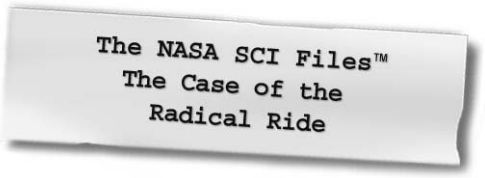


Segment 4

Although Dr. D and the detectives continue to move slowly in traffic, their wireless Internet connection is holding up, so they hope that they will at least be able to see the awards ceremony by web cast. The detectives still don't think they have enough information about what transportation of the future will look like, so R.J. sets off to visit Mr. Andrew Hahn at NASA Langley Research Center to learn about Personal Air Vehicles (PAVs). Mr. Hahn tells R.J. that someday in the not so distant future, we might have our own airplane cars and live in airport communities! Bianca and Kali also contact Mr. Terry Hertz at NASA Headquarters. As NASA's Director of Aeronautics Technology, Mr. Hertz gives the detectives a glimpse into a few of the unlimited possibilities for the future of transportation. Finally, it is time for the awards ceremony, but Dr. D, Jacob, and Katherine don't make it in time. In the meantime, Bianca and Kali are surprised when they get the chance to meet Mr. Frederick Gregory, Deputy Administrator of NASA! Not long after the awards ceremony, Dr. D and the other detectives arrive, and they all talk with Mr. Gregory about the importance of education and what NASA is doing to inspire the next generation of explorers as only NASA can!

Objectives

The students will

- learn about personal air vehicles (PAVs) and how they will affect our society.
- envision the future of space and air travel.
- explore various careers in aeronautics and space.

Vocabulary

airport community—a community that centers around a small airport where the houses have hangars instead of garages so that people can fly to and from their destinations instead of driving

intermodal delay—time spent going from one mode of transportation to another

Personal Air Vehicle (PAV)—concept for a future transportation vehicle that would fly like a plane but operate like a car

Small Aircraft Transportation System (SATS)—a proposed system of over 5,000 small airports across the U.S. using low-cost electronics that will make the airports safe for anyone to use

sonic boom—a sound like that of an explosion produced when a shock wave formed at the nose of an aircraft traveling at supersonic speed reaches the ground

supersonic—moving at a speed that is faster than the speed at which sound travels through the air

vision—a vivid picture created by the imagination

Video Component

Implementation Stratey

The NASA SCI Files™ is designed to enhance and enrich the existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 4 of *The Case of the Radical Ride*, discuss the previous segment to review the problem and what the tree house detectives have learned thus far. Download a copy of the **Problem Board** from the NASA SCI Files™ web site, select **Educators**, and click on the **Tools** section. The **Problem Board** can also be found in the **Problem-Solving** Tools section of the latest online investigation. Have students use it to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 3 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have occurred during Segment 3. Use tools located on the Web, as was previously mentioned in Segment 1.
4. Review the list of ideas and additional questions that were created after viewing Segment 3.
5. Read the overview for Segment 4 and have students add any questions to their lists that will help them better understand the problem.
6. **Focus Questions**—Print the questions from the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the program to answer the questions. An icon will appear when the answer is near.

View Segment 4 of the Video

For optimal educational benefit, view *The Case of the Radical Ride* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. At the end of Segment 4, lead students in a discussion of the Focus Questions for Segment 4.
2. Have students discuss and reflect upon what they have learned about the engineering design process and the future of transportation. The following instructional tools located in the **Educators** area of the web site may aid in the discussion: **Experimental Inquiry Process Flowchart** and/or **Scientific Method Flowchart**.
3. Choose activities from the Educator Guide and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
4. Wrap up the featured online PBL investigation. Evaluate the students' or teams' final product, generated to represent the online PBL investigation. Sample evaluation tools can be found in the **Educators** area of the web site under the main menu topic **Tools** by clicking on **Instructional Tools**.
5. Have students write in their journals what they have learned about the engineering design process and the future of transportation so that they can share their entry with a partner or the class.

Careers

administrator
air traffic controller
civil engineer
electrical engineer
industrial engineer
manufacturing engineer

Resources (additional resources located on web site)

Books

Adler, David A.: *A Picture Book of Benjamin Franklin*. Holiday House, Inc., 1991, ISBN: 0823408825.

Baker, David: *Scientific American: Inventions from Outer Space—Everyday Uses for NASA Technology*. Random House, 2000, ISBN: 0375409793.

Bankston, John: *Henry Ford and the Assembly Line*. Mitchell Lane Publishers, Inc., 2003, ISBN: 1584151730.

Greenblatt, Jacquelyn A.: *Women Scientists and Inventors: A Science Puzzle Book.* Good Year Books, 1999, ISBN: 0673577287.

Parker, Steven and West, David: *53 1/2 Things That Changed the World and Some That Didn't*. Millbrook Press, 1995, ISBN: 156294603X.

Romanek, Trudee: *The Technology Book for Girls and Other Advanced Beings*. Kids Can Press, 2001. ISBN: 1550749366.

Simon, Seymour and Fauteux, Nicole: *Let's Try It Out with Towers and Bridges: Hands-On Early Learning Activities*. Simon and Schuster, 2003, ISBN: 068982923X.

Web Sites

NASA—Aerospace Vehicle Systems Technology Office
Visit this site to learn about exciting new research such as the Personal Air Vehicle (PAV) that is being conducted at NASA Langley to help shape the future of aviation.
http://avst.larc.nasa.gov/news.html

NASA—Small Aircraft Transportation System (SATS)
NASA, in partnership with other government, state, and local aviation airport authorities, is developing technology that will bring new, safe, and affordable operating capabilities to any runway in the nation and in most weather conditions. The new operating capabilities rely on onboard computing, advanced flight controls, Highway-in-the-Sky displays, and automated air traffic separation and sequencing technologies.
http://sats.larc.nasa.gov/main.html

Federal Aviation Administration (FAA): Education
Visit this web site for activities, games, and career information. Teacher resources are also available.
http://www.faa.gov/education/

AirSafe.com®: Aviation Safety
Visit this web site to view critical information for the traveling public, featuring both airport and airline
security.http://airsafe.com/

NASA—Virtual Skies
Explore the exciting worlds of aviation technology, air traffic management, and current research on this web site. Become a meteorologist and try your hand at cloud identification and weather forecasting. Design your own airport, become an air traffic controller, and much more. This site is a great aviation resource for older students and adults.
http://virtualskies.arc.nasa.gov/

NASAexplores: Lowering the Boom
Read an exciting article about how NASA is working with other government agencies and industry partners to find ways to reduce the noise and shock waves associated with supersonic flights. Student activities and an educator guide are included.
http://nasaexplores.com/show2_articlea.php?id=04-017

NASAexplores: The Future of Supersonic Jets Read all about NASA's High-Speed Research (HSR)
Program and the new technology that is being discovered to help change the future of transportation. Student activities and an educator guide are included.
http://nasaexplores.com/show2_articlea.php?id=03-049

Activities and Worksheets

In the Safety Zone

Problem

To understand how air traffic is monitored and safely controlled
To plot coordinates, measure distance, and apply ratios

Materials

Student Materials
(*per group of 4*)
- game board (p. 75-78)
- cardboard (size of game board)
- clear tape
- 4 metric rulers
- 4 different colored pencils
- 20 pushpins or sewing pins
- 4 calculators
- 4 Flight Plans (p. 71)
- 4 Tracking Charts (p. 72)
- 4 Safety Rating Cards (SRC)/Game Constraint Cards (p. 73)
- Aircraft and Storm Game Pieces (p. 74)

Teacher Materials
- stopwatch or timer

Teacher Prep

1. Copy one game board (p. 75-78) per group and assemble using clear tape. Tape or glue the game board to the cardboard.
2. Cut out the Aircraft and Storm Game Pieces (p. 74).

Teacher Note

1. Before beginning this game, students should have a basic understanding of how to plot coordinates on a grid.
2. One person in the class should be designated as the announcer. The teacher, another adult, or a student can play this role.
3. Depending on students' ability, this game can be played with one, two, or three aircraft in each quadrant. The more airplanes, the more difficult the game.
4. The aircraft on page 74 are grouped by quadrants and at least one airplane from each group needs to be selected.
5. At the beginning of the game, draw the airport layout located in the top left corner of the game board on the chalkboard or overhead projector and explain the landing procedures.

Procedure

1. Distribute game boards and other necessary materials to each group: (1) Flight Plan (p. 71) to record landing times, (2) Tracking Chart (p. 72) to track the progress of the assigned plane(s), (3) Safety Rating Card (SRC) (p. 73) to keep track of the total points earned, and (4) Game Constraints (p. 73).
2. Explain the goals of the game to the students.
3. Have each student in the group choose a quadrant on the game board and select one or more aircraft for the quadrant chosen.
4. Have students choose a colored pencil and color each aircraft game piece the same color for the quadrant to ensure correct tracking.
5. Have the students work together to plot the aircrafts' initial positions on the game board by using the initial aircraft flight coordinates provided in the Flight Plan. Students will use a pushpin or sewing pin, along with the correct aircraft game piece, to mark the location.
6. Point out to the students that each aircraft is marked with the flight number and the runway where it is to land.
7. Use the answer key (Figure 1) to award 1 point for each correctly plotted aircraft. Record the total point value on each group's Safety Rating Card (SRC) (p. 73).
8. Have each student measure the direct distance from each of the assigned aircraft to the airport.
9. Have the students calculate the direct distance in km by using the scale: 2 cm : 5 km by rounding results to the nearest km and record on the Tracking Chart (p. 72).
10. Have announcer read the Safety Zone Scenario (p. 67-68) as students play the game.
11. Score the game and determine the Air Safety Travel Index (ASTI).
12. The team with the highest ASTI percentage wins.
13. Discuss conclusion questions (p. 70).

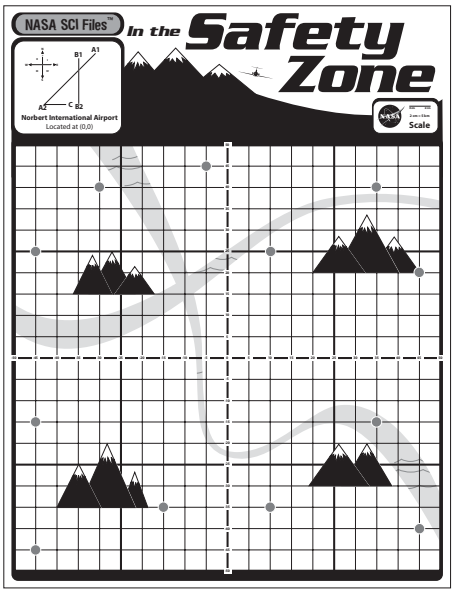


Figure 1

In the Safety Zone (continued)

Scoring the game

Score 10 points for aircraft landed on time, subtract 1 point for each minute ahead or behind schedule, and subtract 5 penalty points for each aircraft coming in on the wrong runway.

Distance and Accuracy Calculations

1. Have students determine the ASTI by calculating the percentage and using the ratio of team points divided by total possible points for the number of aircraft you directed (1 aircraft = 44 total points, 2 aircraft = 88 total points, 3 aircraft = 132 total points). Write the percentage on the SRC.
2. Have students complete the Tracking Chart by calculating the actual linear distance traveled from the aircraft's initial coordinates to the airport by using this equation: 5 (km/min) multiplied by landing time (min).
3. Calculate the difference between the direct distance traveled versus the actual distance traveled, and record the values on the Tracking Chart.

Safety Zone Scenario

Announcer Reads the Following:

1. Each air traffic controller (ATC) is responsible for the aircraft in his or her quadrant. Record the flight number, aircraft type, and runway information on the Tracking Chart.
2. For each minute of play, all aircraft must make 1 move. One move equals 2 cm of linear travel (5 km). Use your metric ruler to verify 2 cm of movement. Remember, an aircraft cannot move backwards.
3. During each minute of play, each ATC must keep track of his/her aircraft's flight paths by using a colored pencil and metric ruler. In addition, after all flight paths have been updated, place a check mark on the Tracking Chart to indicate completion of your aircraft's move.
4. Familiarize yourself with the airport layout located at the top of the game board. The entire airport is located on the origin (0, 0). Please see game constraints for final approach guidelines.
5. Study the Flight Plan and pay particular attention to the arrival times and runway locations and develop a landing strategy.
6. Work quickly, efficiently, and collaboratively during the game. You are working as a team and not playing against each other.
7. We are now ready to begin the game. (Start timer.)
8. Minute 1. Each group has 1 minute to move each aircraft on the game board 2 cm.
9. Minute 2. You have 1 minute to move each aircraft on the game board 2 cm.
10. Minute 3. Continue to move aircraft 2 cm.
11. Minute 4. Continue to move aircraft 2 cm. (After minute 4, stop timer.)

In the Safety Zone (concluded)

12. A thunderstorm is approaching the airport and traveling due east at 5 km/min. The leading edge of the storm is located at (–35, 5) and (–35, –5). Minute 5 (start timer). Continue moving each aircraft 2 cm. (Stop timer after minute 5 has expired.)
13. The storm continues to move east at 5 km/min. Move the storm pieces.
14. Minute 6 (start timer). Continue moving aircraft 2 cm. (Stop timer after minute 6 has expired.)
15. A 737's right (starboard) engine has caught on fire and caused runway B1 to be temporarily closed to incoming aircraft. The storm continues to move east at 5 km/min. Move storm pieces.
16. Minute 7 (start timer). Continue moving aircraft 2 cm.
17. Minute 8: The storm is still moving east at 5 km/min. Move storm pieces. Continue moving aircraft 2 cm.
18. Minute 9. Runway B1 has been cleared for takeoffs and landings. The storm continues to advance east at 5 km/min. Move storm pieces. Continue moving each aircraft 2 cm. (Stop timer after minute 9 has expired.)
19. Flight 1130 is experiencing leaking fuel. Please clear the flight path for an emergency landing. Flight 1130 must land.
20. Minute 10. Continue moving each aircraft 2 cm. (Start the timer again.)
21. Minute 11. The storm is still moving east at 5 km/min. Continue moving each aircraft 2 cm.
22. Minute 12. The storm is crossing the airport and all takeoffs and landings are delayed until the storm clears. Continue moving each aircraft 2 cm.
23. Minute 13. The storm continues to cross over the airport at 5 km/min and is producing heavy downpours and severe lightning. Airport is still temporarily closed. Continue moving each aircraft 2 cm.
24. Minute 14. The storm continues to cross east over the airport at 5 km/min. Airport is still temporarily closed as the storm moves through the area. Continue moving each aircraft 2 cm.
25. Minute 15. The storm continues to cross east over the airport at 5 km/min. Airport is still temporarily closed as the storm heads out of the area. Continue moving each aircraft 2 cm.
26. Minute 16. The storm has dissipated and the airport is now clear for takeoffs and landings. Continue moving each aircraft 2 cm.
27. Minute 17. Continue moving each aircraft 2 cm.
28. Minute 18. Mechanical problems have caused runways B1 and B2 to be closed for the next 3 minutes. Continue moving each aircraft 2 cm.
29. Minute 19. Continue moving each aircraft 2 cm.
30. Minute 20. Continue moving each aircraft 2 cm.
31. Minute 21. Runways B1 and B2 are open for takeoffs and landings. Continue moving each aircraft 2 cm. (Continue to announce each minute until all aircraft have landed.)

In the Safety Zone: Student Page

Background

The Federal Aviation Administration (FAA), an agency of the U. S. Department of Transportation (DOT), runs the Air Traffic Control (ATC) System. The system was developed primarily to maintain safe separation of aircraft throughout the U.S. and to keep air traffic flowing in an orderly manner and as efficiently as possible.

Air traffic controllers coordinate the movement of aircraft to make certain that air traffic stays a safe distance apart. Their immediate concern is safety, but controllers must direct aircraft efficiently to minimize delays. Controllers also keep pilots informed about changes in weather conditions.

Goals of the Game

In this game, you are an ATC responsible for safely and efficiently guiding one aircraft to its destination. Your primary goal is to land the aircraft safely and on time. Points will be rewarded for plotting the plane correctly, landing on time, and landing on the correct runway.

Procedure

1. Choose a quadrant and an aircraft designated for that quadrant.
2. Color the aircraft and retain the colored pencil for tracking.
3. Work together to plot the initial positions of all aircraft on the game board by using the initial aircraft flight coordinates provided in the Flight Plan. Use a pushpin or sewing pin, along with the correct aircraft game piece, to mark the location.
4. On the Safety Rating Card (p. 73), record points awarded for each correctly plotted aircraft.
5. Measure the direct distance from each of the assigned aircraft to the airport.
6. Calculate the direct distance in km using the scale: 2 cm : 5 km. Round results to the nearest km and record them on the Tracking Chart. (p.72)
7. Listen as the announcer reads the Safety Zone Scenario and follow directions.
8. After the game is completed, score your game by giving 10 points for aircraft that landed on time, subtract 1 point for each minute ahead or behind schedule, and subtract 5 penalty points for each aircraft coming in on the wrong runway.
9. Determine the Air Safety Travel Index (ASTI) by calculating the percentage using the ratio of team points divided by total possible points for the number of aircraft you directed (1 aircraft = 44 total points, 2 aircraft = 88 total points, 3 aircraft = 132 total points).
10. Multiply by 100 and write the percentage on the Safety Rating Card (SRC).

In the Safety Zone: Student Page (concluded)

11. Complete the Tracking Chart by calculating the actual linear distance traveled from the aircraft's initial coordinates to the airport by using the equation 5 (km/min) x landing time (min)
12. Calculate the difference in the direct distance traveled versus the actual distance traveled, and record the values on the Tracking Chart.

Conclusion

1. Analyze the difference between the direct distance traveled versus the actual distance traveled. What conclusions can you draw from this discrepancy?
2. Analyze your calculated Air Safety Travel Index. The optimum ASTI value is 100 percent. If your ASTI value is not 100 percent, what are some variables that affected your ASTI value?
3. Why is communication vital to an air traffic controller?
4. Research indicates that air traffic control is one of the most challenging and stressful jobs. After having limited experience with directing aircraft, write a paragraph or two commenting on this statement.
5. Air traffic is expected to increase in the future. What challenges will face the next generation of air traffic controllers?

Extensions

1. Invite an air traffic controller to participate in the game. After the game is played, have the ATC lead a discussion on the qualities of a successful ATC.
2. Design your own script and game board for the game.

In the Safety Zone: Student Page

Name: _____

Date: _____

Flight Plan

	Aircraft Type	Flight No.	Airline	Departure Point	Flight Coordinates	Arrival Time	Runway	Landing Time	Difference in Times
Quadrant 1	757	125	Aspen Air	Denver	(10,25)	+7 min.	B1		
	MD-80	711	Gamble Air	Las Vegas	(45,20)	+12 min.	B1		
	737	625	Cub Tran	Chicago	(35, 40)	+25 min.	B2		
Quadrant 2	767	780	Green Air	Seattle	(-30, 40)	+18 min.	A1		
	Cessna	615	Green Tran	San Francisco	(-45, 25)	+20 min.	C		
	DC-9	1058	WWA	Portland	(-5, 45)	+10 min.	B1		
Quadrant 3	747	239	Dar-Mills Air	Hawaii	(-45, -45)	+27 min.	A2		
	777	1214	Fuji	Tokyo	(-40, -15)	+11 min.	A2		
	MD-80	1130	Tex-Mex	Mexico	(-15, -35)	+15 min.	B2		
Quadrant 4	737	347	Saint Airway	New Orleans	(45, -40)	+23 min.	B2		
	757	432	Tri-Alpha	Atlanta	(35, -15)	+13 min.	A1		
	757	222	Tex-Mex	Houston	(10, -35)	+8 min.	B2		

In the Safety Zone: Student Page

Tracking Chart

Flight Number			
Aircraft Type			
Runway			
Direct Distance From Airport			
Actual Distance Traveled			
Difference in Kilometers			

Minute	Individual Plane Check-Off		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

Use this grid to help yourself remember if you've moved all your planes! After each minute, check off each plane you have moved.

Tracking Chart

Flight Number | Aircraft Type | Runway | Direct Distance From Airport | Actual Distance Traveled | Difference in Kilometers

Minute | Individual Plane Check-Off | 1–30

Use this grid to help yourself remember if you've moved all your planes! After each minute, check off each plane you have moved.

Tracking Chart

Flight Number | Aircraft Type | Runway | Direct Distance From Airport | Actual Distance Traveled | Difference in Kilometers

Minute | Individual Plane Check-Off | 1–30

Use this grid to help yourself remember if you've moved all your planes! After each minute, check off each plane you have moved.

In the Safety Zone: Student Page

ATC: _____

Quadrant: _____

Safety Rating Card

Individual ATC Score	ATC's Points	Max. Points		
		Number of Aircraft		
Initial Aircraft Setup		1	2	3
1 point for each correctly plotted aircraft	_____	1	2	3
Landing Aircraft				
10 points possible for each aircraft landed. Subtract 1 point for every minute early or late. Subtract 5 points for a wrong runway landing.	_____	10	20	30
Total →	_____	11	22	33

Team Score	Points	Max. Points
		Number of Aircraft
		1 2 3
Quadrant I	_____	↓ ↓ ↓
Quadrant II	_____	
Quadrant III	_____	
Quadrant IV	_____	
		44 88 132
Total →	_____	

Air Safety Travel Index x (ASTI) Formula

(A/B) * 100 = ASTI

A = Team's Total Points B = Maxium Points

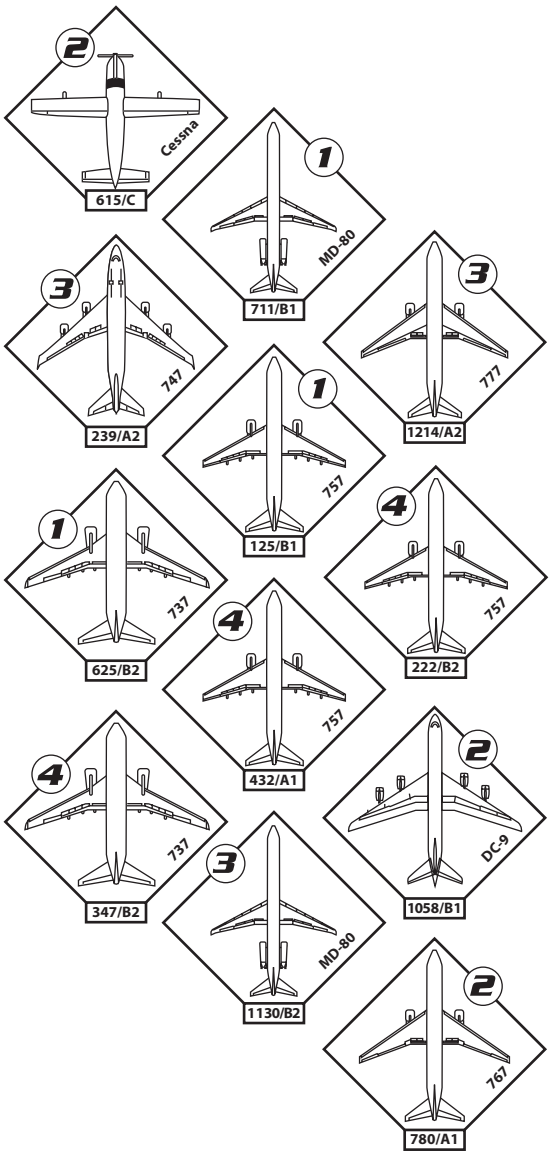
(_____/_____) * 100 =

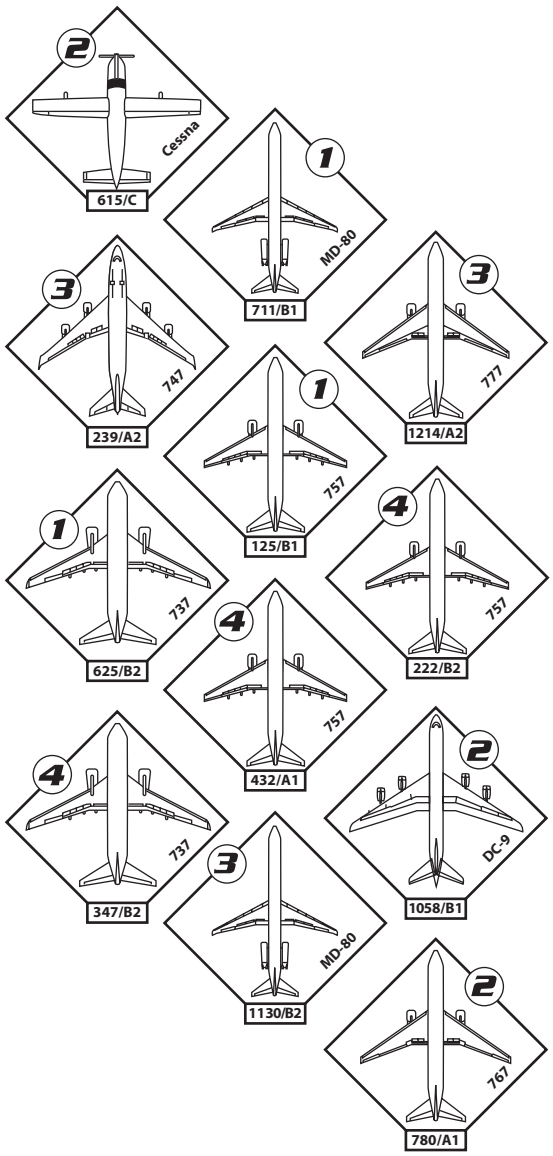
Team Points / Max Points

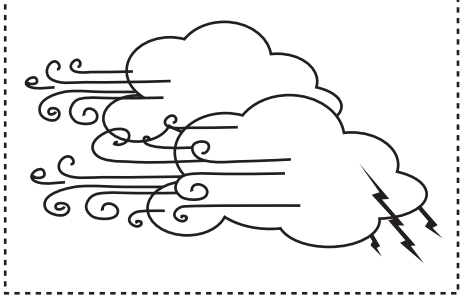
Game Constraints

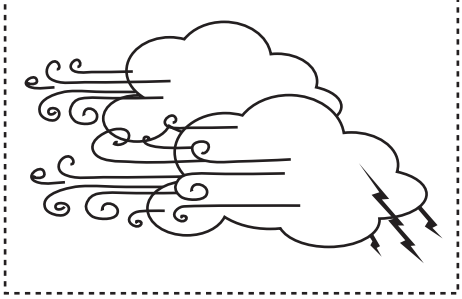
1. For each minute of play, aircraft can move 2 cm in any direction except backwards.
2. Aircraft cannot be closer to each other than 2 cm (5 km).
3. To land on Runway C, aircraft must be on the coordinates (1,0).
4. Runway C is reserved strictly for the Cessna aircraft.
5. To land on Runway B1, aircraft must be on the coordinates (0,1) and for Runway B2 on the coordinates (0,-1).
6. To land on Runway A1, aircraft must land from the northeast from (5,5) and on Runway A2, from the southwest from (-5, -5).
7. Landing an aircraft on the wrong runway results in a 5-point penalty.
8. No two aircraft can land on the same runway at the same time.
9. Within three minutes of landing, the ATC must announce his intention of landing an aircraft by identifying the flight number and runway.
10. Aircraft flight path must avoid mountains and storms.

In the Safety Zone: Student Page









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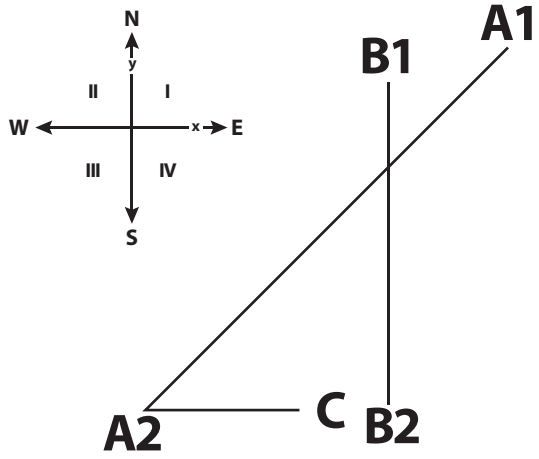


Norbert International Airport
Located at (0,0)

Quadrant 2

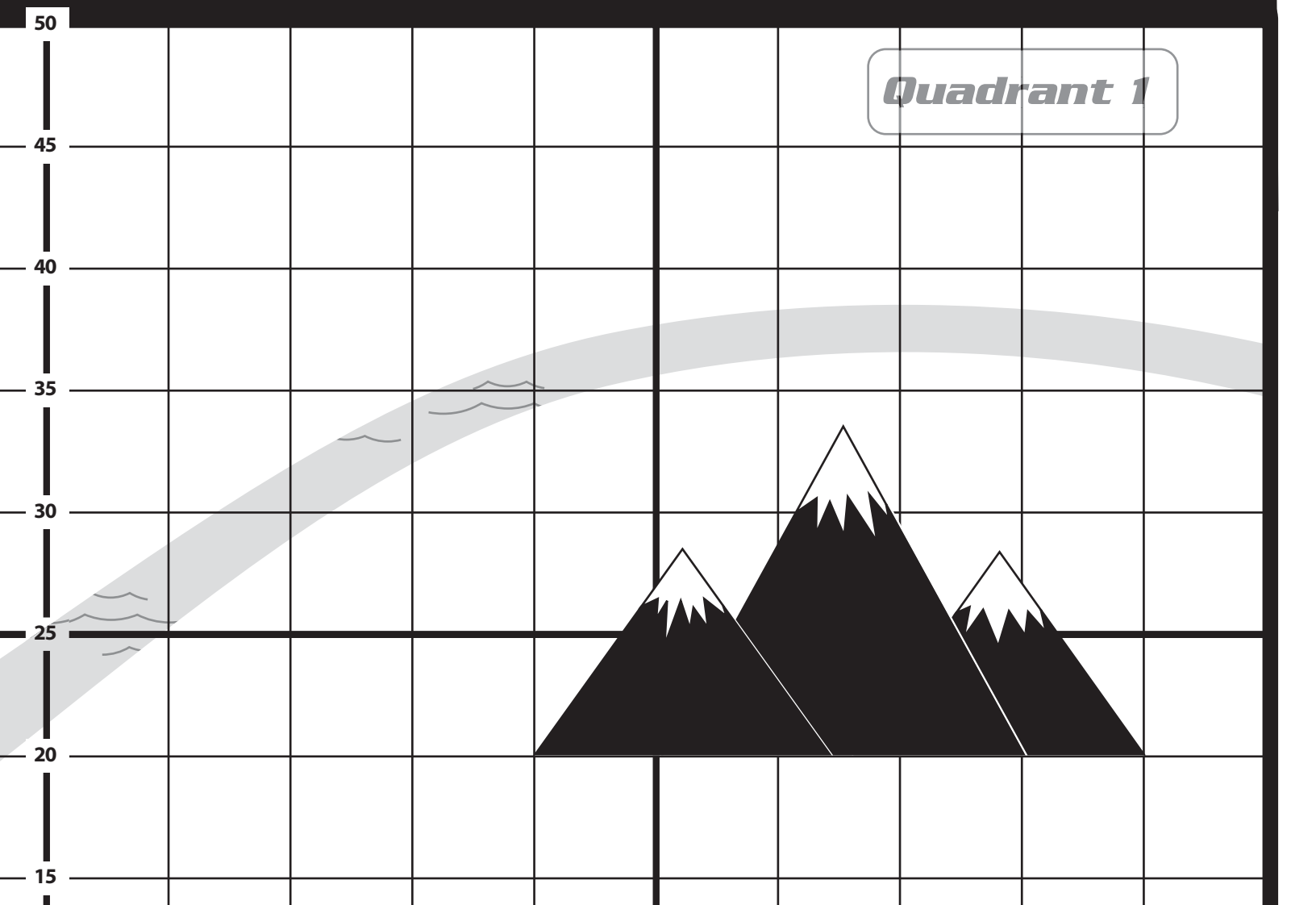
Safety Zone

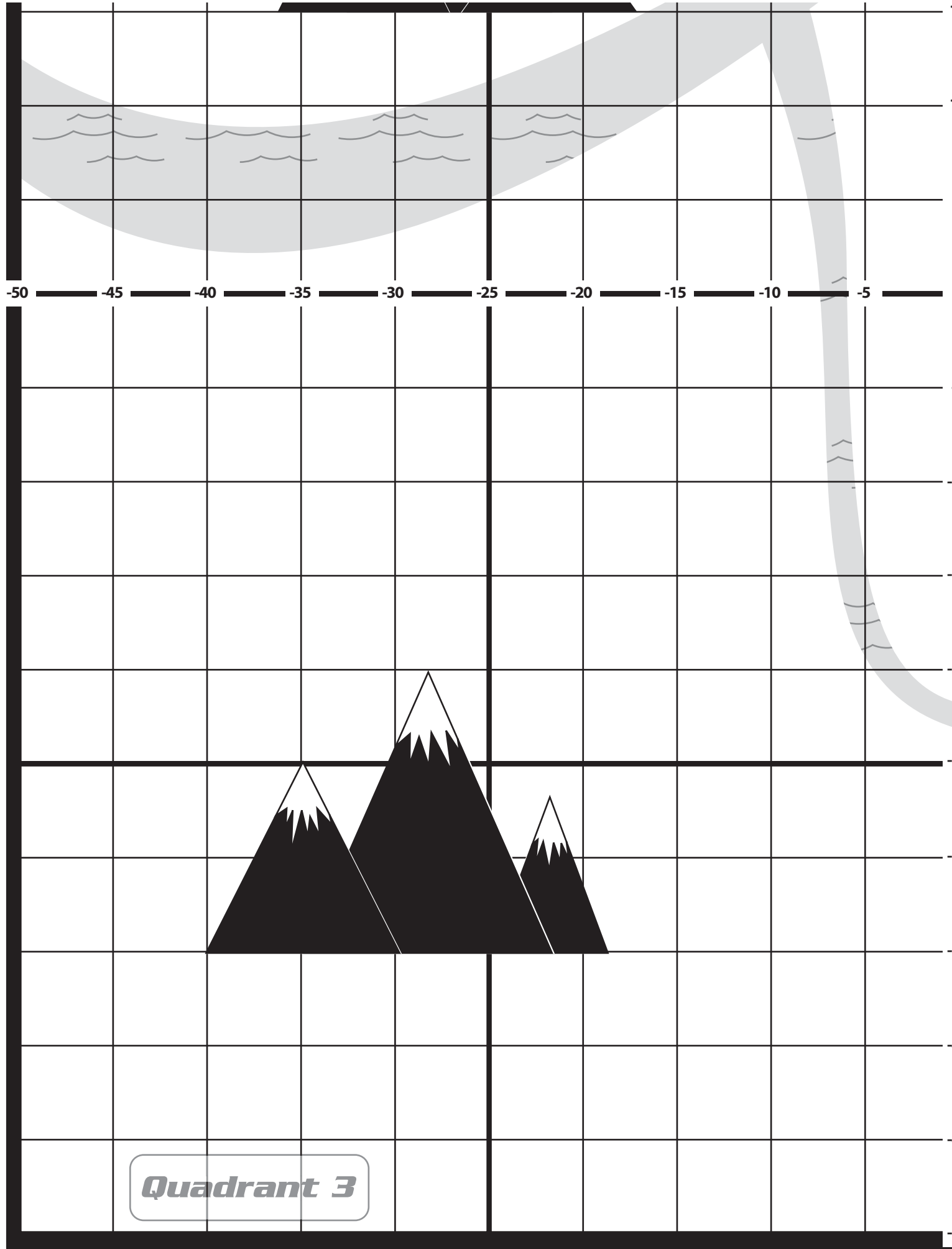
0 cm 2 cm

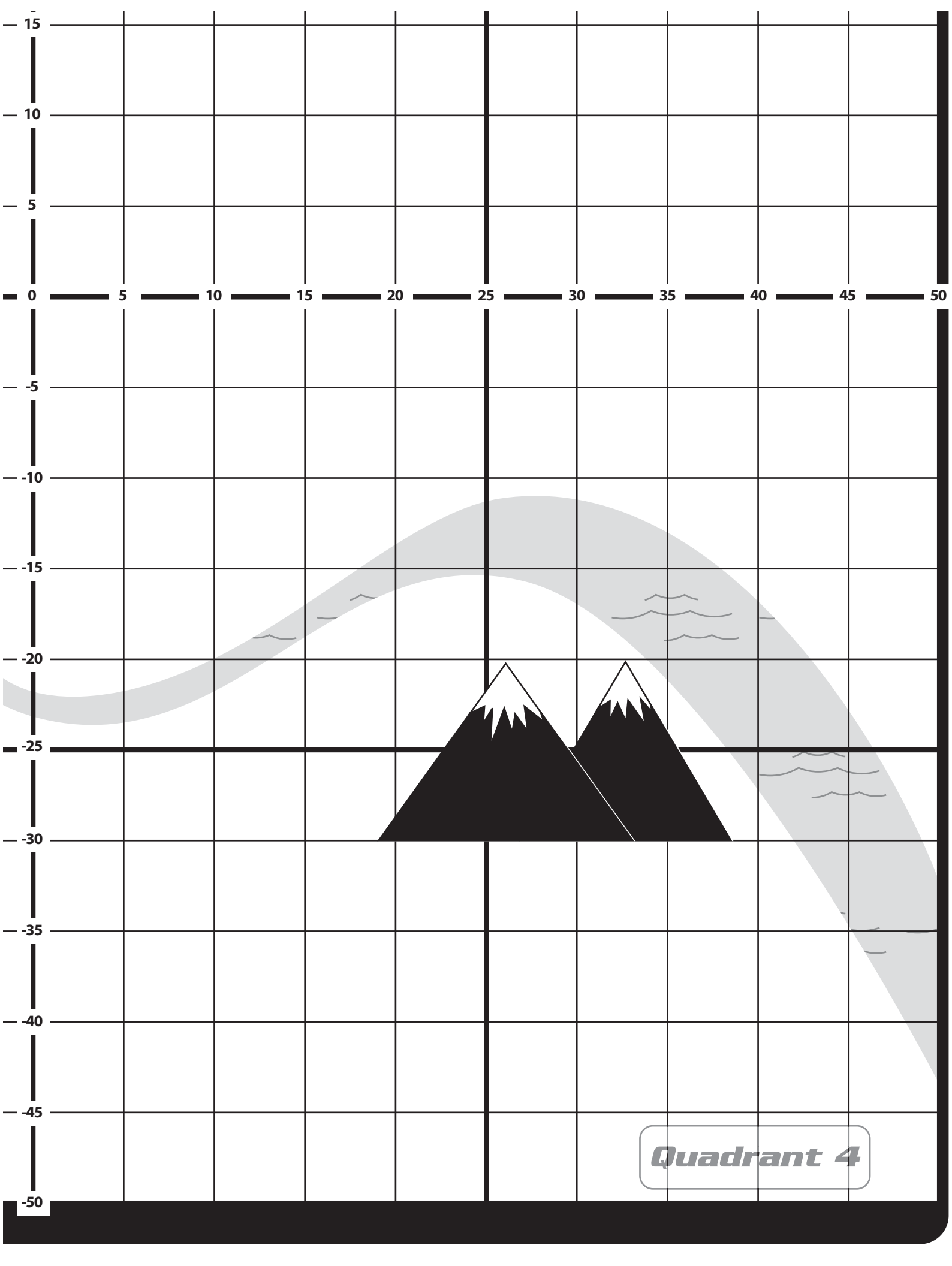
2 cm = 5 km

Scale

Quadrant 1




-50
-45
-40
-35
-30
-25
-20
-15
-10
-5
Quadrant 3


15
10
5
0
5
10
15
20
25
30
35
40
45
50
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
Quadrant 4

Up Close and Personal in the Air

Problem

To design a personal air vehicle for future travel

Materials

Internet *(optional)*
aeronautics
resources
construction paper
colored pencils

Procedure

1. Conduct research on past, present, and future aircraft. Using your research and what you learned in The Case of the Radical Ride, discuss options for future personal air vehicles (PAVs).
2. Brainstorm a list of ideas and use them to create a web or brainstorm map.
3. In your group, decide which concept is the best PAV to present to the class.
4. Draw and color an illustration of your future PAV.
5. Create a report, poster, PowerPoint or other presentation to explain how your PAV will work, why you think it is the best option, and how it will benefit society if it is manufactured.
6. Present your presentation to the class.
7. As a class, vote on the PAV that would have the most effect on society.

Conclusion

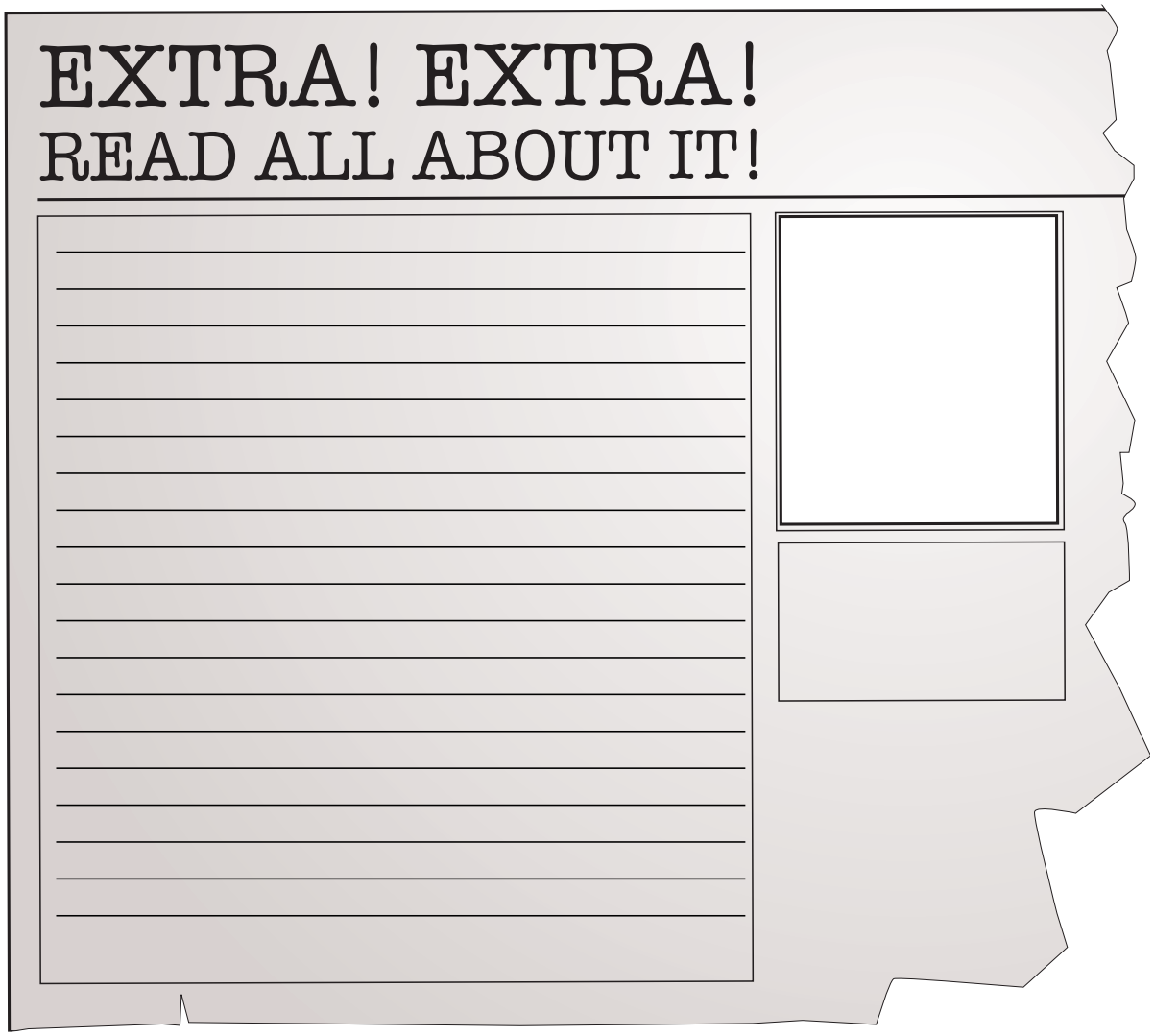
1. When you become an adult, will you buy a PAV? Why or why not?
2. Explain what factor people will consider the most when choosing a PAV?
3. How will society change with the advent of the PAV and small airport communities?

Extension

Create a model of your personal air vehicle.

EXTRA! EXTRA! READ ALL ABOUT IT!

The year is 2025 and you have just invented a new form of transportation. Using a newspaper writing style, write a story about your design and tell how it will affect future societies. Be sure to include a short biography about you, the engineer! Remember, when writing newspaper articles, answer the five Ws and an H: Who, What, Where, When, Why, and How!



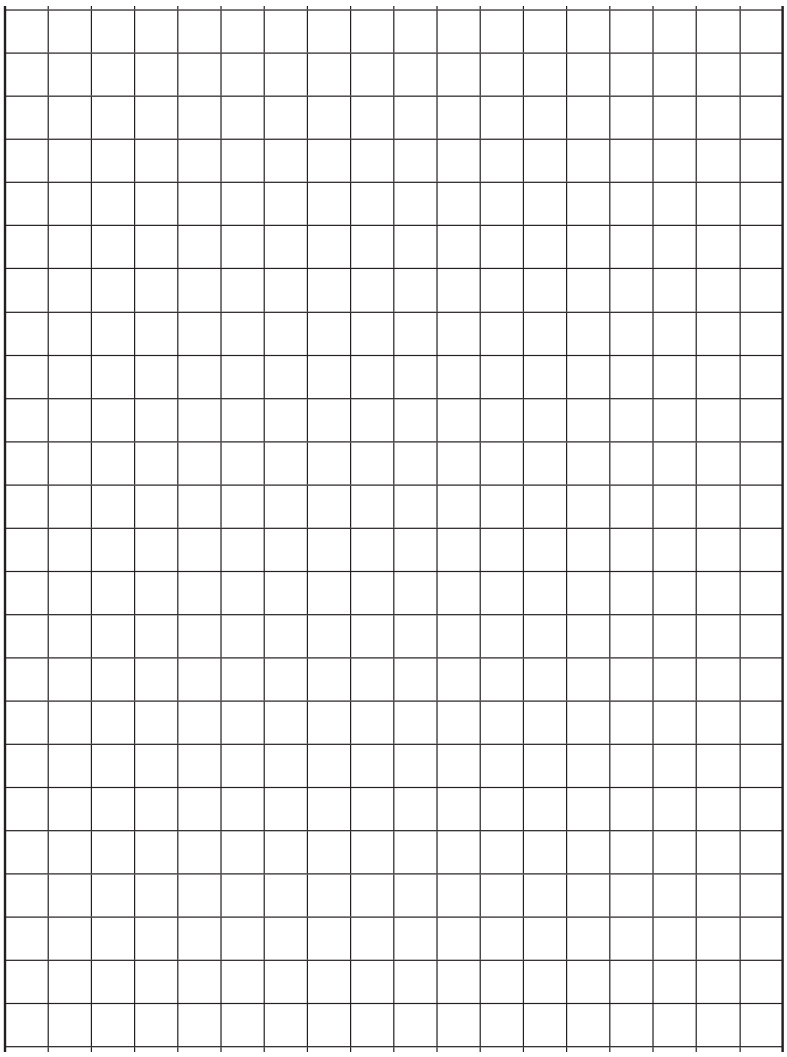
Reaching Into the Future

Find the following words

solution	engineer	tunnel	shuttle
space tourist	rocket	Mars rover	space station
PAV	maglev	iterative	airport community
SATS	transatlantic	crew vehicle	problem
aerospace	aeronautics	intermodal delay	gridlock
design	test	data	redesign

S O L U T I O N A R Y N E A P T A M O O N S
P N M O S A T S I N B A B E U U G U Y I H I
A A C A M O R P M E T S Y N H T R A E U D G
C O V D E P E R I A K M N I C L I P T O I N
E N M A N I O M B N G E M S T O N T H T N E
T H E E G T I U A I L A U X R Y L I S H T O
O K A I I O R K N K I N V Y A E I O I Y E U
U J I L N E S N M D C C E T N L L E R D R G
R L P L E T E T E C T O L I S S A G O R M R
I A I E E E R G E H Z N G N A T E V A I O I
S S M W R T I O E I T V A U T R R A R E D D
T Z Q U I C L I C T O E M M L I O E P U A L
P N L D S A I N D K R R C M A A S A E A L O
R G E A R S Z A I E E G O O N T P E L A D C
O I V E R T S S N G P T D C T I A N C T E K
B S P A C E S T A T I O N T I O C L I A L H
L I R T J E S C I E W T E R C N E I H D A E
E E N E I G D E S I G N K O I S A C E T Y R
M E R C P G S I C I Z U A P T E S T V I C I
A K A T I I T G U D T B I R B I L L W I I N
M A R S R O V E R S R I R I O Y T I E A R G
G A E M O H S O B I T E R A T I V E R Q U E
A E R O N A U T I C S N I K K I N Y C R P V
M F A E B Z X R S W R E D E S I G N S O R E

Shooting for the Stars



Use the words below to create your own crossword puzzle.

Vocabulary

engineer	problem
solution	brainstorm
design	iterative
test	data
analyze	aeronautics
aerospace	transportation

Add your own:

_____

_____

_____

_____

Across

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Down

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Answer Key

In the Safety Zone

1. Answers will vary but might include that various conflicts such as the approaching storm and the runway shutdown caused planes to be diverted from their original plan.
2. Answers will vary and might include the same conflicts as in question 1.
3. Answers will vary but might include that without communication and someone controlling the planes, there would be chaos in the skies. Planes would run into each other and not know when to land, and so on.
4. Answers will vary.
5. Answers will vary but might include that there will be a need for either more controllers and/or better communication equipment.

Up Close and Personal in the Air

1–3. Answers will vary.

Reaching Into the Future

S	O	L	U	T	I	O	N	A	R	Y	N	E	A	P	T	A	M	O	O	N	S
P	N	M	O	S	A	T	S	I	N	B	A	B	E	U	U	G	U	Y	I	H	I
A	A	C	A	M	O	R	P	M	E	T	S	Y	N	H	T	R	A	E	U	D	G
C	O	V	D	E	P	E	R	I	A	K	M	N	I	C	L	I	P	T	O	I	N
E	N	M	A	N	I	O	M	B	N	G	E	M	S	T	O	N	T	H	T	N	E
T	H	E	E	G	T	I	U	A	I	L	A	U	X	R	Y	L	I	S	H	T	O
O	K	A	I	I	O	R	K	N	K	I	N	V	Y	A	E	I	O	I	Y	E	U
U	J	I	L	N	E	S	N	M	D	C	C	E	T	N	L	L	E	R	D	R	G
R	L	P	L	E	T	E	T	E	C	T	O	L	I	S	S	A	G	O	R	M	R
I	A	I	E	E	E	R	G	E	H	Z	N	G	N	A	T	E	V	A	I	O	I
S	S	M	W	R	T	I	O	E	I	T	V	A	U	T	R	R	A	R	E	D	D
T	Z	Q	U	I	C	L	I	C	T	O	E	M	M	L	I	O	E	P	U	A	L
P	N	L	D	S	A	I	N	D	K	R	R	C	M	A	A	S	A	E	A	L	O
R	G	E	A	R	S	Z	A	I	E	E	G	O	O	N	T	P	E	L	A	D	C
O	I	V	E	R	T	S	S	N	G	P	T	D	C	T	I	A	N	C	T	E	K
B	S	P	A	C	E	S	T	A	T	I	O	N	T	I	O	C	L	I	A	L	H
L	I	R	T	J	E	S	C	I	E	W	T	E	R	C	N	E	I	H	D	A	E
E	E	N	E	I	G	D	E	S	I	G	N	K	O	I	S	A	C	E	T	Y	R
M	E	R	C	P	G	S	I	C	I	Z	U	A	P	T	E	S	T	V	I	C	I
A	K	A	T	I	I	T	G	U	D	T	B	I	R	B	I	L	L	W	I	I	N
M	A	R	S	R	O	V	E	R	S	R	I	R	I	O	Y	T	I	E	A	R	G
G	A	E	M	O	H	S	O	B	I	T	E	R	A	T	I	V	E	R	Q	U	E
A	E	R	O	N	A	U	T	I	C	S	N	I	K	K	I	N	Y	C	R	P	V
M	F	A	E	B	Z	X	R	S	W	R	E	D	E	S	I	G	N	S	O	R	E

On the Web

Home Sweet Hangar

1–3. Answers will vary.