

# MAKE YOUR OWN ROBOT HAND

Robots turn up in space all the time in science fiction – but did you know that we really do use robotics to make life in space easier? Part of the training for astronauts living on the International Space Station (ISS) includes learning how to use the CANADARM 2, a robotic arm in space which allows astronauts to make repairs or fit equipment remotely, and allows them to move objects much heavier and bulkier than they could themselves. The CANADARM has many joints, much like the human arm, and it has a specialised unit at the end that allows it to fix on to objects. It can even be used to move astronauts around outside the ISS!

## Your Mission

In this activity you will be an engineer with the job of creating a simple model of the human hand that could become a robotic hand for use on the International Space Station.

Often, when designing a robot, scientists and engineers will try to copy what has been proven to work well at moving and working with objects – in this case the human hand!

Most hands have four fingers and a thumb. The fingers have three bones and the thumb has 2 bones (the finger bones are called phalanges). These are connected to bones in the palm which connect to bones in the wrist and so on.

To open and close the hand you need stretchy material that is connected to the bones and can pull on them in different directions. These are called MUSCLES and TENDONS. FLEXOR muscles and tendons cause the fingers to bend, while EXTENSORS cause them to straighten.

***You are going to build a simple model robot hand with FLEXORS which will allow the fingers to close and let you pick up objects with the hand.***

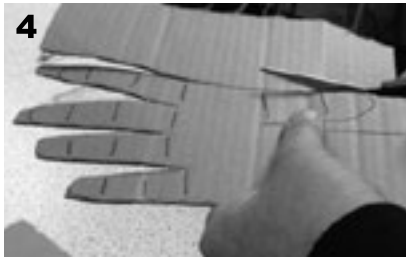
### You will need:

- Corrugated cardboard at least as big as your hand
- Craft knife/scissors
- A straw
- String
- Sellotape

### What to do



1. Place your hand on the cardboard and draw around your four fingers.
2. Add your thumb so that it is pointing in the opposite directions to your fingers. Add a bit of arm to the hand.
3. Mark onto the hand the position of the folds in your fingers.



4. With a craft knife or scissors, carefully cut out around the hand.
5. Using the scissors or a craft knife, score along these lines and carefully bent the fingers in towards the palm. **BE CAREFUL NOT TO GO ALL THE WAY THROUGH THE CARDBOARD!**
6. Cut pieces of straw slightly shorter than the finger segments and carefully tape them between the folds so that they are pointing up along the fingers.



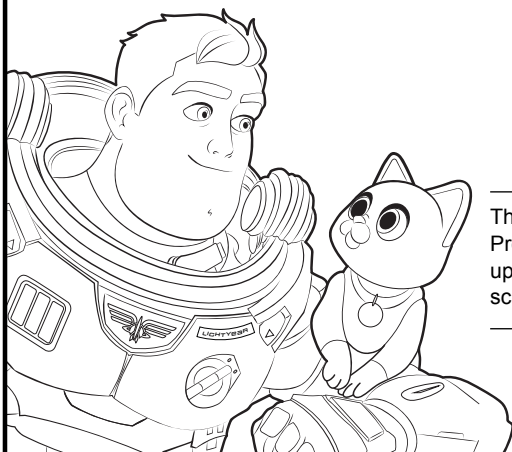
7. Feed a piece of string along all the straws on one finger and tape it to the top of the finger. Repeat this with the other fingers and the thumb.
8. Use a craft knife or scissors to carefully poke a hole through the middle of the hand.
9. Feed the strings through the hole and tie a knot in the strings on the back of the hand.
10. Test your hand! Go to pick up an object. To lose the fingers and thumb around it, pull on the knot of string.

## Extend your mission

Think about how you could improve the design:

Would other materials be better?

Could you alter the design to move each finger independently?



This resource was created by ASDC as part of Project Lightyear: Disney and Pixar have teamed up with ASDC to engage people with exciting science topics inspired by the film *Lightyear*.



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