

KLOUDBusters Rules for Multi-Staged Rockets

There is an old adage that refers to staging of rockets that goes something like this. "The mathematics of staged rocket flight is $1+1=5!$ "



When everything works as designed, a multi-stage high power flight is spectacular. However, when something goes wrong, things can get ugly really quickly. There is no doubt that a multi-staged rocket flight anomaly presents a higher risk of injury or property damage than a conventional single stage rocket. There are several failure modes present in multi -stage rockets not present in single stage flights including sustainer motors firing when they are not supposed to (on the ground or in flight) as well as sustainers firing after the booster has failed for one reason or another. These failure modes directly impact safety of both the flyers and spectators as the result can be the flight of a rocket under thrust in a non-vertical trajectory.

In an effort to minimize risk, effective June 1, 2013, the KLOUDBusters have implemented two new safety rules regarding high power multi-stage flights at the Argonia Rocket Pasture.

Two Stage Rule #1 - This rule applies to multi-stage flights with one or more "K" or greater impulse motors installed. The ignition of the sustainer motor must be controlled by one of two types of electronics:

- (A) An altimeter capable of inhibiting the ignition of the sustainer unless a specific time/altitude threshold is met, or;
- (B) An altimeter that checks for vertical trajectory of flight prior to sustainer ignition. Flights of all "K" and above multi-stage rockets will be required to complete and submit the KLOUDBusters High Altitude Project Submission Template thirty (30) days in advance of the launch (the form can be found here: <http://kloudbusters.org/images/HiAltApp.doc>) regardless of the altitude the rocket will attain. A description of the electronics used to comply with this rule and of the time/altitude threshold or other means of inhibiting sustainer ignition in the event of a not nominal booster flight will be required.

Two Stage Rule #2 - There will not be any drag races of multi-stage rockets regardless of impulse installed. When you consider the complexity of each flight with the number of events that must occur for a successful and safe flight, the KLOUDBusters are not willing to subject our spectators and guests to that level of risk.

If you have any questions or concerns, please contact our prefect at prefect@kloudbusters.org.