REMOVING THE GUESSWORK

You can get away with this during a photo shoot, using formation endorsed pilots. Avoiding close proximity traffic is otherwise highly recommended.

SHELLEY ROSS

"Watching his Six" has never been easier, discovers **Martin Regtien** as he checks out the latest portable collision avoidance technology for pilots.

Ever wanted to have an extra pair of eyes when flying? Someone who alerts you to conflicting traffic even when an overtaking aircraft is outside your normal line of vision?

An *electronic* traffic alerter can greatly assist in detecting who else is flying in your busy airspace. TCAS units, mandatory in larger passenger aircraft, will spot other aeroplanes in the vicinity and issue warnings when they are potentially on a collision course.

Now, collision avoidance technology has become affordable enough that every GA aircraft could be equipped with a PCAS, a *Portable* Collision Avoidance System. It just might save your bacon one day.

I can remember one eventful incident when my tiny Cherokee was overtaken by an enormous B-52.

I was flying just outside a naval air station in Southern California when from underneath a thunderous shadow appeared in front of me. The crew of the eight-engined bomber probably never even saw me as they climbed out after take-off.

That heart-stopping moment made me realise that I need to have eyes in the back of my head when flying in busy airspace. These days we can *know* who's on our six through the use of transponders and electronic traffic alerters.

Technology has come so far in the 30 years since this event that now you can buy that extra security in Australia for less than 700 bucks. I've flown with a number of these devices over the past couple of years and whilst they can never replace the Mark 1 eyeballs, they can detect and track traffic before you're able to spot them. The "See & Avoid" stratagem might now become: "*Detect*, See & Avoid".

So How Does It Work?

I will take as an example a couple of the most popular PCAS units here in Oz: the MRX, a budget model and the XRX, the latest top-of-the-line model in the famed line of Zaon/SureCheck collision avoidance avionics. These units fit easily on top of your dash.

The traffic detection is failsafe, meaning it will detect every transponder equipped aircraft. But there's one big proviso you need to know.

The current generation of PCAS units are *passive* collision avoidance systems. This means that detection depends on the interrogation of ground-based radar stations and/or active TCAS systems along your flight path. Ground radar has a typical coverage of over 200 miles and aircraft-based TCAS cover a bubble around them of some 100 miles, so there is not a lot of airspace where a PCAS doesn't pick up any traffic. That applies certainly to the USA but also to more sparsely populated areas such as here in Australia. The software does not display traffic above FL220 as this is deemed to be not a factor for general aviation aircraft. It also happens to be close to the upper certified level for our pressurised Centurion so I'm okay with that.

Which aircraft are detected? Picture yourself in a 360° sphere and a radius of about five or six miles with your aircraft in the middle. All the aircraft in that bubble should be detected *if they have their transponders on*. The units only display the closest threats within that detection window.

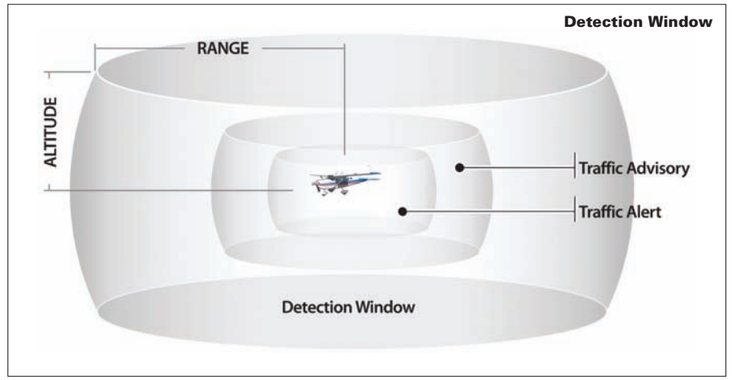
Basic models detect conflicting traffic within your bubble of airspace up to five miles away and within 5000' of your altitude but you still have to swivel your head 360° to see where the threat is coming from. Nearby traffic could well be behind you and closing in. Most aircraft have a huge blind spot underneath, above and behind you and no matter how good someone's scan is there is unseen traffic all around us.

More sophisticated models have a screen that contains the target information of the three nearest threats, with the most acute threat displayed in bigger numbers. You will know instantly how far the other aircraft are, whether they are above or below you or cruising along at your altitude. In addition, you have a trend indication to show whether they are climbing or descending relative to you.

ZaonFlight XRX

The XRX also indicates where exactly you should look to detect the incoming traffic. They have a directional antenna array built in, enabling you to see from which 45° segment the threat is coming from. No nervous swivelling to spot the bogey which could upset your passengers. Instead, you can impress them with your incredible eyesight: "Can you see that aircraft on our right? He is about five miles out and heading straight for us."

Most models have a power adapter for plugging it into your ship's system and an audio cable so that you can hear any warnings immediately through your headset. The female voice is certain to get your attention even if the unit is not directly mounted in your line of sight. Ideally it sits directly in front of you but the dash in our P210 is just a fraction too high to have the box mounted there and interferes with seeing the piano keys on final approach. Needless to say that panel mounted solutions with a remote antenna are the next development. All models come with a built-in pressure altimeter.



Detection Window

Recognition and Reaction Times

Where a PCAS really shines is in detecting traffic that you would otherwise not know about: aircraft in your blind spots for instance. But even in optimal circumstances when visibility is unlimited, aircraft present such a small target that they are hard to spot if they are more than just a couple of miles away. With combined approach speeds of several hundred miles per hour we only have very few precious seconds to determine if we need to take evasive action. From the moment we see an object and recognise it as an aircraft, to the time we conclude that we are indeed on a collision course, takes about six seconds. Then we need to decide to turn left or right, descend or climb, translate that into muscle movement and deal with the aircraft lag time. Add another 6 1/2 seconds. If your combined approach speeds is 600 mph and you first spotted that converging aircraft two miles away you would be half a second into a midair collision...

Some years ago I was doing a charter flight taking a bunch of tourists from Italy on an Outback tour of Australia. Two weeks in the saddle, covering some of the harshest and most stunning geography this continent has to offer. Yes, we also did the obligatory aerial tour of Ayers Rock. With dozens of aircraft circling this massive monolith and the nearby Olgas

Range it was a crowded place. From the radio chatter I knew that the Boeing 737 which I had seen at Alice Springs before, and which carried some US senators, was ahead of me in the circuit. He would be circling the Olgas and heading straight for me just 500 feet below... You can be sure that my plane was lit up like a Christmas tree as I literally sat on the edge of my seat trying to spot that aircraft and avoid a diplomatic incident! That, my friends, is a PCAS moment. I would have paid double the purchase price to have the peace of mind of knowing exactly where that sightseeing 737 was.

We can see that early detection is absolutely critical. A PCAS does not do away with the need to "see and avoid". On the contrary, they add a tremendous tool for traffic detection.

Because aircraft change position all the time it is critical that the PCAS knows how to prioritise. It does this on the basis of the axiom that accidents only occur at your altitude, so relative altitude is the determining factor here.

It takes into account also whether your own aircraft is climbing or descending and, when the threat changes and another aircraft comes closer, you will be notified immediately.

Some models will do this with beeps and/or display warnings. Others will add spoken words through your headset.

In the case of the MRX you might see the word ADVISORY (which is accompanied by two beeps) or the word ALERT. An alert generates four beeps which means it's head-swivelling time!

It also depends very much on your range settings when these warnings are generated. For instance if the range setting is 5.0 NM (the default) and the traffic is within one mile you will receive an Advisory at +/- 1000 ft and an Alert at +/- 700 ft.

The timely alerts from the PCAS enable you to be ahead of the game all the time. When you fly with a PCAS in busy airspace you will be surprised to find how much traffic there actually is. However, it's vital to remember that the system only picks up other aircraft who have their transponder switched on and squawking ALT.

Even though there is absolutely no better TCAS tool than your eyes, and certainly no one should rely solely on electronic means to spot other aircraft, it's sensible to accept all the help you can get.

More information about PCAS units can be found on DigitalReviews.net or ZaonFlight.com ■

ZaonFlight MRX