

NASA Junior Pilot Program

National Aeronautics and
Space Administration



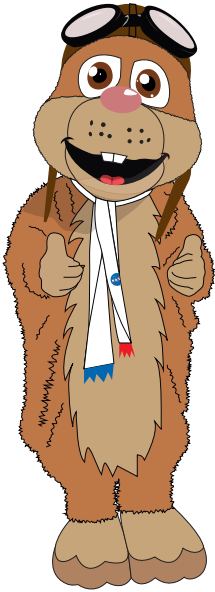
FLIGHT LOG
ENDORSEMENT
CODE
JRPBSA

Elementary Level—Grades K-5



Sustainable Aviation

Orville D. Squirrel



Hi, my name is Orville, and I am a flying squirrel. I can not actually fly, but I can glide from branches high up the trees to the ground. This feels like flying to me.

I was named after one of the inventors of the airplane. My great-great-great-grandfather, Samuel, was lucky enough to see Orville Wright and his brother, Wilbur, become the first people to make and fly an airplane. Samuel fell in love with airplanes and enjoyed watching them get better and better throughout his life. Like Samuel, I love airplanes.

I live in a forest in Virginia, near one of the places where NASA works on airplanes. I have lots of friends who work for NASA. They like to tell me how they make airplanes safer, faster, and quieter. They are also working on "Sustainable aviation" which means making airplanes better for the forests and other places. I love this because it helps protect where I live!

Activity 1:
Decode the
secret
message

Use the key below to decode the secret message.

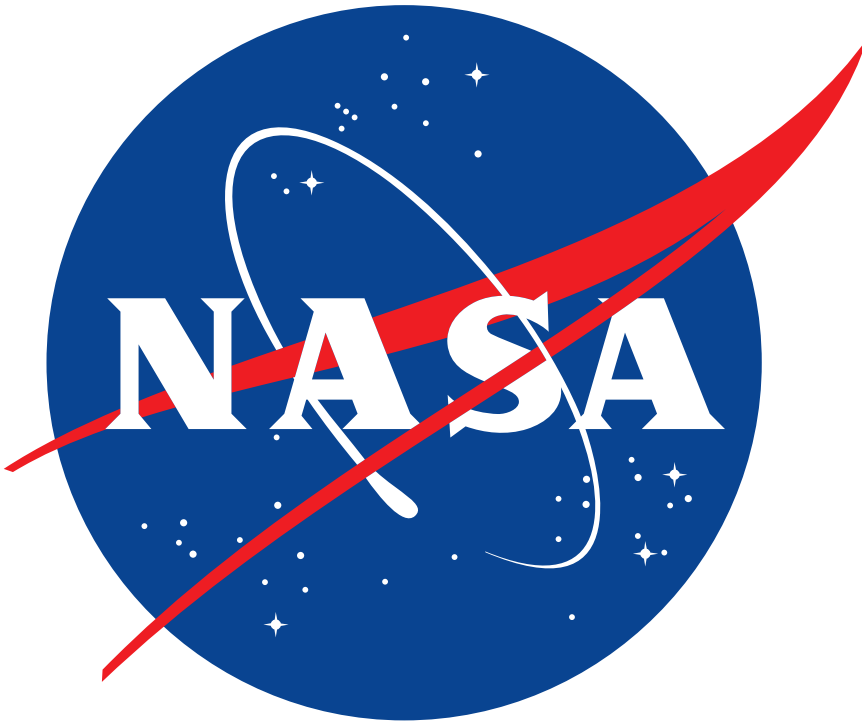
19 21 19 20 1 9 14 1 2 12 5
1 22 9 1 20 9 15 14

KEY

1	2	3	4	5	6	7	8	9	10	11	12	13
A	B	C	D	E	F	G	H	I	J	K	L	M
14	15	16	17	18	19	20	21	22	23	24	25	26
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

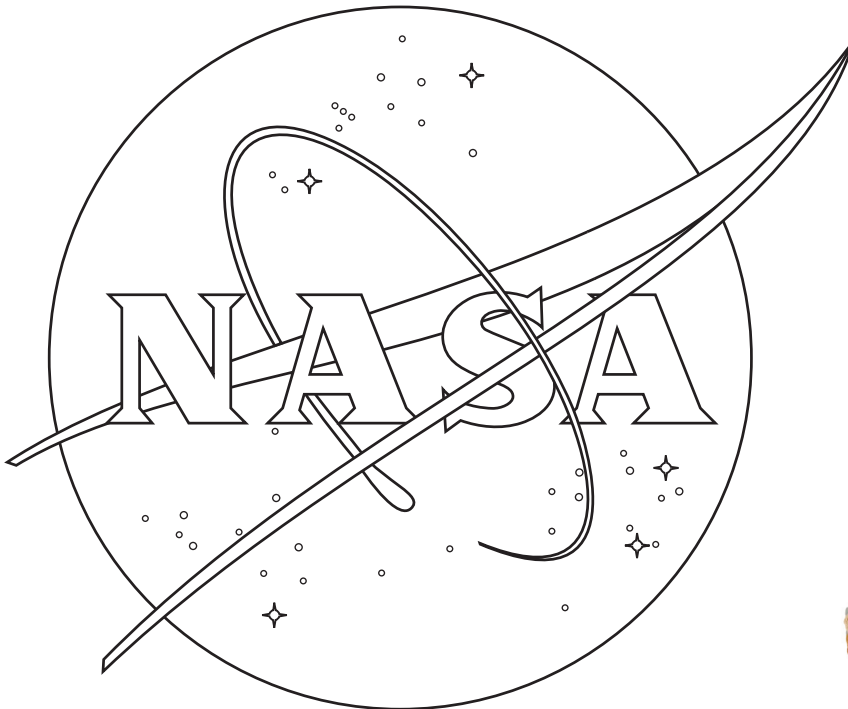
NASA

NASA is part of the United States Government. People who work for NASA work on aeronautics (airplanes and other aircraft) and space exploration. Lots of different people work for NASA doing many different jobs.



NASA's logo is red, white and blue. Do you think it would look cool with other colors? Pick the colors you like and color the logo below to see how it looks!

Activity 2:
Recolor our
logo

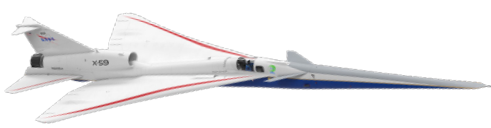


NASA Makes Lots of Airplanes!

Activity 3:
Identify the shadow

NASA has been making airplanes for over 75 years! They have made planes with lots of different shapes and sizes. NASA makes planes to try new things. This will make flight even better!

Below there are 4 different planes that NASA has worked on. There are also shadows that the planes make when they fly. Try to figure out which shadow is made by which plane. Draw a line from each plane to the shadow it makes.



The X-66

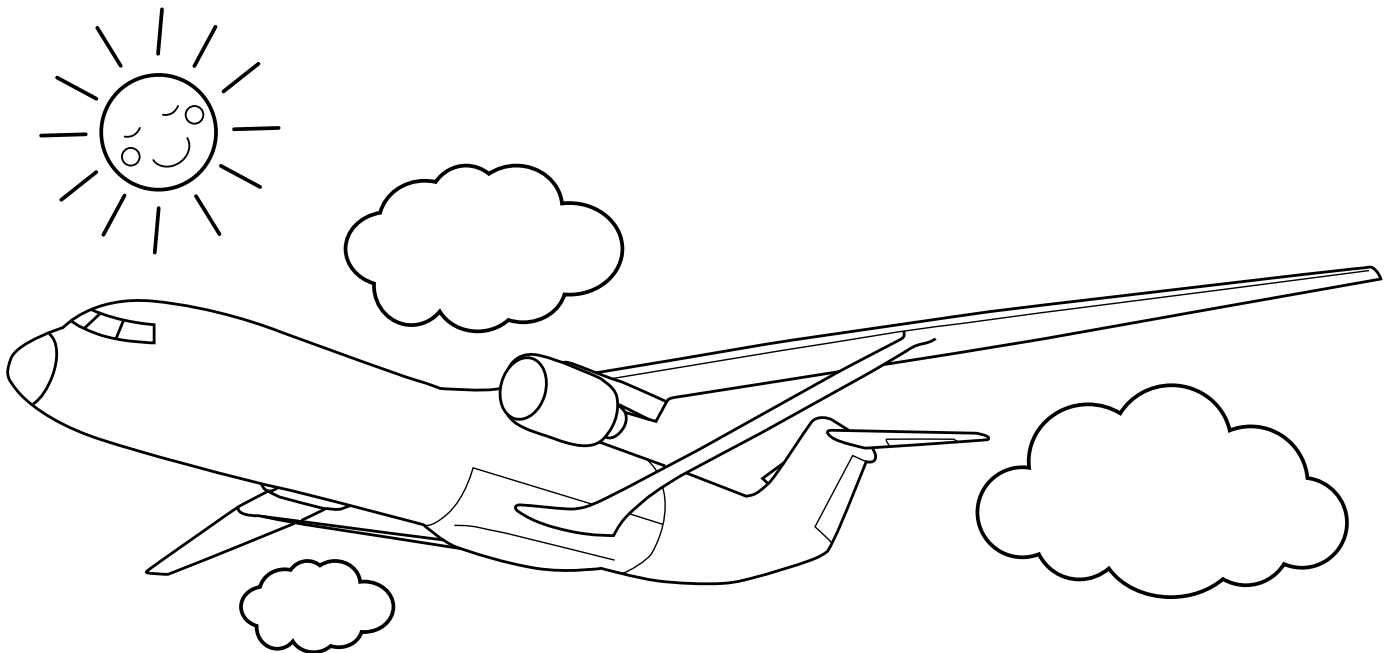
Activity 4:
Color your
own X-66

The Transonic Truss-Braced Wing is a cool new idea for a future airliner.

This airplane is designed to use less gas, which is good for our environment.

The airplane was designed by NASA and Boeing engineers.

How do you think the X-66 should be painted?
Color the picture below to show your design!



Pilots need to see very well to be able to fly planes. How is your eyesight? Look closely at the two pictures of the X-57 below. The X-57 was an airplane NASA worked on that used electricity instead of fuel. The pictures look the same, but there are 5 differences between the pictures. Can you find all 5 of them? Circle the differences.

Activity 5:
Spot the
differences



Source of Power

Activity 6:
Identify which
use batteries

Airplanes need power to be able to fly. Most airplanes get this power by burning fuel, which can hurt the environment. That is why NASA is exploring ways to use electricity for some parts of airplanes! Some aircraft will only use electricity to fly. Others will use both fuel-burning engines and electricity. Some cars, called hybrids, do that now. Using some electricity will save fuel when planes fly.

Lots of other things also get electricity from batteries. Look at the items below. Circle the 5 items that get power from batteries.

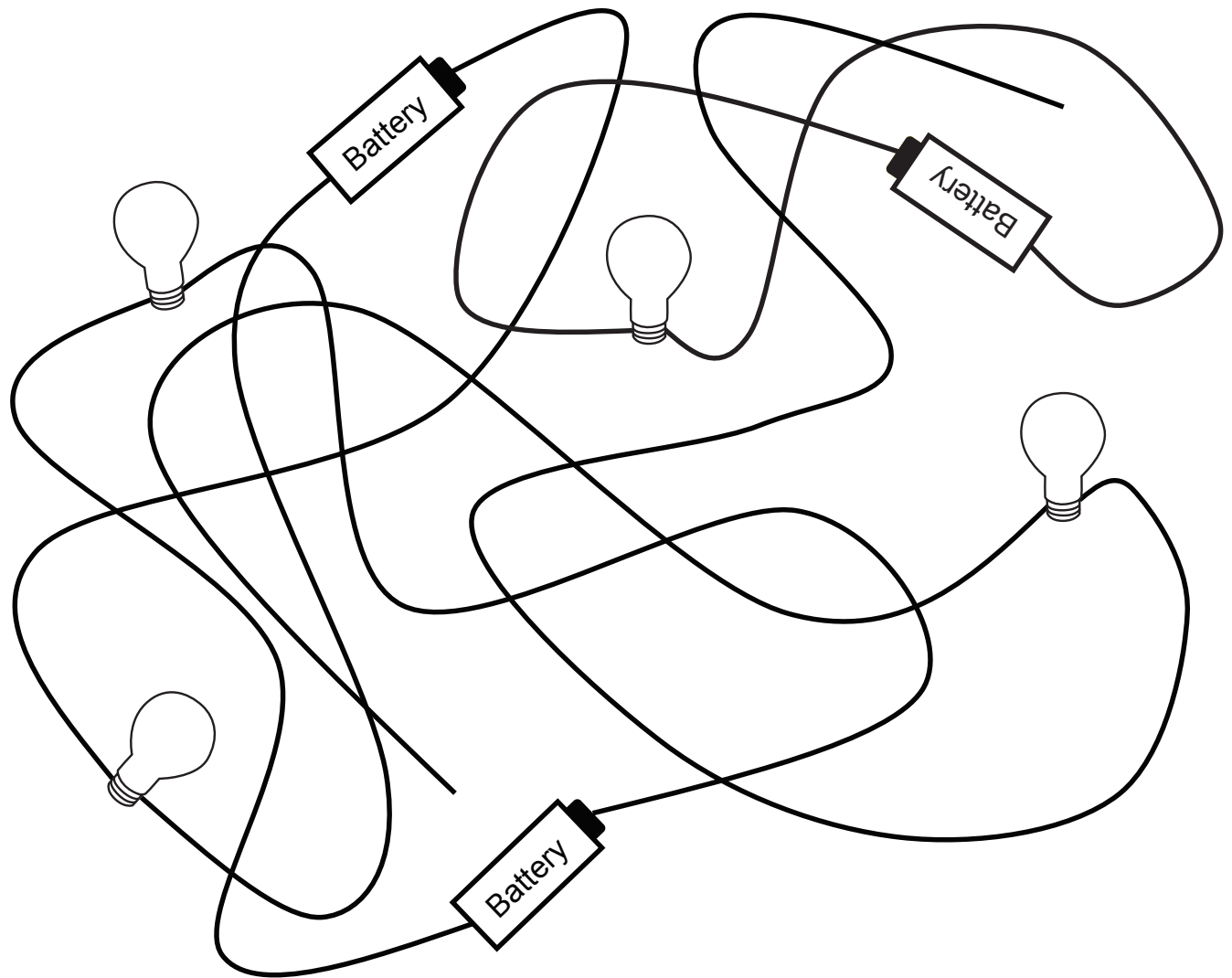


Which light won't light up?

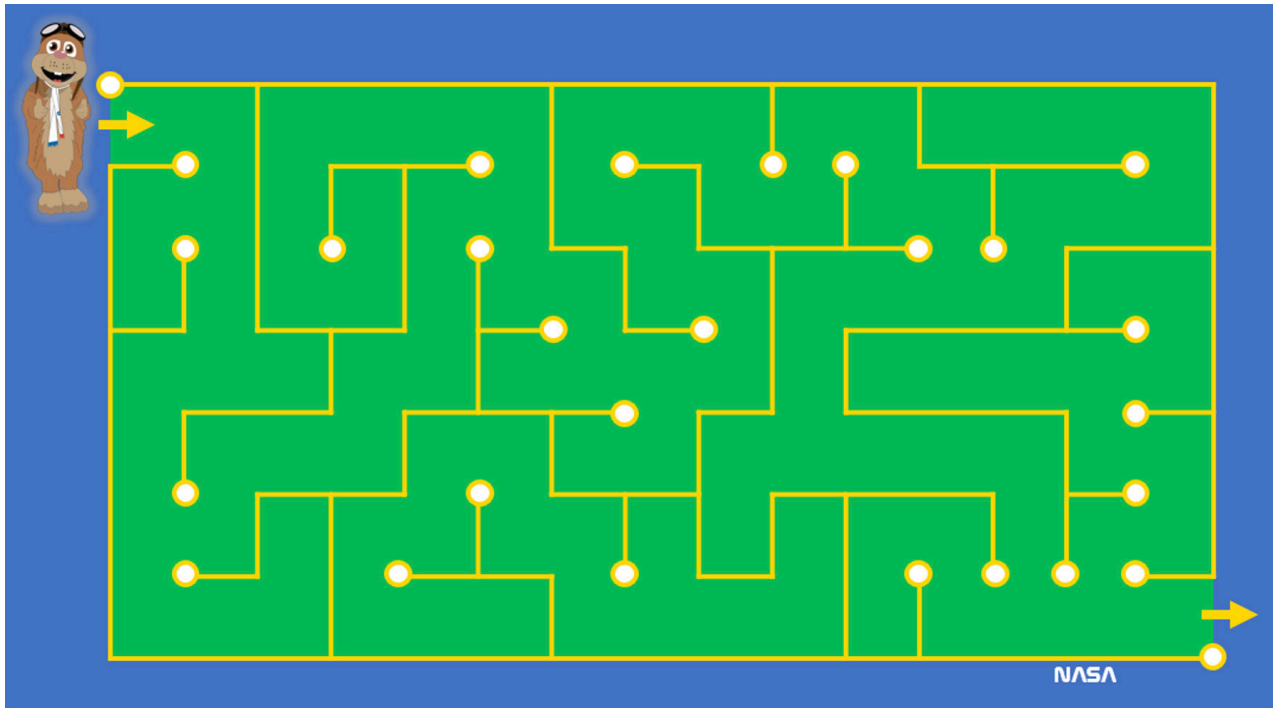
For a light bulb to light up, it needs electricity. It gets electricity when the battery is connected to the bulb. The bulb can be connected with wires or anything else that lets electricity travel through it to complete a circuit.

Below, there are 3 batteries and 4 light bulbs. Follow the wires to see which light bulb is NOT connected to a battery, meaning it won't light up. Circle the bulb that won't light up!

Activity 7:
Follow the
wires



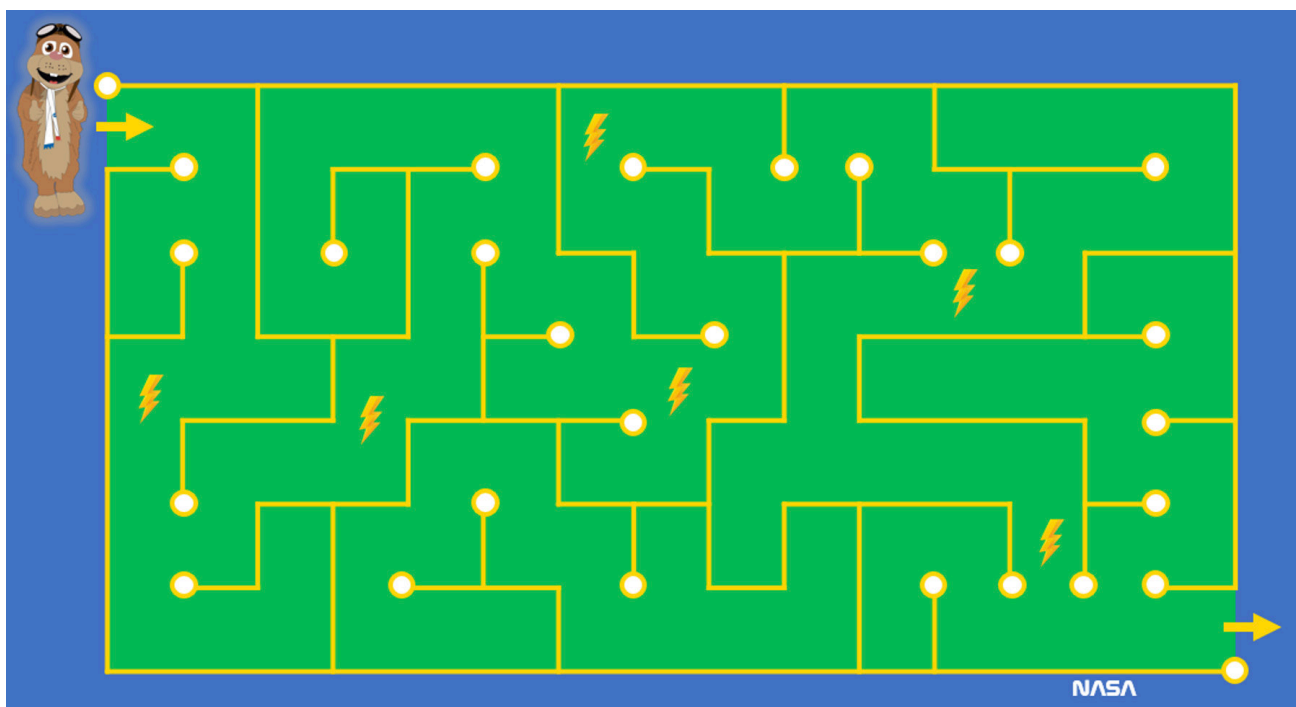
Bonus Challenge: Can you figure out which battery is connected to each light bulb? Draw lines between the batteries and the bulbs they send electricity to. It might be easier if you use different colors for each battery and bulb.



Amazing Electricity

Circuit boards are used in many electronic devices including X-planes. Help Orville find his way through the maze shown above. If the maze is too hard for you, try the maze shown below instead. This version of the maze has lightning bolts to help Orville through the maze. He needs to pass through each lightning bolt.

Activity 8:
Circuit board
maze



Math is Important!

Math can be used to help make art. Look at the math problems in each square below. Some are correct and others are wrong! If the addition problem is correct, color the square black. If the subtraction problem is correct, color the square yellow. If the problem is wrong, do not color that square in. What do you see?

Activity 9:
Do the math

$3+6=10$	$10-5=3$	$6+3=10$	$8-4=5$	$6+6=13$	$9+2=11$	$8-6=5$	$5-4=2$	$1+1=3$	$6+5=12$	$3-2=2$
$8+8=15$	$9-8=2$	$3+6=8$	$5+3=8$	$7+3=10$	$11-3=8$	$9+3=12$	$6+6=12$	$5+6=12$	$9+9=0$	$8-6=6$
$7-2=4$	$12-4=9$	$5+1=6$	$5-3=2$	$6-2=4$	$10-8=2$	$8-5=3$	$8-7=1$	$9+5=14$	$3+8=10$	$12-2=9$
$4-2=4$	$6+4=10$	$15-8=7$	$2-1=1$	$1-0=1$	$2-2=0$	$6-1=5$	$18-9=9$	$9-5=4$	$7+7=14$	$3-3=6$
$7+2=8$	$2+5=7$	$12-6=6$	$5-2=3$	$13-6=7$	$7-4=3$	$7-7=0$	$16-9=7$	$3-3=0$	$1+6=7$	$10-6=5$
$9-8=0$	$8+5=13$	$14-5=9$	$7-2=5$	$11-9=2$	$9-1=8$	$6-4=2$	$8-6=2$	$6-3=3$	$3+6=9$	$6-3=4$
$11-8=4$	$1+9=10$	$14-8=6$	$10-7=3$	$7-3=4$	$17-8=9$	$10-6=4$	$4-2=2$	$10-9=1$	$3+9=12$	$8-8=1$
$15-0=0$	$7+0=7$	$6-4=2$	$15-6=9$	$9-0=9$	$10-8=2$	$14-9=5$	$10-7=3$	$5-2=3$	$3+7=10$	$3+7=11$
$3-2=0$	$6-2=2$	$4+6=10$	$9-4=5$	$11-3=8$	$9-4=5$	$10-3=7$	$7-2=5$	$6+7=13$	$0-0=1$	$2+7=10$
$11-9=1$	$13-7=2$	$8+2=11$	$3+2=5$	$7-3=4$	$15-9=6$	$12-7=5$	$1+8=9$	$6-4=1$	$3-2=2$	$3+8=12$
$4-1=2$	$18-7=9$	$6+6=11$	$4+4=8$	$5-2=3$	$14-7=7$	$12-8=4$	$0+8=8$	$1-1=1$	$11-8=8$	$1+8=10$
$6-2=8$	$16-8=7$	$2+7=6$	$3+7=11$	$6+2=8$	$8-5=3$	$4+7=11$	$8+8=14$	$7+7=0$	$5-6=1$	$3+5=7$
$8-2=5$	$17-9=7$	$5+5=9$	$1+11=6$	$3+3=6$	$6+9=15$	$7+2=9$	$6+4=11$	$2-1=0$	$7-3=10$	$0+12=8$
$10-8=4$	$6+8=15$	$4+7=13$	$3+9=13$	$4+4=8$	$8+2=10$	$5+6=11$	$14+7=7$	$8-0=3$	$9-2=8$	$7+9=17$
$13-8=2$	$0-5=5$	$8-7=10$	$5-0=0$	$4+5=9$	$0+7=7$	$2+8=10$	$8+1=10$	$4+2=7$	$8-3=6$	$8+8=14$
$6-2=5$	$4-1=4$	$3-6=3$	$17-9=9$	$5+6=12$	$3+9=12$	$0+8=10$	$9-6=4$	$7-7=1$	$9-5=2$	$6+4=4$



Math is an important tool for NASA's engineers!!!

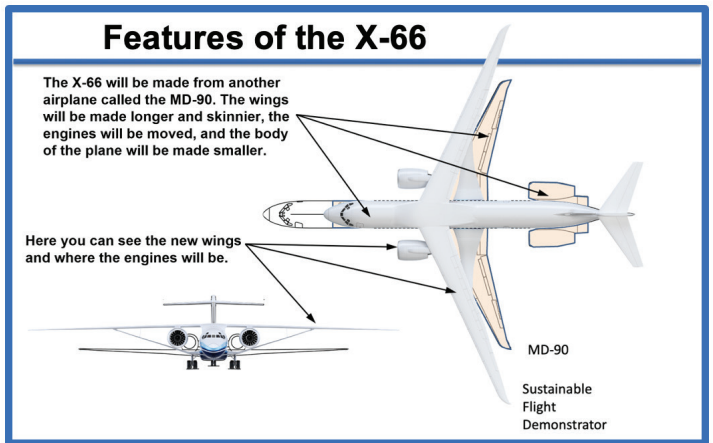


How will the X-66 save fuel?

NASA has been working on airplanes for more than 100 years. In that time, they have learned lots of ways to make airplanes better.

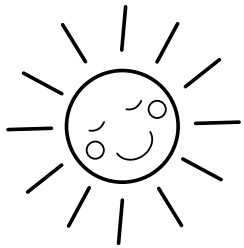
The X-66 will use a lot of different ideas that NASA has learned to make it use less fuel while flying. The wings are longer and skinnier than other airplanes. Also, the X-66 will have engines that use a new kind of fuel.

All these things together will make the X-66 one of the most environmentally friendly passenger airplanes ever made!



Activity 10:
X-66 over
your town

Pretend the X-66 is flying over where you live. Below, draw your town including any trees, plants, buildings, or whatever else is near you. Do not forget to add yourself to the picture!








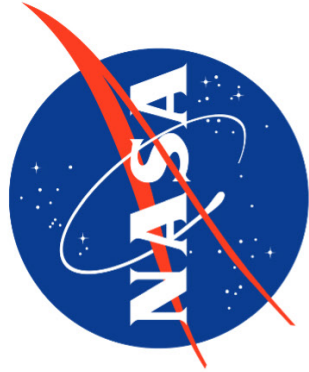
More to Do and Learn!

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

- X-59 Junior Pilot: <https://www.nasa.gov/stem-content/nasas-junior-pilot-program-x-59/>
- Aeronautics @ Home: Lots of fun activities! <https://www.nasa.gov/directorates/armd/aeronautics-home/>
- All About NASA's Sustainable Aviation Program: <https://www.nasa.gov/directorates/armd/sustainable-aviation/>

Answers

<p>Activity 3: Identify the Shadow</p> 	<p>Activity 7: Follow the Wires</p> 	<p>Activity 9: Do the Math</p> 																																																							
<p>Activity 1: Decode the Secret Message</p> <table border="0"><tr><td>S</td><td>U</td><td>S</td><td>T</td><td>A</td><td>I</td><td>N</td><td>A</td><td>B</td><td>L</td><td>E</td></tr><tr><td>19</td><td>21</td><td>19</td><td>20</td><td>1</td><td>9</td><td>14</td><td>1</td><td>2</td><td>12</td><td>5</td></tr><tr><td colspan="11"> </td></tr><tr><td>A</td><td>V</td><td>I</td><td>A</td><td>T</td><td>I</td><td>O</td><td>N</td><td></td><td></td><td></td></tr><tr><td>1</td><td>22</td><td>9</td><td>1</td><td>20</td><td>9</td><td>15</td><td>14</td><td></td><td></td><td></td></tr></table>	S	U	S	T	A	I	N	A	B	L	E	19	21	19	20	1	9	14	1	2	12	5												A	V	I	A	T	I	O	N				1	22	9	1	20	9	15	14				<p>Activity 5: Spot the Differences</p> 	<p>Activity 8: Circuit Board Maze</p> 
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Certificate of Completion

is hereby granted to

To certify that they completed to satisfaction

NASA's Junior Pilot: Sustainable Aviation

Date: _____

Orville D. Squirrel

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National Aeronautics and Space Administration

X-66



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