Gliding Australia Training Manual

Pilot Guide

Unit 39

Advanced soaring instruments and flight computers

Unit 39 – Advanced Soaring Instruments and Flight Computers

WHAT THIS UNIT IS ABOUT

To develop your knowledge and skill in the use of modern flight computers without degrading your lookout and situational awareness.

The focus is on moving map flight computers, including personal devices such as the Oudie and mobile phones.

You should become familiar with the operation of the devices you will use and apply the concepts outlined in this unit.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC Unit 38 Meteorology and flight planning

KEY MESSAGES

- You need to think and look ahead.
- Flight computers can be a distraction from the tasks at hand and degrade your performance.
- Flight computers display accurately what's happening now and in the past. Predictions of finish height, ETA etc. are based on assumptions of climb rate and winds.
- Flight computers can display a huge amount of information - only relevant or useful information should be displayed.
- The display should be uncluttered to allow relevant information to be seen clearly and quickly.

PILOT GUIDE FOR THIS UNIT

Electric Variometers

Electric varios have been around for a long time and are gradually replacing mechanical varios. They display instantaneous vertical movement of the glider but, to varying degrees, still suffer from the same lag and gust sensitivity limitations.

They offer many other advantages over mechanical varios including:

- Averaging of the instantaneous vertical climb/sink rate (averager)
- Netto and relative netto
- Configurable parameters such as total energy compensation based on a mix of the total energy probe, pitot, GPS and inertial sensors
- Speed to fly information
- Many other display features blurring the distinction between varios and flight computers

Figure 1 - the LX S100

Averagers display a moving average of climb rate over the last 20 to 30 seconds (often configurable). They provide a much better indication of climb rate than the instantaneous reading.

Netto vario modes display the movement of the air mass the glider is flying through. It's calculated by subtracting the sink rate of the glider from the instantaneous reading of climb or sink. To do this the gliders polar needs to be correctly configured in the instrument and other settings need to be entered such as the weight and performance degradation due to bugs or rain etc.

Relative netto is a variation that calculates and displays the climb rate that would be achieved at thermalling speed; however given the inherent vario lag and gust sensitivity (ref GPC units 30 and 31 on thermal centring and thermal entry) relative netto is not particularly useful.

With the exception of the basic averager more advanced functions of electric varios require configuration and will give incorrect information if not correctly set up. Speak with your airworthiness inspector if you are unsure.

Flight Computers

There are many types of soaring flight computers available ranging from enhanced electronic variometers (such as the S100, Eos), to apps running on mobile devices (such as Oudie, XCSoar, SeeYou Navigator), to full up flight computers (such as the LX9000, Zeus and ClearNav). This unit can't cover the breadth of these devices, and nor is it appropriate for an in-experienced pilot to use many of the features – you should learn to fly cross country using the basics first then move on to the fancy devices if you wish.

All devices have a manual – read the manual to become familiar with the basis features of the device(s) you will be using. However you'll most likely learn best by actually setting up and using the device, much of which can be practiced on the ground. Most devices have a simulator that can be run on a computer – these are a great way to practice use of the device. If you have access to a gliding simulator with an appropriate flight computer these are a great way to practice before flying.

At a minimum, before you fly, you'll need to understand how to set up and use the following features:

- Configuration of the glider polar and connection to other devices
- Enter a task, start the task navigation, move to the next waypoint etc
- Set the MacCready setting (assumed climb rate), ballast and bugs
- Configure airspace boundaries and warnings and understand how this information is presented in flight
- How wind strength and direction is calculated and displayed
- Display of required track and actual track
- Distance and bearing to next turn point
- Finish height or final glide data, including setting a safety height above the ground to finish the glide

Figure 2 - Oudie flight computer with simple uncluttered display

Task predictions and speed to fly information are based on MacCready setting (MacCready theory is introduced in GPC unit 40 – Cruising, speed to fly, height bands and thermal selection). This MacCready setting is typically manually set, but in some instruments can be automatic. It is recommended that you start with a manual and conservative setting – for example if you expect your next climb to average 4 knots then set MacCready to 2 knots. The MacCready setting makes a large difference to the prediction of Expected Time of Arrival (ETA) and arrival height.

Notes

- Be aware that flight computers will distract you from other tasks such as maintaining good lookout. Screen time should be kept to a minimum – this can be achieved by ensuring that only the required information is presented and that you are well practiced in using the device. Where increased screen time is unavoidable, such as reprogramming a task, this should only be conducted after moving away from other aircraft, conducting a full scan lookout with a 180 degree turn, and then regular full scans. Break longer tasks into smaller sub-tasks and conduct a full scan between each sub-task.
- Incorrect interpretation of the information displayed can lead to errors such as misjudging final glides or infringing airspace. In addition, configuration of flight computers is complex and misconfiguration may give erroneous results, potentially impacting safety. You must be familiar with the use of the device, be aware of limitations and the potential for incorrect setup; basic setup problems include such items as incorrect glider polar, weight, airspace, and task. This should be practiced on the ground.
- Even with correct configuration, predictions by a flight computer are dependent on history and assumptions about future events. For example the flight computer won't know about wind changes and changes in flight conditions ahead – so ETA and final glide height may be incorrect.
- When cruising, use the flight computer to get the correct direction and pick a point in the distance to fly towards. This allows navigation with infrequent looks at the computer.
- While thermalling, check the computer's wind vector by comparing it to the snail trail on the screen. To achieve this, set the screen to zoom-in while thermalling.
- Focus on lookout when approaching the start, turn points and finish line.

FLIGHT EXERCISES FOR THIS UNIT

You'll be asked to check the configuration on a flight computer and set up a task it. Before you fly, make sure that you are familiar with the main functions, can use it for navigation and can correctly interpret arrival height information. In the air make sure that you maintain good lookout at all times. You'll be queried on some of the information displayed and the validity of the assumptions.

THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS	
Problem	**Probable Cause**
Distraction with flight computers resulting in poor lookout	Lack of familiarity with use of flight computers Lack of discipline with dividing on-screen tasks into small units
Relying too much on the information displayed	Lack of understanding of the underlying assumptions and calculations used by flight computers Incorrect configuration of the flight computer

HOW DO YOU DEMONSTRATE COMPETENCE?

- Describe
  - Averager and netto modes of electric variometers
  - The purpose of relevant items shown on flight computer pages and at what stage of the flight each item is of use
  - The basis on which flight computer predictions of wind, ETA and arrival height are made
- Demonstrate
  - Setting up a task and parameters on the ground
  - Navigating a task and adjusting parameters (such as thermal strength) in the air
  - Excellent lookout with minimum “screen time”
  - Correct interpretation of the information displayed

RESOURCES & REFERENCES

- Flight computer manuals and device simulators

SELF-CHECK QUESTIONS

Use these questions to test your knowledge of the unit.

1. What does the netto mode of a vario display?
2. Why is it important to configure an electronic variometer?
3. Why is it important to configure a flight computer?
4. How is wind typically calculated?
5. What are the main assumptions used for calculating ETA and arrival height?
6. Why is it important to divide in-flight changes on a flight computer into small tasks?