

GHATR Flight Test Report
15 January 2010

Flight Date: 9 January 2010
Location: Lucern Dry Lake, CA.
Test Operator: Chris King

Flight Setup:

This was the fourth flight of the Go High Altitude Test Rocket (GHATR). This rocket is capable of altitudes in excess of 10 K feet. Flights tests are to verify the performance of the experimental Sugar Shot to Space Chute Controller (CC) recovery electronics. This flight was a low altitude flight performed with the objective of verifying proper firing of the CC igniter circuits at specific flight events. A Featherweight "Parrot" is also on board as a backup recovery system. For this test the CC was programmed as follows:

Igniter 1: Fixed time of 3 seconds
Igniter 2: Apogee, default time 5 seconds
Igniter 3: Descent Altitude 200 meters, default time 10 seconds
Igniter 4: Not Used

Motor: Aerotech I 357

Note: Prior to the flight I was unable to predict a trajectory based on a specific motor. The motor used was purchased the day of flight and its performance was unknown at the time of CC programming. It was just an available motor. Hence the time values programmed into the CC were chosen with the hope they would be close enough to allow proper operation.

Post Flight Analysis:

The flight was successful as everything was recovered intact however an anomaly was noted in the data. During ground recovery it was first apparent that the CC igniter for the apogee chute did not fire. The Parrot apogee igniter did fire and apparently successfully deployed the chute. The main chute igniter also fired and deployed its chute.

Close examination of the data suggests the following timeline:

Flight Time (s)	Event
0.55	Launch Detect
3	Igniter 1 Fires
5	No external activity noted
10	Ascent Altitude 665 meters, CC Igniter 3 Fires, continuity lost to CC Igniter 2 Main deploys
11.4	Apogee detected, CC Igniter 2 fire attempted
11.5	Max Reported Altitude 2,222 feet
12.2	Parrot apogee igniter fires, already falling on Main
31	Apogee chute fully deploys
76	On the ground

Observations:

Chutes were observed to deploy at apogee and during decent.

The fixed time igniter 1 fired as planned.

The data suggests that the main chute's igniter 3 fired earlier than expected during ascent and severed the wires to the CC apogee igniter 2, thus causing the CC igniter No. 2 to fail. This however was not due to a CC igniter logic failure but the early deployment of the CC igniter 3 for the main. Main chute deployment followed causing an early apogee.

The Parrot back-up fired the apogee chute as programmed.

With the exception of the Main chute's igniter firing early it appears all events took place as one would expect.

Conclusion:

It appears the expectations during initial programming were the problem as opposed to the CC logic--caused by not knowing the trajectory at that time. The fixed 10 second time of igniter 3 fired prior to apogee thus triggering the main on ascent. Had the time been set to 20 seconds it would likely have flown perfectly. It appears that the CC functioned as designed however it makes clear the importance of matching the actual trajectory to the predicted trajectory.

Further, a better understanding of the programmed parameters and their use is recommended. For example the 5 second "fixed time" of igniter 2 triggered no noticeable events early at 5 seconds. The 10 second "fixed time" of igniter 3 however fired at 10 seconds even though still ascending. These two timers are being used differently by the logic somehow.

Video of the flight is available on Youtube. Search for GHATR on 9 January 2010.