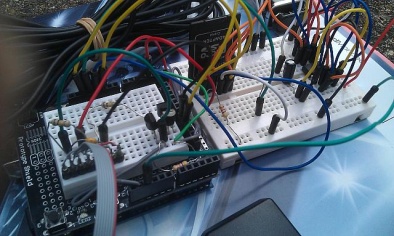
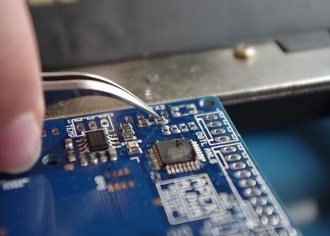
apexhab.org/alpha/

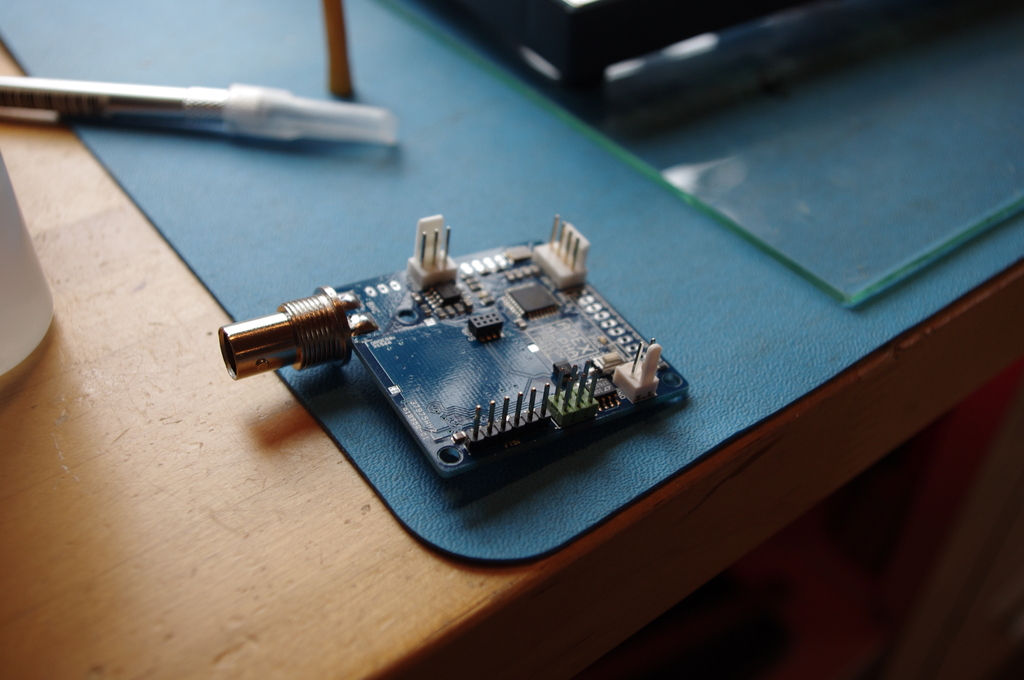


three

The APEX team is a group of teenagers who are passionate about electronics, technology and engineering.

We design complex electronic payloads consisting of various sensors and cameras to collect interesting data and amazing photographs from high altitudes using large meteorological balloons.

The team was started at Sutton Grammar School in 2008 by a small group of students and since then have successfully had 3 launches. Now that the original team have all moved on to greater things, the current team have taken the helm and developed a “next-generation” payload – APEX III.

APEX III has been designed to be modular. Based on the Arduino microcontroller as opposed to PICAXE like APEX II, we have nicknamed the core module ‘Alpha’. Alpha is the bare minimum that can be launched and consists of a microcontroller, GPS, temperature sensors and radio all squeezed into a tiny 5cm x 5cm PCB. Alpha is to be launched on a 2000g balloon in October 2011 and we hope to reach 40km altitude – nearly 4 times the height which commercial aeroplanes fly.

The payload is attached to a large, meteorological balloon filled with helium. Obviously, since helium is less dense than the air around us the balloon rises and takes our payload with it. The electronics takes co-ordinates from the GPS and data from any other sensors and then transmits it back down to Earth where we track it on a live map in the back of our chase cars using amateur radio systems and decoding software. As the balloon increases in altitude, the air pressure decreases causing the balloon to expand in size due to internal pressure being much greater. The latex balloon eventually stretches to up to 25m in diameter before it bursts at which point the payload starts to fall, the parachute slowly opens and it descends at a safe speed until it hits the ground where we can safely recover it.

We can add further modules to Alpha: these include all sorts of sensors, cameras and cutdown devices. This makes up APEX III. We hope to successfully collect radiation data for the full duration of the flight for example - previous payloads always failed to do so due to pressure limitations with the Geiger-Muller tubes being used. We are once again going to include several cameras in hope of catching even sharper, daylight photos – our best photos currently are from the APEX II Dawn launch – and we will launch our brand new HD video camera too. Other modules include light sensors, various gas sensors such as CO2, an ash sensor which could collect interesting data in the event of another volcanic eruption affecting the UK, a pressure sensor and anything else we decide may be interesting.

APEX III has taught the whole team an awful lot, from electronic design to radio communication and complex C++ programming – everything has been developed from scratch to prove that the latest APEX team have what it takes too. We have faced many challenges along the way [examples here].

APEX, along with a few other high altitude projects in the UK, is now a member of the UK High Altitude Society ([www.ukhas.org.uk](http://www.ukhas.org.uk)). UKHAS brings together interested people to help launch and track payloads all over the country. As the hobby becomes more popular, the need for guidelines becomes more apparent – UKHAS tries to provide these guidelines, and it would be great if the government could support them.

* Why you undertook the project (were you part of a club, was it school/college coursework, was it personal interest?)
* What you set out to investigate (Science/Maths stream) or create (Engineering/Technology stream)
* What was the aim of your project?
* How you approached the challenge of your project or activity (your methods and approach?)
* Any challenges you faced and how you overcame them
* The outcome or results of your project or activity
* The conclusions you can draw from your results
* Any wider impact of your project