NOVA SCOTIA SCIENCE 6
TEACHER'S RESOURCE

UNIT 2: FLIGHT

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McGraw-Hill Ryerson

UNIT 2: FLIGHT OVERVIEW

Unit 2 introduces students to flight, focusing on the forces that act on an object during flight, methods of powered flight, motion and control of an aircraft during flight, and different aspects of aircraft and spacecraft design through history. As the unit proceeds, students will design a variety of aircraft.

Students begin by creating a paper glider of their own design to investigate the different properties of flight. Investigations allow students to observe how different forces act on objects during flight, including a hot air balloon, a parachute, a helicopter, and a simple wing. These observations assist them throughout the unit as they create and modify more gliders to investigate the effects their changes have on distance flow, flight time and stability, and the ability to perform aerobatics. Students expand their knowledge by considering different methods of powered flight, and compare similarities and differences between airborne organisms and human-made aircraft. Different aspects of aircraft design are examined and related to function, including surfaces that control aircraft motion. Students wrap up the unit by reviewing aircraft history, including advances in space flight. Finally, they use the knowledge they gained in this unit to design and create an aircraft or spacecraft of the future in the Unit Project.

Chapter 3: Achieving and Maintaining Flight

Chapter 3 provides an introduction to how aircraft and flying organisms become and stay airborne. Students' investigations of various aircraft focus upon how different forces act on crafts and organisms during flight and different ways in which they are propelled through the air. Section 3.1 reviews the force of gravity and introduces the forces of buoyancy and lift. Students discover how gravity must be overcome if an object is to become airborne. Two forces that overcome gravity are investigated: buoyancy and lift. This section requires students to build several hot air balloons to investigate buoyancy and design their own investigation to observe how winged vehicles experience lift. Students go on to investigate lift and create various demonstrations to show how this principle works. Section 3.2 introduces students to the other two forces that affect an object during flight: drag and thrust. Students modify a paper glider and a parachute to learn how material, shape, and other aspects of design influence drag. In section 3.3, students explore the three ways mechanical aircraft generate thrust: propellers, jet engines, and rocket engines. Students investigate these methods through various activities, which culminate in an investigation in which the three mechanical means of propulsion, as well as gravity and muscle power, are compared.

Chapter 4: Flight Design

Chapter 4 explores the various aspects of flight design and how they are related to aircraft and spacecraft function, including motion and control. In section 4.1, students place themselves in the role of aeronautical engineer and explore the characteristics of different specialized aircraft. Flight testing is also introduced and students complete a research activity explaining how wind tunnels are used to test aircraft. In other activities, students build their own wind tunnels, which they use to test how wing angle (angle of attack) and shape influence lift. Section 4.2 focuses on how aircraft design is used to control motion during flight. Students are introduced to the three main motions of aircraft: yaw, pitch, and roll. They design and modify a paper glider to determine which aspects of design best control these motions and provide long, stable flight. A discussion of stable and unstable aircraft introduces the topic of control surfaces, which are used to control flight motion. Students wrap up the activity by using the knowledge they gained on specialized design and control surfaces to compare a stable and unstable aircraft. In section 4.3, students wrap up the unit by exploring aviation history and space flight. Students investigate how airborne organisms have influenced past and present aircraft design and research how aircraft have changed throughout history. Spacecraft and aircraft are compared and students attempt to determine how features of each are incorporated into the design of the Space Shuttle. A discussion of spaceplanes and the future of space flight lead into the Unit Project, in which students use the knowledge they gained in this unit to design and create an aircraft or spacecraft for the year 2030.

Unit 2 Flight: Correlation to Nova Scotia Grade 6 Science Curriculum

	NOVA SCOTIA SCIENCE 6	STUDENT TEXT PAGES
GENERAL CURRICULUM OUTCOMES		
STSE: Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology	• Internet Connect (cars and drag) • Starting Point Activity 4-A: Frisbee™ Flight • Think & Link Investigation 4-G: Comparing Aircraft Designs • Conversation with an Elder • Ask a Commercial Pilot	p. 82 p. 99 p. 117 pp. 128–9 pp. 130–1
Skills: Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.	• Starting Point Activity 3-A: Paper Toss • Design Your Own Investigation 3-D: Winged Vehicles	p. 63 p. 73
Knowledge: Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.	• Think & Link Investigation 3-K: Propulsion • Unit 2 Project: Flight in the Year 2030	p. 95 pp. 132–3
SPECIFIC CURRICULUM OUTCOMES		
Drag • demonstrate methods for altering drag in flying devices and describe and show improvements in design (206-6, 301-18)	• Find Out Activity 3-F: My Flying Machine: Flying Further • Conduct an Investigation 3-G: Design a Parachute • Find Out Activity 4-E: My Flying Machine: Stable and Long-Flying	p. 79 pp. 80–1 p. 112
Lift and Wing Shape • identify characteristics and adaptations from living things that have led to flight designs (104-3, 106-3, 300-21)	• Think & Link Investigation 3-H: Two Flying Organisms • Think & Link Investigation 3-K: Propulsion	p. 84 p. 95
• plan and perform a fair test demonstrating the characteristics that influence lift on objects in flight (204-7, 301-17, 303-32)	• Find Out Activity 3-B: My Flying Machine • Conduct an Investigation 3-C: Build a Balloon • Design Your Own Investigation 3-D: Winged Vehicles • Find Out Activity 4-E: My Flying Machine: Stable and Long-Flying • Find Out Activity 4-F: My Flying Machine: Aerobatics	p. 65 pp. 68–9 p. 73 p. 112 p. 114
Lift: Wind Tunnels • identify characteristics and adaptations from living things that have led to flight designs (104-3, 106-3, 300-21)	• Think & Link Investigation 4-H: Living Things and Flight Design	p. 122
• identify and collect information using models that involve lift (205-5, 303-33)	• Find Out Activity 3-E: Demonstrate Bernoulli's Principle • Find Out Activity 4-B: Wind Tunnel Presentation • Conduct an Investigation 4-C: Wing Angle • Conduct an Investigation 4-D: Wing Shape	p. 77 p. 103 pp. 105–6 pp. 108–9
Thrust and Propulsion • describe examples of technological design between aircraft and spacecraft, and their influence on our lives (105-3, 107-9, 300-22)	• Find Out Activity 4-I: Aircraft Design Over Time • Think & Link Investigation 4-J: Aircraft vs. Spacecraft	p. 123 p. 125
• describe and demonstrate the means of propulsion for flying devices, using a variety of sources (303-34)	• Find Out Activity 3-I: Build a Helicopter • Find Out Activity 3-J: Balloon Jets	p. 89 p. 91

USING ACTIVITY-BASED LEARNING TO TEACH UNIT 2: FLIGHT

A variety of living things and human inventions have the ability to fly. In this unit, students develop and test many different approaches to investigate how things fly; they also develop and test many different devices of their own making. It is this hands-on, minds-on problem solving that will help students grow in the four areas of skills: initiating and planning, performing and recording, analyzing and interpreting, and communications and teamwork.

Assessing Prior Knowledge and Introducing the Unit

Students were introduced to the concept of air taking up space and being felt as wind in Science 2. The force of gravity was explored in Science 5.

Students can examine materials that show living things and devices that fly. This may lead to questions such as "How do these get up in the air and stay there?" or "How do they move and control their movement?" Investigating the features of living things and constructed devices, the accomplishments of different people (such as those who designed the *Gossamer Albatross*, shown on pages 60-61), and the different ways that things get up in the air (achieve lift) should begin the unit.

Ask students to prepare a science logbook or special section in their science logbook for Flight. Ask students to develop and illustrate a cover or section page with the idea of "Flight" as the theme. This will indicate each student's current knowledge of the concept.

Exploring the Key Concepts

The key concepts in this unit include:

- identifying the characteristics that enable living things and objects to fly
- describing and demonstrating the design in flight
- describing various applications

Learning experiences should relate to solving problems, such as "How can I get the airplane to stay in the air longer?" and require students to design, test, modify, and retest their models. Planning a set of steps, making observations, suggesting explanations, and communicating their results using drawings, oral language, models, and public science are all part of this unit. Students may have looked in detail at procedures in the electricity unit, so planning will be reinforced in this unit, but questioning will be worked on in more detail.

Assessing Student Learning

The key point for assessing student learning is that the assessment should reflect the methods used in the learning. Since a minimum of 60 percent of the time is for hands-on, minds-on learning, students might come up with the question(s) or problem(s) that make(s) the investigation more meaningful to them. Adding "Going Further" questions to the end of their experiment can extend the experiences and give opportunities to analyze the activity thoughtfully. This may lead to doing more investigations that help students explore and extend their understandings and solidify concepts.

Having students evaluate their own progress and knowledge and ask related questions that would encourage future investigations will give the teacher evidence of the learning that is taking place. Periodically check students' logbooks to review their knowledge based on the drawing, doodling, and written answers to a variety of open-ended questions. The checklists and rubrics included in this resource offer many possible monitoring strategies. (See the Assessment and Evaluation section of this Teacher's Resource for a complete list. There are also specific suggestions for each activity and a summary at the end of each section.)

IMPLEMENTATION PLANNER FOR UNIT 2 FLIGHT

The implementation planning chart below is intended to help you use *Nova Scotia Science 6* to cover the curriculum by highlighting the activities, investigations, and some suggested assessment options. (See the Assessment section of this teacher's resource for more information.) Page numbers in the student book are indicated in [ ].

WEEK #	ACTIVITIES [STUDENT TEXT PAGE]	ASSESSMENT OPTIONS
	Unit 2 Opener [60-61]	• Getting Ready answers
	Chapter 3: Achieving and Maintaining Flight [62-97]	• Rubric 2, Science Logbook • Checklist 7, Concept Map • Vocabulary BLMs, Science Portfolio (if using) • one-on-one interviews • Chapter Summary assessment
	Starting Point Activity 3-A: Paper Toss [63]	• What Did You Find Out? answers

WEEK #	ACTIVITIES [STUDENT TEXT PAGE]	ASSESSMENT OPTIONS
	Section 3.1: Forces That Act During Flight: Gravity and Life [64-78]	
	Find Out Activity 3-B: My Flying Machine [65]	• Checklist 15, Making Observations and Inferences
	Conduct an Investigation 3-C:Build a Balloon [68-9]	• Rubric 19, Conduct an Investigation
	Design Your Own Investigation 3-D: Winged Vehicles [73]	• Rubric 20, Design an Investigation
	Find Out Activity 3-E: Demonstrate Bernoulli's Principle [77]	• Rubric 3, Co-operative Group Work
	Section 3.2: Forces That Act During Flight: Drag and Thrust [79-87]	
	Find Out Activity 3-F: My Flying Machine: Flying Further [79]	• Rubric 11, Problem Solving
	Conduct an Investigation 3-G: Design a Parachute [80-1]	• Rubric 19, Conduct an Investigation
	Think & Link Investigation 3-H: Two Flying Organisms [84]	• Checklist 15, Making Observations and Inferences
	Section 3.3: Powered Flight [88-96]	
	Find Out Activity 3-I: Build a Helicopter [89]	• Checklist 15, Making Observations and Inferences
	Find Out Activity 3-J: Balloon Jets [91]	• Answers to What Did You Find Out? questions
	Think & Link Investigation 3-K: Propulsion [95]	• Checklist 15, Making Observations and Inferences
	Chapter 4: Flight Design [98-127]	• Rubric 2, Science Logbook • Checklist 7, Concept Map • Vocabulary BLMs, Science Portfolio (if using) • student interviews • Chapter Summary assessment
	Starting Point Activity 4-A: Frisbee™ Flight [99]	• What Did You Find Out? answers
	Section 4.1 Designing Aircraft [100-110]	
	Find Out Activity 4-B: Wind Tunnel Presentation [103]	• Rubric 5 Research Project • Rubric 6 Communication
	Conduct an Investigation 4-C: Wing Angle [105-6]	• Rubric 19 Conduct an Investigation
	Conduct an Investigation 4-D: Wing Shape [108-9]	• Rubric 19 Conduct an Investigation
	Section 4.2: Motion and Control [111-118]	
	Find Out Activity 4-E:My Flying Machine: Stable and Long-Flying [112]	• Rubric 11, Problem Solving
	Find Out Activity 4-F:My Flying Machine:Aerobatics [114]	• Rubric 11, Problem Solving
	Think & Link Investigation 4-G: Comparing Aircraft Designs [117]	• Checklist 15, Making Observations and Inferences
	Section 4.3: Flight—From the Past Into the Future [119-26]	
	Think & Link Investigation 4-H: Living Things and Flight Design [122]	• Checklist 15, Making Observations and Inferences
	Find Out Activity 4-I: Aircraft Design Over Time [123]	• Rubric 5, Research Project
	Think & Link Investigation 4-J: Aircraft Versus Spacecraft [125]	• Checklist 5, Poster [bullet] Rubric 3, Co-operative Group Work
	Conversation with an Elder: Joe B. Marshall [128-29]	• Rubric 5 Research Project • Rubric 6 Communication
	Ask a Commercial Pilot: Bep Hardy-Mattern [130-31]	• Rubric 5 Research Project • Rubric 6 Communication
	Unit 2 Project: Flight in the Year 2030 [132-33]	• Checklist 2, Developing Models and/or Rubric 8, Developing Models • Checklist 12, Project Group Assessment • Rubric 3, Co-operative Group Work Rubric • Checklist 3, Oral Presentation or 4, Computer Slide Show Presentation • Rubric 6, Communication or 7, Multimedia Presentation

MULTIPLE INTELLIGENCES CORRELATIONS FOR UNIT 2 ACTIVITIES AND INVESTIGATIONS

The table below shows the multiple intelligences engaged in the activities and investigations for this unit, in order to help you plan for differentiated instruction in your science lessons. For more information concerning differentiated instruction and multiple intelligences see the Introduction and Implementation section in this Teacher's Resource.

The multiple intelligence codes are as follows:
VL = Verbal-Linguistic; LM = Logical-Mathematical;
N = Naturalist; VS = Visual-Spatial;
BK = Body-Kinesthetic; IE = Interpersonal;
IA = Intra-Personal; MR = Musical-Rhythmic;
E = Existential.

	VL	LM	N	VS	BK	IE	IA	MR	E
UNIT 2: FLIGHT [page #]									
Chapter 3: Achieving and Maintaining Flight [62–97]									
Starting Point Activity 3-A: Paper Toss [63]		■			■				
Find Out Activity 3-B: My Flying Machine [65]		■			■	●			
Conduct an Investigation 3-C:Build a Balloon [68-9]	●	●			■	■			
Design Your Own Investigation 3-D: Winged Vehicles [73]		●		●	■	■			
Find Out Activity 3-E: Demonstrate Bernoulli's Principle [77]	●	■			●	■			
Find Out Activity 3-F: My Flying Machine: Flying Further [79]		●			■	■			
Conduct an Investigation 3-G: Design a Parachute [80-1]		●		●	■	■			
Think & Link Investigation 3-H: Two Flying Organisms [84]	■	●		■					
Find Out Activity 3-I: Build a Helicopter [89]		■			■				
Find Out Activity 3-J: Balloon Jets [91]		●			■	●			
Think & Link Investigation 3-K: Propulsion [95]		■	■						
Chapter 4: Flight Design [98–127]									
Starting Point Activity 4-A: Frisbee® Flight [99]	●	■			■				
Find Out Activity 4-B: Wind Tunnel Presentation [103]	■			■					
Conduct an Investigation 4-C: Wing Angle [105-6]		■			■	■			
Conduct an Investigation 4-D: Wing Shape [108-9]		■		■	■				
Find Out Activity 4-E:My Flying Machine: Stable and Long-Flying [112]		■		■	■	●			
Find Out Activity 4-F:My Flying Machine:Aerobatics [114]		■		■	■	●			
Think & Link Investigation 4-G: Comparing Aircraft Designs [117]		■		■					
Think & Link Investigation 4-H: Living Things and Flight Design [122]		■		■					
Find Out Activity 4-I: Aircraft Design Over Time [123]	■						●		
Think & Link Investigation 4-J: Aircraft Versus Spacecraft [125]	■	■							
Conversation with an Elder: Joe B. Marshall [128-29]	■								●
Ask a Commercial Pilot: Bep Hardy-Mattern [130-31]	■	●							
Unit 2 Project: Flight in the Year 2030 [132–33]	■			●	■	■			

■ indicates the primary intelligences involved in the activity or investigation

● indicates the secondary intelligences. For instance, for a hands-on experiment, students use mostly body-kinesthetic (the tactile skills) and visual-spatial (for observation) intelligence. However, if the activity includes a follow-up discussion or a written recording, there is a verbal-linguistic component. If the activity is done in groups, there is an interpersonal component.

Advance Planning Chart for Activities and Investigations for Unit 2: Flight

ACTIVITY/ INVESTIGATION (student textbook page number)	ADVANCE PREPARATION	MATERIALS	TIME REQUIRED	OTHER CONSIDERATIONS
CHAPTER 3: ACHIEVING AND MAINTAINING FLIGHT				
Starting Point Activity 3-A: Paper Toss (p. 63)	• 1 day before: Gather enough paper for the class to complete the activity. This paper should be of a variety of textures and compositions.	Per student: • piece of paper	• 20 min	• You can bring in pieces of photocopy paper from the recycling bin to use in this activity.
Find Out Activity 3-B: My Flying Machine (p. 65)	• 1 week before: Gather books on paper gliders and glider design. – Book the gym or larger area to test paper gliders. • 3 days before: Gather a class set of materials.	Per group: • paper, various types and sizes • books about paper gliders • Have timers and measuring tapes on hand to measure flight time or flight distance as factors.	• 30 min	• To avoid eye injuries, students should be warned not to throw their paper airplanes at other students. • Have a wide variety of paper in different textures, sizes and colours available for students to experiment with. Possibilities include loose-leaf paper, photocopy paper, tissue paper, Manila paper, used file folders, tracing paper, construction paper, and waxed paper.
Conduct an Investigation 3-C: Build a Balloon (pp. 68–69)	• 3 days before: Gather a class set of materials.	Per group: • 1 small plastic garbage bag • 1 large plastic garbage bag • scissors • ruler • hair dryer • pencils • crepe tissue paper • wire • glue • construction paper • balance	• Part 1: 20 min • Part 2: 60 min	• Remind students to use caution when handling hot hair dryers and plugging in electrical devices. • This can be a loud activity. Ensure that ear protection is available for students with sound sensitivity. • Advise students to handle scissors with care. • Choose crepe tissue paper for completing Part 2 of this experiment.
Design Your Own Investigation 3-D: Winged Vehicles (p. 73)	• 3 days before: Prepare a complete set of materials for each group.	Per group: • K'NEX™ kit that contains wheels • ticket board • masking tape • plastic straws • stiff paper, such as Manila or used file folders • photocopy or printer paper • measuring tape • scissors	• 60 min	• Remind students to be careful when handling scissors.

ACTIVITY/ INVESTIGATION (student textbook page number)	ADVANCE PREPARATION	MATERIALS	TIME REQUIRED	OTHER CONSIDERATIONS
Find Out Activity 3-E: Demonstrate Bernoulli's Principle (p. 77)	• 1 week before: Organize students into groups. • 1 week before: Distribute and review activity handout BLM 3.6 Demonstrate Bernoulli's Principle. • 1 week before: Have groups decide which demonstration they will complete. • 3 days before: Gather material each group requires to complete their demonstration.	Per group: • materials for demonstration, different for each group • activity handout (BLM 3.6 Demonstrate Bernoulli's Principle)	• 20 min to review activity handout and decide on demonstrations • 30 minutes to set up demonstration and record ideas • 5 minutes per group presentation	• You may wish to have students set up their demonstration in pre-designated areas that the class can easily see. That way they do not have to move their demonstration in order to complete their presentation.
Find Out Activity 3-F: My Flying Machine: Flying Further (p. 79)	• 1 week before: Book the gym or larger area to test the paper gliders. • 3 days before: Gather a class set of materials. • 3 days before: Photocopy a class set of BLM 3.7 Flying Machine: Flying Further (Glider Instructions) or other comparable glider instructions.	Per group: • paper of various thickness and smoothness • measuring tape • glider instructions	• 45 min	• To avoid eye injuries, students should be warned not to throw their paper airplanes at other students.
Conduct an Investigation 3-G: Design a Parachute (pp. 80–81)	• 3 days before: Gather a class set of materials. • 1 day before: Have students copy the chart in the student textbook into their notebook.	Per group: • construction paper • cloth • string • glue • masking tape • scissors • timer • tissue paper • plastic • paperclips • small weight • stapler • tape measure	• 60 min	• Remind students to be careful when handling scissors.
Think & Link Investigation 3-H: Two Flying Organisms (p. 84)	• 1 day before: Photocopy a class set of BLM 3.8 Two Flying Organisms.	Per group: • activity handout	• 30 min to complete Procedure steps 1 to 4 • 30–60 min to complete Procedure step 5	• None
Find Out Activity 3-I: Build a Helicopter (p. 89)	• 3 days before: Gather a class set of materials.	Per group: • straw or wooden dowel • scissors • ruler • pencil • stiff paper, such as a used file folder or Manila paper	• 30 min	• Remind students to use caution when handling scissors. • If student helicopters flip upside down, students can increase the weight of the bottom of the helicopter by pushing a paperclip into the bottom of the straw. Have a supply of paperclips available in case this occurs.
Find Out Activity 3-J: Balloon Jets (p. 91)	• 3 days before: Gather a set of class materials.	Per group: • balloons of different sizes • drinking straw • masking tape • 5 m length of string	• 20 min	• Caution students not to pop the balloons. • Desk legs can be used as posts in step 2.

ACTIVITY/ INVESTIGATION (student textbook page number)	ADVANCE PREPARATION	MATERIALS	TIME REQUIRED	OTHER CONSIDERATIONS
Think & Link Investigation 3-K: Propulsion (p. 95)	• None	• None	• 15 min	• None
CHAPTER 4: FLIGHT DESIGN				
Starting Point Activity 4-A: Frisbee™ Flight (p. 99)	• 1 week before: Gather together enough Frisbees™ so there is one for every two students.	Per group: • Frisbee™	• 10 min	• Caution students to only throw the Frisbee™ to their partner, not at other students. • Try to find Frisbees™ in a variety of weights and sizes for students to experiment with.
Find Out Activity 4-B: Wind Tunnel Presentation (p. 103)	• 1 week before: Book the library for student research.	• library books and/or Internet access	• 30 min for research • 30–60 min to create presentation (Optional home time to work on the presentation.) • 5 min per presentation	• None
Conduct an Investigation 4-C: Wing Angle (pp. 105–106)	• 1 week before: Complete the investigation yourself to make sure it works with the materials you have selected. • 3 days before: Gather a class set of materials.	Per group: • stiff paper, such as used file folders or Manila paper • paperclips • string • tape • cardboard box • clear cellophane • scissors • ruler • hair dryer • protractor	• 60 min	• Remind students to use caution when handling scissors. • Advise students to set the hair dryer to the coolest setting to avoid burns. • Students should save their wind tunnels for use in the next investigation, Conduct an Investigation 4-D: Wing Shape.
Conduct an Investigation 4-D: Wing Shape (pp. 108–109)	• 3 days before: Gather a class set of materials.	Per group: • stiff paper, such as used file folders or Manila paper • feathers • straws • toothpicks • paperclips • string • tape • glue • scissors • ruler • hair dryer • protractor • wind tunnel from previous investigation	• 60 min	• Remind students to use caution when handling scissors • Advise students to set the hair dryer to the coolest setting to avoid burns. • Students should use their wind tunnels from the previous investigation, Conduct an Investigation 4-C: Wing Angle.

ACTIVITY/ INVESTIGATION (student textbook page number)	ADVANCE PREPARATION	MATERIALS	TIME REQUIRED	OTHER CONSIDERATIONS
Find Out Activity 4-E: My Flying Machine: Stable and Long-Flying (p. 112)	• 1 week before: Gather books on paper gliders and glider design. • 1 week before: Book the gym or larger area to test paper gliders. • 3 days before: Gather a class set of materials.	Per group: • paper • tape • glue • ruler • scissors • timer • books on paper gliders	• 45 min	• To avoid eye injuries, students should be warned not to throw their paper airplanes at other students. • Remind students to use caution when handling scissors. • Try to have a wide variety of paper in different textures, sizes, and colours available. Possibilities include photocopy paper, Manila paper, used file folders, construction paper, and cardstock. Medium weight paper (20–60 lb weight) tends to make the best gliders. Photocopy paper is usually 20 lb weight; Manila paper is heavier but still works well. • One of the secrets to a long and stable flight is to add weight to the nose of the glider. Adding a paperclip or two to the nose of the plane can achieve this. Have paperclips on hand for students who wish to try this trick. Bending the wings up to form a slight Y-shape will also improve stability.
Find Out Activity 4-F: My Flying Machine: Aerobatics (p. 114)	• 1 week before: Gather books on paper gliders and glider design. • 1 week before: Book the gym or larger area to test the paper gliders. • 3 days before: Gather a class set of materials. • 1 day before: Photocopy BLM 4.4 Glider Instructions for each student.	Per group: • glider instructions • paper • tape • glue • ruler • scissors • books on paper gliders	• 45 min	• To avoid eye injuries, students should be warned not to throw their paper airplanes at other students. • Remind students to use caution when handling scissors.
Think & Link Investigation 4-G: Comparing Aircraft Designs (p. 117)	• None	• None	• 20 min	• None
Think & Link Activity 4-H: Living Things and Flight Design (p. 122)	• None	• None	• 20 min	• None

ACTIVITY/ INVESTIGATION (student textbook page number)	ADVANCE PREPARATION	MATERIALS	TIME REQUIRED	OTHER CONSIDERATIONS
Find Out Activity 4-I: Aircraft Design Over Time (p. 123)	• 1 week before: Book library if using. • 1 week before: Pre-select appropriate books and/or web sites for students to use in their research.	Per student/group: • textbook • library books or the Internet	• 90 min	• You may wish to pre-select aircraft that represent a continuum of change. This will make your timeline more coherent and visually appealing than if all the aircraft were designed in the twentieth century.
Think & Link Investigation 4-J: Aircraft Versus Spacecraft (p. 125)	• 1 day before: Photocopy 4.8 Aircraft Versus Spacecraft and BLM 4.9 Space Shuttle.	Per student: • activity handouts	• 60 min	• None
Conversation with an Elder: Joe B. Marshall: Exploring Further (p. 128)	• 1 week before: Book library and/or computer resources for student use.	• None	• 60 min	• You may wish to provide students with a list of pre-selected, student-friendly web sites that contain information on aviation-related careers.
Ask a Commercial Pilot: Bep Hardy-Mattern: Exploring Further (p. 130)	• 1 week before: Book library for student use.	• None	• 30 min	• None
Unit 2 Project: Flight in the Year 2030 (p. 132)	• 3 days before: Gather enough materials for the whole class.	Per group: • cardboard, Manila and construction paper • paper-maché materials • plastic bottles • tape • glue • drinking straws • toothpicks • Popsicle™ sticks • aluminum foil • paint • modelling clay • scissors	• 2 hours (Some out-of-class time will be required to prepare or practise the presentation. Time will vary per group.)	• Remind students to use caution when handling scissors. • Other arts and crafts materials as needed.