From the Front Lines of Open Innovation: OpenRelief, OpenStreetMap and Openness Challenges

Planning disaster relief efforts is like trying to see through fog.

Image by dicktay2000: http://www.flickr.com/photos/34094515@N00/5888974488/sizes/o/in/photostream/

OpenRelief is a project to develop better communications tools for disaster relief efforts: the tools to clear the fog.

Public domain image: http://goo.gl/ulyox

The idea is to help gather critical information for relief workers on the ground.

U.S. Navy photo by Mass Communication Specialist 3rd Class Dylan McCord: http://www.fotopedia.com/items/flickr-5540847894

Use information to help get the right aid to get to the right place at the right time.

U.S. Navy photo: http://www.fotopedia.com/items/flickr-4317637016

Our first step was to create a robot plane to investigate and map disaster zones.

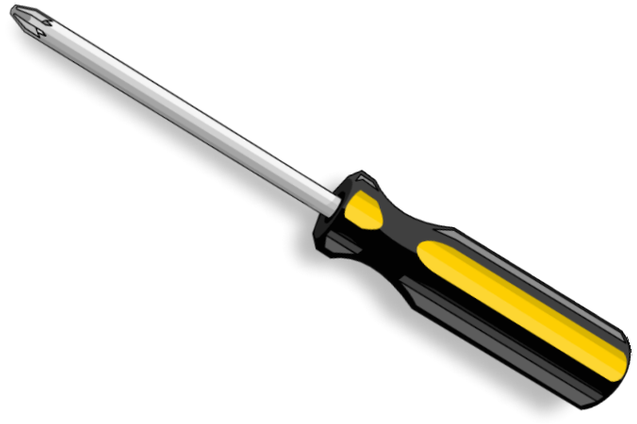
Illustrative image from eranmutai's pre-existing 168 FPV airframe on YouTube: http://www.youtube.com/user/eranmutai

Capabilities

- Take off from footpaths.
- Recognize roads, people and smoke.
- Photograph, film and map the landscape.
- Measure weather, radiation and other conditions via modular sensors.

Seeing Stuff

How It Was Made



- Many off-the-shelf components.
- Open Hardware computer, autopilot and sensors.
- Free and Open Source Software throughout.

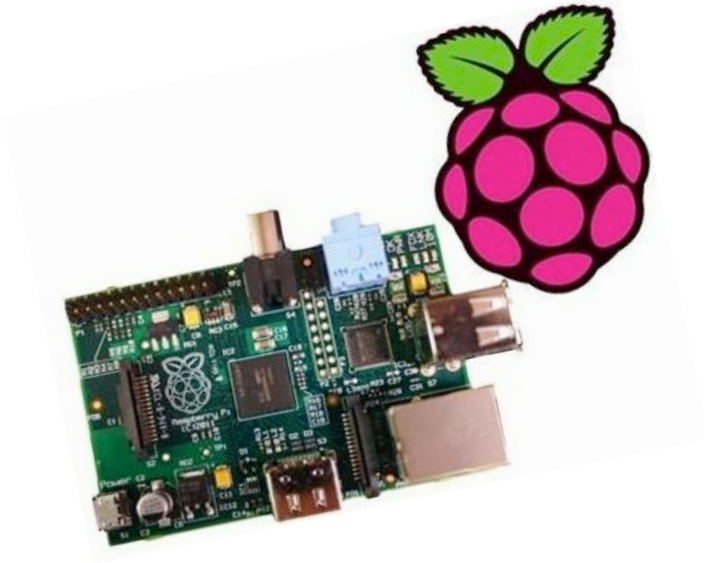
The System

- Ardupilot Mega to fly the plane.
- Super HAD CDD fisheye camera to see.
- Arduino-based sensors to gather information.
- Raspberry Pi to process data.
- Raspian OS to analyze the results.

Autopilot Specs

- 16MHz Atmega2560 processor.
- 256k Flash Program Memory, 8K SRAM, 4K EEPROM.
- 600 3D waypoints and mission commands.
- 16MB Data Logger (Black Box).
- Can reboot the processor in mid-flight.

Computer Specs



- BCM2835 700 MHz ARM11
- 256-MB LPDDR RAM.
- 1080p30 H.264 encode/decode, HDMI.
- GPIO pins, Serial Bus (SPI), UART and 10/100 wired Ethernet RJ45.
- SD / MMC / SDIO card support.

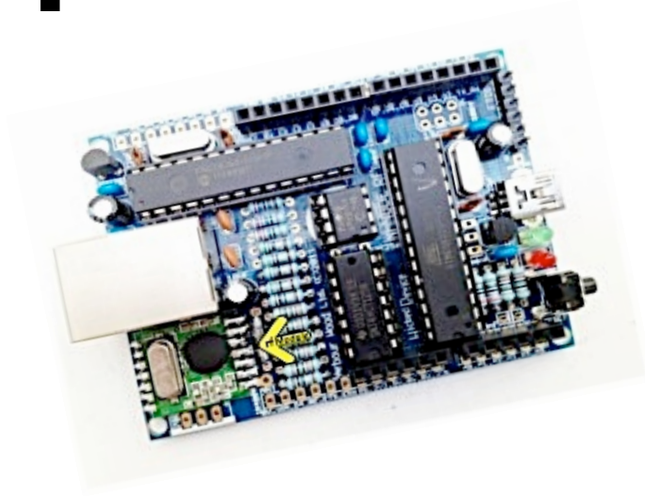
Software Specs

- ArduPlane 2.32 (autopilot).
- Debian 6 (OS).
- OpenCV 2.3.1 (visual recognition).
- Custom code for smoke, people, roads and SfM (structure from motion).

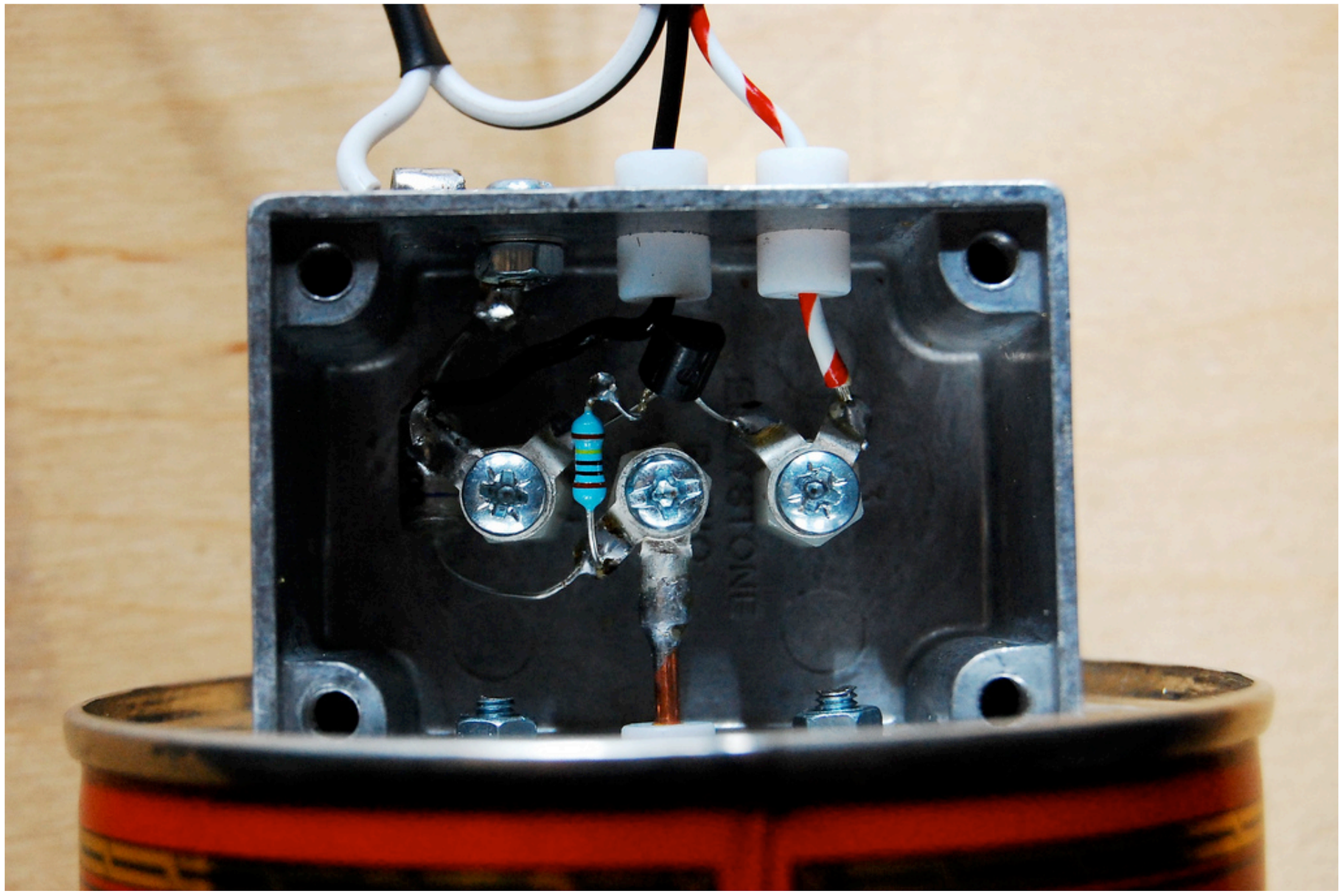
Camera Module Specs

- Sensor: 1/3" Sony Super HAD ii CCD
- Lens: 1.78mm170 degree view angle.
- Minimum Light: 0.1 Lux at F1.2.
- Auto Tracking White Balance.
- Operating Temp.: -10°C ~ +50°C

Radiation Module Specs



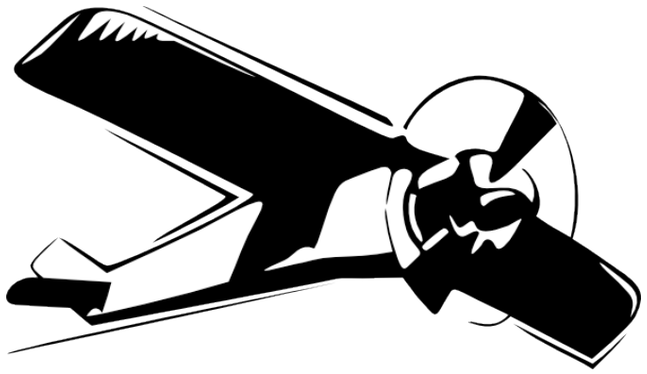
- Nanode RF:
  - ATmega328p 8-bit RISC microprocessor.
  - RFM12B radio module (100 meter range).
- Custom Ionization chamber or J305β Geiger Tube.



Mission Control

- Laptop with a USB connection.
- Debian 6, Ubuntu 11/10 or Windows.
- Mission Planner 1.1.89.
- VLC Player 2.0.1.
- Disaster management software at HQ (Sahana Eden or similar)

Test Airframe



- Body: Fiberglass and balsa wood.
- Wing Span: 1660mm.
- Fuselage: 1190mm.
- Weight: 2 - 3kg.
- 20 - 30 minutes endurance.

A Little Eco-System

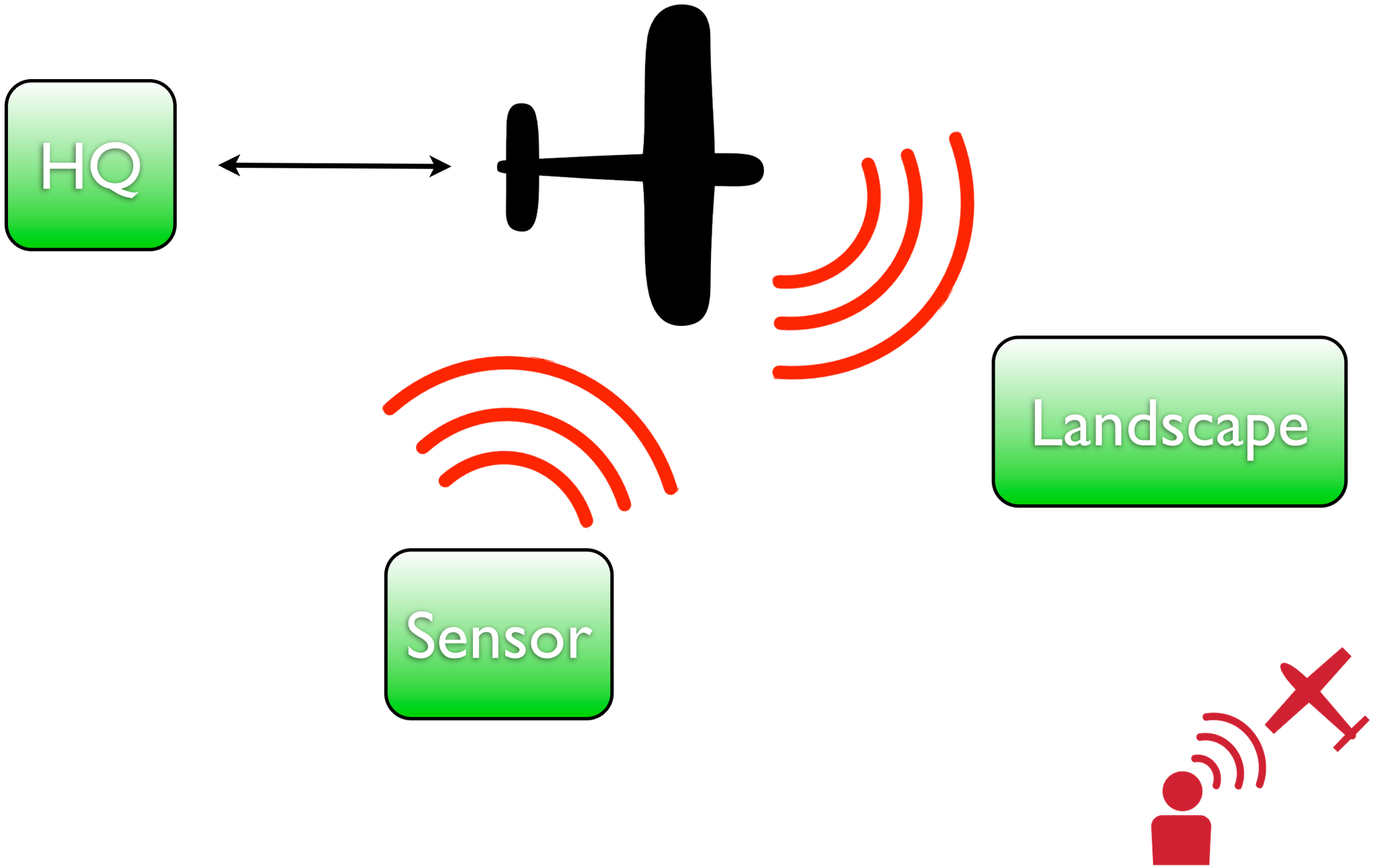
pendawn

CodeThink

Toradex

nan⚙de
open source

Putting It All Together



Potential vs Reality

- The software is quick to hack, but a lot of it requires specialists to improve.
- The airframes nearly always suck.
- Integration of all the software and hardware is a significant challenge.

Milestones

Jan 2012
Development

Jul 2012
UK/Japan Testing

Jul 2011
Research

Jun 2012
Project Launch

Dec 2012
Production Ready

OpenRelief is part of a global community to develop solutions around the world.

NASA Goddard Space Flight Center: http://visibleearth.nasa.gov/view.php?id=57723

Global Improvement

- CanberraUAV has created excellent UAV tools for flight and imaging.
- OpenRelief was approach by an aviation specialist to release a capable, open airframe.
- We are building relationships with emergency responders and universities to further integration.

Take two - getting a cool airframe out there

NASA Goddard Space Flight Center: http://visibleearth.nasa.gov/view.php?id=57723

It’s the little things

NASA Goddard Space Flight Center: http://visibleearth.nasa.gov/view.php?id=57723

Be Part Of This

- Visit www.openrelief.org
- Join our user list to get up to speed.
- Join our developer list to work on tools.
- Join our outreach list to help spread the word.

Get Our Tools

- You will find test code at:
  www.gitorious.org/OpenRelief
- You will find device schematics at:
  www.solderpad.com/OpenRelief

Thank You!

Oldham College