

2018-19 Design, Build, Fly Q&A #1

Fuselage

1. How do you define a fuselage? How is underneath or bottom of the fuselage defined?

Answer: The fuselage is defined as the main body of the airplane that is not the wings, stabilizers, or other control surfaces or features and is typically along the centerline of the airplane. In the case of a non-conventional airplane design such as a blended wing body, the fuselage will be defined for this competition as the center 20% of the total wing span in the flight configuration. The underneath of the fuselage is defined as any part of the fuselage below the center waterline of the fuselage. The attachment point for the stores must be below the center waterline but the shape of the store itself can extend above the waterline.

2. What if the aircraft does not have a fuselage, but rather a twin tail boom?

Answer: The tail boom can act as the fuselage for attachment of additional stores.

3. Does the fuselage of the airplane need to be explicitly defined?

Answer: No

4. Does the bottom of the fuselage have to be uniform or in the same horizontal plane?

Answer: No

5. Can attack stores be placed inside the fuselage?

Answer: No

Radome

6. Can the radome spin using aerodynamic forces in flight?

Answer: Yes, but it still must meet the requirement of no rotation until completion of the first 180 degree turn and stop rotation after the completion of the final 180 degree turn. During the ground mission, if aerodynamic forces are used for rotation, the ability to lock the radome must be demonstrated along with remote release capability and ability to spin freely.

7. Is the radome any rotating component mounted onto the radome mounting structure?

Could the radome include a bearing-type component that mounts to a static mounting structure? Would the bearing have to be attached to the mounting structure or could it be removed with the radome? Can the static mounting structure be removed for missions 1 and 3? Is the motor/servo of the radome on the airplane or with the detachable radome? Can the radome and its mounting structure be one part or should they be two different parts?

Answer: The detail design of the radome, how it is attached to the mounting structure, how the radome/mounting structure is attached to the airplane and where the rotation servo, bearing, etc is located is up to each team to determine. The mounting structure for the

radome may be left in place for missions 1 and 3 if the team desires and can be in place while the airplane is in the stowed configuration.

8. Can the one inch min thickness include a static mounting plate that nest inside the radome or does there have to be a one inch min thickness for the rotating portion? Should the radome have a [minimum] thickness across the entire disc or can it have a [minimum] thickness at the center?

Can the radome be a flat plate with just a 1 inch hub in the middle or does it have to be an ellipsoid?

Answer: The only requirement is that the radome must be one inch minimum thickness at the center. There is no requirement for the rotating portion to have a one inch minimum thickness nor is there a requirement for the entire radome to have a one inch minimum thickness. However, the one inch thickness at the center must be easily verified during tech inspection. It is recommended that sufficient diameter of at least ½ inch diameter at the center of the radome meets the one inch minimum thickness requirement for verification.

9. Will the radome be mounted on the plane when in the stowed condition?

Answer: The rules state that the aircraft must enter the staging box Mission 2 and the mission box for the Ground Mission in the stowed configuration with radome **not installed**.

10. Is there any limit on the shape of the radome (disc/rotating plank)?

Answer: The radome must be circular in planform. The cross-section of the radome only need meet the one inch minimum thickness in the center

Does the radome have to be solid or can it be a wire frame?

Answer: The radome must be solid.

11. Does the radome have to rotate at a minimum speed? What is the rotation direction of the radome?

Answer: There is no requirement for a minimum rotation speed or direction. But the rotation must be easily observed by the flight line judge. How each team does this is up to the teams, but if the flight line judge cannot determine that:

- the radome does NOT rotate before completion of the first turn
- does rotate in flight and
- STOPS rotating after the final turn

you will not get credit for the lap/mission. Also, which direction it turns is up to the teams but it must turn continuously in only one direction in flight.

12. Can the radome support post double as the vertical stabilizer? In other words, can we attach the radome closer than three inches to the tail if it is considered the “support post”?

Answer: No.

13. Is a worm gear regarded as self-locking?

Answer: No.

14. Are we supposed to unmount the radome as the end of the second mission?

Answer: Unmounting or removing the radome is not part of the mission.

15. Can the radome be mounted vertically as shown in Figure [below]?

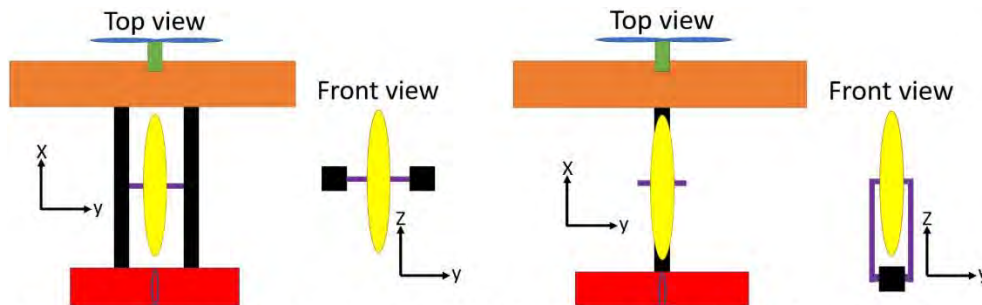


Figure 1. Vertical radome attachment with double boom (left) and single boom (right); the wing and tail were omitted in the front view

Answer: The radome cannot be mounted vertically as shown. The intent is to mimic a Navy AWACS aircraft as shown below. The radome must be generally parallel to the longitudinal axis of the airplane.



Landing Gear

16. What is defined as landing gear?

Answer: Any portion or component of the airplane that touches the ground in the pre-flight or resting condition.

17. Does a tail skid count as a rearmost landing gear?

Answer: Yes.

18. Is the end of the landing gear at the contact point with the ground or the back of the wheel?

Answer: Contact point(s) with the ground.

19. Can a pair of skids be used instead of the conventional landing gears?

Answer: Yes.

20. Are the use of bicycle landing gears legitimate:

Answer: Yes.

Attack Stores

21. Can attack stores be stored inside the fuselage?

Can we have a bomb bay?

Answer: No, all stores must be mounted externally.

22. Can the structure that holds the attack stores also drop with it?

Are we allowed to drop anything other than the stores, such as small pieces of hardware?

Answer: No.

23. Are we allowed to store the attack stores in a compartment that is underneath the wings/fuselage?

Would enclosing or partially enclosing the attack store under the wing still be abiding by the rule that states attack stores “must be mounted under the wings...”?

Do the stores have to be attached to the wing in open air or can it be in a fairing?

Answer: The attack stores must be in the free airstream and cannot be protected with fairings or in a separate compartment.

24. For the store release, they are specified as independent. Does this require that they are able to release in any order, or just release at different times in a set order?

Do you have to drop each bomb independently on command? Or can you set up a system so that it counts (bomb 1 first, but can only drop bomb 2 next)?

Will the judge indicate which store is to be dropped next or are we allowed to drop any store of our choice?

Does the plane require the ability to drop attack stores in ANY order, or can the order be pre-determined?

Answer: The order for stores release is up to each team. There is no requirement for a specific order or to release a specific store on command.

25. For release of the attack stores, they are specific to be “under” the wing. Does that mean directly under the wing or just under the horizontal plane the wing sits in?

Answer: They must be under AND attached to the wings, not just under the plane of the wing.

26. Is a release mechanism that employs a Nichrome (burn) wire to cut or otherwise release a restraining mechanism to drop stores legal.

Answer: No, for safety reasons, no “energetics” can be used to drop stores. All release mechanisms must remain fully intact before and after release of the store and remain on the airplane.

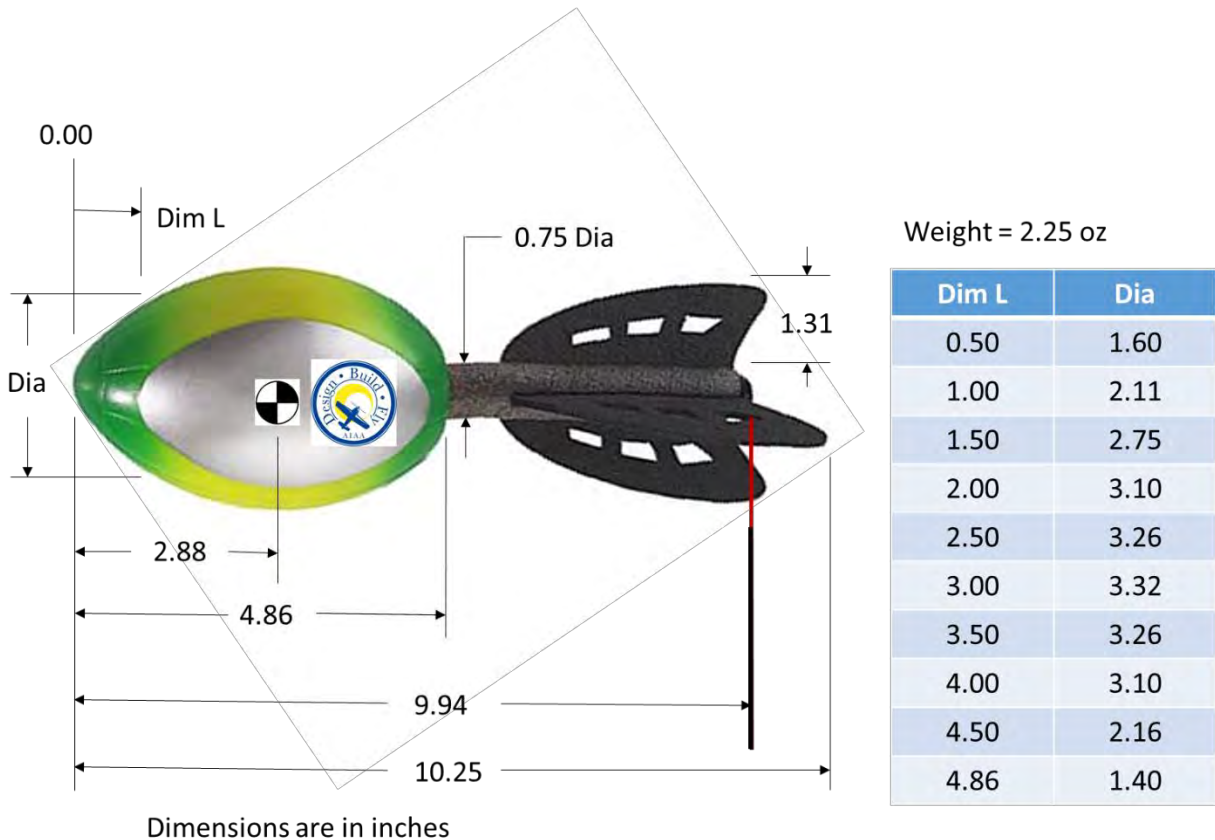
27. Can something be attached to the attack stores to assist in connecting and release from the plane?

Are we allowed to modify the attack stores, or darts, that we are affixing to our plane?

Answer: No. The stores cannot be modified in any way.

28. Will the dart provided at the competition have the same size as the dart samples on the website on Page 9? Could you give us the exact model number of the dart we will use as the competition so that we can purchase them to test our design?

Answer: There is no model number. It is described as a “Large Dart Rocket”. In addition to the basic dimensions found in the DBF rules, additional data is provided below.



29. Should each store be mounted on its own “armament drop”? Or can the team mount multiple stores on an armament drop, yet detach each store individually and independently?

Answer: There is no requirement for separate and independent store attachments, only that they be released one at a time.

30. Should the armaments to mount the stores on the wings be fixed and non-removable? Or can they be removed in missions 1 and 2?

Answer: Store mounts on the wings or fuselage can be removable and are not required for missions 1 and 2, but must be in place for tech inspection, mission 3 and ground mission.

31. Must the aircraft be armed with stores when in the stowed configuration? Or the stores are armed by the crew after the aircraft is remotely commanded to the flight configuration?

Answer: Teams enter the staging box for mission 3 without stores attached and in the stowed configuration. After remotely commanding the airplane to the flight configuration, the stores will be attached by the crew member.

32. Do the stores need to be below the lowest point of the fuselage if fuselage is curvy?

Answer: The stores do not have to be below the lowest point of the fuselage, just attached to the lower “half” or bottom of the fuselage.

33. What counts as mounting hardware for the attack store? Could teams count the wing as mounting hardware to directly attach a store to with wing?

Answer: No since the rules require a minimum distance of ½ inch of separation from any part of the airplane other than mounting hardware.

34. Do you provide the attack stores? Or can we bring our own? If we bring our own, can we modify them? E.g., can we mount a kind of a shackle to attach the store to the aircraft?

Answer: All stores for mission 3 will be provided at the competition and no modifications of any kind are allowed.

35. Can the attack store be positioned, as shown in Figure [below], behind the fuselage but also considered to be below the slo-stick fuselage with a tail fairing behind it?

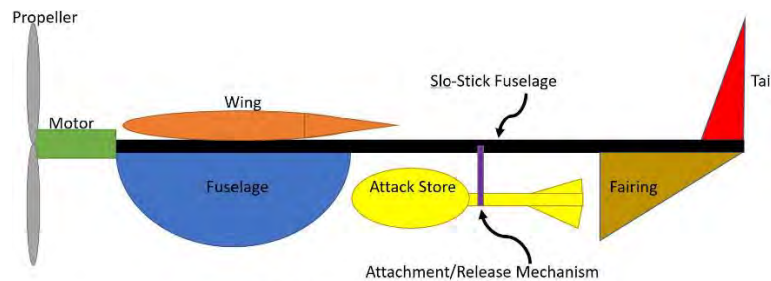


Figure 2. Attack store placement

Answer: In this configuration, the “slo-stick” is considered part of the fuselage and this would be allowed.

36. If we are using a bi-plane aircraft, which wing should the stores be mounted on?

Answer: The lowest wing.

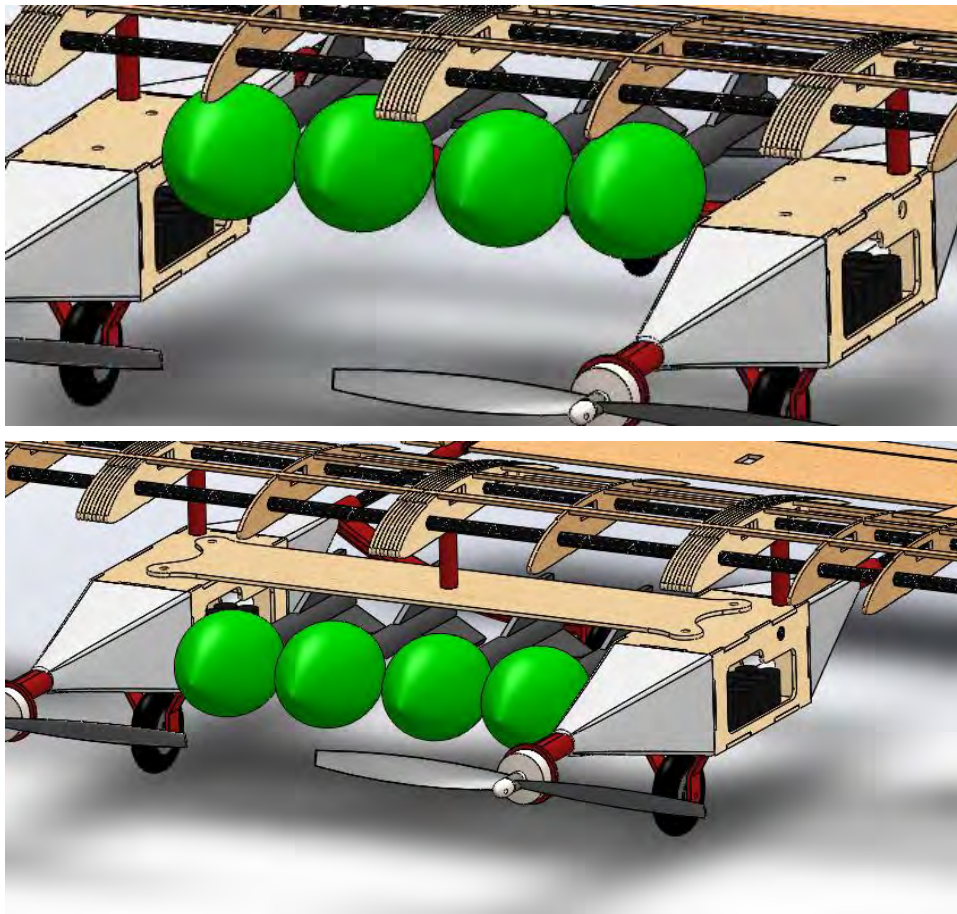
37. Do we have to follow a specific configuration for the attack stores? Or can we for example mount several attack stores on top of each other?

Answer: The requirements are in the rules. The first four stores must be mounted under the wings and must have a minimum clearance of ½ inch between stores and any part of the aircraft. The exact configuration that meets these requirements is up to each team.

38. Can we mount attack stores on top of the wing?

Answer: As stated in the rules, the stores must be under the wings for the first four stores or bottom of fuselage or under the wing for more than four. It is clear that no stores can be mounted on top of the wing or anywhere else.

39. Do the attack stores have to be mounted under the AND on the wing? Or can they be attached to any surface that is technically below the wing? The “dog bone” shaped plate in its current position could in theory lift as a wing does.



Answer: The stores must be mounted under the wings and attached to the wing structure as shown in the top figure above. The bottom figure is not attached to the wing structure and is not allowed.

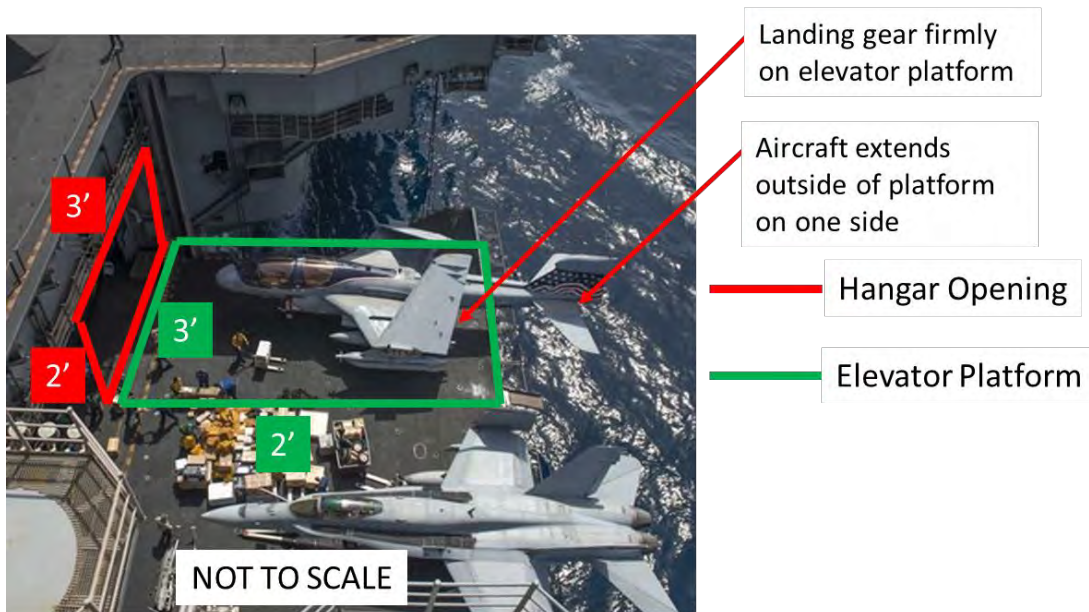
40. If the attacking stores touch any parts of the plane or other attacking stores after separation due to aerodynamic forces, will it count as a valid separation?

Answer: Release of a single store for each lap is the only requirement. How it separates or where it lands is not part of the criteria.

3 x 2 x 2 Box

[Note: the 3 x 2 x 2 box represents the elevators on an aircraft carrier. The landing gear must fit within the elevator platform and the aircraft cannot extend beyond three sides of the elevator platform but the aircraft could extend over the platform on the outboard side (over the water). Once the elevator platform is lowered, the aircraft must be capable of rolling into the hangar and clear the opening into the hangar, including

height. The illustration below shows the correlation to an aircraft carrier elevator platform and hangar opening to this year's rules.]



41. Can the wings stick out of the back of the 3 x 2 x 2 ft box which the plane must roll through?

Answer: Yes, see illustration above and below.

42. What exactly do you mean by “roll through”?

Answer: Once confirmed that landing gear fit within the box with the nose of the plane inside the box, it must continue to pass through the box on its landing gear to assure any components that stick out of the back of the box will fit through the 3 x 2 opening in the box. The aircraft must then fully pass through the boxing by rolling on and in the direction of the landing gear. See illustration below.

43. What counts as the nose of the plane when doing the 2' depth requirement to the gear?
For example, if the wing pivots remotely, can that extend beyond the front of the box?

Is a wing mechanism which instead of a folding wing, rotates the wing 90 degrees such that one wingtip extends past the nose of the fuselage be allowed or would that violate the 2 ft depth from the nose of the aircraft to the rear landing gear?

Does a wing count as a nose once it folds forward?

Answer: The nose of the airplane is defined as the forward most point of the airplane in the stowed configuration. In this example, the forward most point of the wing in the stowed configuration would need to fit inside the 3 x 2 x 2 box with the landing gear.

44. Are the wings allowed to stick out of the box when folded and stowed?

Answer: Any part of the aircraft can stick out of the box on the side opposite the nose.

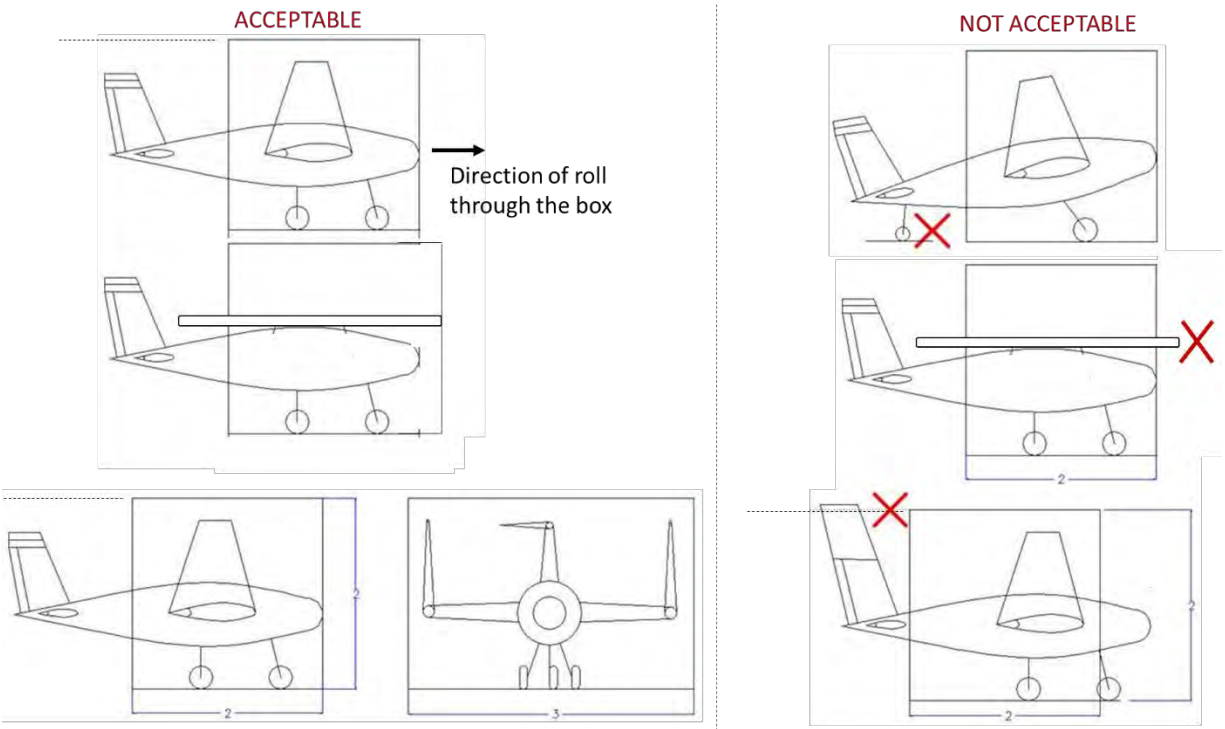
45. Does the plane have to be propelled through the box or can it be pushed?

Answer: It can only be pushed through the box by hand.

46. As per our understanding of the rules, the 3 x 2 box is 3 feet wide and 2 feet high, and there's no constraint on the length of the box. Is this true?

What does "any part of the aircraft aft of the rear landing gear may extend outside the box" mean exactly? Does it essentially mean only the parts originating aft of the rear landing gear may extend outside the box

Answer: The box length is 2 feet and the landing gear nose or forward most point of the aircraft in the stowed configuration must fit within this length. There is no constraint on the length of the aircraft aft of the landing gear.



47. When rolling through the [box], does the aircraft have to do so on its landing gear or can it be resting on the tail as it rolls through if the wing folding causes the CG to shift backwards?

Answer: The aircraft must be stable and resting on all landing gear in all possible configurations required for the competition – stowed or flight configuration, with or without radome in either and with or without stores.

48. Do the propeller(s) need to rotate freely during the “roll” through the box or can it/they be folded?

Answer: The propeller(s) can be folded while the airplane is in the stowed configuration. However, if they are retained in a specific position in the stowed configuration, they must be remotely released to the flight configuration.

49. “(any part of the aircraft aft of the rear landing gear may extend outside of the box)”, is this regarding the aircraft in the flying condition or the stowed condition?

Answer: The aircraft must fit inside and roll through the box in the stowed configuration.

50. When do we have to use the 3 x 2 box?

Answer: This will be verified during tech inspection.

Folding Features and Locking Mechanisms

51. What exactly does “folding” mean? Does that include hinges or pivots, like the hinges shown below?

Do the wings have to fold or can the wings telescope out?

Is it legal to simply rotate the entire wing 90 degrees about its point of connection with the fuselage as the “folding mechanism”?

Is there a particular axis on which surfaces must fold to constitute as folding? Meaning, would teams be able to, along a standard three-dimensional axis, have a wing folding along the Y-axis?

Can the wings fold upward or if they can fold in a backward direction laterally along the sides of the aircraft?

What classifies as a “folding” wing? Does this include any technique to move the wings into a permissible stowed configuration, such that it fits within the 3 x 2 box? Examples would be rotating the wings back, rotating the wings as a whole, telescoping wings, etc...

Can a retractable wing be used for the aircraft?

Answer: Location and types of pivots and hinges and direction of fold and unfold are up to each team. Exact definition of “folding” is also up to the teams. It can mean rotation, pivot, telescope or any other means of articulation to fit inside the 3 x 2 x 2 box and then convert remotely to the flight configuration.

52. Are the wings only required to actuate from the stowed to flight configuration? We wanted to know if our locking mechanism needs to ever be unlocked remotely.

Does the aircraft need to fold from the flight configuration to stowed configuration remotely as well or can that be assisted (i.e., a snapping lock mechanism to hold the wing in place which must be unhooked by hand)?

Answer: The transition from the stowed to flight configuration must be conducted remotely. The transition from flight back to the stowed configuration can be done manually, including unlocking the locking feature(s).

53. What defines a folding surface and does this surface have to be on the wing? For example, can the elevators (of a traditional tail) hinge upward to be parallel with the rudder and be considered to satisfy this folded surface requirement.

Answer: With a minimum wing span of 4 feet and a requirement to fit inside a 3 foot wide box, some form of folding features will have to be on the wings. Exactly how and where the fold occurs and which surfaces or components “fold” is up to each team to determine. For other surfaces such as elevators and rudders, they must fit through the 3 x 2 foot box, so

folding or articulation of these surfaces may be required if larger than the box. Again, up to the teams to determine.

54. Here alongside the word “stowed”, “folded” is written in parenthesis. So, does this mean only folded surfaces are supposed to be remotely commanded to the flight configuration? We are having a retractable fuselage having sliding mechanism so as to fit inside the box. So is that supposed to be remotely commanded to flight configuration or can it be done physically?

Answer: Any features, surfaces, components, parts, sections, etc that are stowed to fit inside the 3 x 2 box must be commanded to the flight configuration remotely.

55. Is a locking mechanism that works with a servo actuated bolt allowed or does it have to non-electric for example with spring and bolts?

Answer: The locking mechanism design is up to the teams whether it is self-locking or servo actuated or some other means. But it must pass the wing tip test during tech inspection with the heaviest configuration and in the staging box prior to each mission.

General Questions

56. Is the use of an on-board electronics such as an Arduino to control mechanisms allowed?

Answer: Yes, but only for control of mechanisms or store release.

57. Is the use of an autopilot system allowed:

Answer: No.

58. Is the use of a telemetry system for determining battery voltage and velocity allowed?

Answer: Yes, as long as it is part of the 2.4 GHz RC transmitter link.

59. For the rule “Li-Poly batteries are NOT legal for use as propulsion for RC batteries”.

Does this refer to the batteries in the handheld controller as well.

Answer: **There is also a rule that “Lithium batteries of any type are not allowed”. This rule is intended to apply only to the items and sub-systems designed and manufactured by the teams for DBF. Upon further review by the DBF OC, Li-Po commercially procured batteries used in commercial, un-altered radio transmitters are allowed. But they are strictly forbidden on any aircraft or ground equipment and sub-systems developed for DBF.**

60. Can aircraft use propellers as well as powered wheels (using brushless motors) on take-off?

Answer: No, all takeoff power must come from the propeller(s).

61. Is it acceptable to bring additional fuselages or wings to build off of if something is broken during one of the missions?

Can you only use on plane ever even if you go through tech inspection again?

Answer: No, the airplane or components must be repaired if damaged. New this year is that new or modified battery packs can be used after the initial tech inspection if the new or modified batteries are approved in tech inspection.

62. Can a separate transmitter-receiver pair be used for the flight and controlling of the mechanisms be used?

Can we use a different transmitter for activating some functions (like rotating the radome and releasing darts?) and can it be of a different kind from the one we use to fly the aircraft?

Any limit on the number of radio controls this year?

Can we do a buddy pilot (second RC controller) where the second person is only in charge of dropping stuff for mission controls and not aircraft controls?

Answer: A separate transmitter can be used, but only for non-flight control functions such as controlling the aircraft from the stowed to the flight configuration and radome and store release. If a team chooses to use a second transmitter for non-flight control functions, it can only be operated by the Observer crew member.

63. Can you change the structural materials or battery packs after the design report submission:

Answer: Minor changes to the aircraft configuration, such as sizing, materials used and battery packs, are allowed as long as the basic configuration is maintained.

64. Is a tail sitter, VTOL, aircraft allowed? Is this considered rotary wing or not?

Answer: Thrust vectoring is allowed, but for this competition, the aircraft must execute a rolling take-off and the aircraft is required to roll through the 3 x 2 x 2 box on landing gear.

65. Is it allowed to use the propelling system to provide part of the lift force, especially when we use multiple motors (like the Boeing Bell V-22)

Answer: The rules allow the use of thrust vectoring.

66. Where is exactly the start/finish line [for the Ground Mission]?

Answer: The start/finish line will be determined at the competition but will be approximately 10 feet from the mission box.

67. Are there any motor limitations, in particular, the motor power?

Answer: The requirements for the motor(s) are defined in the rules and there is no limit on the batteries or fuse this year.

68. Can we hide the landing gear (for example wheels) after the take-off?

Answer: Yes.

69. Can we use a Gyro Stabilization unit to automatically trim the aircraft during the dropping of the stores in mission 3?

Answer: Yes.

70. Will the plane fly with the tail hook or can it be removable?

Answer: The tail hook is required for ALL missions.

71. Can a team choose a take-off direction?

Answer: Yes, the take-off ramp is easily configurable for take-off in either direction.

72. What material is the surface of the ramp made out of?

Answer: Plywood or OSB painted with a satin or semi-gloss paint.

73. Can we use the same rotation type system for the radome for the wings?

Answer: Teams can choose the method of radome rotation and moving surfaces and features to the flight configuration and can duplicate methods within the aircraft.

74. Do the stores and radome have to be on the plane during the tip test?

Answer: For tech inspection, it will be with the heaviest configuration intended to fly. For all flight and ground missions, in the configuration required for that mission.

75. How many people during the ground mission get to touch the plane?

Answer: Only the crew member can touch the plane.

76. Can we point/move/angle the ramp whatever we want (for wind on the runway)?

Answer: The ramp is fixed and parallel to the runway, but can be easily configured for take-off in either direction.

77. Is ground mission open call or part of the flight order?

Answer: Part of the flight order.

78. Are two receivers necessary to separate the flight avionics and flight propulsion?

Answer: It is not necessary to have separate receivers for flight avionics and flight propulsion.

79. The rules say that the "aircraft must have a tail hook on the bottom, centerline of the fuselage". Our current conceptual design has not center fuselage. Is it okay to attach the tail hook to the center of the wing section on the centerline of the aircraft?

Is the mounting of the tail hook on the bottom centerline of the tail boom allowed as long as the tail boom is in the centerline of the fuselage or [does it have] to be mounted on the fuselage.

Answer: Yes as long as it meets all requirements for the tail hook stated in the rules.

80. The course layout picture shows a 360-degree turn. Do we have to fly this 360 on each lap?

Answer: Yes.

81. The rules say the propellers pitch/diameter can be changed for each flight attempt. Can the number of battery cells be changed as well?

Answer: Yes, but only if battery packs have passed tech inspection.

82. If our plane was to utilize a folding propeller, could we modify or manufacture our own hub, on which would be mounted off the shelf propellers?

Answer: Yes.

83. Can we use a delta wing configuration or does it have to be a traditional fuselage/wing aircraft?

Answer: The configuration of the aircraft is up to each team as long as it meets all of the rules.

84. For ground mission, is it possible for us to pick the stores installation position, such as 2 under the fuselage and 2 below the wing?

Answer: The four stores for the ground mission must mount under the wings.

85. What is the target that the stores are going to hit? How large is the target?

Answer: There is no requirement to hit a target, only that one store be released per lap on the downwind leg for a lap to count.

86. In the ground mission, can radome installation proceed as the craft unfolds?

Answer: The aircraft must complete transition to the flight configuration and locked prior to installation of the radome.

87. Is there limitation on tail hook method? For example, is rope cutting acceptable?

Answer: Rope cutting or any other physical separation action is not allowed. The aircraft must be held by the tail hook by hand during power up and released at the discretion of team's flight crew for takeoff.

88. What is the maximum angle of attack allowed on takeoff that would not be considered vertical flight? The motors would not be capable of thrust vectoring and the thrust vector would be parallel to the chord of the wing.

Answer: There is no requirement or limit on angle of attack of the aircraft, only that it must take off from the ramp while resting on its landing gear.

89. Can we mono-coat the gap between the rotating radome and the aircraft?

Answer: No, the rules require a minimum distance of 3 inches between the radome and any feature or part of the aircraft.

90. Since [the design shown above] does not have a central fuselage to mount a tail hook on, can we mount the tail hook along the centerline of the aircraft as a whole?

Answer: The tail hook must be on centerline on the bottom of the fuselage. The main purpose of the tail hook is for the ground crew member to restrain the aircraft on the ramp during power up and to release for take-off. Exactly how it attaches to the fuselage and its exact configuration is up to each team to decide.

91. Can the wing area be changed after take-off?

Answer: In the rules under FAQ, variable aircraft geometry is allowed as long as it is controlled remotely through the transmitter.