

FAQ's about the 2016-2017 Midwest High-Power Rocket Competition
Written up after the Introductory Telecon on September 27, 2016

1. May we change the angle of the launch rail between flights?
A: No. Assume the rail will be vertical for all launches.
2. Please clarify what will count as a "direct" measurement of velocity.
A: Calculating velocity based on acceleration information would be classified as "indirect," as would sensing changes in ambient pressure then looking up altitude-vs-pressure tables to calculate velocity. In this competition calculating velocity based on gps data – again watching for changes in altitude as time goes by then calculating velocity from them – would also be considered "indirect." However measurements used in wind tunnels to determine air speed, like pitot tubes, hot wire anemometers, and rotational anemometers, would all be considered "direct" measurements. Be sure to fully describe your velocity-measuring plans in your CDR so you can get feedback from the judges about whether or not they will be considered "direct."
3. Does a single parachute, deployed at one altitude then opened, using a chute release, at a lower altitude count as "dual deploy"?
A: No. Your competition rocket needs to have two parachutes that fully open at two different altitudes (and in view of your up-looking video). However you may elect exactly when and how to deploy them from the vehicle, as long as you do so no earlier than apogee and can distinguish electronic deployment (good) from motor-eject deployment (required as a back-up, but considered less good). Deploying your main at apogee, along with a drogue, but keeping the main from opening till the rocket is lower using a chute release would be acceptable.
4. May we use cluster motors and if we do, how will "total impulse" and "total thrust" be defined?
A: After some post-telecon consultation we have decided to say "no" to cluster motors, due primarily to safety concerns. One main concern is that sometimes not all motors in a cluster will ignite, resulting in asymmetric thrust which can destabilize a rocket during the boost phase. (This can be mitigated to some degree by canting the motors toward the CG of the rocket.) A related problem is that motors, especially if they are not identical, may not come up to pressure at the same time. This can lead to the rocket leaving the rail at an unsafe speed (too low) and possibly tipping over before full thrust is achieved with the rocket no longer vertical. Notice that decision this precludes both ground-ignited clusters as well as air-starting additional motors.
5. May we deploy braking devices while the motor is still boosting?
A: No. Related to this point, though, remember that the rocket needs to look identical at launch and as it approaches apogee for all flights so before the rocket reaches apogee you need to retract and stow any adaptability devices that were deployed upon ascent. Any changes made between flights must be exclusively internal. Switching motors (and motor cases) would be one such change that every team will make.
6. May teams re-fly the rocket they built last year at this year's competition?
A: No. Although that rocket might be able to achieve some of this year's goals, the process of actually designing and building a rocket would suffer if we allow this. Teams may look back at past designs – their own or others – as a starting point. But they should plan to design and build

their own rocket. Perhaps tell them “That design/rocket was good – now make another one that is even better!”

7. What is an example of an “adaptable” rocket that looks the same on launch yet performs differently in flight?

A: Last year many teams built rockets with airbrakes that only extended out (then retracted) on certain flights. On other flights they were left retracted the whole time. That approach might work again for this new challenge.

8. Are we allowed to use other types of thrusters (i.e. not solid rocket motors) like pressured gas thrusters or ducted fans, to provide additional upward (or downward) thrust?

A: Yes, but no additional solid-fuel motors (that would be a cluster) and no liquid-fuel motors (though using pressured gas to expel an inert liquid like water would be acceptable). Be sure the thrust you provide does not destabilize the rocket, so keep it symmetric. The additional thrust and the additional impulse provided by such systems will NOT count toward your thrust ratio or impulse ratio, but might help improve your apogee ratio.

9. If we elect to fly more than twice do we have to re-do both the lower-power and the higher-power launches?

A: No. At the end of the competition launch day you may select your two best flights for scoring, as long as they satisfy the competition criteria. That said, you might even try a “conservative” higher-power flight followed by an “aggressive” higher-power flight, to see which works better (i.e. your repeated flights don’t necessarily even need to be on the same motors as your original two flights).

10. Are rockets allowed to go supersonic?

A: Yes, but be sure to use an altimeter that can deal with going supersonic and you will need higher-grade construction techniques as well.

11. Please clarify what you mean when you say that the motors should be “as different as possible.”

A: Don’t take this phrase too literally – refer to the scoring formula in the handbook to see exactly which aspects count. To get the most points, select motors that have different total impulses (indeed, they need to be in different motor classes, but that still leaves a wide range of impulse ratios available) and different average thrusts. However having different diameters, different number of grains, different burn time, etc. won’t garner extra points. The real key is to figure out how different you dare go with your motor selection, especially total impulse and average thrust, yet still achieve the same apogee.

12. May we use control surfaces on the fins to intentionally cause non-vertical flight to keep from going so high?

A: No. Controls are allowed, but only ones designed to maintain vertical flight. Tripoli regulations (and federal regulations) allow controls, but only as long as the rocket is “stable, not guided.”

Notes from Gary Stroick, competition technical adviser, and James Flaten, MN Space Grant organizer:

- Don’t cut things too close regarding test flights in the spring. If things don’t go as planned (weather delays, minor damage, major damage, delivery delays in getting parts, etc.) you want to leave yourself enough time to recover and still get your final written report in on time. That

report is due in early May, so aim to be doing test flights in March and early April, not even late April, if at all possible.

- Don't be late in submitting your written documents. They are time-stamped when submitted by e-mail and will suffer a 20% deduction for every day, or fraction of a day, they are late. This includes being even one minute late on the day they are due! Real life has hard deadlines – do not expect due date extensions or flexibility.