



This article is featured in the December 2005 issue of The Controller Magazine.

Subscription details are available at www.the-controller.net

The article and its contents may not be reproduced without prior permission from the editor.

Get your own personal (virtual) radar

By Philip Marien

It had to happen. To further enhance the 'spotters' experience, a UK based company has developed the first 'virtual radar'. An affordable combination of a hardware receiver and PC based software, the system uses Mode-S and ADS-B (Automatic Dependant Surveillance-Broadcast) signals to build a 'radar' picture on your computer.

How does it work? Both Mode-S and ADS-B use the same frequency as a regular Mode A/C transponder (1090 MHz). Instead of the 4096 combinations that Mode A/C has to offer, Mode-S replies to a secondary radar interrogation with a 24 bit answer. In these 24 bits, information such as a unique identification code of the aircraft can be coded. Simply cross referencing this fixed code with a database can give you the identity of the aircraft (company, type ...).

ADS-B transmits information from the airplane's on-board systems. It uses the same frequency as mode A/C/S. The difference with regular transponder information is that it doesn't answer an interrogation from the ground. Instead, it regularly broadcasts the information for anyone to pick up. Most obvious and currently used, is position and speed vector information of the aircraft together with some identification such as the callsign. The position and speed vector is derived from the onboard navigation system and therefore should be very accurate. Because the information is very regularly broadcast (typically once every second) it is much more up to date than other systems such as ACARS. In the future, other information may be transmitted, such as selected altitude, speed or even route information.

Coupling both Mode-S and ADS-B position and vector information, a receiver station can create a situation display, which some people would call a virtual radar - Don't let any IFATCA Technical committee member hear you or you'll have to suffer his or her wrath for calling it a radar! With a good antenna setup, it should be possible to receive the broadcasts from equipped aircraft as far as 200-250 Nm away. Of course the system will only display aircraft that carry this equipment. But in a lot of regions, it is mandatory already or it will become required in the very near future - unlike ACARS. it is

well within budget of many spotters, aviation geeks and whoever wants to know what's flying above their head

UK based Kinetic Avionics (www.kinetic-avionics.co.uk) markets the receiver which connects to a PC via USB (an Ethernet version is under development). While not cheap (750 or US\$900), it is well within budget of many spotters, aviation geeks and whoever wants to know what's flying above their head. The device doesn't actually interrogate the aircraft but intercepts the Mode-S replies to radar stations as well as the ADS-B broadcasts. In combination with a laptop, it is quite portable and can be used on the move (e.g. from a car).

While currently the software operates as standalone, a version that can network different users is under development: by sharing the received information via the internet, a much bigger area will become available and it will be possible to see large geographical areas, without line-of-sight limits that the receiver has. Access to the information could then not be limited to people who own the hardware, but could be extended to people who buy a piece of software and/or a subscription. Something similar already exists for ACARS information (e.g. www.airnavsystems.com), but the update rate is nowhere near that of an ADS-B system.

While the obvious target audience for a device

like this is aviation enthusiasts, it is quite easy to imagine 'alternative' uses. The first airmis reports are already circulating on internet forums. It would of course be easy enough to implement conflict detection algorithms in the software program. And it doesn't stop there: the current TCAS systems also use the 1090 MHz band for coordinating TCAS RA's between the aircraft involved. It should not be too difficult to adapt the software to catch TCAS RA's as they happen. An easy and cheap way for tabloid newspapers to generate sensational headlines, without any need for annoying expertise to put things in perspective...

Other concerns include security issues: I don't know whether it's equipped, but imagine being able to track Air Force One with a system like this... I'm sure the Secret Service won't be impressed. It could even tempt certain individuals with a two-way radio to issue clearances to the aircraft they see on their system, as opposed to 'transmitting blind', as has happened in the past.

While monitoring ATC through scanners is already widespread, the ability to monitor actual traffic situations with systems like these will make our jobs much more transparent. Hopefully, it'll increase the appreciation and admiration for the job we do. I can dream, can't I?

