ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 2

EO M240.02 – INVENT A SPACE TECHNOLOGY ITEM

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to orient the cadets to space technology and to give an overview of it.

An in-class activity was chosen for TP2 as it is an interactive way to provoke thought and stimulate an interest among cadets.

A group discussion was chosen for TP3 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions and feelings about space technology.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson and in groups of no more than four, the cadet shall have invented a space technology item.

IMPORTANCE

It is important for cadets to learn about the characteristics of space to gain an appreciation for space technology. This lesson will assist in stimulating the cadets' interest in space technology, which forms a significant part of the Canadian Space Agency, and will lead to future summer training progression opportunities in the Air Cadet Program.

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Teaching point 1 **Explain That There Are Many Challenges Astronauts Encounter While in Space**

Time: 5 min Method: Interactive Lecture

Travelling to and From Space

One of the biggest challenges for astronauts is travelling to and from space. The astronaut's body and the space shuttle experience a large amount of stress through turbulence as they pass through the Earth's atmosphere. Temper Foam is a cushioning material that is shock absorbent and is also softest where the body contacts it. It is a NASA-developed technology that is used in the seats on the space shuttle to reduce the stress through turbulence that the astronauts experience during the violent shaking during launch.

Heat stress that occurs as they re-enter the Earth's atmosphere is also another challenge. Imagine a place with no air, with temperatures that vary from extreme hot to extreme cold, and where particles of dust travel at speeds that could kill you. These are just some of the situations astronauts have to cope with when they travel in space.

The Living Environment

The strangest condition in space is the lack of gravity. Gravity is a force that makes objects move toward each other. The Earth's gravity keeps your feet on the ground and makes objects fall down by pulling them toward Earth. On a spaceship, there is no gravity and everything floats in the air. Velcro is used to anchor objects and prevent them from floating around. It takes time for an astronaut's body to adjust to living in space and many astronauts suffer from space sickness for the first few days or weeks of a mission.

Astronaut apparel has evolved over the decades from Mercury's aluminium foil-looking outfits to the bulky, 275-pound whites now used on space walks outside the space station. The U.S. suits are easier to work in for long periods of time but their complexity causes more maintenance. The one-size-fits-all Russian suits are used a few times and thrown away, but they are also not easy to work in.

NASA is hoping to make new suits that are both high-tech and low-maintenance.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is one of the biggest challenges with space technology?

Q2. What is the strangest condition an astronaut experiences in space?

Q3. What do many astronauts suffer from for the first few days or weeks in space?

ANTICIPATED ANSWERS

A1. One of the biggest challenges with space technology is travelling to and from space.

A2. The strangest condition an astronaut experiences in space is the lack of gravity.

A3. Many astronauts suffer from space sickness for the first few days or weeks in space.

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Teaching point 2 **Conduct an Activity Where Cadets Invent and Construct a Space Technology Item**

Time: 35 min Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadets invent a space technology item that would help overcome the challenges of living in space.

RESOURCES

Consumable items for construction.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS



Consumable items are items that are readily available (e.g. cereal boxes, egg cartons, milk cartons, pop cans, etc.) at no cost for construction of the space technology invention.

Cadets may draw diagrams of their space technology item as an alternative to the construction of a model.

- Divide cadets into groups of no more than four.
- Provide the groups with consumable items for construction of their invention.
- Groups will have 35 minutes to invent a space technology item using any of the consumable items provided for this activity.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' invention/construction of a space technology item will serve as the confirmation of this TP.

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Teaching point 3 **Conduct a Group Discussion Where Cadets Share Their Space Technology Item With the Entire Group**

Time: 15 min Method: Group Discussion

BACKGROUND KNOWLEDGE



The point of the group discussion is to discuss the cadets' space technology inventions and their applications using the tips for answering/facilitating discussion and the suggested questions provided.

GROUP DISCUSSION



TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, e.g. everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What is your space technology invention?

Q2. What challenge are you trying to overcome in space?

Q3. Explain how you see it overcoming a challenge in space.



Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

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Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the group discussion will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the activity in TP2 and the group discussion in TP3 will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Inventing a space technology item will help the cadet learn about the characteristics of space and gain an appreciation for space technology. Stimulating the cadets' interest in space technology will lead to future summer training opportunities in the Air Cadet Program.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C3-040 (ISBN 0-7787-1140-4) Goodman, P. (2002). *Arty Facts: Space and Art Activities.* St. Catharines, ON: Crabtree Publishing.

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