



## 2023-24 Design, Build, Fly Q&A #1



**NOTE:** The final DBF Rules have been updated and are available on the DBF website as “DBF Rules Final – UPDATED 17 Nov 2023

### General Questions

1. Does the airplane have to be in any particular orientation within the parking spot? Can the airplane be standing up on its nose with the landing gear touching the floor?

Answer: As stated in the rules: “The airplane in the parking configuration, while on its landing gear in the upright orientation, must fit inside a parking spot 2 ½ feet wide”.

2. [Regarding transition from the flight to parking configuration] What does “removed from the airplane” mean? Can we remove and reattach something? Can we attach two parts of a plane to a lanyard and change the position of one of them without removing the lanyard, and have the whole plane be technically connected?

Are detachable wings allowed?

May components be removed from the aircraft during the conversion and then reassembled, or may not a single component (bolts, pins, etc.) be removed from the aircraft during the conversion between parking and flight configuration?

In regards to the statement on page 8 of the rules, “the airplane must be configured to fit without any components removed from the airplane,” are there allowed to be mechanical fasteners that are removed to facilitate folding wings? Or do all fasteners have to be attached to the aircraft at all times? If yes, is a tether from the fastener to the aircraft allowed?

What constitutes the wing being removed from the aircraft during staging? Does it just need contact points which stay in contact throughout the entire process? Eg. the wing is lifted up but supported by stilts - hence not removed?

What are the limitations of reconfiguring the aircraft in/out of flight and parked configurations? Are wings allowed to fold and if so, what are the hardware limitations? Are tools allowed to loosen something such as a set screw and could a pin be completely removed or would it need to remain tethered to the aircraft?

Answer: The final DBF rules have been updated and posted on the DBF website and includes the following update to the parking configuration requirements:

- If the wingspan exceeds the parking spot width, then the airplane must be configured to fit without any components removed or separated from the airplane other than temporarily removing fasteners, locking pins or other mechanical retention devices, which must be replaced back on the airplane in their original location (no loose parts allowed).
- When transitioned back into the flight configuration, all retention methods must meet the requirements under Technical Inspection for positive retention of all components in flight.

Additionally, components may not be attached by lanyards, rubber bands, strings, etc. No components can be physically removed from the aircraft other than those clarified in the updated rules.

3. Can we put tape onto the plane and then change where the tape is while reconfiguring it?

Answer: The use of tape is considered a one-time use material only, so using it to secure components for configuration changes is not acceptable since it would be permanently removed from the airplane. As always, the use of tape to secure components in general must be approved during Tech Inspection.

4. Is the restraint system part of the insert?

Are you allowed to have a restraint mechanism that touches a portion of the passenger besides the bottom of the passenger?

Do passengers and crew need to only be restrained by the floor?

Is there any limitation on how the passengers are restrained (around the head ...)?

Can all passengers be restrained by a single body/part?

Is a neck restraint allowed for the passengers, EMTs and crew?

Are we allowed to have a restraint system for the passengers other than the insert?

For the restraint system, the rules mandate that the dolls must not touch any part of the plane except for the floor or insert. Would a restraint system that consists of (1) a floor slotted for the dolls and (2) a frame (see Picture 1) that holds the dolls in place be counted as “inserts”? Would this restraint system be acceptable under this year’s rules?



How can the crew be secured if they can only be touching the flat floor? Does the floor have to be a continuous flat plane, or can it be recessed to hold the crew secured, or have a strap connected to the floor to secure them?

Can [the crew] touch the restraint system?

Answer: The restraint system for the crew, passengers, EMTs, Patient on gurney and Medical Supplied Cabinet do not have to be part of the insert, if an insert is used (not required by the rules, only allowed). If an insert is used AND the payload restraints are tied or connected to the insert, then the insert must be secured in the airplane to prevent any movement during take-off, flight, landing or taxi and this must be demonstrated during Tech Inspection. If no inserts are used, the restraint system is not limited to just the floor. The design, location on payloads, how it secures, etc. of the restraint system is up to each team to determine and must be approved in Tech Inspection. **[NOTE: The DBF Final rules have been updated to add this clarification (DBF Rules Final – Updated 17 Nov 2023)]**

5. What does “horizontal” mean? Does it mean parallel to the direction of flight? Does it mean parallel to the ground when the plane is on its landing gear? What is the angular tolerance to which this is specified?

Can the fuselage be tilted with respect to the runway ground (i.e., the passenger floor not horizontal with respect to the ground)?

Answer: Horizontal is in reference to direction of flight. The floor does not have to be horizontal to the ground while on the landing gear. There is no tolerance applicable as horizontal in flight cannot be measured but will be assessed during Tech Inspection for compliance.

6. The payload for Mission 2 is the Crew, EMTs, Patient on gurney, and Medical Supply Cabinet. However, the equation for M2 score in the rules uses the variable payload\_weight. Does payload\_weight measure only the medical supply cabinet, or does it also include the crew, EMTs, and patient on gurney ?

Answer: Only the Medical Supply Cabinet weight.

7. What does “side of the airplane” mean? For example, what is the side of a spherical fuselage? What is the side of a flying wing?

What does “extend beyond [the fuselage centerline] mean”?

What does “centerline” mean? Does it mean the x-z plane? Does it mean the x-y plane? Does being roughly along the centerline count as crossing it?

What is meant by centerline?

How is the centerline defined for the hinge and hatch placement (top of fuselage, side)?

The rules specify the hatches are on the side of the airplane. What exactly is considered the side of an aircraft?

What is considered the fuselage centerline - both the centerlines on y-z and x-z planes, or only x-z plane?

One page 10 of the rules, what is the definition of the “fuselage centerline?” Does this split the plane into front and back halves, left and right halves, or top and bottom halves?

Is the fuselage centerline the vertical or horizontal plane?

Can a hatch be placed at the rear of the aircraft? If not, how is the hatch oriented?

Answer: The final DBF rules have been updated to further clarify the hatch requirements and is provided below:

The passenger compartment shall be accessed via a hinged hatch(es) on the side of the airplane. **The hatch opening cannot extend past the fuselage vertical centerline on top or bottom, including the hinge(s) for the hatch(es).** The hatch(es) are limited to a width of 6.00 inches. There is no limit to the number of hatches implemented.

Further, the side of the airplane is defined as outboard of the vertical (x-y plane) centerline with a general vertical orientation. In the case of a flying wing, a hatch could be outboard of the vertical centerline but would have a generally horizontal configuration if implemented on top of the wing, so it would not be allowed. It is conceivable that a flying wing with a compliant hatch design is achievable.

8. How do you define the “width” of a hatch? Is it the distance in the x-direction from the hinge to the opening opposite of the hinge?

Is the width of the hatch the dimension measured along the axis of the hatch hinge or the dimension along z-axis?

Is the width of the opening also limited to 6 inch, or does the limitation only count for the hatch (e.g. can a single opening have two separate hatches, both with the width of 6 inches)?

Does side hatch width (6 inches) constraint refer to width along length (roll axis) or height (yaw axis) of fuselage?

Does “width” mean along the length of the fuselage or along the length of the wing? (With regards to the hatch size)

Can hatches be directly next to each other, without any material in between them?

Answer: The width of the hatch is defined as the largest distance of the hatch opening in the fuselage in the longitudinal (x-axis) direction. The hatch cover can be larger than the hatch opening. No single hatch opening can exceed 6.00 inches but multiple hatch covers could be implemented on any single hatch opening. If more than one hatch opening is implemented, there must be separation between hatches so no single hatch opening exceeds 6.00 inches in width.

9. Can the hinges be in any direction as long as they do not cross the “centerline”?

Answer: Yes.

10. What is meant by the passengers can only touch the floor?

Answer: The passengers cannot touch any other part of the inside of the fuselage walls, bulkheads, etc., other than the restraint system. There must be a discernible gap between the passengers, EMTs, patient on gurney and the any internal features when verified in Tech Inspection.

11. As long as the hatch/door remains before the centerline, is it fine for the latching mechanism that attaches the two hatches/door together to extend beyond the centerline?

Answer: The latching mechanism can extend beyond the centerline.

12. What defines the bottom of the passenger?

Answer: Both surfaces shown below may be used as the bottom of the passenger.



13. Do the pilots have to be able to see out of the plane? Must it be a transparent material in front of the pilots? Can it be opaque?

Does the crew need windows?

Answer: There is no requirement to use transparent material. But it is up to each team to assure the design can be verified in Tech Inspection to assure the crew heads are above the fuselage in front of them.

14. Do the wings have to lock in the upright, parked position?

Answer: Any components that are moved to achieve the parked configuration must be able to maintain that configuration on their own. Keep in mind that the ground mission and the staging boxes are outside in Wichita in the wind and there can be no external assistance to keep the configuration in place.

15. Are removable sections allowed for the purpose of electronic access?

Can we put an electronics component (speed controller) in the cockpit of the aircraft in front of the pilot and copilot?

Can there be additional access hatches around the aircraft that are not used for Mission Staging or the Ground Mission?

Can we have separate access hatches that are not used as part of the mission?

Answer: Location and access of aircraft subsystems are up to each team to determine and not regulated by the rules other than to be compliant with safety requirements.

16. Are we allowed to put crews/passengers on the floor insert outside the airplane before putting the whole assembly in the airplane?

Can the passengers be inserted into floor inserts and then be placed into the aircraft?

Do the floor inserts have to be fixed in the aircraft during all stages, or can they be removed from the aircraft during the loading (e.g. to put the passengers in and then put the insert back into the airplane)?

Can the passengers go into the floor insert before putting the insert into the aircraft?

During mission staging, can payload (crew; patient, EMTs, medical supply cabinet for M2; passengers for M3) be placed in the insert outside of the aircraft and then installed together, or do the inserts need to be installed in the aircraft first, and then the payload components installed?

Is there a specific order of operations for aircraft configuration? For example, must the insert be installed before the passengers are boarded?

Can you start out with passengers on the floor insert before time starts?

Does loading the passengers into the insert (with the insert outside of the plane) count as part of the recorded time for GM?

Can we load the passengers into the insert as part of the staging process before the time starts?

Can we load the passengers into a tool that is not the insert before the time starts?

Do the different components in the medical transport mission have to be loaded in a certain order?

Can passengers be loaded into the insert before being placed in the plane?

For the Staging Window and Ground Mission, will the time it takes to load payload and passengers into the inserts themselves be accounted for? Or can the payload and passengers be loaded into the inserts before the missions?

Are we allowed to line the passengers up or orient them before loading?

If we are not allowed to load the passengers into the insert in advance, are we allowed to arrange them into a specific formation before time starts?

Answer: The order of assembly of payload components is up to each team to decide. Payloads and components may be arranged as each team desires prior to starting assembly. Payloads may be loaded onto inserts prior to installation into the airplane but this is part of the timed Ground Mission loading and the 5-minute staging box time. Payloads may not be loaded into inserts prior to starting the Ground Mission or the 5-minute staging window. And as stated in the rules, if floor inserts are used, they must be outside of the airplane prior to starting the Ground Mission or when entering the staging box.

17. Does the bulkhead need to seal off the passenger compartment from the cockpit or does it seal off the entirety of the nose section?

Answer: The bulkhead is only required between the passenger compartment and cockpit.

18. Can the crew bulkhead have wires pass through it?

Answer: No, it must be a solid bulkhead as specified in the rules.

19. When the aircraft is in the staging box, can the wings remain connected by rubber bands, or must there be a joint involved?

Answer: As specified earlier, rubber bands are not an acceptable method of retaining components.

20. Are hatches on the top of the fuselage legal?

Answer: No.

21. Gurney and patient layout in mission 2, is the patient lay on the gurney and its layout is horizontal?

Answer: Yes, the patient must be on the gurney in a horizontal position (parallel to passenger compartment floor).

22. Can the passengers only be placed in one horizontal plane, or can the insert be made in such a way to allow the passengers to be one above other?

Can the passengers for M3 be stacked on top of one another, so long as they are not touching each other?

Answer: As clearly stated in the rules, the airplane shall have a single, horizontal floor.

23. Must the passengers be placed vertically or can they be angled?

Do the passengers for M3 have to be in an upright position?

Are there any regulations on the orientation of the passengers during flight?

Answer: The passengers must be perpendicular to the floor. [NOTE: The DBF Final rules have been updated to add this clarification (DBF Rules Final – Updated 17 Nov 2023)]

24. Can there be any structure on the horizontal floor, or does it have to be smooth?

The rules require a “single plane, horizontal floor.” Can the floor contain holes or protrusions? For instance, screw holes, weight-reducing perforations, or mounting bosses for an insert?

Answer: There are no requirements or restrictions on the design of the floor other than it must be a single, horizontal floor.

25. Can tools for conversion between configurations be brought to the mission separately or do they have to be carried on the aircraft during the mission flights? (Screwdrivers, Wrenches ect.)?

Can additional tooling/setup be used in the Staging Box and Ground Mission area to help facilitate loading and unloading?

Can a tool be used to load the passengers into the insert that is either outside or inside the fuselage; or do they need to be individually loaded one by one?

Are we allowed to make a sorting jig for the passengers to orient them correctly?

Can external tools such as jigs be used to help arrange, load and unload payloads?

Answer: Tools, fixtures, materials, etc for configuring the airplane and installing payloads are not required to be carried inside the airplane. The crew, passengers, EMTs, patient on gurney or Medical Supply Cabinet cannot be placed into a fixture or tool prior to starting time for the Ground Mission on Staging Box assembly.

26. Can magnets be used for the loading mechanism to make it easier to load the passenger modules? After these are inserted into the fuselage, systems in the fuselage take over the acting forces on the passenger elements. The magnets therefore do not perform any securing tasks during the flight?

Answer: In this example, magnet would be acceptable as long as they are not the method of securing any components or payloads as required in the rules.

27. Can the wing be manually adjusted between configurations, or does this have to be done using an automatic mechanism?

Answer: There is no requirement for an automated mechanism to change configurations.

28. Are inflight adjustable propellers allowed?

Answer: Yes, but it must be a commercially procured item and unaltered.

29. Can the nose of the aircraft be folded to the side using hinges on the side wall to load the crew?

Answer: This would meet the requirement for a separate hatch or canopy.

30. The rules state that the crew/passengers have a base with a diameter of 1 in. We ordered them on Amazon but the ordered figures have a base diameter of 1.2 in. What will be the base diameter from the figures at the competition?

Answer: The manufacturer has provided an updated drawing shown here. **[NOTE: The DBF Final rules have been updated to add this clarification (DBF Rules Final – Updated 17 Nov 2023)]**



31. Can a weight be inserted in the payload compartment for mission 1?

Answer: Yes, but the restraint for the weight must be validated in Tech Inspection.

32. Can inserts have multiple parts/sections that are loaded separately?

In the rules, the passenger cabin insert is referred to in the singular. Must the cabin insert be one piece, or may it be composed of many, separate insert pieces? If it must be one contiguous piece, are we permitted to have a larger door or separation in the fuselage to insert it, or must it be inserted through a passenger boarding door?

Can the insert for missions 2 and 3 be in multiple parts?

Answer: The insert for a specific mission may be made up of multiple sections and must be installed through the allowed payload hatches. The order of installation of payloads and inserts are up to each team to determine.

33. On page 10 of the rules, do the hatches have to be able to move independently? If yes, can there be an additional system to open all hatches simultaneously?

Answer: Operation of hatches is up to each team to determine.

34. Can the battery location be changed between missions?

Answer: Yes.

35. Page 10: Payload layout - Does the layout have to be identical to that in Fig.4? With patient to the left and EMTs to the right? Can this be rotated or reoriented? (Apart from the EMTs and Patient having to be together and not separated by the MSC.)?

Answer: The patient on gurney must be oriented such that it is in the longitudinal direction as shown but can be either on the right or left side of the airplane.

36. Can a timber strip be attached to all the hatches to latch them to the fuselage at once, or does each hatch need its own individual locking mechanism?

Answer: A locking mechanism can secure multiple hatches but must demonstrate in Tech Inspection that it will secure the hatches during all phases of the missions.

37. Do the crew inserts need to be removable? Can the crew insert be permanently inside the cockpit such that only the crew needs to be inserted in the staging time?

Can we have an insert for the crew as well?

The rules state that the flight crew shall be “placed side-by-side without touching each other or any part of the airplane other than the floor.” However, they also state that “Crew ... must have a restraint system to secure them from moving during taxi, take-off, flight, and landing.” Notably, passengers are permitted to touch the insert. Must crew restraints be a part of the floor? For instance, may the crew have an insert?

Answer: The rules allow for the use of inserts for missions 2 and 3 because the payloads are different for each mission. Since the crew does not change based on the mission, removable inserts are not required and not allowed in the rules. The restraint system for the crew inside the cockpit is up to each team to decide.



38. Does the gurney have to be separate to the insert or can it be one unit?

Answer: The gurney is a specific, separate requirement from the inserts, which are actually optional, and must be separate from inserts, if used.

39. Does the gurney height refer to the distance from the patient to the floor or just the side height of the restraint holding the patient?

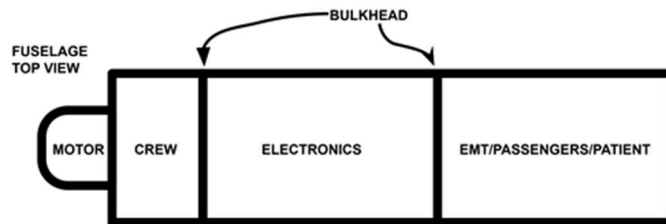
Answer: The gurney height is the distance between the patient and any surface the gurney sits on (airplane floor, insert, Tech Inspection table, etc).

40. Are lift fans allowed, assuming that the total thrust vector is still majority forward?

Answer: The use of commercially available ducted fans and thrust vectoring are defined in the rules and the FAQ. This would be considered a propulsion system and must meet the rules under Batteries.

41. Regarding the layout of the cabin, the rules mention that there should be a solid bulkhead between the crew and passenger compartment. Would it be unacceptable if the design adds an avionics compartment between the two aforementioned compartments in addition to the bulkhead?

Can we put all the electronics for the aircraft behind the crew (pilots) and behind the electronics the EMT, passengers & patients, followed by bulkheads after each segment as presented in the image below?



Answer: This would be acceptable as long as a bulkhead is present that meets requirements.

42. What are the full dimensions of the parking spot?

Answer: As stated in the rules, the airplane must fit in a parking spot that is 2 ½ feet wide. This will be verified during Tech Inspection. There is no limit on the length or height. For the Ground Mission, the parking spot is just a “mark” as a starting point in the Ground Mission box.

43. Can the restraint system for the patient and gurney be the same fastening system?

Answer: Yes.

44. Can the floor be removed? Can you use different floors for different missions? Can the floor be multiple pieces??

Answer: The floor is part of the airplane configuration and as clearly stated in the rules, the configuration cannot be changed between missions. The rules allow for inserts to be used for this purpose.

45. Do mission 2 and mission 3 have a 5-minute staging and flight window? Or is there a 5-minute staging window followed by a 5-minute flight window?

Answer: The staging window and flight window are independent of each other. Staging window is to prepare the airplane for the mission followed by the flight window to execute the mission.

46. Can we fly with the medical cabinet weight less than the maximum declared value?

Answer: The rules clearly state that: "...the weight can be varied for each mission attempt not to exceed the maximum weight declared in Tech Inspection."

47. Does secure mean that the passengers cannot be dislodged in the event of a crash?

Answer: The rules clearly state that the restraint system must: "...secure them from moving during taxi, take-off, flight, and landing."

48. The team would like to have a clearer understanding of "The Crew, EMTs, Patient on gurney, and Passengers must have a restraint system to secure them from moving during taxi, take-off, flight, and landing." Are the dolls to be restrained in such a way that no tilt due to the adjustment of the plane's attitude, nor in-place rotation due to vibrations should occur?

Answer: The restraint system should prevent any movement as clearly stated in the rules quoted above.

49. To comply with the parking width requirement, the team has been working on a folding wing design. Would it be acceptable if a short spar is removed when reconfiguring from flight to parking?

Answer: It is up to each team to decide what their design is for transitioning to the parking configuration. See Q#2 for what is allowed to be removed then replaced during the transition. A spar or other configuration item may be moved as long as it remains attached to the airplane.

50. Can the patient on the gurney touch the aircraft walls?

Answer: No.

51. For assembling and preparing the plane for flight, is there a particular order in which the ground crew must do tasks? E.g. can the ground crew load and secure crew/passengers before putting the plane in flight configuration or does this have to be done afterwards?

Answer: The DBF Rules have been updated to clarify that the airplane must be put into the flight configuration prior to loading any payload components. **NOTE: The DBF Final rules have been updated to add this clarification (DBF Rules Final – Updated 17 Nov 2023)**

52. To what extent, if at all, is feedback and telemetry allowed?

Answer: In-flight telemetry feedback through the RC controller is allowed.

53. What constitutes a legal crew cabin design? Is there some max allowed gap between pilot's head and the fuselage exterior that is laterally ahead of the pilot? Is there some minimum required distance between the nose and the pilot?

Answer: The crew cockpit requirements are defined in the rules. Detail design beyond compliance with the rules is up to each team to decide. There is no minimum distance required between crew and nose of the airplane.

54. Does the same restrictions for passengers during flight (ie. no touching anything except for floor/insert, tightly secured) apply while loading passengers into the plane?

Answer: The rules clearly state the requirements which do not include the process of loading payloads.

55. Are we allowed to write custom scripts and programs on an OpenTX transmitter to configure and do various actions with the aircraft such as take off or auto trim?

Answer: Yes.

56. Are we allowed to flash or modify the existing controller logic on the receiver to optimize for our aircraft?

Answer: Yes.

57. Can we add velcro to the passengers/EMT/patient as a restraint system?

Answer: Velcro is acceptable to use in the restraint system as long as it is verified to securely restrain the payload during Tech Inspection.

### **Ground Mission**

58. Does [the airplane] have to roll into the parking spot?

How does the plane have to get into the parking spot? Can we slide it sideways into the spot?

Does the plane have to move itself into the parking spot?

Answer: No, it is placed in the parking spot prior to the start of the Ground Mission by the crew member.

59. How many passengers have to be loaded in Ground mission? Is it the maximum declared in Tech Inspection?

How many passengers are to be loaded for the Ground Mission? Is it the maximum declared passengers?

Answer: The number of passengers required for the Ground Mission is the maximum number declared in Tech Inspection. **[NOTE: The DBF Final rules have been updated to add this clarification (DBF Rules Final – Updated 17 Nov 2023)]**

60. Does the assembly crew member have to remove the passengers from the insert, or as long as the passengers are outside of the plane it counts?

During ground mission, do the passengers need to be removed before the insert, or can the insert and passengers be removed at the same time?

Do passengers have to be removed from the insert for the last section of the ground mission?

Answer: The passengers are only required to be removed from the airplane during the timed event. If an insert is used, the passengers do not have to be removed from the insert before calling “STOP”.

61. Can the passengers be placed in a specific way in the terminal area, or must the passenger placement be the same for all teams.

Answer: There will be a general terminal area defined in the Ground Mission near the parking spot. How teams choose to arrange the various payload components, inserts if used, tools, fixtures, etc within the terminal area is up to each team to determine and this will be done before the timed mission starts.

62. Can the passengers be pre-inserted into floor inserts at the start of the ground mission?

Can the dolls be loaded onto the inserts before putting the inserts in the payload compartment in the GM?

Answer: Passengers, EMTs, patient, etc cannot be pre-installed into inserts or fixtures prior to time starting.

63. Do propellers need to be changed during ground mission?

Answer: There is no requirement to change propellers or any other airplane subsystem during the Ground Mission.

### **Power**

64. Can we change the propulsion battery capacity, voltage or size between missions?

Can different batteries be used for different missions?

Answer: Yes, but ALL propulsion batteries must be approved in Tech Inspection and this will be verified upon entering the staging box. If a team enters the staging box without a Tech Inspection approved battery, they will lose their mission attempt and must return and have the batteries approved by a Tech Inspector before attempting another mission.

65. Is the battery capacity used in the score calculation of M3 in (mAh) or in (Wh)?

Answer: As clearly stated in the rules: "The score will be a function of the number of laps flown \* number of passengers / rated battery capacity (Wh).

66. Can the peak current exceed 100 A, if the continuous current is below 100?

Answer: The requirement verified in Tech Inspection is that the arming fuse capacity does not exceed 100 amps.

67. Is a second avionics battery allowed to be in contact with the main propulsion battery?

Answer: No, there must be sufficient spacing to prevent overheating and this will be validated in Tech Inspection.