Gliding Australia Training Manual

Pilot Guide

Unit 22

Use of Situational Awareness Aids

WHAT THIS UNIT IS ABOUT

To describe the operation of a range of electronic aids to situational awareness and their use in supporting effective lookout; and to describe the limitations of these aids.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC Unit 9 – Lookout Scan Procedures
- GPC Unit 21 – Radio Use and Endorsement

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 39 – Advanced Soaring Instruments and Flight Computers.

KEY MESSAGES

- Modern electronics and radio communications have delivered a variety of devices that can assist the pilot in obtaining and maintaining situational awareness.
- These devices are not perfect and have multiple failure modes. This means they are an adjunct to, not a replacement of, the main situational awareness processes. Always maintain lookout as the primary means of maintaining situational awareness.
- Pilots need to understand how these devices operate, how they are configured and used, how to interpret the information they provide.
- Pilots also must understand their limitations and how to know that they are configured and operating correctly.
- These devices must not be allowed to distract from the prime duties to lookout, see and avoid.

PILOT GUIDE FOR THIS UNIT

- There are different types of equipment providing aids to Situational Awareness. Each comes with different displays and configurations. The manual appropriate to the device used in the aircraft must be consulted for the correct setup, usage and diagnostic procedures.
- The following types of devices can improve your situational awareness providing they are working configured correctly.
    - Aeronautical Radio (VHF)
    - FLARM
    - Transponders (XPNDR)
    - Moving Map displays (discussed in GPC 39).

There are limitations of these devices which are:

- Range of communications.
- Need for electrical power.

- Continuous drain on aircraft battery.
- Readability of displays / clarity of audio output.
- Ability to display complex data on a limited area.
- Need for configuration and calibration.
- There is also a need for regular updates for some devices

- Let's look at the advantages and limitations of these devices.

Radio

- Almost all gliders in Australia are fitted with a radio even though a radio is not mandatory. Radio is however, very useful.
- The essential thing to remember about the use of a radio is the old adage, "aviate, navigate, communicate." What that means, especially to low hours pilots, is that their highest priority is to fly the aircraft and keep a good lookout for others rather than becoming distracted by trying to make a correct radio call.
- The biggest use of radio is when returning to the strip and circuit area to tell other aircraft where you are. The radio is also very useful when gliders are flying together so that their respective positions can be provided. This promotes a targeted scan and improves safety. The downside of this is that we can fall into the trap where you think you have all the positions of the gliders in the area, so our scan is only for these aircraft. We then find there are one or two gliders operating without radio or not using your frequency.
- Stating the obvious the radio will only be effective if you are on the right frequency. If you are operating in the circuit area, then you should be on that CTAF/Tower frequency. If you are going cross country in G class airspace, then you should be on a nominated glider frequency. Various gliding sites use a common frequency for pilots from that area, so you need to be aware of which frequency will be best to used depending on where you are flying.

Power supply in gliders

- There's no doubt that technology such as GPS has revolutionised many aspects of gliding, and most of it is good. However, getting these devices to work in a sunlit cockpit requires a lot of energy from batteries or solar panels.
- With all glide computers there is a problem of power supply. The more powerful the computer and the bigger the display, the greater the power drain, especially where a system is fitted like a transponder or a device such as ADS-B which broadcasts and receives the position of civil aviation aircraft.
- What happens when the electricity runs out? You might not lose all your instruments but things like radios which need a lot of power to transmit will stop working properly and you may not know that you are not transmitting as the battery voltage sags.
- One of the best ways of providing more power to run these extra instruments is solar panels built into the glider's fuselage. This may be only possible with new gliders, but a couple of small solar panels can mean your battery voltage rarely drops, even during the longest flights.
- Newer battery technology can be used to provide more power but the extent to which this is possible is limited by a few factors including whether the battery is available in a size which will fit a glider, whether a particular battery technology is certified to be used in a glider and whether the battery or its charging system are fire-proof enough that you would want to carry them in a glider cockpit.

- If your power supplies fail there are two situational awareness aids that are always available that require no electricity and are free to use: the sun and the compass.

Flarm and ADS-B

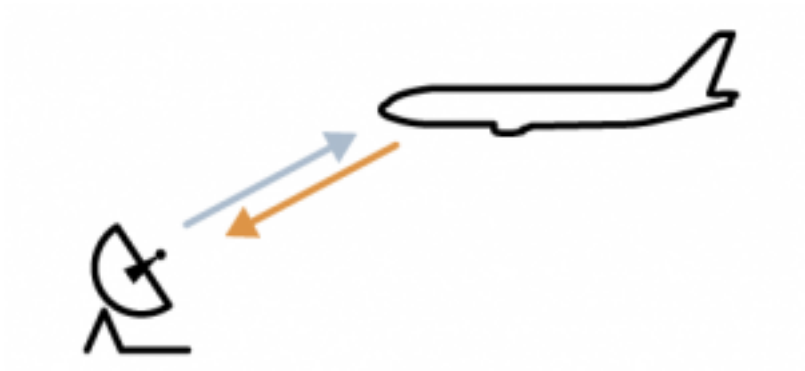
- **FLARM** (Flight Alarm)– uses an alarm to alert pilot to review display and determine closest and immediate threats.
- Two computer/GPS based instruments are available to increase situational awareness in gliders, Flarm and ADS-B.

Typical Flarm display

- Flarm is an instrument invented in Switzerland in 2003 to give glider pilots an audio-visual alert of other Flarm equipped aircraft and predict potential collisions. It analyses the flarm GPS signal of other gliders and identifies when the aircraft are converging and therefore have potential for collision risk. The light indicates the presence of another glider close by and if collision is predicted it will also sound an alarm.
- Most Flarms have an integrated data logger which can be used to record flight tracks for badge claims, competitions and flight analysis. The Flarm also includes a world-wide terrain database which can be used to predict potential collisions with ground features from antennae to mountains.
- **ADS-B** is a more recent technology which is used by a much wider range of general aviation, sport and transport aircraft. It's available as receive only (ADS-B in) and receive and transmit (ADS-B out). Full ADS-B installations can be expensive and use a lot of power.
- ADS-B in is being increasingly fitted to gliders to provide optimal situation awareness of the traffic around you. Instruments such as PowerFlarm have both improved FLARM and ADS-B capability.
- Flarms are mandatory in most competitions and in many day to day club operations and it's likely that ADS-B will follow the same route.
- Both technologies fix the speed and position of the aircraft the device is installed in using a built-in GPS and solid-state altimeter. The instrument's computer predicts the aircraft's future track and broadcasts this signal. The instrument also receives signals from other equipped aircraft within a range of 3 km or more and uses this information to predict potential collisions.
- These devices can be connected to voice modules and also display weather information, the rate of climb and call sign of other aircraft giving pilots a more descriptive warning of potential hazards.

- Flarm units use little power and are reasonably priced. ADS-B is somewhat more expensive and uses more power but these parameters are being improved and we should expect to see gliders with ADSB in the near future..
- Since Flarm devices are mostly fitted only to gliders, it's a great technology for glider-only airspace where that exists. ADS-B can be fitted to a much wider range of aircraft and it has a much greater potential for making airspace safer. ADS-B is mandatory in Australia for aircraft flying under IFR (Instrument Flight Rules) but is not mandatory for VFR (Visual Flight Rules) which represents the majority of general aviation and sports flying.

Transponders:



- Some gliders are fitted with transponders. The definition being; a transponder (XPDR) is a receiver/transmitter which will generate a reply signal upon proper interrogation; the interrogation and reply being on different frequencies. (ICAO)
- A 4-digit code is displayed on the unit in the glider which can be selected to any number requested by Air Traffic Control (ATC). For gliders flying VFR this would normally be 1200.
- Its main purpose is to let ATC know where you are for traffic purposes and is a requirement normally to enter controlled airspace. For the glider pilot there is little information gained in regards to situational awareness from this device.
- The transponder also has a relatively high- power demand on your battery.

Moving Map Displays

- Glide computers fitted with moving map displays have even more capabilities. They can be loaded with hundreds of waypoints and details of aerodromes and outlanding strips. Aerodromes can have a picture attached with details of runway length, direction, altitude and local frequencies etc.
- The recent history of your flight can be shown as a "snail trail" coloured to display lift and sink on track and as an aid to centring thermals and finding lost ones. A display to show the strongest and weakest parts of a thermal around the circle.
- Airspace can be shown with displays and warnings of possible airspace violations. Where a terrain database is loaded, the glide computer can give you information about possible collisions with ridges, mountains and towers.
- When interfaced with common gliding software such as SeeYou, the glide computer can be used for task planning and modification in flight. A complete set of task statistics can be displayed in flight to optimise your flight.
- If you are flying cross-country and running out of height, it can display information and bearings to a number of nearby strips.

- Maps can be zoomed in or out to show details or whole tasks. Map pages showing task points or distance and bearing to alternative waypoints or your home strip can be switched instantly. Screens or pages can be customised in many ways to suit your preferences and display the information you want to see.
- Glide computers with data loggers are not expensive and can add enormously to the fun of gliding, both in the air and on the ground after the flight.
- Good airmanship requires that you should have an accurate idea of the facts and you should not rely solely on instruments like GPS and glide computers. They should be an aid to flying and navigation and not your only tool.
- You should never use electronic instruments to the detriment of the basic airmanship skills of aviate, navigate, communicate. GPS should not be used as a primary means of navigation, especially not for avoiding controlled airspace. Visual pinpointing and official charts remain the primary legal means of cross- country navigation.

Computer software for glider pilots

- There's a small range of computer software intended for glider pilots. The programs range from simple for uploading tracks waypoints to and from GPS devices to more powerful software like SeeYou.
- SeeYou is a flight planning and analysis program. It allows you to plan tasks over terrain maps using a library of waypoints and upload this to a GPS or glide computer. After the landing, you can download your flight track and analyse it.
- Flights can be re-flown on the computer so you can analyse your thermalling performance and decision making. If you've been flying a comp or in a group, flights can be re-flown in sync.
- You can see the statistics for your flight including the time spent circling, time spent in cruise, L/D etc. Some hand held GPS units can run programs like SeeYou for use in the glider. SeeYou is commonly used in competitions for planning tasks and coordinating scores.
- Software is not just for experts though. When you're learning, tools like SeeYou can be very useful to analyse flights and thermalling performance to improve your cross-country skills.

Personal Electronic Devices.

- There are also many personal electronic aids that can be displayed on your phone or IPAD such as LX Nav, Win Pilot, Avplan and OzRunways which provide an enormous amount of information to the aviator.
- Another standalone device is "Oudie" which provides the same information as a fitted NAV computer described above.

- You will spend more time with this and other NAV units in GPC 39.

Important Notes:

- As all these devices can be very distracting, you should ensure that they are programmed and set up before you go flying.
- You should know how to power cycle the device and how to determine that it is operating correctly.
- You should know how to configure and determine the calibration and update status of the device.
- All these aids can make gliding very enjoyable and provide confidence in our navigation but as mentioned throughout your glider training aircraft still run into each other so:
- Set up your navigation aids correctly before take-off and spend the majority of your time looking out as the Vario, Radio and FLARM will provide audio warnings without having to get your head inside.

FLIGHT EXERCISES FOR THIS UNIT

- Your instructor will show you how to operate your gliders electronic aids and how to check and configure the device.
- Inflight you can demonstrate receiving information either by radio, FLARM or other aids to determine location and the direction of traffic.

THINGS YOU MIGHT HAVE DIFFICULTY WITH

Problem	Solution
• Some devices can be complex to set up and use, which can distract you from your core flying skills.	Use the basic information available rather than trying to use all capabilities.

HOW DO YOU DEMONSTRATE COMPETENCE?

- When you can unassisted set up and operate the aids in your glider and demonstrate awareness of other aircraft using these aids.

RESOURCES & REFERENCES

- Australian Gliding Knowledge Pages 80-82, 229-231
- Operation manuals for the various devices

SELF-CHECK QUESTIONS

- How does FLARM increase your situational awareness?
- What is the approximate range of FLARM?
- What is the purpose of the Transponder?