FAQ: 2023-2024 Design-Build-Vertical Flight Competition
[Updated 1/3/2024]
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Q: The RFP states- "a separate battery is required to power the ESC/flight control system". Can you please explain this further?
A: The ESC and motor must use their own 'propulsion system' battery, which is one and the same. The flow of power goes from battery, through the ESC, to the motors. The flight control system must use its own battery that is separate and disconnected from the propulsion system battery.

Q: We understand that the purpose of the shunt plug is to kill all power should it be pulled, and that it is required to be placed between the battery and ESCs. Can you give some examples of how teams in the past have installed shunt plugs on their aircrafts? Or how you would recommend installing the shunt plug?
A: The shunt plug can be a very simple device. A high power wire placed in series between one of the battery bank terminals and the ESC. Pulling the shunt plug opens the circuit, disrupting the flow of power from the propulsion system battery bank to the rest of the aircraft. In the past, teams have physically built a shunt plug using a strip of insulated high power wire with a plug-in connection to the power system. 'Yanking' on the shunt plug disconnects it and opens the circuit.

Q: The RFP states, "For the purpose of competition safety, unaltered commercially available LiPo batteries of six cells or less (6S or less) may be used." When referring to unaltered commercially available batteries, is it illegal to alter the connectors on a commercially battery? For example, can teams alter connections on the batteries from xt to bullets? Or if teams use a battery with no connectors can teams attach on their own?
A: It is legal to change the external connection that connects the battery pack to the onboard components for your aircraft design. It is illegal to alter anything inside the LiPo packaging between cells, etc.

Q: The RFP states, "Note that a separate battery is required to power the ESC/flight control system." What precisely does the flight control system refer to? Is it just the flight computer or does it extend to servos as well? For example, if servo motors are used on our control surfaces, to control but not propel the vehicle should it be powered by the flight control system?
A: Typically in RC model aircraft building, servos attached to control surfaces can be powered by the flight control system battery so as to retain some control of the aircraft in the event of propulsion system power failure or shut-down. This decision is left up to the team but is recommended. The flight computer and onboard transmitter hardware, at a minimum, must be isolated from the propulsion system battery that provides power to the propulsion system.
Q: Is it legal to have 2 separate and independent power systems, as long as it adheres to other limitations? For example, would it be acceptable to have one battery system running 2 motors of a quadrotor, and a second battery system running the other 2 motors? In this example is it acceptable to have 1 shunt plug that will break both systems (i.e. a dual pole)?

A: Yes, this is acceptable so long as it follows the RFP regulations on batteries, single action shunt plug, etc.
Q: If more than 5 members want to attend the flyoff competition, will there be viewing areas for the members who will not be actively participating, or should only 5 members ever be present on the fly-off site? Is it permitted to have different members of the team make up the 5 participants for different days of the fly-off?
A: The 5 team member limit has been historically imposed due to venue space limitations in the event of inclement weather requiring indoor space at the competition. The VFS DBVF committee may increase this number leading up to the competition, however, the current guidance is always 5 team members. It would be permissible for a team to rotate participating members on each day of the competition, if they adhere to the maximum of 5 team members on site at any given time.

Q: Per RFP section 2.0 and 2.3.1, must the SoftGrip weights have a safety wire through the grommet connecting to the frame for all payload configurations, or only if the payload is mounted externally?
A: There must be a safety wire through the grommet.

Q: Please clarify MTOW? If an aircraft can take off at 20 lb (MTOW) but the team decides to fly with a lighter battery to increase mass fraction, the score (payload weight/MTOW) would not change. A better scoring formula may be (payload weight/gross takeoff weight).
A: Maximum take-off weight for this scoring formula is the maximum weight the vehicle will take off at in the competition. It is not the maximum weight the vehicle could take off at. The scoring formula can be interpreted as 'payload weight / gross takeoff weight.'

Q: Must the shunt plug be located 6" away from the rotors only, or must it be 6" away from any part of the aircraft?
A: The shunt plug must be located 6" away from the disk area swept by the rotors throughout their rotation.

Q: Please provide an example of a shunt plug that would be acceptable?
A: A shunt plug is simply a wire placed somewhere in series between the power system battery and the ESC. Pulling the shunt plug disrupts the flow of electricity to the ESC and kills the power to the ESC and motor.
Q: Can teams legally connect six, one cell batteries together in series in place of a single 6S battery?
A: Teams would be permitted to string 6 one-cell batteries together in series, as long as the maximum pack or bus voltage remains under 25.2V. Batteries tied together in series must be identical commercially available batteries of similar age and use history.

Q: The RFP states Lithium Polymer batteries as a requirement quite clearly, does this include Lithium-Polymer High Voltage (LiHV)?
A: Per the DBVF RFP Section 4.0, item 3 (text copied below). Commercially available LiPo batteries with a maximum specified capacity up to 4.2V/cell are permitted. The maximum size battery pack permitted is a 6S pack, i.e. 25.2V maximum.
A: High voltage LiPo batteries (LiHV) are not permitted.

Q: Is there a chance that Lithium-Ion batteries may be allowed?
A: Lithium Ion batteries are not permitted.

Q: What is the protocol for a tie during a fly-off event (i.e. If two teams fly the same number of laps how will scoring be approached)?
A: Per the RFP, the competition scoring takes into account several competition components including the Final Technical Report, Team Presentation, and Aircraft Mission Performance. Even if two teams flew the same number of laps, the total team scores as described in the RFP will be used to declare the overall winner.

Per the DBVF RFP Section 4.0, item 3 (pages 14-15).

3. Propulsion System Batteries and Fuses: For the purpose of competition safety, unaltered commercially available LiPo batteries of six cells or less (6S or less) may be used. The team needs to select the proper capacity for their vehicle.

- Multiple batteries following the requirements in this section can be combined in parallel for the propulsion system.
  - For batteries tied together in parallel, each battery must be identical.
  - Note that a separate battery is required to power the ESC/flight control system. It can be a different capacity from the main flight batteries but must still follow the battery guidelines specified throughout the RFP.
- All LiPo batteries at the competition must be charged and stored inside a LiPo charging bag. They are only allowed out while being actively used with the aircraft.
- The host will provide power and a location to charge batteries, but teams should bring their own charging equipment.
- A 6S LiPo battery has a nominal voltage of 22.2V (3.7V/cell) and charging these batteries to the manufacturer’s specified capacity is allowed (typically 4.2V/cell).
- When connecting multiple batteries, ensure that the batteries are a) of the same chemistry, voltage and capacity; b) at the same charge level; and c) of the same age, charge cycle history, and health. Running LiPo batteries in parallel can cause reduced battery performance, which may lead to a crash and subsequent damaging of the batteries, but usually not in itself leading to a thermal event. However, if you try and charge those damaged batteries, it can lead to a thermal event. As such, batteries will be inspected after any crash to assess their readiness for continued use.
- The propulsion and flight control systems must have separate batteries. A propulsion system battery monitor run through the flight control battery is acceptable so long as the
The connection between the propulsion system battery and the flight control system is not a high-power carrying line. i.e. Any connection should transmit a signal only, and no substantial amount of power. This separation of propulsion and flight control system battery is commonly done to allow continued control of an aircraft even after a remote-kill command has been issued to the main propulsion system battery, or if it has otherwise failed.
Q: The rules mention that the team captain, including faculty advisor, must be a current member of VFS at the time of submitting the letter of intent. Does this mean that both the team captain and the faculty advisor both need to be members of VFS? Or just the team captain (whether or not the team captain is the faculty advisor) need to be a VFS member?

A: Both the student team captain(s) and the faculty advisor(s) need to be a VFS member at the time of submitting the team’s Letter of Intent. [https://vtol.org/what-we-do/benefits-of-membership](https://vtol.org/what-we-do/benefits-of-membership)

Explanation of RFP Revisions made on 9/13/2023

2.3: The Fly-Off (page 6)

- Team pilots must have proof of their FAA Part 107 Drone Certification (US based teams) or equivalent certifying authority (non-US based teams) to compete. Refer to Section 7.0 Pilot Requirements
  - FPV piloting is permitted in this year’s competition.

4.0: Aircraft Design Restrictions, Requirements, and Operational Procedures (page 14-15)

3. Propulsion System Batteries and Fuses: For the purpose of competition safety, unaltered commercially available LiPo batteries of six cells or less (6S or less) may be used. The team needs to select the proper capacity for their vehicle.

- Each battery is limited to 100 W hr. [No longer limited to 100 W hr.]
- Multiple batteries following the requirements in this section can be combined in parallel for the propulsion system.
  - For batteries tied together in parallel, each battery must be identical.