Announcing "PiSkyTracker"

This is to announce the availability of a "kit" to enable people to track and log aircraft flying over their location using a fairly cheap combination of electronics.

To make effective use of the kit, you will need a PC or Mac for initial set up and an internet connection to make best use of the main features. Following initial set-up, the kit can run autonomously using only a little electricity.

It will work anywhere in the world – you just need the correct power supply for your country.

Background

For some years now, it has been possible to track aircraft flying over your location using such devices as the AirNav Radarbox and the SBS-1, but these have been quite expensive – costing as much or more than a Laptop PC, which is needed to view the results.

Also online, sites such as www.FlightRadar24.com, Flight Aware and Virtual Radar offer tracking and aircraft identification features, though can be slow to update and somewhat cumbersome to use. Similarly, there are Android and iPhone Apps which interface to these online services and allow you, for example, to identify flights by holding up your phone in the direction of a plane in the sky. Of course, not everyone has an iPhone or Android phone...

The hardware solutions, like the AirNav box, allow flights to be logged but their logging features are not very flexible. For example, with the AirNav box (2010 version of the software), all the messages received and decoded by the box can be saved to log files – but in a day, 600,000 messages may be received from all the aircraft that are detected, resulting in large log files, which need to be processed by special software to extract useful information. Additionally, for continuous 24/7 logging, things like the AirNav box "tie up" a PC or laptop which may be needed for other uses.

The Website and Phone App solutions don't have logging features of any great sophistication, so there is something needed to allow this logging and counting of aircraft automatically.

This is where PiSkytracker comes in to the picture.

Main Features

- **Automatic Logging of Flights and Flight statistics**

  You configure whether you want PiSkytracker to log flights that pass over your location. PiSkyTracker will log either all flights, or flights above a certain altitude. It will keep count of the

number of planes it detects in certain altitude boundaries and their start lat/long and final lat/long co-ordinates.

One of the main reasons for developing the kit and the software is for it to try and determine changes in the level of air traffic which may occur when aircraft trails are seen in the sky.

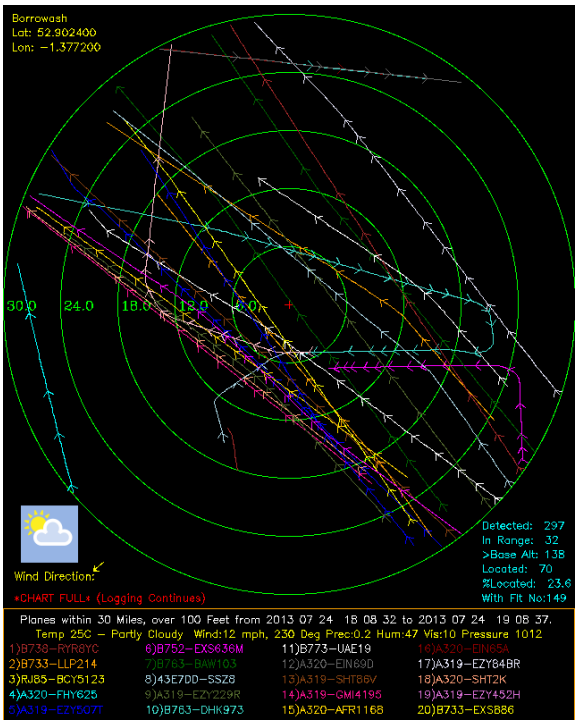
- **Camera Support to Photograph The Sky every Few minutes**

PiSkytracker can use a web cam or the custom Raspberry Pi Camera board to regularly take photos of the sky – at an interval you choose. Photos are time-stamped and annotated with a label which you can configure.

- **Automatic Capture of Weather Data**

Weather data is collected automatically (internet connection required and free account set up may be needed) and collated with plane logs and charts, so that it can be matched to plane observations

- **Comprehensive Plane Charting**



- **Spoken Flight Announcements**

The built-in speech engine can be set to announce when planes above a certain altitude come into range and it will indicate the direction in which to look for them (you could use the Google Map to check as well – see below). You need to attach some speakers to your Pi, of course! USB-Powered speakers can be obtained cheaply

- **Data saved in Standard Formats**

All this data is saved on a standard SD Card in formats which can be easily read and processed by other software. For example, flight logs and flight counts are saved in **CSV** format and Charts are saved in **PNG** format. Photos are saved in **JPG** format.

Microsoft Excel - 2013-07-24-PlaneStats.csv

	Date/Time	Temp C	Weather Desc	Windspeed	Wind Dir	Precipitation	Humidity	Visibility	Pressure	Unique Planes Detected	Military Flights	Planes within 30 Miles	Planes Having Lat/Long	Planes with Flight No	Alt 15000 to 19999	Alt 20000 to 24999	Alt 25000 to 29999	Alt 30000 to 39999	Alt 40000 and above	Total Abov Base
2	2013-07-24--17-08-32	25	Partly Cloudy	11	210	0.1	51	10	1013	340	17	31	76	157	19	24	26	78	0	
3	2013-07-24--18-08-32	25	Partly Cloudy	11	230	0.1	51	10	1013	312	5	36	62	136	14	20	21	68	0	
4	2013-07-24--19-08-32	25	Partly Cloudy	12	230	0.2	47	10	1012	297	1	32	70	149	28	18	23	69	0	
5	2013-07-24--20-08-32	25	Partly Cloudy	11	240	0.2	44	10	1012	257	2	43	79	139	13	26	32	55	0	
6	2013-07-24--21-08-33	24	Sunny	9	210	0.1	47	10	1012	259	5	50	80	147	21	27	22	71	0	
7	2013-07-24--22-08-33	22	Sunny	6	190	0.5	57	10	1012	205	4	38	78	114	14	10	12	63	0	
8	2013-07-24--23-08-33	22	Clear	6	210	0.5	61	10	1012	170	3	34	65	87	8	13	6	44	0	

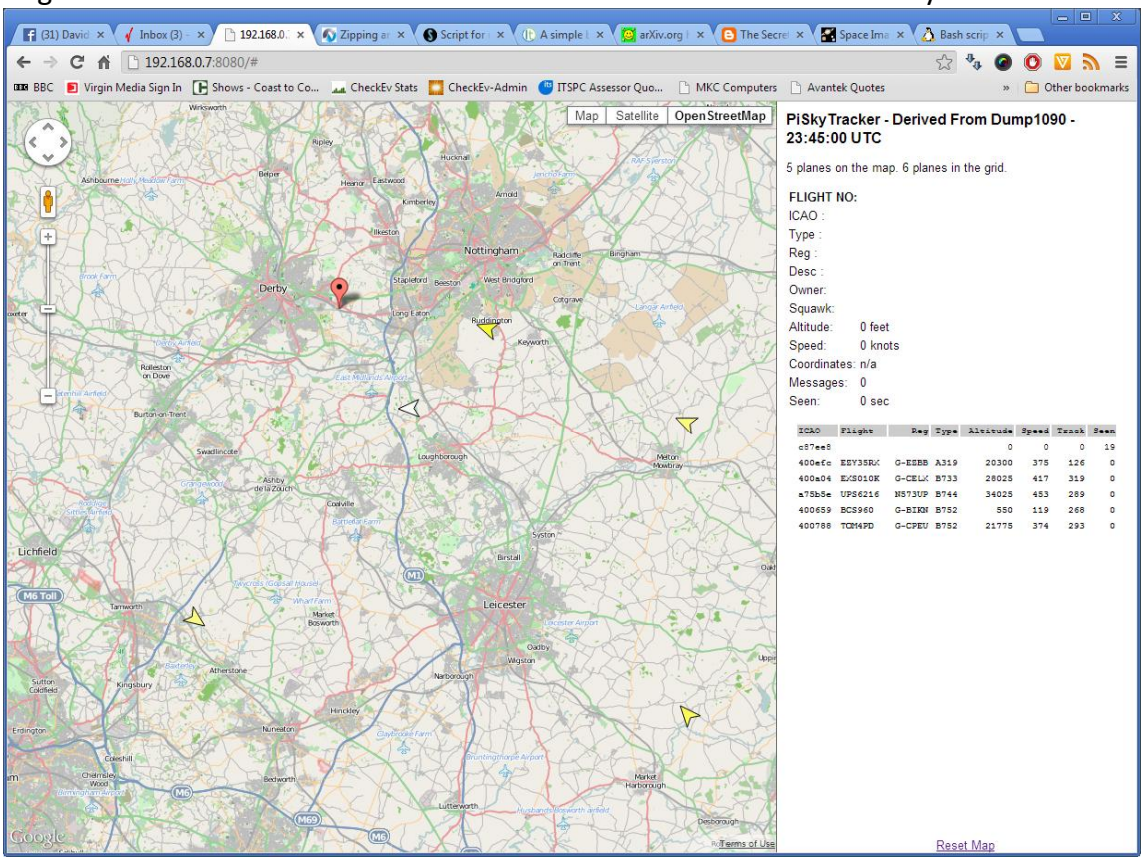
Microsoft Excel - 2013-07-23-FlightsDetected.csv

	Time	ICAO	Flight No	Aircaft Type	Description	Owner	Max Speed	Max Alt	Min Alt	Start Lat	Start Long	End Lat	End Long
2	2013-07-23--00-03-08	4CA702	RYR6ZE	B738	Boeing 737-8AS	Ryanair	436	38000	0	51.6915	-2.76507	51.7261	-2.9406
3	2013-07-23--00-03-09	4065C7	EZE9626		Embraer ERJ 14	Eastern Airways	0	9350	0	0	0	0	0
4	2013-07-23--00-04-55	4009BB	EXS005G	B733	Boeing 737-377	Channel Express	352	11175	0	52.35502	-1.86156	52.81558	-1.36078
5	2013-07-23--00-05-25	4065C7	EZE9626		Embraer ERJ 14	Eastern Airways	0	2450	0	0	0	0	0
6	2013-07-23--00-06-31	400A33	EXS008B	B733	Boeing 737-377	Jet2 (Channel Express)	374	23025	0	53.42959	-1.32991	52.45042	-0.9816
7	2013-07-23--00-08-32	406954					0	0	0	0	0	0	0
8	2013-07-23--00-08-36	400A33	EXS008B	B733	Boeing 737-377	Jet2 (Channel Express)	311	20775	0	52.29799	-0.96319	52.29492	-0.96291
9	2013-07-23--00-10-48	400895		ATP	British Aerosp	Atlantic Airlines	0	7950	0	0	0	0	0
10	2013-07-23--00-10-57	406954					0	32025	0	0	0	0	0
11	2013-07-23--00-12-36	401049	AWC11K	B733	Boeing 737-33A	Untitled (Titan Airways)	432	35025	0	53.26781	-1.28736	52.43369	-0.10618
12	2013-07-23--00-13-37	4.00E+79		B752	Boeing 757-256	Untitled (Titan Airways)	0	0	0	0	0	0	0
13	2013-07-23--00-14-50	405F7D	NPT004S	B733	Boeing 737-322	Untitled (Atlantic Airlines)	369	20425	0	53.48607	-2.2544	52.83774	-1.36551
14	2013-07-23--00-15-44	34334E	BCS4341	B733	Boeing 737-3M8	Swiftair	338	21150	0	0	0	0	0
15	2013-07-23--00-16-22	4.05E+26	TOM77J	B738	Boeing 737-8K5	Thomson Airways	453	38000	0	52.37178	-1.43466	52.45052	-1.45584
16	2013-07-23--00-16-22	4.00E+79	EXS984	B752	Boeing 757-256	Untitled (Titan Airways)	405	27900	0	53.18849	-0.27813	53.19724	-0.32878
17	2013-07-23--00-16-22	400A5E	EXS009H	B733	Boeing 737-330	Jet2 (Channel Express)	448	34025	0	52.51996	-1.20701	52.86468	-1.44455

Data files can be uploaded to a server, automatically, if the user configures this option – this allows statistics from different trackers in different parts of the country to be collated more easily.

- **Track Planes in Your Local Area on a Google Map**

You can connect to PiSkyTracker over your network and see the planes the detector is picking up – this gives an idea of where to look for them. The software on which PiSkyTracker is based included



a google map and simple webserver to allow planes to be tracked on a google map. This same function is included on PiSkyTracker, but has been improved slightly. **Try it out! Here is a link to my Raspberry Pi detecting planes in the Derby Area:** http://80.1.155.43:8080/

- **Network File Access**

  Files captured can also be easily access over your Local Area Network – from a Windows or Mac computer, for viewing and analysis.

How does it Work?

The whole system relies on the fact that many aircraft are now transmitting ADS-B (Automatic Dependent Surveillance – Broadcast) messages when in flight. These messages contain the following information

- A code number identifying the aircraft
- Flight Number
- Altitude
- Position (Latitude/Longitude)
- Speed
- Heading

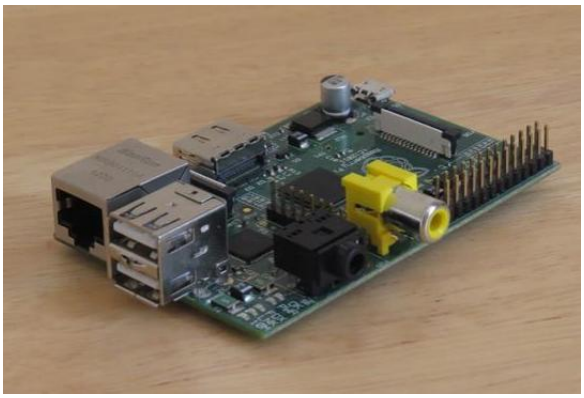
(This page has a good explanation: http://planefinder.net/about/ads-b-how-planefinder-works/) The tracker simply receives and decodes these messages – then software can be used to process the messages in any way desired. For example, you can count the number of aircraft which are detected in a given period, within a certain range and above a certain altitude or between certain altitudes.

Not all aircraft broadcast all the information above. It seems only about 25% of aircraft detected in my area broadcast their position.

Components of the Kit

The basic kit can be obtained from me, for a cost of around £60 or with the Raspberry Pi Custom Camera for £80 – or more – depending on options - and it can consist of the following items. I will also be providing links so that people can buy their own components if they wish and they will be able to download the software, free, for PiSkyTracker:

- **Raspberry Pi Single-Board Mini Computer and Case**



  This has been developed by the Raspberry Pi foundation and is essentially somewhat similar to the "guts" of a modern mobile phone. It runs a version of the Linux Operating System, and is a self-contained computer system but without a screen, keyboard and mouse! 2 USB ports on the port allow these things, and other hardware to be connected. A wired (RJ45) network connection is also included.

- **SD Memory Card**

  This can be from 4GB in size upwards and stores both the raspberry Pi Operating System and all the captured data. When the Pi is Powered down, the

card can be removed and put into a standard card reader for easy access to the data files PiSkyTracker generates and captures.

- **Power Supply**

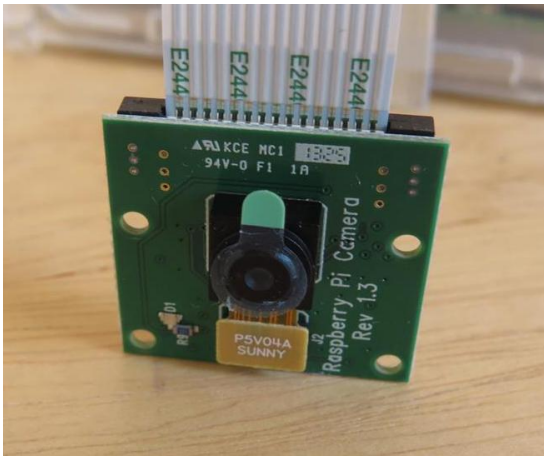
To get the Pi to work properly, a 5 volt power supply must be added – and it needs to supply at least 1.2A. Alternatively, if you have a powered USB hub, which will supply more than 1A, this can be used to Power the Pi. The Pi is powered through a Micro-USB socket – photo is of a power supply for the USB Hub.

- **DAB/DTB TV Dongle for Receiving Signals**

The supplied software uses the dongle to decode the aircraft's ADSB messages. It is basically a sensitive "programmable tuner".

- **Optional Raspberry Pi Camera or IP Based Webcam**

You can use the Raspberry Pi camera board so that you have an "all in one unit" – other than that, IP-based cameras are supported.



- **Optional Speakers/Headphones**

If you plan to take advantage of the Speech facility, you will need to connect speakers – USB-powered speakers may be convenient.

- **Optional USB Hub**

If you plan to attach USB-powered speakers, a Hub may be required and you may additionally wish to add other devices to your Pi such as a USB Hard Drive.

- **Optional Wireless Network USB Dongle**

Raspberry Pi can connect directly to your router using a network cable, but it may be more convenient to connect via a USB Wireless dongle.

- **Optional Screen/Keyboard/Mouse**

These are not really needed, because the tracker is designed to be automatic and can be configured by inserting the SD card in your main PC. You can connect the Pi to a TV or monitor that has an HDMI input. Keyboard and Mouse can be connected to a free USB port.