

**Date:** 9/1/19

**Location:** Argonia, KS (LDRS 38)

**Rocket:** Mach Wave II Stage

**Motors:** CTI J760WT to Aerotech I211W

**Weight:** 14 lbs

**Weather:** sun and clouds, <10mph winds, 90°F

**Launch:** 17:15 (22:15 UTC)

**Avionics:**

Altimeter	Booster/Sustainer	Drogue	Main	Pyro/AUX
TeleMega S/N 4324	Sustainer (primary)	Apogee	500	Pyro A: T+5s, <20°, 400ft AGL
EasyMini S/N 4686	Sustainer (secondary)	Apogee +2	400	
TeleMetrum S/N 5099	Booster (primary)	Apogee		
RRC3	Booster (secondary)	Apogee +2		AUX: T+1.8s, 100ft AGL launch trigger
Jolly Logic CR	Booster (main)		1000	

**Pre-flight Prep:** Attempted to launch first thing in the morning of Sunday, September 1, day 4 of LDRS 38. Sustainer had been previously wired together at home on Tuesday, August 27 without noticeable battery depletion. Ejection charges and motors assembled inside Big Red at 5:00 that morning due to inability to sleep. Stages were ready around 9:30, but a low cloud ceiling kept flights under 3000ft grounded. The new black-red sustainer igniter conduit wire was easy enough to use. Should ideally be 2-3cm longer. Jolly Logic was on for 1-2 hours before being shut back off, and no battery loss in that time.

**At the Pad:** After volunteering for most of the afternoon, the rocket could be racked. Wasn't rushed racking on the 70s pads. No issues, but rubber band for securing the sustainer igniter was forgotten. Before leaving the pad, telemetry information was checked. There was another device transmitting on the same channel (4), so AltOS kept refreshing and toggling between the two ("pad" and "landed"). Because the telemetry was refreshed consistently and nominally, it was not deemed an issue. Back at Away RSO, the receiver antennas lost connection with the TeleMega and TeleMetrum unless there was direct line of sight. Valuable observation.

**Flight:** J760WT lit immediately and flew up with some tilt. No telemetry on the sustainer because the shared channel appears to have prevented properly monitoring the flight. Sustainer ignition good; I211W took about 1.5 seconds to come up to pressure, so at T+6.4s. The other rockets on the 70s continued launching, making tracking these 2 stages difficult. Sam spotted the booster falling fast, without the chute attached. Booster hit hard. No eyes on the sustainer, no telemetry.

**Recovery:** Booster undamaged except for the sled threaded rod attachment points which 3 of 4 snapped. Sustainer was located the next morning with aid of one of the three corrupted telemetry files indicating a fragment of the flight just after apogee for a duration of 48 seconds indicating descent under drogue.

**Comments from the field:**

1. Winds seemed higher than the previous attempt, but sustainer ignition wasn't inhibited, even with the extra 2 seconds of coast time.
2. Flying this at a big launch was much more stressful. Extra transmitters, extra flyers and launches made tracking two stages more difficult.
3. Booster chute became detached – may have not been attached via quick link during prep.
4. Sustainer main chute was out, but looking at data, did not open up. Could have also explained why it wasn't spotted.

**Flight Data:**

Altimeter	Max Height (ft)	Max GPS Height (ft)	Max Speed (ft/s)	Max Boost Accel (G)	Ascent Time (s)	Touchdown speed (ft/s)
TeleMega S/N 4324	8281	8560	747	13.08	23.5	56
EasyMini S/N 4556	8256		518	7.95	24.4	58
TeleMetrum S/N 5099	3126	3127	576	12.97	13.5	66
RRC3	3121		546		13.8	95

**Data Analysis:**

1. No main slowdown for either stage.
2. I211W took about 1.5 seconds to come up to pressure after receiving ignition signal.
3. TeleMega tilt angle rose to 15° during booster motor burn but returned down to 9-12° during coast and separation. Tilt at 13° during Pyro A signal. Tilt limit of 20° was reached at T+11.5s.
4. Large G kick of 12Gs at T+2.3s where RRC3 AUX trigger occurred and stage separation charge fired. Perhaps didn't drag separate due to 10° tilt angle.

**Commentary:**

1. Booster electronics lost power on landed – switch came loose and may have been jarred off.
2. RRC3-triggered stage separation charge was good to have, will continue to be necessary.

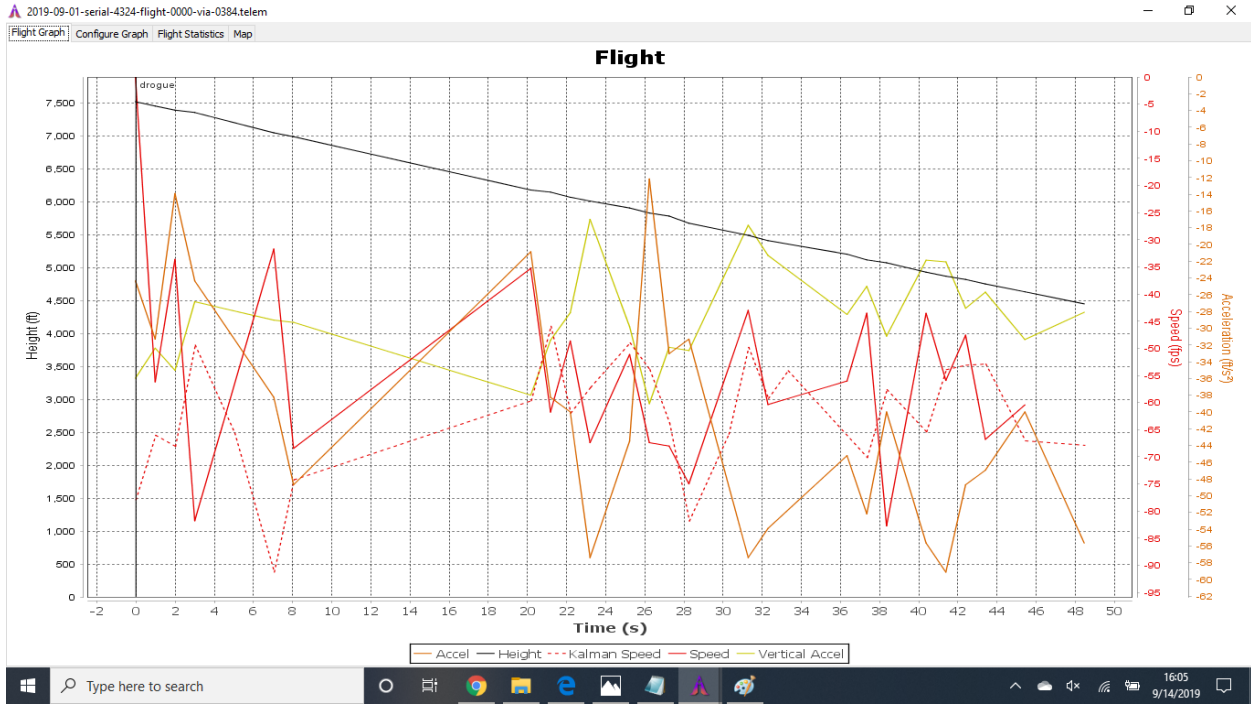
**Future Actions:**

1. Booster avbay needs repair.

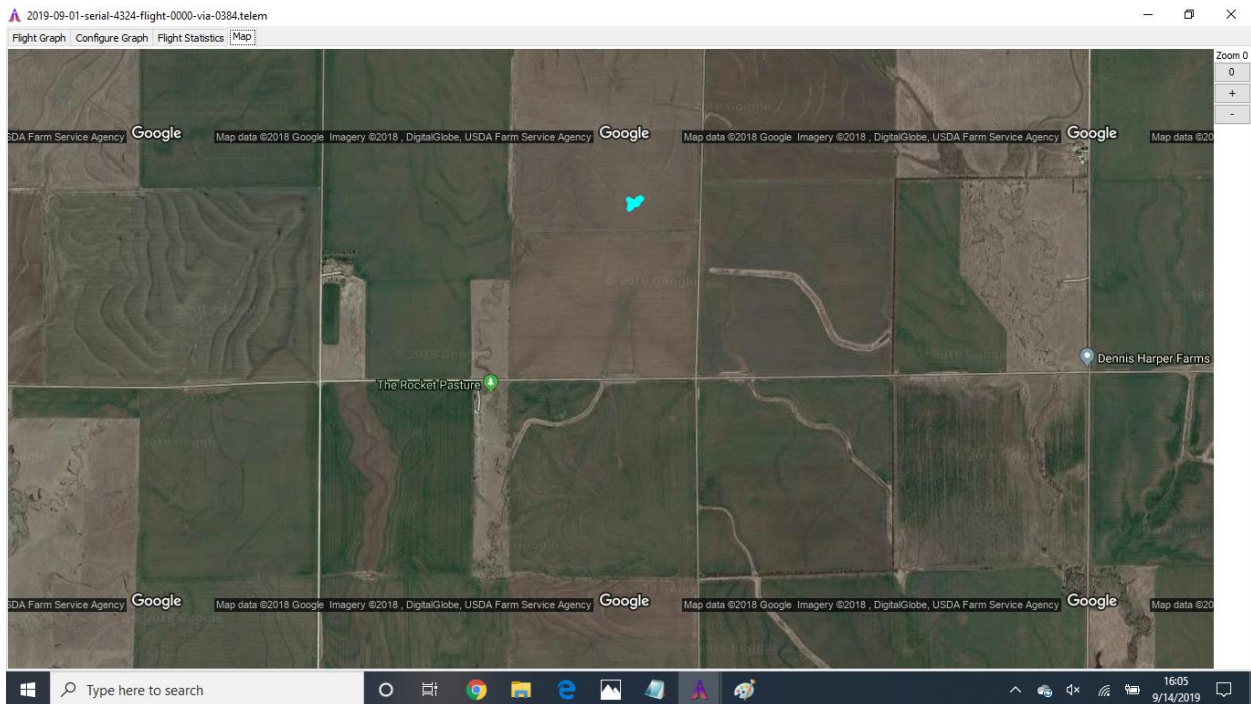




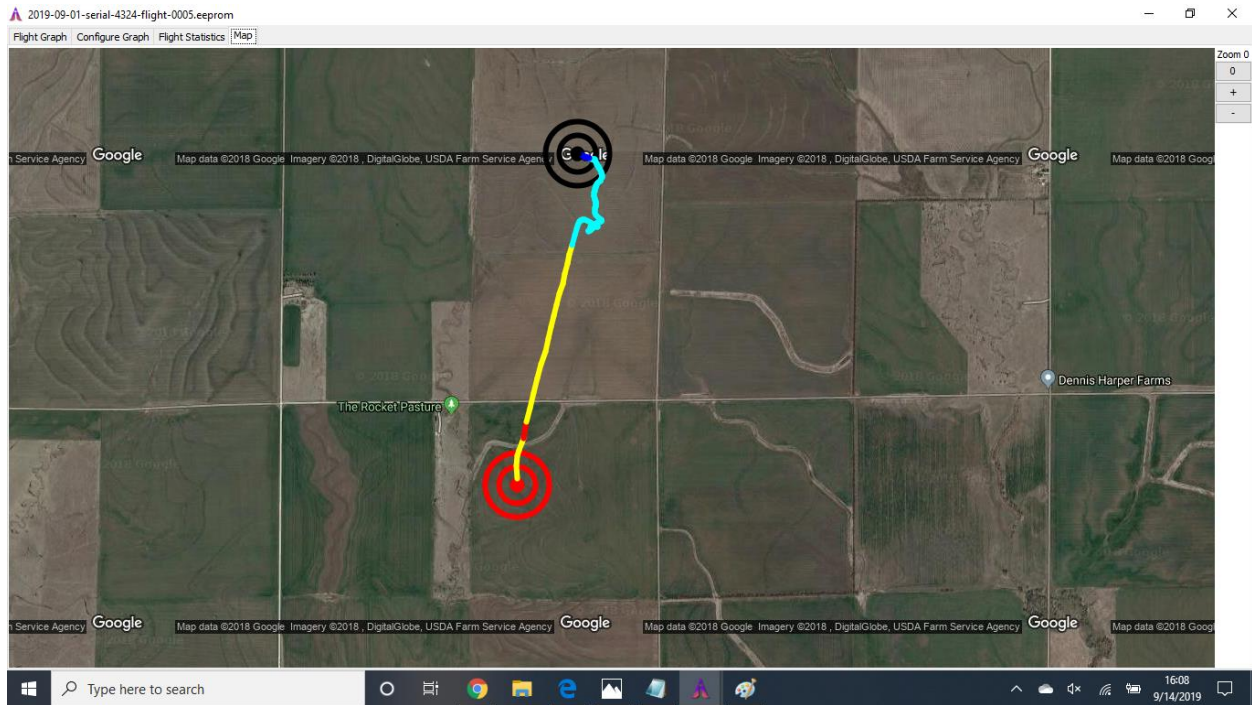




*Telemetry fragment indicating descent under drogue*



*GPS trace fragment from telemetry.*



*Full GPS trace after finding sustainer*

