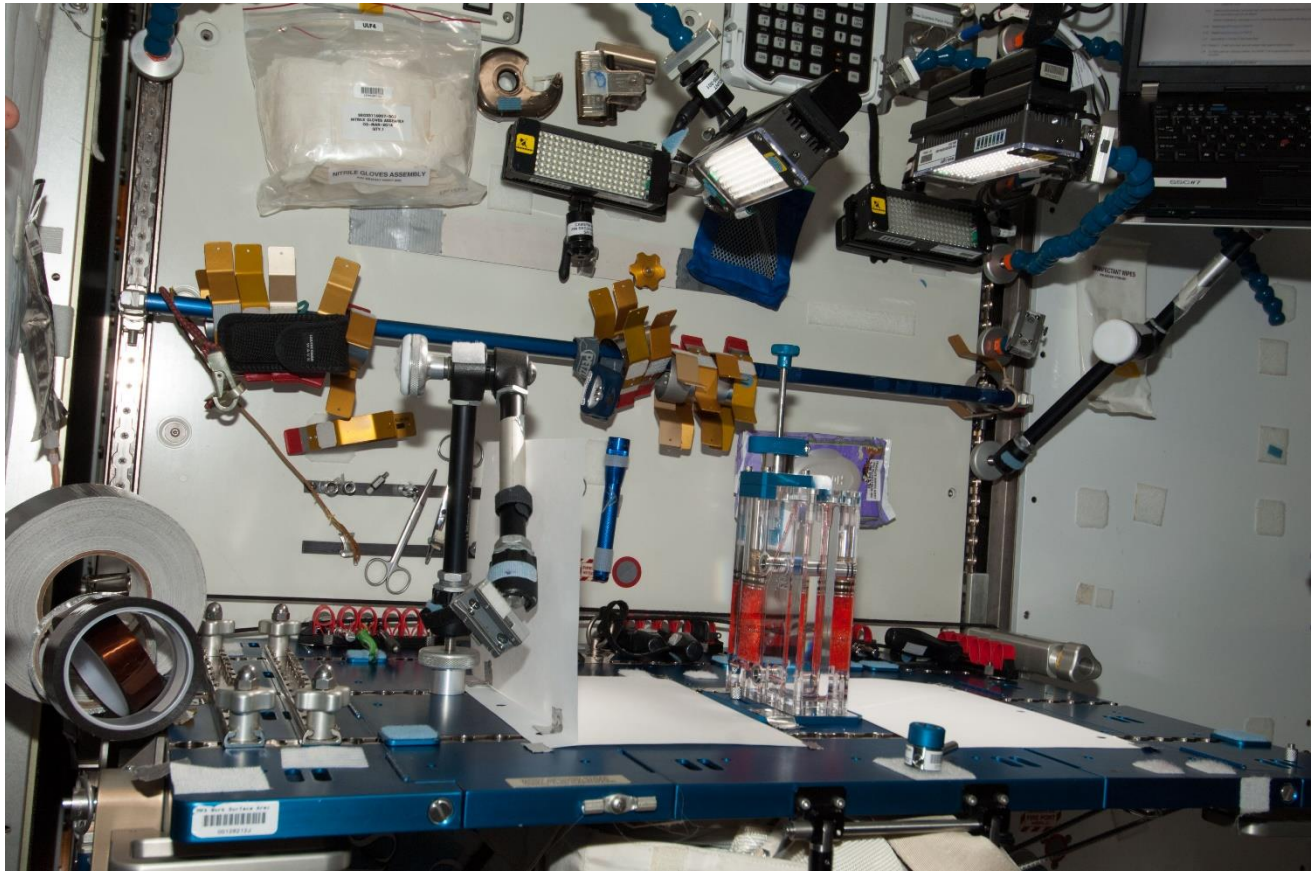
HUNCH One handed Tape dispenser

Mentors: Glenn Johnson, Alli Westover, Flo Gold, Bill Gibson, Bob Zeek,

Schools: Windsor H. S. CT, Lakewood H.S. CO, Cypress Woods H.S. TX, Decatur H.S. AL, Clear Creek H.S. TX, Dade County M.S. GA



Problems with tape on orbit

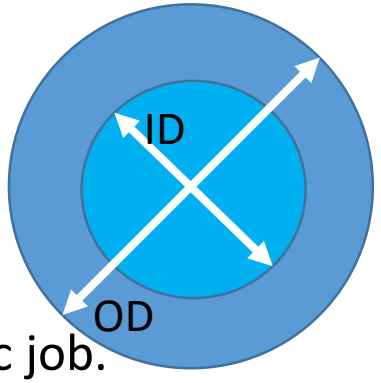
- Kapton and Gray tape are the most commonly used tapes on the ISS
- Although there are over 22 different types of tape on the ISS, these two are the most commonly used and the ones the crew has the most problems with.
- Both are used on a daily basis for both mundane activities and critical activities including sealing bags, holding parts, panels, screens, filters, ……
- Both Gray tape and Kapton tape are difficult to rip and are often cut with scissors or by ripping with teeth and require two or more hands to separate effectively.
- Without gravity, static electricity often will pull a long strip of tape back onto itself after being cut, making the tape less effective or useless.
- Dealing with these difficulties causes wasted time and materials as well as crew frustration.
- None of the COTS dispensers for kapton and gray tape have a mechanism for holding the roll strongly enough to pull the tape—because gray tape is pretty tough to get off a roll, some sort of seat track attachment would be preferable.
- There is already a COTS dispenser for Scotch tape on ISS.

Flight design that was adopted from student ideas and NASA engineering teams.

These are the requirements the students had worked off:

Tape Dispenser

- – Tape is difficult to manage on-orbit and a one-hand-operable solution is desired.
  - There are 22 different kinds of tape on orbit but a dispenser is currently only needed for the Kapton tape, and Duct Tape.
  - Fresh roll of Kapton tape– ID= 3” OD= 4” width of tape is either 1” or 2”
  - Fresh roll of Gray tape (duct tape)– ID= 3” OD= 6 ¾” width of tape is either 1” or 2”
  - One handed use of tape is important.
  - Cutting edge should be protected so crew isn’t cut by accident when floating past.
  - Helpful if individual rolls can be stowed together but may be separated for a specific job.
  - Seat track, handrail and/or Velcro attachment are good options for restraint. Velcro may be weak for one handed operation.
  - The pictures are only to illustrate that there are many different types of tape dispensers—don’t limit your ideas to what you have seen.



Engineering with the students

Talking points to students

- Mount to seat track—potentially 2 orientations
- Method of protecting blade needs to stay simple—needed?
- Gray tape and kapton tape may need different cutting blades.
- KEEP IT SIMPLE

What we learned from the many designs we saw.

- Most 3D printed designs were not Strong enough to handle repeated ripping of tape
- There was a lot more engineering in a good tape dispenser than we initially thought.
- HUNCH found a few designs that had potential for being simple enough for the ISS.

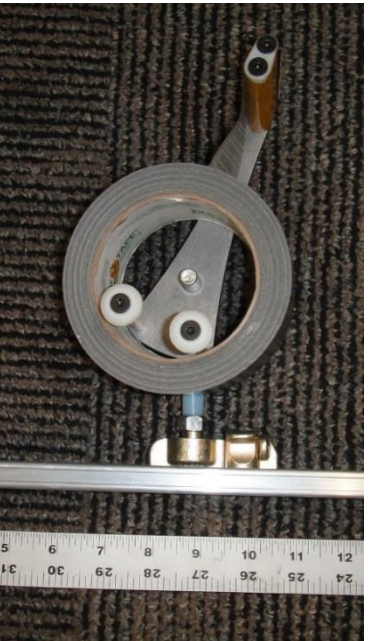
Lakewood H.S. Colorado

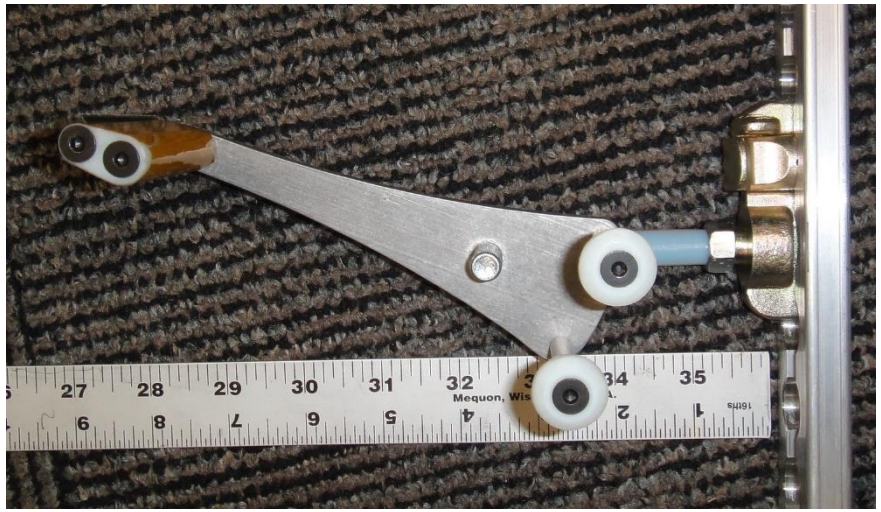
- tape holder box
- Has a retractable blade guard
- Flexible one piece roll holder
- Introduced the one handed seat track foot

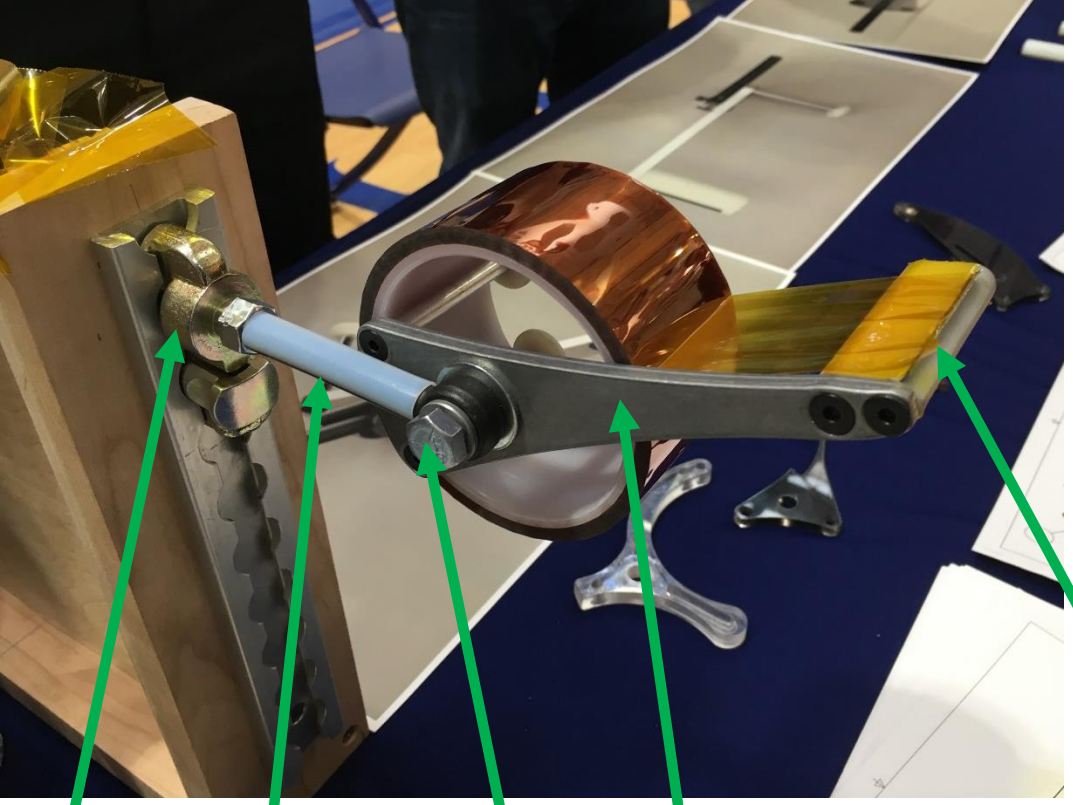
Tyler Cole
Jesse Marcelo
Cid Quazada
Oscar Hammond

Designed and built by Winsor High School in Connecticut

- Dustin Ricci (Teacher), Aaron Spaulding (team lead), Sam Driscoll, Tim McCaffrey, John Spear, Sean McCarty, Sean Doolittle, Jashua Holmes, Bryan Plunske, Sam Witham







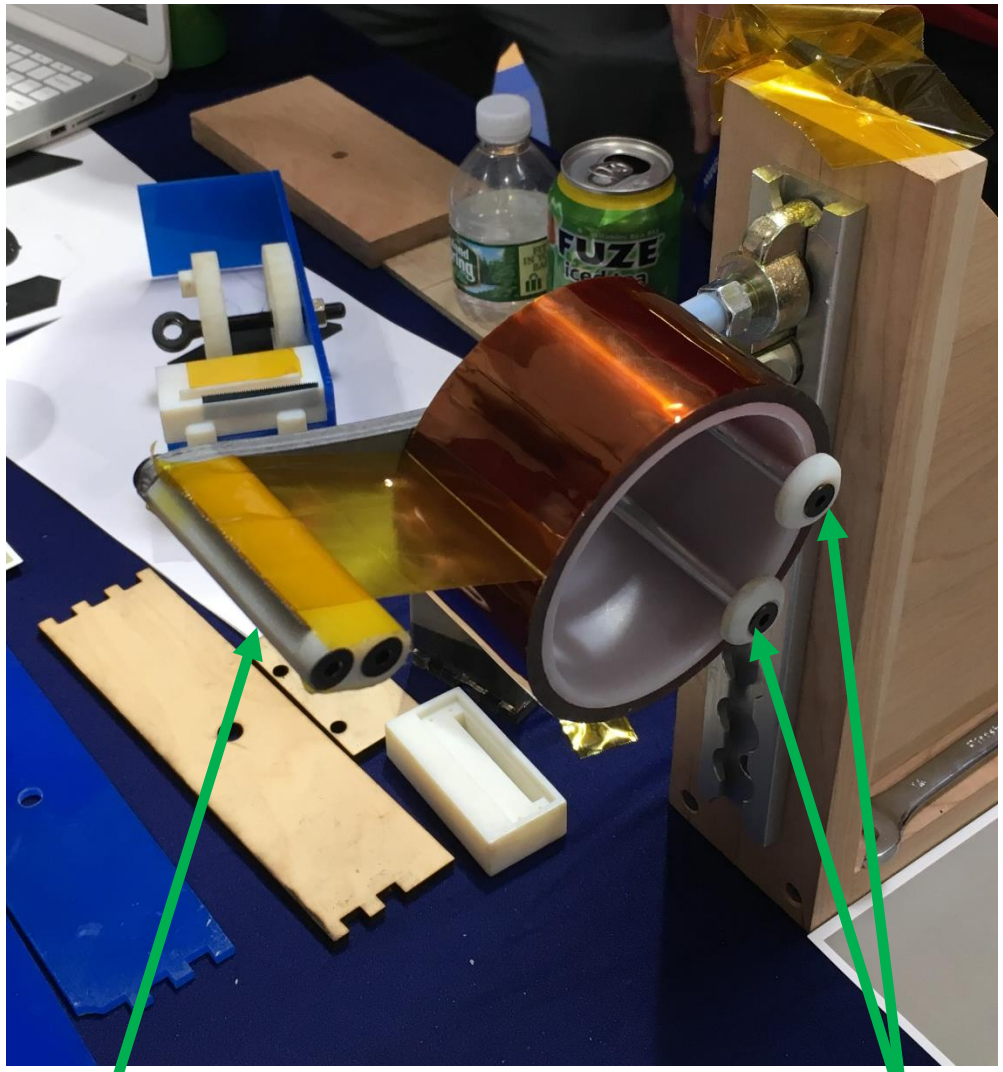
Seat track
Foot

3/8”-24 Eye bolt,
carbon steel, Teflon
covered threads

Pivot point

Aluminum Frame

cutter

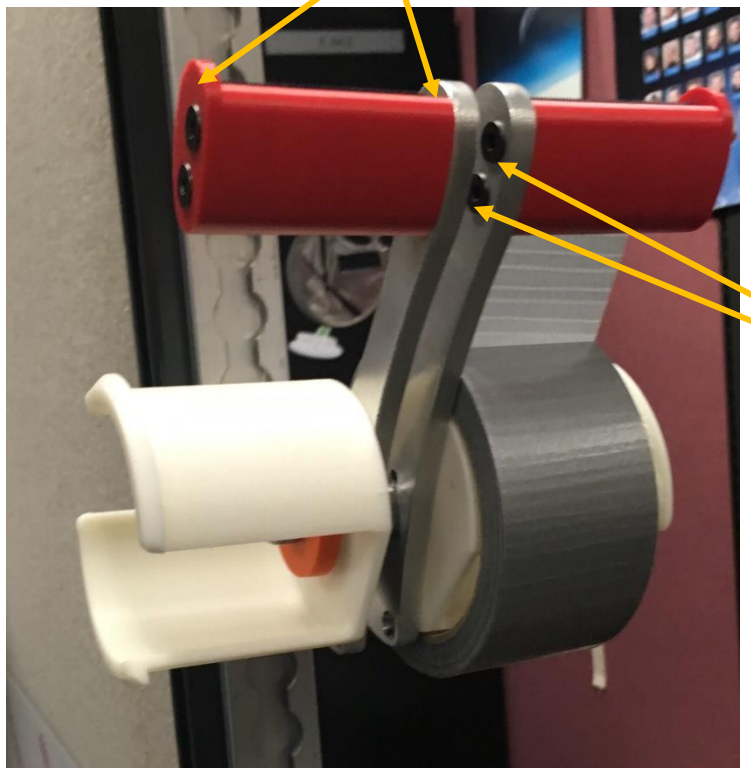


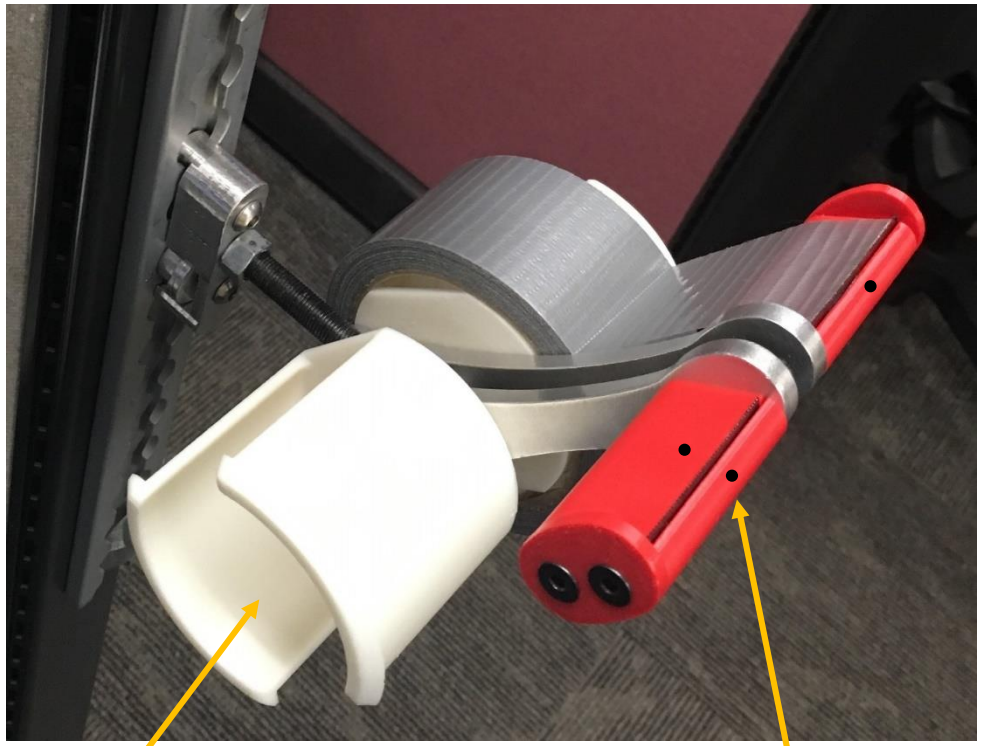
Blade holder and tape chin
ABS 3D printed plastic.

Roll holding pins

Tape Dispenser Upgrades

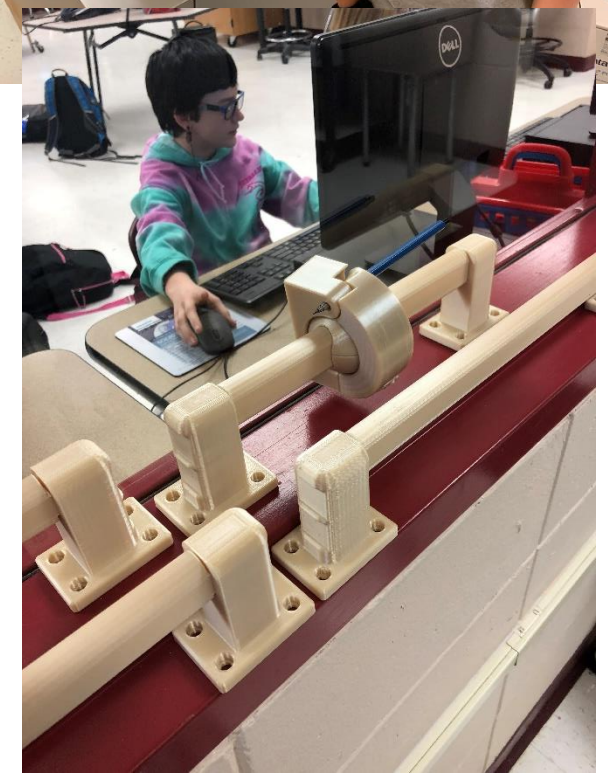
- Two dispensers on one seat track foot—one for duct tape and one for Kapton tape
- Updated dispenser axel
- Changed the angle of the dispenser to increase protection of the blades
- Added side blade guards
- Added one piece roll holder
- Added roll pin to hold cutter blades
- Added Helicoils to arm





ULTEM 3D printing

To save machining time and launch mass, many parts are printed out of light weight ULTEM. We are fortunate to have Dade County Middle School stepping up with the necessary equipment and excited students to help with the production and cleaning of flight hardware.

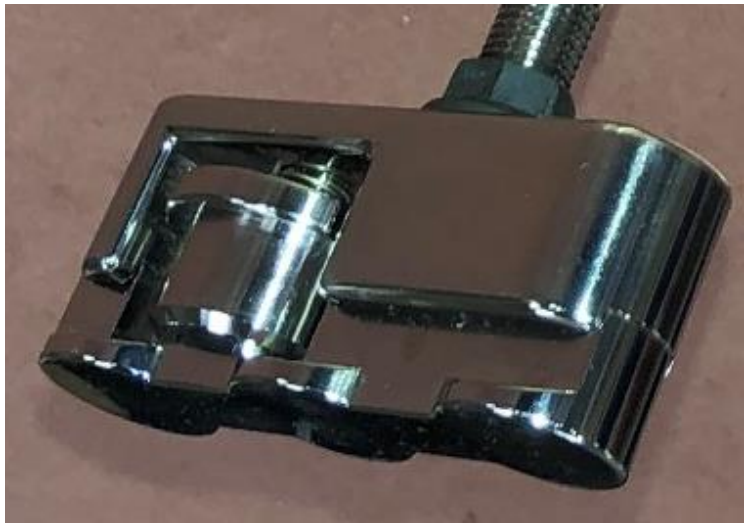


Seat track attachment

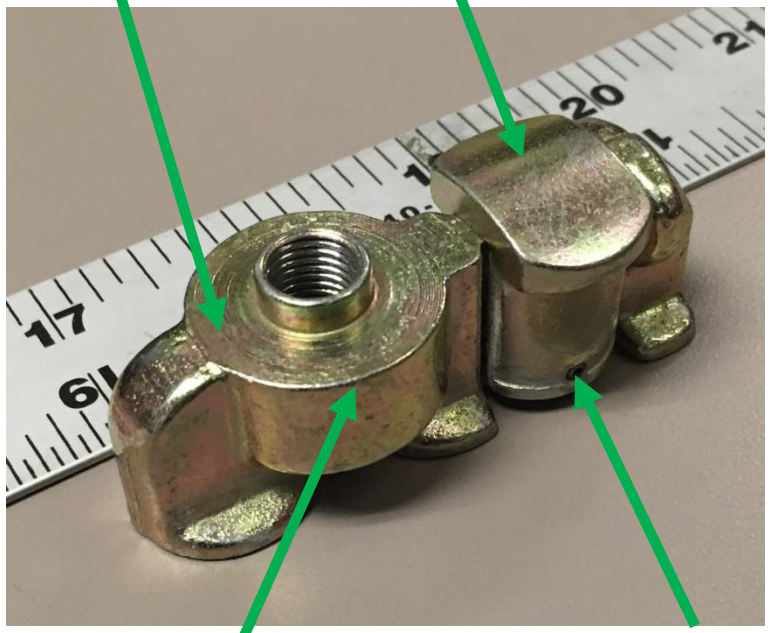
We had students at Winsor reverse engineer a cast steel Chinese seat track foot and simplify the design so it could be machined more easily.
The new seat track foot is made out of 15-5 stainless steel and machined by students from the Career Academies advanced manufacturing team in Decatur Alabama.

Brayden Brigans

David Crawford



Simplified design from students in Connecticut.



Original design

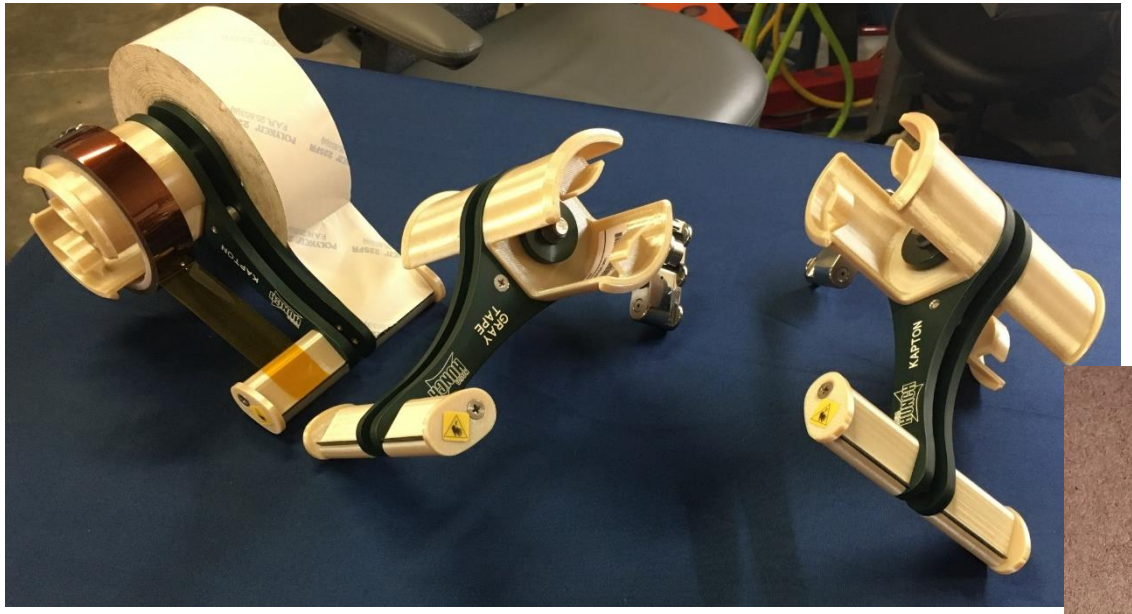
Safety

- It has a serrated blade to cut tape—necessary to be effective
  - Position the tape dispenser to minimize the chance of crew getting cut
  - Side bumpers to minimize chance of contact with the cutters
  - Sliding polyurethane sheet to avoid abrasion

  Expected materials include:
  - ULTEM, 6061 aluminum, stainless steel 15-5 for seat track, stainless steel bolts.

This is a 3M tape dispenser with a sliding paper sheet to minimize risk of abrasion. The HUNCH Tape Dispenser is utilizing a similar technique.

HUNCH Tape Dispenser



- Cuts gray tape and kapton tape easily
- Handles either 1” or 2” tape rolls
- Allows for one handed operation
- Aluminum, ULTEM, stainless steel construction keeps Dispenser solidly on seat track when pulling and cutting tough tape
- Angled attachment to seat track to minimize obstruction of translation path and exposure to cutting blades

Urethane blade covers protect people from blades but stays out of the way for cutting tape

Side guards around cutter helps prevent bumping into the blades

Finger tabs make it easy to remove and replace tape rolls

One handed seat track foot allows for easy installation and removal to new location

HUNCH One handed Tape Dispenser on Orbit with Expedition 64