

# Elijah 1 Mission Report

*Flight name:* Elijah 1

*Flight call sign:* KC9EJY

*Launch time:* 0715 CST

*Launch site:* UWEC Athletic Field, Eau Claire, WI

*Latitude:* 44.819

*Longitude:* -91.479

*Altitude:* 211 meters

*Traveling direction:*

- Southerly for 37 miles (approx)
- West-southwest for 5 miles (approx)
- Westerly for 10 miles (approx)
- Southwesterly for 16 miles (approx)

*Bursting altitude:* 106,000 ft

*Landing time:* 1115 CST

*Retrieval location:* Eyota, MN, farmer's bean field

*Latitude:* 43.97464

*Longitude:* -92.26339

*Altitude:* 381 meters

*Total distance balloon traveled:* 68 miles

*Payload(s) recovered:* Tracking payload, not scientific payload

The launch of Elijah 1 was 95% successful. The tracking payload was recovered, but unfortunately, the scientific payload was not. If students had retrieved both payloads, launch and recovery would have accomplished 100% satisfaction.

## **Summary of Balloon Launch and Retrieval**

The preparation for launch went smoothly. Team members arrived around midnight on the University of Wisconsin-Eau Claire campus. Around 12:25 am Monday morning preparation began. As the sun came up weather conditions were ideal for launch. The balloon was launched at 7:15 am. Video coverage and still digital photographs of the entire launch process were taken. Both student chase vehicles were set up to receive information from Elijah 1. Based on sounding predictions from the Chanhassen, Green Bay and Davenport National Weather Service Offices, the balloon's predicted landing site was southwest. Elijah 1 traveled further southwest than anticipated and eventually crossed into Minnesota. While crossing over the Mississippi River, Elijah 1 reached approximately 106,000 feet. The balloon landed in Eyota, Minnesota, just east of Rockchester.

Communication with Elijah 1 was maintained throughout the duration of the flight and after landing. From the final readings, the team was able to locate the parachute and payload in a bean field. The tracking payload and parachute were recovered, but the scientific payload was lost. The path of Elijah 1 and the tracking vehicles is located on the flight predictions & results page.

### **Problems Encountered**

- Neither chase vehicle received every transmission from Elijah 1
- The scientific payload was lost during flight

## **Description of Problems Encountered and Possible Solutions**

*Neither chase vehicle received every transmission from Elijah 1*

This is something that is unavoidable. As the vehicles encounter hills, heavily wooded areas and as the balloon ascends to extreme heights (above 60,000 feet) transmission intervals may be increased. The primary chase vehicle did receive more transmissions than the secondary vehicle in difficult areas simply because it had a more sensitive radio and a taller antenna. But both vehicles received information as the balloon initially ascended to 60,000 feet and as the balloon descended below 60,000 feet. One solution to ensure both vehicles receive as many transmissions as possible is to put another more powerful radio in the secondary chase vehicle.

### *The scientific payload was lost during flight*

We suspect that the scientific payload was lost during the descent period. When the balloon initially bursts the entire system freefalls for approximately 30,000 to 40,000 feet until the air becomes dense enough to open the parachute and slow the system down. We believe that at the point where the parachute opened it caused such an immediate deceleration that the force of the payload on the hooks holding it in place broke clean off and the science payload was lost. In order to ensure that this will not happen again we will be using a total of 23 hooks (versus the original 7 hooks) on the two payloads in a webbing fashion to secure the two payloads to the parachute.

## **Conclusion**

The flight of Elijah 1 was easily 95% successful. The launch procedure and retrieval went smoothly, with the team of four acting on the experience of only one prior launch. The tracking system proved to work better than expected by maintaining contact at 106,000 feet, as well as after the balloon landed. Other than the surprise of a westerly movement, the balloon acted as expected, taking two hours to ascend and one hour to descend. While crossing the Mississippi River north of La Crosse, WI, Elijah 1 reached 106,000 feet. Overall, the team was proud of their achievement. The loss of the scientific payload was disappointing, but is a misfortune easily corrected.

# Elijah 1 Predictions & Results

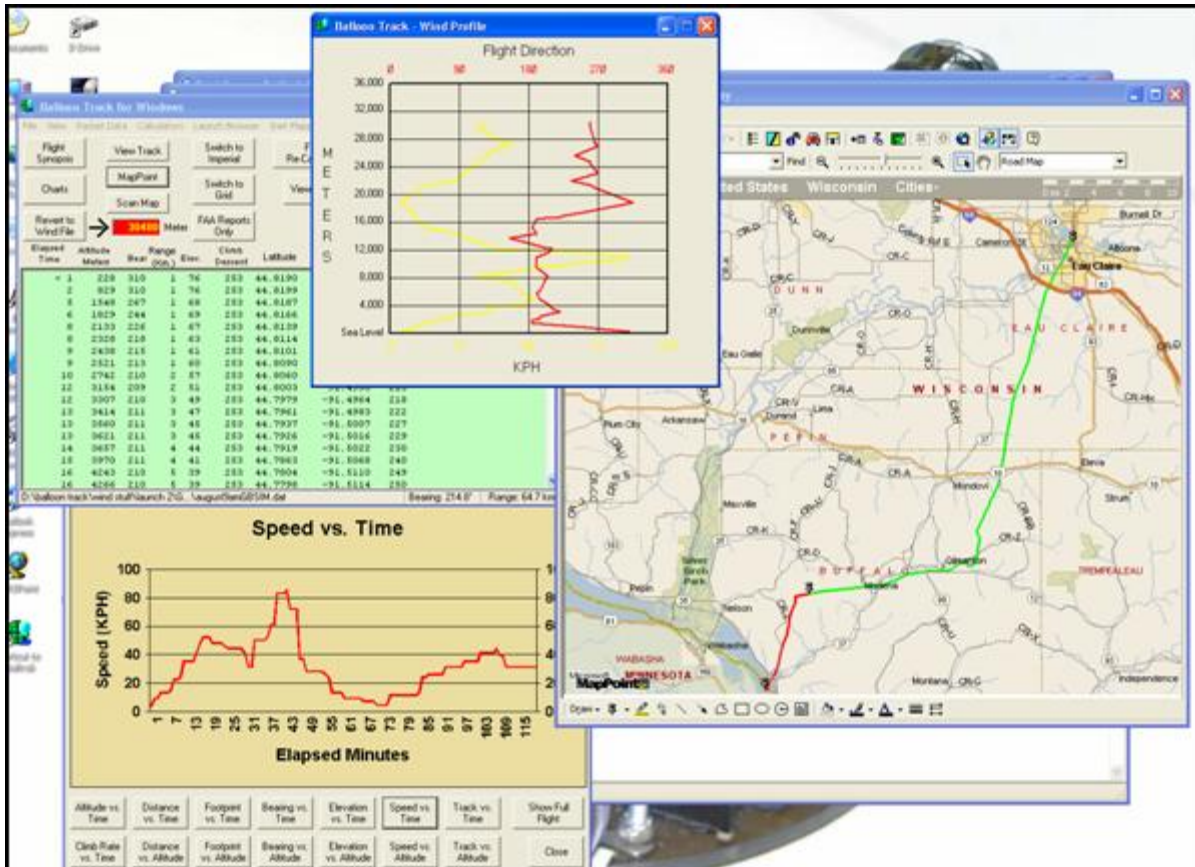
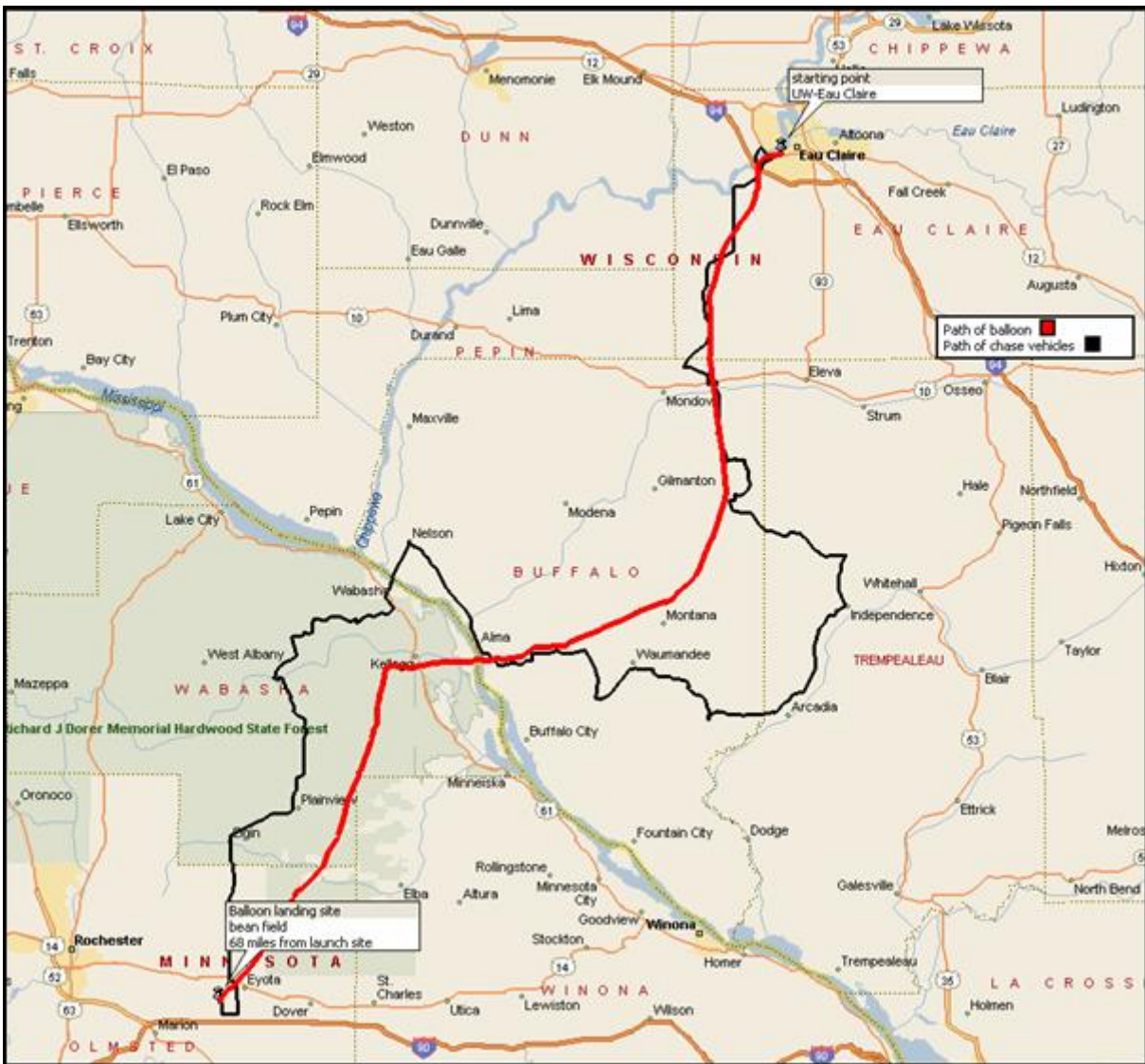
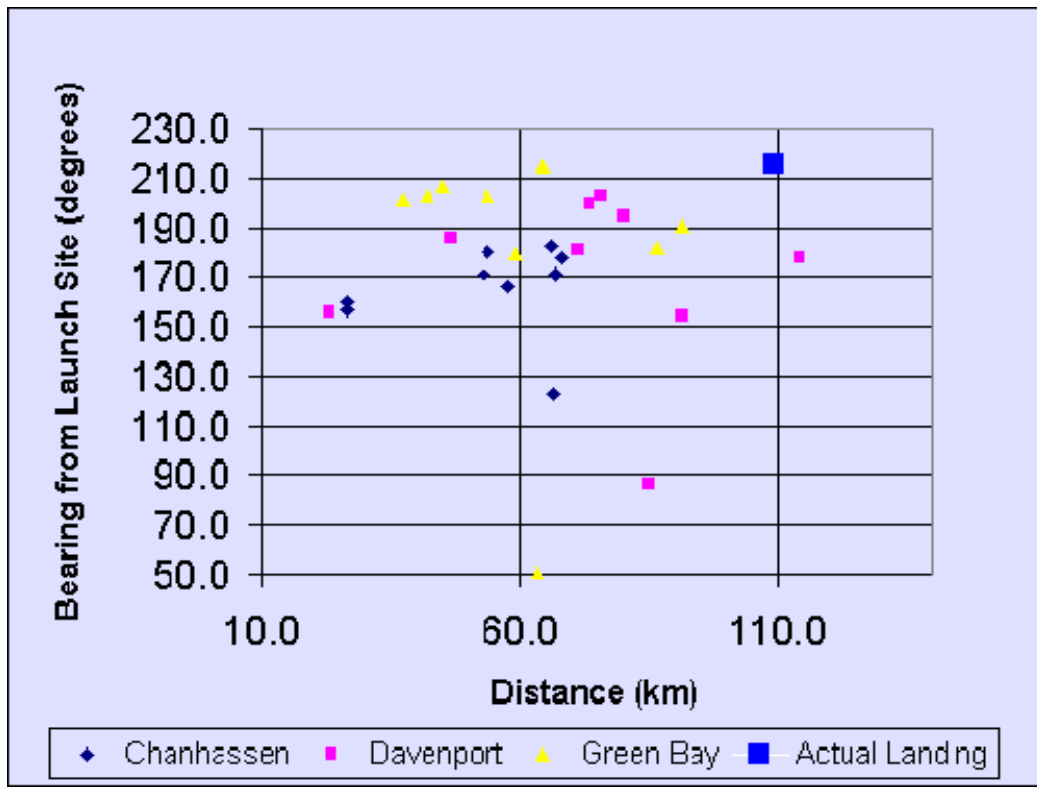


Figure 1: Screen capture of most recent predicted path prior to launch.



**Figure 2:** The path of the balloon and chase vehicles.



**Graph 1:** Actual landing location in comparison to prediction run landing sites

Location	Bearing from launch site (degrees)	Distance (km)
Chanhassen	122.3	66.6
	170.9	66.9
	159.6	26.7
	156.9	26.5
	179.8	53.7
	182.0	66.2
	177.7	68.3
	171.1	53.0
	166.0	57.8
Green Bay	86.3	85.1
	177.2	114.5
	154.4	91.4
	155.7	23.1
	185.4	46.8
	199.0	73.7
	194.8	80.3
	180.9	71.4
	202.6	76.0
Davenport	50.9	63.4
	190.3	91.5
	181.2	86.7
	179.5	59.4
	201.0	37.4
	206.7	45.4
	202.2	53.9
	202.7	42.2
	214.8	64.7
Actual Landing	215.2	109.4

**Table 1:** Predicted and actual bearing and distances from launch site