Understanding The Technology Behind OpenRelief

Our first step is 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

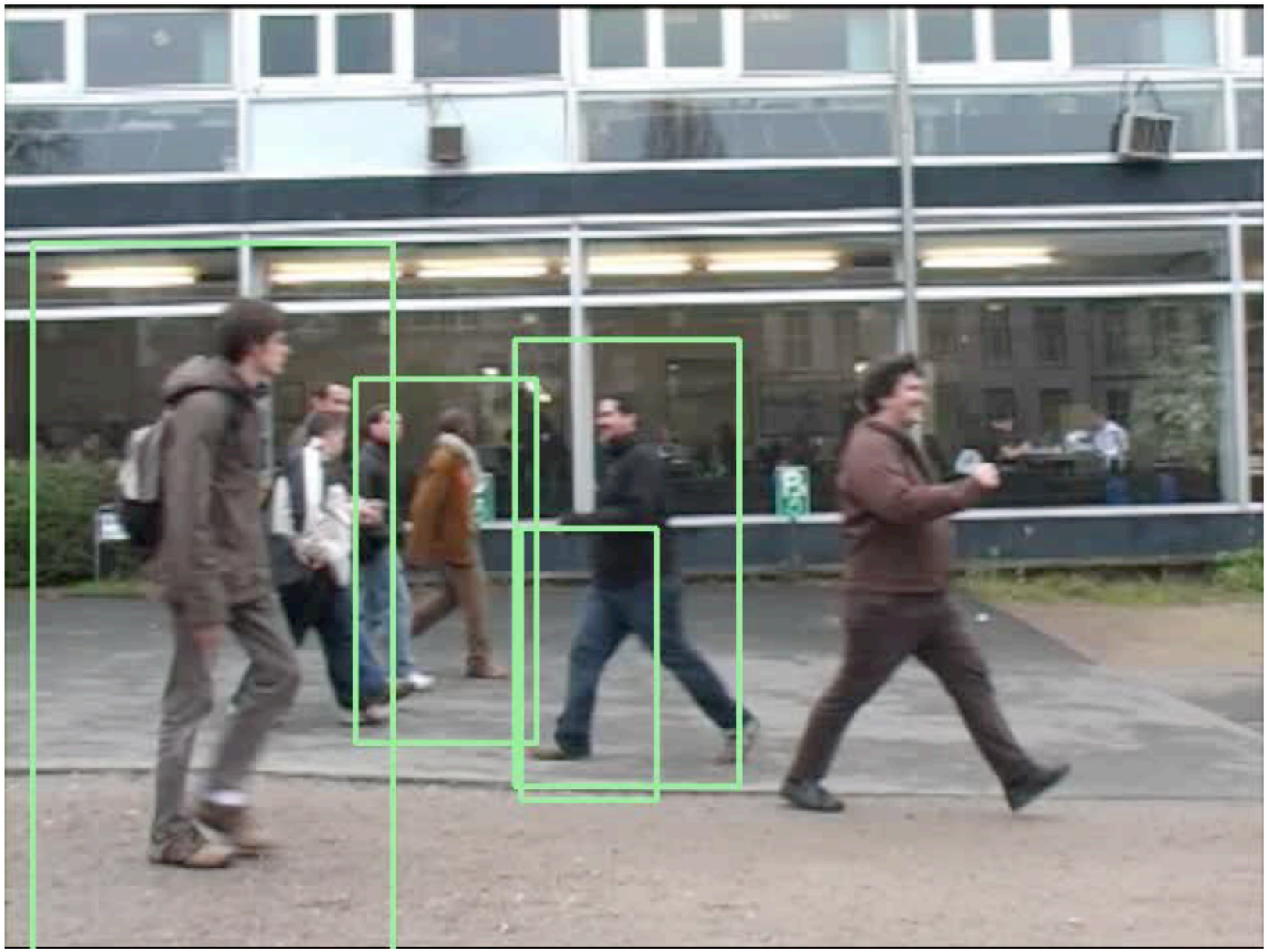
What The Plane Does

- It can take off from footpaths.
- It can recognize roads, people and smoke.
- It can photograph, film and map the landscape.
- It can measure weather, radiation and other conditions via modular sensors.

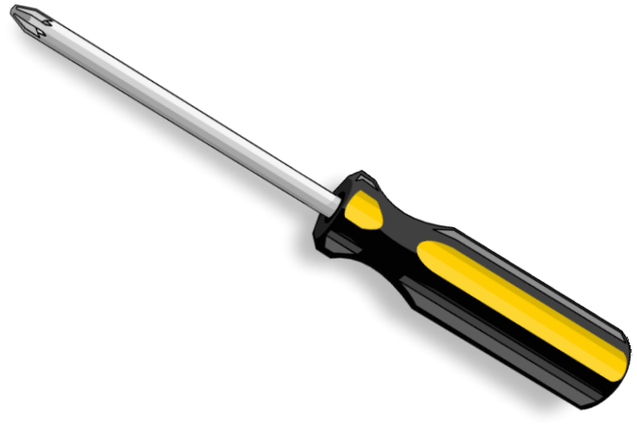
Smoke Detection

Road Detection

People Detection

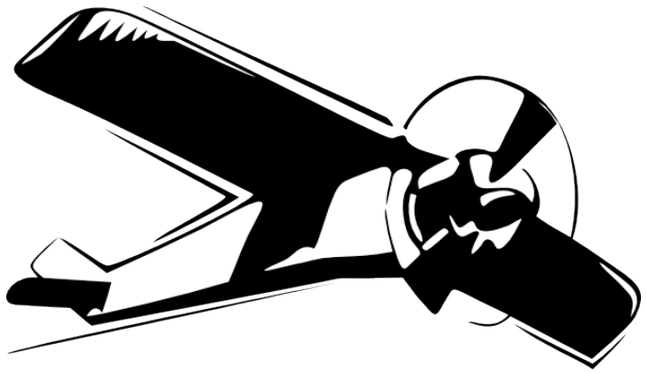


How The Plane Is Made



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

The Airframe



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

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.
- Debian OS to analyze the results.

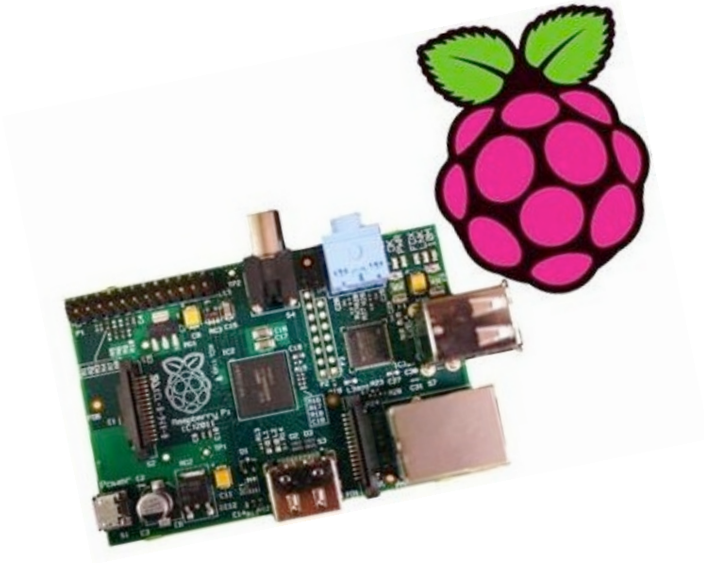
Autopilot Specs

- 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.

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

Computer Specs

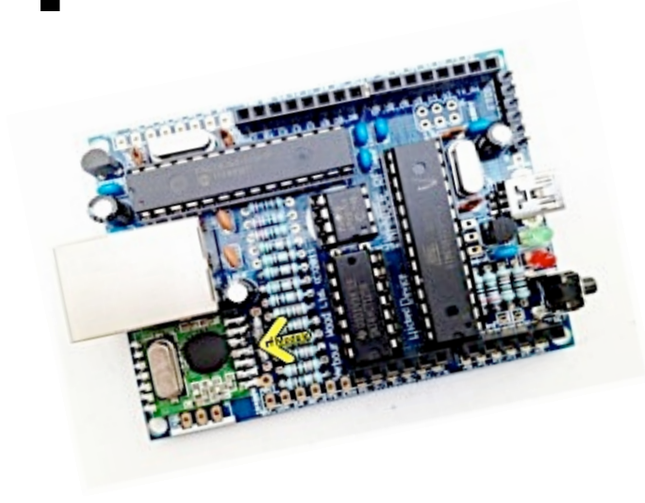


- BCM2835 700 MHz ARM11
- 256-MB LPDDR RAM.
- 1080p30 H.264 encode/decode, HDMI.
- GPIO pins, Serial Bus (SPI), UART and 10/100 wired Ethernet RJ45.
- SD / MMC / SDIO card support.

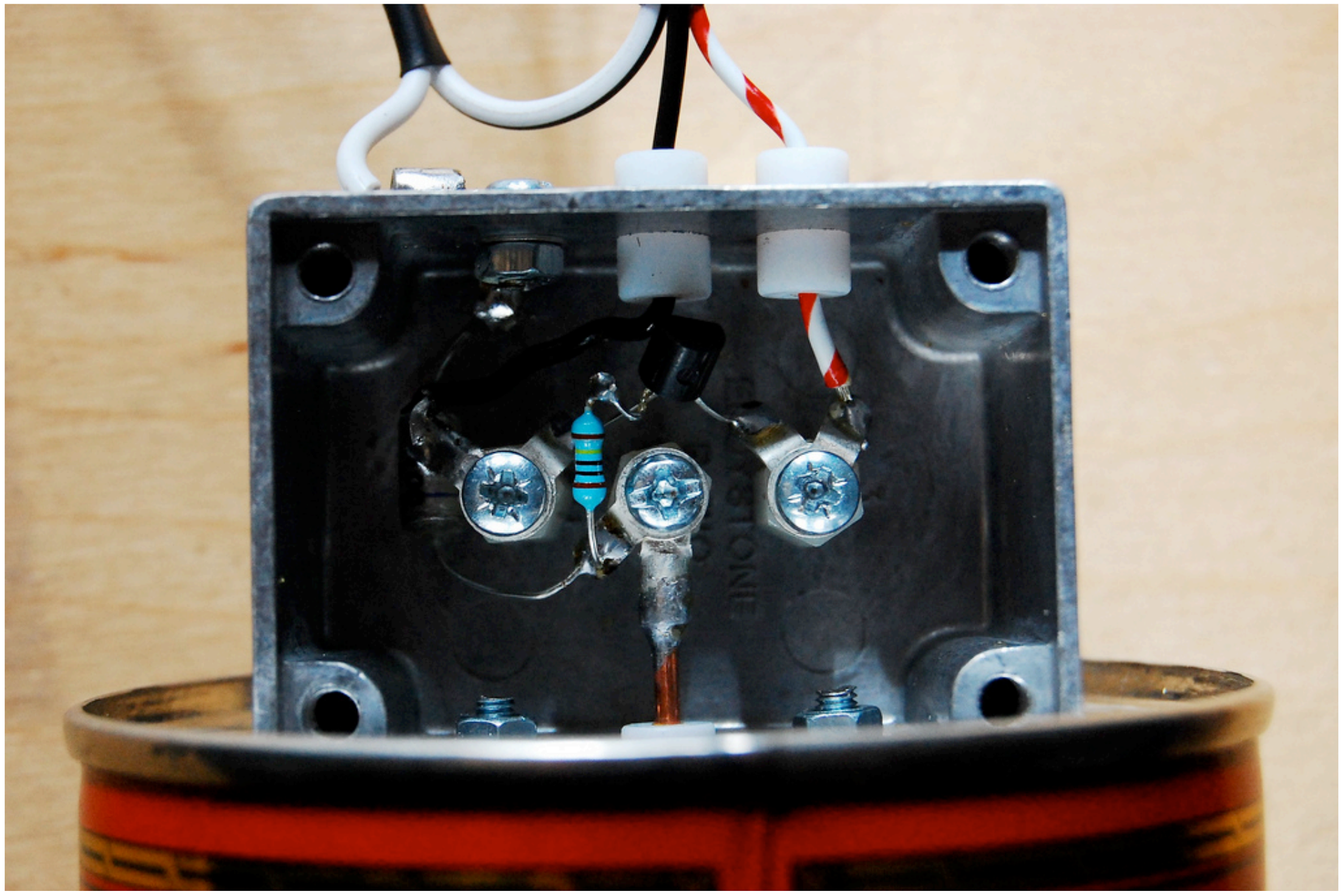
Software Specs

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

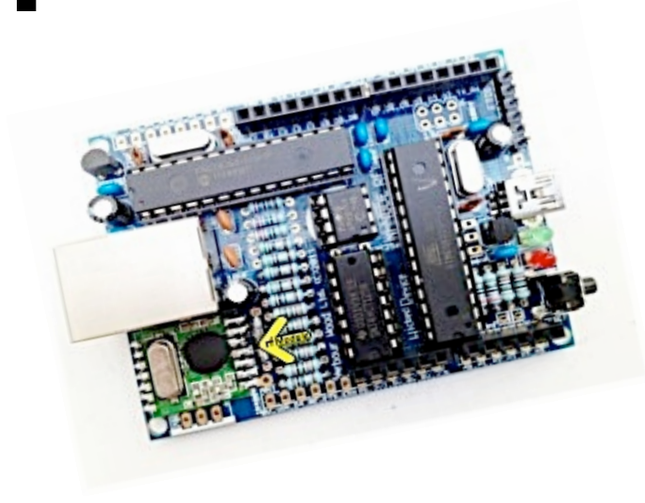
Radiation Module Specs



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



Weather Module Specs

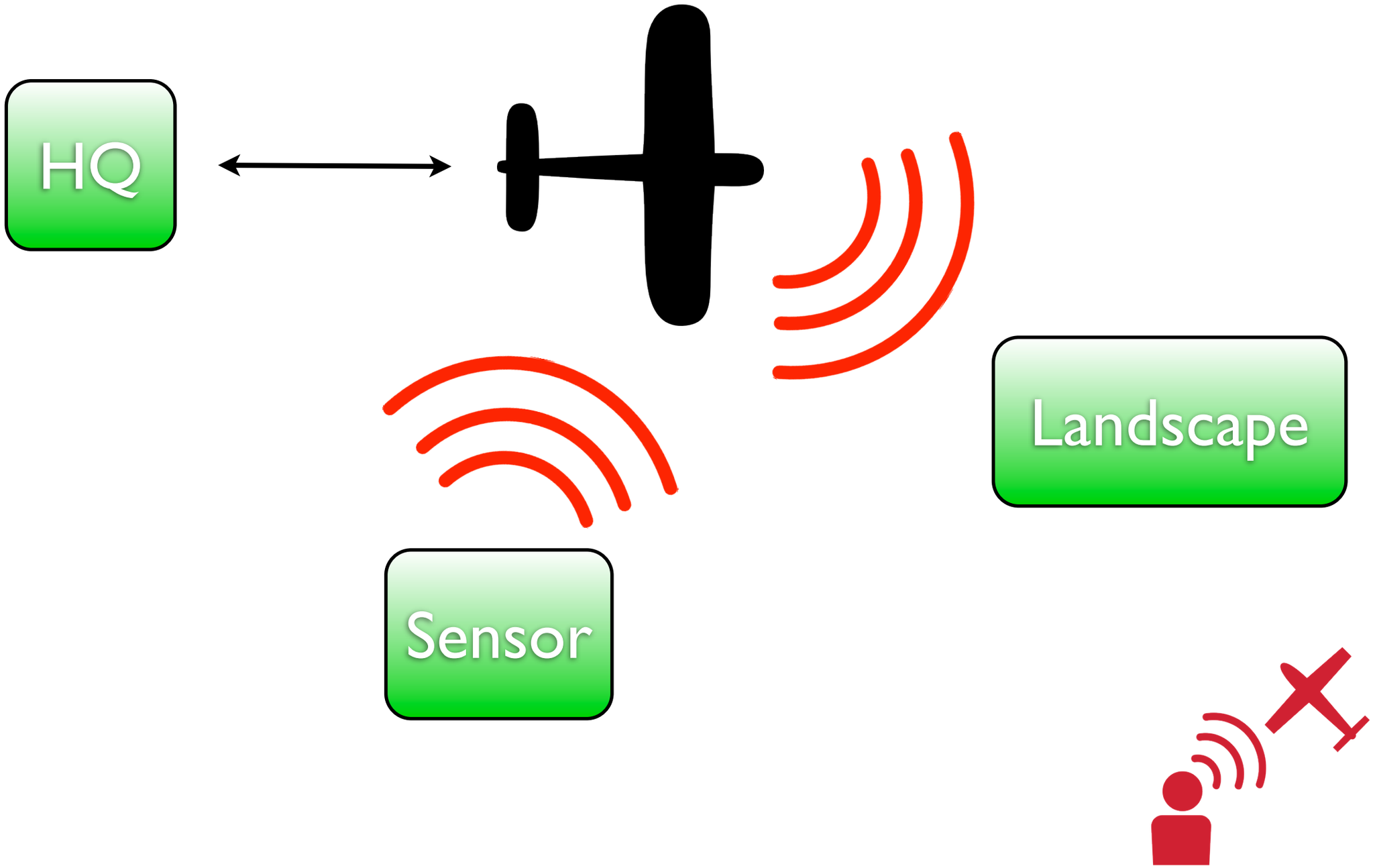


- Nanode RF:
  - ATmega328p 8-bit RISC microprocessor.
  - RFM12B radio module (100 meter range).
- Off-the-shelf sensors with RJ11 terminated cables.

Mission Control

- Laptop with a USB connection.
- Debian 6, Ubuntu 11/10 or Windows.
- Mission Planner 1.1.58.
- VLC Player 2.0.1.
- Disaster management software at HQ (Sahana Eden or similar)

Putting It All Together



Milestones

Jan 2012
Development

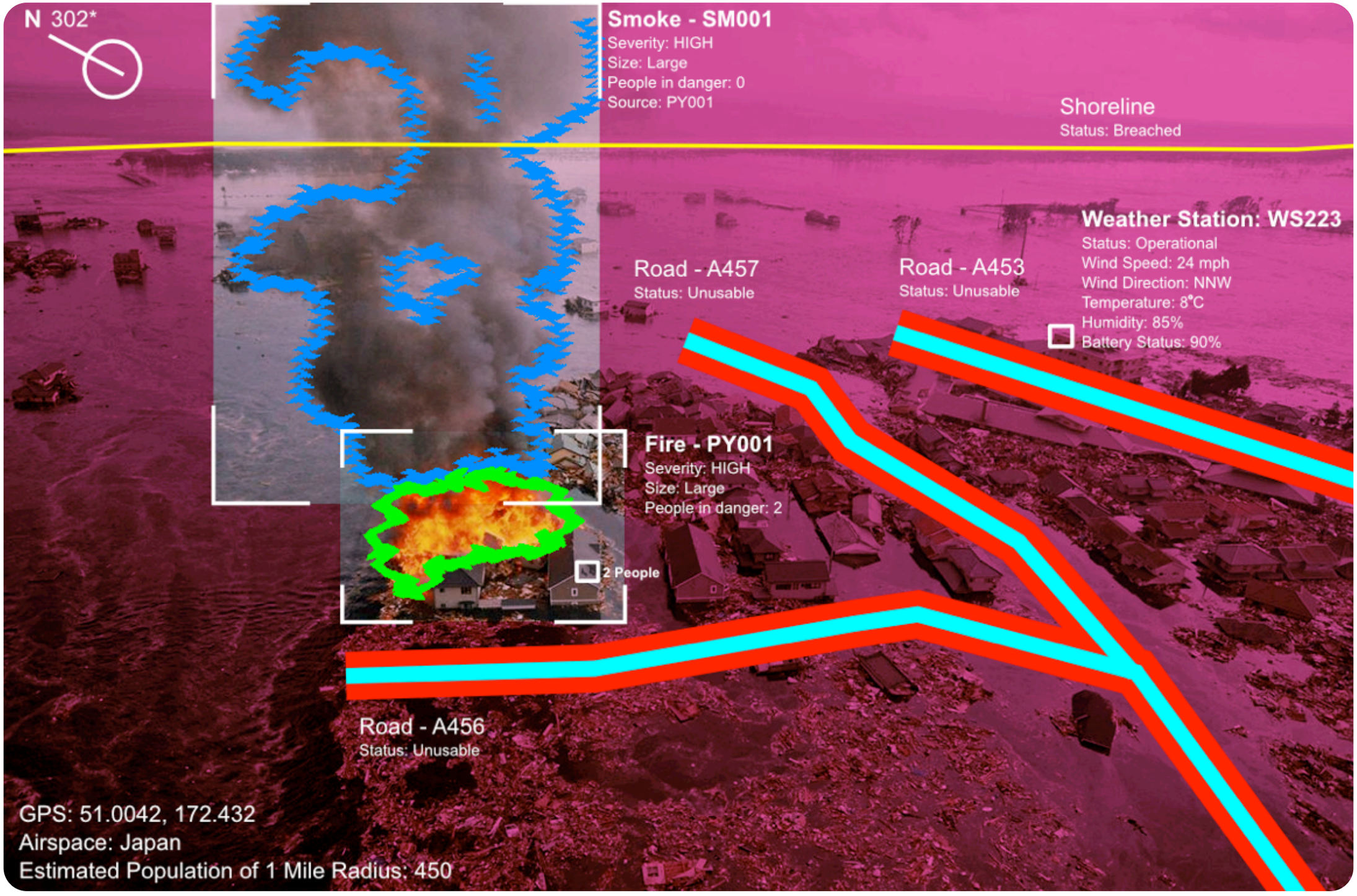
Jul 2012
UK/Japan Testing

Jul 2011
Research

Jun 2012
Project Launch

Dec 2012
Production Ready

Where This Is Going



Get Our Tools

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  www.gitorious.org/OpenRelief
- You will find our schematics at:
  www.solderpad.com/OpenRelief

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