ARTICLE 3: RED DRAGON, CAMERA POSITION AND MORE

The Red Dragon lifts off on September 12, 2021.

Image:
DJI FPV
4K@60fps

By TR Garman

Introduction

In my previous articles, I wrote about cameras and rockets and ways to mount cameras on rockets.

A Tripoli Pittsburgh club rocket, the Red Dragon, recently flew at our local launch and makes an excellent example of some of the equipment and techniques that I have been presenting. Using the most basic mounting method (the Stick and Tape) a single RunCam Orange was mounted to the center section of the Dragon to capture onboard images.

In addition, a ground mounted camera was placed on a tripod and a drone captured aerial footage. A phone camera was used for launch pad shots and around the pits.

We'll also use the Red Dragon examples to dig a little deeper into Camera Position and how it affects our images.

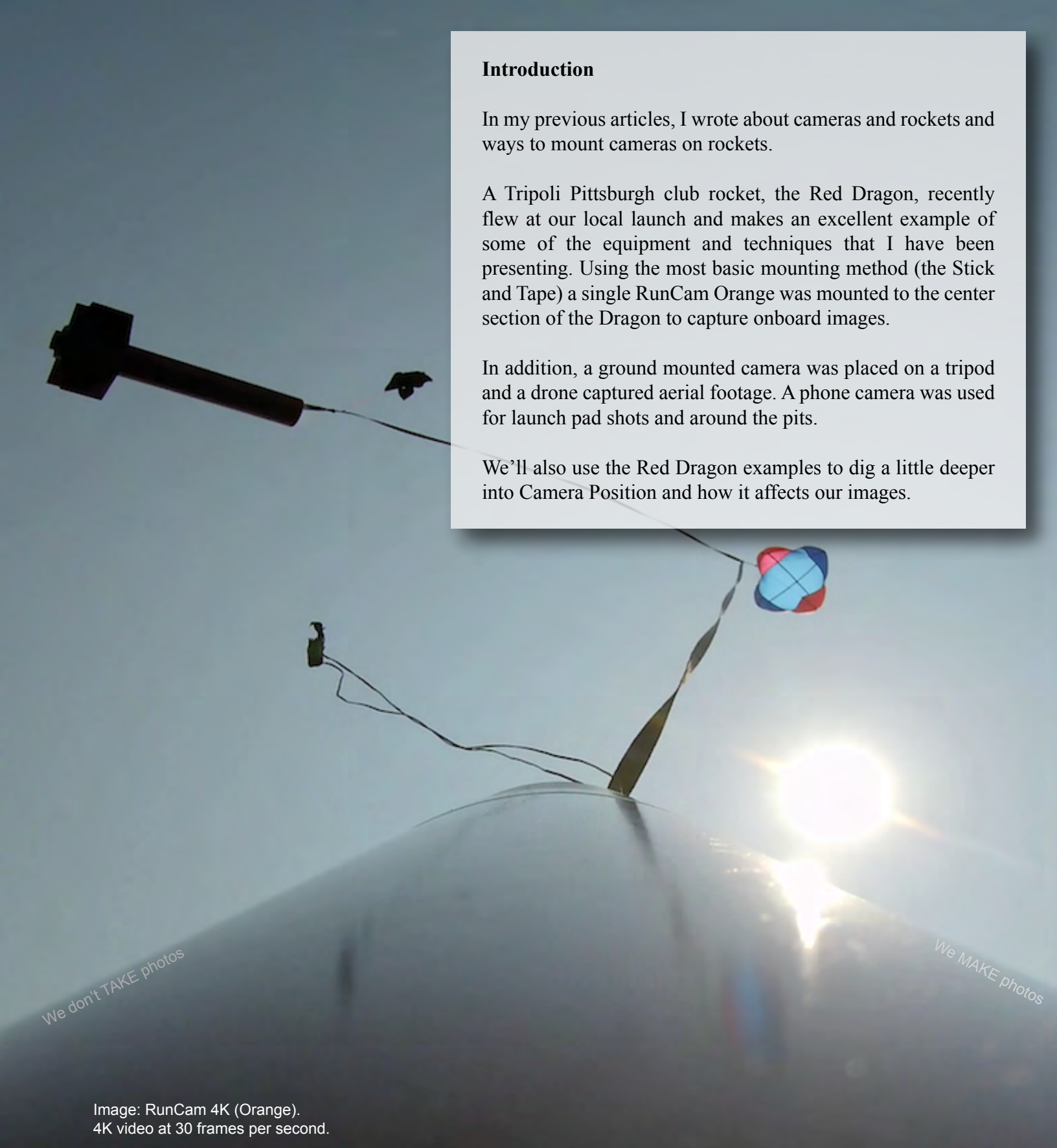


Image: RunCam 4K (Orange).
4K video at 30 frames per second.

Composition

One way to look at any shot is as a Subject and a Story. In this case our Subject is the Red Dragon and in this particular shot the Story might be titled “Dragon Setup in the Pits.”

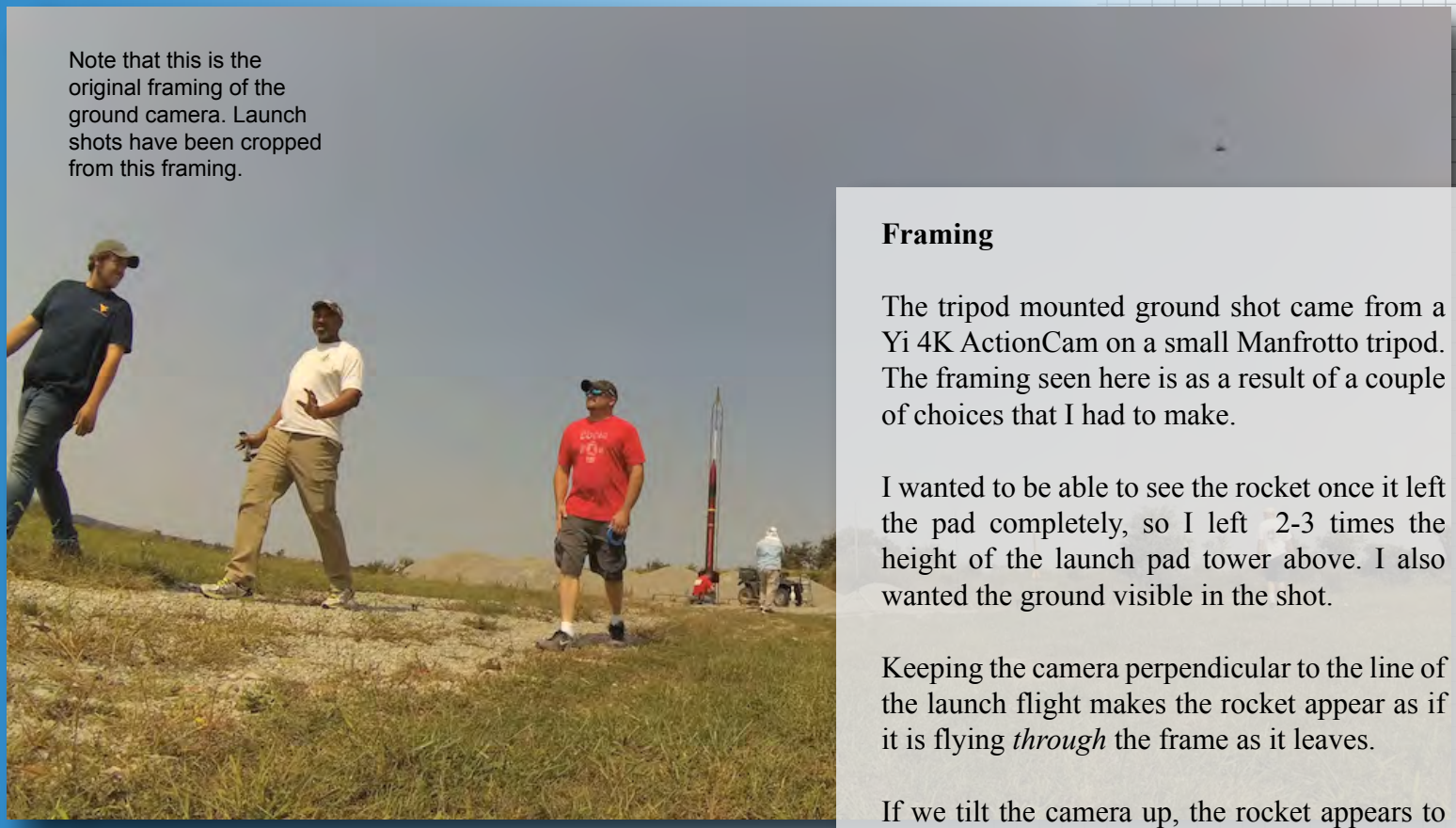
To compose a shot like this, place your subject in the frame and fill the rest with the story. In this case the Dragon lying on the table tells a different part of the story from a launch shot.

Scale is a problem when shooting pictures of rockets. A small rocket can look like a large rocket if there is nothing else in the frame to give it scale. This shot is a little tricky in that I could be shooting a small rocket close up in a way to make it look larger.

Ground Shot

I wanted a launch shot pretty much like this one. Due to the slight tilted up attitude of the camera, the rocket has a little bit of a “flying out of the back of the frame” look. See next page for more.

Image: Yi 4K ActionCam
4K video at 30 fps



Note that this is the original framing of the ground camera. Launch shots have been cropped from this framing.

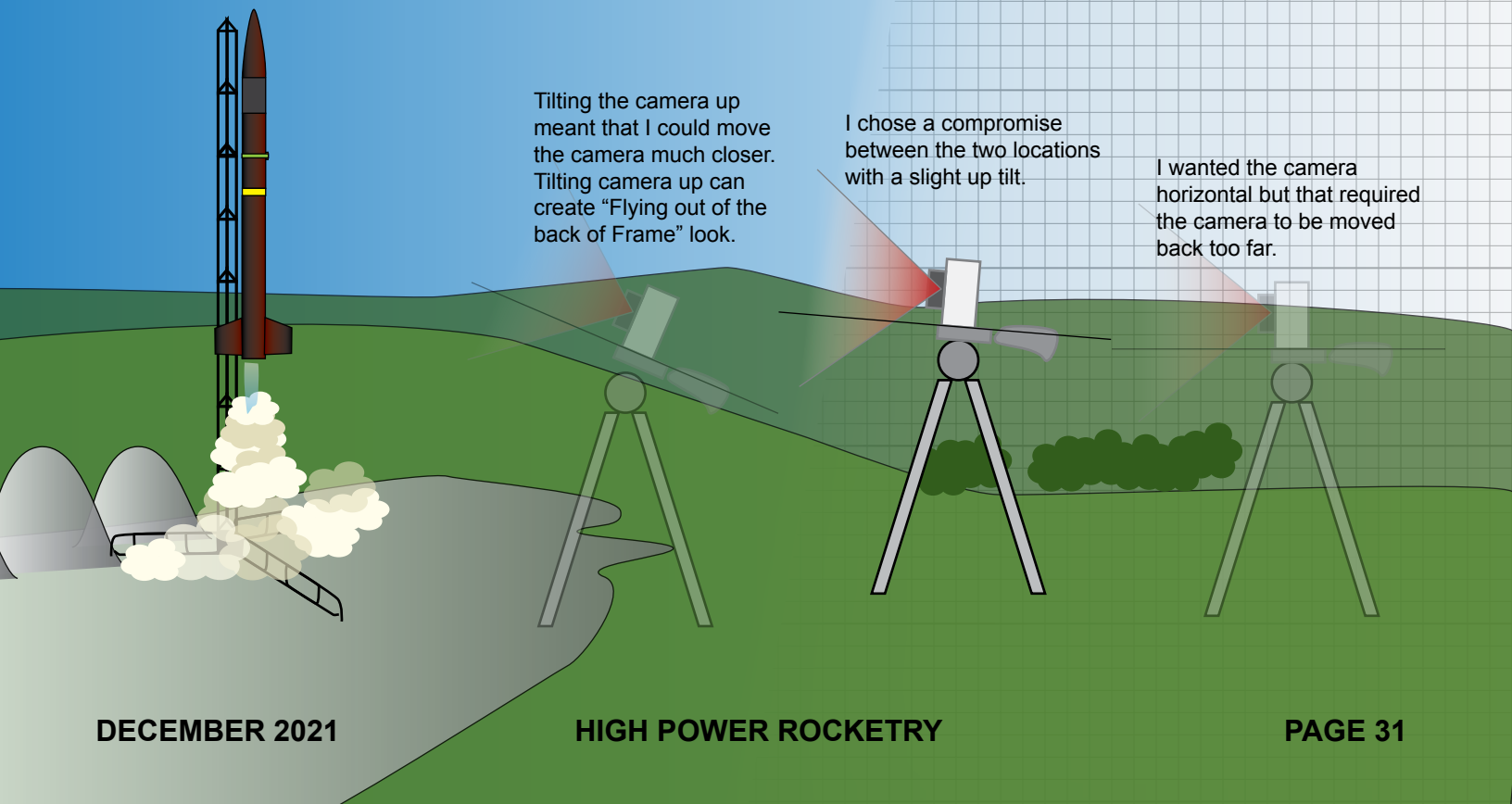
Framing

The tripod mounted ground shot came from a Yi 4K ActionCam on a small Manfrotto tripod. The framing seen here is as a result of a couple of choices that I had to make.

I wanted to be able to see the rocket once it left the pad completely, so I left 2-3 times the height of the launch pad tower above. I also wanted the ground visible in the shot.

Keeping the camera perpendicular to the line of the launch flight makes the rocket appear as if it is flying *through* the frame as it leaves.

If we tilt the camera up, the rocket appears to be *leaving* the frame. I refer to this as "Flying out of the back of the frame."



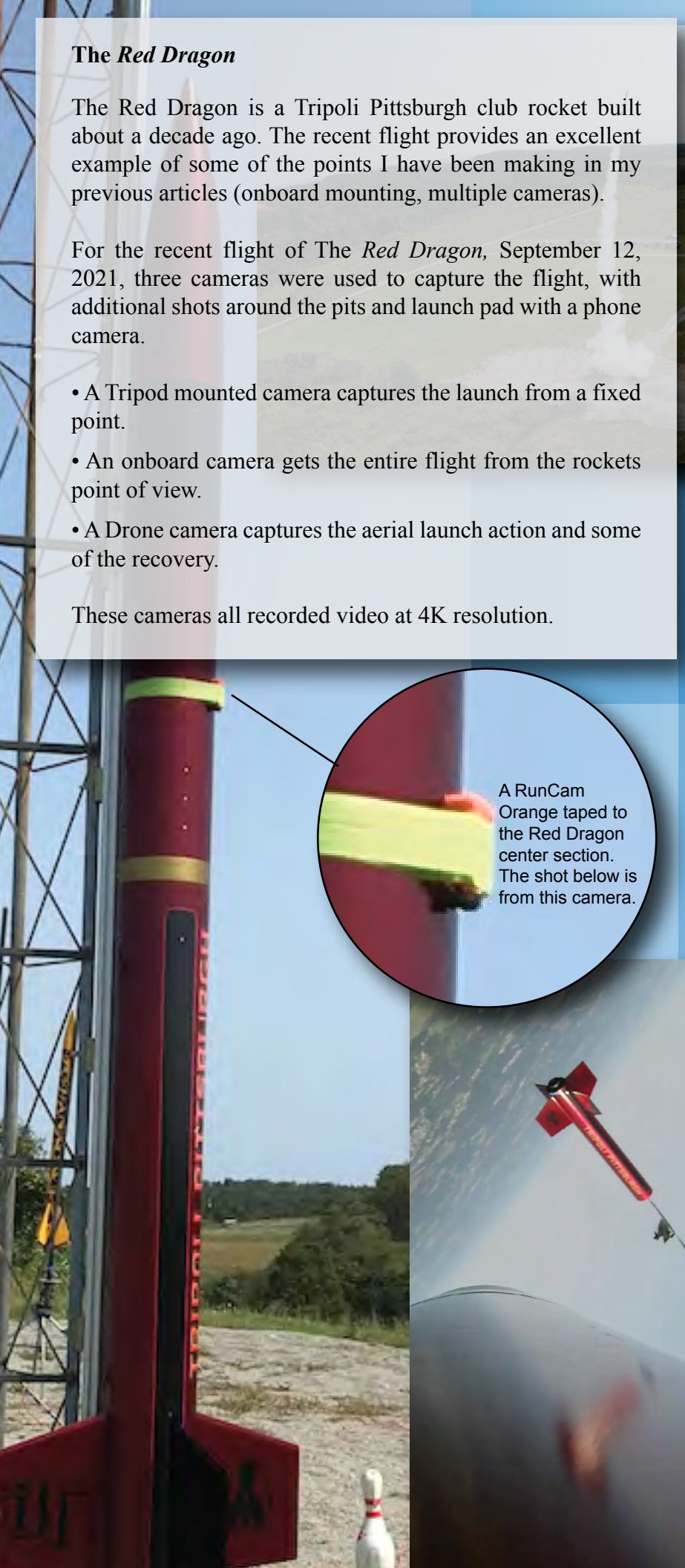
The *Red Dragon*

The Red Dragon is a Tripoli Pittsburgh club rocket built about a decade ago. The recent flight provides an excellent example of some of the points I have been making in my previous articles (onboard mounting, multiple cameras).

For the recent flight of The *Red Dragon,* September 12, 2021, three cameras were used to capture the flight, with additional shots around the pits and launch pad with a phone camera.

- A Tripod mounted camera captures the launch from a fixed point.
- An onboard camera gets the entire flight from the rockets point of view.
- A Drone camera captures the aerial launch action and some of the recovery.

These cameras all recorded video at 4K resolution.



About The *Red Dragon* by Joe Pscolka

The Red Dragon rocket was originally a Tripoli Pittsburgh group project for BALLS 19, sponsored by Curtis Turner of Performance Rocketry. The build team consisted of Tom Blazanin, Dave Rose, George Pike, Christine Rial, and myself.

The rocket flew successfully at BALLS 19, boosting on a 152mm, NASSA O4760, burning NASSA White propellant. I believe it went to a little over 18,000'.

Two years ago I decided to rescue the rocket from Tom's musty shed where it had lived for quite a few years. Once I got it to my shop, I discovered several desiccated mice as well as a bird inside one of the body tubes. The rocket was filthy and smelled strongly of mildew. I took all the parts outside and sprayed them inside and out with bleach; afterward I pressure washed away the filth.

I completely rebuilt the electronics bay, trashed the old motor mount and installed a new 152mm motor mount. Next, I built a 98mm motor mount adapter. I then removed the old nose cone bulkhead, installed a full length 3" dia. payload bay and electronics sled, then installed a new bulkhead with new hard points.

The rocket is 8" in diameter, 133.5" in length, and weighs 89 pounds without a motor.

First flight after the resurrection was on a 98mm NASSA M1533, burning NASSA Violet propellant, to an altitude of 4,100' at the September 2021 launch.

The RunCam2 4K (Orange)

I referred to this as the *Orange* in my earlier articles because that is what I call it. Since then, the RunCam company introduced another camera called the "Orange" which is cube shaped.

In article #2 from this series, I illustrated the mounting method for an Non-integrated camera/rocket setup. A Non-integrated system means the camera can be added to an existing rocket without integrating it into the design beforehand.

The *Red Dragon* is a perfect candidate for a Non-integrated camera setup and the most basic of the mounting methods was used: Stick and Tape.

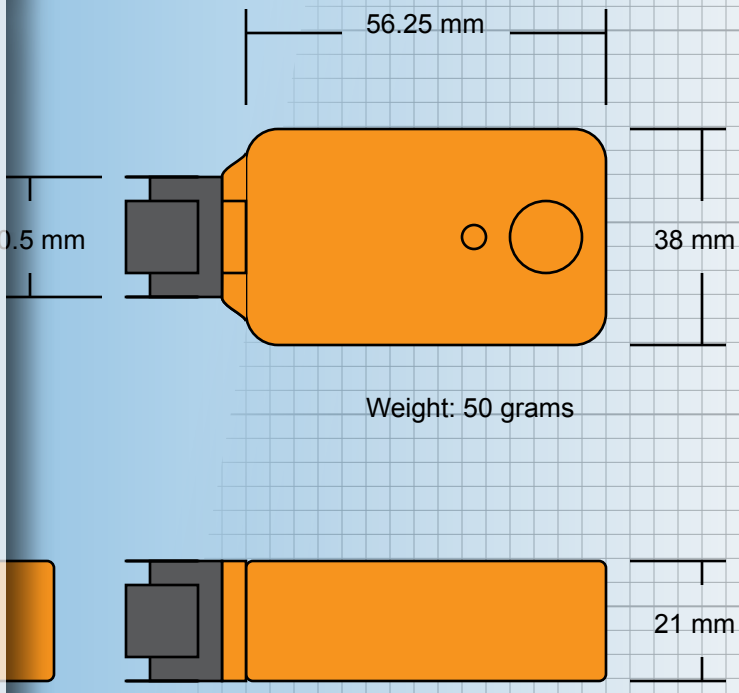
Stick and Tape: Use double sided tape to stick the camera into place. Wrap masking tape around body tube and camera. Leave Power button accessible.

For the *Red Dragon* flight, the *Stick* part was eliminated and only green 3M/Scotch 233+ Automotive Masking Tape was used to wrap around the body tube. I recommend using the *Stick* part also.

According to flight data, the *Dragon* topped out at 0.58 mach with an altitude of about 4,100 feet.

In general I don't really recommend using the *Stick and Tape* method for a rocket this big (8" diameter, over 100 lbs at lift off, M motor, etc), but the flight of the *Red Dragon* demonstrates that it can be done.

Improvements for camera mounting on the *Red Dragon* are currently in the works, so check back in a future article for the results.



The RunCam taped to the Red Dragon. Tape was pulled taught and quite a few layers were wrapped.

Note:

Shoot better pictures than I did!

This is the only shot that I have that shows the mounted RunCam on the Red Dragon.

The single camera onboard misses portions of deployment due to the angle between the 2 sections as they separate. A second camera on the opposite side most likely would have captured the action that the single camera missed.

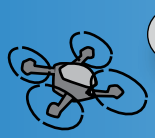
The Flight of the *Red Dragon*

Three cameras were used to capture the images of the most recent flight of the Red Dragon on September 12, 2021. Additional shots with phone camera.

1. **Drone**. DJI FPV drone, 4K@60fps video. The cover page image for this article shows the shot from this FPV drone.

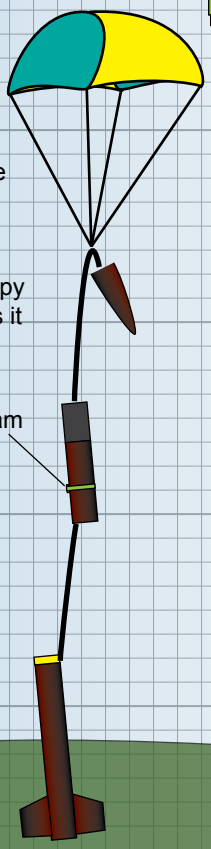
2. **Onboard**. Runcam 4K (Orange), 4K@60fps video. Images from this camera can be seen on the following pages.

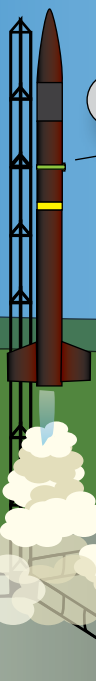
3. **Ground**. YI 4K Action Cam. Images on following pages.



The DJI FPV drone was essentially parked in place for the launch.

Under main canopy the camera views down to the booster and the approaching ground. None of the main canopy action was captured as it occurred behind the camera.





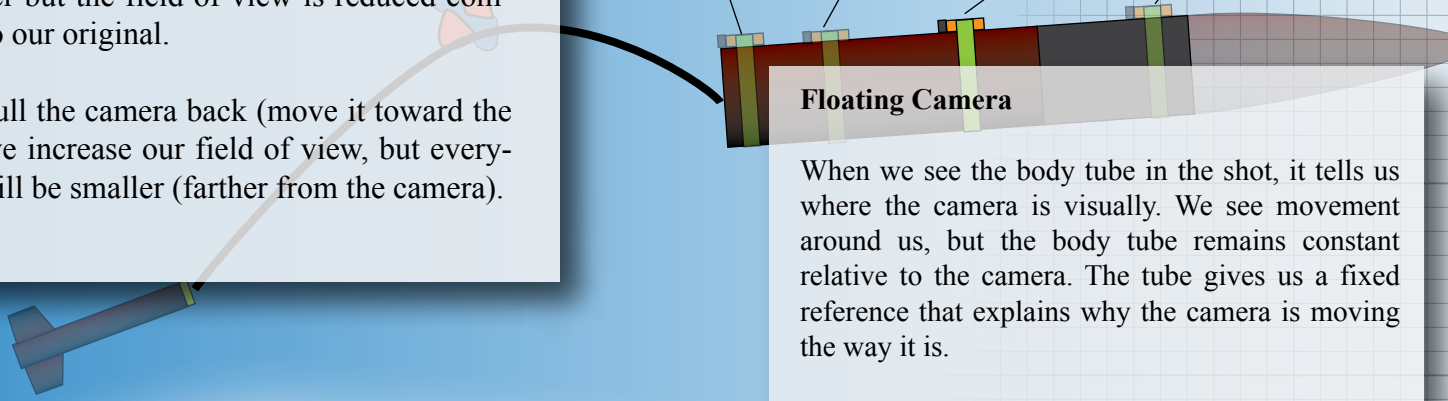
The onboard camera viewed down the body tube in classic *CineRoc* fashion. See previous article for more on the *CineRoc* shots.

The tripod mounted shot was placed about 50’ from the launch pad.

Onboard Camera Position

Where our camera is positioned along the length of our body tube has a large bearing on our final image. Moving the camera closer to the point of deployment will cause everything that we see to be larger but the field of view is reduced compared to our original.

If we pull the camera back (move it toward the nose) we increase our field of view, but everything will be smaller (farther from the camera).

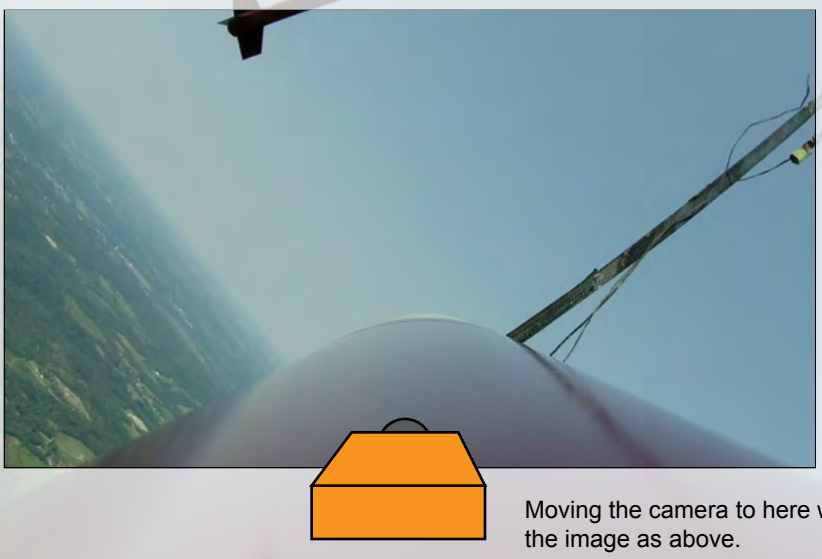


Floating Camera

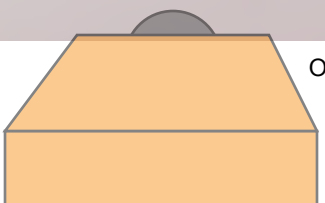
When we see the body tube in the shot, it tells us where the camera is visually. We see movement around us, but the body tube remains constant relative to the camera. The tube gives us a fixed reference that explains why the camera is moving the way it is.

If change the camera position to the end of the tube, we can view much more of the deployment but we lose our reference point. It can appear as if the camera is floating on it's own.

The Floating Camera is primarily an issue for video, but the body tube in the frame tells us a lot in still photos too. How much tube is up to you!



Moving the camera to here would change the image as above.



Original Camera Position

Image Data

While our altimeters provide us with the altitude and other data, the camera can provide us with a visual record that suppliment the numbers.

The image behind was taken just before apogee deployment. Using various points (launch pad, smoke trail, current location/position of rocket, etc) we can draw an approximate line of the Flight Path.

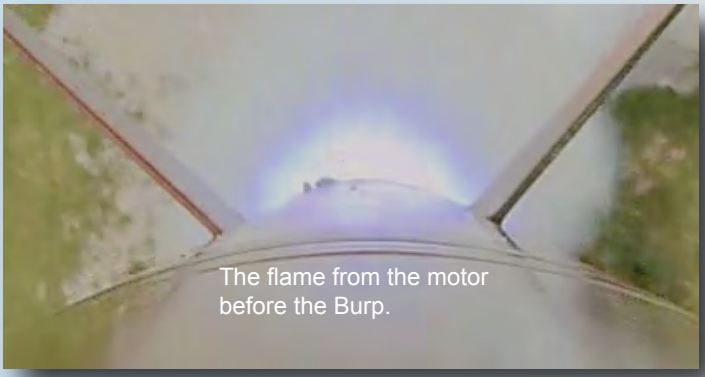
How we can determine rocket position/orientation relative to the launch site and how we might justify the Flight Path line in the image is a topic to be addressed in a future article. But the image here gives us a good idea of where we are heading.

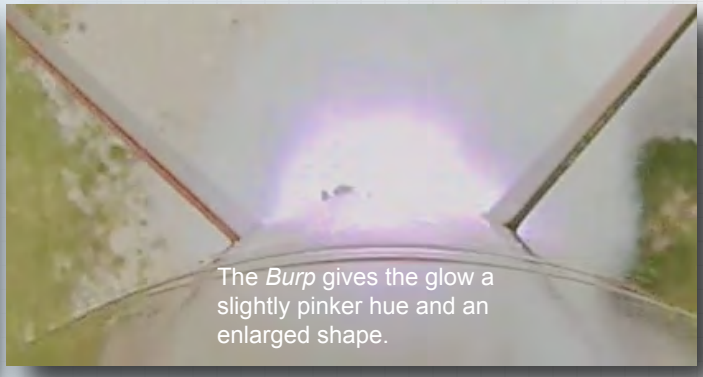
A minor motor event that occurred just after lift off, the *Burp*, was discovered from the onboard footage and is detailed below.

The Burp

At just over 2 seconds after liftoff, the motor made a little “Burp”, as I call it. Up until the *Burp*, the glow of the motor burn appears realativly consistant in size, shape and color. The frame on the right shows the *Burp* and the change in the burn image.

A number of different hypothosis are being discussed as to the possible cause of the *Burp* and will be reported on in a later article.



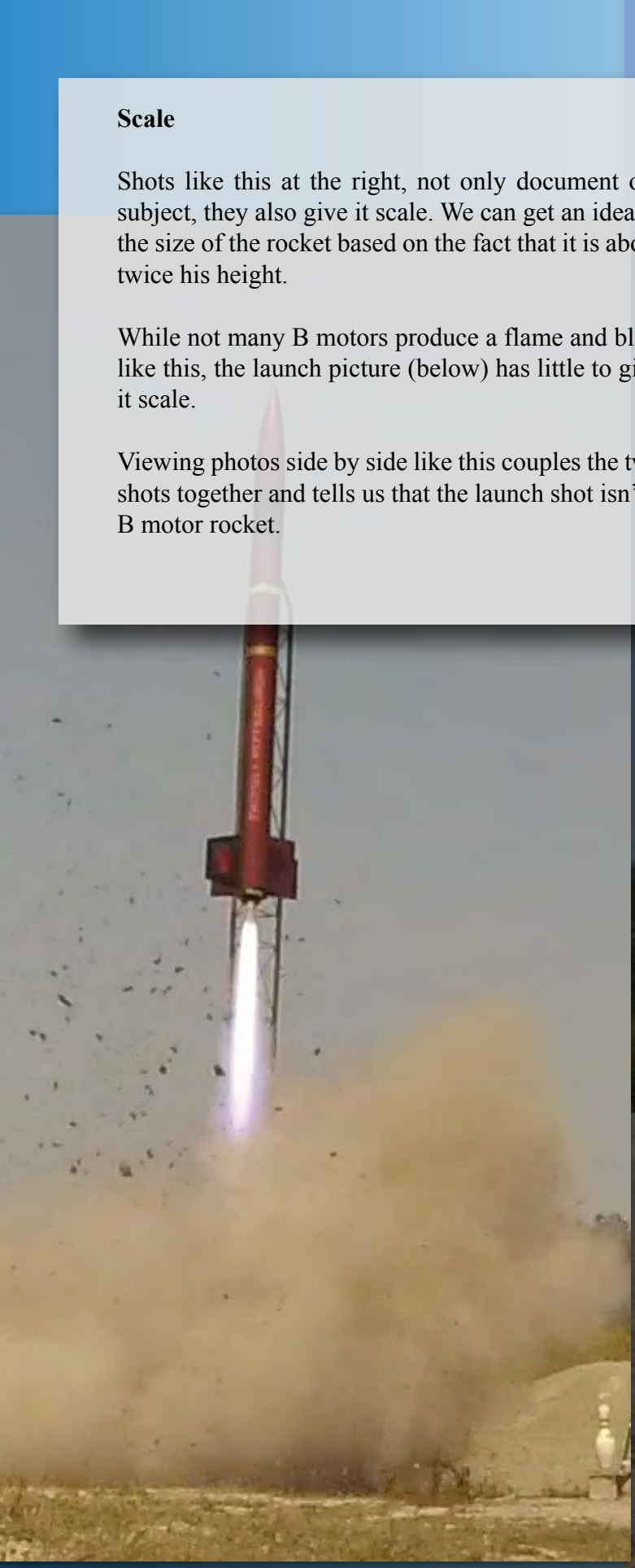


Scale

Shots like this at the right, not only document our subject, they also give it scale. We can get an idea of the size of the rocket based on the fact that it is about twice his height.

While not many B motors produce a flame and blast like this, the launch picture (below) has little to give it scale.

Viewing photos side by side like this couples the two shots together and tells us that the launch shot isn't a B motor rocket.



Cover Shot

The cover shot came from a DJI FPV drone parked a safe distance from the launch. In this shot we can see the tripod mounted camera that produced the ground shots (below).

A safe distance for this drone shot turned out to be a good framing distance as well. I wanted to be able to see the rocket break the horizon into the sky (as in this shot) so I didn't want the camera tilted down. My rule of thumb is to frame it so that I have a little sky in view, and then add a little more sky. A bit of extra sky adds a little safety margin for getting the shot that I want. More about drones in the next article.

The Red Dragon nearly disappears against the background trees (inset below) compared to the contrast against the sky.

Ground camera on tripod

Drone Safety

If we define our safe distance as one Ruler, we can get a visual means to estimate our safe distances for our drones. Use the pits as a reference.

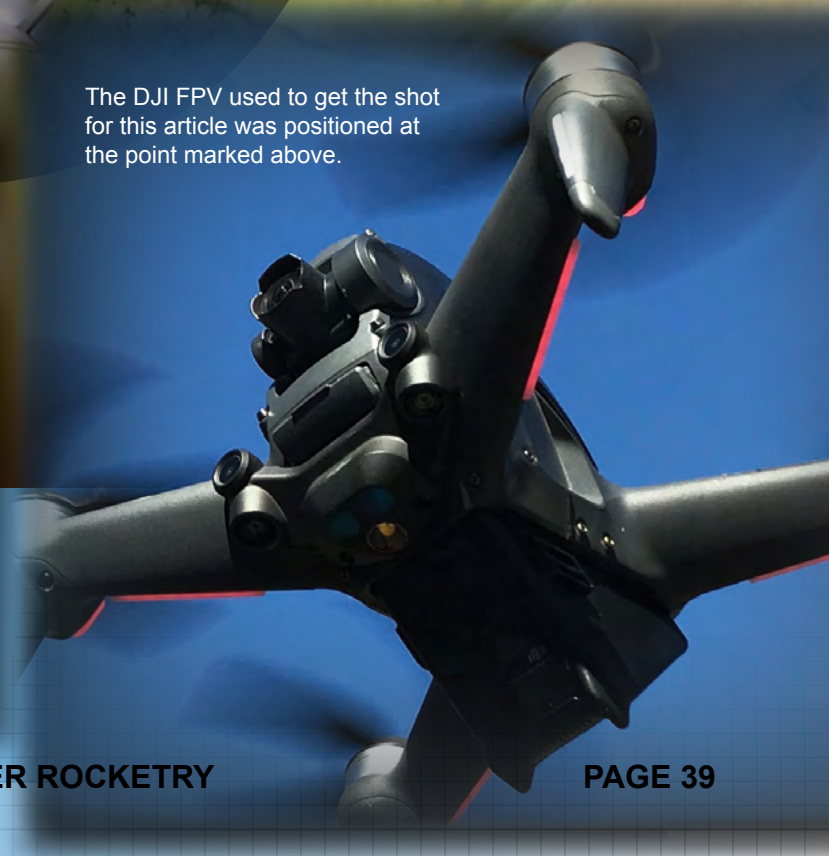
Keeping the sky in our shot as I recommend, then a safe distance at a low altitude (under 100') is one ruler or more.

With NO rockets scheduled to launch, fly your drone to a point above the launch site and make a Ruler in your head. Draw a circle around the launch pad with the ruler as a radius. Keeping our drone outside the circle means our drone is safely clear of our rocket launch.

Drone

The drone used for the *Red Dragon* flight was a DJI FPV (pictured here). The FPV was designed to be used for drone racing and is flown with goggles. Viewing drone flight through goggles is a great way to frame our shots, but there are a couple of issues.

The FPV does not have a stabilizing gimbal (the camera rolls side to side with the drone), so it may not be the best for a first time drone purchase if you are looking for dead solid footage.



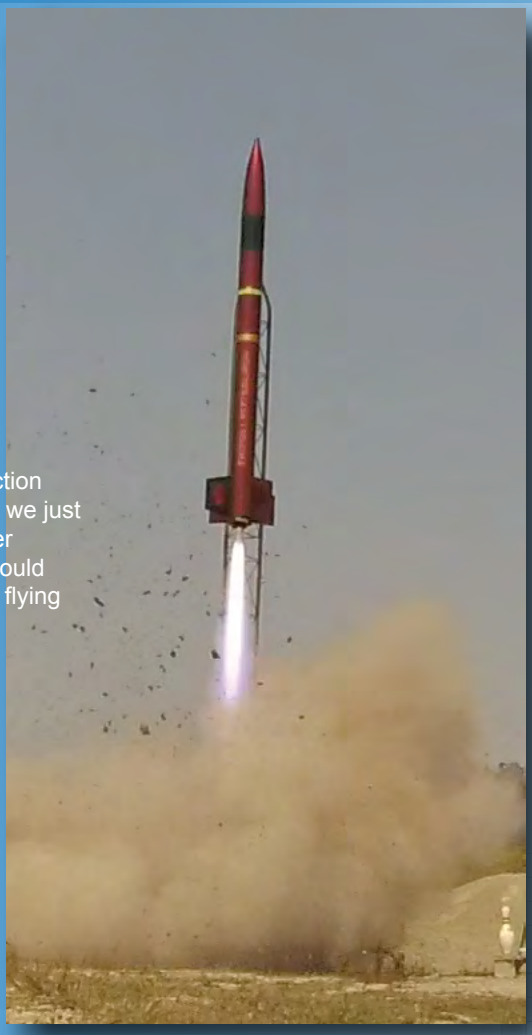
The DJI FPV used to get the shot for this article was positioned at the point marked above.

Another Case for Multiple Cameras

In my previous articles, I made the case to use multiple cameras for shooting images of your rockets. I hope that the examples presented here back up my assertions. But even using 3 (or 4) cameras to shoot the Red Dragon, I missed a number of shots that I would have liked to have captured.

One of the missed shots from the onboard camera was the deployment of the apogee charge and the goodies inside the Dragon. The 3 shots at right illustrate this.

Another major shot that I wanted but missed was the deployment of the main parachute. The camera pointed down the body tube meant that the main was behind the camera. Next time perhaps...



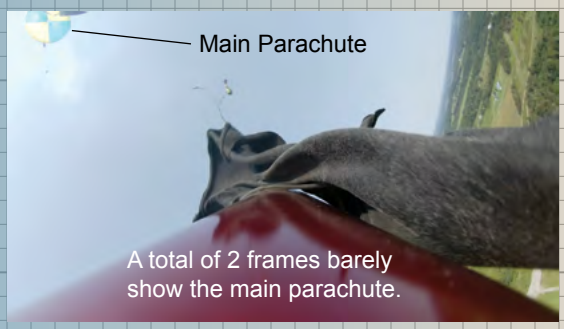
There is a lot of action going on here that we just barely see. Another camera closeup would have captured the flying debris.

This frame shows the moment of deployment at apogee.

Nearly one second passes, looking like this

24 frames later, the booster returns into view.

Later...



A total of 2 frames barely show the main parachute.

Choose Your Postcard

In my first article, I suggested choosing a shot that you like and making your own Postcard. Here are just a couple that I chose from the onboard footage although we could choose many. Add some nice looking text and get some photo paper and basic frame. Even a print done on an inkjet type printer can look pretty good. Or take it to a copy/print place and have a good print made. Get a basic frame and stick it on the wall.

I might choose a couple of the launch shots from the ground camera and the drone. Both of the launch cameras got good footage as well for a postcard.

Another option is to make a mural of some kind. Crop and resize your shots and put together a single page representing the whole flight. You may want to make it physically larger than typical printer paper.

Red Dragon

NASSA Violet M-1533
September 12, 2021

Add some text to the shot with pertinent information.

Conclusion

I wanted to get certain shots and footage during the flight of the Red Dragon. In general I got most of what I wanted and the next flight I'll get even more. I hope that the information presented in this article documents the flight of the Dragon and how the pictures were captured.

And I hope that this article has been at least of some use to some of you who have made it this far. Thanks for sticking with me and remember to charge your batteries early and often.

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Quiz Question

The *Red Dragon* body tube (seen here) ends below the center of the image frame.

How far do we need to move the camera back before the tube will extend above the center line? (See page "Onboard Camera Position")

Answer in next article.