

**Date:** 2/9/19

**Location:** Argonia, KS (February Fun Fly)

**Rocket:** Mach Wave II Stage

**Motors:** Aerotech I284W to Aerotech H73J

**Weight:** 13.0 lbs

**Weather:** cloudy, 12-16mph winds, 35°F

**Launch:** 14:21 (19:21 UTC)

**Avionics:**

Altimeter	Booster/Sustainer	Drogue	Main	Pyro/AUX
TeleMega S/N 4324	Sustainer (primary)	Apogee	800	Pyro A: T+4s, <18°, 400ft AGL
EasyMini S/N 4556	Sustainer (secondary)	Apogee	500	
TeleMetrum S/N 5099	Booster (primary)	Apogee		
RRC3	Booster (secondary)	Apogee +1		AUX: T+2s, 100ft AGL launch trigger
Jolly Logic CR	Booster (test parachute)		500	

**Pre-flight Prep:** Chute Release rubber band snapped and replaced with a regular rubber band, cold weather made me impatient and wanting to skip the all up test. Augmented igniter in I284W shorted and didn't fire pyrogen tip.

**Flight:** Rocket immediately cocked into the wind, no chance of sustainer ignition. Failed to reach 1000 feet in altitude, separation charge appears to have worked, Chute Release functional. Second stage inhibit successful.

**Recovery:** No damage, both TeleDongles sent telemetry back successfully throughout the short flight.

**Comments from the field:**

1. The cold and wind were brutal, and I felt myself less engaged, and the cold eroded my patience and caring. I wanted to skip steps on my checklist like the all up test.
2. Battery levels didn't seem too impacted from the cold.
3. Single-stage flights can go in windy conditions, but from now on I don't expect to ever launch a multistage if winds exceed 10mph.
4. I will target a TWR of 10+ in no wind, and 13 or more in 5-10mph winds. This rocket will probably need a full J to ever safely launch again.
5. Checklists were great. Sam and Katelyn were helpful to have at the pad. Stepladder needed for arming sustainer electronics.
6. Biggest complaint: dangling switch wires. Twist and tape was not fun in the cold.

7. More slack was needed in the sustainer ignitor wires.
8. Time at the pad took 15-20 minutes.

**Flight Data:**

Altimeter	Max Height (ft)	Max Speed (ft/s)	Max Boost Accel (G)	Avg Boost Accel (G)	Ascent Time (s)	Touchdown speed (ft/s)
TeleMega S/N 4324	1065	219	6.7	3.53	8.3	21
EasyMini S/N 4556	991	198	3.61	0.16	7.2	20
TeleMetrum S/N 5099	994	231	6.65	2.23	7.9	20
RRC3	982	220			8.1	28

**Data Analysis:**

1. RRC3 AUX separation event timer was set to fire 2 seconds after the 100 ft launch trigger
  - a. It reached 100 feet in 0.95s after launch, AUX fired at 3s into flight which was intended
2. TeleMega tilt events: started at 3° from vertical, T+0.5s at 11°, T+0.63s at 18° (max allowed), T+1.94s at 27° (motor burnout), T+3.03s at 29° (separation), T+4s at 35° (intended sustainer ignition)

**Commentary:** Overall this was a very good flight. Would have much preferred this outcome than sustainer ignition with it having tilted over as much as it did. The booster need much more thrust and less wind. There was a discrepancy between what Aerotech as listed on their master motor matrix, its .ENG file in OpenRocket, and what is printed on the motor packaging. I284 was not a good choice. I picked up a J460T from Mark Logan at this launch, but even that won't be enough. It will produce about 9Gs at launch, but 12 or more is probably best. Will move to use CTI J760WT or AT J800T as smallest possible booster motors in the future for this rocket.

This flight has also made me reevaluate the goals for this kit and project. Original goal was 18000 feet at LDRS on a K700W to J570W, but after this came out heavier than expected, I don't think that is a good goal to rush towards. I'd rather use the resources from the rocketry team to get a few lower-altitude flights under my belt and practice staging. To maximize altitude, I'll build a new kit with electronics and staging improvements.

**Future Actions:** Launch with more thrust in the booster and less wind. I fell victim to "go fever." Will try to replace the switch wires with actual switches. I'll also try to just drag separate the stages with a backup separation charge. The pain at the pad came from aligning the sustainer with the booster when installing the ignitor and attaching the shear pins while horizontal.











