

# As-Needed Manufacturing of Personalized Hand/Wrist Splints for Therapeutics in Space Flight Missions

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# Introduction

- Utilization of additive manufacturing for treatment of medical conditions in space flight
- Problem Statement
  - Given the low likelihood and high consequence of a major medical event in space flight, how much operational resources (mass, volume, training time, etc.) are dedicated to addressing the medical event given the limited amount space vehicle space and crew time
  - Current space flight logistics paradigm is to resupply from Earth

# Introduction

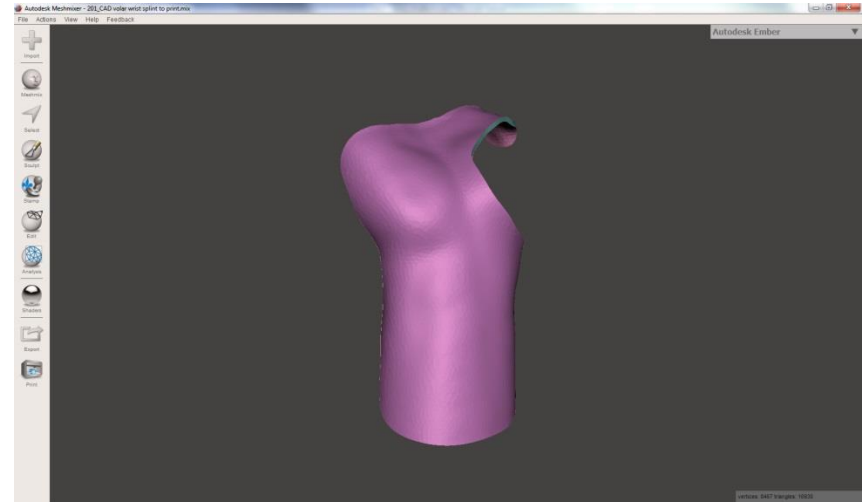
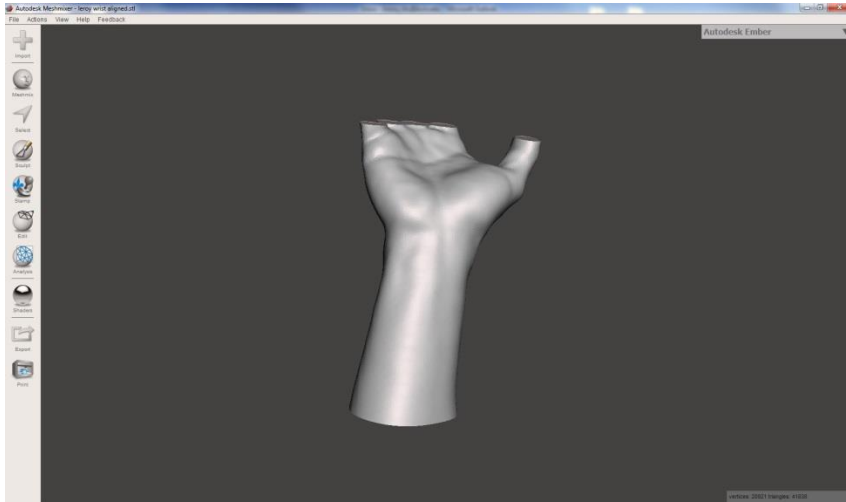
- Additive Manufacturing gives the capability to fabricate hardware as-needed for usage or resupply
- Coupled with 3D scanning, personalization of medical hardware is possible

# 3D Scanning

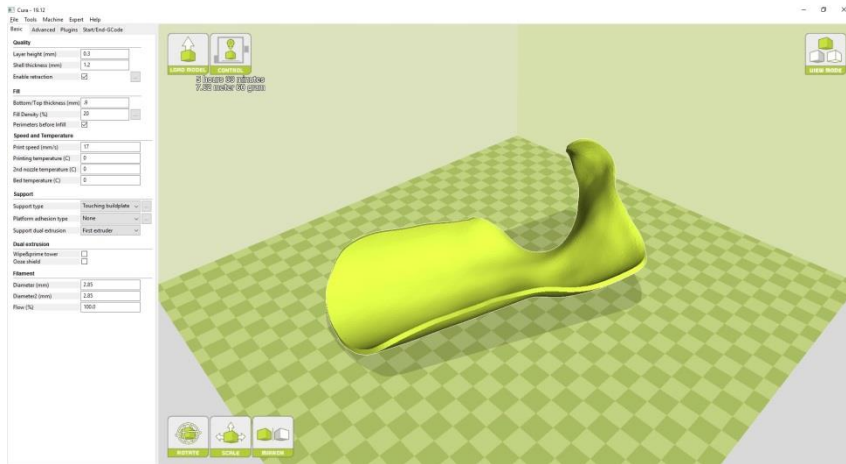


TechMed3D BodyScan

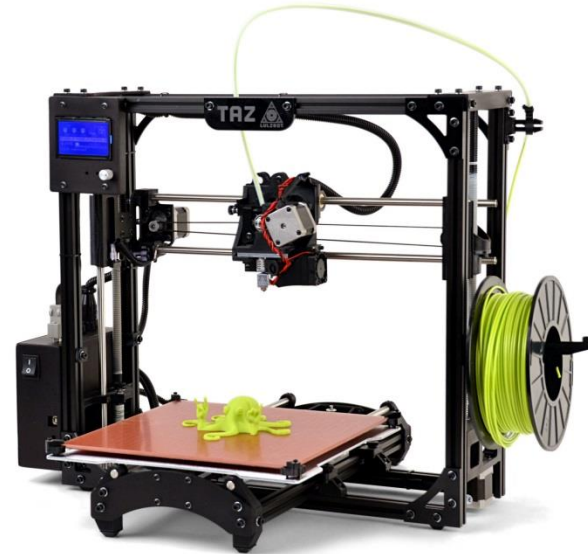
# CAD Manipulation



# 3D Print

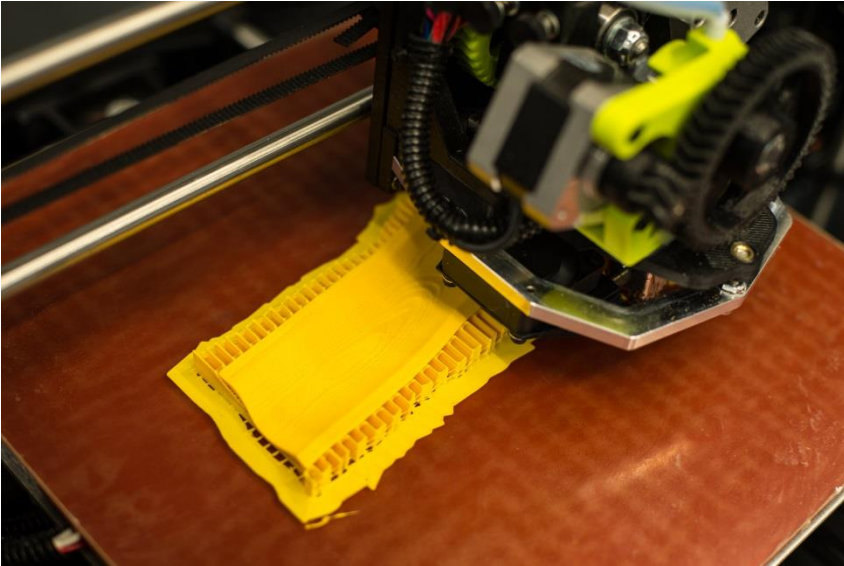


Cura gcode slicer



LulzBot TAZ 5

# 3D Printed Splints





# Next Steps

- Continue evaluation and comparison of 3D printed splints against conventional splinting technology
  - Methodology, technical skill set
  - Mass, volume, power, training time, etc.
  - Clinical outcome

# Future Vision

- Expand to other orthopedic injuries
  - 14 of 100 medical conditions on Exploration Medical Condition list are orthopedic in nature
- As-needed fabrication of medical equipment and biosensor hardware
  - Multi-constituent 3D printing of more complex devices
  - Modular design approach using 3D printing to fabricate chassis, connectors, and interfaces
  - Develop platform of personalized biometric wearables

# Future Vision

- Personalization
  - Customized to anthropometric needs
- Attachments to aid novice or robotic operators
- Novel space medical operations paradigm not dependent on Earth-based resupply
  - Transmission of digital CAD files
  - Digital library of hardware

# Collaboration Opportunities

- Recycled Feedstock
  - Determine material performance
- Integrated 3D scanner and printer systems
  - Fabricate on top of an existing component
- Integration with content presentation platforms for refresher and/or just-in-time training
  - Fabrication of hardware should also be accompanied by training to use the hardware

# Thank you