

ISS020E008141

HUNCH CEVIS Handles

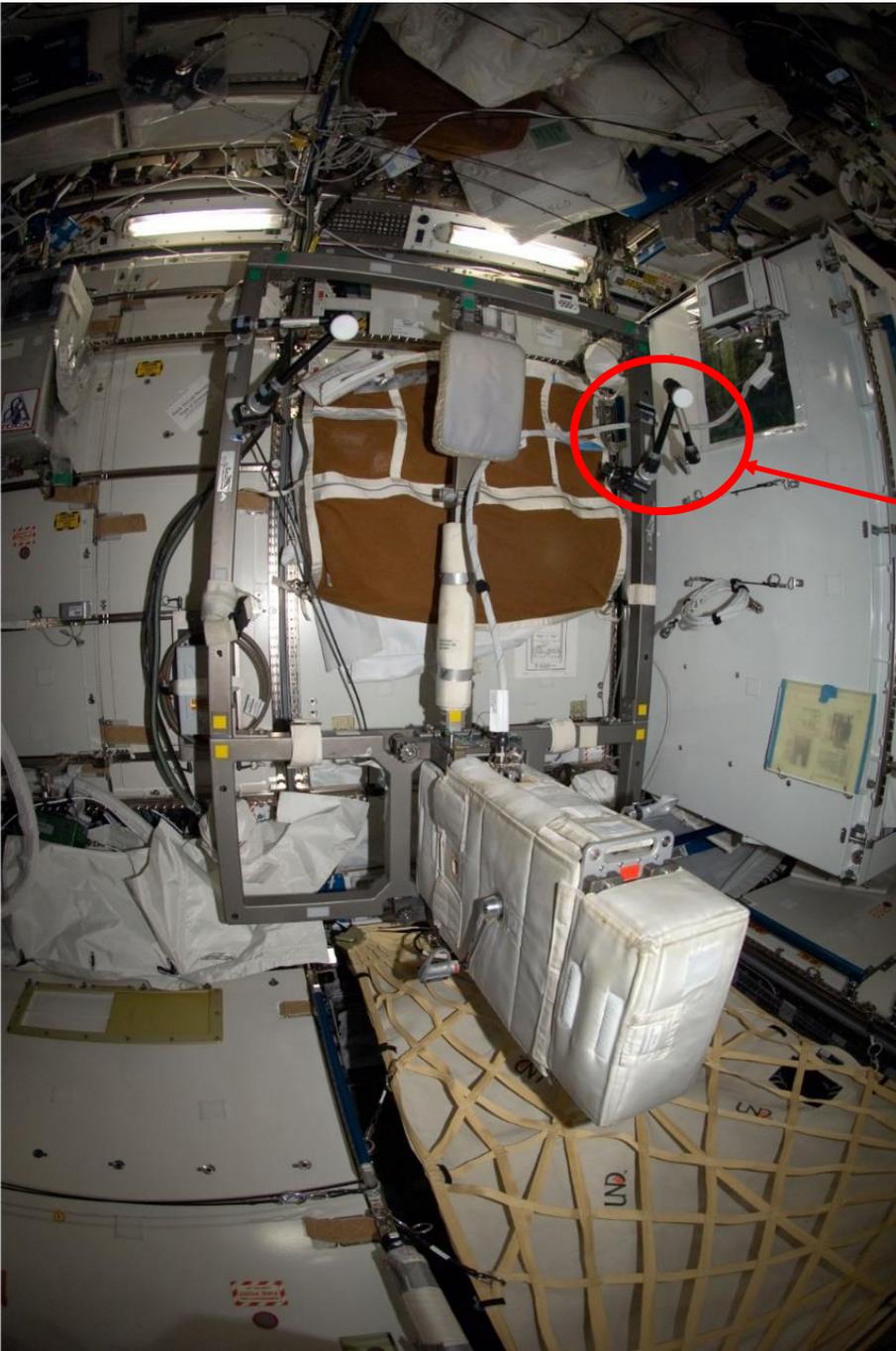
Schools—Lakewood H.S. Colorado

Students—Jorge Isaac Toledano Burciaga, Morgan Cox, Brian Simpson

Teachers—Matt Brown

Mentors- Alli Westover, Glenn Johnson

Engineers—Mike Rapply, Bob Tweedy



Bogan Arm
with IP Clamp
holding

The CEVIS (Cycle Ergometer with Vibration Isolation System) is a bicycle like exercise device for the International Space Station. The astronauts attach their feet by way of clips on the shoes and the cranks. The 4 wire balls at the corners of the frame minimize vibrations from the exercise wiggling the Station. Getting on and off the cycle can be tedious when everything is floating and moving and trying to clip feet into the cranks- thus the need for some handles. This wasn't seen as a problem in the development process of the CEVIS but the crew has come up with on orbit solutions.

Problem:

The original set up, determined by the crew, was to use 2 IP clamps and two bogan arms as handles for positioning when getting on/off CEVIS as well as support while riding. Unfortunately Bogan arms were not designed for those types of forces. Ground teams were concerned that the extra forces were damaging hardware that is difficult to replace.

HUNCH students were asked to come up with a new type of handle that would be more comfortable, more rigid when getting on an off, and last longer than the bogan arms.

Crew were given some more options and made some changes. The current configuration is using 4 IP Clamps and two 8.5" handrails.

ISS020E008141

Bogan Arm (2)
IP Clamp attaches to frame and provides seat track for the Bogan arm to attach to.

Storage bag for shoes and supplies (behind CEVIS)

Pedals and cranks

Vibration isolation wire balls (4)

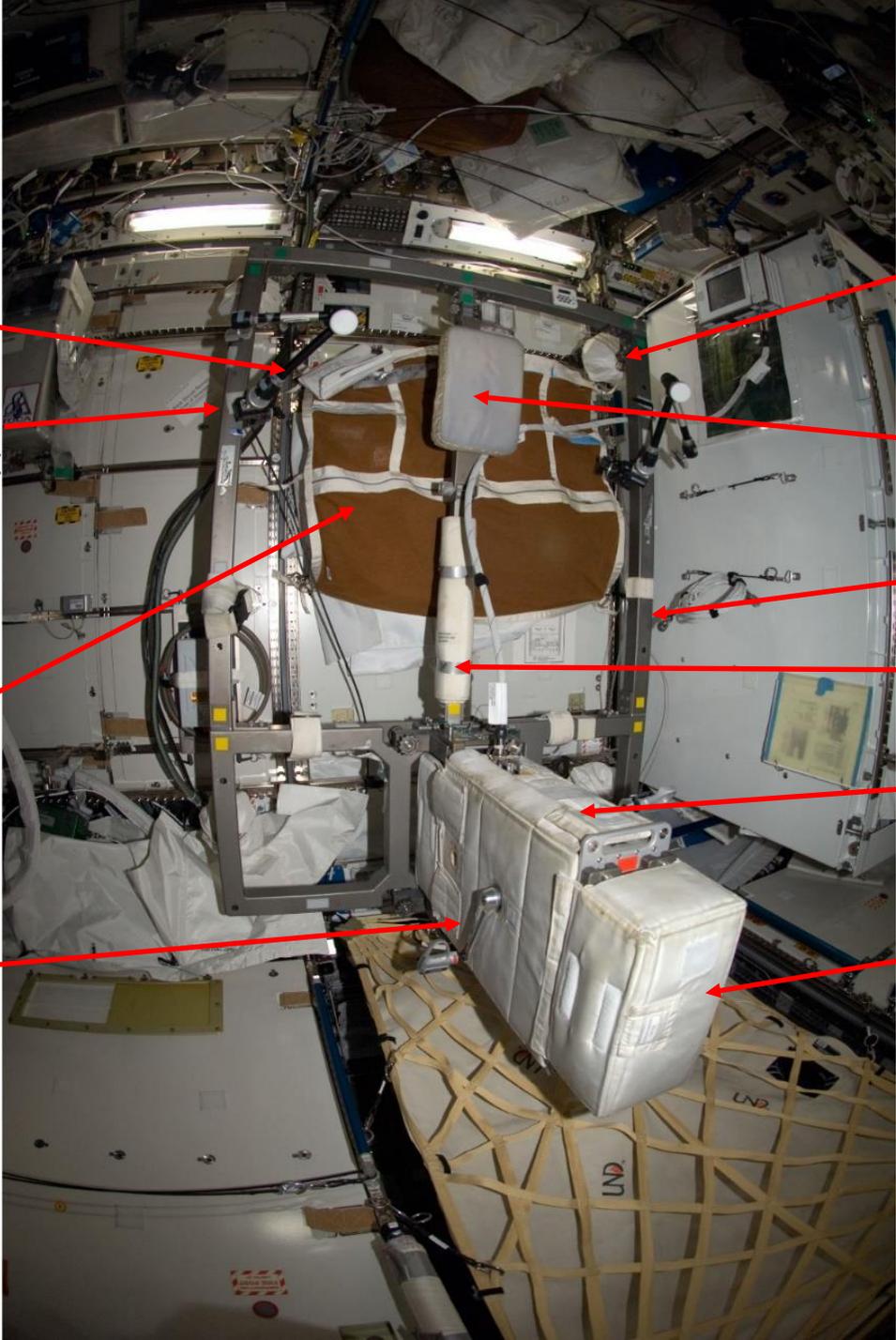
backrest

Frame

padding

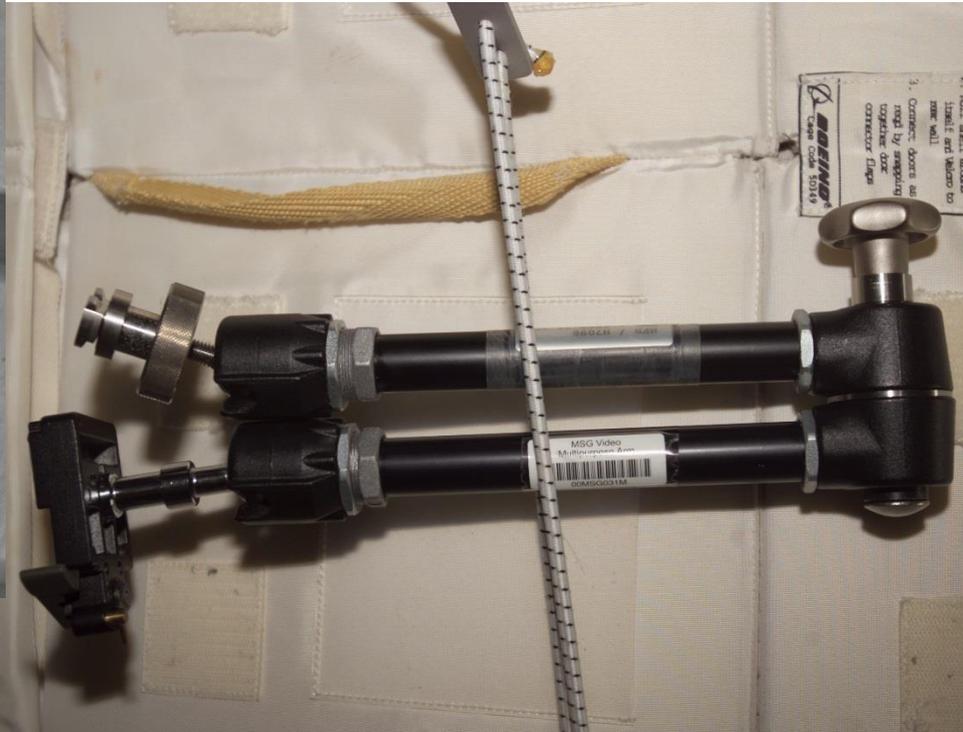
Ergometer

Bag of parts and supplies

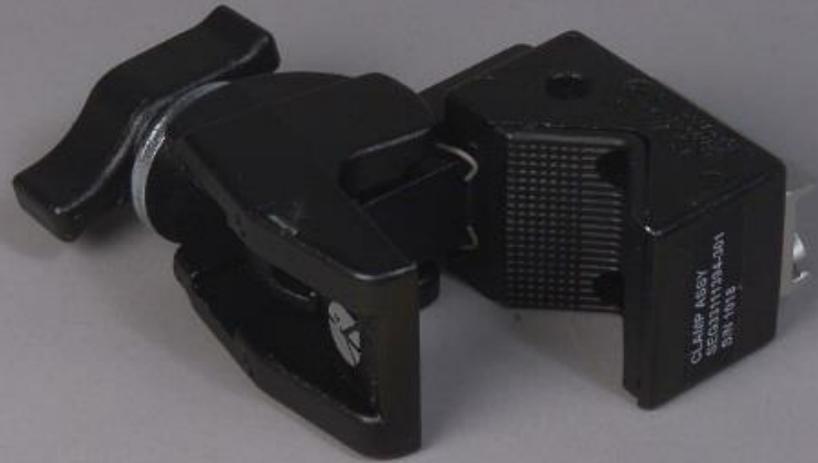


Multi-Use Bracket (MUB) also know as a Bogan Arm

Bogan Arms are a commercially available product that have been modified to have NASA style ends. They have a seat track foot on one side and a Camera Shoe on the other. When the central handle is loosened the two ball ends and the center joint loosen and the arm is floppy and can be positioned as desired. Once the center handle is tightened, the joint and ball ends lock in the current position and are difficult to move. The problem is that it isn't designed to handle lots of pushing and pulling while in the lock position so the ball joints start getting loose. They are also not an ideal or comfortable handle.



IP Clamp



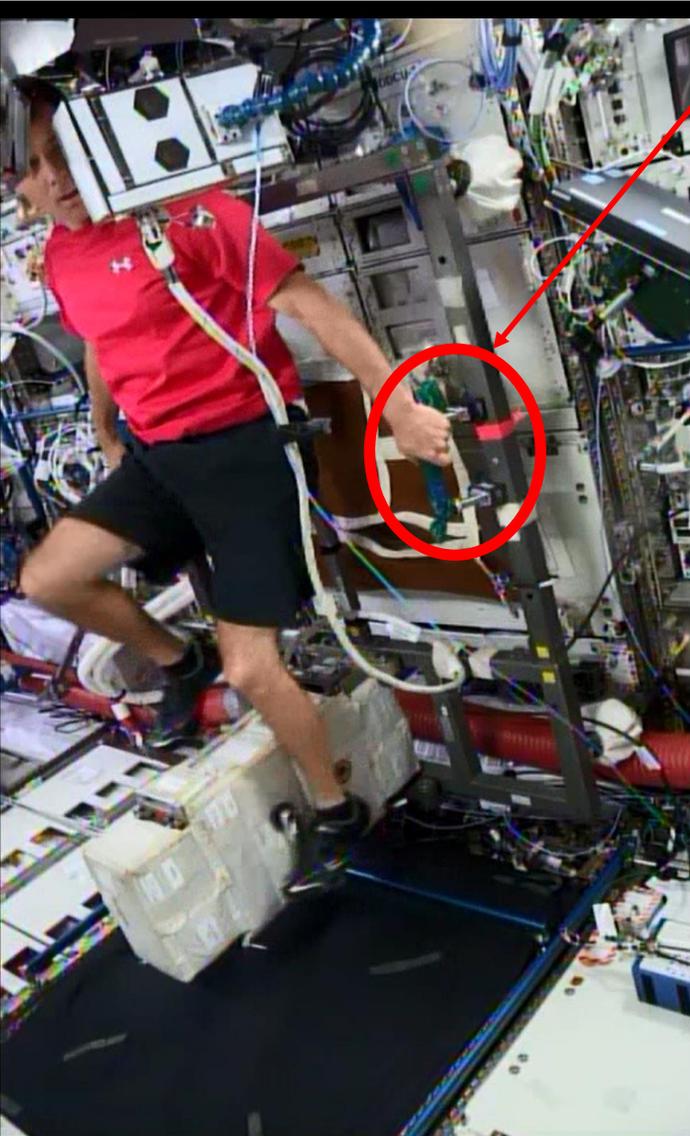
BRACKET CLAMP ASSY, MULTIUSE (IP CLAMP)

SEG33111394-301

A Bogan Arm can be attached to the seat track of an IP Clamp. This is also a commercial camera device that has been modified by NASA by placing the seat track button on one side. They are very good for clamping onto a square rail like that of the CEVIS. The IP Clamp allows the crew to slide the Bogan Arms up or down the rail to the comfortable position for them.



On orbit configurations



Handrails **Now**

- Strong attachment. Does not move or shift while in use.
- Can slide up or down on CEVIS frame by way of IP Clamp.
- Only supports one hand position

Before

Bogan Arms

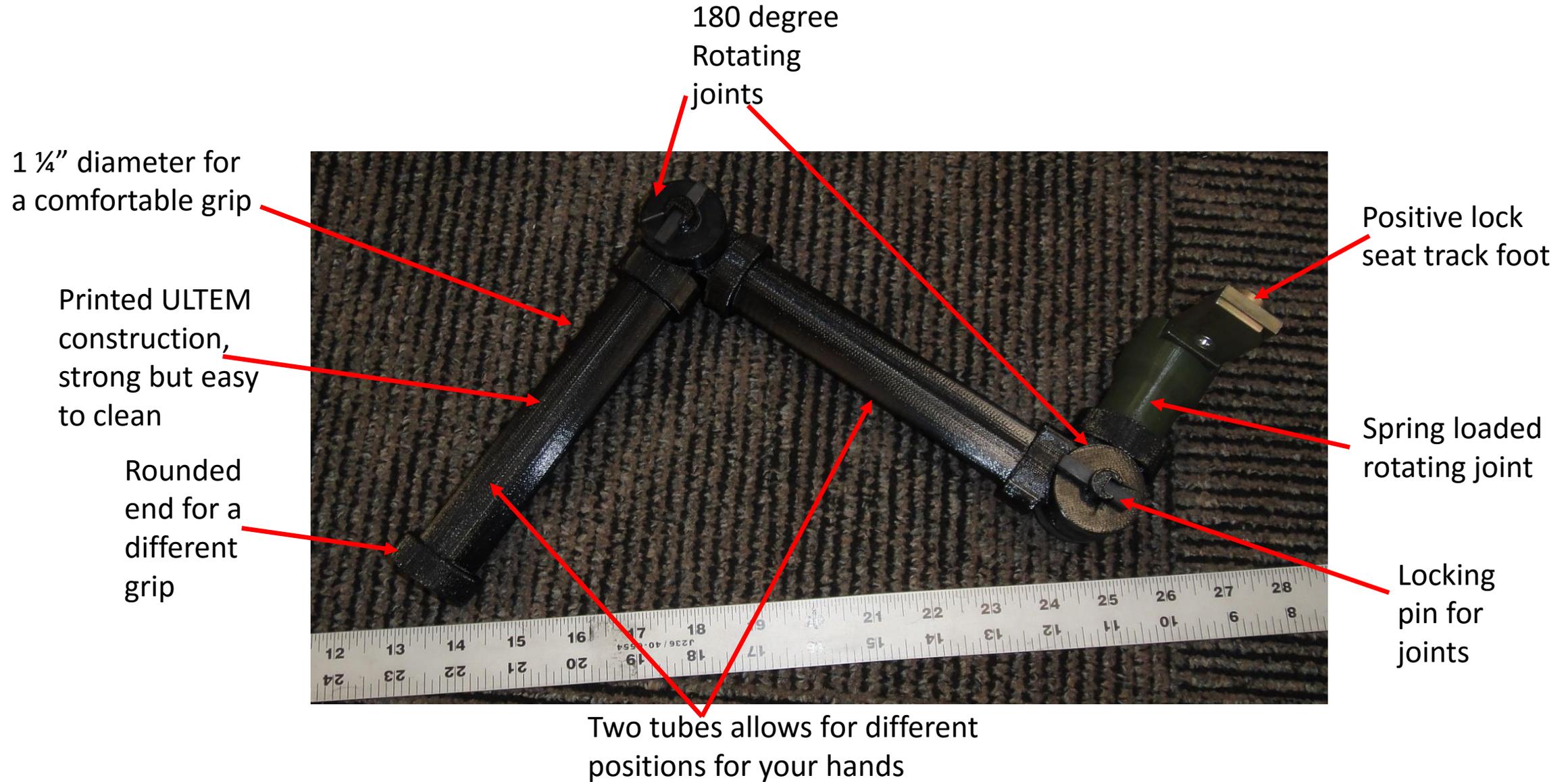
- Semi rigid hand hold as the Bogan arm has some slippage.
- Can slide up or down on CEVIS frame by way of IP Clamp.
- Many hand positions because of articulation of the bogan arm and position of the IP Clamp
- Not so comfortable on hand.





Students from many different schools came up with several simple ideas that had good value.

Multi position CEVIS Handle

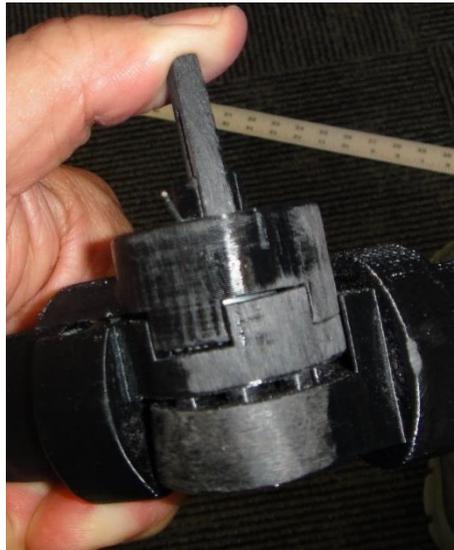


Motion of a joint

Unlock position of pin



Depress pin to disengage teeth and then rotate



Spring loaded, eight position joint for 180 degrees of rotation



Lock position of pin



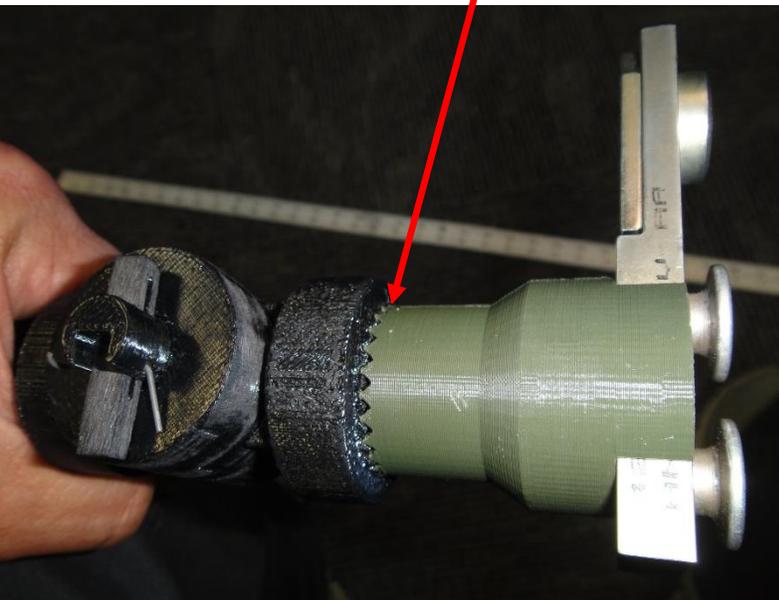
Full rotation at the base

The teeth on the bottom segment allow for many options for rotation and also a positive stop. Unfortunately it has a spring that allowed it to rotate when jostled. It needs some kind of lock to keep it in position.

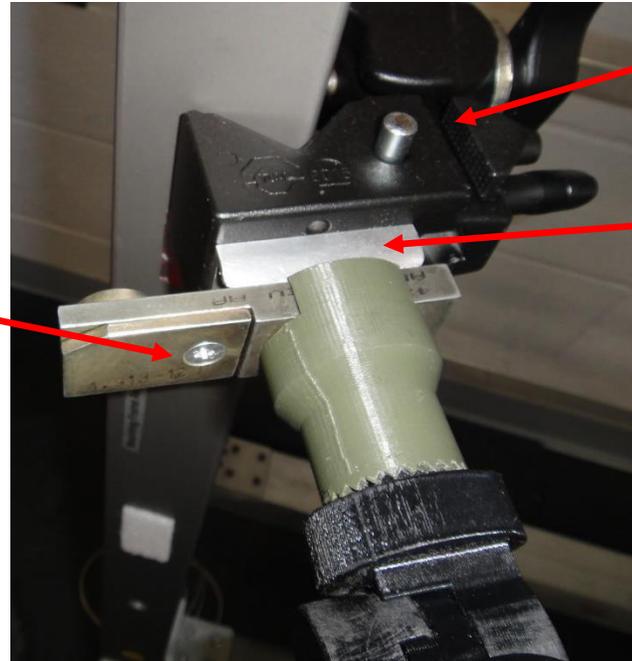
Although I like the ability to screw down and lock the seat track in position, this Seat track foot doesn't quite fit the seat track button on the IP Clamp.



Teeth provide a good stop

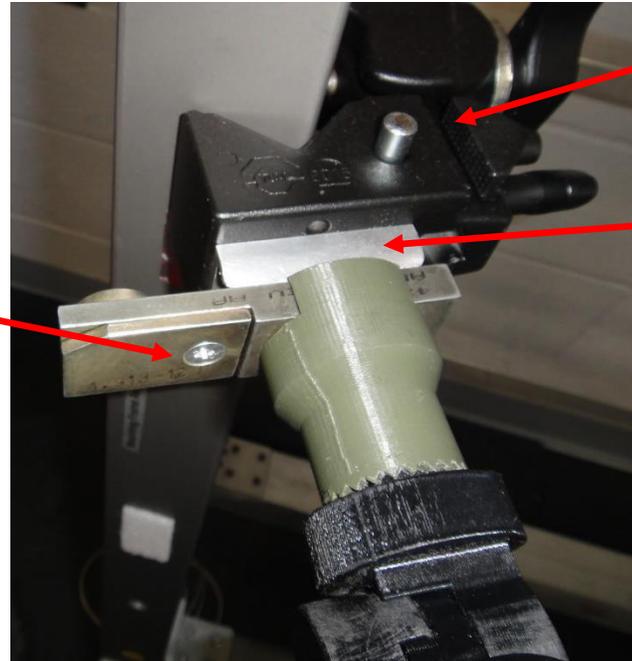


Locking screw and plate of the seat track foot



IP Clamp

Small seat track segment of the IP Clamp



Fit Check at the CEVIS trainer at Johnson Space Center.

- This is the CEVIS trainer frame at Johnson Space Center (the Ergometer is not attached). Each of the two blue handrails are attached to the CEVIS frame by two IP Clamps similar to how they are positioned on orbit. They can be moved up or down the frame but they can not be extended outward from the frame.

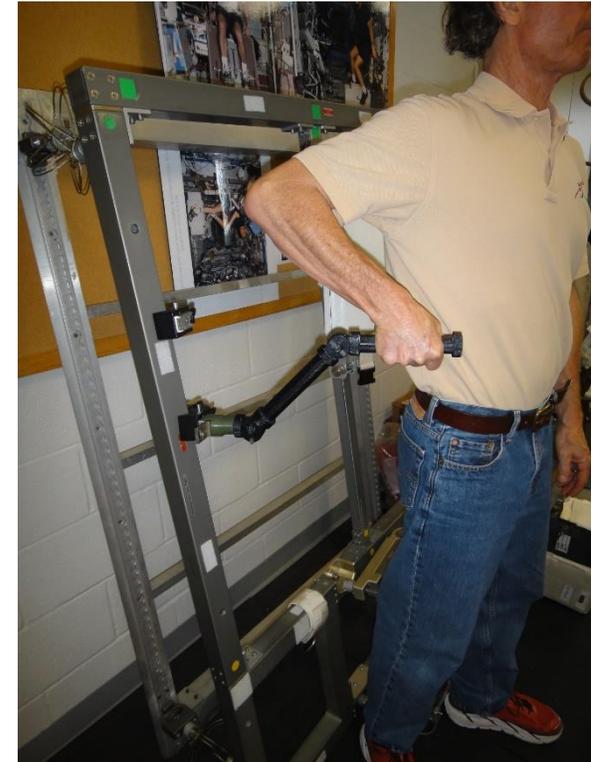


This is the CEVIS Handle positioned on one of the IP Clamps and showing two possible orientations.



How does it fit with a person?

CEVIS Handrail positioned onto the IP Clamp attached to the CEVIS trainer frame. Bob Tweedy, astronaut trainer, demonstrates a few of the many options of arm and hand positions.



The Current Plan

- This idea has a lot of promise as a versatile, multi position handle. There are several small things that could be improved to make it fit the need and location better but it is a good, solid, ULTEM handle that may be able to handle the needs without being machined out of aluminum or steel.
- Unfortunately for HUNCH, the most recent astronauts are satisfied with using the existing blue handrails for steadying and positioning themselves on the CEVIS. Without more crew members being dissatisfied with the handrails, there isn't a need for us to continue the development without more specific direction.
- On the brighter side, there are always astronauts with new opinions and needs. There may also be other locations where this type of handle may be needed. There are specific ideas contained in the handle that may migrate to another project. The CEVIS Handle will remain on the HUNCH development desk to show off and promote when people are looking for good ideas.