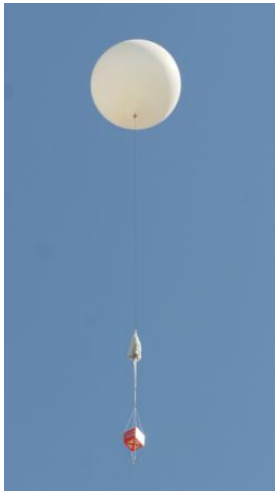
High Altitude Ballooning For Fun and Education



Steve Krause KG5AO

Dan Croskrey KF7THD

An Emerging Hobby for Hams

- **High altitude ballooning is an emerging hobby, since 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 the 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 the earth. Air pressure in near space reaches 99% of a vacuum or better.**
- **Air temperatures drop to a low of -60 degrees 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.**

PaulVerhage

- **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 one of his 100th balloon launch in the March 2012 edition of "Nuts and Volts"**

PaulVerhage (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 Spacecraft is less than $1,000. “Our launch vehicles and fuel are latex weather balloons and helium,” he said.**

PaulVerhage (continued)

- **Has launched 100 balloons. Payloads on his Near Spacecraft include 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 Enthusiast's

- **High Altitude Balloon Launches take place in the Eastern Washington and Spokane area.**
- **Steve Krause and Dan Croskrey have led the launch of XX balloon launches using hydrogen filled balloons and APRS Tracking transmitters.**

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In Flight Photos

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What Does It Take

- **A launch Vehicle–A weather balloon. 1000 gms ($89) to 1,500 gms ($145)**
- **The 1,000 gm. balloon expands to ~22ft before it Bursts.**
- **The 1500 GM. Balloon expands to ~32 ft before it bursts.**
- **The larger the diameter when it bursts, the higher the altitude it can attain.**

What Does It Take

- **Tank of Hydrogen $ 85.**
  or Helium >$ 200.
- **The balloon is inflated with 210 cu ft. of gas**
- **Hydrogen yields 10% more lift for a given volume over helium**

What Does It Take

- **Parachute $ 30 to $100 (eBay)**

What Does It Take

- **APRS Transmitter (Byonics)**

Micro Trac 300
100 milli-watts out

lot
vailable

Micro Trac 800FA
10 watts out

What Does It Take

- **APRS Transmitter (Byonics)**

Micro-Trak RTG FA

GPS 4 High altitude antenna

What Does It Take

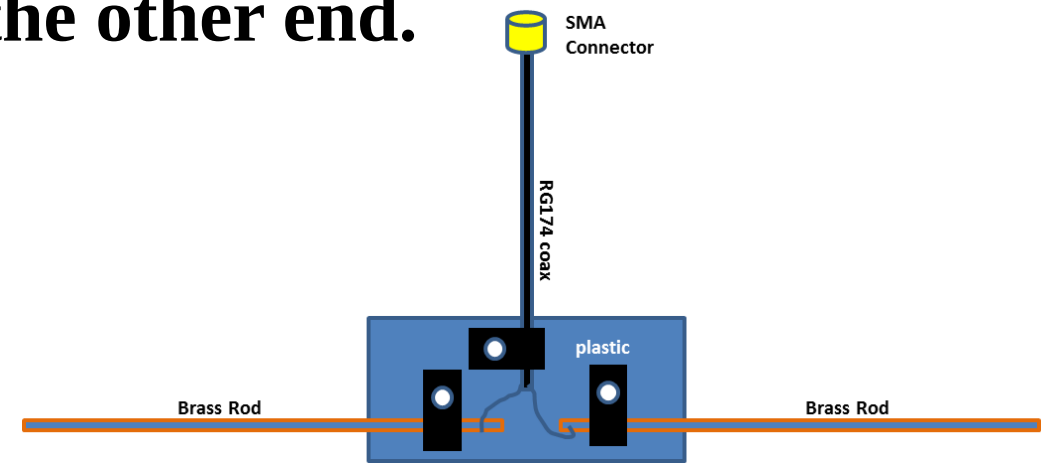
- **GPS Receiver**

Reports longitude, latitude, altitude, and assent and decent rate (speed)

Byonics GPS2OEM - $64

What Does It Take

- **Hanging Dipole Antenna $15 (Home built)**
- **¼ wave dipole is 2 pieces of 0.100 inch brass rod 19.45 inches long**
- **Coax is RG174 with SMA Male connector on one end and directly soldered to the two brass rods on the other end.**



What Does It Take

- **Camera $**

What Does It Take

- **Other electronics $**

The Payload Construction

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Micro-Trak RTG FA

GPS 4 High altitude antenna

Micro-Trak RTG FA – $150

Micro-Trak RTG FA

GPS 4 High altitude antenna