

MISSION X

TRAIN LIKE AN ASTRONAUT



THE SPEED OF LIGHT

Team Leader Guide

MISSION OVERVIEW

Students will perform an activity with a ruler as accurately as possible to test and train their reaction time.

LEARNING OBJECTIVES:

- Practice concentration and improve the hand-eye reaction time.
- Make and record observations about improvements in this skill-based experience in the Mission Journal.

Skills: hand-eye coordination, fine-motor skills, communication, teamwork, reaction time.

INTRODUCTION

Each time you practice a sport or engage in physical activity, you are improving your reaction time. Reaction time is how fast you can respond to a stimulus. A stimulus can be a noise or something you feel or see. During astronaut training, they often simulate unforeseen situations and events to help the astronauts practice their reaction time and concentration in space to be prepared for their mission. Some good examples of when astronauts need to have quick reaction times are when operating the robotic arm on the International Space Station (ISS) or during Extra-Vehicular Activities (EVAs).

A good way of training for these specific operations and testing an astronaut's reaction time is by using a virtual reality environment on Earth. Astronauts can wear special gloves, video display helmets, chest packs, and controllers to learn how to orient themselves in outer space. In space, up and down are not recognized and even a minor tweak with a thruster can send someone spinning off into space. Therefore, astronauts must depend on their reaction time and concentration in order to have a successful mission in space.

Did you know that also space shuttle pilots used simulators on Earth to improve hand-eye coordination and sharpen concentration skills? Space shuttle pilots know the importance of reaction time and concentration because they are required to land the space shuttle safely!

FAST FACTS

Subject: Physical Education

Age: 8-12

Lesson Time: 10-15 min

Location: inside the classroom or outdoors



Credit: ESA/NASA

↑ ESA astronaut Luca Parmitano is shown flying above Earth attached to the International Space Station's Canadarm2 robotic arm.

LET'S TRAIN LIKE AN ASTRONAUT!



MATERIALS

Team Leader

- Tape measure or meter stick.
- Watch or stopwatch.

Student

- Mission Journal and pencil.

Optional to be used in Mission Adaptations

- Pool noodles, a chair to sit on, a tap light or sound emitting device.

PROCEDURE

The crew member will do the following:

1. Extend the dominant arm out in front of the body and make a fist with your hand, thumb side up.
2. Point the thumb and index finger forward, keeping them about 2 cm apart.
3. Use the index finger and thumb to catch the ruler immediately after it has been released by the trainer.

The trainer will do the following:

1. Hold the ruler between the outstretched index finger and thumb of the crew member's dominant hand.
2. Line the top of the crew member's thumb level with the zero-centimetre line on the ruler.
3. Without warning, release the ruler letting it fall between the crew member's thumb and index finger.
4. When the crew member catches the ruler, determine the distance between the bottom of the ruler and the top of the crew member's thumb and link this distance to a time from the Distance and Time Chart.

Record the measurement in centimetres and time in the Mission Journal and repeat this for a total of ten times. Measure each time score using the Distance and Time chart. After ten times, the pair can switch roles and repeat the entire procedure.

Use the following open-ended questions before, during and after practising the skill-based activity to help students make observations about their own skill level and their progress in this skill-based activity:

- Are your trial scores improving as you are practicing?
- Was your first and last trial different? If they were, what do you think played a factor in making both trials different?
- If your reaction time did not increase, what can you do to make your reaction time faster?

SET-UP

Students do this activity in pairs of 2 and sit or stand directly across from each other. One will be the crew member the other the trainer.

Print or display a copy of the following Distance and Time Chart.

Distance	Time
5 cm (2 in)	100 ms (0.10 sec)
7.5 cm (3 in)	120 ms (0.12 sec)
10 cm (4 in)	140 ms (0.14 sec)
12.5 cm (5 in)	160 ms (0.16 sec)
15 cm (6 in)	180 ms (0.18 sec)
17.5 cm (7 in)	190 ms (0.19 sec)
20 cm (8 in)	200 ms (0.20 sec)
22.75 cm (9 in)	220 ms (0.22 sec)
25.5 cm (10 in)	230 ms (0.23 sec)
27.5 cm (11 in)	240 ms (0.24 sec)
30.5 cm (12 in)	250 ms (0.25 sec)



THINK SAFETY

- Sit or stand in a comfortable position during this activity.
- Use tools and equipment in the appropriate manner for this activity.
- Avoid obstacles, hazards, and uneven surfaces.
- Wear appropriate clothes and shoes that allow you to move freely and comfortably.

MISSION ADAPTATIONS



Increase Difficulty

- Squeeze a stress relief ball 15 times and then try the Speed of Light activity.
- Ride in an elevator while doing the Speed of Light activity where you catch the ruler.
- Do twenty jumping jacks and then try the Speed of Light activity..



Increase Accessibility

- Perform while seated or supported against a wall.
- Use brightly colored objects, or ones with wide stripes to visibly measure reaction speed.
- Use a bigger item like a pool noodle.
- Instead of catching the item, have the participant drop an item at the same time as the instructor.
- Do this activity with a tap light or sound emitting device to replace the ruler.



Decrease Difficulty

- Use a full-hand grip instead of only the thumb and index finger to catch or hold ruler.
- Choose a yard stick or longer item.
- Try a slower moving object such as a plastic bag.



This resource has been adapted from NASA's "Speed of Light".

Original Credits: Lesson development by the NASA Johnson Space Center Human Research Program Education and Outreach team with thanks to the subject matter experts who contributed their time and knowledge to this NASA Fit Explorer project.