

Midwest Rocketry Competition

Post Flight Performance Report

Team: **SEDS TnTech**

Rocket Name: **Aquila II**

Mentor:

Paul Hickman

phickman32@gmail.com

865-386-4549

Faculty Advisor:

Dr. Sally Pardue

parduespring@gmail.com

931-372-3792

Student Team Lead:

Nathan Krupla

ndkrupla42@students.tntech.edu

615-918-5318

Team Members:

Nathan Daniel (Electronics Lead)

Elijah Vivio (Pneumatics Lead)

Wesley Kizer (Electronics)

William Stump (Electronics)

Darsh Dinger (Manufacturing)

Ryan Colon Clone (Electronics)

Josh Steele (Manufacturing)

Caroline Ellis (Electronics)

Andrew Little (Electronics)

Reagan Clo (Pneumatics)

Wallace Anderson (Pneumatics)

Flight Performance Comparison

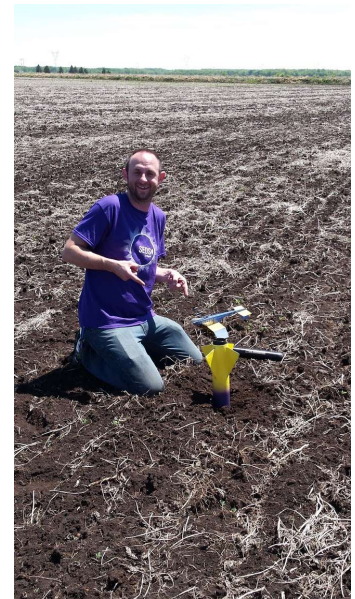
Table 1: Flight Characteristics

	Predicted	Test Flight 1	Test Flight 2	Competition Flight 1	Competition Flight 2
Mass	7 kg	7.06 kg	7.06 kg	7.06 kg	-
Motor	Cesaroni J760	Aerotech J800	Loki J820	Aerotech J800	-
Max. Altitude	3900 ft	3175 ft	2520 ft	Unknown	-
Max. Velocity	550 ft/s	Unknown	3291 ft/s	Unknown	-
Max. Acceleration	375 ft/s ²	Unknown	312 ft/s ² (9.72 g)	Unknown	-
Descent Rate	20 ft/s	Unknown	33.7 ft/s	Ballistic	-

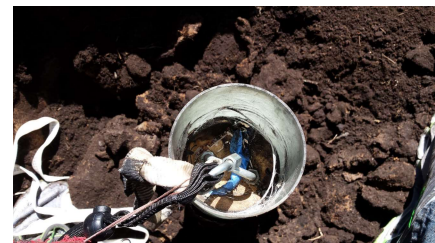
- Roll angle sensing unavailable
- Screenshots from flight video unavailable

Discussion of Results

Aquila II launched successfully, but was not able to separate or deploy its parachutes. Tape was used to hold the body tube sections together during launch, and it is thought that the reason for lack of separation was a failure to “score” this tape, or cut small slits in it to allow for easier breaking. The team was aware of this necessity, but neglected it because it was not on the hastily constructed checklist. Aquila II therefore came in ballistic. Upon discovery, it was found to have stuck almost 6 ft into the ground. The team spent the remainder of the launch day digging to try to salvage the launch data.



The fin can and recovery systems were found to be undamaged, and both the motor and altimeter backup charges were seen to have gone off. However, the heavy pneumatics section had slid forward under its own momentum, crushing the commercial altimeter and preventing the team from learning Aquila II’s max altitude.



Upon further digging, the entire rocket - its airframe relatively intact - was able to be extracted. The nose cone, where all the electronics were mounted had entered a layer of mud and was filled with water and sand. The remainder of the day was spent attempting to disassemble the heavily warped nosecode in order to recover the camera and data SD cards.

The camera SD card had files up to the launch, but the most recent file was corrupted. While the team still has hope of recovering the launch footage, this has not been possible up to this point.

The data SD recorded by the Teensy Flight Controller only had data for approximately 2 seconds after powering on. This is thought to be a programming error. An LED was designated to blink up until launch, but in the last video file prior to launch it was observed to go on permanently after about 2 s, indicating that the controller had entered an incorrect state. The exact nature of this error is unknown. The ground station remained in contact with the Teensy Flight Recorder for the entire flight, but only received a message indicating that the electronics were receiving power rather than sending any telemetry. This was a decision made shortly before the competition due to a malfunction serial port between the two flight computers.



In conclusion, a check list error resulted in a ballistic descent, and consequently insufficient data exists to verify whether the roll control system was successful. In the future, the full team will be involved in creating a comprehensive checklist well in advance of the competition. In addition, more priority will be placed on ensuring that data is remotely sent to the ground station to avoid the results of future parachute deployment failures.

A word from the team Lead:

As team leader I accept full responsibility for the failure that was experienced Sunday May 20th, 2018. It was my responsibility to hold my team and myself to certain standards of procedural organization, and I failed. I am grateful that Aquila II's trajectory carried it away from the spectators who were present, and I hope that my mistakes do not reflect poorly upon my team, Tennessee Tech, or the teams from Tennessee Tech who may follow in our footsteps in this competition.

Thank you for the opportunity to compete, and for all of the help we received leading up to the competition.

Nathan Krupla