 -Translation Control
 -Fusion Feed Control

PFMI/SUBSA Video Cameras
 -22:1 Zoom Range
 -Auto-focus
 -Onboard ISS

Process Control Module
 -Command & Data Handling
 -Temperature Control
 -Video Overlays

NASA/MSFC Stratasys SFF

Apparatus Flown on the KC-135 Aircraft



Translation Motors

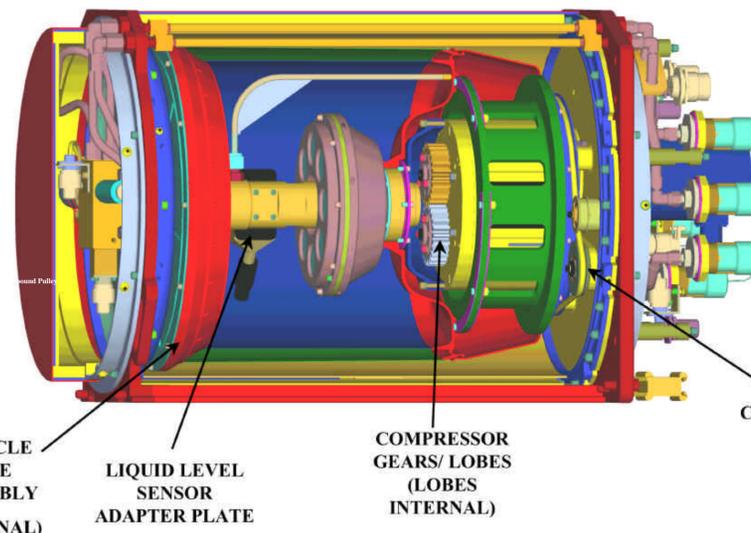
Processing Head
 -Exchangeable
 -ABS Plastic
 -Polycarbonate

Thermal Enclosure

DaqPad Module
 -Gathers Temperature Data
 -Onboard ISS for PFMI/SUBSA

ISS ECLSS Urine Processor Distillation Assembly Parts Produced by SFF

DISTILLATION ASSEMBLY



RECYCLE TUBE ASSEMBLY (INTERNAL)
 LIQUID LEVEL SENSOR ADAPTER PLATE
 COMPRESSOR GEARS/LOBES (INTERNAL)
 COMPOUND PULLEY

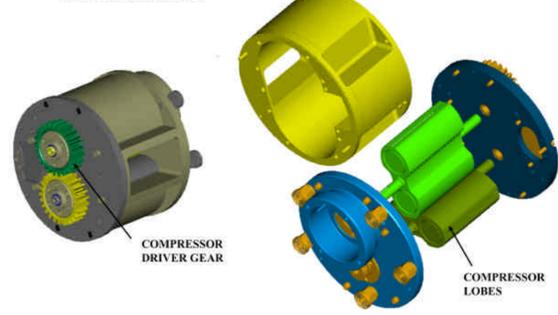
ECLSS UPA Distillation Assembly Unit
 Driver Gear (Compressor)



ECLSS UPA Distillation Assembly Unit
 Compound Pulley



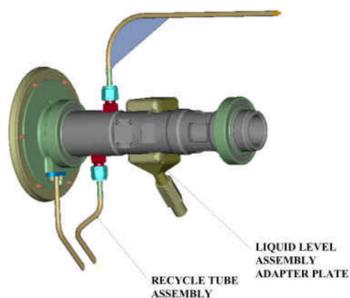
COMPRESSOR ASSEMBLY



COMPRESSOR DRIVER GEAR

COMPRESSOR LOBES

ECLSS UPA Distillation Assembly Unit
 Recycle Tube Assembly



LIQUID LEVEL SENSOR ADAPTER PLATE
 RECYCLE TUBE ASSEMBLY

ECLSS UPA Distillation Assembly Unit
 Adapter Plate / Liquid Level Sensor Assembly



ECLSS UPA Distillation Assembly Unit
 Compressor Rotor Lobe

