2019-20 Design, Build, Fly Q&A #1

**Batteries**

1. Can the LiPo battery be used to power motors as well as receiver and servos, through using a battery eliminator circuit?

   Answer: No, the propulsion battery must be separate from the receiver battery, regardless of battery type used.

2. Can we use different-sized batteries for different flight missions?

   Answer: Yes as allowed in the rules and all batteries must be approved during tech inspection.

3. Will the 200 Whr limit be determined by the mAh and voltage displayed on the pack?

   Answer: Yes, the watt hour value is determined by the mAH and voltage rating on the battery pack (WH = mAH x voltage / 1000)

**Banners**

4. What can be considered part of the banner vs part of the deployment, towing, release mechanism? For example, if an unspooling mechanism similar to a toilet paper roll is used, can that be released from the aircraft at the end of mission 3 or must that part stay on the aircraft?

   Is the towline considered a part of the banner for purposes of releasing it? In other words, when the banner is released, can the towline be released also?

   Answer: Components used to help deploy the banner (like the toilet paper roll example above) and tow line may be released with the banner at the end of M3. The actual mechanism that retains the banner in flight and releases the action to deploy the banner must stay on the aircraft and must be on the airplane for all missions.

5. Can we construct a nacelle to carry the banner in that is external from the main aircraft body or must the banner be mounted in the free stream air flow?

   Can the banner be attached externally in a recessed portion of the plane?

   Page 9 also states that "the banner must be compactly stowed externally to the aircraft for take-off." Does this mean that we cannot, for example, stow the banner within a compartment in the tail of the aircraft and deploy it by opening a hatch? Does it preclude us from having an aerodynamic fairing over the stowed banner?

   Can the banner be stowed in a tube that is external to the aircraft?

   Answer: The banner must be mounted in the freestream airflow.

6. How is aspect ratio defined for a banner? For example, can a pennant shape be used if it satisfies the aspect ratio defined for aircraft of [length]^2 / [area]? Or does the banner have to be rectangular in shape?
Answer: The banner must be rectangular.

7. Is a banner allowed that uses a mesh with attached letters similar to the picture below if the mesh (not letters) satisfies the aspect ratio requirement? Or does the banner have to be a solid, continuous surface?

Answer: The banner must be made of solid material, not a mesh.

8. During research, we have found many banners use small streamers and/or small parachutes at the rear of the banner that help keep the banner taught during flight. Do these streamers/drag chutes count towards the length of the banner or only the solid continuous surface?

Answer: Stabilization chutes, weights, etc are not part of the banner dimensions.

9. How does "The banner must remain in vertical orientation during flight" get enforced? For example, if the front of the banner is vertical, but the rear whips around a lot, does that violate the rule?

Page 9 of the rules states that "the banner must remain in the vertical orientation during flight." Does "vertical" in this rule refer to the reference frame of the aircraft or the ground?

Answer: The Flight Director has sole discretion to determine if orientation requirements are met in flight. Generally speaking, portions of banner that are “flapping” or otherwise instantaneously moving in the wind stream are acceptable. The banner does not have to remain vertical during turns, only during level flight.

10. Does the logo on the banner have to be semi-readable from the ground observer?

Answer: No.

11. For tech inspecting multiple banners, do the banners all have to be the same length or can we tech multiple size banners to try during competition?

Answer: The banners can be different sizes. This rule is to allow teams to select a banner based on weather conditions, airplane performance and to improve a previous M3 score.

12. Can flag be made of multiple materials? If there is a section at the end with higher drag, is this considered part of the flag and accounted for in the aspect ratio 5:1?
Answer: The banner can be made of multiple materials as long as it is flat and solid and within the required dimensions and aspect ratio.

13. Can the "banner" be multiple banners or one singular banner?
Answer: Only one banner at a time can be flown during M3. Multiple banners are allowed at the competition to allow the teams to select a banner for each M3 attempt depending on weather, desired score, etc.

14. When we put on a banner and everything that it comes with in the M3 and GM, is it ok if something stays on the plane after the release?
Answer: Yes, but anything that stays on the airplane after released must be present for all missions.

15. Will the total length still be the length of one banner if we fly more banners parallel?
Answer: Only one banner can be flown during a mission.

16. Banner attachment: Is it possible to fold the banner before the ground mission or does it have to be folded during the mission?
Answer: The banner must be folded during the ground mission time and it must also be folded during the five minute staging box time for M3.

17. Are Sponsors allowed to be on the Banner?
Answer: Yes – and don’t forget the main sponsors: AIAA, Textron and Raytheon!!

18. Is it allowed to modify the banner’s structure for aerodynamic purposes, e.g. performing some cuts at the end of the banner?
Answer: No, the banner cannot be modified within the required rectangular shape of the banner, but features or materials can be added for this purpose.

19. Does the banner deployment mean that banner must be rolled and then it must be remotely unveiled in the midflight?
Answer: Yes, it must be rolled up, folded or other method to stow it external to the airplane for deployment in flight.

20. We are confused about the banner deployment so please guide us. Because in ground mission the banner deployment and release will be tested also, which means we cannot place the banner at the bottom of the fuselage.
Answer: In the ground mission, the crew member will be able to hold the airplane above the ground to demonstration of the banner deployment.

21. Are we allowed to have a servo/receiver/battery on the banner that is installed during the ground mission? If so, would they have to be released along with the banner during flight?
Answer: Batteries of any kind cannot be intentionally released from the airplane.
22. The banner must remain in the vertical orientation during flight. Does this mean that the banner must also be in the vertical orientation while stowed?

Answer: There are no requirements for banner orientation in the stowed condition.

23. Is the banner required to be made of any specific material or can it be a plastic material?

Answer: There are no restrictions on the banner material used other than it must be a solid material.

Mission 2 Payload

24. Is there a minimum number of passengers we must carry? Can a team choose to carry no passengers? If so, would they be able to skip that part of the ground mission?

Answer: The airplane must be designed for all missions and this will be validated during tech inspection. For Mission 2, the minimum number of passengers would be one to meet this requirement.

25. Could we place the passengers and luggage on one plane and load the plane directly in mission 2 or do we need to load the passenger and luggage one by one?

Answer: Passengers and luggage must be loaded individually directly into the airplane without assistance of any devices, fixtures, tools, etc. They cannot be loaded into a fixture and then the fixture loaded into the airplane. The restraint system can be external to the airplane during loading, but must be inside the airplane at the start of the ground mission or mission 2.

26. Does the luggage have to be carried in front of and/or behind the passengers as a collective or can they be carried similar to the personal item spot on airliners with one piece of luggage in front of and/or behind each passenger?

Answer: Can all luggage be in one compartment and all passengers in another or does each piece of luggage have to sit in front of the passenger it belongs to? Are both configurations allowed?
Answer: The passengers must be in one compartment and the luggage must be carried in a separate compartment(s) either in front of and or behind the passenger compartment. Luggage cannot be intermingled within the passengers. In the figure above, the arrangement on the left is not allowed and the arrangement on the right is allowed, along with additional luggage may be stored in a compartment to the right of the passengers as well.

27. Are magnets allowed to be designed into the passengers?
Answer: Magnets are not allowed for passenger restraint.

28. Can we use adhesive to secure passengers?
Answer: No.

29. What qualifies as a harness for the passengers and luggage: Magnets, Velcro?
Answer: Magnets are not allowed. Velcro is allowed to secure a restraint mechanism, but not directly attached to the passenger or luggage.

30. Does the bottom surface of the passenger/luggage box need to be flat? Can it be designed to “click” into the seats?
Answer: The passenger size and shape cannot be altered from the required dimensions in the rules. All restraints will be validated by the tech inspector to assure passengers and luggage are safely restrained.

31. Page 7 states that "The luggage must be carried in front of and/or behind the passengers." Does the luggage have to be on the same horizontal plane as the passengers, or can it be placed under or over the passenger compartment?
Answer: The luggage compartment(s) do not have to be on the same plane as the passenger compartment, but it cannot be below or above the passenger compartment, even partially.

32. What constitutes "behind or in-front of passengers" for the luggage compartment? If our cabin is a U-shape, and the luggage is in the middle of the U, is it still behind the passengers?
Answer: Between the passengers is not in front of or behind.

33. What defines a single compartment for passengers? Do they have to be in specific rows?
Answer: An open compartment with no dividers or bulkheads. The configuration of the passengers within the compartment is up to each team to determine.
34. Could you clarify how the luggage one can be oriented, relative to the passengers and other luggage? Is there anything prohibiting the stacking of luggage?

   Can all of the passengers' luggage touch one another?

Answer: The orientation of the luggage is up to each team to decide and touching of luggage and stacking is allowed.

35. Can the luggage touch passengers?

Answer: No.

36. Is it allowed that the restraining system is not physically touching the passengers?

Answer: The restraint system must restrain the passengers. It is not feasible that a restraint cannot touch the passenger and restrain it.

37. Do we have to bring our own passengers/luggage?

Answer: Yes, teams must bring their own passengers and luggage.

38. Does the luggage restraint structure have to be structurally independent of the passenger restraint structure, or can they be combined, provided the passengers never touch the luggage?

Answer: The restraints could be combined if all rules are satisfied and the tech inspector deems it will restrain both passengers and luggage sufficiently.

39. Can we drill a hole in the passengers for use in a restraint system? To add weight?

Answer: For a restraint system – no; for adding weight – yes.

40. Is there a minimum number of passengers we must carry? Can a team choose to carry no passengers? If so, would they be able to skip that part of the ground mission?

Answer: The airplane must be designed for all missions and this will be validated during tech inspection. For Mission 2, the minimum number of passengers would be one to meet this requirement.

41. In past years passenger restraints were required to resemble real life restraints. Do the restraints this year also have that restriction?

Answer: The restraints for this year do not have to resemble real life restraints.

42. Can the passenger/luggage have additional protruding elements (given that minimum sizing requirements are met)?

Answer: No, the dimensional requirements are strictly enforced.

43. Can we tape down the passengers after installation?

Answer: Tape is not a sufficient restraint mechanism.

44. Do you have any tolerance for the passengers as long as the weight restriction is preserved, or they must get precise dimensions?
Answer: Specific tolerances have not been decided but there will be allowances in tech inspection. Deviations of 1/8 inch are excessive and will not be allowed.

45. Can the fuselage structure or skin be used for passenger or luggage restraint?
Answer: No, there must be separate restraints or restraint system.

**Ground Mission**

46. How the plane is placed into the 10'x10' box, is it a must to place the fuselage parallel to one side of the box?
Answer: The plane can be anywhere inside box for the mission.

47. Can the passengers/luggage be placed in a tool that can be used to assist in loading during the ground mission that is not part of the aircraft? Or do all the passengers have to be placed on the ground similar to the way the attack stores/radome were placed in last year's ground mission?

What (if any) will be the configuration in which the passenger/luggage must begin for the ground mission?

For the Ground Mission, can the assembly crew member pre-arrange the passengers and luggage however they wish within the mission box before the timer begins, so long as they are not on or inside the aircraft?

Answer: The passengers and luggage can be placed anywhere within the mission box prior to the start of the mission including the use of a fixture to hold the passengers in place prior to loading. The fixture cannot be used to assist in loading the passengers or luggage, just for holding prior to the start of the mission.

48. Can the passenger compartment/restraint system be completely removable from the aircraft such that the compartment with all the passengers preloaded can be loaded onto the aircraft at once?
Answer: No.

49. Can the assembly crew member use any external tools to assist with loading/unloading the passengers/payload/banner during the ground mission? These tools would begin outside the mission box.

Answer: Yes, but all tools must be inside the mission box at the start of the mission.

50. Can our banner be pre-packaged or pre-folded for ground mission?
Answer: No.

51. How many passengers must the team load into the aircraft?
Answer: The maximum number of passengers validated during tech inspection.
52. Can remote-controlled mechanisms, such as servo-equipped hatches, banner deployment mechanisms, etc be actuated by the pilot during the ground mission to assist with loading/unloading passengers and luggage or installing the banner?

Answer: Yes as well as during the M2 and M3 staging.

53. How far is the start/finish line from the staging area?

Answer: The exact layout will be determined at the competition site, but assume about 10 feet.

54. If we are deploying a banner with a help of air in flight, are we at least able to shake the plane at GM for it to deploy properly? Or does it have to fall of the airplane on switch exclusively?

Answer: The crew member can orient and manipulate the airplane during deployment for the ground mission as long as he/she does not physically touch or release the banner.

55. Does GM Time account for loading time or locking time? For example, what happens if we load the passengers, walk away, and then they place themselves into the locked configuration some time later? Is our time the loading time or the time to the locked configuration?

Answer: The passengers and luggage must be secured by the crew member for both the GM and M3 and can be with the aid of the pilot functioning servos. They cannot lock themselves into place. Securing the passengers and luggage is part of the GM time and must be completed within the 5 minute staging time for M2.

56. During the Ground Mission, do the PAX need to be unloaded one-by-one or is it possible to unload them all at once?

Answer: Passengers and luggage must be loaded AND unloaded one at a time.

57. When holding the aircraft by the nose and releasing the banner during the ground mission, will the team be disqualified if the banner hits any of the tail surfaces?

Answer: No, only demonstration of deployment is required.

**General**

58. Are we allowed to use a gyroscope/fly-by-wire system?

Answer: Passive gyro stabilization is allowed, active stabilization of any kind is not.

59. Can there be ejection of rubber bands or does that fall under the rule that no objects may be ejected from the aircraft during flight?

Answer: No objects can be ejected from the airplane during flight. Of course, this excludes the banner and tow line at the end of M3.

60. Is designing a bush plane an actual requirement or just the title of the competition?
Answer: Just the title of the competition.

61. Can the observer help adjust the trim during the flight?
Answer: Yes.

62. What happens if there is in-flight damage to the banner?
Answer: If the Flight Director determines there is damage to the banner, the flight attempt fails.

63. How is the 20 ft takeoff rule being enforced? Will it be determined by painted lines on the ground, or will there be an obstacle at 20 ft?
Answer: A line on the runway to be enforced by the Flight Director and/or line judge.

64. Is a team member allowed to hold the plane while the motor is spun up for takeoff?
Answer: No.

65. Are we required to have a single arming plug to arm the entire system, or can we have one arming plug per motor in the case of a multi-motor configuration with a separate power system for each motor?
Answer: Multiple arming plugs with multiple motors are allowed.

66. Can propeller tips extend beyond the 5-ft wingspan?
Answer: No.

67. Are we allowed to remove a component from the plane for loading?
Answer: Yes as long as it is installed at the beginning of the ground mission and when entering the staging box for the flight missions and then re-installed prior to flight.

68. Does the entire banner have to pass the flaggers before a turn can be initiated?
Answer: Only the airplane must pass the 500 foot turn line.

69. To complete M3, does the banner have to pass the finish line before release or just the plane?
Answer: Only the airplane must cross the finish line in order to release the banner.

70. Does takeoff need to be parallel to the runway?
Answer: Yes.

71. Can we change the landing gear between missions?
Answer: The rules do not prohibit it but it cannot be changed from a tricycle to tail dragger configuration, for instance and all landing gear must be approved in tech inspection.

72. Can the passenger compartment be removed for Missions 1 and 3?
Answer: No. The airplane must be flown in a configuration that meets all three mission requirements.
73. Can the passengers be in two separate compartments separated by the wing spar?

Answer: No, the rules require a single passenger compartment.

74. Can the luggage be stacked on each other behind the passengers as shown?

Answer: This is allowed.

75. Will the banner be fixed in the aircraft during mission 1 and 2 or just the banner mechanism?

Answer: The banner will not be included in Mission 1 and 2, but the restraint and release mechanism – all components and features that are not released with the banner – must be on the airplane for all missions.

76. According to the statement: "the maximum size allowed is 5 feet", we want to know for our case, if we have a tandem configuration, will the two-wingspan sum or, if each wingspan accomplishes size allowed of 5 feet?

Answer: The maximum applies to the total width of the aircraft, regardless of number of wings or other features.

77. Regarding the CG test, every team has to go up the aircraft with each wing tip, if the aircraft has tandem configuration, how will the aircraft be accepted this test?, or is it possible to put it on a tiny bar to see if is the CG is located in the properly location?

Answer: The tech inspector will direct the teams on how to conduct the test based on the actual aircraft presented.

78. Can we add ballast?

Answer: Yes.

79. Ground Mission: Can the passengers be installed head first?

Answer: Uh, No to both. No further explanation required.

Can the passengers be secured in any way or does it have to be a way that is suitable for securing an actual human being? (i.e. Can we put a noose around the neck area of a passenger and attach it to a "seat"?)

Answer: Uh, No to both. No further explanation required.