

Glider Competition

Spring 2024

Rules and Design Requirements



Introduction

The glider competition is a local event that is sponsored and led by the American Institute of Aeronautics and Astronautics (AIAA) Central Florida Section. Originally created by Louis Turek with the Orlando Youth Aviation Center (OYAC), the glider competition is designed to give students the opportunity to utilize their knowledge of aircraft design and performance and to learn even more by designing, testing, and building gliders and competing against other local teams of students. The rules and design requirements for the competition are as follows:

Rules and Restrictions

1. Teams must design and build a glider from scratch. No kit-built gliders or parts from any kind of aircraft or rocket kit are allowed. Other than supplies and parts from a kit, or potentially dangerous materials (see rule #2) there is no restriction on the materials used in building the gliders.
2. Do not use metal (including coins), glass, spikes, rocks, gravel, or any other hard material to construct the glider. The intent of this rule is to prevent any injuries should the glider come apart or hit a person. Use of these materials will automatically disqualify the team from the competition. The Head Judge will make the final decision as to whether the materials are not allowed.

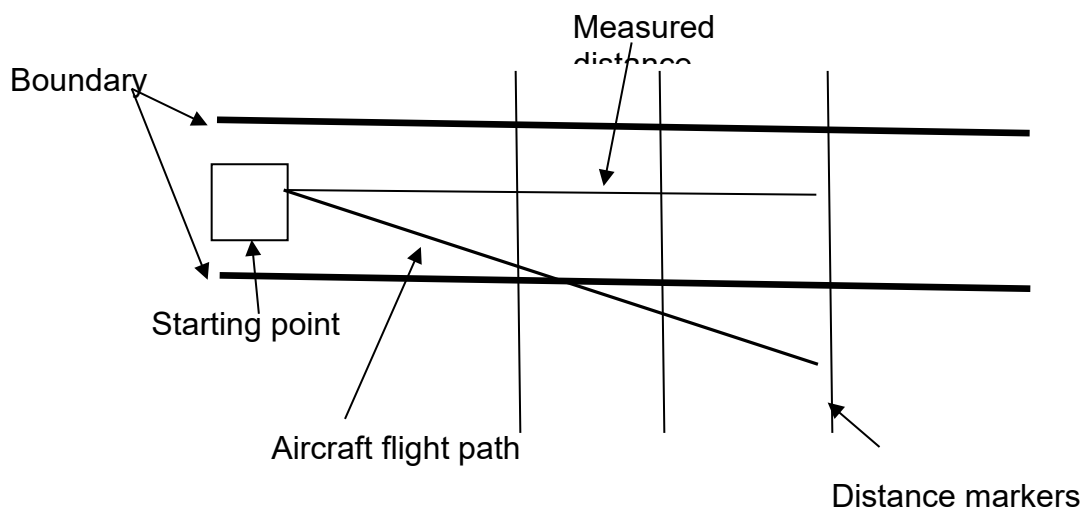
3. Only one glider per team is allowed. Each team will consist of 3 students. At least one student per team must be present on competition day to compete.
4. The payload for the gliders will consist of marbles that will be supplied by the competition coordinators on the day of the competition. The marbles will be 0.56 inches in diameter and have an approximate mass of 3.8 g (0.134 ounces) each. These are ordinary craft marbles that can be bought at any craft store.
5. The glider must carry approximately 16 marbles, which will have a total mass of 2 ounces.
6. The marbles must be kept in a single location in the glider.
7. On the day of the competition, the marbles supplied by the competition coordinators will be sealed in a sandwich bag. The marbles are required to be kept in this sandwich bag to ensure that they do not spill out if the glider is damaged.
8. The gliders will be hand launched with no power assist (springs, bungee cords, etc.) or any other device by a team member in an indoor facility to be designated by the competition coordinators. The team member must have their feet planted in a box approximately 18 inches by 18 inches square when launching the glider. If the person's foot is outside the box upon throwing the glider, the flight will have to be redone.
9. No radio control of the gliders is allowed.
10. No glider may have a total weight (including the marbles) more than 12 ounces (340 grams), nor may it have a total weight less than 8 ounces (227 grams). Aircraft with a total weight less than 8 ounces or greater than 12 ounces will not be eligible to compete. Again, the 8 and 12 ounce weight limits include the 2 ounces of marbles.
11. The glider must have a minimum wingspan of 2 feet (24 inches). This will be measured from wingtip to wingtip with a tape measure.
12. The glider body must be no more than 4 inches wide and no more than 4 inches high. This is for the body only and does not include the wingspan or the tail surfaces. There is no restriction on the overall length of the glider.
13. The glider body may not consist of folded paper (no large paper airplanes are allowed).
14. Ballistic entries are not allowed. In other words, you cannot toss it like a shot put.
15. Points will be earned by the distance that the glider travels. One point will be awarded for every foot of gliding distance.
16. Each team will be given a total of 4 flight attempts. The team's total score for the competition will be the sum of the scores of all flight attempts.
17. The distance glided will be measured using the nose of the aircraft, regardless of what position the aircraft is in upon landing.
18. Any flight that results in the aircraft breaking into multiple pieces will be reduced by 25%. Hence, if the glider travels 40 feet but any piece breaks off upon landing, the distance will be scored as 30 feet. This includes the marbles, which must remain inside the glider during the impact of landing for that flight to count. The only exception is if the aircraft travels the entire length of the facility being used (likely an indoor atrium) and hits the wall at the far end of the

facility. If impact with the wall causes the aircraft to break into multiple pieces, that flight will still count with no penalty.

19. No wheels are allowed on the glider. It must slide to a halt on the ground, not roll to a stop.

20. The distance glided by the aircraft will be measured in a straight line from the starting point using distance markers on the ground, as shown below. The measured distance will be determined only by the distance from the starting point perpendicular to the distance markers. In other words, even though the aircraft may travel the distance shown by the solid line below, the measured distance will be that of the dashed line. It is up to the teams to design and develop an aircraft that is directionally stable.

21. The competition coordinators will set up a boundary (shown by the very thick lines below) which are guaranteed to be clear of obstacles and people. If an aircraft strays outside of this boundary it may hit a wall or support column and suffer damage. As mentioned above, if any pieces break off from the glider its flight will be reduced by 25%. If the glider does not suffer damage outside of the boundary, there is no penalty. The boundary is set up to define the region in which the glider is guaranteed to not be in danger of hitting a wall or other structure. It will be approximately 10 feet wide and again it is up to the teams to build a glider that can fly straight and thus not stray outside of this safe zone.



Essential Things to Consider when Building a Glider

Balance: The absolute most important thing that an aircraft needs in order to fly is to be properly balanced. The best way to test the glider's balance is to place your finger underneath the body of the glider about half way back between the front edge and back edge of the wing. The glider should be at least close to balancing on your finger. The absolute most common problem that prevents gliders from gliding well is that the tail is too heavy. This means that when you place your finger under the middle of the wing as described above, the tail will tend to drop. This means that it is essential to design a tail that is lightweight. If the tail is too heavy, the glider has no chance of flying properly.

A properly shaped wing: A wing that is block shaped (like a rectangular block of styrofoam) or consists simply of a flat surface (like a piece of poster board) will never work efficiently. The wing should have a rounded leading edge and then taper to be much thinner at the back edge. If you search for images of an "airfoil", this will illustrate the concept. A good airfoil for a glider looks like an elongated drop of water.

Properly sized tail surfaces: The whole reason for a tail on an aircraft is to stabilize that aircraft. In order to do this, the tail surfaces must be big enough to be able to do their job. A good rule of thumb is that the horizontal tail should be about one fifth the size of the wing area while the vertical tail should be about one tenth the size of the wing area. These are the minimum values of the tail surface areas. They can and perhaps should be bigger than these minimum values.