OPERATION: NEGOTIATION

TEAMWORK AND COMMUNICATION

MISSION DESCRIPTION

Participants will be divided into small teams. Each team represents a different fictional country that is seeking help to fund their space mission(s). Each team will be given primary and secondary objectives. They will also be given a budget. Countries will need to collaborate in order to define a mission or multiple missions that meet everyone's priorities within the allocated budget. Teams can conduct research before the negotiations, and will formulate positions and then debate with their fellow teams.

Difficulty: **DIFFICULT**

Duration: **SEVERAL HOURS (CAN BE SEPARATED OVER A FEW DAYS)**

Materials: **MINIMAL**

GOALS

Teams will debate, discuss and come to a consensus on what mission(s) to participate in and fund.

OBJECTIVES

By the end of the activity, participants will be able to:

- Create and communicate arguments for why different space missions are important
- Collaborate with peers and negotiate in order to define a space mission(s) that meets their priorities

MISSION PREPARATION

TIMELINE

Breakdown	Duration
Introduction and Team Assignments	30 minutes
Country Mission Planning	Approximately 2 hours
Space Mission Research (Optional)	60 minutes
Team discussion and planning	60 minutes
Conduct Mission Negotiations	Between 1.5 and 2 hours
Opening Statements	20-30 minutes
Open Floor Negotiation	30 minutes
Presentation of Proposals	30 minutes
Closing Statements	20 minutes
Debrief (Optional)	TBD by teacher
Total	**Variable**

MATERIALS

- Background information on each country: their primary and secondary mission objectives, and their total mission budget (see participant handout)
- Background information on different types of missions and total funds required for each (see participant handout)

BACKGROUND

International collaboration is an important part of space exploration. Missions can be very expensive, and working together with other countries helps fund projects that one country would have a hard time accomplishing on their own. Canada has several international partners like NASA and the European Space Agency (ESA). Every three years, ESA member states and partners come together to decide what projects they will undertake, and which countries will partner together to make those projects successful. Each country decides which missions will best meet the needs of their goals and population and then commits funding and technology to the mission.

In the spirit of this program, this activity will challenge participants to balance their country's needs and budget with partner countries to collectively fund a space mission.

MISSION INSTRUCTIONS

1. INTRODUCTION AND TEAM ASSIGNMENTS

a. Divide participants into teams of 3 to 5 people. Each team will represent a different fictional country. There can be anywhere from 4 to 8 countries.

b. Each country will be given primary and secondary mission objectives that are specific to them. They will also be given a budget of funds allocated for a mission. Note: No team will be able to fund large missions alone (see participant handoutf).

c. All countries will be given the same background information about different types of space missions and the funds required for each (see participant handout).

2. COUNTRY MISSION PLANNING

a. Optional pre-activity research: Based on the mission objectives given to each country and the list of missions, individuals and teams can conduct additional research on these topics or on other types of space missions.

b. As a team, each country will determine which missions they are interested in pursuing and will need to set priorities and decide what is or is not negotiable for them. Based on mission objectives and the funds available, team members should come to an agreement on which mission(s) they want to fund, and what portion of their budget will go towards it.

Note: Teams do not need to fund 100% of the full cost of a mission and can participate in one or more missions.

c. Participants will need to come up with an opening statement that summarizes their objectives and what missions they are interested in supporting. It should also include information about what technical ability the country can bring to the selected projects (based off information in their country description and objectives).

3. PROGRAM NEGOTIATION

a. Each country will present their 2–3 minute opening statement to the entire board of countries.

Note: As you are listening to the opening statements of other teams, take note of which countries are providing support for each mission. This information will be useful in the upcoming negotiations. Each mission will require the partnership of a minimum of two countries.

b. After each country has presented, there is a 20–30 minute open negotiation period. During this time, delegates from each country can meet and discuss budgets and partnerships. The goal of this portion is to create initial partnerships and negotiate how much funding each country will contribute to specific missions.

c. All delegates return to the negotiation table. With the activity facilitator as moderator, delegates from any country can raise their hand to propose a collaboration on a specific mission.
    i. In their proposal, the delegate will state which countries are contributing and how the total cost of the mission is met.
    ii. Each country that is named in the proposal can accept or reject this proposal.
    iii. All unnamed countries can also decide to join the mission by committing funding as well. Any amount of new funding provided reduces the financial commitment required from the other contributors.
    iv. This step continues until each proposed collaboration has been discussed one by one.
d. Each team should take 5 minutes to prepare a short closing statement which addresses the following topics:
    i. Which mission(s) they are contributing to, including the funding breakdown.
    ii. What direct benefits their countries will receive from the mission(s), taking into account their country descriptions and objectives.

One by one, the teams present their closing statements. This confirms their commitment to each space mission.

4. DEBRIEF (OPTIONAL)

a. a. At the activity facilitator's discretion, have the teams respond to the following questions:
    i. Was it more challenging to negotiate within your own country, or with other countries?
    ii. Do you feel like your country met its objectives?
    iii. Is there a mission that your country wanted to participate in that it couldn't? If so, did this prevent you from meeting objectives?
    iv. Did you learn anything new about space missions and their benefits?

PARTICIPANT HANDOUT

LIST OF COUNTRIES

There are 8 countries with varying primary and secondary science and technology objectives. Teams should attempt through negotiation to satisfy at least one of the two objectives. It is not necessary that all objectives are 100% satisfied, as no organization has the budget required to fund everything they want to do.

Note to activity facilitator: Provide each team with the information about their country only. If only assigning 4 countries it is recommended to use Andromeda, Betelgeuse, Epimetheus and Fornax.

1. Andromeda

Andromeda is a large country with a long history in space, and has contributed to significant development in technology for human space travel. The current focus of the Andromedean administration is human exploration in space.

Primary objective: Determine how humans can survive long term in deep space, and explore the potential for human habitation off Earth.

Secondary objective: Improve understanding of the long-term effects of space on the human body and develop technologies to mitigate negative impacts of living in space.

Space budget: 55 SpaceBucks

2. Betelgeuse

Betelgeuse is a small island nation with a great interest in the formation of the universe and life on Earth. Betelgeuse University is home to world experts on planetary science and geology.

Primary objective: Understand the origin of life on Earth and continue the search for extraterrestrial life.

Secondary objective: Develop knowledge of the formation of extraterrestrial planetary bodies and how this can influence what we know about Earth.

Space budget: 45 SpaceBucks

3. Calypso

Calypso is an international leader in artificial intelligence and technology. While their space program is fairly new, the technical acumen of Calypsians is an asset to the international space industry.

Primary objective: Demonstrate the country's significant AI capabilities through testing a novel algorithm for machine learning (e.g. geographical feature categorization, biological models, autonomous driving, navigation).

Secondary objective: Develop and test robotic systems for space to aid in performing tasks autonomously or with human operators.

Space budget: 35 SpaceBucks

4. Deimos

Deimos is a northern country with thousands of kilometres of shorelines and frequently harsh climates. Deimotians look to space exploration as a way to better understand and protect their own country and coastlines, and have significant experience in remote sensing projects.

Primary objective: Monitor polar ice cap melting to gain an understanding of the possible effects of climate change on Deimos's borders and population.

Secondary objective: Develop new techniques for providing food to northern communities with limited growing seasons and harsh weather.

Space budget: 30 SpaceBucks

5. Epimetheus

The rocky and cratered terrain of southern Epimetheus parallels geological features seen on other bodies in our solar system. Learning more about the creation of these formations and the formation of the universe remains a key objective for Epimetheans, as seen by their investment in state-of-the-art geological analysis techniques.

Primary objective: Improve knowledge of the formation of the universe and its initial expansion.

Secondary objective: Collect specimens from ancient bodies that can inform us about planetary and celestial development.

Space budget: 40 SpaceBucks

6. Fornax

Fornax has an impressive history of being on the cutting edge of space technology and wants to continue to expand their development of in-situ technology. Their current tech includes advanced prototypes for fuel generation.

Primary objective: Develop in-situ techniques for extracting water and other required resources for long-term human habitation on other planets/moons.

Secondary objective: Develop and test in-situ techniques for rocket fuel generation off Earth to expand humanity's reach into the cosmos.

Space budget: 50 SpaceBucks

7. Ganymede

Ganymede is located in a desert, and Ganymedeans are constantly working to develop new techniques to improve crop yields and quality of life. They believe that conquering challenges related to food production in space can help with terrestrial crop development, and Ganymede is already among the most advanced countries in limited resource food production.

Primary objective: Demonstrate food production in space, i.e. on board an orbiting science platform or other celestial body.

Secondary objective: Monitor crop yield in low precipitation/harsh environment regions on Earth to enable the development of improved long-term crop planning.

Space budget: 30 SpaceBucks

8. Halley

Hallean material science is on the cutting edge of space technology. Halley's recent focus has been on understanding radiation shielding and how conquering this challenge can bolster international space exploration.

Primary objective: Showcase a new material that can significantly decrease the effects of radiation on biological or electrical systems.

Secondary objective: Further understand the effects of radiation in deep space and characterize its levels throughout the galaxy.

Space budget: 30 SpaceBucks

LIST OF MISSIONS

There are several missions that will help countries reach their objectives. Below is a list of some examples to help teams think about what kind of space missions could meet their priorities. Teams do not have to pick from this list. They are encouraged to conduct additional research on different possible space missions that relate to their country's priorities. If they develop new missions, the cost should align with the examples below.

Note to activity facilitator: Provide this information to all teams.

GENERAL GUIDELINES

- A mission needs to be supported by a minimum of 2 countries.
- Emphasis is placed on working collectively towards a solution that meets at least one primary or secondary objective for every country.
- Depending on the required funding, the solution to meet a country's objectives could be multiple missions.

1. Short-Term Crewed Mission

In a short-term crewed mission, a small team would be sent to a celestial body in our solar system. The maximum mission duration (on the surface) would be one month.

Potential objectives

- Human exploration
- Technology demonstrations
- Short-term space medicine
- Sample collection and return
- Solar system exploration
- Search for extraterrestrial life

Cost: 100 SpaceBucks

2. Long-Term Crewed Mission

In a long-term crewed mission, a small team would be sent to a celestial body in our solar system. The mission could be a long-term return mission (6+ months) or the beginning of an indefinite colony.

Potential objectives

- Human exploration
- Technology demonstrations
- Long-term space medicine
- Sample collection and return (if returning)
- In-situ resource processing
- Food production
- Solar system exploration
- Gateway to deep-space exploration
- Search for extraterrestrial life

Cost: 140 SpaceBucks

3. Earth Observation Satellite

A specially made satellite will be sent up to observe Earth using a variety of techniques and will send meaningful data back to the people on the ground.

Potential objectives

- Technology demonstrations
- Earth observation

Cost: 40 SpaceBucks

4. Deep-Space Telescope

A specially made satellite will be sent up to observe the universe using high-powered lenses. This can be used to observe other planetary systems, galaxies or significant cosmological events.

Potential objectives

- Deep-space exploration
- Technology demonstration
- Determining origins of the universe

Cost: 55 SpaceBucks

5. Orbiting Science Station Visit (around any celestial body: planet, moon)

A group of astronauts will be sent up to an existing orbiting space station where they can perform a variety of science experiments and research related to human longevity in space and test new technologies.

Potential objectives

- Human exploration
- Technology demonstrations
- Short-term space medicine
- Food development

Cost: 40 SpaceBucks

6. Sample Return Mission (from any celestial body: planet, moon, asteroid)

A probe will be sent to a celestial body with the goal of collecting and bringing back material from its surface.

Potential objectives

- Sample collection/return
- Solar system exploration
- In-situ fuel generation (for return trip)
- Technology demonstration
- Search for extraterrestrial life
- Determining origins of the universe

Cost: 60 SpaceBucks

7. Deep-Space Probe

A probe will be sent into deep space to observe our solar system and galaxy. This data will be sent back to Earth, where it will be analyzed by scientists and engineers.

Potential objectives

- Solar system exploration
- Deep-space exploration
- Technology demonstration
- Search for extraterrestrial life
- Determining origins of the universe

Cost: 60 SpaceBucks

8. Robotic Mission (rover, etc.)

A robotic device will be sent out to a celestial body where it will roam around and perform numerous experiments and sample analyses to further our understanding of that celestial body.

Potential objectives

- Sample collection/in-situ analysis
- Solar system exploration
- Technology demonstration

Cost: 50 SpaceBucks