

NASA International Space App Challenge 2020

**Challenge: Create
(Virtual Planetary Exploration)**

Multi Tool Kit - Down The Load to Reduce Payload

By - Team Mad Engineers

PROBLEM

- Payload is directly proportional to cost and therefore is the most crucial determinant in any space mission.
- It costs \$10,000 for each Kilogram in a space shuttle.
- Thus they need to RATION everything they carry from fuel, food to form of things

CONSEQUENCE

- A crew of 4 would carry 11000 kgs / 24000 pounds of rationed food on space missions
- Carry Dehydrated packets as weight is an issue, also water is very heavy
- N-number of tools for various applications

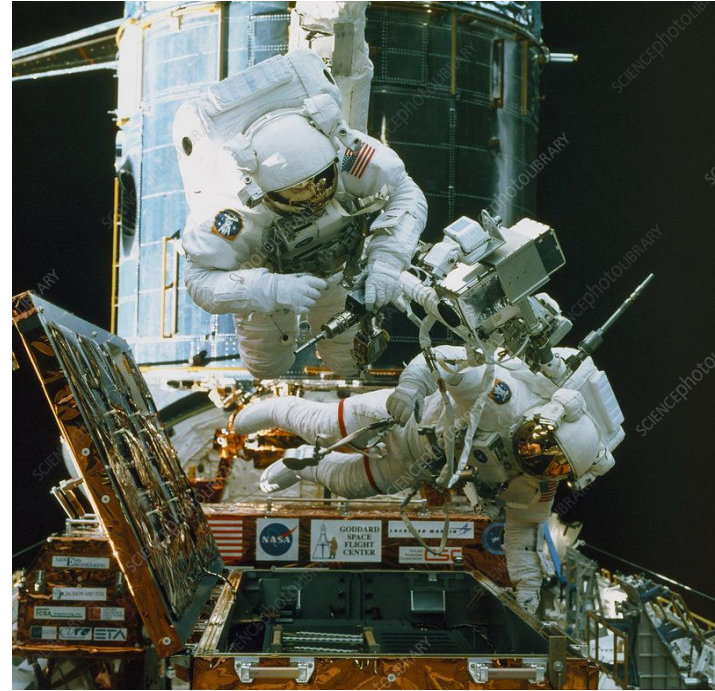
AREA OF RESEARCH

MACHINERY PROBLEMS IN SPACECRAFT:

- Waste accumulation after the Columbia disaster.
- Air leak and Elektron oxygen generator failure.
- Elektron oxygen generator fails again.
- Venting of gas.
- Computer failure.
- Torn solar panel.
- Damaged starboard Solar Alpha Rotary Joint.
- Excessive vibration during reboost.

TOOLS USED BY ASTRONAUTS:

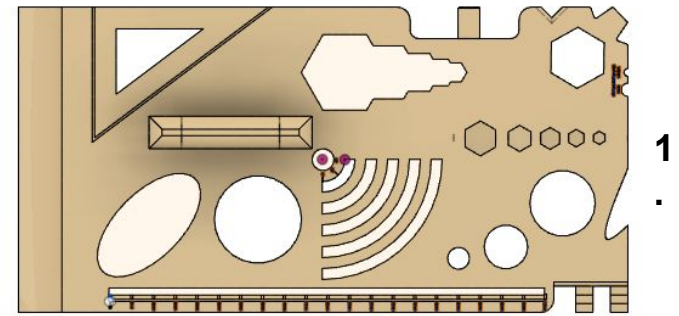
- The astronauts use trowels, scrapers, Screw Driver, Wrench, Spanner, Various Keys, infrared camera, thermal sensor, and caulking gun for repairing things in the spacecraft.



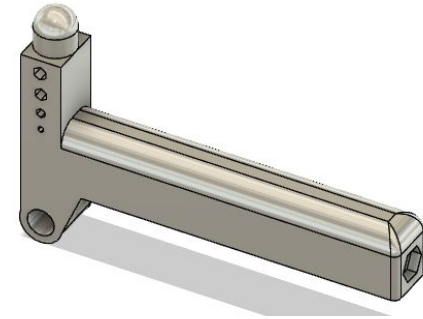
SOLUTION

A Unique 3D tool that serve Multipurpose functions for most common and many repairworks. We also made Geology hand tools.

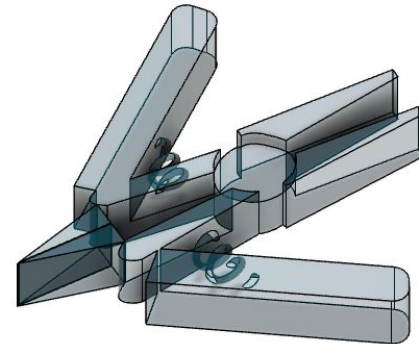
- 1. Multi Engineering Tool:** Has 25 integrated tools on it. Shortlisted the most commonly used tools Spanner, Wrench, Allen Keys, Hex Spanner, Wire Striper, Screw Driver, Bottle Opener, Ruler, Protractor, Set Square, Various Geometry, 3D Printer filament Gauge, Scraper, Nozzle Removal Tool etc.
- 2. 4 In 1 Tool**
- 3. Swier = Scissor+Wire Cutter**



1
.



2
.



3
.

Solution Brief

- The Problem is that, **reducing a amount of total payload** without compromising mission objective and to withstand in any situation from space shuttle launch to space/planet exploration & **efficient utilization of space in space craft.**
- But again it requires a **lots of tools** for maintenance, for daily work, science experiments & for planetary exploration.
- Multitool can reduce weight up to 0.5 kg per tool depending upon types of tool.

Benefits

- Printing this one tool will use less material, space and weight/ payload
- Accessibility to many tools
- Weight Reduction due to more tool integration in one tool
- Consumes less space in storage
- Some tools can be easily 3D printed
- Reduce the production cost of tool
- Reduce the total amount of payload in space mission
- 3D model files easily available

Use of Data Resources

- For developing multi engineering tools, we used many data resource which is given by NASA, ESA, JAXA etc. Below mentioned resources we used as reference.

1. [Apollo 16 Press Kit](#)
2. [NASA 3D Models](#)
3. [Artemis Geology Tools EVA Exploration](#)

3D Model Web Deployment - [Website Link](#)

