Gliding Australia Training Manual

Pilot Guide



Unit 10 Use of Ancillary Controls



WHAT THIS UNIT IS ABOUT

To develop the practical skills and knowledge to operate the Airbrakes, Flaps, Undercarriage, Canopy and Tow release in various gliders.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC Unit 4 Orientation & Sailplane Stability
- GPC Unit 5 Primary Effect of Controls
- GPC Unit 6 Aileron Drag & Rudder Coordination
- GPC Unit 7 Straight Flight, Various Speeds & Trim
- GPC Unit 9 Lookout Procedures

COMPLEMENTARY UNITS

Nil

KEY MESSAGES

- The airbrakes are used to control the rate of descent of the glider, typically on approach to land. They are not used to control the airspeed the elevator controls airspeed.
- Extending airbrakes will increase the stall speed of the wing by increasing the wing loading.
- Flaps enable the camber of the wing to change and enhance slow and high-speed flight characteristics. Typically used on landing to allow a slower touch down speed and steeper approach.
- Canopies are expensive and easily damaged parts of the glider.

PILOT GUIDE FOR THIS UNIT

Notes

Locate - Identify - Operate

- All ancillary control must be positively located and identified as the one required prior to use. This eliminates any possibility of error in selection of the wrong control.
- The principle applies to all ancillary controls airbrake, flaps, and undercarriage and in the latter case extends to ensuring that the undercarriage selector is placed in the appropriate position (ie. Down and Locked prior to landing) in accordance with the placards fitted to the glider.
- For standardisation gliders will have the following colours painted on the relevant controls. This is to avoid confusion when flying different types of glider. The standard colour coding are:

CANOPY Normal Release – WHITE.



CANOPY Emergency Release -RED		
TRIM	-	GREEN (lesson carried out in GPC 9)
AIRBRAKES	-	BLUE
TOW RELEAE	-	YELLOW
FLAPS	-	GREY
UNDERCARRIAGE	-	BLACK

NOTES:

- Some manufactures may not conform to colours for Flaps and Undercarriage
- Always identify the control before using.

Airbrakes. (BLUE)



- The primary purpose of the airbrake is to control the angle of descent of the glider on approach to land. It is this control that controls the angle of the glider on approach where the elevator controls the speed.
- The airbrake control colour is always **BLUE** and this control handle should always be identified before using.
- All spoiler and airbrakes have maximum speeds for activation. See Aircraft Flight Manual and placards in cockpit.
- Airbrakes can also be used in other circumstances such as trying to reduce height quickly or to reduce the chances of an overspeed.

Flaps: (GREY)



Why flaps are fitted?

- Flaps enable the camber of the wing to be changed so the wing will be at its optimum for the speed being flown.
- Correct use of flaps will keep the wing operating near its optimum angle of attack and will result in the fuselage meeting the airflow at the angle which causes the least drag.

Flap settings

- The flaps normally found on gliders will allow the trailing edge of the wing to be lowered through typically two stages (pre-set angles). This is **positive** flap.
- The first stage will be about 5 degrees for flight at slow speeds (thermalling) and the second stage will be about 30 degrees for landing.
- On high performance gliders the flaps can also be raised above the neutral (or 0 degree setting) to reduce the camber of the wing. These settings are for flight at high speeds. There are usually 2 or 3 high speed settings available. These flap settings are negative flap.
- The flaps may be linked to the ailerons, so that as flap is raised or lowered both ailerons rise or lower in unison, making sure that as much of the wing as possible has the best camber for the phase of flight.
- The flaps are normally controlled by a single lever in the cockpit which is moved aft to lower them, and forward to raise them.
- Generally, positive flap lowers the stall speed; negative flap raises the stall speed (check your flight manual)
- It is worth noting that lowering ('drooping') the ailerons reduces the roll rate of the glider and thus selecting full landing flap in such gliders may need to wait until after the turn on to final is complete.

Use of flaps on take off

- For take -off, the flaps should be set to give the wing enough camber to produce the maximum amount of lift as early as possible without creating too much drag. This would normally be at the thermalling setting.
- Some gliders may begin the take off with flaps set at zero to ensure adequate aileron control during the ground run, others may use a negative (upward) setting such as -7 degrees. This will raise the ailerons and give the maximum aileron control at low speeds, which may be necessary in light or cross wind conditions to prevent wing dropping during the early part of the ground roll.
- As soon as good aileron and directional control is achieved (before the glider reaches flying speed), the flaps can then be lowered.

If this technique is used it is essential that the Pilot maintains their hand in proximity to the release handle until aileron control is achieved before moving their hand back to the flap handle. Again, the handle must be positively identified.

• As changing the flap setting at this stage of the flight may cause the glider to become airborne suddenly, be prepared for this to prevent the glider getting too high.

Use of flaps in flight



- The large airspeed ranges used by modern gliders means that if flaps are fitted they should be adjusted as the airspeed is changed. This will keep the gliders wing flying at the optimum angle of attack and give it the best camber for the phase of the flight at any one time.
- When a glider is thermalling or flying slowly in rising air the flaps should be lowered to a positive setting (about 5 degrees). Refer to the Aircraft Flight Manual as to which setting to use.
- Zero flap setting (0 degrees) is used to achieve the best glide angle.
- Once the glider accelerates to fly at speeds of over 60 knots then a thinner less cambered wing is an advantage, with less drag as the lift increases with speed. So you can move to negative flap settings.
- The glider must be flown within the speed/flap range or performance will suffer.
- You should keep your hand on the flap lever when in flight smoothly easing the flaps up or down as the airspeed is increased or decreased. Try and avoid jerky flap movements and unnecessary changes of flap.
- When rolling into thermals it may be best to delay application of large positive flap settings until the aircraft is established in the thermal, to maintain aileron control and reduce drag...

Use of flaps during approach and landing

- NOTE: Use of positive flap gives a lower nose attitude for a given speed. It is important to ensure you establish the correct speed on final and verify it on the airspeed indicator.
- For normal landings positive flap should be set to enable lower speed, with airbrake used to control the rate of descent. This will enable a lower approach speed due to the lower stall speed with flaps deployed.
- The landing flap position lowers the flap beyond the point where a useful amount of extra lift is produced to a setting where a large amount of drag is produced. This setting should not be used unless you are on finals and can safely reach the landing area. It is only for short landings over obstacles where a steep descent is required.
- Flap should not be raised once on final as it will cause a loss of lift (and hence, height) and increase the stalling speed.
- After touchdown selecting negative flap on the ground run may give better aileron control, however if it may cause a distraction so often better to give full concentration to the ground roll.

Limiting flap speeds

- The maximum speed permitted will vary according to the flap setting. Exceeding the maximum speed for a given flap setting could cause damage to the aircraft.
- See Aircraft Flight Manual or cockpit placards and the ASI for details.

Summary

- The primary reason for flaps fitted to some gliders is to enable the camber of the wing to be modified so the wing will be operating at its optimum for the speed being flown.
- Flaps on gliders are lowered by a single handle moved aft which lowers them and forward to raise them.
- When the flaps are lowered, they will increase lift but also drag. Normally there are two settings down about 5 degrees for slow speed flight and 10-30 degrees for landing.



- Some gliders, to increase the performance, have flaps can be raised above the neutral setting and may have 2 or 3 settings. This is known as negative flap.
- When flaps are lowered which is positive flap the stall speed will be lower. If the glider has negative flap the stall speed will be higher.
- In some gliders the flaps maybe linked to the ailerons so that when the flaps are lowered the ailerons move in the same direction to provide maximum lift and control along the wing.

Undercarriage: (BLACK)

- Gliders are fitted with retractable undercarriage purely to reduce aerodynamic drag in flight.
- Each glider type will have different mechanism and handle to raise and lower the undercarriage which your instructor will brief you. All systems are manual with no assistance from a power source.
- It is important to identify which direction the handle must be moved in order to raise and lower the undercarriage. Different glider types may move in the opposite direction, which could add embarrassment and cost if you put the undercarriage up when landing.
- Again, it is very important to identify the handle before use to ensure you have the correct handle before moving. The use of the F.U.S.T checks remind you at the release point and before landing when to activate the gear.
- Due to the importance of the gear when landing some gliders have an electrical warning system that either displays a red light or horn and sometimes both. This warning can be activated by the use of the airbrake or another system.
- Your instructor will indicate any potential down-but-unlocked scenarios if this is possible with your aircraft.

Canopy: (White Normal. RED EMERGENCY).

- Your instructor would have indicated the normal and emergency handles for your glider type in your previous flights.
- It's very important in your pre take off checks that all these handles are in the correct locked position as having a canopy open during take- off or flying can be very dangerous.
- It's also important to note the actions required in your glider to jettison the canopy in an emergency.
- When on the ground be careful when opening and closing the canopy in high winds as they can be easily damaged. Again, never leave a canopy open when unattended.

Tow Release: (YELLOW)

- The tow release handle will always be coloured yellow.
- After giving the thumbs up to take off, your hand should be near this release so that you can disconnect quickly in an emergency.

FLIGHT EXERCISES FOR THIS UNIT

Airbrake

• You should be able to practice and "feel" the airbrake before take-off.



- Remember before use identify BLUE Handle.
- You would have observed the use of the airbrake by the instructor when landing on previous flights.
- You would have seen a relatively large change in attitude with full activation of airbrake. If this causes a discomfort, please notify your instructor.
- Your instructor will let you operate the airbrake first at altitude so that you can feel the forces involved and the changes in nose attitude to maintain speed before using on the approach to land.
- Remember it's used to adjust the angle of descent not the speed. The speed is controlled by your elevator.

Flaps

- If your training glider has flaps then your instructor will demonstrate the attitude at various speeds for positive and negative flap.
- Remember to identify the correct control. You will practice and maintain the new attitude and trim. The flap can be used for themalling at slower speeds.
- Your instructor will demonstrate full positive flap and attitude which you will also practice maintaining correct attitude and trim.

Demonstration of Undercarriage:

- You should be aware of the undercarriage movement from previous flights.
- Your instructor will indicate the action required to raise and lower your type of undercarriage. Your instructor will also show you the up and down indicators and any electronic warnings and any potential down-but-unlocked scenarios if this is possible with the aircraft.

THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS

- initially you may have issues identifying the correct lever take your time.
- as you will be looking inside for handles and indications don't forget your lookout!

HOW DO YOU DEMONSTRATE COMPETENCE?

- Knowledge of the Ancillary controls, and how they are activated from the cockpit.
- Ability to use the airbrakes and flaps controls to control the aircraft and the correct use of the undercarriage.

RESOURCES & REFERENCES

• Australian Gliding Knowledge pages 45,48,58-61,89

SELF-CHECK QUESTIONS

 Where would you find the airspeed limitations of the flaps, Airbrake and Undercarriage in your glider.



• Does the Airbrake control the airspeed or angle during an approach to land?