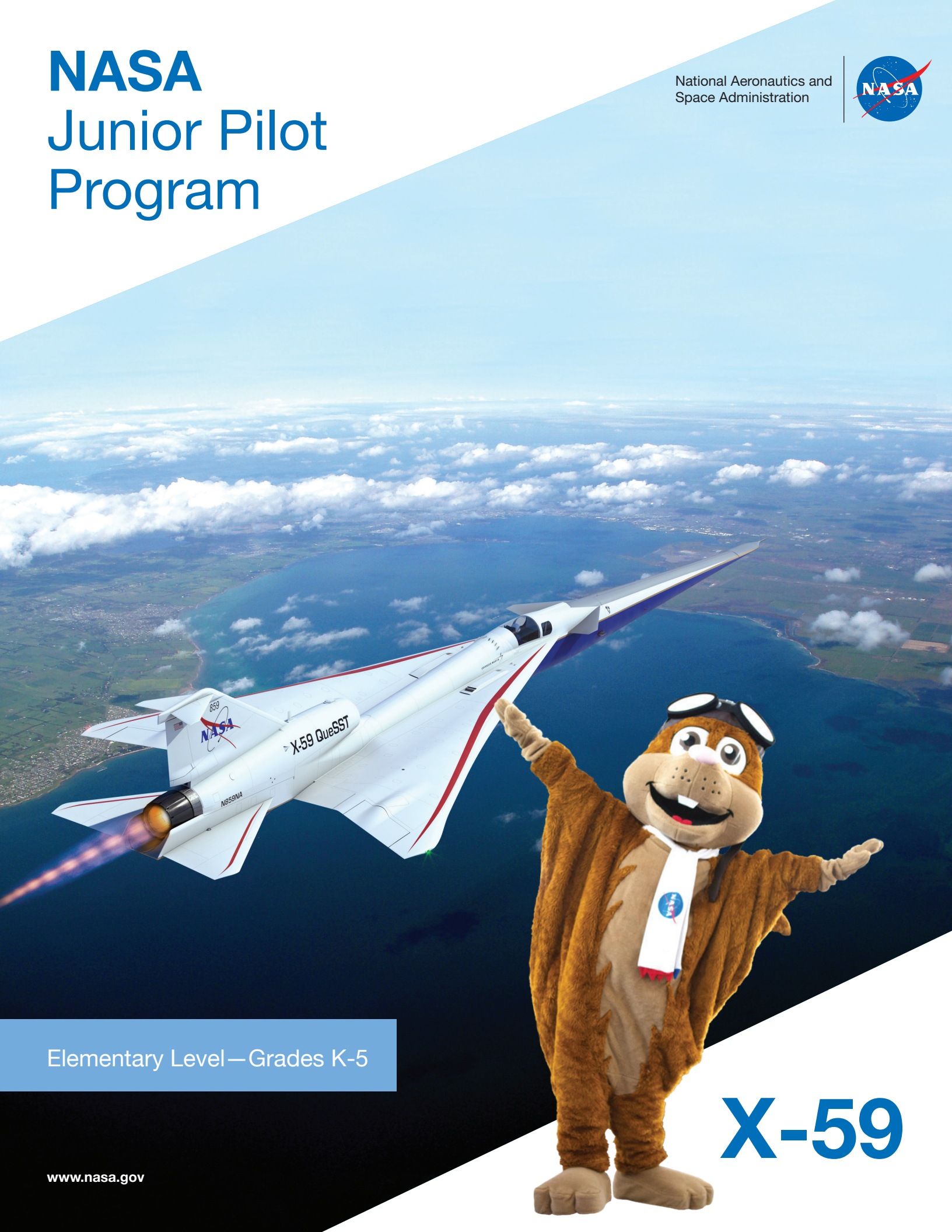


NASA Junior Pilot Program

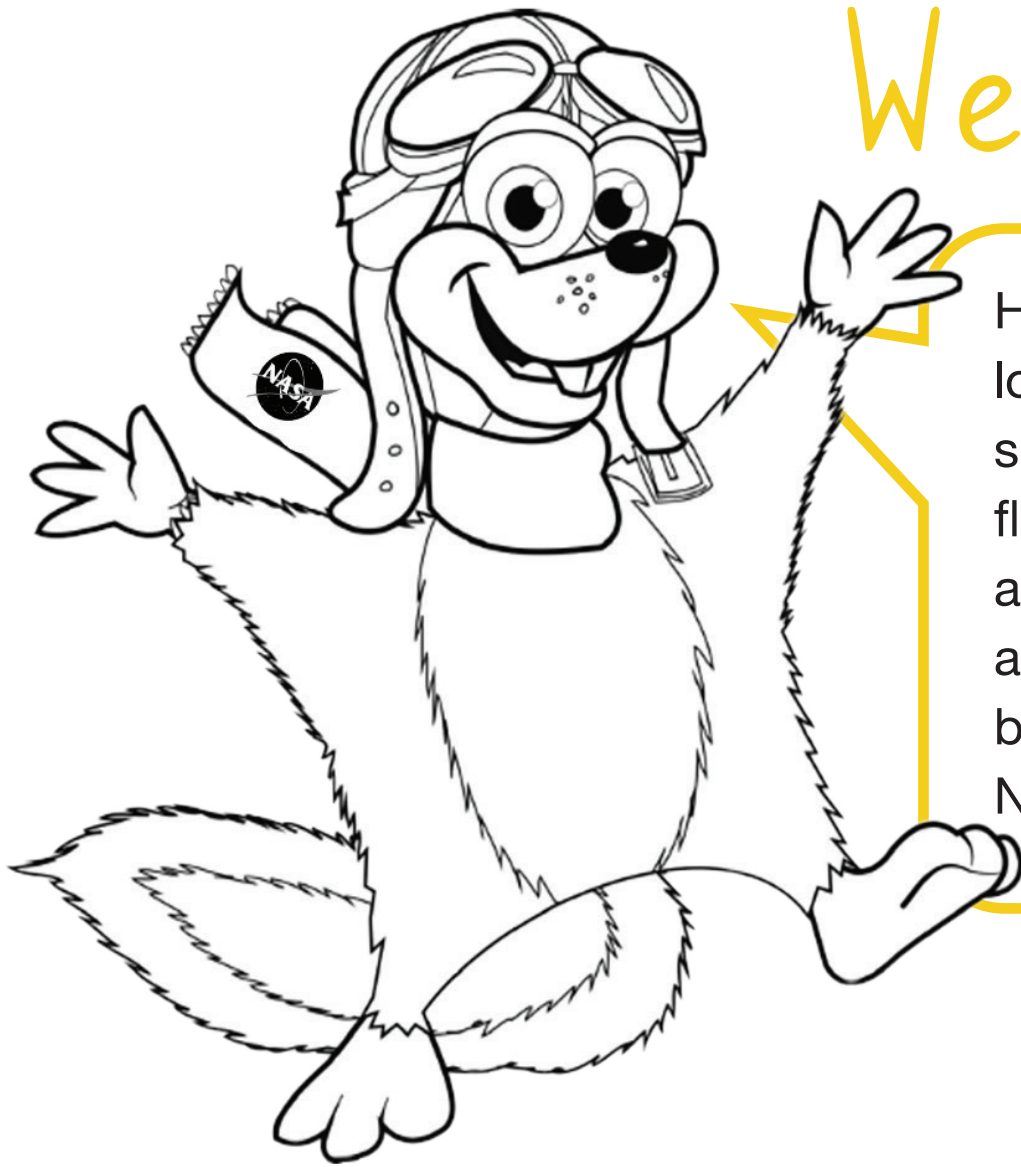
National Aeronautics and
Space Administration



Elementary Level—Grades K-5

www.nasa.gov

X-59



Welcome!

Hi! I'm Orville and I love to fly! I want to show you all about flight and the X-59 airplane. So, follow along with me to become an official NASA junior pilot!

Activity 1:
Color Orville

I am a flying squirrel; Orville is my name.
I get to work at NASA – that's my source of fame.
I am a fan of airplanes; I love to see them fly.
I think it is amazing, how they soar across the sky.

I learned to fly when I was young - when I was only one.
It is something that I love, 'cause it's lots of fun!
Since my arms have flaps of skin, that work like airplane wings,
I can glide great distances, from trees and other things.
Viewing Earth from in the sky, enables me to see,
The beauty of our planet, the way it's meant to be.

We need to help the trees and land, and help the waters too.
That's one of NASA's missions, something that we do.
We help to improve airplanes, in lots of different ways,
To make them clean and quiet, for greener future days.

Who is NASA?

NASA is short for National Aeronautics and Space Administration. It is an agency of the United States Government that works on space exploration and aeronautics. People with all different jobs work for NASA. Some of these jobs include engineers, writers, chefs, graphic designers, and just about any other job you can think of!

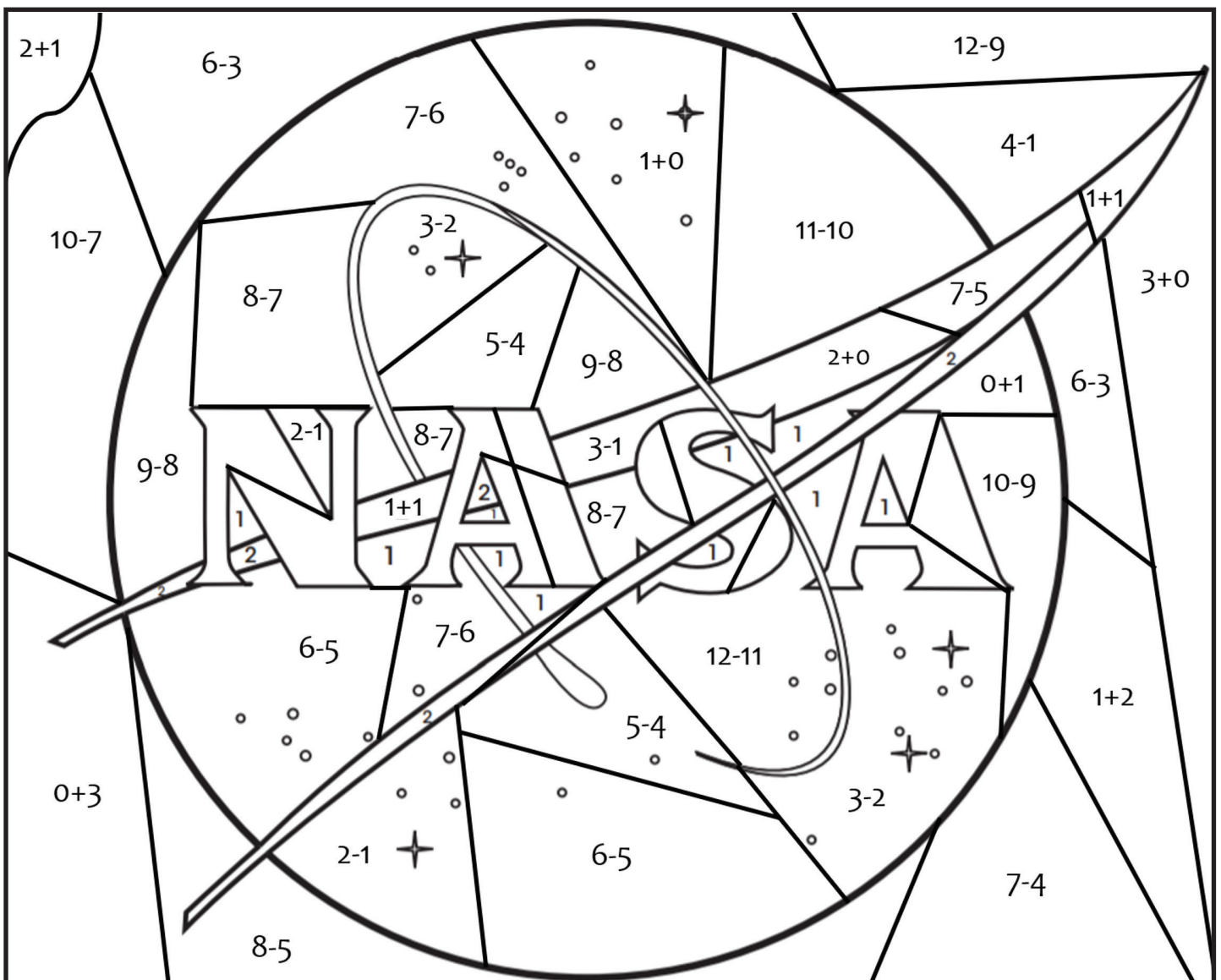
Activity 2: Color By Number

Each area of the picture below has a math problem to solve. Use the answers to figure out what colors to use. Do not color in areas that have no number.

1 – BLUE

2 – RED

3 – BLACK



What is Aeronautics?

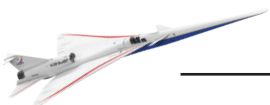
Activity 3: Find the Words

Aeronautics is the science of travel through the air. NASA does a lot of research in aeronautics to make airplanes and helicopters better and support missions to space. NASA is even working to make drones and flying cars something you will see in the sky around you!

How many smaller words can you make using the letters in the word **AERONAUTICS**? Write your words on the lines below.

Aeronautics





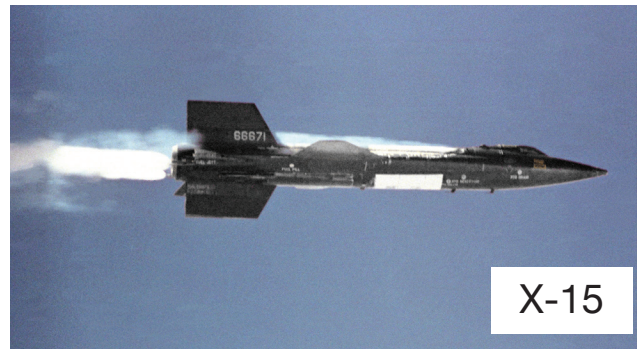
The History of X-Planes

One of the ways NASA makes planes better is by making new planes. These planes, called X-planes, are used to test new ideas. The “X” in the word X-plane is short for experimental because they are planes that test new designs and ways to fly.

The very first X-plane built by NASA was the Bell X-1. It was flown by an Air Force pilot named Chuck Yeager. In 1947, while flying the X-1, he became the first pilot to fly faster than the speed of sound.



Since then, NASA has designed and built more than 20 different X-planes. They have been used to make planes faster, safer, and more friendly to the environment.



The X-15 (2nd image) was the fastest X-plane ever flown. The X-29 (3rd image) has wings that go forward. The X-57 (bottom image) flies using only battery power.



Credit: All photos from NASA



If you were a NASA engineer designing an X-plane, what would it do? In the space below, draw a picture of your plane. Then, use the lines to talk about your plane. How fast would it go? Would it do anything special? Would it carry people?

Activity 4:
Make Your
Own X-Plane

Describe your plane:

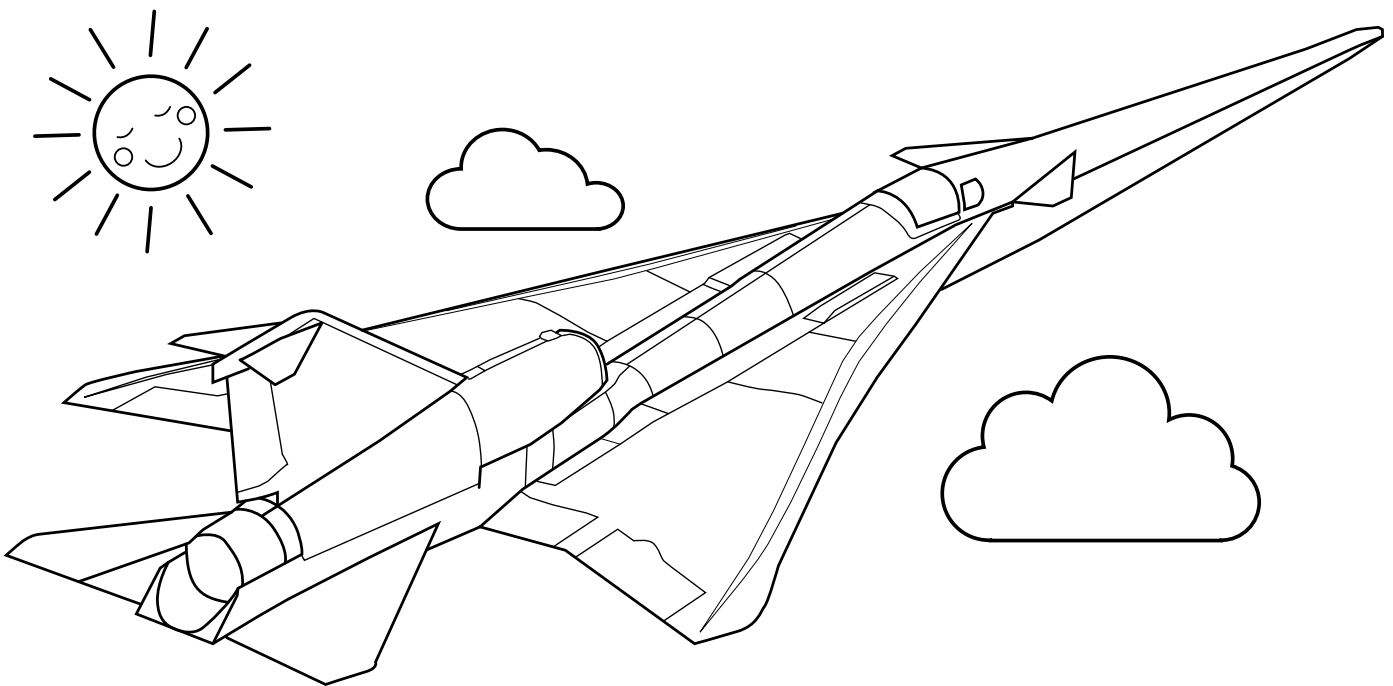
What is Aeronautics?

Activity 5:
Color Your
Own X-59

When planes fly faster than the speed of sound, they make a very loud noise called a sonic boom. This is caused by the sound waves made when flying at supersonic speeds (faster than the speed of sound). The X-59 is a new type of airplane that will fly supersonic without a sonic boom.

If the X-59 work is successful, people might be able to fly across the United States very quickly. Who knows, maybe you'll have the chance to fly on a supersonic plane some day!!!

If you worked at NASA and had the job of painting the X-59, what would you want it to look like? Color the picture below to show your awesome design!



Who will fly the X-59?

Did you know there are more than 15 men and women at NASA who have the job of flying airplanes? They fly lots of different types of planes and helicopters all over the world!

Do you think you might want to be a test pilot?



The X-59 will be flown by someone at NASA called a test pilot. A test pilot flies new airplanes to make sure they are safe.

Nils Larson is a test pilot at NASA's Flight Research Center in California and is NASA's lead pilot for the X-59. He also helps NASA with almost all parts of their flight research projects.

Nils has flown many supersonic research flights, which are flights where the airplane flies faster than the speed of sound. This includes supersonic flights in California, Florida and Texas.

Before joining NASA in 2007, Nils was in the U.S. Air Force. He has flown for more than 7,000 hours total in over 100 different aircraft.

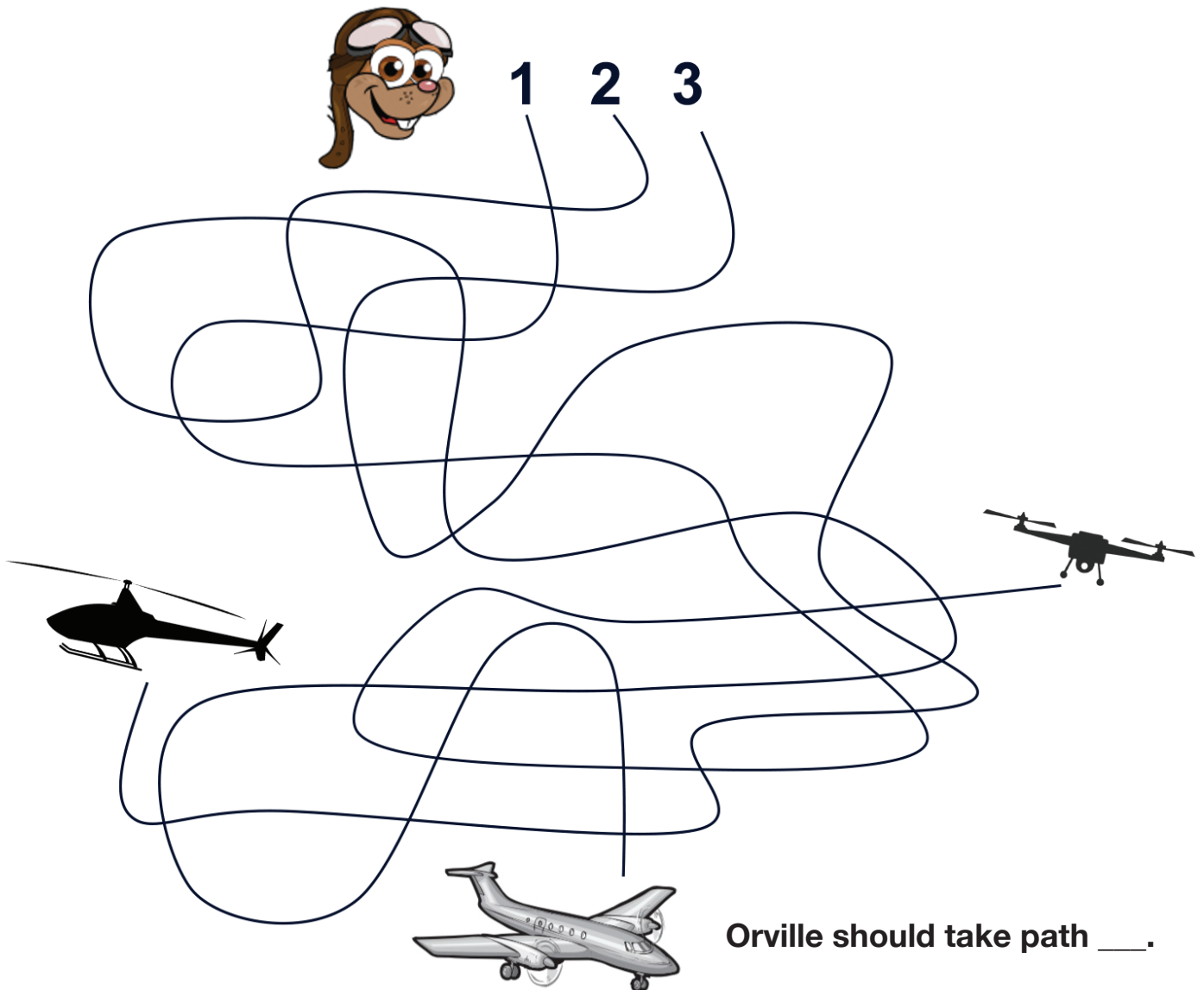
In college, he earned a Bachelor of Science in astronautical engineering from the U.S. Air Force Academy in Colorado Springs, Colorado.

Help Orville Find His Plane

Orville loves flying! After learning about NASA's test pilots, he decided he wanted to become one.

To become a test pilot, Orville needs LOTS of practice flying. So, he flies planes every chance he gets. He is going to fly today but is not sure which path he should take to get to the plane. Can you help him?

Activity 6:
Find the
Right Path



Orville should take path ____.

How Fast Does the X-59 Go?

The X-59 is a supersonic airplane, which means that it travels faster than sound! Its top speed is 940 miles per hour! This is almost twice as fast as a regular commercial airliner like the ones that you see at airports and flying overhead.

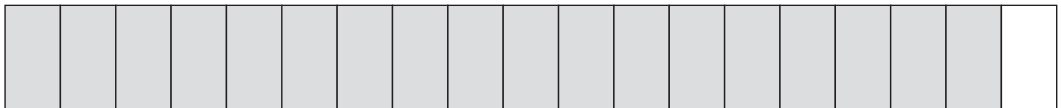
Activity 7: Graph It

Color in the squares of the graph below to show how fast each one can go. The table shows you how many squares to color in for each item. For half squares, color in the left half of the square. The X-59 is already completed for you.

	Top Speed (Miles per Hour)	Number of Squares to Color in
X-59	940	19
Runner	25	$\frac{1}{2}$
Cheetah	75	$1\frac{1}{2}$
Airliner	550	11
Car	100	2



X-59



Runner



Cheetah



Airliner



Car



250

500

750

1000

Speed (Miles per Hour)

The Science of Sound



Sound is created when something vibrates and sends out waves of energy called vibrations. These vibrations, called sound waves, travel through the air to your ear and your brain recognizes them as the sounds you hear.



Sound waves travel through the air at about 770 miles per hour. Supersonic planes travel even faster than this! The problem is that when planes go that fast, the sound waves get pushed together. This makes a very loud sound called a sonic boom. NASA is hoping to make sonic booms much quieter. This will be good for people and animals.

Activity 8:
Unscramble
the Words

Unscramble each set of letters to make words and enter those words in the boxes. Then, take the letters from each of the 5 highlighted boxes. You can unscramble these letters to answer the final puzzle at the bottom.

DOLU

--	--	--	--

PRESUCINSO

--	--	--	--	--	--	--	--	--	--

IERTUQE

--	--	--	--	--	--	--

COINS MOBO

--	--	--	--	--	--	--	--	--	--

GENYER

--	--	--	--	--	--



I hardly heard a

--	--	--	--	--

Hint: All the answers are words found in the paragraph above.

What Do Sound Waves Look Like?

You just learned that sound is made when something “vibrates.” But what does that really mean? When something vibrates, it moves back and forth. We hear different sounds because things vibrate differently and at different speeds.

We can use a computer to show us what the vibrations for a sound look like. The picture the computer makes is called a waveform. Here is an example of a waveform.



This waveform shows the sound waves made when a hammer hits a nail five times. Each of the hits caused vibrations which can be seen in the picture above.

The second and third time the hammer hit the nail, it was louder than each of the other times. That is why it made bigger vibrations for those two hits.



Go to the next page to see if you can identify sounds from their waveforms.

Identify the Sound

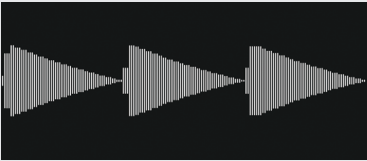
Activity 9: Identify the Sound

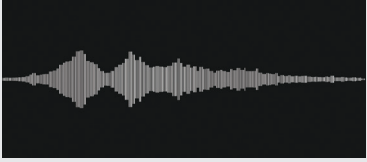
Below you will find waveforms for seven different sounds. For each of the sounds, you need to figure out which waveform shows that sound. You can listen to each of the sounds by visiting the following web page:

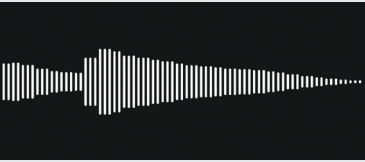
<https://www.nasa.gov/feature/identify-the-sound/>

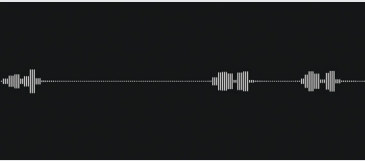
Once you figure out which waveform shows a specific sound, enter your answer in the table next to the pictures of the waveforms below. The first answer is given to you.

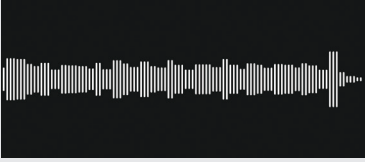
A

B

C

D

E

F

G

Sound	Waveform
1	B
2	
3	
4	
5	
6	
7	

If you don't have a way to listen to the sounds, you can use the descriptions below to complete the activity.



- **Sound 1:** This sound is a warning whistle that blows 3 times.



- **Sound 2:** This is the sound of a plane flying by. It gets louder and then quieter.



- **Sound 3:** This is a doorbell ringing. It has a quiet noise followed by a louder noise that slowly gets quieter.



- **Sound 4:** This is the sound of a drumroll. There is noise the whole time that gets a little louder and quieter.



- **Sound 5:** This is the sound of a frog croaking 3 times. There is a long pause between the first 2 croaks and short pause between the other 2.



- **Sound 6:** This is a trumpet playing a tune. There are a lot of notes with short pauses between them.



- **Sound 7:** This is the sound of a car horn honking twice with silence between the honks.

Important Words

There are a lot of special words that are important for NASA's X-59.
The meaning of some of these words are shown below.

Activity 10: Word Search

AERONAUTICS – the science of travel through the air

AIRPLANE – a vehicle that flies through the air

NASA – a government agency that studies the science of flight and more

SONIC BOOM – a very loud noise created by planes that fly supersonic

SOUNDWAVE – how sound moves from one place to another

SUPERSONIC – faster than the speed of sound

XPLANE – an experimental plane used to test new ideas

Find each of the words defined above in the puzzle.

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

AERONAUTICS

AIRPLANE

NASA

SONIC BOOM

SOUNDWAVE

SUPERSONIC

XPLANE

Bonus: Can you
find my name in
the puzzle?



More to Do and Learn!

You can visit these NASA web pages to find more activities and information:

- Aeronautics @ Home: Lots of fun activities! <https://www.nasa.gov/aero-at-home>
- All About the X-59: You can learn lots more about this awesome plane!
<https://www.nasa.gov/specials/X59/>

Answers

Activity 2: Color by Number

Activity 6: Find the Right Path

Activity 7: Graph It

Vehicle	Speed (Relative)
X-59	100%
Runner	10%
Cheetah	20%
Airliner	60%
Car	10%

Activity 8: Unscramble the Words

DOLU L O U D
 PRESUCINSO S U P E R S O N I C
 IERTUQE Q U I E T E R
 COINS MOBO S O N I C B O O M
 GENYER E N E R G Y
 I hardly heard a S O U N D !!

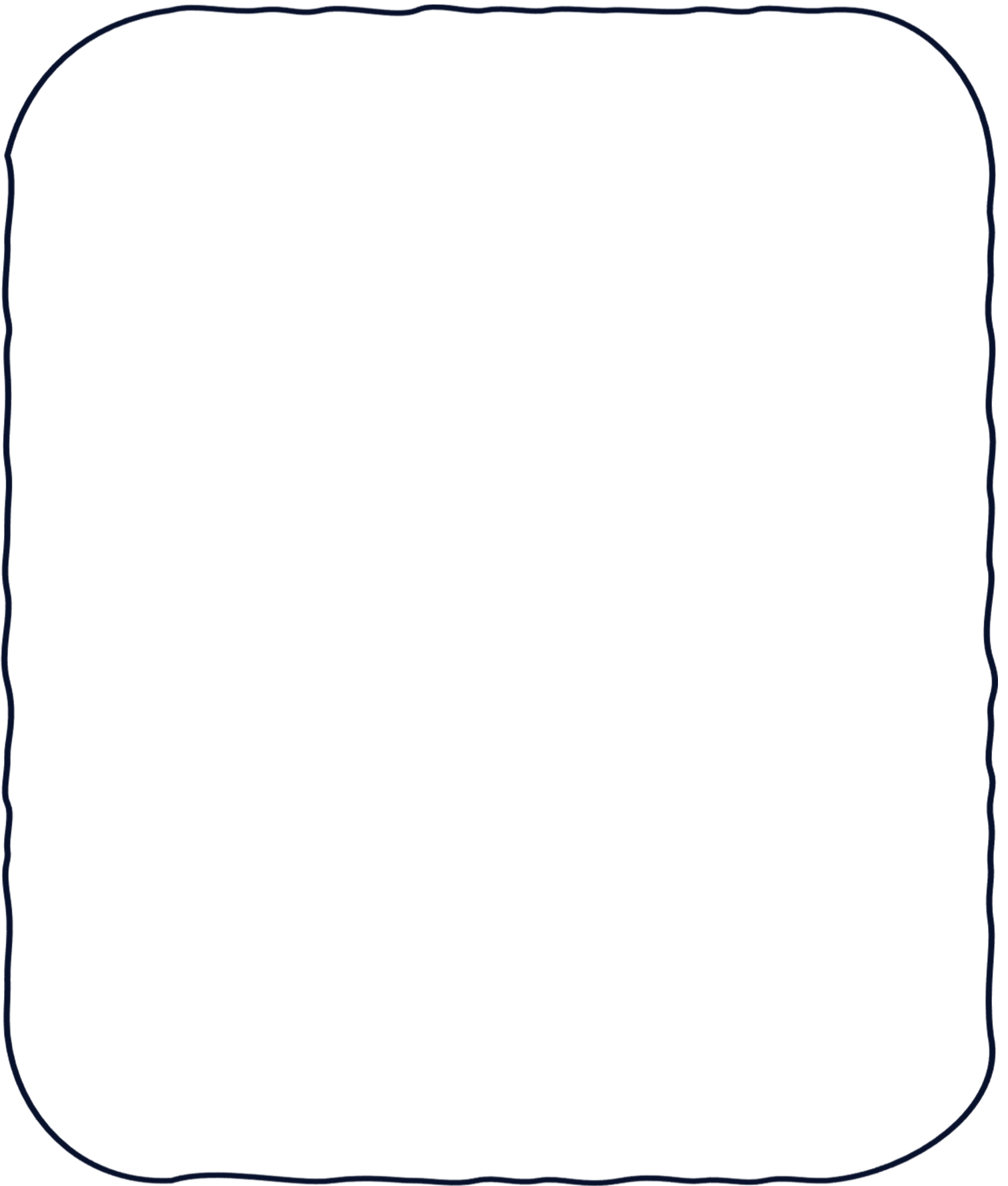
Activity 9: Identify the Sounds

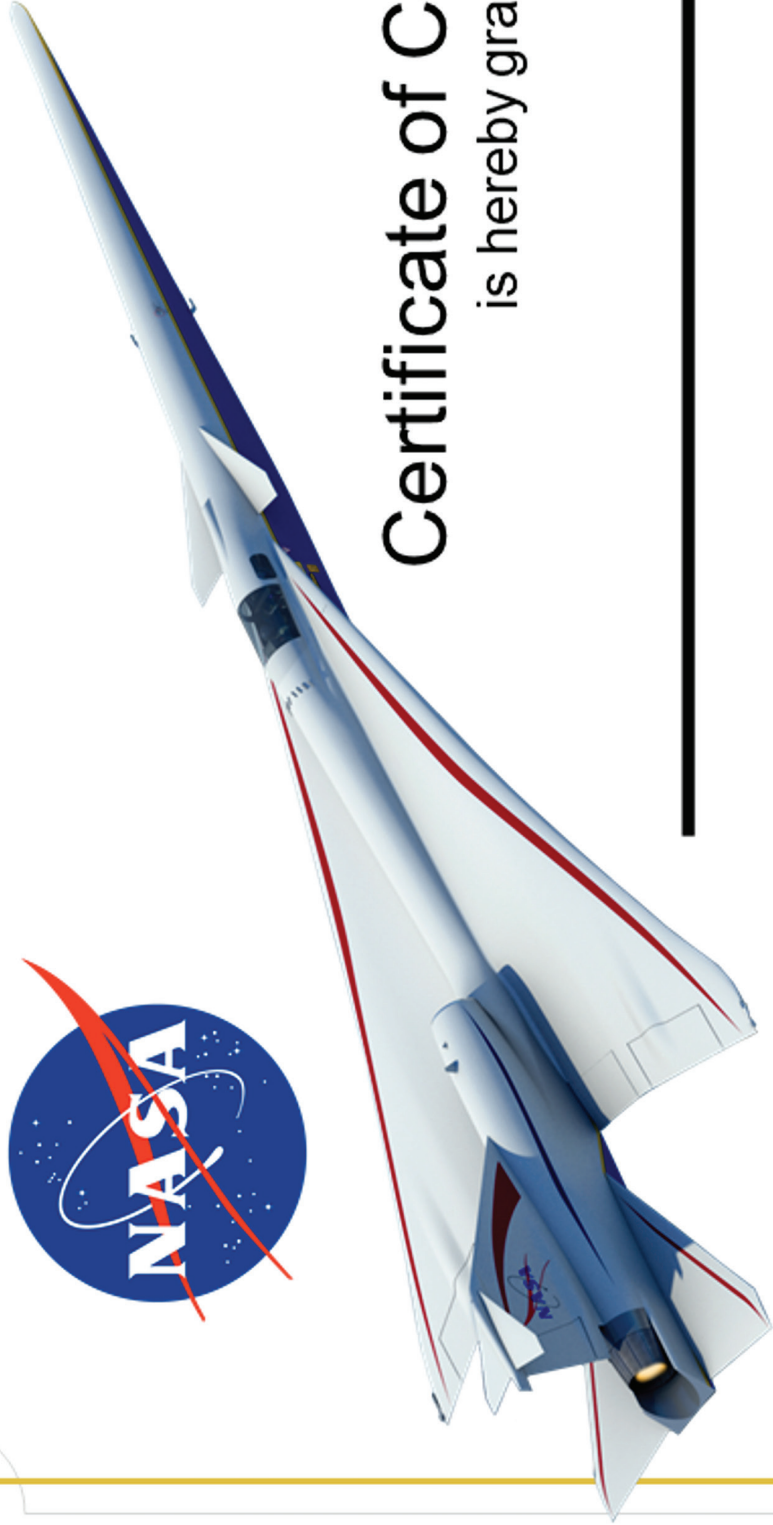
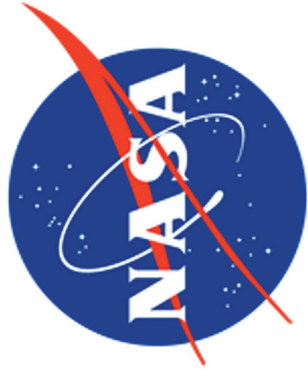
Sound	Waveform
1	B
2	C
3	D
4	F
5	E
6	A
7	G

Activity 10: Word Search

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

Doodle Space





Certificate of Completion

is hereby granted to

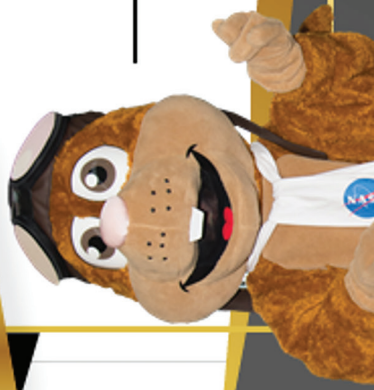
To certify that they completed to satisfaction

NASA's Junior Pilot: X-59 Program

Date: _____

Orville D. Squirrel

Orville D. Squirrel, NASA Aeronautics





National Aeronautics and Space Administration

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