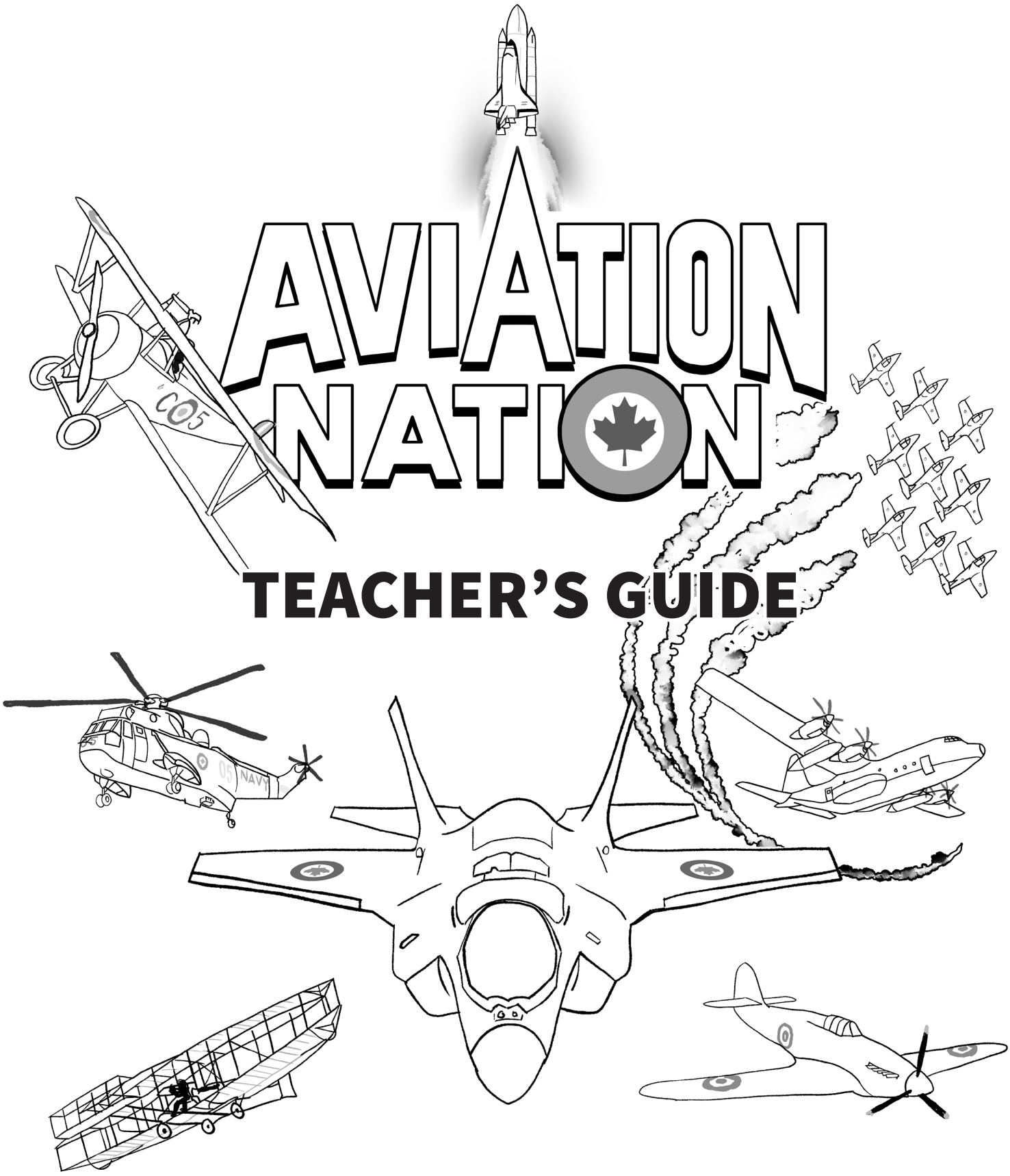

TEACHER'S GUIDE

RCAF FOUNDATION
FONDATION de l'ARC

Hey teachers! This guide will help you educate your students about aviation in Canada through stories about famous aviators, flights, aircraft, and innovators. It's proudly brought to you by the Royal Canadian Air Force (RCAF) Foundation.

The RCAF Foundation's mission is to support the Royal Canadian Air Force by inspiring young people like you with community-based fun and educational programs and special events that honour both the RCAF and aviation in Canada. The Foundation works hard to ensure that aviation continues to grow as an important part of Canada's future.

In 2024, we celebrated the RCAF's Centennial—100 years of the Air Force in Canada!

To find out more about the Foundation, including podcasts, specials events, and videos (on our YouTube channel), visit our website https://rcaffoundation.ca/ or follow us: @rcaf_foundation.

AREAS OF FOCUS

SUPPORT

INDUSTRY

YOUTH ENGAGEMENT

COMMUNITY

HERITAGE

STORY OVERVIEW
AVIATION NATION

Lesson	Stories Used
1: Dream of Flight	Independent reading: • Two stories of choice from Chapter 1: Origin Stories • The Royal Canadian Air Force Association (RCAF) Roundel: A Maple Leaf Marks the Spot
2: Forces of Flight	Independent reading: • Avro Arrow: Swift, Sleek, and On Point • The Beartrap: How to Snag a Helicopter • The Twin Otter: Built for the Great White North
3: History Takes Flight	Whole group: • The Silver Dart: From Sleigh to Skis to Skies Small group suggested stories: • CF188 - The Hornet with a Sting • The CC - 150 Polaris: The Flying Fuel Station • The Trisonic Wind Tunnel: Testing at Supersonic Speeds • The G-Suit: It's Not Rocket Science (Actually... it is!)
4: Wings and Wind	Whole group: • The Trisonic Wind Tunnel: Testing at Supersonic Speeds
5: Musical Wings	Whole group: • The RCAF Tartan: Showing its True Colours
6: High-Flying Heroes	Whole group: • The RCAF Flyers: Bringing Home Olympic Gold • The Kraut Line: They Shoot... They Score! • Stocky Edwards: Knight Flyer
7: Legends of the Sky	Whole group: • Allan Bundy: Soaring Beyond Racial Bias
8: Aviate and Innovate	Whole group: • Aerospace Control Operator: Keeping the Skies Safe! • The Trisonic Wind Tunnel: Testing at Supersonic Speeds
9: Beyond the Horizon	Culminating activity

To simplify the structure and make the text easier to read, we have used the masculine as a neutral gender to refer to women, men, and non-binary individuals alike.

UNIT OVERVIEW

AVIATION NATION

Lesson	Activity Overivew	Assessment Overview
1: Dream of Flight	In this lesson, students will be introduced to the concept of aviation, the forces of flight and the Royal Canadian Air Force.	• Concept map/Word cloud • Exit slip
2: Forces of Flight	In this lesson, students will deepen their understanding of the forces of flight and participate in an experiment.	• Pre-, during, and post-experiment documentation
3: History Takes Flight	In this lesson, students will research the history of Canadian aviation and create visual artifacts.	• Small group reading summaries • Small group infographic creation • Small group presentations
4: Wings and Wind	In this lesson, students will explore and test the properties of aerodynamics by creating a functional wind tunnel.	• Pre-, during, and post-experiment documentation • Individual reports
5: Musical Wings	In this lesson, students will learn about the RCAF's connection to music, history, and traditions.	• In-class discussion Individual written responses
6: High-Flying Heroes	In this lesson, students will learn about prominent Canadian aviation heroes and their influence on society, with a focus on physical education.	• Individual/small group research and journaling
7: Legends of the Sky	In this lesson, students will research important figures in Canadian aviation, and create visual artifacts.	• Small group reading summaries • Small group infographic creation • Small group presentations
8: Aviate and Innovate	In this lesson, students will explore and research contemporary aviation innovations, and discuss and document their findings.	• Small group mini sign creation
9: Beyond the Horizon	In this culminating task, students will apply the design-thinking process to brainstorm, prototype,and present innovative solutions for the future of aviation.	• Culminating activity

CURRICULUM MAP
ALIGNED WITH THE ONTARIO GRADE 6 CURRICULUM

LESSON ONE

Science expectations

- D1. Exploring and understanding concepts — demonstrate how the properties of air apply to the principles of flight and flying machines.
  - D1.1 Describe characteristics and adaptations that enable organisms to fly.

LESSON TWO

Science expectations

- D2. Describe the relationships between the four forces of flight — lift, weight, thrust, and drag — that make flight possible.
  - D2.1 Identify flight-related applications of the properties of air.
  - D2.2 Describe how flying machines and various organisms use balanced and unbalanced forces to control their flight.
  - D2.3 Describe ways in which the four forces of flight can be altered.

LESSON THREE

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Social studies expectations

- A1. Assess contributions to Canadian identities made by various groups and communities, including First Nations, Métis, and Inuit communities, and by various features of Canadian communities and regions.
  - A1.1 Analyze contributions made by various settler/newcomer groups to Canadian identities.

Arts expectations

- D1. Creating and presenting — apply the creative process to produce artwork in various traditional two- and three-dimensional forms, as well as multimedia artwork that communicates feelings, ideas, and understandings. Achieve this by using the elements, principles, and techniques of visual arts, along with current media technologies.
  - D1.1 Create two-dimensional, three-dimensional, and multimedia artwork that explores feelings, ideas, and issues from a variety of points of view.
  - D1.2 Demonstrate an understanding of composition, using selected design principles to create narrative or themed artwork.

LESSON FOUR

Science expectations

- A1. STEM investigation and communication skills
  - A1.1 Use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems.
- D2. Exploring and understanding concepts — demonstrate an understanding of how properties of air can be applied to the principles of flight and flying machines.
  - D2.1 Identify flight-related applications of the properties of air.
  - D2.2 Describe the relationships between the four forces of flight — lift, weight, thrust, and drag — that make flight possible.
  - D2.3 Describe how flying machines and various organisms use balanced and unbalanced forces to control their flight.
  - D2.4 Describe ways in which the four forces of flight can be altered.
  - D2.5 Describe characteristics and adaptations that enable organisms to fly.

CURRICULUM MAP
ALIGNED WITH THE ONTARIO GRADE 6 CURRICULUM

LESSON FIVE

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Music expectations

- C2. Reflecting, responding, and analyzing — apply the critical analysis process (see pages 23–28) to communicate feelings, ideas, and understandings in response to music and musical experiences.
  - C2.1 By the end of Grade 6, students will express detailed personal responses to musical performances in a variety of ways (e.g., write a critical review of a live or recorded performance; write analyses of works they have listened to in a log or journal; and/or create a drawing or graphic representation of their initial reaction to a song).
- C3. Exploring forms and cultural contexts — demonstrate an understanding of various musical genres and styles from the past and present, as well as their sociocultural and historical contexts.
  - C3.1 Compare some aspects of the music of one culture and/or historical period with music of another culture and/or historical period.

LESSON SIX

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Language expectations

- D1. Developing ideas and organizing content Reflect on lessons learned from
  - D1.5 to explain and compare how the strategies and tools helped students develop ideas, organize content for texts, and improve as text creators.
- D2. Creating texts
  - D2.1 Draft complex texts of various forms and genres, including narrative, expository, and informational, using media, tools and strategies.
- D3. Publishing, presenting, and reflecting
  - Reflect on lessons learned from D3.3 to compare how various strategies and tools helped students convey their intended message when publishing and presenting texts. Suggest future steps for improvement as a text creator.

Health and physical education expectations

- B1. Active participation
  - B1.1 Describe the factors that motivate students to participate in physical activity every day — at school and during leisure time — and that influence their choice of activities (e.g., the impact of friends, enthusiasm for outdoor activities, preference for team or individual activities, encouragement from others, spending more time with friends, availability and affordability of programs, enjoyment of healthy competition, influence of media role models) [A1.1 Emotions, 1.2 Coping, 1.3 Motivation, 1.5 Self].

CURRICULUM MAP
ALIGNED WITH THE ONTARIO GRADE 6 CURRICULUM

LESSON SEVEN

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Social studies expectations

- A1. Assess contributions to Canadian identities made by various groups and communities, including First Nations, Métis, and Inuit communities, and by various features of Canadian communities and regions.
  - A1.2 Analyze contributions made by various settler/newcomer groups to Canadian identities.

Arts expectations

- D1. Creating and presenting — apply the creative process to produce artwork in various traditional two- and three-dimensional forms, as well as multimedia artwork that communicates feelings, ideas, and understandings, using elements, principles, and techniques of visual arts and current media technologies.
  - D1.1 Create two-dimensional, three-dimensional, and multimedia artwork that explores feelings, ideas, and issues from a variety of points of view.
  - D1.2 Demonstrate an understanding of composition, using selected design principles to create narrative or themed artwork.

LESSON EIGHT

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Language expectations

- A1. Transferable skills — demonstrate how the seven transferable skills are used in various language and literacy contexts.
  - A1.1 Explain how transferable skills can be used to support communication in cultural, social, linguistic, and domain-specific contexts, and apply them when reading, listening to, viewing, and creating texts of various forms.

LESSON NINE

Science expectations

- D1. Relating science and technology to our changing world.
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Language expectations

- D3. Publishing, presenting, and reflecting
  - D3.2 Publish and present texts created by students using selected media and tools. Analyze how their choices supported the communication of their intended message.

Art expectations

- D1. Creating and presenting
  - D1.3 Use design elements in artwork to communicate ideas, messages, and understandings.

LEARNING OBJECTIVES
STUDENT-FRIENDLY LANGUAGE

STUDENT-FRIENDLY LEARNING OBJECTIVES BY LESSON

Each lesson in this unit includes specific learning objectives designed to guide instruction and clarify the goals of each activity. Teachers may find it helpful to use student-friendly language or co-construct the objectives with students to increase engagement and understanding. This approach encourages students to take ownership of their learning and better understand what success looks like in each lesson.

To support this, we've provided examples of student-friendly learning objectives for each lesson below. Additionally, the attached slide deck includes two templates for writing or typing the lesson's learning objectives. These templates are intended to be displayed in the classroom, either by projecting or printing, offering students a visible reminder of the lesson focus throughout the session.

Lesson 1: Dream of Flight
Today, I will learn about the history of aviation and understand how symbols represent pride and identity in aviation.

Lesson 2: Forces of Flight
Today, I will learn about the forces that make things fly — lift, weight, thrust, and drag — and how they work together to keep objects in the air.

Lesson 3: History Takes Flight
Today, I will learn about important moments and inventions in Canadian aviation history and make a timeline to show how they evolved over time.

Lesson 4: Wings and Wind
Today, I will explore how the shape of objects affects their ability to fly by building and testing a wind tunnel.

Lesson 5: Musical Wings
Today, I will learn about how music is connected to the Royal Canadian Air Force and create a music piece that shows pride and unity.

Lesson 6: High-Flying Heroes
Today, I will learn about Canadian aviation heroes, the challenges they faced and how they made a difference in history.

Lesson 7: Legends of the Sky
Today, I will research an influential Canadian aviator and create a poster showing what they achieved and why it's important.

Lesson 8: Aviate and Innovate
Today, I will investigate a modern aviation technology, learn how it was created, and share my findings with the class.

Lesson 9: Beyond the Horizon
Today, I will use design thinking to create an innovation for the future of aviation and present my idea to others.

DREAM OF FLIGHT

LESSON ONE

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 1 hour

LEARNING GOALS

- We will name various terms and concepts related to flight.
- We will recognize the characteristics of things that fly.
- We will describe the characteristics of things that fly.

MATERIALS AND RESOURCES

- Connections Game
- Exit Ticket
- Student Notebooks
- Whiteboard/Chalkboard/Smartboard

SUCCESS CRITERIA

- I can work collaboratively with peers to categorize flight-related terms and provide a justification for their categories.
- I can participate in a thoughtful class discussion about the impacts of aviation on society, locally and globally, historically, and presently.
- I can comprehend the text and independently answer a critical thinking question.

ASSESSMENT

Curriculum expectations: D2.5 Exploring and understanding concepts — demonstrate an understanding of how the properties of air can be applied to the principles of flight and flying machines.

– D2.5 Describe characteristics and adaptations that enable organisms to fly.

Assessment for learning: The teacher will monitor student involvement in the discussion and connections game. The teacher may collect and provide a completion mark for the mind map.

Assessment as learning: Students will submit their exit slip at the end of class for a completion mark.

DIFFERENTIATION

Reading level: Provide reading materials about Canadian aviation innovations at different reading levels to accommodate diverse learners. Offer simplified versions or additional resources for students who need extra support, and challenge advanced learners with more complex texts or primary sources.

Grouping: Assign groups strategically to ensure a mix of abilities and strengths. Pair students who may need extra support with peers who excel in the subject matter, allowing for peer tutoring and collaboration.

Mind map formats: Allow students to choose the format of their infographics based on their preferences and strengths. Some students will create digital infographics using software like Canva or Piktochart while others will hand draw their designs.

LESSON OUTLINE

Introduce the Unit: Throughout this unit, students will demonstrate an understanding of how the properties of air apply to the principles of flight and flying machines. Using the RCAF Foundation's book, Aviation Nation, students will explore topics related to the history of flight, the properties of air, airplanes and their components, living things and flight, costs and benefits associated with aviation, and the use of aviation for defence, protection, search and rescue, dispatch, diplomacy, innovation,and exploration.

Minds On (5 minutes): Introduce the provided template to create and post a timeline in your classroom. Explain to students that this timeline will document key events discussed in Aviation Nation throughout this unit.

DREAM OF FLIGHT
LESSON ONE: PAGE TWO

LESSON OUTLINE continued

Action (30 minutes): The teacher will post the provided slide and introduce the game "Connections" (found in the appendix).In this game, 16 words will be shown on the board. Students will work together in groups of 2 to 4 to categorize the words into four groups, each containing four words. Allow 10 minutes for group discussion. Afterward, students will share their ideas with the class.

The teacher will lead a discussion using the categories and words as a starting point. The teacher will document the key points of the conversation, using tools such as word clouds and concept maps, to support students in completing their exit tickets. This will serve as an example for the later activity.

Topics for discussion (more details in the teacher notes):

- Similarities and differences of the objects, animals and things that fly (shape, speed, size, location, creation, etc.)
- Purposes of the objects, animals, and things that fly
- A review of the forces of flight and how they relate to an object's ability to fly.

After the discussion, give students the remaining time to read three stories from Chapter 1: Origin Stories (two stories of choice, plus the RCAF Roundel: A Maple Leaf Marks the Spot) to introduce them to the Royal Canadian Air Force and its history.

Consolidation (25 minutes): Using the teacher's example, students will create a concept map, word cloud, or discussion documentation. Remind students that learning looks different for everyone and that they can use the content from the collaborative version to create their visualization.

Students will then complete an exit slip found in the student workbook:

- The RCAF's tartan and roundel symbolize history, pride, and identity for its members. Students will be asked questions like:
  - What symbols or traditions are important in your life or community, and why?
  - How do these symbols contribute to a sense of belonging and shared identity?
- They will also create a tartan and roundel based on their answer to the exit card question.

Culminating (end goal): Students will be tasked with solving an aviation challenge or taking advantage of an opportunity in the innovation field by developing an innovation. They will use the design thinking process to empathize, define, ideate, prototype and test their innovation. (Note: This task will not be introduced to students yet.)

TEACHER'S NOTES

LESSON ONE

TEACHER'S NOTES

- While the purpose of the connections game is to inspire discussion and critical thinking among students, the intended answers for this activity are:
  - RCAF innovations: Dart, Arrow, Hornet, Bear
  - Nicknames of Aviators: Sandy, Skeets, Stocky, Billy
  - Forces of flight: lift, drag, weight, thrust
  - Benefits of flight: transportation, surveillance, evacuation, photography
- Other possible categories:
  - Movements: drag, thrust, lift, dart
  - Animals: bear, hornet, billy goat
  - Recreational activities: photography, weight, dart
  - _____ equipment: photography, surveillance, weight
  - Nature: sandy, hornet, bear
- Potential topics to address during group discussion:
  - Similarities and differences among objects, animals and things that fly
    - Shape: Discuss how flying objects and animals have different shapes optimized for flight.
    - Speed: Compare the speeds at which different flying objects and animals travel.
    - Size: Explore how size influences flight characteristics.
    - Location: Investigate where different flying objects and animals are found.
    - Creation: Discuss how flying objects are engineered or how animals evolved for flight.
- Purposes of the objects, animals and things that fly:
  - Natural purposes:
    - Survival: Flight helps birds, insects and bats hunt, escape predators and migrate.
    - Reproduction: Birds and insects use flight for courtship and mating displays, showing fitness.
    - Foraging: Flight aids in finding food, especially in spread-out or seasonal environments.
  - Human purposes:
    - Transportation: Planes and helicopters transport people, deliver cargo, provide emergency services, and serve military needs.
    - Recreation: Flying kites, model airplanes, drones, and hot air balloons are popular activities.
    - Scientific exploration: Drones and aircraft support research, environmental monitoring, aerial photography, and mapping.
    - Entertainment: Airshows, paragliding, skydiving, and aerial acrobatics offer entertainment and sport.
  - Symbolic and spiritual purposes:
    - Symbolism: Flying creatures like birds and angels symbolize freedom and spirituality in various cultures.
    - Ceremonial: Kites and lanterns in festivals and ceremonies symbolize hopes, dreams, and prayers.
  - Technological purposes:
    - Exploration: Unmanned aerial vehicles (UAVs) explore hazardous or inaccessible areas like disaster zones and remote landscapes.
    - Communication: Satellites and communication balloons support telecommunications, internet access, and broadcasting.
- Review the forces of flight and how they relate to an object's ability to fly:
  - Lift: Remind students that lift is the force that enables objects to overcome gravity and stay airborne. Discuss how wings generate lift through the Bernoulli Principle and the deflection of airflow.
  - Gravity: Explain how gravity acts as a downward force that pulls objects toward the Earth's surface. Emphasize that lift must counteract gravity for sustained flight.
  - Thrust: Discuss how thrust is the forward force that propels flying objects through the air. Engines or propulsion systems provide the necessary thrust for airplanes while birds generate thrust through wing flapping.
  - Drag: Define drag as the resistance encountered by objects moving through a fluid medium, such as air. Discuss how minimizing drag is essential for efficient flight.

TEACHER'S NOTES
LESSON ONE

TEACHER'S NOTES continued

Timeline events are to be added as you progress through the lessons and cover these events and milestones. They can also be found in Teacher Resources.

1858 – Avro Arrow (Innovation)
1909 – Aviation in Canada (Event)
1909 – Silver Dart (Innovation)
1914 – First World War (Event)
1915 – Billy Bishop (People)
1919 – William "Billy" Barker (People)
1920 – Canadian Air Force (People)
1921 – First Photo Flight (Innovation)
1924 – Royal Canadian Air Force (People)
1929 – Elsie MacGill (People)
1939 – Allan Bundy (People)
1939 – Second World War (Event)
1939-1945 – Carty Brothers (People)
1939-1946 – The Kraut Line (People)
1941 – The G-Suit (Innovation)
1941 – Willard John Bolduc (People)
1942 – RCAF Tartan (Event)
1944 – James "Stocky" Edwards (People)
1948 – The RCAF Flyers (People)
1962 – Trisonic Wind Tunnel (Innovation)
1982 – Charter of Rights and Freedoms (Event)
1988 – Tammy Negraeff (People)
1992 – CC-150 Polaris (Innovation)
1995 – Chris Hadfield (People)

Extra timeline cards have been added if you have innovations, events, or people that you or your students feel are important to the history of aviation.

FORCES OF FLIGHT LAB

LESSON TWO

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 1-2 hours

LEARNING GOALS

- We will understand how the forces of flight make things fly.
- We will explain how the forces of flight can be changed or adjusted to affect how things fly.

MATERIALS AND RESOURCES

- Prepared paper airplane templates (two per team)
- Scissors, tape, and glue
- Student workbooks
- Teacher rubric
- Metre sticks, rulers, and tape measures

SUCCESS CRITERIA

- I can effectively communicate my reasoning for decisions and demonstrate an understanding of the relationships between the forces of flight.
- I can actively participate in a discussion showing an understanding of the forces and impact of flight.
- I provide thoughtful and evidence-based responses that reflect my understanding of key concepts and ideas presented in the lesson

ASSESSMENT

Curriculum expectations: D2. Describe the relationships between the four forces of flight — lift, weight, thrust, and drag —that make flight possible.

- D2.1 Identify flight-related applications of the properties of air.
- D2.2 Describe how flying machines and various organisms use balanced and unbalanced forces to control their flight.
- D2.3 Describe how the four forces of flight can be altered.

Assessment for learning: Students will submit their workbook at the end of class for review by the teacher. This will help track student progress and help inform future lessons. Afterwards, teachers will use the rubric to assess student work.

Assessment as learning: Students will complete the rubric as a self-assessment before the teacher, setting a goal for the remainder of the unit.

DIFFERENTIATION

Reading level: Provide a variety of reading materials about Canadian aviation innovations at different reading levels to accommodate diverse learners. Offer simplified versions or additional resources for students who need extra support, and challenge advanced learners with more complex texts or primary sources.

Grouping: Assign groups strategically to ensure a mix of abilities and strengths. Pair students who may need extra support with peers who excel in the subject matter to encourage peer tutoring and collaboration.

Tactile tasks: Be available to support students who may need guidance or extra help with building their airplanes.

Modifications: Provide pre-cut paper airplane templates or print them in larger sizes if needed. Offer printed or video instructions for constructing airplanes. Allow students to respond to the prediction, observation, and conclusion questions verbally, with support, or digitally.

FORCES OF FLIGHT LAB

LESSON TWO: PAGE TWO

LESSON OUTLINE

Minds on (10 minutes): The teacher will begin by writing the words lift, weight, thrust, and drag on the board. This will prompt students to think back to the connections game from Lesson 1 and remind them of the forces of flight. Ask students to share what they remember about these terms and concepts.

Then, share this video: https://www.youtube.com/watch?v=wFTHh-6jIT8

Action (60 minutes): Deliver a lesson on the forces of flight.

- Lift: The upward force generated by the difference in pressure on the upper and lower surfaces of an aircraft's wings, counteracting gravity.
- Weight: The downward force exerted by gravity, acting on the aircraft's mass.
- Thrust: The forward force produced by the aircraft's engines, propelling it through the air.
- Drag: The backward force that opposes the aircraft's motion through the air, caused by air resistance.

Review safety expectations for using paper airplanes:

- Paper airplanes cannot be thrown in the classroom.
- Students must receive permission before testing their airplanes.
- Highlight any other safety measures relevant to your class.

Demonstrate how to follow the instructions and templates to create paper airplanes. Show students how to record their observations. After the demonstration, have a student team, of two to four people, complete the prediction section of their workbooks. Once this step is completed, provide each team with two different paper airplane templates (six templates are available in the teacher resources section). Distribute two templates per team to facilitate different experiences among students. Students will build each of their templates and then proceed to their workbook activities.

Consolidation (30 minutes): Using the provided pages in the student workbook, students will:

1. Predict what will happen based on the shape, size, and other characteristics of their planes and their knowledge of forces of flight (to be completed before building).
2. Conduct a test flight and record the results and observations of the flight.
3. Write a conclusion and summarize findings from the experiment, incorporating their understanding of the forces of flight.
4. Provide recommendations to improve the plane's flight distance or duration, based on their understanding of the forces of flight.

Extension: Upon completing the experiment, students will read stories, including, *Avro Arrow: Swift, Sleek and OnPoint*, *The Beartrap: How to Snag a Helicopter*, and *The Twin Otter: Built for the Great White North*. These stories highlight various aviation innovations designed to serve specific purposes. After reading, students will answer the final question in their workbook: What type of job would their planes be best suited on their shape, size and capacity? Examples could include carrying goods, surveillance, or passenger transport.

FLIGHT OBSERVATIONS

LESSON TWO: SELF-ASSESSMENT/TEACHER RUBRIC

Student Name:	Beginning	Approaching	Achieving	Exceeding
I have collaborated positively, followed instructions, and built 2 airplanes.				
I have demonstrated an understanding of the forces of flight and made informed predictions.				
I have accurately documented the data from my experiment.				
I have used my data to explain and make informed decisions.				
I have used my data and knowledge of the forces of flight to make suggestions for future innovations.				

Student Name:	Beginning	Approaching	Achieving	Exceeding
The student can positively collaborate, follow instructions, and build airplanes.				
The student demonstrates an understanding of the forces of flight and makes informed predictions accordingly.				
The student can accurately document data from their experiment.				
The student can use their data to explain and make informed decisions.				
The student can use their data and knowledge of the forces of flight to make suggestions for future innovations.				

HISTORY TAKES FLIGHT

LESSON THREE

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 3-4 hours

LEARNING GOALS

- We will learn about how Canadian aviation technology affects society, both near us and around the world.
- We will identify inventions in Canadian aviation history.
- We will create artifacts to demonstrate our knowledge.

MATERIALS AND RESOURCES

- Example infographic
- Instructions and elements of the timeline (additional materials detailed in instructions)
- Markers, coloured pencils, crayons, etc.
- Glue or tape
- Technology (as necessary)

SUCCESS CRITERIA

- I can accurately name and describe important Canadian aviation inventions, their origin, and their purpose.
- I can recognize the impact aviation inventions have had on the local and global community.
- I can create an infographic that highlights key information.
- I can work well in a small group to learn about our assigned aviation invention.
- I share my ideas, listen to others, and help us all work together to make a great presentation.

ASSESSMENT

Curriculum expectations:

Science expectations

- D1. Relating science and technology to our changing world
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Social studies expectations

- A1. Assess contributions to Canadian identities made by various groups and communities, including First Nations, Métis, and Inuit communities, and by various features of Canadian communities and regions.
  - A1.2 Analyze contributions made by various settler/newcomer groups to Canadian identities.

Arts expectations

- D1. Creating and presenting — apply the creative process to produce artwork in various traditional two- and three-dimensional forms, as well as multimedia artwork that communicates feelings, ideas, and understandings. Achieve this by using the elements, principles, and techniques of visual arts, along with current media technologies.
  - D1.1 Create two-dimensional, three-dimensional, and multimedia artwork that explores feelings, ideas, and issues from a variety of points of view.
  - D1.2 Demonstrate an understanding of composition, using selected design principles to create narrative or themed artwork.

Assessment for learning: After completing the timeline and infographics, have students provide feedback to their peers using the “two stars and a wish” strategy. You may need to pre-teach appropriate ways to give kind and constructive feedback. This encourages students to critically evaluate the work of others and reflect on their own contributions.

Assessment as learning: Encourage participation by posing thought-provoking questions during the think-pair-share activity on the societal impacts of aviation technologies. Have students discuss their ideas with a partner before sharing them the class. Students can document these ideas on individual whiteboards, notebooks or using other tools.

Peer feedback: After groups present their summaries of their assigned aviation innovations, peers will provide feedback on the accuracy and clarity of the information presented.

HISTORY TAKES FLIGHT

LESSON THREE: PAGE TWO

DIFFERENTIATION

Reading level: Provide reading materials about Canadian aviation innovations at different reading levels to accommodate diverse learners. Offer simplified versions or provide additional resources for students who need extra support, and challenge advanced learners with more complex texts or primary sources. ***Tip:*** Collect books related to this topic at a variety of levels from the school library.

Grouping: Assign groups strategically to ensure a mix of abilities and strengths. Pair students who may need extra support with peers who excel in the subject matter to encourage peer tutoring and collaboration.

Timeline tasks: Assign different roles within each group for the timeline creation process. For example, some students could focus on researching and writing summaries of the innovations, while others could be responsible for designing and decorating the timeline.

Infographic formats: Allow students to choose their preferred format for creating infographics. Options can include digital tools like Canva or Piktochart, or hand-drawn designs.

LESSON OUTLINE

During Lesson 1, the teacher should have created and displayed a blank timeline in the classroom. This will be important for the lesson.

PART 1 (50 MINUTES):

Minds on (10 minutes): Begin the lesson by introducing the concept of a timeline and explaining its purpose in organizing historical events chronologically (additional details in teacher notes). Prompt students to recall key dates, figures, and innovations they have learned about so far in the unit or from prior knowledge. As students share their ideas, hand them pre-made timeline cards (in the teacher resources at the end of the document), or document any new ideas that are not yet prepared. Revisit new ideas to create timeline cards, either digitally or by hand, using the provided templates in the teacher resource section.

Action (30 minutes): The teacher will read The Silver Dart: From Sleigh to Skis to Skies and place the Silver Darton the classroom timeline. After the reading, lead a discussion on the importance of aviation innovations and their societal impacts, both in Canada and globally (more details in teacher notes). Following the discussion, facilitate a think-pair-share activity using prompts provided in the teacher's notes.

Consolidation (10 minutes): Students will record their reflections in their workbooks.

PART 2 (60 MINUTES):

Before the lesson, divide students into small groups and assign each group a story from Aviation Nation. Suggested stories include: *CF-188: The Hornet with a Sting*, *The CC-150 Polaris: The Flying Fuel Station*, *The Trisonic Wind Tunnel: Testing at Supersonic Speeds*, and *The G-Suit: It's Not Rocket Science*. Organize groups to include mixed ability levels and select stories suitable for their reading levels.

Minds on (20 minutes): In their groups, students will read and discuss the story, focusing on key details such as the innovator(s) involved, the purpose of the innovation, its impact on aviation in Canada, and any challenges faced during its development. Ask students to identify and discuss three important takeaways from the story.

Action (30 minutes): Each group will collaborate to prepare a summary of their story and then present it to the class.

Consolidation (10 minutes): Students will pair with a peer from another group and share one interesting fact from their story. This peer-to-peer exchange will help reinforce their understanding of the material.

LESSON OUTLINE continued

PART 3 (WORK PERIODS OVER SEVERAL DAYS):

Minds On (20 minutes): The teacher will introduce the concept of an infographic and its role in visually representing information. Show examples of infographics and encourage students to discuss what they notice and what they wonder about each one.

Action (teacher discretion): Provide students with materials for creating infographics such as printed images, markers, coloured pencils, and digital tools (e.g., Canva). Instruct each group to design an infographic representing the key points of their story, including visuals and brief explanations. Depending on the class, several work periods may be required for this task.

PART 4 (60 MINUTES):

Before this lesson, create jigsaw groups by placing one student from each story into each group. Each group will present their infographic to a small group of students to promote accountability, participation and engagement.

Minds on (10 minutes): Give each group time to practice their presentation. Groups can decide the key aspects they want to share.

Action (40 minutes): Once all infographics are completed, each group will present their summary and infographic to their jigsaw group. Students use the peer evaluation forms provided in their workbook to assess each presentation.

Consolidation (10 minutes): Students will attach their infographics to the timeline in the appropriate locations. They will then fill in a reflection in their student workbook, based on an innovation they learned about from another group.

TEACHER'S NOTES
LESSON THREE

TEACHER'S NOTES

- Discuss the importance of aviation innovations and their impact on society, both in Canada and globally.
  - Significance of aviation innovations:
    - Teacher script: "Aviation innovations have fundamentally transformed the way we connect with one another and the world. In Canada, innovations like the Canadarm and the Avro Arrow have showcased our nation's leadership in aerospace technology, space exploration, and strengthening defence."
  - Economic impact:
    - Teacher script: "The economic impact of aviation innovations in Canada cannot be overstated. Our aerospace industry contributes billions of dollars each year and employs thousands of Canadians. From the construction of airports and manufacturing plants to the maintenance of aircraft, aviation innovations have created countless job opportunities and have fueled economic growth across the country." Please refer to the "Careers in Aviation" in Chapter 6 of Aviation Nation.
  - Social and cultural changes:
    - Teacher script: "Aviation innovations have facilitated greater mobility and cultural exchange, bringing people together from different regions and countries. In Canada, air travel has made it easier for Canadians to explore their vast and diverse country, connect with loved ones, and experience new cultures."
- Think-pair-share prompts:
  - "How have aviation innovations transformed the way people and goods are transported globally and locally?"
  - "How has aviation innovation affected cultural exchange and the exchange of ideas between different regions and countries?"
  - "How do you think future aviation innovations will continue to shape society, both globally and locally, in the coming years?"
- Timeline introduction:
  - Teacher script: "Today, we're going to explore the concept of a timeline and its significance in understanding historical events. A timeline is like a visual roadmap that helps us organize and chronologically sequence important events in history — meaning a timeline puts together events in the order they happen. In the context of our lesson on Canadian aviation innovations, a timeline allows us to see the progression of key events over time, starting from the earliest innovations to the most recent advancements. Think of a timeline as a series of snapshots of history, providing us with a clear and concise overview of the past."
- Infographic introduction:
  - Teacher Script: "Now that we've discussed and read stories about Canadian aviation innovations, it's time to explore the concept of an infographic and its role in visually representing information. An infographic is a visual representation of data, information or knowledge, designed to make complex concepts easier to understand and remember. In our lesson, infographics will serve as a creative way for you to showcase the key facts and insights you've learned about Canadian aviation innovations from *Aviation Nation*. By incorporating images, charts, and text, infographics allow us to convey information in a visually engaging format that captures the attention of the audience and effectively communicates the significance of the innovations you've researched. Think of infographics as a way to tell a story visually, using colours, shapes, and symbols to convey meaning and engage your audience."

WINGS AND WIND

LESSON FOUR

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 2-4 hours

LEARNING GOALS

- We will understand the basic properties of air.
- We will explain how aerodynamics influence flight.
- We will explore how the manufacturers and RCAF apply principles of aerodynamics in aircraft design and operational strategies.

MATERIALS AND RESOURCES

- Strip of paper (approximately 3 cm x 15 cm)
- Fan or hairdryer
- Plastic and/or cardboard to create a tunnel
- Lightweight string or thread
- Paper airplanes from Lesson 2
- Other items to test in the wind tunnel
- Journal to record observations and final reflection

SUCCESS CRITERIA

- I can demonstrate an understanding of air pressure and airflow.
- I can use the engineering design process to create a wind tunnel and test objects in it.
- I can predict what will happen to an object in the wind tunnel and record my observations.
- I can explain how aerodynamics affects an aircraft wing.

ASSESSMENT

Curriculum expectations:

- A1. STEM investigation and communication skills
  - A1.2 Use an engineering design process and associated skills to design, build and test devices, models, structures, and/or systems.
- D2. Exploring and understanding concepts — demonstrate an understanding of how properties of air can be applied to the principles of flight and flying machines.
  - D2.1 Identify flight-related applications of the properties of air.
  - D2.2 Describe the relationships between the four forces of flight — lift, weight, thrust, and drag — that make flight possible.
  - D2.3 Describe ways in which the four forces of flight can be altered.
  - D2.4 Describe characteristics and adaptations that enable organisms to fly.

Assessment for learning: The teacher will monitor student involvement throughout the lesson. The teacher will interact with students as they work on their experiment and take note of participation and understanding.

Assessment as learning: Students will finish the lesson by reflecting on their predictions and the outcomes using the reflection pages provided in the student workbook. They will submit their workbook at the end of class.

DIFFERENTIATION

Simplified predictions: Provide sentence starters for students who need help making predictions (e.g., “In the wind tunnel, I think the paper airplane will...”).

Visual aids: Use diagrams and videos to explain aerodynamic concepts for visual learners.

Procedure: The entire wind tunnel experiment can be done as a teacher-led demonstration. In this case, students would make predictions, record observations, draw conclusions, and reflect on the lesson.

LESSON OUTLINE

Minds on (10 minutes): The teacher will begin by posing questions to the class: “Have you ever stuck your hand out of the window of a car while it was driving? What did you notice? How might you explain what your hand was feeling?” Discuss how air can flow over and around objects, affecting their movement. Introduce the term “aerodynamics.”

WINGS AND WIND

LESSON FOUR: PAGE TWO

LESSON OUTLINE continued

Action (90 minutes over two days): Demonstrate *Bernoulli's Principle* (teacher-led or whole group participation)

- Hold a strip of paper in front of your bottom lip so it curves down freely. Blow a steady stream of air towards the top surface of the paper — faster airflow over the top of the paper will cause it to lift up. ***NOTE:*** This is not a true demonstration of *Bernoulli's Principle*, but it can be helpful for students to visualize the effect of airflow on a surface.

The teacher will introduce the properties of air: air has mass, it takes up space, and it can exert force. Briefly review the four forces of flight, inviting students to think about the role of airflow.

Present the following video (5 minutes) to the class, *How do airplanes actually fly?* — Raymond Adkins, TED-Ed: https://www.youtube.com/watch?v=p4VHMsIuPmk

Invite students to turn and talk to discuss with their peers (1-2 minutes) how a scientist might test an aircraft before it is ready to be flown with people on board.

Then, read the story, *The Trisonic Wind Tunnel: Testing at Supersonic Speeds*, from the book Aviation Nation. Students will return to their turn-and-talk groups to continue discussing their ideas for testing an aircraft and how their original ideas compare to the *Trisonic Wind Tunnel*.

Optional: Provide time for students to research examples of modern wind tunnels, including those used by NASA, as well as other non-aviation uses for wind tunnel testing.

The teacher will decide whether the class will create multiple wind tunnels (individually or in small groups) or if one pre-constructed wind tunnel will be shared by all of the students. If students are creating their own wind tunnels, the lesson timeline will be extended.

Constructing the wind tunnel (Create a smaller version of the wind tunnel using this video: https://www.youtube.com/watch?v=bE00HT8I-Sw)

- Using cardboard or other available materials, create a long tube or rectangular prism shape (must be large enough to fit a paper airplane inside). This is the basic structure of the wind tunnel and should be left open at both ends.
- Cut a large section out of one of the sides to create an observation window. This will need to be covered with clear plastic wrap or plexiglass to prevent airflow from escaping.
- Tie a string from the "ceiling" of the tunnel's interior to suspend objects.
- Ensure the tunnel is stable and the fan or hair dryer can be easily turned on and off at one end.

Experimentation:

- In their workbooks, students will make predictions for how they think each object might behave in the airflow of the wind tunnel, and how the shape could affect its movement.
- After completing the predictions, students will place a strip of paper or ribbon at the entrance of the tunnel to visualize the airflow. Turn on the fan or hairdryer and let students observe the airflow inside the tunnel without any objects.
- Secure a paper airplane or other wing-shaped item to the string in the tunnel one at a time.
- Students should record observations in their workbooks for each object, focusing on how the airflow affects each one.
- Students can test other objects including a ping pong ball, a small toy car, a feather, a plastic spoon, and an inflated balloon.

Analyze Results:

- Discuss why different objects behaved differently in the wind tunnel.
- Relate the observations to the four forces of flight: lift, weight, thrust, and drag. Were you able to observe any of these forces in this experiment?
- Discuss high and low-pressure areas around the objects.
- Summarize key points about how airflow affects different shapes and weights.
- Encourage students to think about real-life applications of these principles (e.g., aircraft design, sports, racecars, etc.)

Consolidation (10 minutes): Students will finish the lesson by reflecting on their predictions and actual outcomes using the reflection pages provided in the student workbook.

MUSICAL WINGS
LESSON FIVE

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 2-4 hours

LEARNING GOALS

- We will learn about the music played and associated with the RCAF.
- We will learn about the RCAF's history, uniforms, and connections to music.

MATERIALS AND RESOURCES

- Provided presentation

SUCCESS CRITERIA

- I can communicate the role of music in the RCAF, as well as its history.
- I can describe what the band looks and sounds like, and discuss the music they play.
- I can offer my own thoughts about the significance of the music and musicians, how the music makes me feel, and how I connect to the music and the RCAF.

ASSESSMENT

Curriculum expectations:

Science expectations:

- D1. Relating science and technology to our changing world
  - D1.1 Assess the societal impacts of aviation technologies, while considering both local and global perspectives.

Music expectations:

- C2. Reflecting, responding, and analyzing — apply the critical analysis process (see pages 23–28) to communicate students' feelings, ideas, and understandings in response to a variety of music and musical experiences.
  - C2.1 Express detailed personal responses to musical performances by writing a critical review, writing an analysis of works they have listened to in a log or journal; or creating a drawing or graphic representation of their initial reaction to a song.
- C3. Exploring forms and cultural contexts — demonstrate an understanding of a variety of musical genres and styles from the past and present, and their sociocultural and historical contexts.
  - C3.1 Compare aspects of the music of one culture and/or historical period with music of another culture and/or historical period.

Assessment for learning: Students will monitor their involvement and participation in the discussion, throughout the lesson.

Assessment as learning: Students will play their composition for the class and submit their reflection at the end of class for a completion mark. The teacher will also monitor student participation throughout the lesson.

DIFFERENTIATION

Assistive technology: Students can use text-to-speech and speech-to-text in the research and journal writing phases.

Peer support: While this is an individual assignment, classmates can suggest appropriate research and resources, or provide writing assistance.

Deliverable format: Instead of writing in a journal, students can make a short podcast news piece (audio only, or limited accompanying writing), a video news piece, or slide presentation using writing, photos, videos, audio, etc.

MUSICAL WINGS
LESSON FIVE: PAGE TWO

LESSON OUTLINE

PART 1 (50 MINUTES):

Minds on (10 minutes): Begin the lesson by discussing the type of music, instruments, style, etc. associated with the Royal Canadian Air Force. Find examples in the teacher notes.

Action (20 minutes): Read the stories, *RCAF Band: Inspiring National Pride and Unity* and the *RCAF Tartan: Showing its True Colours*, and watch this video: *12 Wing Pipes and Drums Tribute to Stalker 22*. The teacher will guide students through the presentation and a discussion about their observations on the photos, including the style of uniforms and types of instruments. The teacher can choose to supplement the lesson with additional audio from the RCAF band.

Consolidation (20 minutes): Students will reflect on the content shared and communicate their feelings, ideas and understandings through a journal entry.

PART 2 (WORK PERIODS OVER SEVERAL DAYS):

Action (up to teacher discretion): The students will form small groups and compose a melody or rhythm that they feel might be suitable for a piece played by the RCAF. Students can sing melodies, play an instrument, use body percussion or objects or music software. Students will present their compositions to their peers.

Consolidation (10 minutes): Students will explain the inspiration behind their compositions and why it is appropriate for RCAF musicians to perform. This could be documented as a written journal entry or an audio/video recording.

TEACHER'S NOTES

LESSON FIVE

TEACHER'S NOTES

- Potential questions to spark discussion about the RCAF's music, instruments or style:
  - What emotions or feelings do you associate with the RCAF?
  - When you think of the RCAF, what type of music comes to mind? (Patriotic, classical, military marches, modern, etc.)
  - Which instruments do you think are commonly used in music associated with aviation or the military?
  - How does the tempo or rhythm of music related to aviation differ from other genres?
  - Are there any specific musical styles or genres that you think reflect the history or ethos of the RCAF?
  - Can you identify any famous songs or musical compositions related to aviation or the RCAF?
  - How does music play a role in ceremonies, events or celebrations within the aviation or military communities?
  - Do you think the RCAF's music preferences have evolved over time? If so, how?
  - Are there any cultural or regional influences in the music associated with aviation or the RCAF?
  - How do visuals, such as album covers or music videos, complement the music associated with aviation or the RCAF?
  - Did you know that the RCAF's Snowbirds were the first aerobatics team to perform to music?
- Software options for musical compositions:
  - Chrome Music Lab
  - Garage Band
  - Any other media teacher deems appropriate and acceptable

HIGH-FLYING HEROES
LESSON SIX

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 2-4 hours

LEARNING GOALS

- We will research historical Canadian aviation heroes
- We will learn about aviator's impacts' on society
- We will apply the influence of an aviation role model into our every day life

MATERIALS AND RESOURCES

- Provided presentation

SUCCESS CRITERIA

- I can identify and discuss Canadian aviation heroes and their influence on flying and society.
- I can make connections with these historical figures and contemporary role models.
- I can communicate motivations to balance exercise and commitment to personal goals.

ASSESSMENT

Curriculum expectations:

Science expectations:

- D1. Relating science and technology to our changing world
  - D1.1 Assess the societal impacts of aviation technologies while considering both local and global perspectives.

Language expectations:

- D1. Developing ideas and organizing content
  - D1.5 Explain and compare how the strategies and tools used helped students develop ideas and organize content for texts of the chosen forms, genres, and media, and how they helped improve their skills as text creators.
- D2. Creating texts
  - D2.1 Draft complex texts of various forms and genres, including narrative, expository and informational texts, using various media, tools, and strategies.
- D3. Publishing, presenting and reflecting
  - D3.3 Compare how various strategies and tools helped them communicate their intended message when publishing and presenting texts, and suggest future steps for improvement as text creators.

Health and physical education expectations:

- B.1 Active participation
  - B1.3 Describe factors that motivate them to participate in physical activity every day, at school and during leisure time, and that influence their choice of activities (e.g., influence of friends, enthusiasm for the outdoors, preference for either team or individual activities, encouragement from others, increased time with friends, availability and affordability of a program, enjoyment of healthy competition, influence of media role models). [A1.1 Emotions, 1.2Coping, 1.3 Motivation, 1.5 Self]

Assessment for learning: The students will monitor their involvement in the discussion and participation throughout the lesson.

Assessment as learning: Students will submit their completed journal article at the end of class for a completion mark and feedback.

HIGH-FLYING HEROES

LESSON SIX: PAGE TWO

DIFFERENTIATION

Assistive technology: Students can use text-to-speech and speech-to-text in the research and journal writing phases.

Peer support: While this is an individual assignment, classmates can suggest appropriate research and resources, or provide writing assistance.

Deliverable format: Instead of writing in a journal, students can make a short podcast news piece (audio only, or limited accompanying writing), a video news piece or slide presentation using writing, photos, videos, audio, etc.

LESSON OUTLINE

Minds on (10 minutes): Prompt students to consider figures in aviation or sports that they are inspired by (see teacher notes for prompts). They may consider another figure who has a well known hobby as a sport or an athlete with a second career.

Action (30 minutes): Together, the teacher and students will read three aviation stories, *The RCAF Flyers: Bringing Home Olympic Gold*, *The Kraut Line: They Shoot... They Score!* and *Stocky Edwards: Knight Flyer*. The teacher will share the presentation, which includes additional media related to these stories.

Students will reflect on these figures and their accomplishments in aviation and athletics and continue developing their initial thoughts from the beginning of the lesson.

Note about the story The Kraut Line: They Shoot...They Score!: The term "Kraut" was historically used as a nickname for the Kraut Line due to the players' German heritage and Kitchener's former name, Berlin. At the time, it was not intended to be derogatory, and the trio embraced the name as part of their identity in hockey. However, today, "Kraut" is perceived as an offensive term for people of German descent. It emerged during First World War and Second World War, often used by Allied forces to dehumanize and insult German soldiers. This reflects how language evolves and how terms can be perceived differently over time, depending on cultural and historical perspectives.

Task (timing up to teacher discretion, work periods over several days): Students will research an influential figure (athlete, aviator, inventor, artist, etc.) and write an article in the style of the stories and associated media they have read (article outline available in the resource section).

Extension:

- Integrate playing one of the sports discussed in the stories.
- Students write a short reflection in which they choose a figure in aviation or sports and explain how and why they are inspired by that person.

TEACHER'S NOTES
LESSON SIX

TEACHER'S NOTES

- Prompts for engaging students in a discussion about aviation and sports role models/influences:
  - Name a Canadian who has been to space.
  - Name a Canadian who has flown for the RCAF.
  - What other careers or passions might a pilot or astronaut have?
  - Name a Canadian athlete who has excelled in more than one sport.
  - Name a Canadian who has been inducted into a sports hall of fame.
  - What hobbies or second careers might a professional athlete pursue after retirement?
  - Name a Canadian who has made significant contributions to aviation.
  - What other fields might an aviator or aerospace engineer be passionate about?
  - Name a Canadian who has made a notable impact on sports or another industry.
  - What are some examples of Canadian athletes who have transitioned to careers in media or entertainment?
  - Name a Canadian who has received national recognition for their contributions to sports or aviation.
- Alternative considerations:
  - Try out the 5BX exercise program invented by the RCAF and featured in Aviation Nation.
  - Play the video and follow along: https://www.youtube.com/watch?v=InOqdEBysfM

LEGENDS OF THE SKY

LESSON SEVEN

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 95 minutes

LEARNING GOALS

- We will learn about important Canadian aviators.
- We will talk about how aviators have changed society.
- We will make infographics to show what we've learned.
- We will share our learnings together.

MATERIALS AND RESOURCES

- Student workbooks
- Sticky notes, mini whiteboards, etc. for documentation
- Markers, coloured pencils, crayons, etc.
- Scissors

SUCCESS CRITERIA

- I can name and describe influential Canadian aviators, their key achievements, challenges, and contributions.
- I can think about how each aviator affected society. I understand how they impacted society locally and globally.
- I can create an artifact about my assigned aviator with important facts in a clear, creative, and concise way.
- I can work well in a small group to share ideas, listen to others, and research our assigned aviator.

ASSESSMENT

Curriculum expectations:

Science expectations:

- D1. Relating Science and Technology to Our Changing World
  - D1.1 Assess the societal impacts of aviation technologies while considering both local and global perspectives.

Social studies expectations:

- A1. Assess contributions to Canadian identities made by various groups and communities, including First Nations, Métis, and Inuit communities, and by various features of Canadian communities and regions.
  - A1.2 Analyze contributions made by various settler/newcomer groups to Canadian identities.

Arts expectations:

- D1. Creating and presenting — apply the creative process to produce artwork in various traditional two- and three-dimensional forms, as well as multimedia artwork that communicates feelings, ideas and understandings, using elements, principles and techniques of visual arts and current media technologies.
  - D1.1 Create two-dimensional, three-dimensional, and multimedia artwork that explores feelings, ideas and issues from a variety of points of view.
  - D1.2 Demonstrate an understanding of composition, using selected principles of design to create narrative or themed artwork.

Assessment for learning: After completing the timeline and infographics, have students provide feedback to their peers using the "two stars and a wish" strategy. You may need to pre-teach appropriate ways to give kind and constructive feedback. This encourages students to critically evaluate the work of others and reflect on their own contributions.

Assessment as learning: Encourage participation by posing thought-provoking questions during the think-pair-share activity on the societal impacts of aviation technologies. Have students discuss their ideas with a partner before sharing with the class. Students can document these ideas on individual whiteboards, notebooks or using other tools.

Peer feedback: After groups present their summaries of their assigned aviation innovations, peers will provide feedback on the accuracy and clarity of the information presented.

LEGENDS OF THE SKY

LESSON SEVEN: PAGE TWO

DIFFERENTIATION

Reading levels: Provide reading materials about Canadian aviation innovations at different reading levels to accommodate diverse learners. Offer simplified versions or provide additional resources for students who need extra support, and challenge advanced learners with more complex texts or primary sources.

Grouping: Assign groups strategically to ensure a mix of abilities and strengths. Pair students who may need extra support with peers who excel in the subject matter to encourage peer tutoring and collaboration.

Timeline tasks: Assign different roles within each group for the timeline creation process. For example, some students could focus on researching and writing summaries of the innovations, while others could be responsible for designing and decorating the timeline.

Infographic formats: Allow students to choose their preferred format for creating infographics. Option can include digital tools like Canva or Piktochart, or hand-drawn designs.

LESSON OUTLINE

Minds on (15 minutes): Begin the class by reading *Allan Bundy: Soaring Beyond Racial Bias*. Then, discuss different aviation pioneers, their importance in history, and their contributions to the field of aviation (descriptions and examples can be found in the teacher notes). Students should use the timeline in the discussion.

Action (60 minutes): Students will engage in a think-pair-share discussion based on the information they have learned. Learners can record their thoughts using available resources (e.g., whiteboards, journals, sticky notes, etc.). Find prompts for this discussion in the teacher notes.

The teacher will review the class timeline created in Lesson 1 and remind students of the significance of documenting aviation innovations and aviators. Find a script for this discussion in the teacher notes.

Divide students into small groups and provide each group with a story from Aviation Nation about influential Canadian aviators. Instruct students to read their assigned aviator's story and take notes on key achievements, challenges overcome,and contributions to aviation history.

Each group will use the provided "aviator template" (found in teacher resources) to create a 2D version of their aviator, including various facts about them. Remind students about how posters can be displayed in different ways, and this aviator template acts as a combination of text and images to share knowledge.

Consolidation (20 minutes): Once the aviator templates are complete, each group will present their work, including story summaries and aviator details, to the class. Learners will provide peer evaluations and feedback using the forms provided in their workbooks. Students will then attach their aviator to the timeline in the appropriate location. Encourage students to discuss and debate the placement of each aviator if there are discrepancies or uncertainties regarding chronology. You may choose to have students place the aviator either on their birthdate or the date of their significant aviation contribution.

TEACHER'S NOTES
LESSON SEVEN

TEACHER'S NOTES

- Discuss different aviation pioneers, their importance in history, and their contributions to the field of aviation. Descriptions and examples can be found in the teacher notes for this lesson.
  - Notable achievements:
    - Teacher script: "Influential Canadian aviators have made significant contributions to aviation history, leaving a lasting impact on the field. For example, Billy Bishop, a Canadian First World War flying ace, is renowned for his exceptional combat skills and strategic leadership, earning him the Victoria Cross for his bravery in aerial combat. Additionally, Jacqueline Cochran, a pioneering aviator, set numerous speed and altitude records, demonstrating Canada's expertise in aviation innovation and exploration."
  - Global recognition:
    - Teacher script: "Canadian aviators have earned global recognition for their achievements, showcasing Canada's prowess in aviation excellence. For instance, Chris Hadfield, the first Canadian to command the International Space Station, captured the world's attention with his sensational photographs and engaging educational outreach activities. His work inspired millions with his passion for space exploration and science. These achievements highlight Canada's leadership and innovation in the international aerospace community."
  - Barriers and challenges:
    - Teacher script: "Despite their remarkable achievements, influential Canadian aviators faced significant barriers and challenges in their careers. For instance, Elsie MacGill, the world's first female aircraft designer, overcame gender discrimination and societal expectations to become a trailblazer in the field of aeronautical engineering. Similarly, John McCurdy, one of Canada's early aviation pioneers, navigated technological limitations and safety concerns to achieve success in the nascent aviation industry, demonstrating resilience and determination in the face of adversity."
- Example prompts for the think-pair-share discussion
  - "Think about a person who has made a big impact in the world of flying. It could be someone you've heard of before or someone new. Share with your partner who you're thinking of and why you chose them."
  - "Imagine you're an aviator from Canada who achieved something amazing in aviation history. What do you think you would have done? Take turns sharing your ideas with your partner and discuss why you think your aviator's achievement would be important."
  - "Consider the challenges someone might face if they wanted to become a pilot or an astronaut in the past. Discuss with your partner what you think some of these challenges might have been and how they could have overcome them."
- Review the class timeline created in the previous lesson and remind students of the significance of documenting aviation innovations and aviators.
  - Teacher script: "Today, we're going to revisit the timeline we created earlier in this unit to remind ourselves of the importance of timelines and documenting information on aviation history. As we've learned, timelines serve as valuable tools for organizing historical events chronologically, providing us with a clear visual representation of how events unfold over time. Right now our timeline only showcases the progression of key aviation innovations. Starting today, we will be adding the contributions of influential Canadian aviators to the field of aviation."
  - Remember, each entry on our timeline represents a significant milestone in aviation history, from the first powered flight to the latest advancements in aerospace technology. By documenting these events on our timeline, we're preserving the rich heritage of Canadian aviation and gaining a deeper understanding of how these innovations have shaped our world.
  - As we review our timeline, I encourage you to reflect on the stories and achievements we've learned about so far. Consider the impact of each innovation and aviator on Canadian society and the broader global community. Revisiting our timeline reinforces our knowledge of aviation history and celebrates the ingenuity and perseverance of those who have paved the way for future generations of aviators and innovators.
  - So let's take a moment to appreciate the significance of our timeline and the valuable insights it provides into the world of aviation. As we continue to add to our timeline and document new discoveries, let's remember the importance of preserving our aviation heritage for generations to come.

AVIATE AND INNOVATE

LESSON EIGHT

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: 95 minutes

LEARNING GOALS

- We understand the significance of contemporary aviation innovations in shaping the future of flight technology.
- We can contribute to constructing a class timeline documenting the progression of aviation technology.

MATERIALS AND RESOURCES

- Research tools (books, Internet access, tablets,computers, etc.)
- Sticky notes (optional)
- 4x6 cardstock or cue-cards
- Drawing and writing utensils

SUCCESS CRITERIA

- I can research and explain new aviation technologies.
- I can brainstorm and generate creative ideas for future aviation technologies that could solve current problems.
- I can research and describe the development timeline, how a specific aviation technology works and its benefits.
- I can imagine and design a new aviation technology that addresses a specific challenge or improves an area within aviation.

ASSESSMENT

Curriculum expectations:

Science expectations:

- D1. Relating science and technology to our changing world
  - D1.1 Assess the impacts on society of aviation technologies, while considering both local and global perspectives.

Language expectations:

- A1. Transferable skills: Demonstrate an understanding of how the seven transferable skills are used in various language and literacy contexts.
  - A1.1 Explain how transferable skills can be used to support communication in various cultural, social, linguistic and domain-specific contexts, and apply them when reading, listening to, viewing and creating texts of various forms.

Assessment for learning: Students will self-assess group work and their ability to communicate knowledge about their assigned or chosen innovation. The teacher may collect anecdotal notes to track student involvement.

Assessment as learning: Students will submit their mini signs for feedback.

DIFFERENTIATION

Grouping: Assign groups strategically to ensure a mix of abilities and strengths. Pair students who may need extra support with peers who excel in the subject matter, fostering peer tutoring and collaboration.

Content differentiation: Provide students with materials and resources that align with their skill levels. Offer options for the short research component, ensuring all students can access content that meets their individual needs.

AVIATE AND INNOVATE

LESSON EIGHT: PAGE TWO

LESSON OUTLINE

Minds on (15 minutes): Begin the lesson by reading two stories aloud: *Aerospace Control Operator: Keeping the Skies Safe!* and *The Trisonic Wind Tunnel: Testing at Supersonic Speeds*. Lead a discussion that connects the role of Aerospace Control Operators to the Trisonic Wind Tunnel innovation, highlighting how technology supports critical roles in aviation to ensure aircraft safety and performance. Use the talking points in the teacher notes to guide the conversation, emphasizing how aviation careers are closely tied to technological advancements.

Action (work periods over several days, up to teacher discretion): After the discussion, shift the focus to contemporary aviation innovations. Begin by asking students to recall examples of new technologies they may already know, using the class timeline as a reference point. Document each idea on sticky notes for easy distribution later in the lesson. As needed, use the provided slideshow to guide the conversation with additional examples. Introduce students to the process of scientific inquiry in aviation, explaining how professionals in various careers — such as engineers, technicians, and operators — develop and test new technologies to improve safety and efficiency. Explain that students will now conduct a mini research project to explore both a modern aviation innovation and the careers involved in its development and application.

Divide students into pairs or small groups and allow them to choose an innovation to investigate. Options might include drones, electric planes, advanced navigation systems, noise reduction technology, or alternative fuels. Instruct students to research key aspects of their innovation, such as its origin, the time taken for its development and the scientific principles behind it. They should also look into its uses, benefits, and any environmental or societal impacts.

As they research, students should identify careers associated with their chosen innovation. Encourage them to explore what types of professionals work with this technology, the skills or training these roles require, and how these careers contribute to advancing the field of aviation. Encourage students to think critically, considering how their innovation might evolve or shape future career opportunities in aviation.

Once they have gathered information, students will create a small 4x6 mini sign about their assigned innovation and related careers. This sign should include a brief description of the innovation, key facts and mention of relevant careers, along with any visuals or diagrams that help explain the content. These signs will be added to the timeline, highlighting the connection between aviation innovations and career paths..

Consolidation (20 minutes): Students will complete a self-assessment and a reflection in their workbooks. Encourage them to reflect on what they learned about the connection between aviation innovations and careers and how scientific inquiry contributes to various fields within aviation. Additionally, have students consider the societal and environmental impacts of these innovations and how they might influence the future of aviation careers.

TEACHER'S NOTES
LESSON EIGHT

TEACHER'S NOTES

Why we needed these innovations and careers in aviation

Each innovation addressed specific challenges or needs within the aviation industry and required specialized careers to bring these advancements to life. For example:

The G-Suit was developed to protect pilots from the intense forces experienced during high-speed maneuvers, requiring aerospace engineers, technicians and medical researchers to ensure pilot safety and performance.

The Avro Arrow was designed to push the boundaries of speed and technology in fighter aircraft, enhancing national defence capabilities. This project involved teams of engineers, pilots, and control operators.

The Beartrap was created to improve helicopter operations and safety during naval missions, with roles like Aircraft Technicians and Aerospace Control Operators ensuring the effectiveness and reliability of this system.

The importance of innovation

Emphasize that innovation drives continuous progress and solves current and emerging problems. It allows us to improve existing technologies and explore new possibilities. This mindset is essential for addressing future needs and challenges in aviation. Careers in aviation, from technicians and engineers to operators and environmental specialists, play a vital role in implementing and sustaining these innovations.

Key points to highlight during contemporary aviation innovations and careers discussion

1. Role of innovation in shaping aviation: Recent advancements, such as electric aircraft, biofuels, 3D printing, and autonomous drones, are transforming the future of aviation by enhancing efficiency, reducing environmental impact,and increasing safety.
2. Careers behind the innovations: Discuss the variety of careers associated with each innovation. For example:
   - Electric aircraft rely on engineers focused on sustainability, and environmental specialists to monitor their impacts.
   - Autonomous drones involve developers, operators, and technicians who ensure their safe and effective use.
   - 3D printing in aircraft manufacturing requires designers and materials scientists to create lightweight, durable parts.
3. Ongoing need for skilled professionals: Reinforce that the aviation industry relies on a range of professionals — from engineers and technicians to control operators and environmental experts — to drive these innovations and maintain safe, efficient aviation operations.

Aviation research

Encourage students to explore Canadian resources like the National Research Council's website(https://nrc.canada.ca/en/stories/100-years-innovation-civil-aviation) to learn more about aviation innovations and the careers involved in developing them. This research can provide a broader context for their mini-projects, showcasing the connection between technology and career paths in aviation.

FLIGHT OBSERVATIONS

LESSON EIGHT: SELF-ASSESSMENT/TEACHER RUBRIC

Student Name:	Beginning	Approaching	Achieving	Exceeding
I have demonstrated an understanding of the forces of flight and made informed predictions.				
I have actively participated in group discussions and significantly contributed to group work.				
I have created a creative and engaging mini sign that is organized and easy to read.				
I have presented my mini sign with confidence and clearly articulated my knowledge of the innovation.				

Student Name:	Beginning	Approaching	Achieving	Exceeding
The student conducts thorough research in order to have an in-depth understanding of the innovation.				
The student actively participates in group discussions and significantly contributes to group work.				
The student creates a creative and engaging mini sign that is organized and easy to read.				
The student presents their mini sign with confidence and clearly articulates their knowledge of the innovation.				

BEYOND THE HORIZON

LESSON NINE

LESSON OVERVIEW

Grade/Class: Grade 6 Science

Time required: Up to teacher's discretion to allow time for the culminating task

LEARNING GOALS

- We can apply the design thinking process to develop innovative solutions for contemporary aviation challenges.
- We can develop and present prototypes or concept designs for our innovative solutions.

MATERIALS AND RESOURCES

- Sticky notes or index cards
- Creative utensils (markers, pens, etc.)
- Research materials (books, articles, Internet access, etc.)
- Presentation tools (poster boards, PowerPoint, etc.)
- Peer feedback forms
- Design thinking resource, launch by John Spencer and A.J. Juliani

SUCCESS CRITERIA

- I can apply my knowledge of aviation technologies and their societal impacts to develop design solutions that address real-world challenges in the aviation industry.
- I can demonstrate my ability to take scientific concepts and create a practical design solution.
- I can create a physical prototype, digital model or detailed concept design to illustrate my proposed solution.
- I can create a visually appealing prototype of my idea.

ASSESSMENT

Curriculum expectations:

Science expectations:

- D1. Relating science and technology to our changing world
  - D1.1 Assess the impacts of aviation technologies on society, considering both local and global perspectives.

Language expectations:

- D3. Publishing, presenting, and reflecting
  - D3.1 Publish and present texts, using selected media and tools, and analyze how students' choices helped them communicate their intended message.

Art expectations:

- D3. Creating and presenting
  - D1.1 Use elements of design in artwork to communicate ideas, messages and understandings.

Assessment for learning: Have students self-assess using the same rubric teachers use.

Assessment as learning: The teacher will review completed Design Thinking pages from student workbooks. The teacher will complete a rubric for each student or group.

DIFFERENTIATION

Presentation format: Offer various presentation formats for students to accommodate different learning styles and preferences (written, oral, digital and physical).

Scaffolding: Have various tools (templates, organizers, prompts, etc.) for students.

Collaboration: Encourage collaboration and peer mentoring to foster a supportive learning environment.

Feedback: Provide ongoing feedback and celebrate student contributions.

Time: Extra time given to students who require it.

BEYOND THE HORIZON

LESSON NINE: PAGE TWO

LESSON OUTLINE

Minds on (10 minutes): The teacher will begin the lesson by engaging students in a reflective conversation about the progression of aviation throughout history, using the timeline as a backdrop for this discussion. Share with students that although the timeline is completed for the unit, it is time to think beyond the timeline and create ideas for the future of aviation. Remind students of the last lesson, and what technologies are currently being or have recently been developed.

Action (work periods over several days, up to teacher discretion): Have students begin with a think-pair-share. Students will brainstorm a potential aviation technology that solves a specific challenge or makes an improvement. At this point, students should be encouraged to think outside of the box. Once students have an idea, they will pair up and share their ideas with their peers. Together, the students will choose to either present one of the ideas, a combination of the ideas or a brand new idea to the class.

After this discussion, the teacher will introduce students to the concept and process of design thinking, explained in teacher notes. It is recommended that you post the design thinking steps up for students to view while completing the task. The remainder of the lesson will follow the design thinking process.

Empathize and Define: As a whole class, engage students in a discussion about current challenges and opportunities facing the aviation industry (see teacher notes for prompts). Based on the needs and interests of your class, you may choose to select a problem/opportunity for students to try to address in their culminating activity, provide students with a menu of options that they can select from or have students research and propose their own problem or opportunity.

The remainder of this lesson could be done in small groups or individually depending on the needs of your students. Students will work through the design thinking pages in the student workbook as they develop their innovation.

Ideation: Have students begin generating ideas for innovative solutions to address the proposed problem or opportunity.

Prototype: Students may select one of their brainstormed solutions to develop into a prototype. This could be a digital creation, a2D or 3D model or a concept design.

Testing and Feedback: Have students present their prototype to others to test and receive feedback on their concept. Have students complete the ideation testing page in their student workbook.

The teacher will provide adequate time for students to work through the design thinking process multiple times, using the testing and feedback phase to iterate and refine. Students should work through up to three design thinking cycles for this activity.

The teacher will divide the class into groups to give students time to practice their innovation pitch. This is an opportunity for students to showcase their work before the expo and present it as a pitch that companies would want to buy. Allow students to present their pitch in a model that makes the most sense to them (e.g., pre-recorded digital presentation, short podcast recording,live demonstration, interactive website, storyboard, etc.).

The teacher will organize an Aviation Expo, allowing students to showcase their finalized design solutions to their peers in a culminating presentation. Similar to the pitch, students may choose to present their final product in a model that makes the most sense for them (e.g., pre-recorded digital presentation, short podcast recording, live demonstration, interactive website, storyboard,etc.).

If possible, invite other classes, community members, faculty, parents, etc. to attend the expo. Each group or individual should present their prototype, explaining the rationale behind their solution, its key features and its potential impact on the future of aviation.

Encourage students to use visuals, multimedia elements and persuasive language to communicate their ideas.

Consolidation (20 minutes): After the expo, the teacher will prompt students to reflect on the design thinking process and the innovative ideas developed. Encourage students to share one thing they learned about aviation innovations and one idea they are excited about potentially being developed in the future.

TEACHER'S NOTES
LESSON NINE

TEACHER'S NOTES

The 5-Step Design Thinking process is a user-centred approach to problem-solving and innovation. It involves the following stages:

1. Empathize: This step focuses on understanding users and their needs. Designers immerse themselves in users' environments through observations, interviews, and other engagement methods to gain deep insights into their experiences and challenges.
2. Define: In this stage, designers synthesize the information gathered during the empathize phase to identify the core problems. They articulate these problems in a clear problem statement or point of view (POV) that guides the subsequent stages.
3. Ideate: During ideation, designers generate a wide range of creative solutions to the defined problem. Brainstormingsessions, sketching, and other techniques encourage out-of-the-box thinking and explore as many ideas as possible without immediate judgment or constraints.
4. Prototype: This step involves creating tangible representations of the ideas generated during ideation. Prototypes can below-fidelity (e.g., sketches and paper models) or high-fidelity (e.g., interactive digital mock-ups). Use prototypes to quicklytest and refine ideas.
5. Test: Prototypes are tested with users to gather feedback and insights. This phase is iterative, as the feedback is used to refine and improve the prototypes. The goal is to identify what works, what doesn't, and what can be enhanced, leading to a better understanding of the users' needs and the best solutions.

Design Thinking is iterative, meaning designers may cycle through these stages multiple times, revisiting previous steps based on new insights and feedback. This flexibility ensures that solutions are well-suited to users' needs and are continuously improved.

Potential challenges/opportunities:

- **Climate change resilience & sustainability:**
  - Design aircraft/innovation that can withstand the effects of climate change, such as extreme weather events or rising sea levels, ensuring the resilience and sustainability of aviation operations in the face of environmental challenges.
  - Alternative fuels: Create an aircraft design or propose new technologies that utilize alternative fuels, such as biofuels, hydrogen, or electric power, to reduce greenhouse gas emissions and dependence on fossil fuels in aviation.
  - Reusable snack packaging for in-flight meals: Design eco-friendly snack packaging for in-flight meals that can be reused or easily recycled, reducing waste generated during air travel. Students can brainstorm ideas for snack containers made from biodegradable materials or designed for multiple uses, promoting sustainability and environmental stewardship in aviation.
- **Energy efficiency:**
  - Develop an airplane design or technology that reduces fuel consumption and increases energy efficiency, helping to lower emissions and minimize environmental impact.
- **Noise reduction:**
  - Design an aircraft or implement new technologies that significantly reduce noise pollution during takeoff, landing, and flight, contributing to quieter and more peaceful aviation operations.
- **Accessibility:**
  - Create innovations that improve accessibility and inclusivity in aviation, making air travel more convenient and comfortable for individuals with disabilities or special needs.
- **Urban air mobility:**
  - Develop solutions for urban air mobility, such as electric vertical takeoff and landing (eVTOL) vehicles or air taxis, to address transportation challenges in densely populated areas and reduce traffic congestion.

BEYOND THE HORIZON

CULMINATING ACTIVITY RUBRIC

	Exceeding	Achieving	Approaching	Beginning
Presentation	Clear, engaging and persuasive; strong use of visuals and multimedia; thorough explanation of prototype and its impact	Clear and engaging; good use of visuals and multimedia; adequate explanation of prototype and its impact	Somewhat clear use of visuals and multimedia; basic explanation of prototype and its impact	Unclear or lacking engagement; minimal use of visuals; poor explanation of prototype and its impact
Group work	Highly effective collaboration and communication; all members contribute equally	Effective collaboration and communication; most members contribute equally	Basic collaboration and communication; unequal contribution from members	Poor collaboration and communication; minimal contribution from some members
Research	Thorough and detailed research; demonstrates strong understanding of innovation	Adequate research; demonstrates good understanding of innovation	Basic research; demonstrates some understanding of innovation	Minimal or incomplete research; demonstrates poor understanding of innovation
Design Thinking workbook	Detailed and insightful completion of design thinking stages; strong application of empathy, ideation, prototyping, and testing phases	Good completion of design thinking stages; application of empathy, ideation, prototyping, and testing phases	Basic completion of design thinking stages; some application of empathy, ideation, prototyping, and testing phases	Incomplete or unclear completion of design thinking stages; minimal application of empathy, ideation, prototyping, and testing phases
Ideation testing pages	Comprehensive and reflective testing and feedback; significant iteration and refinement of prototype	Good testing and feedback; some iteration and refinement of prototype	Basic testing and feedback; minimal iteration and refinement of prototype	Minimal or incomplete testing and feedback; no significant iteration or refinement of prototype

Comments _____

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OPTIONAL EXTENSIONS

MULTILITERACIES AND TECHNOLOGY INTEGRATION

SUGGESTIONS

To deepen student engagement and provide multimodal learning experiences, consider integrating the following tools and activities:

1. Extended reality (XR)/virtual reality (VR)/augmented reality (AR) components:
- Use XR/VR to simulate flight environments or recreate historical aviation moments, supporting a deeper understanding of aerodynamics and aviation history.
- Encourage students to create AR experiences to explore unit concepts of depth using apps like CoSpacesEdu, MyWebAR, or Adobe Aero.

2. Interactive stations:
- Set up "force of flight" stations for hands-on learning about lift, drag, thrust, and weight, allowing students to physically manipulate objects.

3. Digital journaling:
- Have students document experiments digitally, adding photos, videos, and reflections to make learning tangible and engaging.

4. Collaborative digital tools:
- Use Padlet or Mentimeter to facilitate collaborative concept mapping, where students can add words, images,and media to capture their understanding. Use Canva or Piktochart for infographic creation, allowing students to incorporate visual and textual elements. Include peer feedback through digital checklists.

5. Enhanced lesson activities:
- Lesson 1: Introduce a "flight crew mission planning" role-play to reinforce aviation roles and teamwork.
- Lesson 2: Add a VR simulation for the forces of flight and QR codes in workbooks that link to video demonstrations.
- Lesson 3: Create a digital timeline for historical aviation milestones, creating a live, multimedia document.
- Lesson 4: After studying RCAF band music, have students use GarageBand or Audacity to compose pieces or create an 8D sound experience.
- Lesson 6: Use tools like Adobe Spark to create multimedia "Hero Profiles" of aviators.

6. Peer evaluation and reflection:
- Integrate structured peer review in group activities, focusing on criteria such as clarity, creativity, and content application.

7. Additional multimodal extensions:
- Provide audio or video summaries to support auditory learners.
- Provide digital resources for at-home use in flipped classroom models.
- Offer tech alternatives like speech-to-text to meet diverse learning needs.

8. Interactive exhibit:
- Host an "Aviation Expo" where students present mini-research projects and can participate in Q&A sessions with peers or guests.

9. Enhance multiliteracies pedagogies:
- Incorporate opportunities for students to interpret and present information through various media, such as:
  - Video analysis
  - Story mapping of historical figures or
  - Using interactive tools like Canva for infographic creation.
- Encourage exploration of critical literacies and digital literacies alongside other multimodal learning approaches to deepen students' understanding of aviation concepts.

10. Multimodal learning materials:
- Offer diverse learning materials, including no-tech, low-tech, and high-tech options, to accommodate many learning needs. This approach supports a "low-floor, high-ceiling, wide-walls" model, making content accessible while allowing for deeper exploration and creativity at various levels of engagement.

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