

MISSION X

TRAIN LIKE AN ASTRONAUT



CREW ASSEMBLY TRAINING

Team Leader Guide

MISSION OVERVIEW

Teams of students will assemble a puzzle as quickly and correctly as possible.

LEARNING OBJECTIVES:

- Demonstrate the importance of dexterity and hand-eye coordination and improve communication and problem-solving skills.
- Make and record observations about improvements in dexterity and hand-eye coordination.

Skills: teamwork, communication, problem-solving skills, dexterity, hand-eye coordination.

INTRODUCTION

Astronauts are required to put many objects and devices together as part of their missions. Part of those are small objects that astronauts must manipulate during their stay at the International Space Station (ISS). Sometimes astronauts must do spacewalks, or Extra-Vehicular Activities (EVAs), to accomplish these tasks outside of the ISS. EVAs are carried out on the ISS for continued assembly and maintenance and to restore and upgrade it.



↑ ESA astronaut Andreas Mogensen training for spacewalks in NASA's Neutral Buoyancy Laboratory in Houston, USA.

When assembling or maintaining objects in space, astronauts must have good dexterity and hand-eye coordination and work as a team. They must also be able to manipulate tools and objects while wearing a pressurized spacesuit that includes gloves over their hands. These gloves, worn to protect astronauts from the space environment, can be thick and bulky. They are made so astronauts on an EVA can move their fingers as easily as possible. They must learn to work with their gloves on to handle both large and small objects. To help prepare astronauts for working in a spacesuit and manipulating objects during an EVA, they train in the Neutral Buoyancy Lab (NBL), a large pool used to train astronauts by simulating microgravity conditions. Astronauts only have 6-7 hours of life support during an EVA, so timing, efficiency and teamwork are very important while working in space. As astronauts practice manipulating tools quickly and accurately in their spacesuits, they are improving their dexterity and hand-eye coordination for a space mission.

FAST FACTS

Subject: Physical Education

Age: 8-12

Lesson Time: 15-30 min

Location: indoors on a flat surface such as on a table or on the floor

LET'S TRAIN LIKE AN ASTRONAUT!



MATERIALS

Team Leader

- Containers large enough to hold at least 25 labelled pieces of one floor puzzle.
- Two pairs of gloves per team member: tight-fitting children's gloves and either working gloves or ski gloves. Students can also share by switching gloves when it's their turn.
- Two pieces of cardboard large enough to cover the completed puzzles.
- Marker.
- Watch or stopwatch for each team or a clock viewable in the room.

Student

- Mission Journal and pencil

Optional to be used in Mission Adaptations

- Puzzle with knobs and shape puzzle, zipper board, latch board; Velcro pieces (three-dimensional objects)
- Sticks/jacks, large bricks or blocks

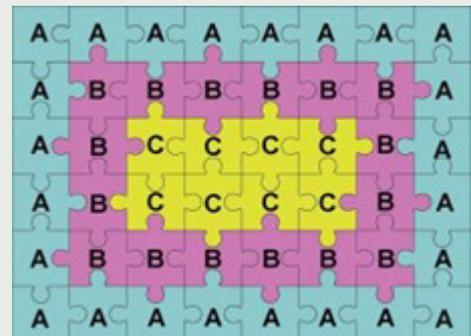
PROCEDURE

1. Divide the students into teams of at least 2, forming an astronaut crew. Designate a starting area (home base) and an assembly area for each crew of at least 3 meters apart.
2. Distribute one complete puzzle per crew, disassembled in a container (see set-up). Instruct each crew to divide the pieces among the crew members, making sure all the same letter pieces go to the same crew member. Crew members are allowed to hold puzzle pieces with different letters.
3. All crew members will wear one or two pairs of gloves while conducting the mission.
4. When the time starts, each crew should try to complete their puzzle as fast as possible. Each crew member with the letter "A" puzzle pieces start by leaving the home base, assembling their pieces at the assembly area, and return to the home base.
5. Next, crew members with pieces labeled "B" will go to the assembly area and assemble the next layer moving inward of the puzzle, and so forth until the puzzle is completed.
6. Students can record their time in their Mission Journal and compare with other teams.

SET-UP

Assemble a puzzle of at least 25 pieces on a piece of cardboard. Label the back of each piece from the outer to the inner ring with subsequent letters of the alphabet.

Prepare as many of the same puzzles as there are teams. Disassemble the puzzles, putting each puzzle into its own container.





THINK SAFETY

- Keep all the puzzle pieces together.
- Avoid uneven surfaces.
- Use communication skills properly.

MISSION ADAPTATIONS



Increase Difficulty

- Increase the number of pieces per puzzle.
- Add creative new rules:
 - Ground communication was lost and now no one may speak to each other.
 - Because of a suit malfunction, only the left hand can be used to place puzzle pieces.
 - Not enough room in the space vehicle, therefore only one piece can be placed at a time.
 - Lighting is unstable. Everyone must close an eye.



Increase Accessibility

- Place braille on the puzzle pieces.
- Crew members can go by 2 to the assembly area to help each other complete one letter of the puzzle. One can tell/guide hand-by-hand where the piece must go while the other place the puzzle piece.
- Eliminate distances to carry pieces.
- Use a puzzle with knobs and shape puzzle, zipper board, latch board.



Decrease Difficulty

- Use a puzzle with knobs and shape puzzle, zipper board, latch board.
- Use velcro pieces (threedimensional objects)
- Attach objects to a larger surface like a table or wall.
- Shorten or eliminate distances to carry pieces.
- Crew members can go by 2 to the assembly area to help each other complete one letter of the puzzle.



This resource has been adapted from NASA's "Crew Assembly".

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