Situational Awareness

Situational awareness is the key to collision avoidance. Improving these skills could save your life one day. Simply put, situational awareness can be described as, “What was, what is, and what might be”.

To gain and maintain situational awareness, you need to Gather, Understand, and Think Ahead – in other words, get some GUTs.

We gather information through preparation and by scanning the environment. We understand information by comparing the information with our mental models. We use those models to make decisions, take action, and review.

**Gather**

In order to attune yourself to your surroundings, you need to develop a sound systematic scanning pattern and sufficient mental capacity to absorb the information.

Carlton Campbell, CAA Standards Training and Development Officer, explains how important it is to build the big picture.

“Constantly honing your lookout and listening skills is important, but this is only one component of situational awareness. Other building blocks include your knowledge of airspace, weather, terrain, approach procedures, aerodrome patterns, and aircraft configuration,” says Carlton.

**Scanning Technique**

To scan effectively, you must pause to focus as you move your head and upper body from side to side.

While your head is moving, your vision blurs so unless you fixate, you won’t be able to recognise all the objects in the scanning area.

Looking outside the aircraft should take up 90 per cent of your scanning time.

There is no one-scan-fits-all technique that will suit every pilot or every situation. You need to find the scan that works best for you.

The method you use must include pauses to focus, and be as close to a 360 degree scan as the aircraft structure will allow.

One method is to start your scan in the centre, moving progressively to the left, pausing for two seconds every 20 degrees. Then swing quickly back to the centre and continue your scan to the right.

*Continued over →*
If scanning before turning the aircraft, do your scan so that it ends in the direction of the turn. The illustration doesn’t show the scan reaching right around to the sides, but this is essential, as the following example illustrates.

Milford Sound Accident
On the day of the accident, 17 aircraft departed from Milford Sound in a 20-minute period. A busy stream of departures was common procedure, and still is.

DAX, a Cessna 207, took off at 1525. The pilot-in-command had 1100 hours, and had learned to fly in the Queenstown area.

DQF, another Cessna 207, got airborne three minutes later. The pilot of DQF had 450 hours, and had just qualified for Milford Sound flights.

After DAX and DQF became airborne, the lead aircraft in the stream of flights reported that the Mackinnon Pass was closed due to cloud. All aircraft in the stream were forced to turn back to Milford Sound and take an alternate route to Queenstown.

Subsequently, DAX and DQF paralleled each other’s track for about 90 seconds. Neither pilot saw the other aircraft. A passenger in DAX filmed DQF as it flew alongside, but failed to alert the pilot to the close proximity of the two aircraft. English was not the first language of the passengers on board DAX and DQF.

The two aircraft collided – the pilot of DAX managed to fly the damaged aircraft back to Milford and land safely, but DQF crashed into Milford Sound. The wreckage was never recovered.

A safety investigation identified that causal factors included the pilots’ restricted cockpit vision, the lack of an effective lookout, the high density of traffic, and the unplanned merging of two streams of aircraft.

Unexpected Tigers
Flight Examiner, Penny Mackay, was caught out by multiple aircraft.

“I was telling my student that even when you’re in an area without much traffic, maintain a vigilant scan at all times. I spotted a Tiger Moth approaching us, but the student didn’t.

“While I was discussing this with the student, two more Tiger Moths that I hadn’t anticipated appeared and passed us. Neither of us saw them.

“This shows the importance of not making an assumption that you’ve seen all the traffic.

“Aircraft can also be on a different frequency, or NORDO,” says Penny.
Understand

Once you have gathered all the information, you need to make sense of it. We achieve this by comparing the gathered information with our mental model.

» Is the information you are receiving what you expected it to be? If not, why not? The information is often there, but not absorbed.

» Do you understand the airspace limitations?

» What are the threats?

You also need to prioritise, knowing what’s important to concentrate on and why, while managing your workload to avoid crunch points.

The world won’t always conform to your mental model – sometimes your model is wrong. Don’t fall into the trap of willing the information to fit your mental picture.

Your mental model also needs to be dynamic, constantly changing and updating to fit the circumstances of your flight.

Advice from Flight Examiner, Paul Kearney, is to get yourself out of a situation when you need more time to figure it out.

“There are times when you have a whole bunch of facts and information presented to you, and they don’t fit the mental picture you have in your head.

“You can spend a long time convincing yourself that those facts and figures are wrong. In doing that, you are getting yourself further and further into trouble.

“One thing I’ve learnt is that as soon as you start to notice this happening, get yourself out of the situation. Give yourself some time to think and then you can look at the information that’s being presented in a more rational way,” says Paul.

Think Ahead

Always keep reviewing your information, and assess how it compares with what you should be seeing.

Prepare before something happens. For example, before approaching an aerodrome, have the aerodrome chart out and plan your calls. Before that cloud descends, get a weather update and have some alternatives planned.

This is often referred to as keeping ahead of the aircraft.

Flight Examiner, Mark Woodhouse, says your gut feeling is probably telling you something.

“I was very fortunate – I’ve had some very good teachers through my pilot training. One of them said to me, ‘Listen to the whispers.’ What he meant by that is, if it feels wrong, it probably is,” says Mark.

When thinking ahead, ask yourself:

» What are the threats?

» Have the threats changed?

» Are there any new threats I didn’t identify previously?

A pilot can take 5 to 7.5 seconds to react after sighting a potential threat.

If the closing speed between the aircraft is high, for example, a light twin and a jet, there could be less time available than the required 5 to 7.5 seconds to detect and react to the other aircraft.

If you determine another aircraft is a potential threat, and you know its whereabouts or operating level, take decisive action.

You can take precautionary action by climbing, descending, changing heading, turning on anti-collision and landing lights, or reporting your position.

Collision Statistics

Do you think your risk of being involved in a mid-air collision increases or decreases as conditions become clearer and visibility increases?

It increases. On a poor weather day with restricted visibility, your field of vision is reduced, allowing you to focus your scan in a narrower area. On a clear day, your attention will be less focused as you have a full 360 degrees of unlimited sky to scan.

New Zealand data supports the following overseas findings.

According to the European General Aviation Safety Team, nearly all mid-air collisions occur in daylight and in excellent visual meteorological conditions.

Collisions are also more likely to occur when aircraft are concentrated, especially close to an aerodrome, and when one or both aircraft are turning, descending, or climbing.

The UK CAA identified the most frequent causal factor (41 per cent) of all accidents was a lack of positional awareness in the air by the pilot.

One third of situational and positional awareness errors could be attributed to distraction. The available information was not used effectively in these situations.

French studies show that most collisions take place in uncontrolled airspace, and in every case, radio use was not optimal.

In recent New Zealand occurrences, however, adequate radio calls were made, but did not prevent collisions.
Listening to the whispers and taking positive action is illustrated by Mark Woodhouse.

“I was in a helicopter formation and we were turning. I just knew something wasn’t right, so I left the group – got out of there. I was told afterwards that I was within feet of colliding with another helicopter.”

**Position Reporting**

A good lookout will help you avoid another aircraft, but an accurate position report will help other aircraft know where you are.

When reporting your position, be clear and accurate. Where possible, give a position relative to a published reporting point.

In lieu of a visual reporting point, or a clear geographical feature, give a position report using direction and distance from an aerodrome.

**Think Back (Evaluate)**

Carlton Campbell says we can all learn from our experiences if we are honest with ourselves.

“Avoid becoming complacent, and when things don’t go as well as they should have, take ownership of the situation and learn all that you can from it.”

Evaluating your performance allows you to build your situational awareness through experience.

Try to be specific in noting the actions that you took, or failed to take, and devise ways you can improve.

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**AvKiwi Safety Seminar 2013**

This year’s AvKiwi Safety Seminar, *Get the Mental Picture*, was about situational awareness. The seminar was held in 31 places, from coast to coast and Kerikeri to Invercargill. Over 2230 people attended.

**Seminar Surprises**

A surprising number of people were not familiar with the symbols on the Visual Navigation Charts. These can help you build your situational awareness. For example, you can note where there might be glider winch launching, or model aircraft activity on your planned route.

Here’s a quiz you can take to see if you are familiar with the chart symbols. The answers are somewhere in this issue of *Vector*.

The other surprise was how many people were unaware of the distances marked on the Visual Navigation Charts. These can help you estimate distance, and make accurate position reports.

When using your Visual Navigation Charts to determine distance, the divisions of latitude on the longitude lines represent one nautical mile.