



Operational Safety Bulletin

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Lookout for Glider Pilots

The following will be familiar to most. It is the application that needs improving. This should be an invariable habit for all.

Recommended Procedures

Be conscious of your Lookout responsibility 100% of the time.

Set up your cockpit to maximise your time outside the cockpit. Instrument layout, GPS operation, map handling and etc. should be set up to allow maximum time outside.

HINT! - Put a sticker next to your main vario which says – “LOOKOUT”.

1. Use a scan technique appropriate to what you are doing. Good situation awareness is essential.
CRUISING SCAN – Straight glides.
FULL SCAN – Cruise scan plus appropriate priority to the flight situation, e.g. in circuit or when establishing climb in lift.
TARGETED SCAN – Cruise scan plus targeted priority to the flight manoeuvre before initiating e.g. Pull-up into thermal.
2. Look in particular for turning gliders indicating a gaggle thermalling ahead.
3. Slow down before entering an identified area of lift especially if it already contains gliders.
4. When thermalling at turnpoints and in the circuit, experience will readily dictate where to look for potentially conflicting gliders so here particularly use a priority scan.
5. In particular when pulling into a turn, remember that you have changed the situation significantly so you need to take primary responsibility for remaining clear of other gliders. Particularly scan back along the tack direction when entering a thermal looking for expected and unexpected gliders on that same track.
6. Because gliders around us will sometimes be easy to see and other times will disappear as we look, it is necessary to make a conscious effort to maintain situation awareness – i.e. keep track of the gliders around you and what they are doing.
7. Remember modern gliders in particular have high energy. Speeds are higher than before. Height gain in pull-ups is significant, and rapid.
8. Hazards are greater on cross-country cruise/racing. Stay alert.

9. Increased stress at contest start points, getting low on track, approaching a turn point, navigation checks and etc. force pilots back into the cockpit. Be particularly aware of this and force yourself to lookout!

Physiological Effects

Finally be aware of and allow for the effects age, fatigue, low blood sugar, dehydration and mild anoxia. If you have any of these be sure to concentrate more than ever on technique.

Lookout Processes

1. Process of Lookout

The table below shows the visual target size and time available to avoid a conflict at various target distances. The visual target size is defined as the apparent wingspan of a 15 m glider subtended at 1 metre (i.e. arm's length) at the chosen range.

Actual distance to glider	Apparent 'Arms Length' Target Size	Time to collision at closing speed		
		50 kts	100 kts	200 kts
100 m	30 cm	4 sec	2 sec	1 sec
500 m	6.0 cm	20 sec	10 sec	5 sec
1000 m	3.0 cm	40 sec	20 sec	10 sec
1500 m	1.5 cm	60 sec	30 sec	15 sec

- Image size of a glider (at arm's length as above) at initial detection is rarely much smaller than 1 cm so normal first detection range is about 1500 m. This means that, even at 50 knots, proceeding longer than 60 seconds without a visual scan is equivalent to flying blind!
- Clearly, the high closing speed and small target area of head-to-head conflicts make such conflicts more difficult to see than other conflicts.
- Analysis of glider collisions tells us that one glider would have had a clear view of the other.
- The picture we 'see' in our brain is not updated by any automatic process. It is all too easy to 'look' without 'seeing'. In order to 'see' the small target provided by another aircraft we need to make a conscious effort to 'see' when we look 100% of the time.
- Focus on the horizon and notice some detail.
- Examine each section of the sky with the eye focused on infinity and stationary for a short period of time before moving to the next segment. A moving eye will not see any detail.

2. Priority of Lookout

- Consciously retain good situation awareness by being aware of the likely traffic patterns and any known aircraft in your vicinity. Target the scan to the areas of potential hazard. "Think of the possible even if unlikely."

- Where the traffic pattern is random (lone cross-country or in the terminal area, i.e. local soaring) concentrate the scan on straight ahead and then to about 60° to each side. When flying fast, concentrate more on straight ahead; when flying slower expand the area of concentration. Regularly, but less frequently, do a full scan to the side and as far back as possible, especially where slowing, weaving or to achieve situation awareness when (say) heading off from the top of a thermal or approaching the airfield. However, the highest risk of collision is glider-to-glider, cross-country flying.
- The terminal area (within, say, 5 miles) at a crowded site is a high traffic area with random traffic. This is particularly dangerous airspace and lookout needs to be excellent. High speeds in this area are not appropriate. Flying pre start in a competition is a particularly hazardous situation of this type.
- Gliders on a reciprocal heading are very difficult to see. Avoid such circumstances and where this is not possible take special care. Examples are; in obvious streets and to from an obvious thermal close to a turn point.
- When gliding in a group or on a set task, much of the traffic will be on a similar heading. Head-to-tail conflicts are easily avoided – however this traffic provides an ongoing hazard from gliders doing a pull-up, weaving turning or backtracking.
- Do not fly in another aircraft's blind spot; for example, do not follow another directly astern and higher. A glider doing a pull-up can be in a double blind situation – there is no obvious fix for this so prevention is the only defence.
- When weaving or entering a turn make sure the lookout goes as far back as you can see. The responsibility for clearing the air remains with the turning glider for at least the first full turn. Subsequently the responsibility may be shared with other aircraft. Look over your head to see traffic conflicting with your turn particularly back along the mutual track. If necessary, roll level to allow the conflicting glider to pass in front before re-entering the turn. Following gliders, particular if higher than the leading glider, must be aware of the likelihood of a turn associated with a pull-up and be ready to take appropriate action.
- Be particularly careful when back-tracking (in lift) as this creates a head-to-head conflict.
- Potentially dangerous situations are those where a following glider is a few hundred feet above the leading glider.
- Other areas of potential conflict are obvious traffic patterns, such as at turn points, when final gliding, when approaching the terminal area, and in the circuit. Be aware of these and scan accordingly.

NOTE. For any queries and further details see the GFA Manuals and/or your Instructor.

Lookout Scan

This paper defines the different **SCAN** techniques recommended for use by glider pilots and indicates **WHEN** to use each technique and **WHAT** to do.

Name of Scan	Process
Cruising Scan:	Forward conical scan; 60 degree, left/right. Up and down.
Full Scan:	Complete visible sky scan. Each side, above and below, behind each side round to as far back as possible. Vital for situation awareness.
Targeted Scan:	Used in specific circumstances. Scan concentrates on that part of the sky where the hazard is expected.

When to Use Each Technique

Flight Activity	Scan Required
Cruising: Constant Heading and Constant attitude.	CRUISING SCAN plus regular FULL SCAN
Change Situation: E.g. Approach gaggle, approach aerodrome, final glide, etc.	Ongoing CRUISING SCAN plus regular FULL SCAN plus TARGETED SCAN specific to the situation.
Flight Manoeuvre: E.g. Pull up, turn etc.	Ongoing CRUISING SCAN plus regular FULL SCAN plus TARGETED SCAN specific to the situation.
Joining a Thermal:	TARGETED SCAN then FULL SCAN to search for other gliders, then TARGETED SCAN with periodic FULL SCAN to maintain situational awareness.

NOTE: The frequency of use of FULL SCAN and TARGETED SCAN in each Situation or Manoeuvre will be adjusted by your SITUATION AWARENESS.

Specific Examples

Flight Situation	Specific Requirement
Start point:	Full scan. Up/down. Left/right
Turn point:	Full scan. Up/down, Left/right. Check opposing, crossing tracks. Into and exit from Turn Point.
Approach airfield:	Full scan. Radio alert. Check crossing tracks. Approaches and Departures.
Final glide:	Full scan. Radio alert. Watch for finishing gliders. Circuit traffic.
Circuit:	Targeted scan. Radio alert. Watch for power aircraft. Watch for modified circuits.
Receive nearby radio Call:	Full Scan. Target traffic location.

Flight Manoeuvre	Specific Requirement
Veering:	Prior to veer, scan in direction of veer including behind and up. NB. This is more than clearing the airspace you are about to enter.
Turning:	Prior to turn - scan in direction of turn, behind and up and down. Continue to look through turn. Look for following gliders.
Pull up:	Prior to pull up, look each side, and behind each side and overhead as high as possible
Approach thermal:	Full scan above and below. Look for thermalling gliders and approaching gliders. Look for opposing gliders leaving or traversing the thermal.
Thermalling:	Maintain horizontal and vertical separation. Look for gliders joining.
Leaving thermal:	Full scan. Look down. Commence cruising scan plus full scan process.

LOOKOUT TRAINING NOTES FOR INSTRUCTORS

Purpose

Operations Directive 1/03 introduced changed concepts in the way glider pilots are to conduct lookout procedures, with the intention of improving the overall effectiveness of lookout as the primary defence against collision risk in all flight situations.

These training notes are issued to assist and guide Instructors with the introduction of these procedures in practical flight training exercises.

Lookout procedures relating to “turning” and “pull-ups” have been chosen for these training notes for the following reasons:

1. They embody all of the scan techniques pilots are required to use, for easily identified reasons and at specific times during the manoeuvres.
2. Turns and pull-ups have been assessed as manoeuvres conducted by gliders that have the potential to bring about a conflict with other aircraft and therefore times when “see and avoid” is of paramount importance.
3. Lookout training for turns and pull-ups can (must) be taught at a very early stage of pilot training, thereby emphasising the primacy of “lookout”
4. The principles learned to adopt and maintain a safe lookout procedure during these manoeuvres are easily adapted to other flight situations.

It is worth analysing what lookout needs to achieve and why during these two manoeuvres before detailing the training exercise.

Turns

A turn by definition results in a change of direction, it can be a slight change of heading, a full circle, or anywhere in between. This means that when a turn is initiated the relationship that exists with other aircraft that might be nearby changes, anywhere from slightly to dramatically. If a potential flight path conflict occurs action must be taken to make the situation safe. Seeing other aircraft is the first stage of this “see and avoid” procedure. Therefore, it is vital that the pilot has a lookout procedure that allows him/her to sight other aircraft before and during a turn.

Some examples:

- (a) Two gliders flying at similar heights and speeds on the same heading, separated laterally by a distance of about 1km and with one ahead of the other by a similar distance, are not in any immediate danger of collision. However, if the leading glider turns through 90degrees and assumes a new heading towards the path of the oncoming glider, there is now a very real risk of a collision.
- (b) Whenever a glider pilot finds lift and decides to climb in it by circling, his/her glider becomes effectively a stationary object in the sky and there is a potential for conflict with any other aircraft passing through from any direction. The pilot must have a lookout procedure that ensures his/her decision to stop and thermal does not bring about an unaccounted for conflict with other traffic.

Pull-ups

A “pull-up” in this context is defined as a climb initiated by a pilot to reduce speed quickly by converting speed into a height gain. Unlike most other aircraft, gliders regularly employ this manoeuvre, it has the potential to quickly and dramatically change the relationship that exists between a glider and other aircraft and therefore it is a manoeuvre that requires a lookout procedure specifically designed to take account of these circumstances.

Scan Definitions

The three scan techniques below must be clearly understood by the student, if necessary, an explanation could precede the pre-flight briefings.

CRUISING SCAN – Forward conical scan 60 deg. Left and right; Up and down – This area ahead of the glider is a prime collision risk zone.

FULL SCAN – Complete visible sky scan – A scan of all the airspace visible to the pilot from his/her position and orientation.

TARGETED SCAN – Scan concentrating on a specific area – Scans conducted of specific areas of the sky, at designated times and for specific reasons.

Lookout Training Exercise 1 – Turns

Note: The following exercise should be introduced as soon as the Instructor considers that the student is comfortable enough to conduct the scans and before the student has been introduced to turn training.

With the instructor flying, it is suggested that the glider be flown in straight and level flight for a period of at least 30 seconds before the turn is commenced. The turn should be kept to no more than a moderate angle of bank, to allow the student time to carry out his/her lookout procedure and fully understand when and where to look at each stage of the sequence.

There is normally sufficient time to conduct the training exercise when the glider is allowed to turn through 90 degrees before rolling out onto a new heading, however, if the instructor feels that more time is required then the turn should be extended, as appropriate.

Pre-flight Briefing

A vital component of the exercise is to train the student how to scan the area of the sky that has been hidden from view behind the glider before the turn was commenced. To do so the pilot must look into this area as soon as it becomes visible to him/her. Students will often not look further back than the wing tip. To emphasise the importance of looking back as far as possible, the student should be seated in the glider on the ground with the right wing tip down and the instructor then walk to a position of about 4-5 O'clock and ask the student to look for him/her. It should be emphasised that this is where a threat might first appear and by turning to look back over his/her shoulder as far as is comfortably possible, will ensure that any threat is seen and assessed as soon as possible.

The intended flight exercise should then be explained

Example patter:

On this flight, I am going to take you through the lookout procedures for turns. Before we begin the exercise we will have been flying in straight and level flight for a period of time and will have been conducting an appropriate lookout procedure for that mode of flight – CRUISING SCAN with regular FULL SCANS – any other aircraft in our area and within our field of vision should therefore have been located and we will have decided it is safe to initiate the turn we want to make, however, before we initiate the turn we will conduct another brief FULL SCAN followed by a TARGETED SCAN with our target area being the airspace in the direction we intend to turn

into. If satisfied that it is safe to turn, we will then roll into the turn, as the glider turns we will be aware that airspace that was blind to us, because it had behind us before we commenced the turn, will now be opening-up to our view. It is vital that this airspace be scanned carefully as the area progressively opens to our view – to do so we will conduct several TARGETED SCANS of this airspace until we are completely satisfied that any aircraft in this area will have been sighted, the hazard assessed and with appropriate action taken.

Before rolling out of our turn and assuming a new heading we must conduct another TARGETED SCAN with the target area being the airspace we will be entering. As we assume our new heading we will re-establish our - CRUISING SCAN with regular FULL SCAN - cruising lookout procedure.

If we had stayed in the turn, we would have progressively adopted an appropriate circling scan procedure.

Airborne demonstration

With the glider in straight and level flight and in appropriate circumstances, the exercise and patten could be as follows:

As we talked about before we took-off, I will now take you through the lookout for turns exercise. We have been flying straight and level for a while now and I want make a right (or left) turn and then straighten out on a new heading at a right angle to our present heading. We have been keeping a lookout and I believe that it is safe to turn, but before I do we will now do another brief full scan together, followed by a targeted scan on our right side looking carefully into the area our turn will take us – I am satisfied it is safe to turn, do you agree? (Wait for a response). I am now rolling into a right turn, as the glider turns we must be sure that we are not turning towards someone we have not been able to see – you are now able to see into a piece of the sky that we couldn't see before we turned, because it was behind us – look very carefully into it now, above and below, as well as at our level and repeat the scan as we come around the turn.

Now we are ready to roll out of the turn onto our new heading, do another targeted scan of the area ahead of us that we will be flying into – now that we are out of the turn and flying straight and level again, do a full scan and then we will go back to our cruising lookout.

Lookout Training Exercise 2 – Pull-ups

It is essential that the student appreciates that when a pull-up is conducted there can be a dramatic and rapid change in the relationship that exists with other aircraft, due to the glider moving vertically into new airspace.

With the Instructor flying, it is suggested that the glider be brought to a speed suitable to produce a gentle pull-up that can be sustained for a sufficiently long period of time to complete the following exercise. The speed required will vary depending on the glider type, but might typically be 70-75 Knots. It must of course be within the placarded speed range of the glider.

Whilst it is important that students be introduced to lookout procedures and training as early as possible, some students feel uncomfortable with this manoeuvre and there is little point in attempting to conduct the exercise in these circumstances. However, it should be conducted as soon as practicable after the Instructor has assessed that the student will be comfortable with the manoeuvre.

Pre-flight Briefing

Example patten:

On this flight, I am going to take you through the lookout procedure for pull-ups. Before we begin the exercise we will have been flying in straight and level flight for a period of time and will have been conducting an appropriate lookout procedure for that mode of flight – CRUISING

SCAN with regular FULL SCANS – any other aircraft in our area and within our field of vision should therefore have been located. Provided that we agree it is safe, I will gently lower the nose and let the speed build to about 70-75 knots. We will then decide we want to reduce our speed markedly by pulling-up. Before we initiate the climb we must clear the airspace we will be flying into, to do this we will conduct a TARGETED SCAN of the area above and ahead of the glider. Although it is a TARGETED SCAN it needs to be fairly large in area, as we need to be aware that other aircraft could be entering the area, from any direction. If we are satisfied it is safe, I will initiate the climb, after commencing the climb, we will continue, or regularly repeat, the same TARGETED SCAN while we are climbing in the pull-up. As we level out at the top of the climb, we will conduct a FULL SCAN being very conscience that the manoeuvre we have just performed may not have been anticipated or noticed by other pilots, before re-establishing our - CRUISING SCAN with regular FULL SCAN – cruising lookout procedure.

Airborne demonstration

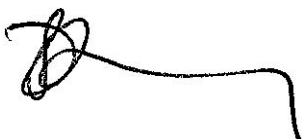
Note: When a pull-up is conducted in straight flight, there are areas particularly behind the glider that cannot be scanned before, during, or after the sequence. There must therefore be some reliance that following aircraft will “see and avoid”, however, an appropriate radio broadcast prior to initiating the climb is recommended to enhance safety.

With the glider in straight and level flight and in appropriate circumstances, the exercise and patten could be as follows:

As we talked about before we took-off, I will now take you through the lookout for pull-ups exercise. We have been maintaining a lookout and I am satisfied that it is safe to increase speed, do you agree? (Wait for a response). Now that we have reached the speed we wanted we are ready for the pull-up – before we begin our climb I want you to conduct a targeted scan with me of the area above us, looking carefully at and around the area ahead and above us that we will be climbing into. When both the Instructor and Student agree it is safe to do so, the instructor initiates a steady, moderate but purposeful climb. Now that we are climbing keep looking out, remember we are going up into new airspace. As I am now levelling out at the top of the climb – we will now conduct a careful full scan, be aware that we have changed our situation and it is possible that other pilots might not have noticed.

Conclusion

The above exercises should be repeated several times until the student fully understands how to conduct these lookout procedures. As they will be introduced at an early stage of pilot training, it is not expected that students will perform the lookout procedures with full competency, however, instructors must continue to monitor the student’s lookout procedures and prompt when required to ensure that the competency level improves as their training progresses.



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