XCSoar for the New Cross-Country Pilot

How a glide computer can help you stretch your wings and fly away from Camden

What this presentation will cover

- What is a glide computer?
- What can a glide computer do for me?
- Which glide computer should I use?
- What hardware does XCSoar need?
- What else do I need for XCSoar?
- The XCSoar user interface
- How do I install XCSoar?
- How do I configure XCSoar?
- What should I do now?
- What should I do before and after each flight?
- What should I do between now and Xmas?
- What should I do at the Xmas camp?
- Safety first
- Warnings about glide range calculations
- Questions and answers
  - but feel free to ask questions along the way

What is a glide computer?

- As the name implies, it's a computer…
- …with some specialised gliding software
- …and a GPS receiver so it knows where you are
- …and (usually) maps and waypoints so it knows what is below you
- …and (sometimes) airspace information so it knows what airspace is around you
- It can provide you with information to make your early cross-country flights a lot less daunting

Some glide computers

From left to right: Oudie, Cambridge 303 (top), LX 8080 (bottom), iPhone running iGlide, Android smartphone running XCSoar (shown approximately to scale)

What can a glide computer do for me?

- Display your position and path on a moving map
- Provide early warning of potential problems eg airspace infringement, landing after last light
- Provide lots of information useful for cross-country flying eg which direction to fly, where the nearest airfield is, what the wind speed and direction are
- Estimate whether you are likely to make it home (this feature alone is worth the price of admission)

Which glide computer should I use? (option 1)

- The Cambridge 303 is built into our best single-seat glider, the DG-303
  - It's always available and ready to use
  - You can use it for claiming badges
  - It's been superseded by newer technology
  - It doesn't have a moving map
  - It's only available in the DG-303
  - It can't be removed from the aircraft
- The LX 8080 is built into our best two-seat glider, the DG-1000
  - It's a modern glide computer
  - It's always available and ready to use
  - You can use it for claiming badges
  - It's only available in the DG-1000
  - It can't be removed from the aircraft

Which glide computer should I use? (option 2)

▸ **The Oudie is a portable glide computer you can buy yourself**
  - It's a modern glide computer
  - Everything you need is in the box: computer, SeeYou Mobile software and suction mount
  - It has a sunlight-readable screen and high capacity battery
  - It's portable, so you can use it in any glider
  - It's a bit pricey: $760 from www.gosoaring.com.au
  - You can't use it for claiming badges unless you buy the $1400 model (use one of the club's Nano data loggers instead)

Which glide computer should I use? (option 3)

- iGlide is just software; you provide the hardware
  - It's modern glide computer software
  - If you have an iPhone, you have the hardware
  - It's portable, so you can use it in any glider
  - It only runs on Apple iPhone and iPad
  - You also need a suction mount and external battery pack
  - You can't use it for claiming badges, so you'll need one of the club's Nano data loggers
  - Screen readability in direct sunlight may be a problem
  - It costs €119.99 (~$190[†]) for the intermediate version and €219.99 (~$350[†]) for the advanced version
  - The manual states that, to be fully functional, iGlide needs an external GPS data source
  - The manual is only 18 pages long, so the software is lacking in either features or documentation

[†] at AU$1.00 = €0.63

Caveat: I haven't used this software so can't vouch for its suitability or reliability

Which glide computer should I use? (option 4)

- XCSoar is just software; you provide the hardware
  - It's modern glide computer software
  - It's free, so the value for money is excellent
  - If you have an Android smartphone or tablet, you have the hardware
  - It works on other hardware as well
  - It's portable, so you can use it in any glider
  - You also need a suction mount and external battery pack
  - You can't use it for claiming badges, so you'll need one of the club's Nano data loggers
  - Screen readability in direct sunlight may be a problem

- Other choices are valid, but this presentation concentrates on XCSoar
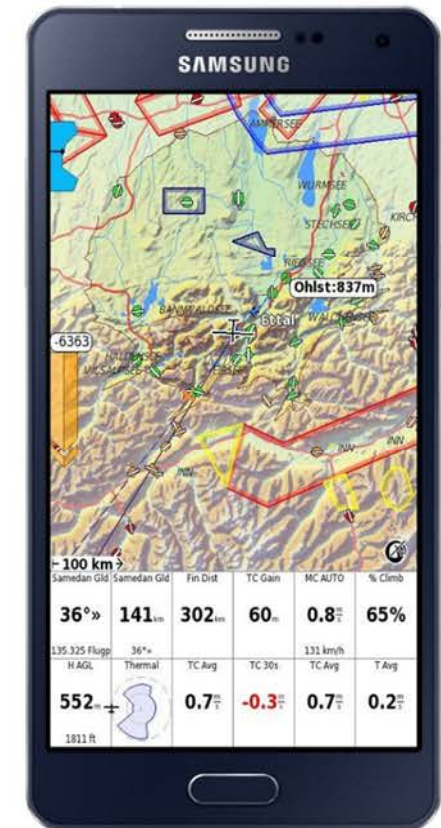
What hardware does XCSoar need?

- The simplest option is an Android smartphone (eg HTC, LG, Samsung, Sony)
- Another option is a small Android tablet with built-in GPS
- Another option is a Kobo eBook reader (eg Kobo Mini), but you have to attach a GPS receiver
- You can run XCSoar on your home PC to experiment
- Using a car navigation GPS was common in the past, but getting it to work was a bit difficult and it only worked on some brands
- Using a PDA was common in years past, but PDAs are a superseded technology

What else do I need for XCSoar?

- A way to mount the device securely in the cockpit
  - Most smartphones have suction mounts available from the manufacturer
  - Third party suction mounts (eg from RAM Mount) may be expensive but can work well
- A way to supply additional power
  - The battery in your smartphone is fine for an hour's flying around Camden, but for cross-country flying you need supplementary power
  - Small USB battery packs are readily available at reasonable prices

The XCSoar user interface

- The standard XCSoar screen shows a moving map and some "InfoBoxes"
  - You need to install a map for your region
- The InfoBoxes display useful information
  - There are lots of InfoBoxes to choose from (100+)
  - You choose which ones you want displayed
  - You configure how many you want displayed and where they appear on the screen
- You configure how you want XCSoar to work
  - There are lots of settings to configure (150+)
  - Configure the settings before you fly, not in the air!
- You access the settings by double-tapping on the screen and following the menus
- You can "draw" on the screen to access some of XCSoar's features
  - eg swiping up or down zooms the map in or out
- The screen can be oriented in portrait or landscape mode, but is shown here in portrait mode for convenience

How do I install XCSoar?

- For Android devices, install the XCSoar app from Google Play
  - It's had over 50,000 downloads and gets a 4.7 star rating
- For other devices, download the appropriate version from the XCSoar web site (www.xcsoar.org/download)
- Installing XCSoar on some devices (eg Kobo Mini, car navigation GPS) can be a bit tricky, so read the manual and consult the web site (www.xcsoar.org/hardware and forum.xcsoar.org)

Start XCSoar

- Start XCSoar
- Select `SIM` so it doesn't attempt to use the GPS receiver, which probably won't work indoors
- The screen is mostly blank because you haven't installed a map yet

Download map and airspace files

- You'll need to be connected to the Internet to download the map and airspace files (they're less than 10MB in size)
- Double-tap on the screen and select `Config`, then `Config`, then `File Manager`
- Select `Add`
- Highlight the map file `AUS NSW VIC HighRes.xcm` and select `Select`
- Select `Add`
- Highlight the airspace file `Australia Airspace.txt` and select `Select`
- Wait for the download to finish
- Select `Close`

Configure map and airspace files

- Double-tap on the screen and select `Config`, then `Config`, then `System`
- Select `Site Files`, then `Site Files`
- Set `Map database` to `AUS_NSW_VIC_HighRes.xcm`
- Set `Airspaces` to `Australia Airspaces.txt`
- Select `Close`

Configure Australian units

- **Select** `Setup`, **then** `Units`
- **Set** `Preset` **to** `Australian`
- **Select** `Close`

Configure the screen layout

- **Select** `Look`**, then** `Screen Layout`
- **Enable** `Expert`
  - Some settings aren't visible until you enable Expert mode
- **Set** `InfoBox geometry` **to** `12 Bottom or Right`
  - You can customise this differently later if you want
- **Set** `Inverse InfoBoxes` **to** `On`
  - The InfoBoxes are easier to read when they have white text on a black background
- **Select** `Close`

Restart XCSoar

- Select `Close`, then `OK`
- Double-tap on the screen and select `Quit`, then `Yes`
- Restart XCSoar
- Select `SIM` so it doesn't attempt to use the GPS receiver
- There is still no map because XCSoar is in "SIM" mode, so doesn't know where you are
- Double-tap on the screen and select `Config`, then `Config`, then `System`
  - This allows you to continue configuring XCSoar with the new units and screen layout

Configure safety settings

- **Select** `Glide Computer`**, then** `Safety Factors`
- **Set** `Arrival height` **to** `1200 ft`
  - ◦ You should aim to get back to the airfield with some extra height
- **Set** `Terrain height` **to** `1000 ft`
  - ◦ You don't want to fly too close to mountains
- **Set** `Polar degradation` **to** `5%` **and** `Auto bugs` **to** `On`
  - ◦ Glide calculations shouldn't assume your aircraft is in pristine condition
- **Set** `Safety MC` **to** `0.0 kt`
  - ◦ Don't assume we will find any more lift
- **Set** `STF risk factor` **to** `0.3`
  - ◦ XCSoar will guide you to fly slower as you get closer to the ground
- **Select** `Close`

Configure airspace settings

- **Select** `Map Display`**, then** `Airspace`
- **Set** `Airspace display` **to** `Auto`
  - Only display information and warnings for airspace boundaries which are close by
- **Set** `Margin` **to** `500 ft`
  - The default setting of 328 ft is a bit too close
- **Select** `Close`

Configure task settings

- **Select** `Task Defaults`, **then** `Turnpoint Types`
- **Set** `Start point` **to** `Start line` **and** `Finish point` **to** `Finish line`
  - FAI rules require start and finish lines, not cylinders!
- **Set** `Turn point` **to** `FAI quadrant`
  - FAI rules prefer quadrants to cylinders
- **Set** `Task` **to** `FAI badges/records`
  - Apply FAI rules to tasks
- **Select** `Close`

Configure InfoBoxes

- **Select** `Look`**, then** `InfoBox Sets`
  - There are three standard sets of InfoBoxes, one which is displayed when circling, another when cruising (ie not circling) and another when on "final glide" (ie when you have enough height to head for home)
  - XCSoar displays the appropriate set automatically
  - The selection and layout of InfoBoxes in the following slides is the result of my experimentation, testing and personal preferences, but feel free to choose whatever works best for you

Configure InfoBoxes (part 2)

- **Select** `Cruise`
- **Set InfoBox 1 to** `Next waypoint`
  - Where do I go next?
- **Set InfoBox 7 to** `Next distance`
  - How far is the next turnpoint?
- **Set InfoBox 2 to** `Speed MacCready`
  - How fast should I be going?
- **Set InfoBox 8 to** `MacCready setting`
  - What is the MacCready setting?
- **Set InfoBox 3 to** `Speed task achieved`
  - How fast have I gone so far?
- **Set InfoBox 9 to** `Task time to go (ground speed)`
  - How long still to go, assuming current ground speed?

Configure InfoBoxes (part 3)

- **Set InfoBox 4 to** `Last thermal average`
  - How good was the previous thermal?
- **Set InfoBox 10 to** `Thermal average over all`
  - How good have all the thermals been?
- **Set InfoBox 5 to** `Altitude GPS`
  - How high am I above sea level?
- **Set InfoBox 11 to** `Height AGL`
  - How high am I above the ground?
- **Set InfoBox 6 to** `Wind speed`
  - What is the wind speed and direction?
- **Set InfoBox 12 to** `Battery percent`
  - We don't want to run out of power

Configure InfoBoxes (part 4)

- **Select** `Copy`
  - This makes a copy of the Cruise InfoBox settings
- **Select** `Close`
- **Select** `Circling`
- **Select** `Paste`, **then** `Yes`
  - This pastes the settings into the Circling InfoBoxes

Configure InfoBoxes (part 5)

- We just need to change the InfoBoxes which are relevant for Circling mode rather than Cruise mode
- Set InfoBox 2 to `Thermal climb, last 30s`
  - How fast am I going up now?
- Set InfoBox 8 to `Thermal average`
  - How good is this thermal?
- Select `Close`
- Select `Close` again

Configure map settings

- **Select** `Map Display`, **then** `Orientation`
- **Set** `Circling orientation` **to** `Target up`
  - Makes it easier to see in what direction to leave a thermal
- **Select** `Close`
- **Select** `Map Display`, **then** `Waypoints`
- **Set** `Label format` **to** `Full name`
  - Abbre locat names isn't parti helpf
- **Set** `Arrival height` **to** `Terrain avoidance glide`
  - You may need to fly around hills to get to an airfield
- **Set** `Landable symbols` **to** `Traffic lights`
  - Red/orange/green indicators are more intuitive
- **Select** `Close`

Configure miscellaneous settings

▶ Some of these settings are a bit obscure, but don't worry
▶ Select `Setup`, then `Logger`
▶ Set `Pilot name` to your name
▶ Set `Log book` to `On`
  ◦ This logs your takeoffs and landings
▶ Select `Close`
▶ Select `Glide Computer`, then `Route`
▶ Set `Route mode` to `Both`
  ◦ Route calculations will avoid terrain and airspace infringements
▶ Set `Reach mode` to `Turning`
  ◦ You may need to fly around hills to get to an airfield
▶ Select `Close`
▶ Select `Close` again
▶ Select `OK`

Configure aircraft types

- XCSoar does its glide range calculations based on the performance of your aircraft, so you need to specify the aircraft you are flying
- Double-tap on the screen and select `Config`, then `Config`, then `Plane`
- Select `New`
- Set `Registration` to the registration of the glider eg `HDP` for the Junior
- Select `Polar`
- Select `List`
- Select the glider type eg `SZD-51-1 Junior` for the Junior
- Select `OK`, then `OK`
- Repeat these steps for all of our aircraft
  - `SZD-51-1 Junior` for the Junior HDP
  - `G 102 Astir CS` for the Astir WVJ
  - `DG-300` for the DG-303 DGU
  - `SZD-48-2 Jantar Std 2` for the Jantar IZU
  - `DG-1000 (20m - PAS)` for the DG-1000 DGI with two pilots and the wingtip extensions
- Select `Close`

That's it!

- Double-tap on the screen and select `Quit`, **then** `Yes`
- You've configured XCSoar with some fairly useful settings in under 10 minutes

What should I do now?

- Find an Android smartphone or tablet to experiment with (even an old one will do)
- Load XCSoar and configure it by following these instructions
  - I'll make this presentation available as a PDF
- Print the manual and start reading
  - The July 2015 edition is 180 pages long, so you have a bit of reading to do
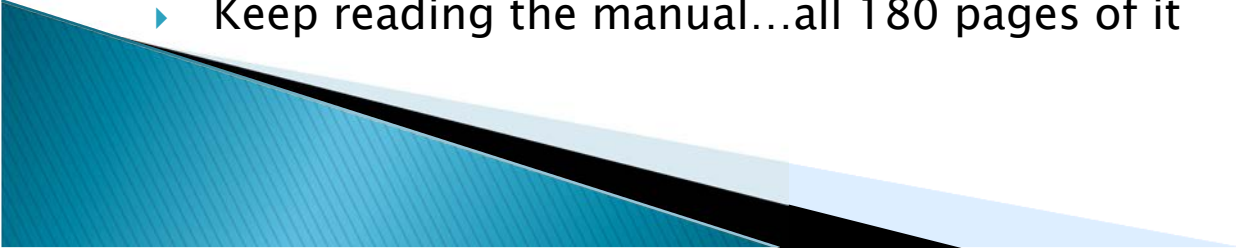
What should I do before each flight?

- Tell XCSoar what aircraft you are flying, so it can do glide range calculations correctly
  - Double-tap on the screen and select `Config`, then `Config`, then `Plane`
  - Highlight the aircraft you will be flying and select `Activate`, then `OK`
- If you are flying a task, tell XCSoar what the task is
  - Double-tap on the screen and select `Nav`, then `Task`
  - Defining tasks is beyond the scope of this presentation
- Get your glide computer set up <u>before</u> you climb into the cockpit
  - Turn your smartphone or tablet on and start XCSoar
  - Mount the device securely
  - Connect the battery pack if you are using one
- When you're in the cockpit, don't let XCSoar distract you from preparing for launch!

What should I do after each flight?

- If you turn off the power to your smartphone or tablet while XCSoar is running, the flight log may not be saved correctly, so shut down XCSoar first
- Double-tap on the screen and select `Quit`, then `Yes`
- Now you can turn the power off

What should I do between now and Xmas?

- Read the manual some more
- Fly with XCSoar at Camden and get to know how it works
  - Set up a simple task (eg Woody's Task: St John's Church Camden/McDonalds Narellan/The Oaks/return) and fly it
  - Remember that you need to stay within glide range of the airfield at Camden!
- Tweak any settings you think need changing
  - Always make your changes on the ground, not in the air!
- Sort out any mounting issues
  - Get hold of a suitable suction mount
  - Make sure you position the smartphone securely so it's easy to see but doesn't obstruct your view
- Sort out any power issues
  - Make sure your supplementary battery pack works
- Sort out any visibility issues; if the screen is difficult to read in sunlight, you have a few options
  - Make a simple sun shade out of cardboard and sticky tape
  - Get a smartphone or tablet with a more readable screen
  - Consider using a Kobo eBook reader (you'll need soldering skills to attach a GPS chip or to purchase an external GPS unit)
- Do a coaching flight in the DG-1000 with Derek Ruddock or Dave Boulter
  - If you've never flown cross-country before, it will be a real eye-opener
- Keep reading the manual…all 180 pages of it

What should I do at the Xmas camp?

▸ You'll be very busy at the Xmas camp, so you should do as much preparation as possible
- You should have read the manual and know how XCSoar works
- You should have flown with XCSoar at Camden and be familiar with it
- You should have sorted out any mounting, power and screen visibility issues

▸ Try and do a long cross-country flight in the DG-1000 with an experienced instructor
- You'll learn an enormous amount which will build your confidence

▸ Aircraft are allocated each evening, so you can tell XCSoar what aircraft you will be flying the night before

▸ There is a weather briefing each morning, so you can set up your task afterwards
- Always consult the instructor in charge about your proposed task
- Set up a few different tasks so you have options if conditions change
- If you're doing a badge flight, don't forget your declaration and data logger!

▸ The aircraft is yours for the day, so get everything ready in the cockpit before you tow out to the flight line

▸ Don't forget about all your other requirements for cross-country flying: compass, charts, water, food, sun protection, tie-down kit, torch, mobile phone…

▸ Flying cross-country on your own for the first time can be stressful, so concentrate on flying and navigating, not fiddling with XCSoar

▸ Keep your focus outside the cockpit

▸ The _less_ time you spend thinking about XCSoar, the better!

Safety first!

- You're the Pilot In Command, so you're responsible for the decisions you make and the actions you take
- XCSoar provides you with information, but you need to use that information wisely
- Any glide computer can be a distraction if you let it; remember that your primary responsibility is to fly the aircraft ("aviate, navigate, communicate")
- Computers can fail, so you still need a compass and charts for cross-country flying, and you must know how to use them

Warnings about glide range calculations

- Just because XCSoar thinks an airfield is landable doesn't mean it is (perhaps the airfield is closed)

- Just because XCSoar thinks an airfield is within glide range doesn't mean it is (perhaps there's a wind change coming)

- You should err on the side of caution; the large flat paddock below may be a safer option than the airfield on the edge of your reported glide range

Any questions?

I've lots of answers, some of them right...
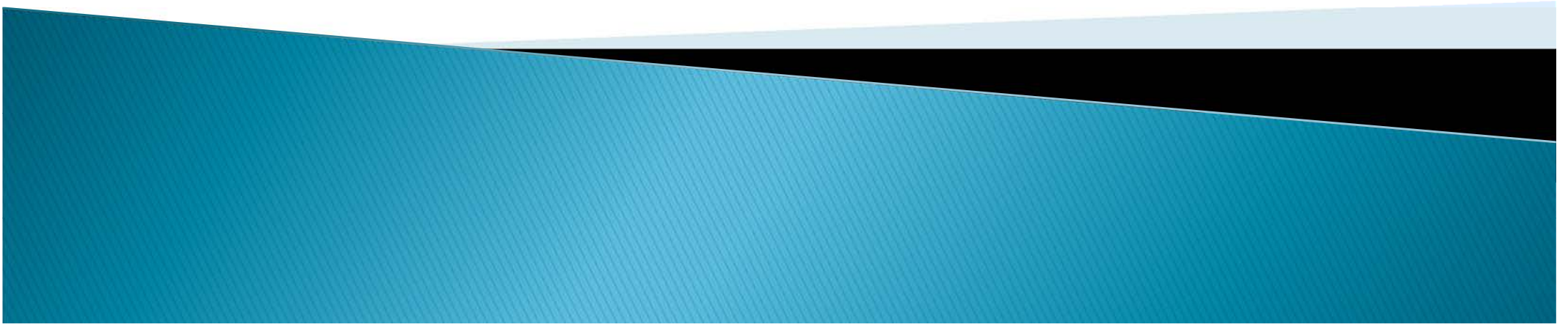
Thank you for your attention

You've been a wonderful audience