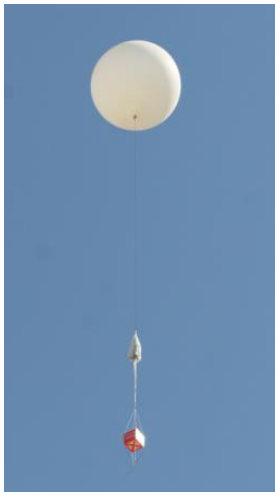
High Altitude Ballooning For Fun and Education



Steve Krause KG5AO

Dan Croskrey KF7THD

Presentation prepared by Jack Tiley AD7FO

An Emerging Hobby for Hams

- **High altitude ballooning is an emerging hobby, since the price of GPS and communications equipment has gotten quite low.**
- **It is an excellent hobby for people fascinated by space flight with learning aspects - from systems design, electronics and software engineering.**
- **There is also an exciting risk factor, namely, that you could lose your precious electronics if something malfunctions.**
- **From these flights we have verified that Earth is indeed round and that space is black.**

Breath Taking Views From Onboard Cameras

Description	Earth and clouds seen at 100,000 feet above Oregon, USA
Date	2010-04-04 (original upload date)
Source	Own work Transferred from en.wikipedia
Author	Justinhamel

The Edge of Space

- **Very few people have images from the edge of space in their personal photo albums--snapshots in which a hazy blue atmosphere hugs the curve of our planet against a backdrop of the black abyss beyond.**
- **But of those who do, many are amateurs, average people, taking regular trips deep into the stratosphere and peering out from the edge of Earth.**
- **Their hobby, high altitude ballooning, has been called “the poor man's space program" because they are probing an environment more similar to that found on Mars than to any down here on Earth.**

What is Near Space?

- **Near Space is that region of the atmosphere above 60,000 feet but below the accepted altitude of space: 328,000 feet.**
- **These altitudes make Near Space far more like Earth orbit than the surface of Earth. Air pressure in Near Space reaches 99% of a vacuum or better.**
- **Air temperatures drop to a low of -60º F or colder. Cosmic radiation is over 100 times greater than at sea level.**

What is Near Space? (CONTINUED)

- Near Space is located within the ozone layer and therefore is an environment of increased damaging ultraviolet radiation.
- Near Space is reached by helium or hydrogen filled weather balloons.
- Since it is far less expensive to send payloads into Near Space than Earth orbit, organizations like NASA will send new designs into Near Space first, as a test.

Paul Verhage

- **Former United States Air Force officer, college network administrator, and high school science and electronics teacher, high altitude balloon enthusiast**
- **University of Kansas**
  Lawrence, KS 66047
- **See article on his 100th balloon launch in the March 2012 edition of "Nuts and Volts"**

Paul Verhage (continued)

- Usually, the cost to launch anything into space on regular rockets is quite high, reaching thousands of dollars per pound. Additionally, the waiting period for payloads to be put on a manifest and then launched can be several years.
- High altitude balloon enthusiast, Paul Verhage, says that the total cost for building, launching and recovering these Near Space craft is less than $1,000. “Our launch vehicles and fuel are latex weather balloons and helium,” he said.

Paul Verhage (continued)

- Has launched payloads on his Near Space craft including mini-weather stations, Geiger counters and cameras.
- He also stated that because of the low air pressure, the air is too thin to refract or scatter sunlight. Therefore, the sky is black rather than blue. So, what is seen at these altitudes is very close to what the shuttle astronauts see from orbit.
- His highest flight reached an altitude of 114,600 feet (35 km), and his lowest went only 8 feet (2.4 meters) off the ground.

Spokane County Inland Empire Near Space Enthusiasts

- **High Altitude Balloon launches take place in the eastern and south central Washington area.**
- **Steve Krause and Dan Croskrey have led seven balloon launches with hydrogen filled balloons and APRS Tracking transmitters.**

Spokane County Inland Empire Near Space Enthusiasts

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There it is!!!

In Flight Photos

In Flight Photos

In Flight Photos

In Flight Photos

In Flight Photos

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In Flight Photos

What Does It Take

- **A launch vehicle – A 1,000 gram weather balloon. From Kaymont - $100**

What Does It Take (continued)

- **195 cu ft. of Hydrogen $ 55.**

- **195 cu ft. of Helium $ 225.**

What Does It Take (continued)

- **Parachute $20 to $100 (Ebay)**

What Does It Take (continued)

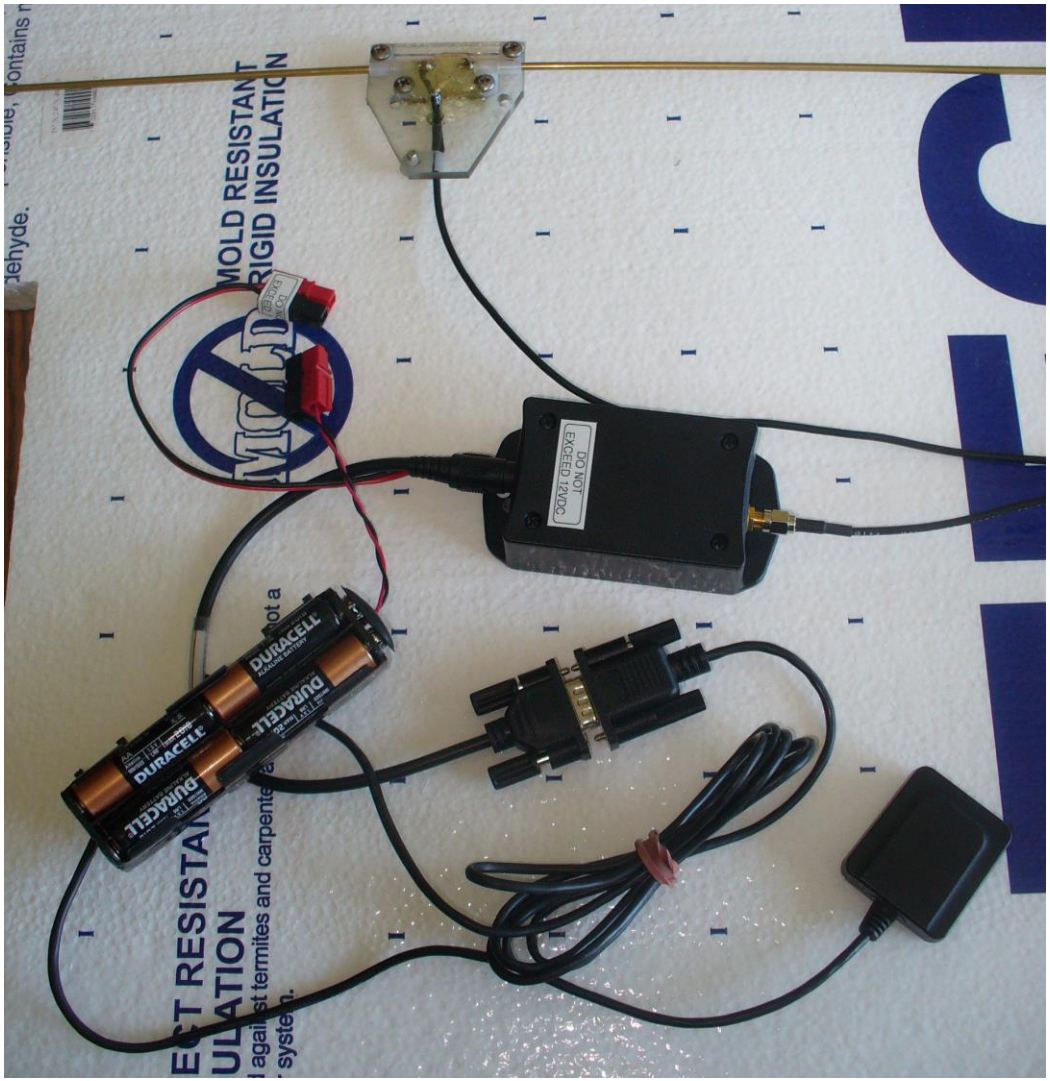
Nine volt battery

GPS

TT3

VHF ham radio

What Does It Take (continued)



Dipole antenna

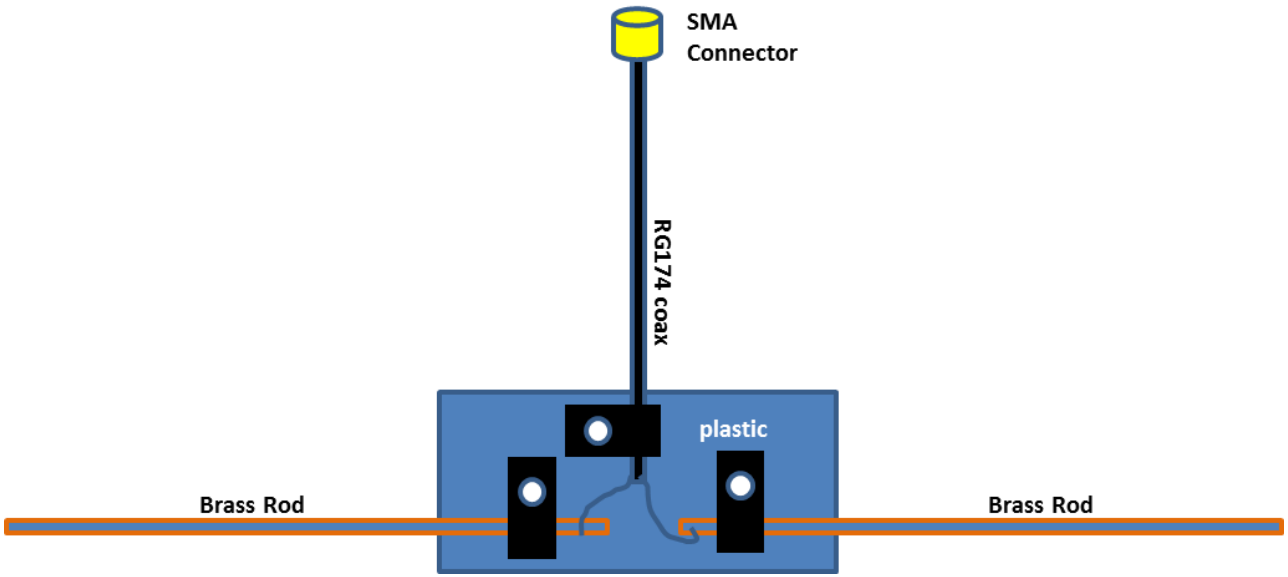
Byonics RTG

Battery

GPS

What Does It Take (continued)

- **Hanging Dipole Antenna $15 (Home built)**



What Does It Take (continued)

- **Actual Dual Hanging Dipole Antennas**

What Does It Take

Canon Camera (2) ~ $40 on eBay

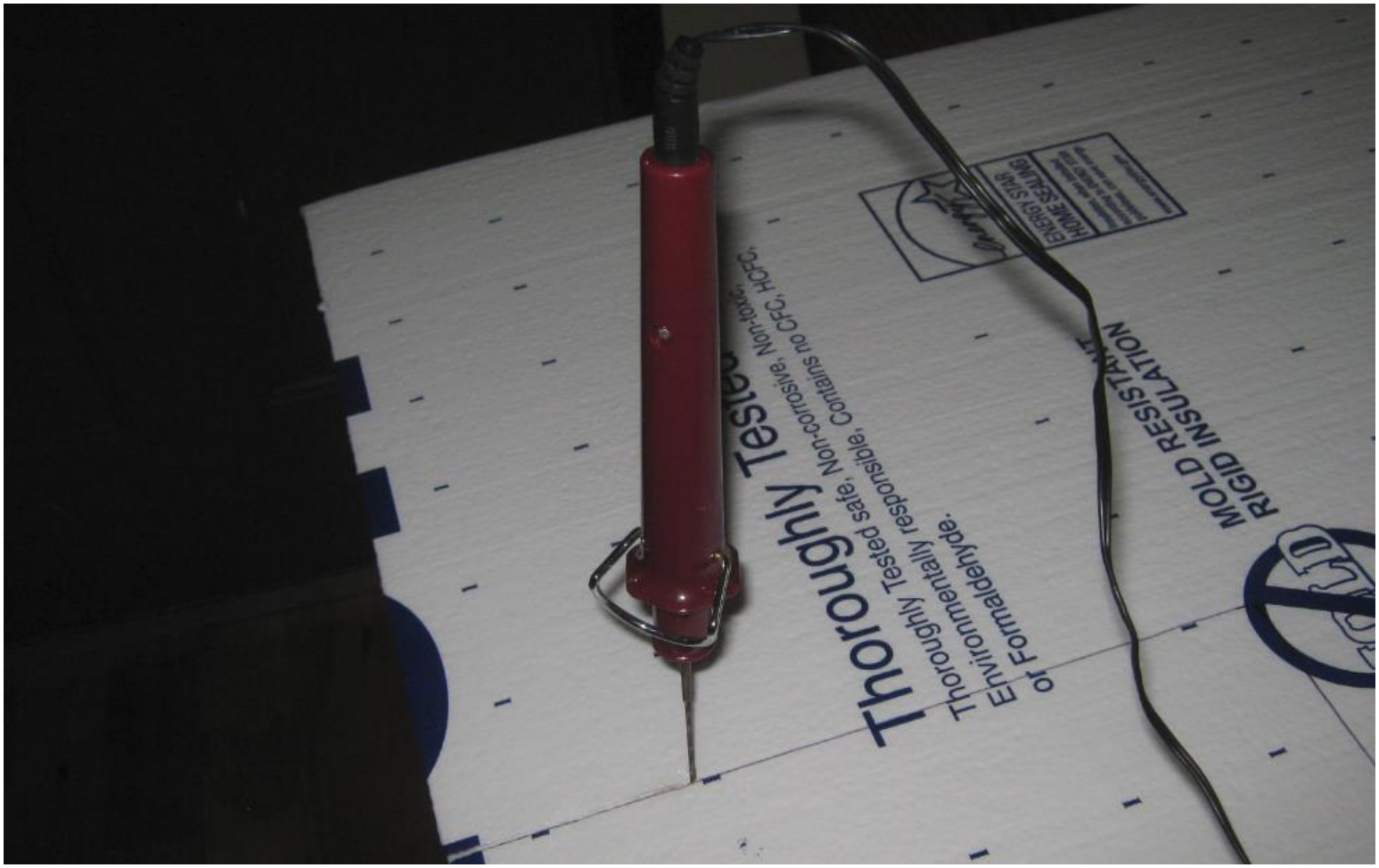
What Does It Take

Adding it all up

• Byonics RTG tracker	$250
• Byonics AIO tracker	$320
• Canon cameras $40 ea.	$ 80
• Video camera	$ 17
• AA lithium cells (24)	$ 40
• Box	$ 3
• Parachute	$ 20
• Balloon	$100
• Hydrogen	$ 55
Total	**$885**

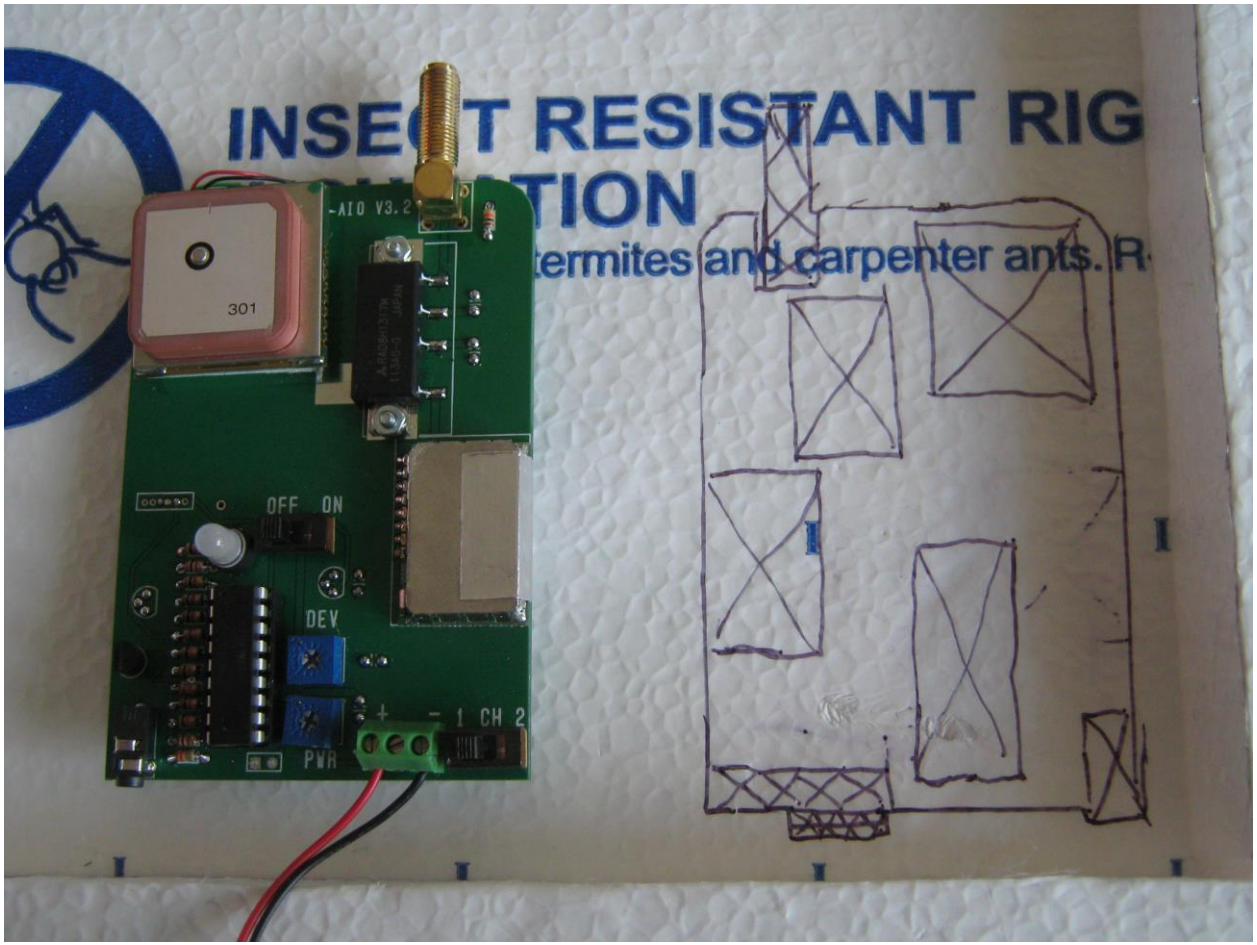
The Payload Construction

The Payload Construction



The Payload Construction

- Cutting the recess for the Byonics AIO



The Payload Construction

GPS receiver

Byonics RTG and battery

Two Canon cameras

Tracking the Flight

Tracking the Flight

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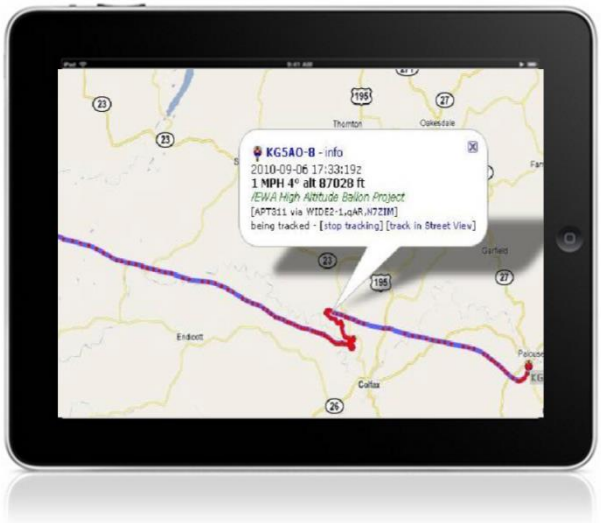
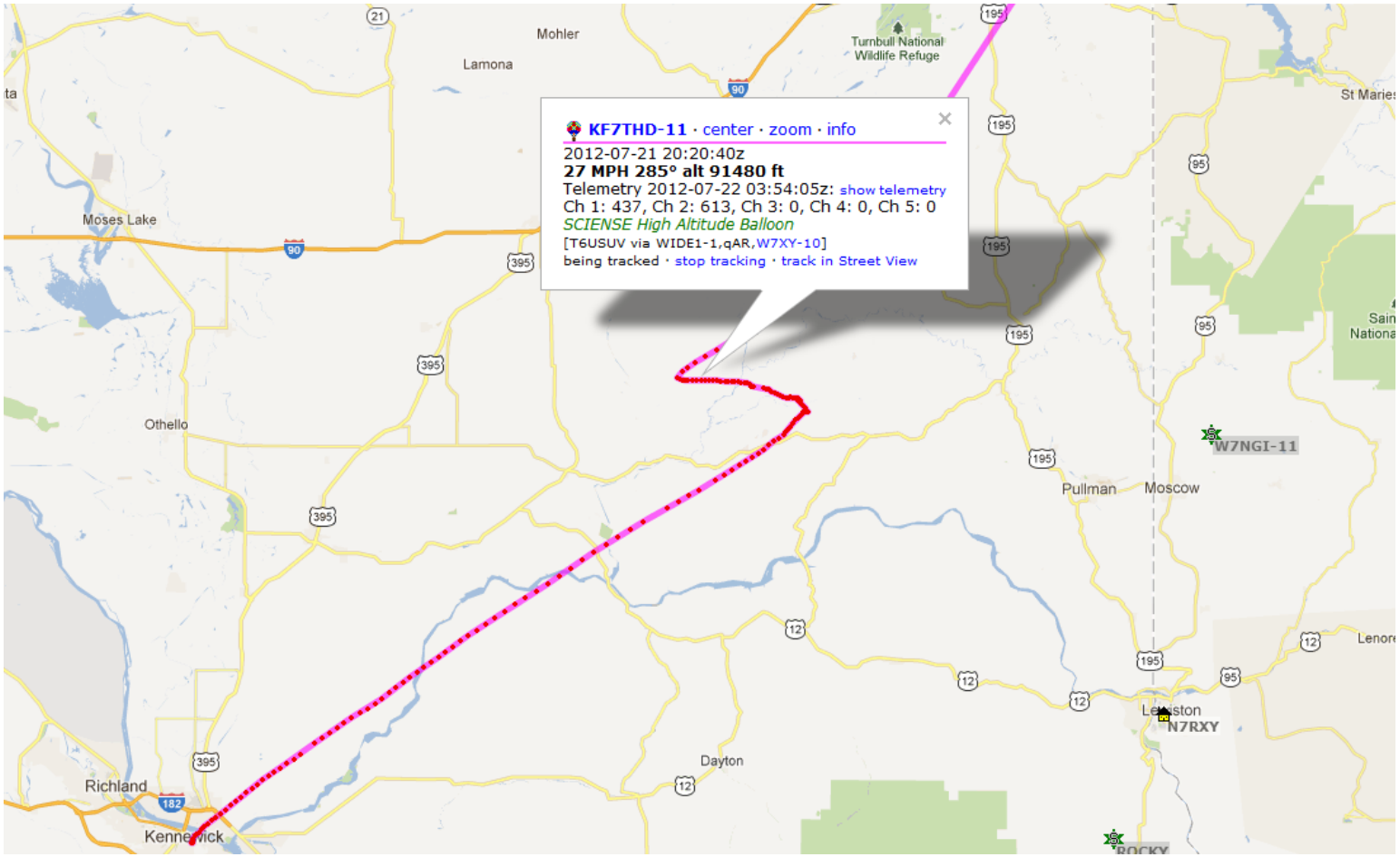
Tracking the Flight

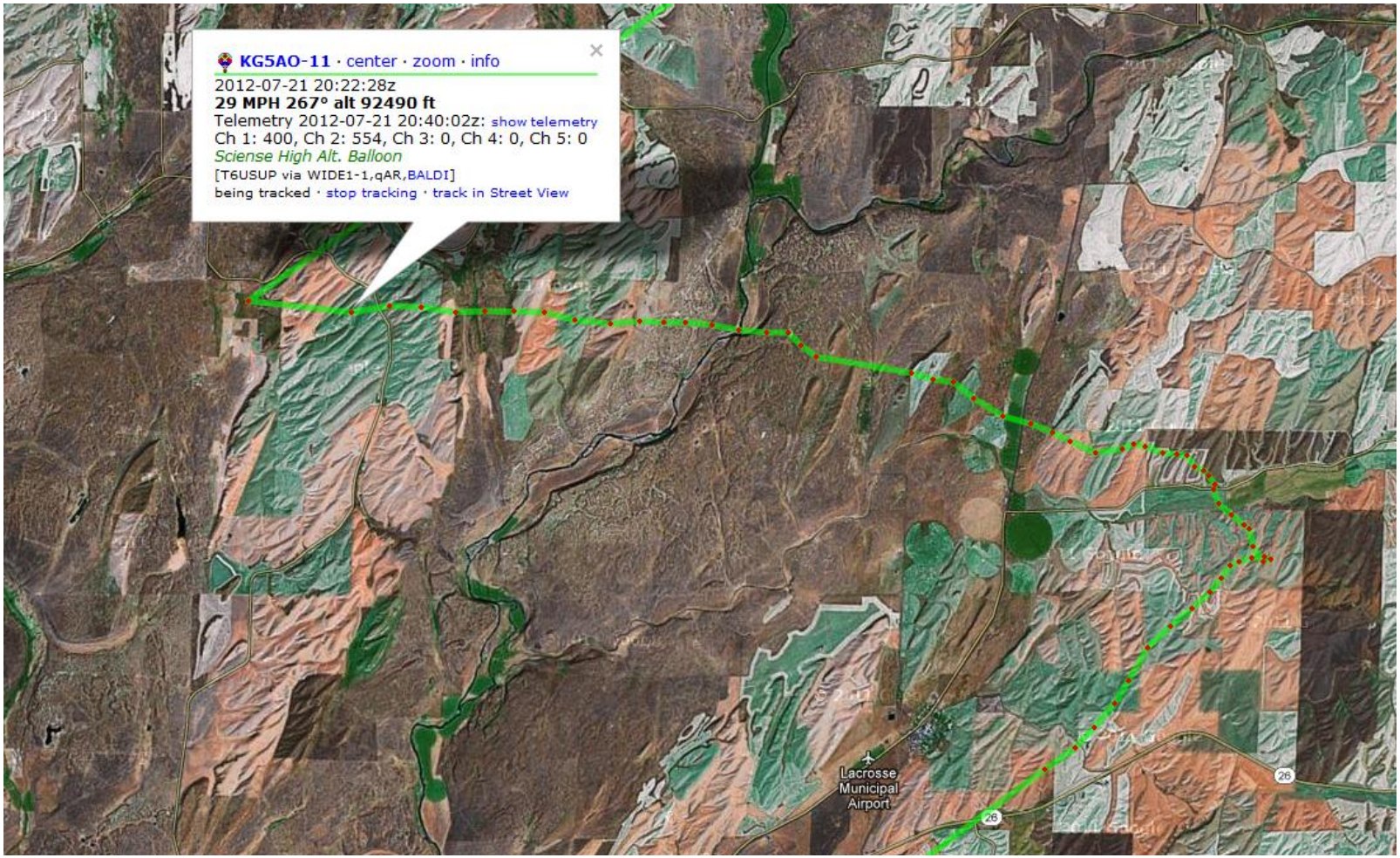
- A Computer with internet access can be used to track the flight
- An iPad 3 with 4G Cellular makes an excellent portable tracking tool.
- It can show a standard map or a terrain map that could assist in recovery.



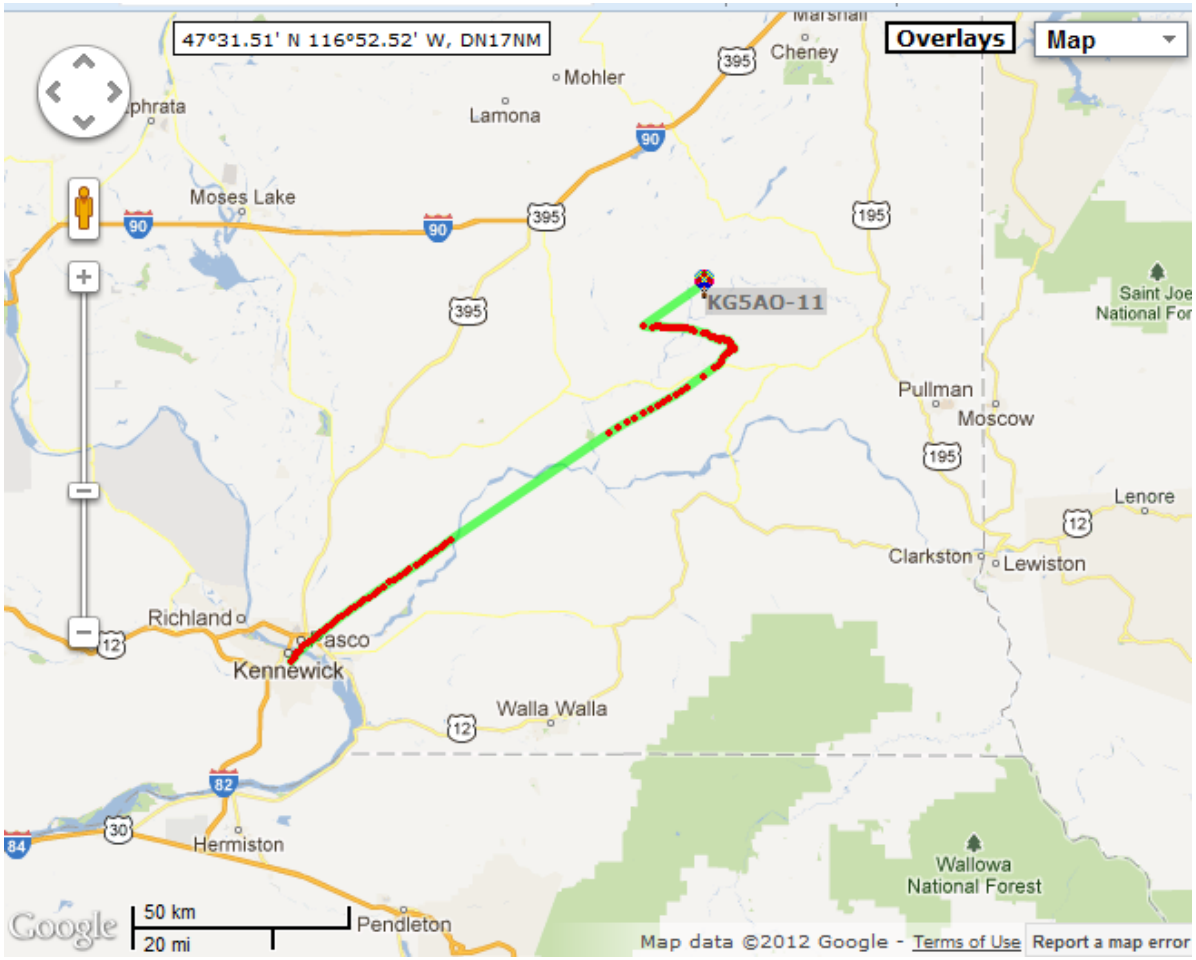
Tracking the Flight



Tracking the Flight



Tracking the Flight



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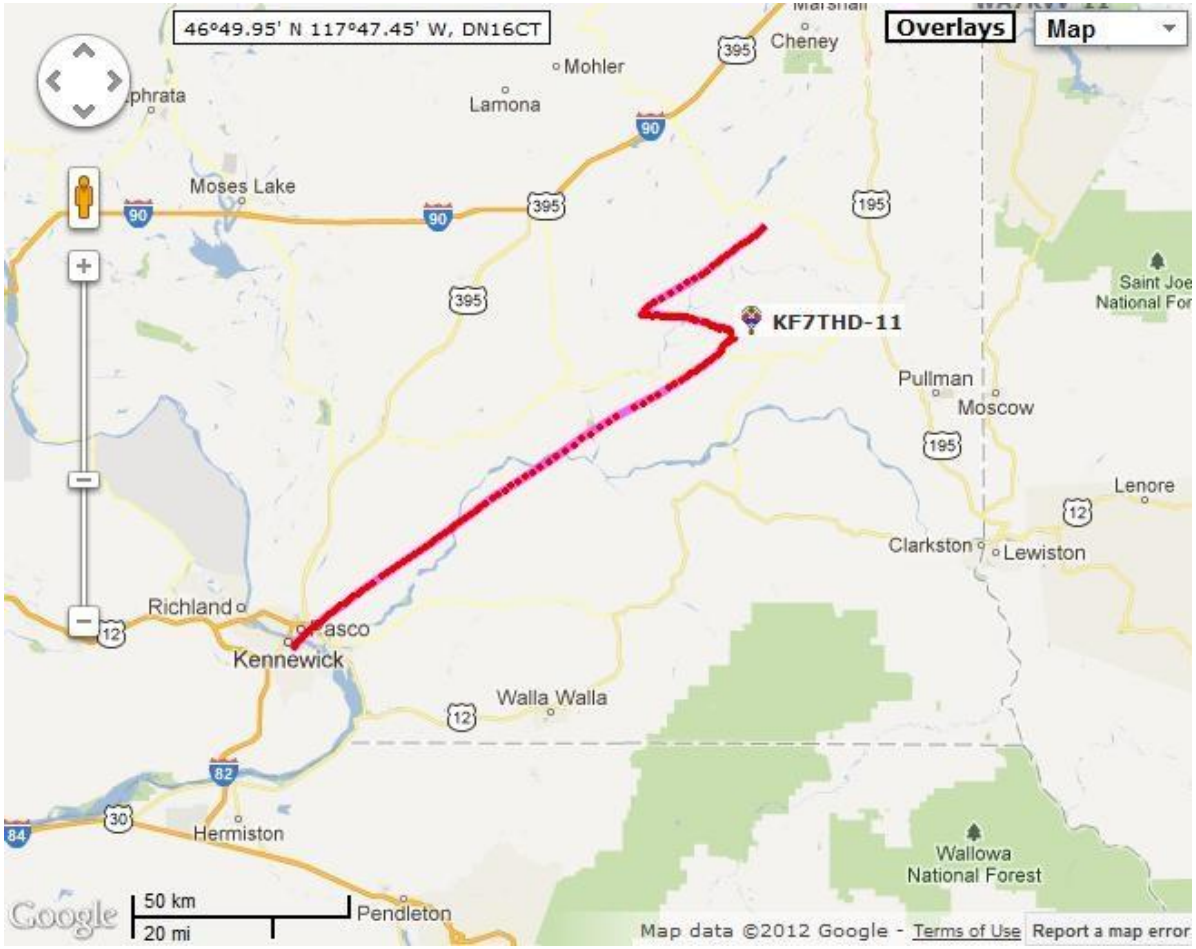

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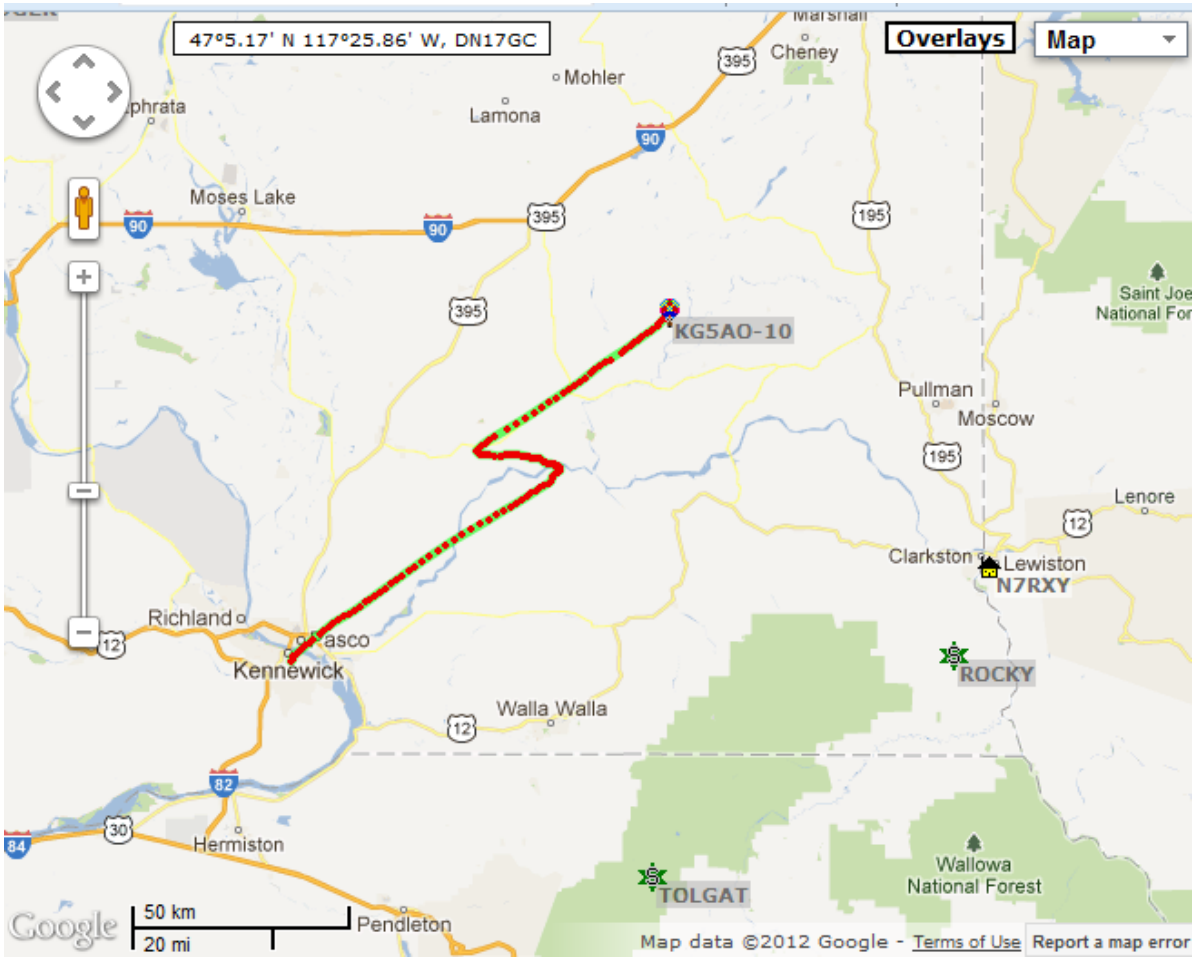

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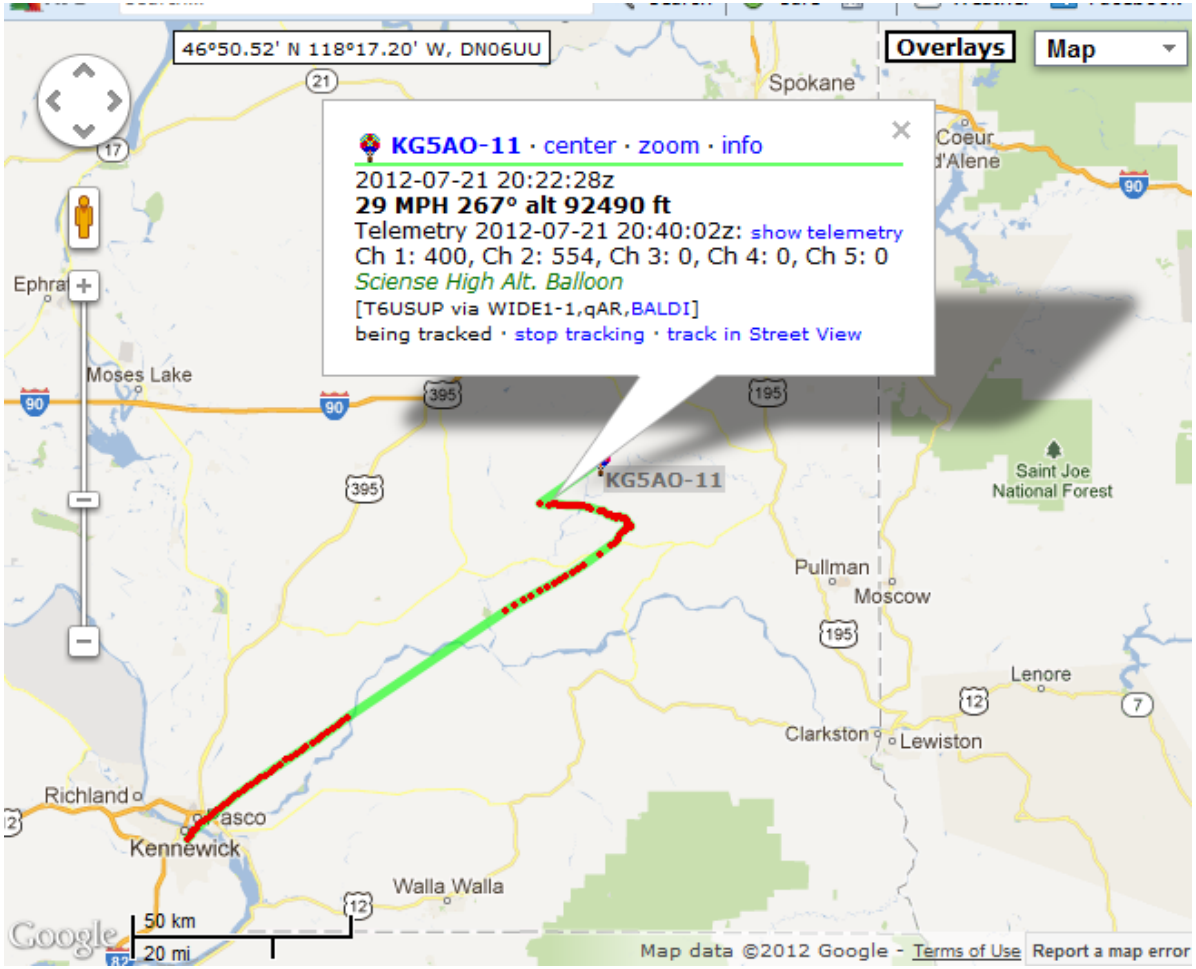

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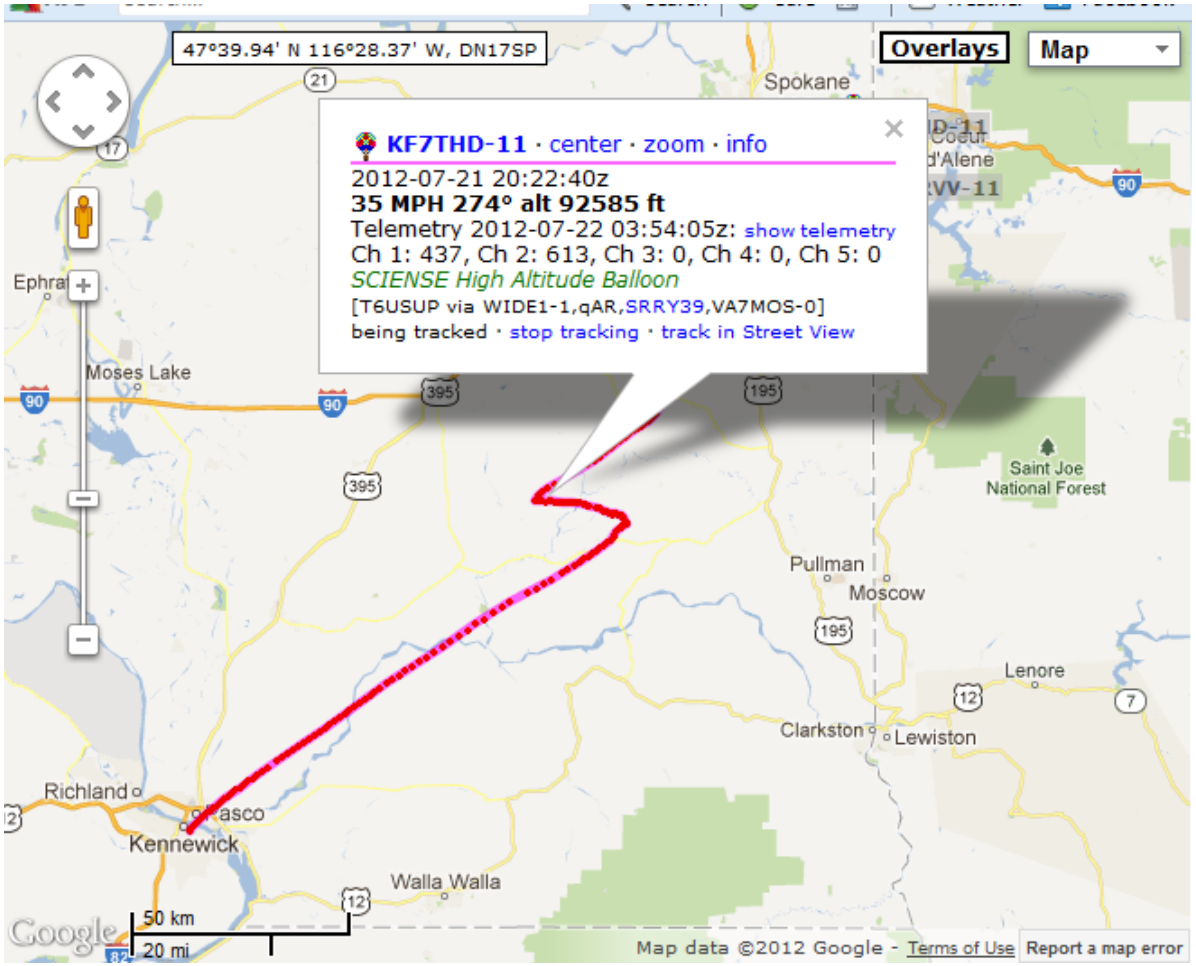

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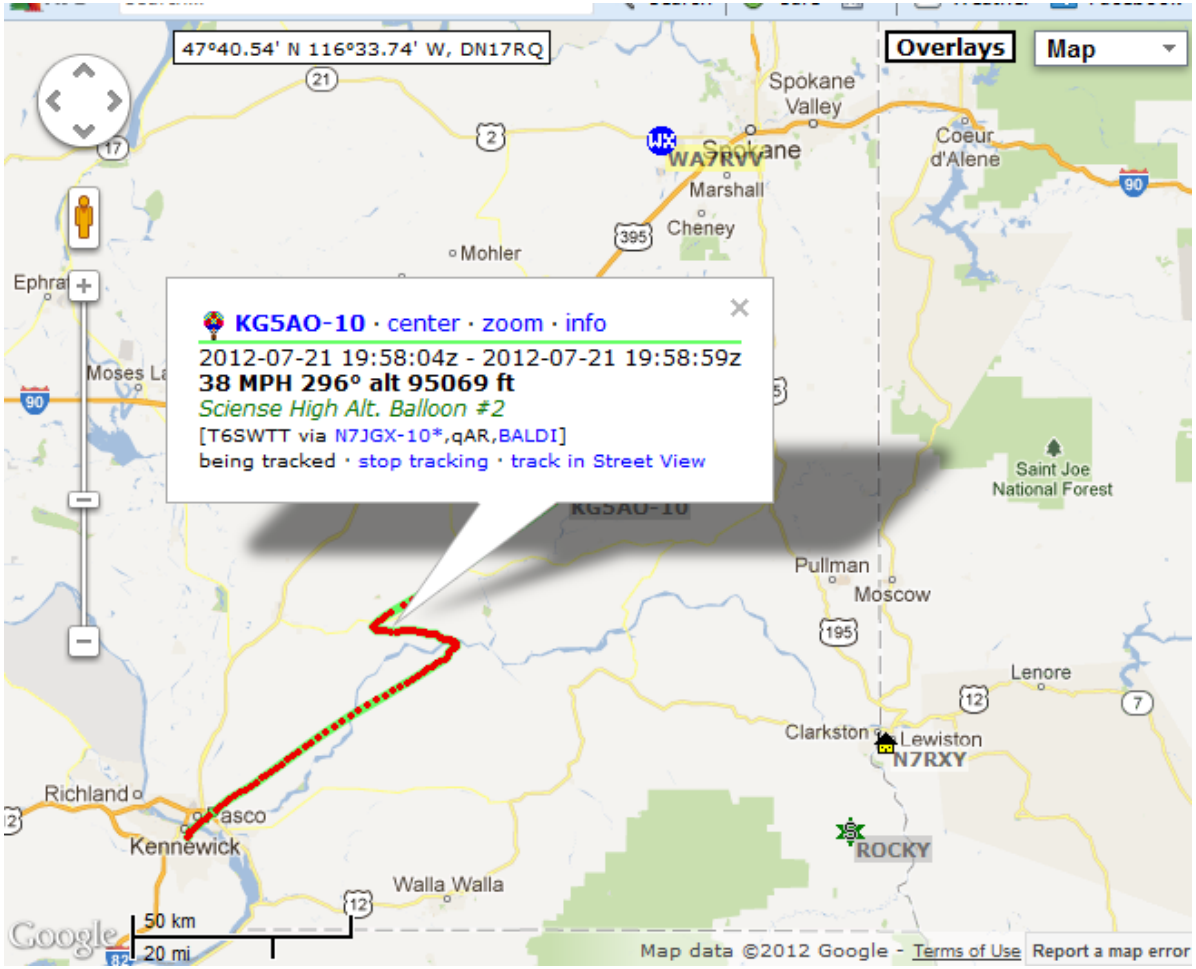

Happiness is a Successful Launch and Recovery of the Payload

Questions


We are always looking for a few folks to help us with our launches