WELCOME...

to the annual Airprox Magazine 2017

EYES, EARS, FORESIGHT, INSIGHT, ADVERTISE AND PRIORITISE... Every year there's an increase in Airprox as the better weather of spring and summer arrives. It's probably no coincidence; those who aren't hardy winter flyers get back into the cockpit, perhaps a little rusty after a bit of a lay-off and, as a result, there's a great temptation to focus on getting hands and minds recalibrated rather than looking out.

On average we see something like one mid-air per 60 Airprox, so attention to themes from previous Airprox is worthwhile. I've chosen six that merit particular attention, and these are expanded in posters, articles and a short animation. Look out for them at flying clubs, and you can also see them at airproxboard.org.uk in the 'Dir UKAB's Topical Issues and Themes' section alongside other useful stuff.

So help yourself to avoid becoming a statistic by taking a couple of minutes to remind yourself of the risks and causes of Airprox before flight, and keep your eyes outside as much as possible. Remember:

- **Eyes** – lookout and develop a robust scan technique.
- **Ears** – communicate by talking/listening on the radio to make your intentions clear and maintain situational awareness of others.
- **Foresight** – fly defensively, with vigilance, courtesy and consideration for others (aka airmanship).
- **Insight** – review your understanding of ATC services, rules of the air, circuit patterns and procedures.
- **Advertise** – make your presence known through conspicuity measures (electronic and visual).
- **Prioritise** – time-share cockpit tasks and avoid distractions compromising your lookout.

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When EVERY second COUNTS

How long do you reckon it takes from seeing another aircraft to hitting it – 30 seconds to a minute, maybe? You'd be wrong

If you've been unlucky enough to have a very close encounter you'll know you have nowhere near as long as even 30 seconds to take action; a bit like a slow motion train crash everything seems to take a long time until the last few moments when it all happens in split seconds.

Apart from those instinctive 'jeez' moments when push or pull comes down to a split-second of survival instinct, research shows that in normal circumstances the average pilot and aircraft needs anything from nine to 12.5 seconds (about how long it's taken you to read to here…) from spotting another aircraft to processing the closure geometry and avoiding a potential collision.

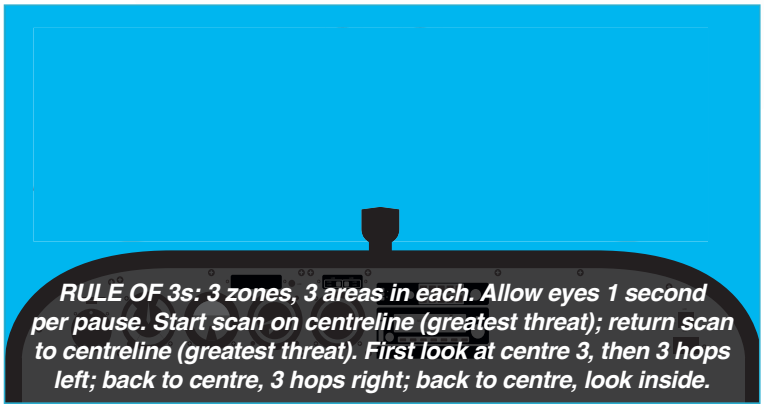
So take two PA-28s meeting head-on at around 90kt each (pictured top right); there's around ten seconds from the most eagle-eye'd being able to spot the other aircraft and impact. The crucial thing here is that in the first five seconds little seems to happen with not much change in the size or motion of the oncoming PA-28, it's only in the last five seconds that it suddenly blooms in size; the mind then takes a couple of seconds to recognise it as a threat, leaving just three seconds or so to take action.

Naturally, the odds of spotting a potential collision reduce in relation to time spent looking out, and the best rule of thumb is 80:20 – 80 percent of the time looking out and just 20 percent inside the cockpit in small chunks.

A recent collision between two PA-28s shows just how looking down into the cockpit can lead to trouble.

The two aircraft were flying on a converging track, and while one pilot looked down to set QFE on his altimeter in preparation for landing, the other looked down at his map – moments later they collided. They were lucky, one aircraft's propeller blade struck the other's left wheel while the other's left tyre struck the upper surface of the first aircraft's wing. Both were able to land safely.

The AAIB concluded: 'It is likely that the poor into-sun visibility, the constant angle between the tracks of the aircraft, and the fact that the attention of both pilots was inside their respective cockpits before the collision, contributed to the



RULE OF 3s: 3 zones, 3 areas in each. Allow eyes 1 second per pause. Start scan on centreline (greatest threat); return scan to centreline (greatest threat). First look at centre 3, then 3 hops left; back to centre, 3 hops right; back to centre, look inside.

breakdown of the see-and-avoid.'

So looking for other aircraft is vital, especially before going head-down in the cockpit, but just 'looking' isn't enough, and here's why.

Even in a featureless sky eyes tend to focus somewhere, but if there's nothing specific to focus on they rather lazily revert to a relaxed intermediate distance which means you don't necessarily see anything that's going on out there. You'll probably know much of this already, but it's worth re-examining how the eye works to understand why this happens.

Essentially, the lens focuses light to form an image on the retina which is made up of more than 100 million light sensitive cells that convert the light (image) to electrical impulses which are then sent to the brain. So to develop an effective 'lookout' it's important to understand the distribution and function of the retina's two types of cells, rods and cones.

What you see might seem like one big picture, but detailed interrogation of the world is only provided by rods in the central, focal, part of the visual system, an area no larger than a thumbnail held at arm's length. Not only is this area small, but an image falling on it has to be stable and the pilot's attention directed towards it for active interpretation – still getting the big picture?

Meanwhile, the cones in the periphery of the retina are responsible for the ambient visual system that relies on an object's motion in the outside world to attract the focal system's attention, so movement is a very important attention-getter.

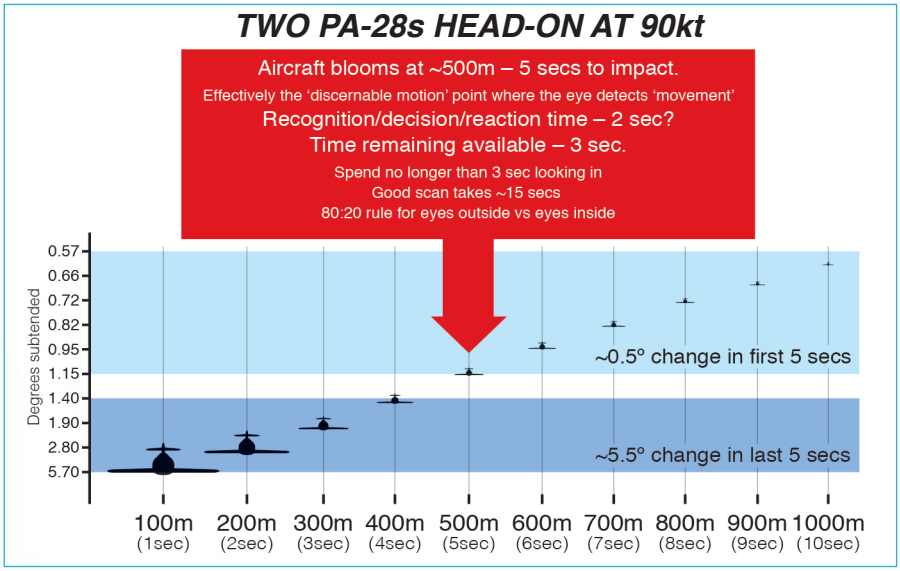
With no visual cues to attract the eye's attention, there's a tendency for it to focus at a point in space one to two metres away, making you effectively short-sighted so you're not necessarily going to see something at a distance; a periodic glance at objects such as the wingtips will stop this 'empty field myopia'.

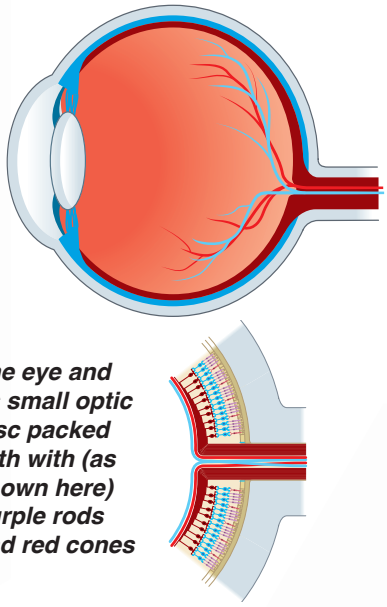
Quite apart from the physiological limitations, the eyes are vulnerable to other visual distractions; lighting, foreign objects, illness, fatigue, emotion, the effect of alcohol, certain medications and age all play their part. Then there are additional challenges such as atmospheric conditions, glare, deterioration of transparencies, aircraft design and cabin temperature, which all take their toll on your eyes and what you can see.

Most pilots know that when looking out you should shift glances and try to refocus at intervals, but doing it randomly doesn't really work; to spot a potential conflict needs an effective scan in front – and a check on who might be coming at you from the side…

You'll probably be familiar with the problem of 'constant relative bearing' or 'stationary in the field of view', where colliding aircraft have a relative bearing constant to each other until impact. The subjective effect of this is that the collision threat remains in the same place (stationary) on the canopy unless you move your head to stimulate the ambient visual system. An unfortunate consequence of 'constant relative bearing' is that no other aircraft that the pilot has ever seen will have possessed the same characteristic as that of a colliding one… So moving your head, relative to the canopy or windscreen, is an important aid to lookout and, of course, it helps to take out the blind spots such as canopy furniture, pillars, high/low wings etc.

A quick bit more science shows that as a collision threat approaches, its size on the retina roughly doubles with each halving of the separation distance, so colliding aircraft stay relatively small until shortly before impact when it all happens rather quickly.





The eye and its small optic disc packed with with (as shown here) purple rods and red cones

This presents a bit of a challenge even if you do perform a good 'lookout', but it underlines the importance of apportioning the correct amount of time for a systematic and repetitious scan pattern.

It's a curious thing about flying that many pilots believe they keep a good lookout when in reality it's less-than-effective; glancing out and scanning with smooth and continuous eye movements is incorrect because for the pilot to perceive another aircraft, time is needed for a stable image of it to fall on the centre of the retina and the pilot's attention directed towards it.

Lookout' should be performed using a series of small eye and head movements with intervening rests, the latter being the only time when the outside world is really being interrogated. Carrying out regulated scans might sound a bit formulaic and, let's be honest, boring, but they do work.

That said; there's no one technique that suits all; although horizontal back-and-forth eye movements seem preferred by most. It's important to develop a comfortable and workable scan.

First, know where and how to concentrate 'lookout' on the most critical areas at any given time. In normal flight, most of the risk of a mid-air collision can generally be avoided by scanning an area at least 60° left and right of the intended flight path. This doesn't mean the rest of the area to be scanned should be forgotten. At least 10° above and below should also be searched.

One of the simplest and effective is the rule of threes as detailed in the graphic (left):

No one is immune to mid-air collision, but an understanding of the limitations of vision, collision geometry and visual scanning technique will help to avoid one. the cockpit.

Hopefully by now you get the big picture. ■