SILICON CHIP

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AirNav RadarBox: WOW!

Track real-time progress of any airline flight – ANYWHERE IN THE WORLD!

Airline: Germanwings
Registration: D-AGWD
Type: Airbus A319-132
C/N: 3011

Flight: GWI935

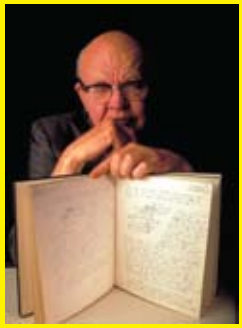
TO BUILD:

Simple 12V Speed Controller

Engine Oxygen Sensor Display

IrDA board for the Musicolour

Fiftieth Anniversary of the first INTEGRATED CIRCUIT



Ever wanted to be an air traffic controller? This will let you experience it all – from the comfort of your PC!

AirNav RadarBox

by Ross Tester

We get to see a fair amount of new software and hardware here at SILICON CHIP. Most of it is pretty ho-hum – in many cases a new way to re-invent the wheel.

Every now and then, though, something comes along that leaves us open-mouthed. Gobsmacked, even.

For example, Google Earth (and its latest variant, Google Streetview) was/is such a program. I don't know about you but I still find the sheer concept of it absolutely amazing.

Well, now there's another piece of software (or more correctly, software **and** hardware) which has left all of us here saying "WOW!" (capital letters intended!).

It's called AirNav Radar Box

As the package says, it's the closest you can be to real world aviation without leaving your computer chair. If you are at all interested in aviation (and even if you're not!) we're sure you will agree with our first reaction. WOW!

Let's see if we can paint a picture for you.

We'll imagine great-aunt Mabel is flying from her home in the far north of Scotland to sunny Sydney to spend some time with you. She's sent you her itinerary, telling you each of the flights she's catching: from her home town of Wick to Edinburgh on RyanAir, from Edinburgh to London (Heathrow) on British Airways then from London to Australia on Qantas via the Kangaroo Route of Bahrain, Singapore and Sydney.

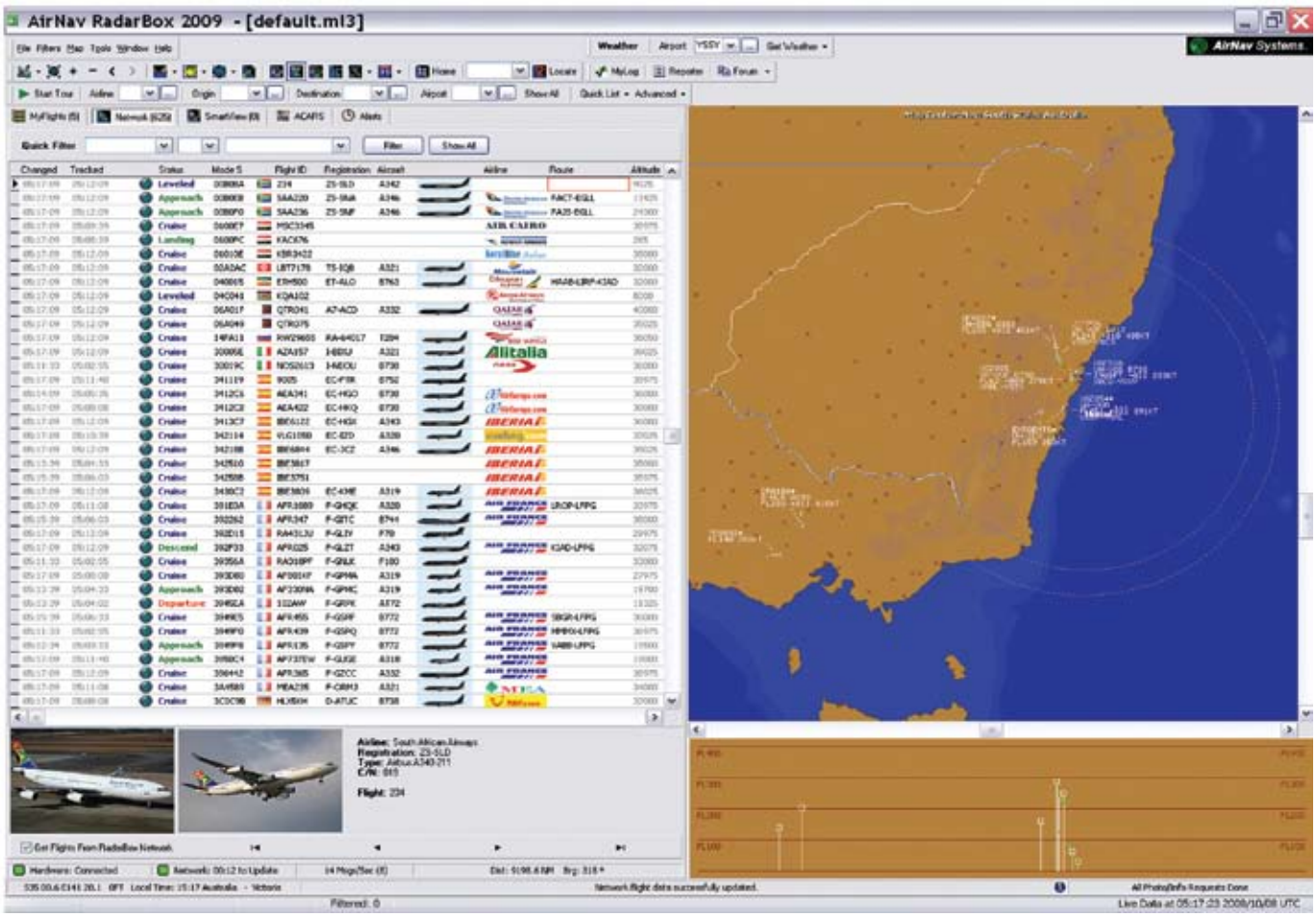
Of course, you can see from her itinerary (or look up on the web) the (hopeful?) departure and arrival times of each flight.

But with AirNav Radar Box and your PC, you can see so much more. You can "track" great-aunt Mabel all the way, knowing precisely where she is at any time.

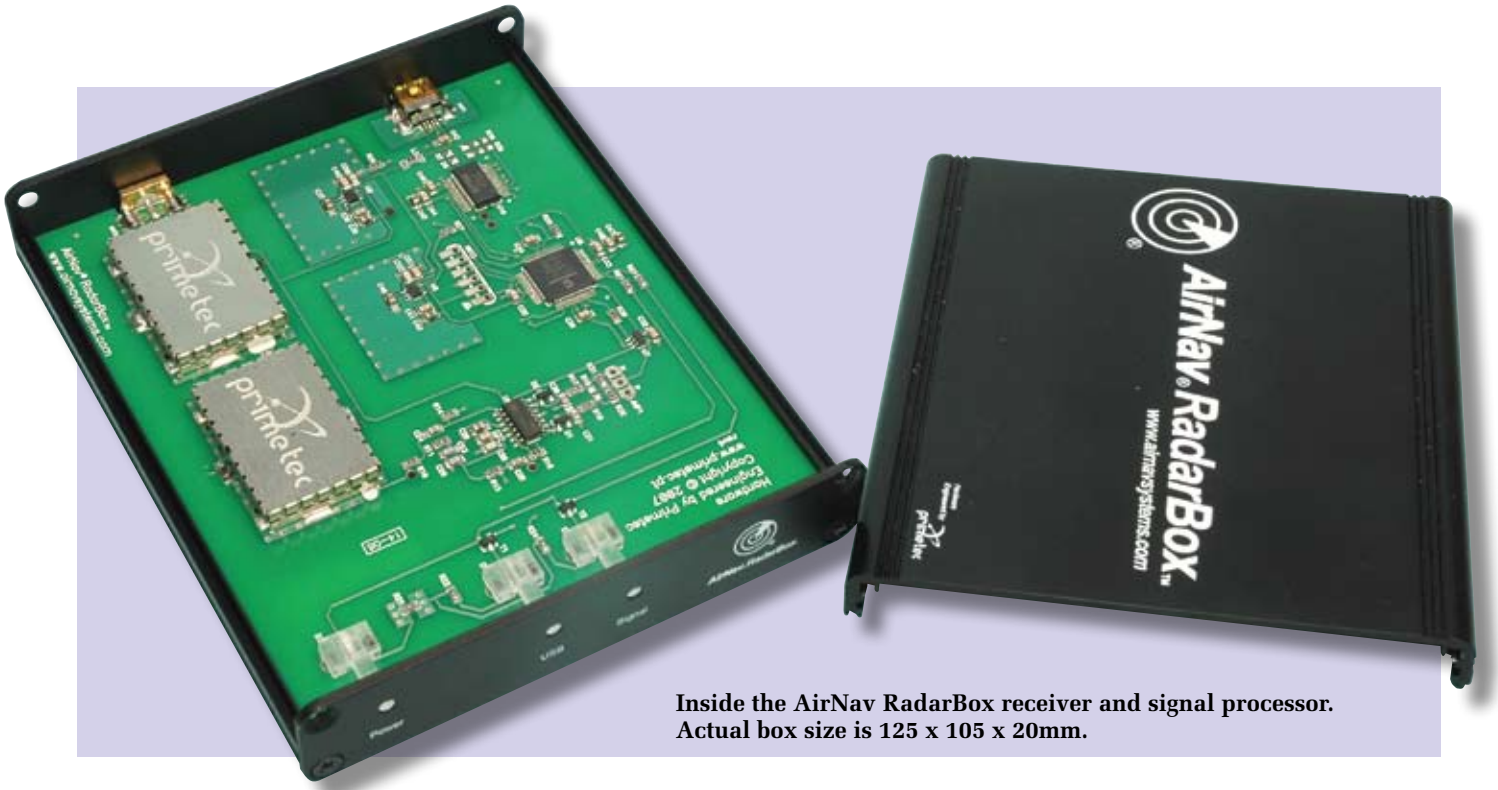
You can "zoom in" on any or all of these airports and see each flight's progress on a "radar" screen, with virtually all of the information an air traffic controller at each of those locations: its exact location, the aircraft identification, aircraft type (even, in most cases, with a photograph of the actual aircraft, not just an aircraft of the same type), its heading, its height, its rate of climb or descent. . . just about everything.

Click on any of the airports along the way and you can follow great-aunt Mable's progress all the way! Or you can store great-aunt Mable's flight details and AirNav Radar Bpx will alert you when it finds the flight.

You'll even know that great-aunt Mable's flight is running late (or early) as it approaches Sydney, probably even before the Captain has told great-aunt Mable and the other passengers – so you could delay your journey to Sydney



A quiet afternoon in south-east Australia, as shown by the screen at right. Perhaps this is more a limitation of the antenna's field of view, being somewhat blocked in the direction of Sydney airport. Compare that with the screen of London Heathrow on the laptop at right – and again, this was a relatively quiet time!



Inside the AirNav RadarBox receiver and signal processor. Actual box size is 125 x 105 x 20mm.

International Airport until the last minute and therefore avoid the huge parking charges!

Impressed? We were! But how much more impressed would you be if we told you that you could do this from any location in the world, for (almost!) any location in the world?

But wait, there's more – so much more. Want to explore the world of aviation? You can look up data for any (well, we believe all identified) commercial airports in the world and get the same information a pilot gets: length of runway, VOR, NDB, FIX, airways and ATC boundaries, weather. (If you don't know what those abbreviations and terms mean, you'll learn very quickly!)

Incidentally, they stand for/mean:

VOR – VHF omni range (ground-based radio navigation aid);
NDB – non-directional (radio) beacon,
FIX – position of an aircraft on its flight route;
Airway – approved flight route;
ATC – air traffic control.
Weather? Ummm . . .

There's also more than a million map locations including detailed shore lines, country boundaries, elevations, roads and much more. A 3D, multi-window display on your PC lets you select multiple features at the one time.

We found looking at the "radar screen" window for an airport like Sydney fascinating. Then we changed to airports such as London Heathrow, Chicago O'Hare and Atlanta Hartsfield-Jackson.

As three of the busiest airports in the world, the amount of air traffic around them was simply unbelievable. Those air traffic controllers might be highly paid – but they're worth every cent and then some!

What's In the box?

There's a small (105 x 125 x 22mm) aluminium "RadarBox" which contains all the electronics, a USB cable, a short (~300mm) 1090MHz vertical wire antenna with magnetic base and (we presume) a ground-plane baseplate plus a CD containing the RadarBox Software. There is no power supply, because none is needed - RadarBox gets its power via the USB interface.

Setting up the AirNav

There can't be anything simpler: plug the antenna lead into the SMC socket on the back of the RadarBox (it works best close to a window and better still if that window is oriented somewhat in the direction of the nearest major airport, then connect the USB cable between the RadarBox and any vacant USB slot on your PC.

Next, run and install the software from the CD provided. We found quite a delay (maybe a minute or so) from the time we activated the AirNav RadarBox – perhaps it takes that time to receive information from around the world. The first time you run the software, it will interrogate you for password and username which will be supplied at time of purchase

Once it's running, you can start tracking flights in real time! There's no power switch; the RadarBox will spring into life as soon as it's plugged in to the USB port.

How it works

AirNav Radar Box operates in two ways.

First, in real time, the receiver picks up data from aircraft using ADS-B (Automatic dependent surveillance-broadcast – see the panel "what is ADS-B) within range of the simple antenna and displays their data on the PC screen. Without you even being aware of it, this information is also relayed via the 'net to all other AirNav Radar Box users

Second, delayed by about five minutes for security reasons (we won't mention the "T" word) similar information is obtain from the many thousands of AirNav Radar Boxes around the world. In many ways, it's similar to peer-to-peer file sharing works, relying on the fact that at any time of the day or night, there will be many computers on around the world with an AirNav Radar Box receiving data. However, it doesn't rely on a connection to another computer; instead all data is sent to a central AirNav server.

After being processed and passing some validation algo-

What is ADS-B

As we explained, the AirNav RadarBox relies on commercial aircraft transmitting and ADS-B signal. But what is ADS-B and how does it work?

First, to set the record straight, it has nothing whatsoever to do with ADSL as applies to broadband – it's an unfortunate co-incidence of acronyms. ADS-B, which stands for Automatic dependent surveillance-broadcast, is a form of air navigation assistance and safety aid for both pilots and air traffic controllers – and now anyone with a suitable receiver and software.

It is similar to the Automatic Identification System (AIS) now becoming widely used in commercial shipping.

Unlike conventional radar, ADS-B can also work at low altitudes and on the ground, so that it can be used to monitor traffic on the taxiways and runways of an airport. It's also effective in remote areas or in mountainous terrain where there is no radar coverage, or where radar coverage is limited.

One of the greatest benefits of ADS-B is its ability to provide the same real-time information to both pilots in aircraft cockpits and ground controllers, so that for the first time, they can both "see" the same data.

Unlike an aircraft transponder, which transmits its aircraft identification when it receives a radio (or more usually radar) signal, the ADS-B transmits its information via a digital data link without any prompting – and often (ADS-B data is updated several times per second).

Furthermore, it works out its own positional information, speed, altitude, etc, to a large degree independently of the aircraft navigation system, from the GPS (global positioning system) satellite signals which we are all becoming very much more aware of, given the plethora of GPS receivers now on the market.

Given the fact that GPS is now routinely accurate to just a couple of metres or so – and in aircraft, flying closer to the satellites without any obstructions, this accuracy would be at its maximum – the ADS-B data is very accurate indeed.

Garmin GLD 90
Data Link Sensor and GPS antenna.

ADS-B offers increased, timely information for both pilots and air traffic controllers, increasing safety for all aircraft. (Courtesy ADS-B Technologies LLC).

An important factor is that this data is transmitted without any interaction by the pilot or crew – in fact, in an ADS-B system the crew has no input whatsoever.

Pilots in the cockpit see the traffic on a Cockpit Display of Traffic Information (CDTI). Controllers on the ground can see the ADS-B targets on their regular traffic display screen, along with other radar targets.

ADS-B provides traffic information to pilots that is currently unavailable to them. Because the system has an effective range of more than 150 miles, ADS-B provides a much greater margin in which to implement conflict detection and resolution than is available with any other system.

Pilots and controllers using ADS-B data will be able to determine not only the position of conflicting traffic, but will clearly see the traffic's direction, speed, and relative altitude. As the conflicting traffic turns, accelerates, climbs, or descends, ADS-B will indicate the changes clearly and immediately.

A plane equipped with ADS-B can theoretically fly closer to other aircraft because the locating data is more accurate and more real-time. Therefore the controller does not have to factor in as much a margin for error.

Its name comes from its components: it's **Automatic** – It's always ON and requires no operator intervention; it's **Dependent** – it depends on an accurate GPS signal for position data; it provides "radar-like" **Surveillance** services; and it continually **Broadcasts** aircraft position and other data to any aircraft, or ground station equipped to receive ADS-B.

There are 57 ADS-B receivers at 28 ground stations around Australia. Indeed, Australia (along with the US) was the first country to trial and later implement ADS-B.

There is considerable discussion (argument?) at the moment about ADS-B being extended to GA (General Aviation) aircraft; the most telling is the cost (around $10,000 plus installation) and annual maintenance for the private aircraft owner.

rithms the data is stored on a queue for server upload. This is where the five-minute delay is built in.

The AirNav server processes up to 10,000 flight messages per second in peak periods. Data is then organized and properly processed (to add to each flight and aircraft as many details as possible - aircraft type, registration flight routing, photos) and an output file is created. Each connected AirNav Radar box computer can then download the updated list of network flights. This list often has more than 500 flights worldwide, with the list is growing daily as AirNav Radar Box gets more popular.

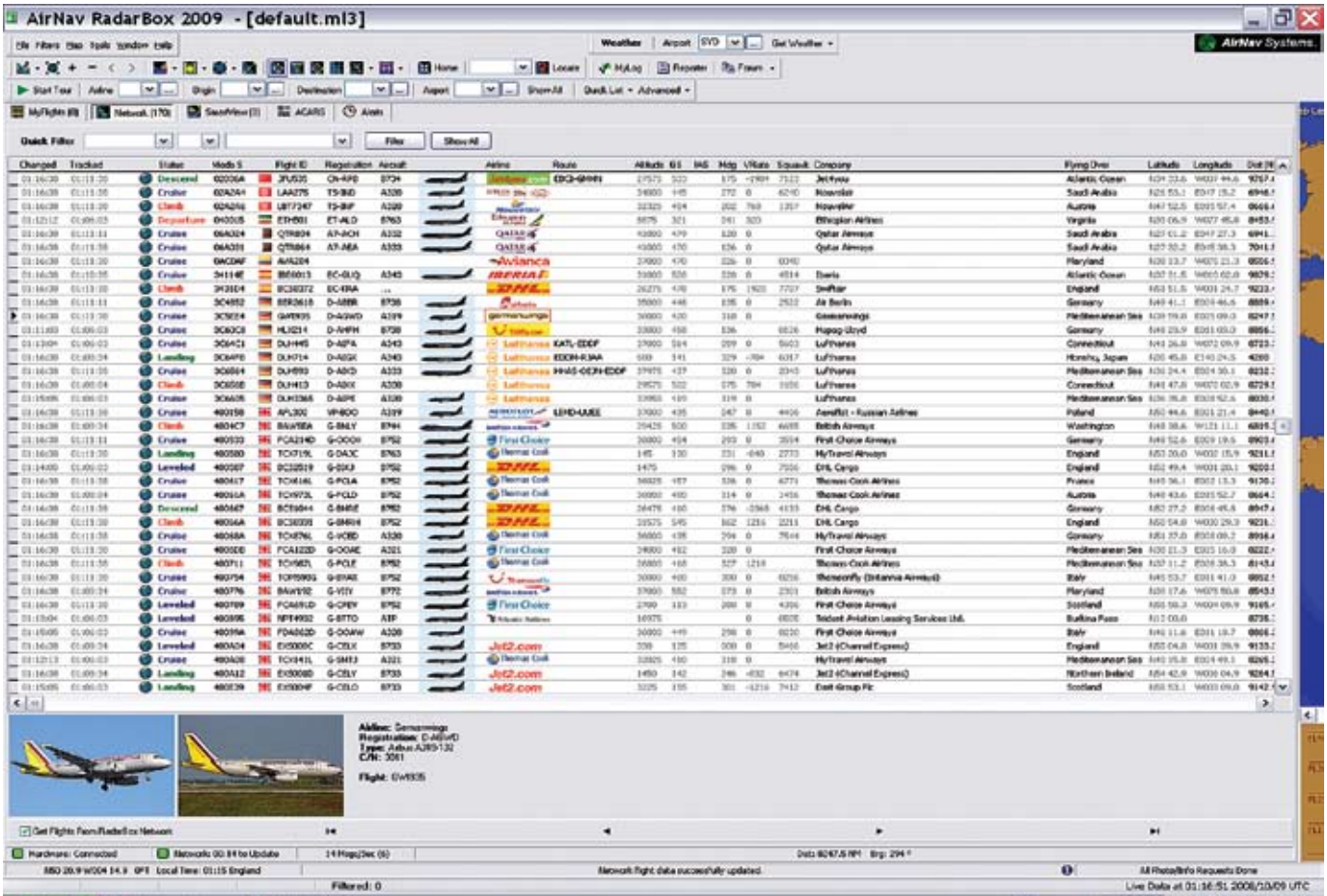
So instead of just "seeing" flights in and around your airport, you can "see" flights in and around the majority of world's major airports.

Data and reports can be exported directly from the system in XML, text and PDF and screen shots/logs can be sent automatically to other AirNav Radar Box users.

Where from, how much

The Australian distributors for the AirNav Radar Box are Hometech Consulting, PO Box 2110, Wattletree Road LPO, East Malvern, Vic 3145.

At time of going to press, (early October), the Australian dollar was in meltdown which made quoting a firm price rather difficult (in just one day the dollar had depreciated more than 4c!). However, Hometech's John Parncutt told us that he would try to hold the price at $960 for as long as possible, assuming the dollar stayed somewhere close to its present level. SC



There's an enormous amount of information presented on each flight, from its status, ID, the aircraft type and registration, airline, altitude, heading, vertical rate, squawk, the company flying, where it is at the moment . . . and much more!