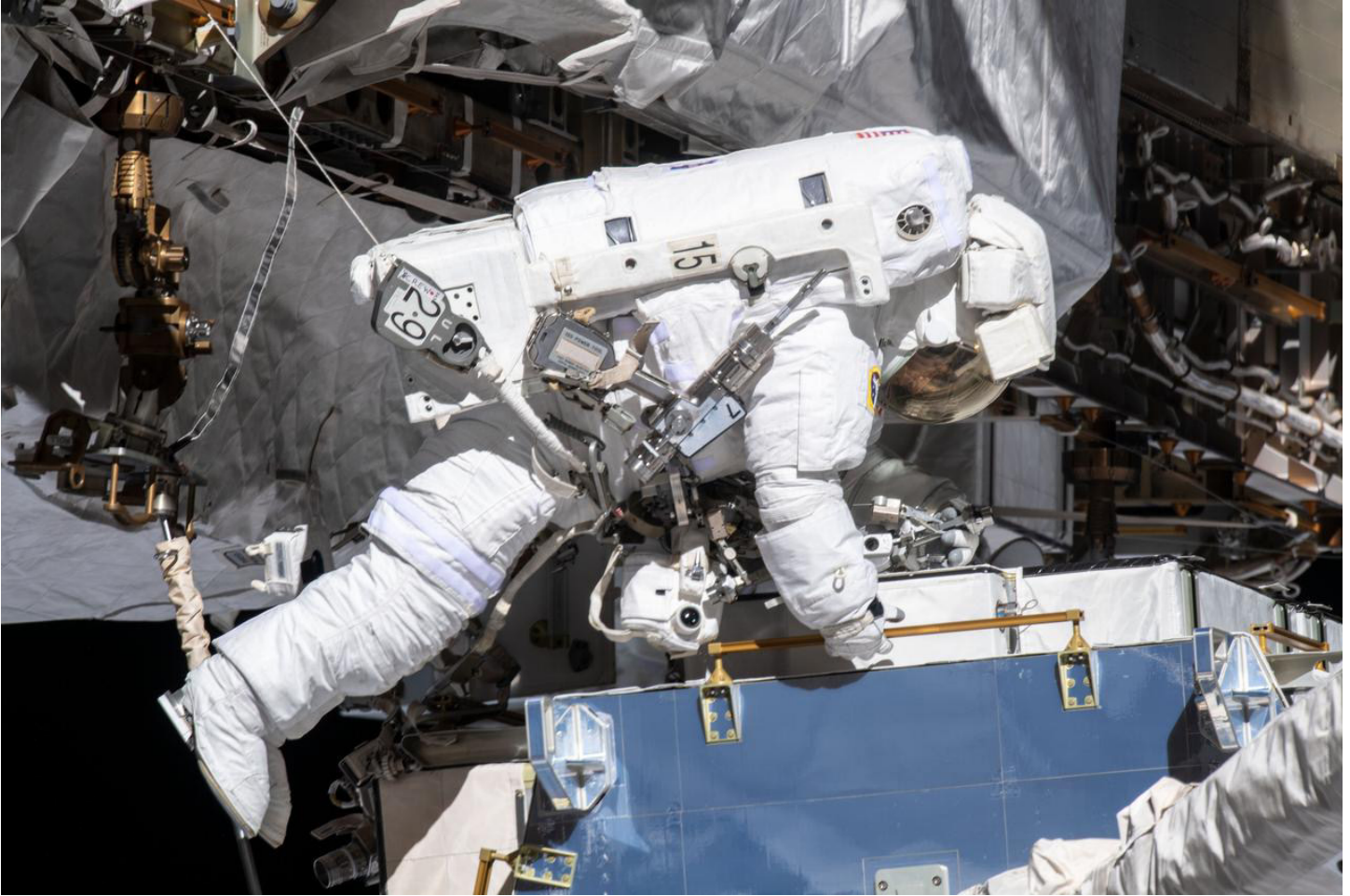


ACTIVITY OVERVIEW



NASA astronaut Christina Koch works while tethered near the Port 6 truss segment of the International Space Station to replace older hydrogen-nickel batteries with newer, more powerful lithium-ion batteries. Credits: NASA

Tasks carried out on Earth become much more difficult under the hostile conditions of the Moon. Extreme changes in temperature represent one of the many challenges for spacewalking. Temperatures on **spacewalks** may vary from as hot as 250 ° F (121 ° C) in the sunlight to as cold as -250 ° F (-121 ° C) in the dark. However, in the permanently shadowed region of the lunar South Pole, the temperature can reach -414 ° F (-248 ° C). Spacesuit gloves must be insulated to handle the low temperatures as well as strong enough to handle the sharpness of lunar dust. This means that the gloves must be insulated but also must allow the astronaut the dexterity to grip, turn, and work with a variety of tools.

In this activity, you will be working with wing nuts, bolts, and washers, examples of hardware commonly used by humans for structures on Earth and in space. Wing nuts and bolts are used to fasten things together. Washers are used with nuts and bolts to help distribute the force when tightening so that the surfaces they are being tightened against are not damaged. You will be performing tests while wearing three layers of different gloves to simulate working with spacesuit gloves. Data collected from these tests will help Space Suit Engineers design tools and work procedures that can be effectively used by humans wearing spacesuit gloves while living and working on the Moon.

SAFETY CONSIDERATIONS

Be sure to follow all safety guidelines from your Mission Director and Progress.

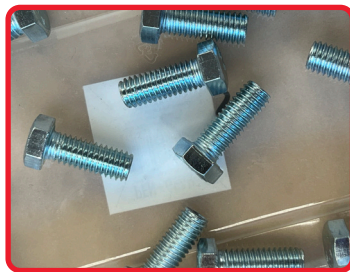


- Students should clean up as they go
- Ensure all hardware stays on the work surface and does not roll onto the floor where it could become a slip/trip issue if stepped on. Use a plastic container/dish to store all small hardware so it does not roll away and onto the floor.

PRACTICE HARDWARE ASSEMBLY

Follow the steps below to prepare for testing!

STEP 1: These are bolts. Count the bolts to make sure there are at least 20 in their container.



STEP 2: These are washers. Count the washers to make sure that there are at least 20 in their container.



STEP 3: These are wing nuts. Count the wing nuts to make sure there are at least 20 in their container.



STEP 4: Slide one of the washers onto a bolt. Twist a wing nut onto the bolt until tight. A completed assembly will look like this.



TRY ON THE SPACESUIT GLOVES

STEP 1: Choose a team member to be the Space Suit Engineer. The Engineer should put the moisture absorbing comfort layer on first.



STEP 2: Now put on the vapor barrier layer. Your teammate can assist you. Take your time so you do not tear this layer. Slide this layer down completely over each finger.



STEP 3: Next put on the outer protective layer. The three gloves should be bulky and tight but not too constrictive. If it is uncomfortable, remove them and try a larger size.



Testing Sequence

1. BEFORE beginning TESTING, each team member should predict how many hardware assemblies they think they can put together in 1 minute with and without spacesuit gloves and record the **predictions** on the Spacesuit Glove Dexterity Data Recording Sheet.
2. The Space Suit Engineer and Test Facilitator should read through steps 1-6 of the Testing Procedure.
3. Team members should stay in their roles and follow steps 1-6 of the Testing Procedure without gloves and then again with gloves.
4. Team members should then switch roles and repeat the Testing Sequence.