

Up and away

Grades 3-5 | Activity Option 2 | ⌚ 50 minutes

Kids will create two paper airplanes and test out how they fly, depending on different variables.

Preparation:

Print out the provided templates and practice making the paper airplanes to use as examples. Have pennies or paper clips ready.

Step 1 (5 minutes)

Introduce the fun activity students will get to do today.

Step 2 (10 minutes)

Have a conversation with the students about flying and airplanes. You may find it helpful to write out any of the included vocab words (paying special attention to the **blue** vocab) or draw the model, below. To help guide the students, ask:

- What are some important parts of a plane?
 - **Nose** - front of the plane, helps with side-to-side movement (**yaw**)
 - **Wings** - helps the plane to fly up into the air (**lift**) and maintain balance
 - **Engine** - pushes the plane forward through the air (**thrust**)
 - **Tail** - back of the plane, helps the plane to fly straight

Materials



Pencils/pens



Tape



Paper clips or pennies



Paper plane instructions and templates

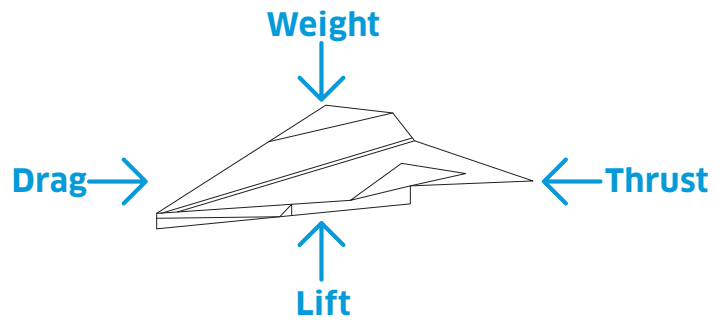


Student handout



Yard stick or measuring tape

- What are some things that you think impact how far planes can fly?
 - **Weight** - pulls the plane toward earth; heavier planes have to generate more lift to overcome their weight
 - **Design** - a more aerodynamic plane experiences less resistance (**drag**) as it moves through the air and wing design impacts the amount of lift
 - **Speed** - a plane must go fast enough to overcome drag



Step 3 (15 minutes)

Tell the students that they will now make two identical paper planes to test. They will then use a variable (penny or paper clip) when testing change in flight.

Hold up the two models you made to help them make their planes. Students should agree on one design that they believe will stay in the air the longest and fly the farthest. They will make two identical planes to test as Alpha and Bravo.

- *As an option, you can forgo the included templates and have students design their own planes.*

Each student should receive:

- One **student handout**
- A copy of the instructions and templates of their choosing (or paper to make their own models)
- One variable material (paper clip or penny)

Each student will construct two planes of the same design. Designate one plane as “Alpha.” The other plane, “Bravo,” will include the placement of a variable weight (penny or paper clip).

- Have the students construct their planes and have them color/label their planes so that they will be able to identify their models.
- Ask the students to think about where they will place their paper clip/penny.
 - Help attach or tape the variable to their Bravo plane.

Step 4 (15 minutes)

A) Now each student will fly their Alpha plane twice.

1. Have the student get their Alpha plane ready to test.
 - Remind the students that their Alpha plane has no variable (paper clips/penny) attached.
 - Students should be ready to record both the distance and time of flight on the **student handout**.
2. Have the student flying the plane stand in front of the room, facing one direction. All other people should move out of the “flight path.”

3. Ask them to ready their Alpha plane for flight.
4. Count to three and let the student take flight.
5. Use a stopwatch/watch or count the seconds out loud until all planes have landed.
6. Using a yard stick or a measuring tape, have the student record the distance that their planes flew and the number of seconds it remained in flight on their **student handout**.
7. Follow the same process for a second flight of the Alpha planes (2 total attempts).
 - Ask the student to try something different the second time and to predict if they believe it will increase or decrease their distance (i.e. have the student change the height they hold their hand, etc.).

B) Repeat the steps above using the Bravo plane they created.

1. Remind the students their Bravo planes have variables (paper clips or pennies) that will affect the flight of their plane.
2. The students should fly their Bravo plane twice and record the time and distance on their **student handout**.

Now that students have completed the Flight Log section, have students answer Question A on the **student handout** comparing the best Alpha and Bravo flights.

Step 5 (5 minutes)

- Invite the students to share what they think helped their planes fly (air, wind, gravity, etc.).
- Did a certain plane design do better than others?
- Why did certain variables impact the time or distance of the plane flight?
 - *How hard you threw the airplane impacted the thrust, or ability to push the plane forward.*
 - *Adding pennies or paper clips increased the weight and the planes fell toward the Earth.*
 - *Putting the weight in different locations changed the stability and balance of the plane, making the plane pitch upward or downward and changing the center of gravity.*
- Go over the **vocab** terms again:
 - **Yaw** – side to side movement
 - **Lift** – the force that opposes the weight of an airplane
 - **Thrust** – force that causes the push for the plane
 - **Drag** – resistance caused by friction and difference in air pressure
- Thank the students for a GREAT job!
- Let them know how much you learned and enjoyed being with them.

Student handout

Record action from step 4

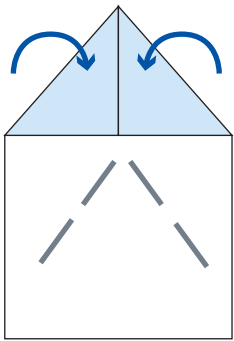
List the names of your flight team:

FLIGHT LOG
You have 2 attempts per plane.
After each flight, record your results below and calculate your speed.

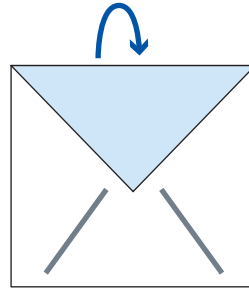
Flight number	Flight name	Distance (to the nearest foot)	Time (to the nearest second)	Speed (s = d/t)
1	Alpha	ft	sec	
2	Alpha	ft	sec	
1	Bravo	ft	sec	
2	Bravo	ft	sec	

QA: What factors do you think caused one plane to travel faster or longer than the other plane?

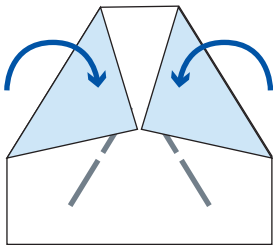
Glider instructions - plane 1



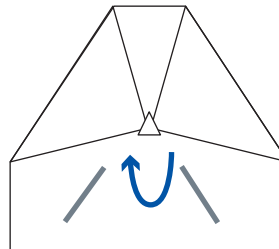
1. Fold the top left and top right corners toward the middle along fold line 1



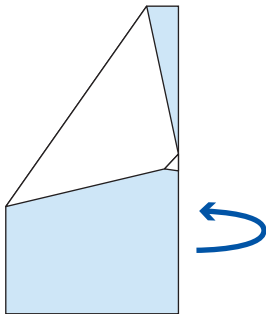
2. Fold the top point down toward you on fold line 2



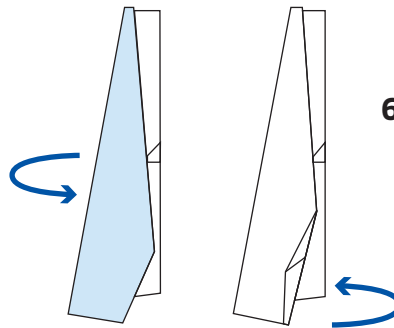
3. Fold the top left and top right corners down along fold line 3



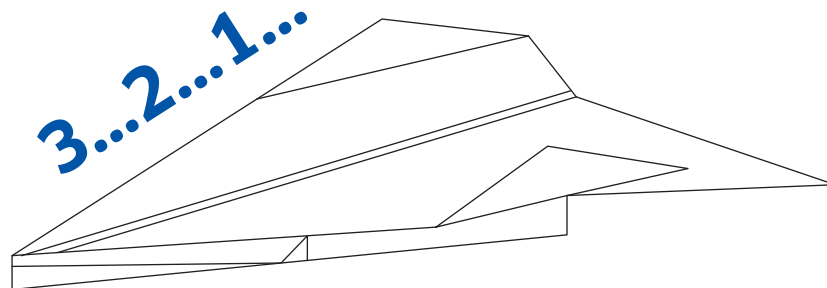
4. Fold up the small triangle along line 4 to secure the step 3 folds in place



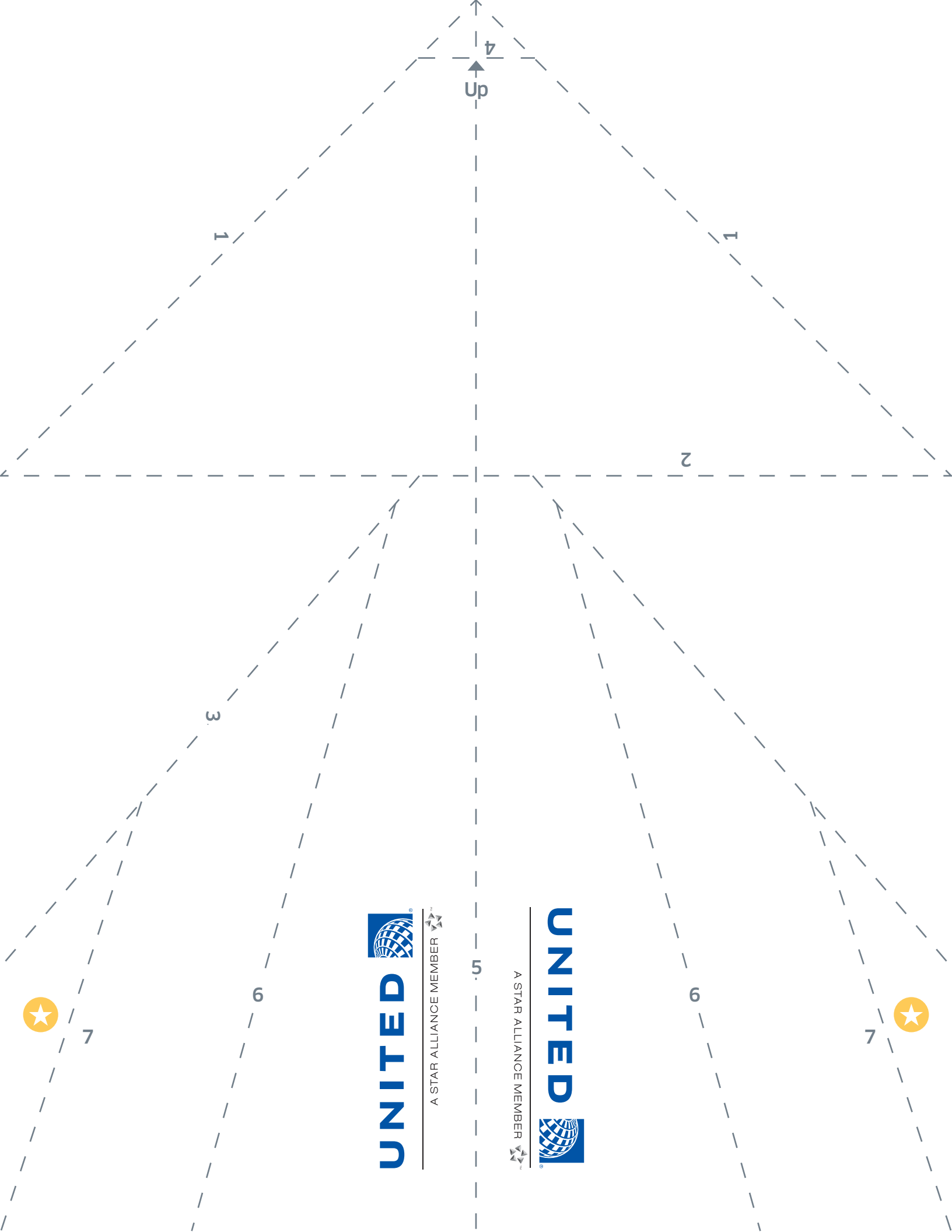
5. Flip the plane over and fold the right side over onto the left along fold line 5



6. Fold the wings down along fold line 6 and the winglets up along fold lines 7



Let's fly!



Up

1

1

2

3

5

9

9

7

7



UNITED

A STAR ALLIANCE MEMBER

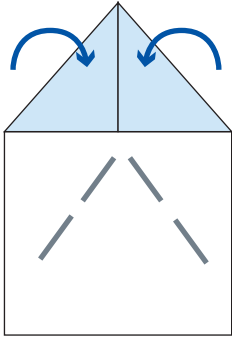
UNITED



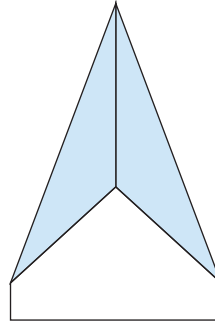
A STAR ALLIANCE MEMBER



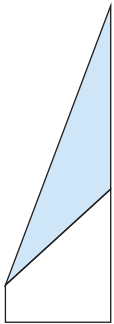
Glider instructions - plane 2



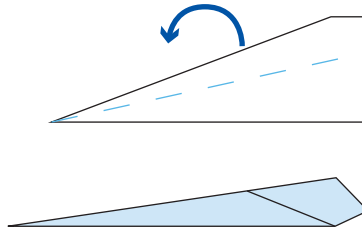
1. Fold the top left and top right corners toward the middle along fold line 1



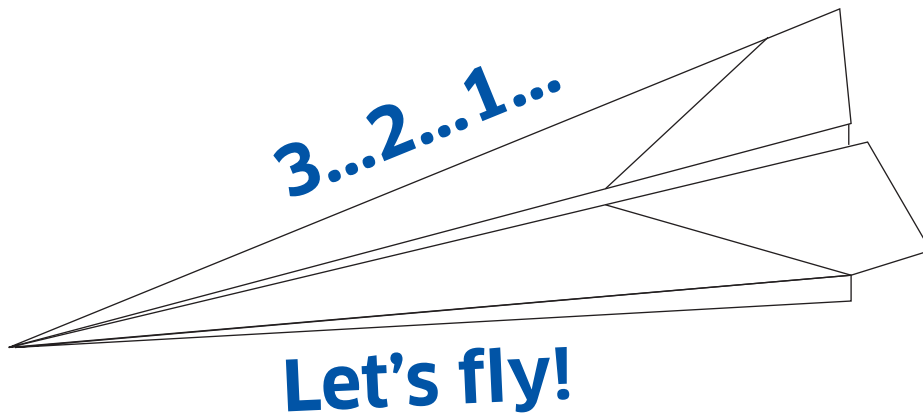
2. Fold the left and the right corners toward the middle fold line 2

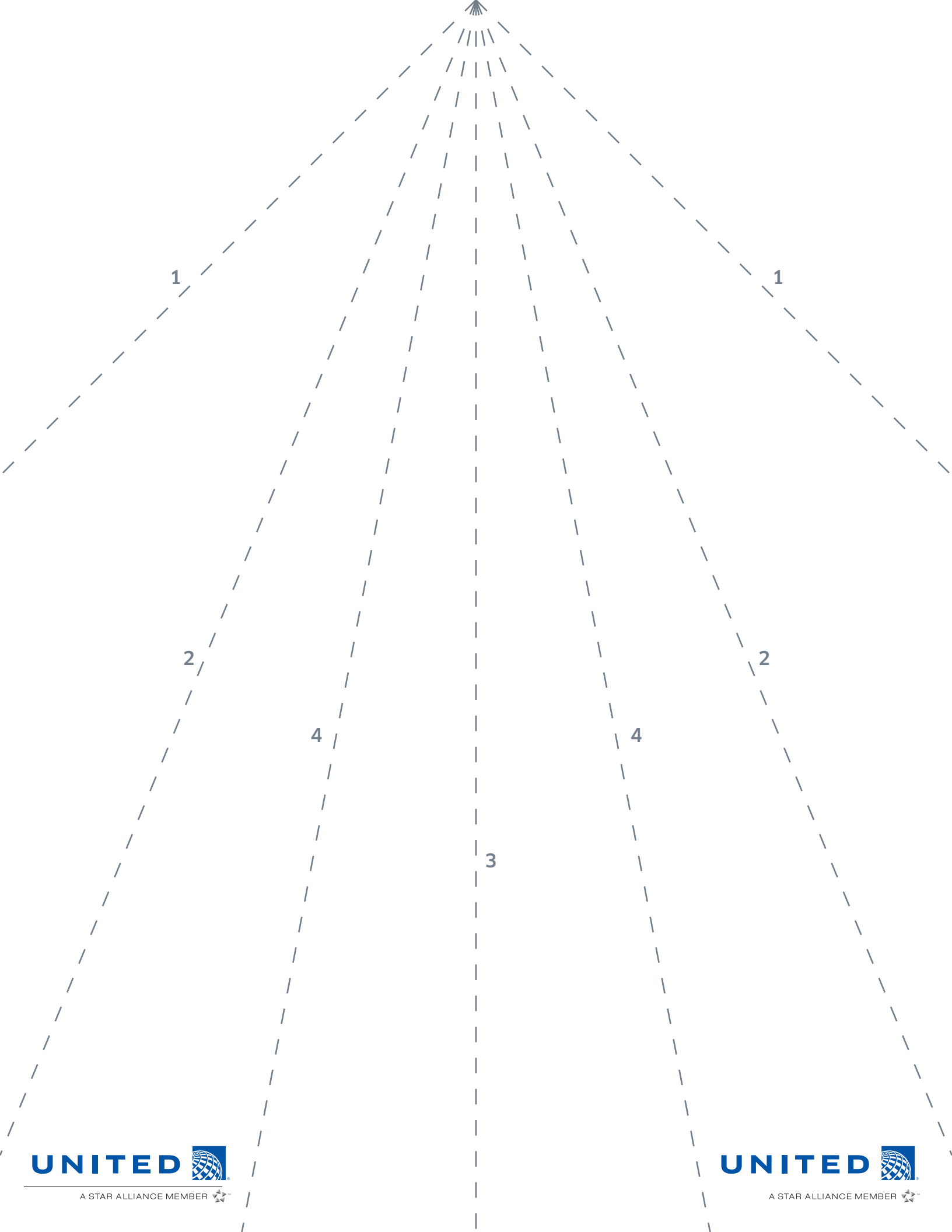


3. Fold the right half over the left half along folding line 3



4. Looking at the airplane from the side, fold down to the bottom along line 4





1

1

2

2

4

4

3