Gliding Australia Training Manual

Trainer Guide

Unit 38
Meteorology and Flight planning

Unit 38 – Meteorology and Flight Planning

AIM

To develop the student's knowledge and skills in determining the suitability of the forecast weather for cross country flight and in setting an appropriate task for the expected conditions.

PRE-REQUISITE UNITS

- GPC Unit 33 Thermal sources and structure
- GPC Unit 34 Outlanding planning, demonstration and execution
- GPC Unit 36 Airspace and Navigation

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 40 Cruising, speed to fly, height bands and thermal selection

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Predict soaring conditions	• **Demonstrate** o Accessing relevant weather information for the local area • **Predict** o Wind speed and direction at different times and heights o Cloud layers o Thermal heights, strengths and the soaring window
2. Plan flight	• **Describe** o Weather threats and mitigation strategies • **Predict** o Cross country speed • **Plan** o Suitable task distance o Suitable task waypoints o Review NOTAMS and radio frequencies.

KEY MESSAGES

- How to access and use weather information relevant to planning a flight.
- Weather threats such as wind, rain, thunderstorms, and dust/smoke and effect on flight planning.
- The concept of the soaring window.
- The likely cross-country speed that can be achieved based on predicted thermal strength, wind and other conditions.
- Selection of a suitable task.

LESSON PLANNING AND CONDUCT

Briefing

Pre-flight briefings are based on predicted weather, so it is important to compare actual flight experiences against the predictions with the student after the flight.

The lesson can either take the form of a presentation covering the details, or a less formal approach of simply working the student through the process prior to a flight. Presenting a lecture is often more efficient with a number of students. The less formal approach works best with a single student.

Meteorology and flight planning is a very large subject. At the GPC level it is only necessary to train the minimum to allow students to predict basic soaring weather for flight planning purposes. Emphasise that inexperienced pilots should be conservative – if in doubt don't fly cross country or speak with an instructor or coach. Meteorology and flight planning will be covered in greater detail in the post-GPC syllabus.

It is important that the student learns to predict the soaring conditions themselves, however most likely there will be a daily club weather briefing and discussion on possible tasks. This is a great learning environment. Student pilots can also talk with experienced pilots on the day.

Weather predictions

This section discusses sources of weather information and the information to be extracted, or predicted, from the weather sources.

Ensure that the student(s) have sufficient knowledge to be able to access weather information sources in future (including login). Demonstrate access to each source listed below and how to find the relevant information:

- Looking outside!
- Bureau of Meteorology – General forecast, synoptic chart, prognostic chart, satellite images
- NAIPS area forecast
- Atmospheric soundings
- Gliding weather models (such as GFA Met, Skysight and XCSkies)

Students must be able to interpret and use general weather forecasts and not rely solely on gliding weather models.

A list of basic weather information required is below. This information is used for task planning (discussed later) and assessment of weather hazards:

- Weather events and timing (fronts, wind, rain, thunderstorms, dust/smoke etc)

- Wind speed and direction during the day (at surface and selected altitudes)
- Cloud – cumulus cloud base and high cloud over the day
- Maximum temperatures over the task area
- Thermal heights
- Thermal strength
- Soaring window

Predicted versus actual. Discuss the importance of comparing information from general and gliding forecasts with actual observations such as local temperatures and satellite images – look outside and don't get seduced by computer models. Are fronts/troughs/cumulus development progressing as expected?

Brief the formation of cumulus cloud from condensation of rising water vapour forming water droplets (condensing when the dew point is reached). Describe calculating the approximate cumulous cloud base in feet (where present) derived from the difference between the observed dew point and temperature multiplied by 400.

At this level predicting thermal heights and strengths from modelled and observed atmospheric soundings is not covered. This information can be found in the gliding weather models, or from talking with experienced pilots. The rule of thumb generally applies that the higher the thermals go, the stronger they are – for example often 3 to 4 knots for 4000 foot thermals, and 6 to 7 knots for 10000 foot thermals.

Similarly predicting the time when thermals start and stop (the soaring window) from first principles is not covered in this unit – this information is available from gliding weather models.

Make sure the student understands the implications of wind on cross country flight:

- Impact on outlanding
- Impact on achieved speed - the stronger the head wind, the slower the average speed
- Impact on thermals – broken and so harder to use, so slower average achieved climb rate
- Increased danger in using thermals low

Flight Planning

Flight planning in the context of this unit is the process of using the weather predictions to plan an appropriate task. This requires the student to develop an understanding of achievable cross-country speeds under various conditions and other considerations for planning a task including safety.

At the GPC level the student only needs to be aware that MacCready theory can be used to calculate achievable cross-country speed given the performance of the glider and the strength of the thermals. It is not necessary to delve into the theory. It should be noted that an inexperienced pilot is only expected to achieve speeds much lower than theoretically possible – generally due to average climb rates significantly lower than for experienced pilots.

The pilot guide for this unit includes guidance on typical achievable speeds for an inexperienced pilot flying an unballasted glider such as an LS4. These speeds are intentionally low and hopefully will provide a sense of achievement when exceeded. If there is any significant wind, then cross country speed will be reduced, particularly for inexperienced pilots. A rule of thumb that can be applied is that if predicted winds are above 5 knots at flying heights, reduce the predicted average speed by about 1 kph per knot of wind speed. If possible, it is useful to review cross country speeds actually achieved by the pilot from previous flights under different conditions.

Some considerations for task planning are:

1. Task time. This should be shorter than the soaring window as predicted from the weather analysis and should take into account time to climb in the first thermal and before leaving on task. Early cross-country pilots should not be too ambitious with task time. Consider landing well before significant weather events.
2. Task distance. Calculated from the predicted cross-country speed in the task time available.
3. Task waypoints. The following should be considered:
    - Airspace restrictions.
    - NOTAMS at aerodromes enroute.
    - Radio frequencies enroute
    - Areas of adverse weather.
    - If possible, fly down wind on 1st and last legs - into wind during the peak of the day.
    - Avoid flying west at the end of the day (visibility is poor).
    - Placing the airfield mid-leg minimises any retrieve.
    - Silver Distance requires flying to at least 50km from the tow release point and launch point. Be aware of other geometry requirements for badge flights.
    - Choose a task that avoids difficult outlanding terrain (or make sure enough height is available to cross) or choose a task that remains within range of suitable airfields.
    - What is the longest retrieve the pilot is comfortable with (if needed)?

Discuss possible tasks using a map or use an application such as SeeYou.

The simple task planner table in the pilot guide for this unit is a tool that can be used for planning a task. The student may wish to keep the completed planner for each day to use for future reference.

COMMON PROBLEMS

Problem	Probable Cause
• Incorrectly setting task distance	Incorrectly predicting the wind and or thermal strengths/heights over the soaring window Incorrectly estimating likely task speed with the student's experience in the predicted conditions Not factoring in the time from launch to leaving on task
• Choosing an inappropriate task	Unfamiliarity with local conditions, terrain and airspace

Flight Exercises

Conduct the planned flight. This flight is best conducted in conjunction with flight exercises from Navigation and Airspace or Advanced soaring instruments and flight computers.

As the flight progresses, query your student on their perception of the conditions encountered relative to the predicted conditions. Emphasise the need to watch for changes such as the progression of a front, cloud and changes in wind direction and strength.

Ask your student to comment on task progress relative to the progress anticipated during flight planning. As necessary, replan the remainder of the flight.

Debrief

It is useful, regardless of whether or not a task was flown, to demonstrate basic elements of reviewing a flight (detailed flight analysis is in the post-GPC syllabus). It would be best to do this with a

recorded flight of the student if possible. Alternatively, a flight showing examples of both good and poor climbs would be helpful.

Attention should be paid to individual thermals and the climb rate achieved for the duration of the thermal. Any drop off in thermal climb rate should be reviewed at the beginning of the thermal and prior to leaving the thermal to highlight thermal centring issues or spending too much time in a weakening thermal.

The achieved heights, thermal strengths and weather should be reviewed against the forecasts for the day. Reasons for variations should be discussed.

If possible, show students how applications such as SeeYou can be used to determine achieved cross-country speed, average thermal climb rate achieved during a task and percentage of time spent thermalling against cruising.

THREAT AND ERROR MANAGEMENT

- The main weather threats include wind, rain, thunderstorms, and dust/smoke. Ensure that the student can access and understand the appropriate information sources to assess the likelihood of these weather events. Appropriate actions may be not to fly, task in a different direction, task for a shorter part of the day, abandon the task, or simply increased vigilance.
- Ensure that the student is aware of the dangers of outlanding in difficult conditions such as strong winds or gust fronts. At all times it's always a good idea for pilots to seek advice from experienced instructors.
- Other than specifically related to weather events, unlandable terrain may be a major cross country flying threat. Ensure that the student understands areas of unlandable terrain in the local tasking area and how to assess this during task planning – for example through the use of Google Maps.
- At some sites it is advisable to fly with a database of airfields and always keep at least one within glide at all times (stepping stones).