The Gliding Federation of Australia Inc. trading as Gliding Australia

AEROTOWING MANUAL

Revision 5

June 2023

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All references to Gliding Australia in this document means the Gliding Federation of Australia Incorporated

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FOREWORD

Gliding in Australia is subject to the Civil Aviation Act 1988, Civil Aviation Regulations 1988, Civil Aviation Safety Regulations 1998 and other relevant Legislation as amended from time to time. Certain exemptions from the provisions of the Civil Aviation Regulations 1988 have been granted to members of The Gliding Federation of Australia Inc (GFA) by way of Civil Aviation Orders 95.4 and 95.4.1. Where exemptions exist, the practices adopted by GFA are outlined in GFA Operational Regulations approved by CASA.

This Aerotowing Manual is the reference document for the assessment of competency of glider tow pilots and the issuing of Glider Towing Endorsements by GFA to the holders of a CASA issued Part 61 flight crew licence, or for the issue of an RAAus glider towing endorsement, or for the issue of a GFA Self-launching Sailplane Pilot Endorsement.

Users of this manual should also refer to Section 18 of the of the GFA Manual of Standard Procedures, Part 2; and in particular, paragraphs 8.1.8, 16.2, 18.2.3, 18.4, 18.5 and 18.8.

This Aerotowing Manual is endorsed by RAAus Ltd. as the definitive document for the assessment of a RAAus pilot certificate holder for the purpose of issuing of a GFA endorsed, RAAus glider towing endorsement.

Where there is a discrepancy between the Civil Aviation Legislation, the GFA Operational Regulations and this manual, the Civil Aviation Legislation will take precedence. Where there is a discrepancy between the GFA Operational Regulations and this manual and the RAAus operational standards that relate to the aerotowing of gliders operated under the GFA, the GFA Operational Regulations and this manual will take precedence.

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Précis of changes	Replaced reference CAAP 92-1 with Advisory Circular (AC) 91-2. Replaced reference CAAP 234-1 with Advisory Circular (AC) 91-15. Replaced reference to repealed Regulation CAR 92 with CASR 91.410. Replaced references to repealed Regulation CAR 166A with CASRs 91.385 and 91.390. Included reference to CAO 95.4. Updated guidance at Section 10.1.10 – Take-off technique.		
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GFA Aerotowing Manual</td><td colspan="2">Tracking Details (Office use only)</td></tr>
<tr><td>Number:</td><td>Date Received:</td></tr>
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DEFINITIONS

Definitions of words, phrases and acronyms used in the Aerotowing Manual, in alphabetical order.

Aerodrome	An area of land or water (including any buildings, installations and equipment), the use of which as an aerodrome is authorised under the regulations, being such an area intended for use wholly or partly for the arrival, departure or movement of aircraft.
Aerodrome Operator	In the case of a certified aerodrome, the person who holds the aerodrome certificate for the aerodrome. In the case of an uncertified aerodrome, the person who is responsible for the operation and maintenance of the aerodrome.
Aircraft Flight Manual (AFM)	The Aircraft Flight Manual is a book containing the information and instructions required to operate the aircraft safely. The pilot must comply with this AFM information.
Aircraft design feature	Means a design feature for which the pilot must hold an endorsement. These include: Tailwheel undercarriage; Retractable undercarriage; Manual propeller pitch control (piston engine); Gas turbine engine; Multi-engine centre-line thrust; Pressurisation system; Floatplane; Floating hull; and Ski landing gear.
Airmanship	Airmanship is the consistent use of good judgment and well-developed skills to accomplish flight objectives. This consistency is founded on a cornerstone of uncompromising flight discipline and is developed through systematic skill acquisition and proficiency. A high state of situational awareness completes the airmanship picture and is obtained through knowledge of one's self, aircraft, environment, team and risk.[1]
AGL	Above ground level.
Altitude	A height above mean sea level, which is shown by an altimeter set to QNH or Area QNH.
AMSL	Above mean sea level.
Area QNH	A pressure setting which represents the average QNH over a given area for a specified period.
Area VHF frequency	The VHF radio frequency used by Air Traffic Services in a certain area, on which radio-equipped aircraft communicate.
CAO	Civil Aviation Order.
CAR	Civil Aviation Regulations 1988.
CASA	Civil Aviation Safety Authority.
CASR	Civil Aviation Safety Regulations 1998.
Certificate	Means a pilot certificate, granted by a recreational aviation administration organisation that administers the activities permitted by the certificate.
Certified Aerodrome	An aerodrome in respect of which an aerodrome certificate is in force.
Circuit area	The area used by an aircraft for manoeuvring between arriving overhead an aerodrome and landing there. Usually, a 3NM radius below 1500ft AGL above aerodrome elevation.

[1] Redefining Airmanship. Tony Kern. 1996.

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Controlled Airspace	Airspace of specified lateral and vertical dimensions within which operations must be conducted in accordance with procedures and requirements specified by the CASA.
Dwelling	A building designed for human habitation.
EM/O	GFA Executive Manager, Operations.
GA	General Aviation
GFA Operations Manual	The GFA Operations Manual comprises the Operational Regulations, the Manual of Standard Procedures - Part 2 (Operations), and CAOs 95.4 & 95.4.1.
Glider	Means a non-power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces remaining fixed under given conditions of flight. The term Glider is interchangeable with Sailplane.
Glider Towing Certificate	A Certificate issued by the GFA to each Tow Pilot recording towing endorsements, privileges and conditions.
Glider Towing Endorsement	An endorsement permitting the holder to aerotow sailplanes. This is by logbook endorsement issued by a Tow Pilot Examiner.
High tow	A position just above the slipstream of a tow plane.
Licence	Means a flight crew licence granted by CASA under CASR 61.B.
Low tow	A position just below the slipstream of a tow plane.
Maintenance Release	The maintenance release records the current legal airworthiness status of the aircraft. All flying times, daily inspections and maintenance defects must be recorded on the maintenance release, so that the next person who intends to fly the aircraft can be aware of any problems and see if there is enough time left on the release for the intended flight.
MOSP	The Manual of Standard Procedures issued by the GFA. This is a five-part document covering Administration (Part 1), Operations (Part 2), Airworthiness (Part 3), Sports (Part 4); and Development (Part 5).
Multiple Gliders	For the purposes of aerotowing, towing multiple gliders is given to mean towing no more than two gliders behind the tow aircraft at the same time.
PIC	Pilot In Command
POH	Pilot Operating Handbook.
Powered sailplane	Means an aircraft, equipped with one or more engines having, with engine(s) inoperative, the characteristics of a sailplane.
RAAus	Recreational Aviation Australia Ltd.
RM/O	GFA Regional Manager, Operations
Sailplane	Means a heavier-than-air aircraft that is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine. The term Sailplane is interchangeable with Glider.
TCDS	Type Certificate Data Sheets. These are a part of the Type Certification Process and contain information relevant to the certification of particular aircraft.
TEM	Threat and Error Management. The process of detecting and responding to threats and errors to ensure that the ensuing outcome is

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	inconsequential, i.e. the outcome is not an error, further error or undesired state.
Touring Motor Glider	Means a specific class of powered sailplane having an integrally mounted, non-retractable engine and a non-retractable propeller. It shall be capable of taking off and climbing under its own power according to its flight manual.
Tow Pilot	A person who is the holder of a CASA issued Part 61 Flight Crew Licence or a RAAus issued pilot certificate, or a GFA issued Self-launching Sailplane Pilot Endorsement who has been assessed as competent to act as pilot in command of the relevant aircraft type/s while towing a GFA registered glider.
Tow Pilot Delegate	A person appointed by the EM/O to assess a GFA tow pilot for the purposes of appointing a tow pilot as a Tow Pilot Examiner.
Tow Pilot Examiner	A person holding a tow pilot examiner endorsement issued by the GFA to assess a pilot for the purposes of issuing a GFA approval to aerotow a glider.
Visual Flight Rules (VFR)	The flight rules under which sailplanes are operated (see Operational Regulation 9.3).
VHF	Very High Frequency (radio) frequencies are in the range of 30-300MHz, with the aeronautical range being 118-137MHz.

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1 PHILOSOPHICAL APPROACH TO TOWING GLIDERS

The principal task of the tow pilot is to launch gliders as safely and efficiently as possible. The reason it is mentioned here is that tow pilots sometimes acquire a belief that the glider is almost secondary to the business of flying a tow aircraft. Thus we get problems like towing too far away from the airfield, towing downwind, towing into the sun for long periods, rough handling, excessively steep turning, "cowboy" descent patterns, etc. Tow pilots are often the “public face” of a gliding club and the GFA in the aviation community. At a busy airfield they will conduct many more take-offs and landings than the average general aviation or recreational power pilot. Their skills, and vicariously those of the GFA are always on display. Tow pilots may sometimes need reminding that if they do not adhere to legal requirements and/or the operating procedures set by the club, they may be shown the door. Having said that, they are a vital part of the club’s operations and should be treated with respect and not as robots on the front of the rope. They do require rest and refreshment, particularly on hot and busy days.

1.1. Desirable Experience

Most tow planes are tailwheel aircraft and it is becoming increasingly difficult to obtain training on this type of aircraft in the mainstream flying schools where almost all school aircraft are tricycle designs. A small number of flying schools specialise in tailwheel endorsements, often together with aerobatics. Alternatively, new pilots considering glider-towing may decide to join Recreational Aviation Australia (RAAus) and do some flying at one of their schools in one of the more demanding tailwheel machines, as these are likely to have flying characteristics (but not the mass) closer to the type of aircraft they will be using to tow gliders.

Experience has shown that the best tow pilots are light aircraft pilots with a strong General Aviation background in aircraft which are quite demanding to fly, such as Austers, Cessna 180s, Vans RV types and the RAAus aircraft mentioned earlier. Pilots experienced on such aircraft tend to have good "hands on" skills and their lookout is usually of a good standard for gliding clubs to rely on.

Another reason to insist on a sound background in a relevant aircraft type is that a tow pilot has to put up with a pressure to fly which was not present before. For example, if conditions get a bit tricky (e.g. strong wind or thermal activity), the glider pilots may be quite happy to keep flying but the tow pilot may never have flown in such conditions before. With glider pilots keen to take advantage of weather conditions, it is much more difficult to decide to stop flying than it was before. Tow Pilot Examiners must not issue endorsements to pilots who lack the experience and/or competence to handle such conditions, and recommend they consolidate their skills with a flying school.

It is worth remembering that the kind of turbulent conditions that upset some power-pilots are the very conditions sought by glider pilots, and a tow pilot will be going up and down all day in these conditions rather than climbing to cruise in the smooth air on top of the turbulent layer.

Finally, Tow Pilot Examiners and gliding clubs should beware of pilots who have learned to fly on tricycle-gear aircraft, then do a minimal conversion to an easy-to-fly tailwheel aircraft like a Citabria and appear at a gliding club wanting to start a towing conversion. If such pilots have a strong gliding background, they are usually not a problem as gliders need good hands-on skill to operate safely and most of them being of tailwheel design. If they have no gliding background and only a minimal tailwheel conversion, they need to be supervised. Although everybody has to start somewhere and some pilots do adapt very well, others never really cope and either need extra work back at the flying school or decide that aerotowing is not for them.

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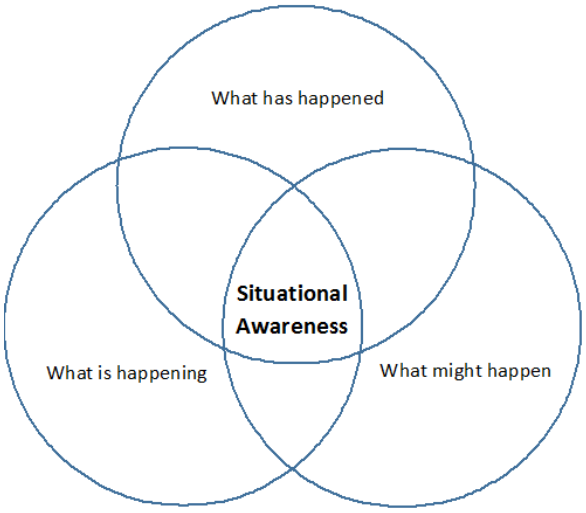
1.2. Assessment of a Candidate's Suitability

Keeping in mind the desirable background outlined above, the Tow Pilot Examiner's task is to make an assessment of the pilot's suitability for the glider towing task. Their job in most cases will be simply to make an assessment of whether the person really has the background and aptitude to tow gliders, and whether further aviation experience is required.

Unfortunately, a common complaint made by Tow Pilot Examiners is that pilots fresh from flying training are often good on procedures and use of radio, but not so good in practical flying ability and airmanship; specifically situational awareness and threat & error management.

Situational awareness is having an accurate understanding of what is happening around you and what is likely to happen in the near future. Situational awareness includes three processes: The perception of what is happening, the understanding of what has been perceived, and the use of what is understood to think ahead. In simple terms, situational Awareness means paying attention to your surroundings. Good situational awareness means analysing the past (what has happened) and the present (what is happening) to help prepare for the future (what will happen).



Situational Awareness, adapted from the book Redefining Airmanship by Tony Kern. Published 1997 by McGraw Hill

Threat and Error Management (TEM) is defined as the process of detecting and responding to threats and errors to ensure that the ensuing outcome is inconsequential. It assumes that pilots will naturally make mistakes and encounter risky situations during flight operations. Rather than try to avoid these threats and errors, its primary focus is on teaching pilots to manage these issues so they do not impair safety. This is expanded upon in Section 13 of this manual.

Under the pressure of having a glider on the back and coping with having to think for two aircraft instead of one, operating in close proximity to other aircraft and in weather conditions that are advantageous to gliding operations, a marginal pilot's airmanship may fall to an unsafe level. It is hard to imagine a more hazardous situation than the PIC of a tow plane/glider combination who is too stressed to look out, experiences a loss of situational awareness and fails to monitor threats or correct errors. Tow aircraft climb and descend through a very busy part of the sky many times in a day and the pilot's airmanship must be of the highest standard.

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Light aircraft engines spend most of their lives at a constant power setting and at a constant cruising speed. In this environment correct engine-handling is important and pilots must be familiar with the engine handling notes for the particular aircraft being flown. Liquid-cooled engines are less demanding than air-cooled engines as the pilot usually only needs to monitor the fluid temperatures.

However, the demands of glider towing are quite different and very demanding on an air-cooled engine. The cycle of high power, low airspeed, followed by lower power, higher airspeed, results in a "thermal gradient" from front to rear of the engine. This is worsened if a pilot allows a very rapid speed build-up and/or closes the throttle too quickly after the glider has released or aggressively sideslips the aircraft, adding the problem of "thermal shock" to the gradient problem already present.

Any pilot who shows signs of rough handling of the throttle, and is not amenable to this characteristic being corrected, will not make a good tow pilot and is likely to cost the club dearly if allowed to escape onto the tow pilot roster. Gliding clubs should consider carefully whether they want such pilots to be in charge of a major asset before they roster them for duty without re-training.

1.3. Application of the Procedures in this Manual

If the pilot meets the minimum prerequisite qualifications and experience to undertake training as a tow pilot, the procedures outlined in this manual may be applied.

1.4. The Relationship of Gliding Experience to Successful Glider Towing

Experience has determined that the best tow pilots are also glider pilots. Glider pilots are skilled at "reading" the sky. They are aware of areas of lift and sink and know how to seek out or avoid such areas. This skill is an essential quality in a tow pilot, as maximum use of lift during the climb and managing to find areas of sink on the descent can greatly reduce the time taken for each tow. This maximises efficiency and reduces costs, but must never be at the expense of safety or airmanship, especially lookout.

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2 GENERAL REQUIREMENTS

2.1. Aerotowing - General

2.1.1. The aerotowing of gliders is only permitted by pilots whose competence for the task has been assessed by a GFA authorised person and who holds a GFA issued Glider Towing endorsement together with a valid Glider Towing Certificate (refer paragraph 2.4).

2.1.2. The holder of a Student Pilot Licence/Certificate cannot be issued with an endorsement to tow gliders.

2.1.3. When the eligibility requirements at paragraph 3.2 are satisfied, the candidate may commence glider-towing training with a Tow Pilot Examiner.

2.1.4. The applicant must demonstrate competency to the Tow Pilot Examiner and a Glider Towing endorsement will be issued if the Tow Pilot Examiner is satisfied the pilot is competent.

2.1.5. A Glider Towing endorsement authorises a pilot to tow one glider at a time from marked aerodromes and/or established GFA-approved gliding sites only, unless further privileges are endorsed in the pilot's logbook and recorded on the Glider Towing Certificate.

2.1.6. The privileges, limitations and revalidation requirements of a GFA Glider Towing endorsement are detailed in this manual.

2.2. Gliding Experience

2.2.1. Gliding experience is not mandatory but highly desirable.

2.2.2. It is preferred the candidate is a current glider pilot in an aerotow environment trained to 'A' Certificate standard.

2.2.3. A candidate with no previous gliding experience must experience the various emergency signals given by the tug pilot, from the glider to ensure familiarity.

2.2.4. Clubs may impose additional requirements as appropriate to their circumstances.

2.3. Membership of the Gliding Federation of Australia

2.3.1. A tow pilot must be a current member of the GFA in order to exercise the privileges of a Gliding Federation of Australia Glider Towing Endorsement.

2.4. Glider Towing Certificate

2.4.1. Tow Pilots will be issued with a Glider Towing Certificate detailing towing endorsements held (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

2.4.2. Glider Towing Certificates will have the expiry date of the holder's GFA membership recorded thereon.

2.4.3. Tow pilots must hold a valid Glider Towing Certificate in order to exercise the privileges of their endorsements.

2.4.4. A Tow Pilot Certificate will lapse when the holder ceases to be a member of the GFA (refer paragraph 2.3.1).

2.4.5. The endorsements on a lapsed Tow Pilot Certificate may only be exercised if the holder:

(a) meets the membership requirements at paragraph 2.3.1; and

(b) has successfully completed a competency assessment with a Tow Pilot Examiner (refer section 8) who is to certify the successful completion of the check in the holder's logbook: **"This is to certify that [name of pilot] has**

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satisfied the competency requirements to continue to exercise the privileges of their glider towing endorsement(s)"; and

(c) has been issued with a valid Glider Towing Certificate.

2.5. CASA Exemptions from Aviation Legislation

2.5.1. Subject to paragraph 2.5.4 a person who would, but for this paragraph, have an obligation under regulation 91.210 of CASR in relation to a relevant towing aircraft (which makes it an offence if a thing is towed by the aircraft without certain authorisations) is exempt from compliance with that regulation to the extent that:

(a) if the aircraft is an aeroplane — the thing being towed is a sailplane; or

(b) if the aircraft is a powered sailplane — the thing being towed is a sailplane or a hang glider.

2.5.2. Subject to paragraph 2.5.4 a person who would, but for this paragraph, have an obligation under regulation 91.267 of CASR in relation to a relevant towing aircraft that is an aeroplane towing a relevant sailplane (which prescribes minimum height rules other than in populous areas and public gatherings) is exempt from compliance with that regulation.

2.5.3. Subject to paragraph 2.5.4, a person who would, but for this paragraph, have an obligation under regulation 91.390 of CASR in relation to a relevant towing aircraft that is towing a relevant sailplane (which prescribes requirements for maintaining the same track after take-offs from non-controlled aerodromes) is exempt from compliance with that regulation.

2.5.4. The exemption of a person under paragraphs 2.5.1 to 2.5.3 is conditional on the person complying with the conditions in CAO 94.4 to the extent to which they are applicable.

NOTE: These exemptions only apply while the tow plane is towing a relevant sailplane. Once the sailplane has released from tow, the tow plot must comply with the relevant Regulations.

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3 OBTAINING A GLIDER TOWING ENDORSEMENT

3.1. Flight activity endorsements

- Endorsement - Glider towing flight activity endorsement.
- Activities authorised - Tow a glider with an approved aeroplane or powered sailplane.

3.2. Eligibility requirements

3.2.1. To be eligible for a GFA glider towing endorsement a person shall:

(a) be licenced or certificated to fly the class and design features of aircraft being used for aerotowing gliders and comply with the conditions of their licence or certificate; and
(b) have logged a minimum of 100 hours aeronautical experience, of which at least 40 hours shall be on Australian or Overseas or RAAus registered fixed-wing powered aircraft including touring motor glider types. Of the remaining experience, sailplane, powered sailplane, fixed-wing military powered aircraft and high performance 3-axis control ultralight aircraft flying time may be counted in full toward the total aeronautical experience; and
(c) have satisfactorily completed a course in towing gliders conducted by a Tow Pilot Examiner; and
(d) have demonstrated competence in the towing of gliders to a Tow Pilot Examiner; and
(e) be a current member of the GFA.

3.2.2. The holder of a current glider towing authority issued by an ICAO Contracting State is deemed to have met the requirements of paragraph 3.2.1(c).

3.3. Issue

3.3.1. When a pilot has met the eligibility requirements the Tow Pilot Examiner will complete the 'Application for Initial Glider-Towing Endorsement' at APPENDIX 1 – APPLICATION FOR INITIAL GLIDER-TOWING ENDORSEMENT, sign it and then send a scanned copy to the EM/O (returns@glidingaustralia.org) for filing with the pilot's GFA records.

3.3.2. The Tow Pilot Examiner will issue the glider tow endorsement by entering the following notation in the pilot's logbook: "This is to certify that [name of pilot] has satisfied the competency requirements for the issue of a glider towing endorsement".

3.3.3. The Tow Pilot Examiner will notate on the endorsement their Full Name in Capital Letters, their GFA Membership Number, Signature and Date.

3.3.4. Pilots will then be issued with a Glider Towing Certificate endorsed with the Glider Towing endorsement (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

3.4. Privileges and limitations

3.4.1. A current glider towing endorsement authorises the holder to act as PIC of an aircraft on glider towing operations subject to the privileges and limitations of their pilot licence or certificate and in such a way as not to endanger persons or property on the ground or any other traffic.

3.4.2. A tow aircraft should not be flown within 100 metres horizontally or 200 feet vertically of another aircraft, except in the case of establishing such separation from a glider or gliders released by that tow aircraft.

3.4.3. The holder of a Glider Towing endorsement may tow a single glider in operations from a Certified or Military Aerodrome, or from an established and suitably marked gliding site approved by the GFA, or is suitable for the landing and taking-off of aircraft (refer to AC 91-02).

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3.4.4. Cross-country glider tows from and to such aerodromes or sites described at 3.4.3 are only permitted by a pilot holding a licence or certificate endorsed for cross-country flight.

3.4.5. Dual towing, outlanding retrieves and competition towing are not permitted unless the holder is endorsed for these activities (refer Paragraph 4).

3.4.6. The holder of a Glider Towing Endorsement may drop a rope and fittings used for towing a glider:

(a) to ensure the safety of the aircraft as far as practicable; and

(b) to minimise hazard to persons, animals or property.

3.5. Tow Pilot Currency requirements

3.5.1. The holder of a Glider Towing Endorsement must not exercise the privileges of the endorsement unless they hold a valid Glider Towing Certificate (refer paragraph 2.4.3) and:

(a) within the previous 12 months, the holder has performed at least 6 glider tows; or

(b) a Tow Pilot Examiner conducts a competency assessment (refer section 8) and certifies the successful completion of the check in the holder's logbook: **"This is to certify that [name of pilot] has satisfied the competency requirements to continue to exercise the privileges of their glider towing endorsement(s)"**.

3.6. Tow Pilot Training and Assessments

3.6.1. Pilots should be trained and assessed in a dual-place tow plane.

3.6.2. Where a dual-place tow plane is not available at a location reasonably convenient to the trainee and examiner or cannot be made available within a reasonable timeframe, training in single-place tow plane may be carried out in accordance with the requirements outlined in APPENDIX 7 – INITIAL TRAINING USING A SINGLE-PLACE TOW PLANE. [**Note**: these requirements are in addition to the Elements of Competency described in Appendix 1.]

3.6.3. Prior to commencing training in a single-place tow plane, the Tow Pilot Examiner must hold an approval from the EM/O in the form at APPENDIX 8 - APPLICATION FOR SINGLE PLACE AIRCRAFT TOW PILOT TRAINING APPROVAL.

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4 ADDITIONAL ENDORSEMENTS

4.1. Dual Towing Endorsement

4.1.1. The holder of a Glider Towing endorsement that includes 'Dual Towing' may tow two gliders simultaneously in accordance with the procedures laid down in this manual and the performance limitations detailed in the AFM or POH and associated performance charts.

4.1.2. The Tow Pilot Examiner will complete the form at APPENDIX 2 - APPLICATION FOR DUAL TOWING ENDORSEMENT, sign it and then send a scanned copy to the EM/O (mailto:returns@glidingaustralia.org) for filing with the pilot's records.

4.1.3. Authorisation will be notified by logbook endorsement: "This is to certify that [name of pilot] has satisfied the competency requirements to conduct dual glider towing operations".

4.1.4. The Tow Pilot Examiner will notate the endorsement with their Full Name in Capital Letters, GFA Membership Number, Signature and Date.

4.1.5. Pilots will then be issued with a Glider Towing Certificate endorsed with the Dual Towing endorsement (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

4.2. Outlanding Retrieve Endorsement

4.2.1. The holder of a Glider Towing endorsement that includes outlanding retrieve may tow a glider from unmarked paddocks and is authorised to land in such paddocks solely for the purpose of launching a glider, subject to the approval of the land-owner and the requirements of CASR 91.410 and AC 91-02.

4.2.2. The Tow Pilot Examiner will complete the form at APPENDIX 3 - APPLICATION FOR OUTLANDING RETRIEVE ENDORSEMENT, sign it and then send a scanned copy to the EM/O (returns@glidingaustralia.org) for filing with the pilot's records.

4.2.3. Authorisation will be notified by logbook endorsement: **"This is to certify that [name of pilot] has satisfied the competency requirements to conduct outlanding retrieves".**

4.2.4. The Tow Pilot Examiner will notate the endorsement with their Full Name in Capital Letters, GFA Membership Number, Signature and Date.

4.2.5. Pilots will then be issued with a Glider Towing Certificate endorsed with the Outlanding Retrieve endorsement (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

4.3. Competition Towing Endorsement

4.3.1. The holder of a Glider Towing endorsement that includes Competition Towing may tow gliders at a GFA approved gliding competition.

4.3.2. The Tow Pilot Examiner will complete the form at APPENDIX 4 - APPLICATION FOR COMPETITION ENDORSEMENT, sign it and then send a scanned copy to the EM/O (returns@glidingaustralia.org) for filing with the pilot's records.

4.3.3. Authorisation will be notified by logbook endorsement: **"This is to certify that [name of pilot] has satisfied the competency requirements to tow gliders at glider competition"**.

4.3.4. The Tow Pilot Examiner will notate the endorsement with their Full Name in Capital Letters, GFA Membership Number, Signature and Date.

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4.3.5. Pilots will then be issued with a Glider Towing Certificate endorsed with the Competition Towing endorsement (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

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5 APPOINTMENT OF CLUB AND COMPETITION TUGMASTERS

5.1. Club Tugmaster

5.1.1. The Club Tugmaster will be an active and current tow pilot but need not be a Tow Pilot Examiner or a Tow Pilot Delegate.

5.1.2. The Tugmaster is responsible for ensuring that the gliding club's towing operations are performed and administered safely and in accordance with all applicable Civil Aviation Legislation, AC 91-02, the GFA MOSP and the GFA Aerotowing Manual.

5.1.3. The quality of the Tugmaster is critical to the safety of the Club's flying operations. The position requires aeronautical knowledge and experience, and the more sophisticated the operation the more sophisticated the expected knowledge baseline should be. Leadership, good communication skills and credibility are also vital.

5.1.4. The Club Tugmaster is appointed by the Club Committee in consultation with the Club's Operations Panel.

5.1.5. The Club Tugmaster will set minimum towing standards relevant to local airfield and airspace requirements, supervise towing operations, ensure that records are kept, and manage the tow pilot group. He/she will work closely with the Club CFI and should ideally have a seat on, or access to, the club's training and/or operations panels. Advice for Tugmasters is readily available from the GFA or a Tow Pilot Examiner. The Tugmaster is responsible for:

- Maintaining a roster of club tow pilots;
- Monitoring local operational procedures and tug pilot flying standards;
- Review of club tug pilots for currency, competence, critiquing of flying habits, and recommending remedial or additional training;
- Identifying tug pilots as candidates suitable for training & endorsement as dual towing, competition towing, and tow pilot examiner;
- Managing future tow pilot requirements;
- Reporting to the club CFI and Operations Panel on matters of aero towing;
- Keeping records of tow pilot flight review and medical expiry dates;
- Liaison between tow pilots and the club committee;
- Disseminating operational information; and
- Managing the airworthiness compliance and maintenance of the club's tug.

5.2. Competition Tugmaster

5.2.1. A Competition Tugmaster must be an experienced and current tow pilot. They are appointed to manage and supervise the towing operations at a gliding competition and ideally the nominee will have been mentored in the role of competition Tugmaster by an experienced colleague prior to being nominated or selected for the role.

5.2.2. The appointment of a Competition Tugmaster must be endorsed by the responsible RM/O and approved by a GFA appointed Tow Pilot Delegate.

5.2.3. The Competition Tugmaster must be in current practice as a tow pilot and hold a Competition Towing Endorsement.

5.2.4. The Competition Tugmaster is responsible for ensuring that competition towing operations are performed and administered safely and in accordance with all applicable Civil Aviation Legislation, AC 91-10, AC 91-02, the GFA MOSP and the GFA Aerotowing Manual.

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5.2.5. The Competition Tugmaster in consultation with the Competition Safety Officer will develop “competition specific” tug pilot guidance material on such elements as local airfield and airspace requirements, towing patterns, airfield movement areas such as take-off and landing, launch heights, fuel requirements and refuelling, fatigue management, aircraft parking and maintenance in the event of a tug unserviceability, and record keeping. Advice for Competition Tugmasters is readily available from the GFA or a GFA appointed Tow Pilot Examiner. The Tugmaster is responsible to the Competition Director for:

- Liaising with local airfield owners, commercial operators, clubs and pilots;
- Selecting and engaging competition tow pilots having regard to currency, competence on tow aircraft type,
- Monitoring competition and operational procedures and tug pilot flying standards;
- Critiquing of competition towing/flying habits, and recommending remedial or additional training to the pilot’s club Tugmaster;
- Fuel availability for the competition and safe ferrying of tow aircraft;
- Reporting to the Competition Director, Safety Officer and Committee on matters relating to towing;
- Keeping competition records with regards to tow pilot AFR, towing currency and medical expiry dates;
- Liaison between tow pilots and the Competition Director, Safety Officer and / Committee;
- Disseminating operational information; and
- Have regard to the airworthiness compliance, maintenance and insurance of competition tow aircraft.

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6 OBTAINING A TOW PILOT EXAMINER ENDORSEMENT

6.1. Training endorsements

- Activities authorised - Conduct training assessment for the issue of a glider towing flight activity endorsement.
- Requirements – Tow Pilot endorsement. Meet GFA Currency requirements as a glider tow pilot (refer paragraph 3.5). May only issue additional endorsements which they themselves hold.

6.2. Eligibility requirements

6.2.1. To be eligible for a Tow Pilot Examiner endorsement a person shall:

(a) be licenced or certificated to fly the class and design features of aircraft being used for aerotowing gliders and comply with the conditions of their licence or certificate; and

(b) have logged a minimum of 175 hours aeronautical experience, of which at least 100 hours shall be on Australian or Overseas or RAAus registered fixed-wing powered aircraft including touring motor glider types. Of the remaining experience, sailplane, powered sailplane, fixed-wing military powered aircraft and high performance 3-axis control ultralight aircraft flying time may be counted in full toward the total aeronautical experience; and

(c) have a minimum of 50 hours experience towing sailplanes in Australia; and

(d) be a current member of the GFA and an affiliated aerotow club; and

(e) be supported in an application to the EM/O by the relevant Club Tugmaster and CFI on Club letterhead.

6.2.2. When the conditions at 6.2.1 are satisfied, a GFA Tow Pilot Delegate will be assigned by the EM/O to train and assess the applicant.

6.2.3. A Tow Pilot Examiner must be endorsed for Dual Towing and/or Outlanding Retrieves and/or Competition Towing and have held such endorsements for not less than 12 months, in order to train and assess competency for the issuing of these endorsements.

6.3. Issue

6.3.1. When a pilot has met the competency standard, the GFA Tow Pilot Delegate will complete the form at APPENDIX 5 - APPLICATION FOR TOW PILOT EXAMINER ENDORSEMENT, sign it and then send a scanned copy to the EM/O (returns@glidingaustralia.org) for filing with the pilot's records.

6.3.2. The GFA Tow Pilot Delegate will issue the glider Tow Pilot Examiner Endorsement by entering the following notation in the pilot's logbook: **"This is to certify that [name of pilot] has satisfied the competency requirements for the training and examining of pilots for the purpose of issuing of a glider towing endorsement"**

6.3.3. The assigned GFA Tow Pilot Delegate will notate on the endorsement their Full Name in Capital Letters, GFA Membership Number, Signature and Date.

6.3.4. Appointment will be signified by the issue of a Glider Towing Certificate endorsed with 'GFA Tow Pilot Examiner (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

6.4. Privileges and limitations

6.4.1. The holder of a tow pilot examiner endorsement can conduct the training and assessment of tow pilots in accordance with this manual;

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6.4.2. The holder of a tow pilot examiner endorsement can conduct revalidation training and assessments of any tow pilot who fails to meet the specified recency requirement as outlined in paragraph 3.5.1.

6.4.3. The holder of a tow pilot examiner endorsement may conduct assessments and provide endorsements for Dual Towing and/or Outlanding Retrieves and/or Competition Towing if they have held such endorsements for not less than 12 months.

6.5. Tow Pilot Examiner Currency requirements

6.5.1. The holder of a tow pilot examiner endorsement must not exercise the privileges of the endorsement unless they hold a valid Glider Towing Certificate (refer paragraph 2.4.3) and:

(a) within the previous 12 months, the holder has performed at least 6 glider tows; or

(b) a Tow Pilot Delegate conducts a competency assessment (refer section 8) and enters the following endorsement in the tow pilot examiner's pilot logbook: **"This is to certify that [name of pilot] has satisfied the competency requirements to continue to exercise the privileges of a Tow Pilot Examiner and their glider towing endorsement(s)".**

6.6. Tow Pilot Examiner Revalidation requirements

6.6.1. A tow pilot examiner endorsement will be automatically revalidated every two years for eligible persons.

6.6.2. To be eligible for automatic revalidation a tow pilot examiner must have exercised the privileges of the endorsement within two years of initial issue or subsequent revalidation.

6.6.3. A tow pilot examiner endorsement will lapse if the holder has not exercised the privileges of the endorsement within two years of initial issue or subsequent revalidation.

6.6.4. Revalidation of a lapsed tow pilot examiner endorsement may only be undertaken by a Tow Pilot Delegate assigned by the EM/O. Reissue of the endorsement will be in accordance with paragraph 6.5.1(b) above.

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7 APPOINTMENT OF A GFA TOW PILOT DELEGATE

7.1. Training of Examiner Endorsement

- Endorsement – GFA Tow Pilot Delegate
- Activities authorised - Conduct training and assessment for the Tow Pilot Examiner endorsement.
- Requirements - Tow Pilot Examiner endorsement. Meet GFA Currency requirements as a glider tow pilot (refer paragraph 3.5).

7.2. Eligibility requirements

7.2.1. To be eligible for appointment as a GFA tow pilot Delegate a person shall:

(a) be licenced or certificated to fly the class and design features of aircraft being used for aerotowing gliders; and

(b) have logged a total of 200 hours aeronautical experience, of which at least 100 hours shall be on Australian or Overseas or RAAus registered fixed-wing powered aircraft including touring motor glider types. Of the remaining experience, sailplane, powered sailplane, fixed-wing military powered aircraft and high performance 3-axis control ultralight aircraft flying time may be counted in full toward the total aeronautical experience; and

(c) have logged a minimum of 100 hours experience towing sailplanes in Australia; and

(d) have held a Tow Pilot Examiner endorsement for a minimum of 3 years; and

(e) have a demonstrated aptitude for assessing the competence of pilots for the purposes of training and testing pilots for the purposes of issuing a Glider Towing Endorsement; and

(f) be a current member of the GFA and an affiliated aerotow club; and

(g) be supported in the application by the relevant RM/O.

7.3. Issue

7.3.1. Only sufficient GFA Towing Delegate appointments will be made to meet the anticipated workload assessed by the RM/O.

7.3.2. Appointment of GFA Towing Delegates will be made by the EM/O on the recommendation of the RM/O if the conditions at 7.2 are satisfied.

7.3.3. When a pilot has met the competency standard, the RM/O will complete the form at APPENDIX 6 - APPLICATION FOR APPOINTMENT OF TOW PILOT DELEGATE, sign it and then send a scanned copy to the EM/O (returns@glidingaustralia.org) for filing with the pilot's records.

7.3.4. The EM/O will record the endorsement on the pilot's records.

7.3.5. Appointment will be signified by the issue of a Glider Towing Certificate endorsed with 'GFA Tow Pilot Delegate' (refer APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE).

7.4. Privileges and limitations

7.4.1. The holder of a GFA Tow Pilot Delegation can:

(a) conduct the training and assessment of Tow Pilot Examiners in accordance with this manual; and

(b) appoint a Competition Tugmaster.

7.5. GFA Tow Pilot Delegate Currency requirements

7.5.1 The holder of a GFA Tow Pilot Delegate endorsement must not exercise the privileges of the endorsement unless they hold a valid Glider Towing Certificate (refer paragraph 2.4.3) and within the previous 12 months the holder has performed at least 6 glider tows.

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7.6. GFA Tow Pilot Delegate Revalidation requirements

7.6.1. A GFA Tow Pilot Delegate endorsement is subject to revalidation every two years.

7.6.2. Revalidation of a GFA Tow Pilot Delegate endorsement is subject to paragraph 7.3.1 above.

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8 COMPETENCY TO BE DEMONSTRATED FOR ISSUE OF GLIDER TOWING ENDORSEMENT

Except for meeting the minimum eligibility requirements, there is no specific number of hours or flights that must be completed; it is left to the discretion of the Tow Pilot Examiner to issue a Glider Towing endorsement when the applicant demonstrates the necessary level of knowledge and competence.

An applicant must be able to show understanding and application of the knowledge and skills listed below.

8.1. Ground Preparation

- The tow pilot's responsibility for the overall safety of the towing operation, as PIC of the tow plane/glider combination.
- The tow plane's Flight Manual Towing Supplement and Towing Performance Chart, if applicable.
- The requirements of the GFA Operational Regulations and Operations Manual in respect of the aerotowing of gliders.
- Preparation of aircraft for glider towing operations, including inspection of tow aircraft release mechanism, mirrors, ropes, release rings and weak links.
- The glider's requirements in aerotowed flight, including maximum and minimum speeds in unballasted and ballasted configurations.
- The implications of glider towing on the fuel consumption of the tow aircraft.
- Minimum rope lengths for the single and, if applicable, dual towing of gliders.
- Weak link requirements.
- Ground signals applicable to glider towing.
- Knowledge of the club’s operations manual, noise abatement procedures, local airfield procedures, preferred towing patterns, and club safety management system.
- Assess the take-off performance required when towing a glider against the distance available under prevailing conditions.

8.2. Take-off

- Demonstrate sound situational awareness and threat and error management practices relevant to the intended operation.
- Correct response to all ground signals.
- Radio broadcasts appropriate for the intended towing activity.
- Monitor expected take-off performance and take appropriate action in the event of not achieving expected performance.
- Demonstrate ability to take-off in a crosswind of not less than 2/3 of the maximum allowable crosswind for the type.
- Use of mirrors to monitor glider position.

8.3. Climb

- Fly primarily by attitude to maintain a safe airspeed and stable platform appropriate to the tow plane/glider combination and the conditions, responding only to deviations in airspeed, smoothing out transient changes in air speed caused by turbulence and the glider’s position on tow.
- Correct handling of engine, using power settings appropriate to the engine handling notes or POH and the requirements of the tow plane/glider combination.
- Maintain a good lookout and adequately compensate for any aircraft blind spots by adjusting attitude and heading. This means avoiding long periods at a constant heading and, in high-wing tow planes, raising a wing to check that the airspace is clear before turning.
- Selection of towing pattern which minimises towing into the sun, takes advantage of forced landing options, stays within gliding range of the field and makes maximum use of any lift which is available. The towing pattern should also take into account the wind velocity and likely release position.

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- Avoidance of conflict with other traffic, glider and power, in the circuit area. Avoid climbing out in the downwind leg of the circuit. Maintain enhanced situational awareness with appropriate radio use.
- Continue to monitor glider position by use of mirrors.
- Without reference to mirrors, recognise the feel of a glider in the high-tow and low-tow position and transition between the two positions.
- Control the tow plane attitude and maintain a stable platform during “boxing the slipstream” by the glider.
- Maintain stable platform, correct towing attitude and speed regardless of whether glider is in high or low tow, is out of position or is transiting between towing positions.

8.4. Release

- Confirm glider release by the use of mirrors and, if possible, by physically turning round in seat to view the glider directly. The tow pilot must not rely on “feel alone” to determine that a glider has released.
- Ensure airspace below tow aircraft is clear to commence descent.

8.5. Descent

- Once release has been confirmed and providing the airspace to the left is clear, commence a left descending turn. If the airspace to the left is not clear, commence a descent maintaining heading. Avoid abrupt manoeuvres, large reductions in power settings, and the rapid build-up of airspeed that will result in the shock-cooling of the engine. Try to avoid turning right, as some tow planes (e.g. Cessnas, Maules, two-seat Pawnees, etc.), have a blind spot on the right-hand side of the cockpit that makes it impossible to clear the airspace into which the aircraft is descending.
- Select correct power setting and airspeed.
- Select descent pattern appropriate to the topography, airfield circuit requirements, wind velocity, sun and other traffic.
- Maintain adequate lookout at all times, compensating for aircraft blind spots.
- Make appropriate radio broadcast for the operational environment.

8.6. Joining Circuit

- Select correct circuit entry, maintaining situational awareness using the radio and good lookout techniques, integrating with other traffic and making appropriate radio calls
- Carry out normal pre-landing checks.
- Select a suitable landing area, with due regard for any special requirements which may be in force.

8.7. Approach and Landing

- Manage the risk caused by the trailing rope/rings and the required obstacle clearance. Awareness of option to drop rope if required.
- The management of the circuit such that low level steep turns on to final are avoided.
- Go-around procedures.

8.8. Cruising on Tow

- Gentle adjustments to attitude during the transition from climb to cruise, with managed reduction of power, in order to avoid slack developing in the rope or glider over run of the tow plane.
- Select appropriate speeds in accordance with conditions and the glider’s placarded aerotow speed limitations.
- Monitor fuel burn during period of extended cross country flight.

8.9. Descending on Tow

- Maintain attitude while gently closing the throttle, avoiding slack in rope and giving the glider pilot time to adjust airbrake settings to maintain position.

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- Maintain adequate lookout and select descent path appropriate to the requirements of the combination.
- Avoid steep turns, and ensure the glider's maximum aerotow speed is not exceeded. Remember, gusts can happen so don't fly to the limit.
- If intending to land on tow, remember obstacle clearance in relation to the position of the glider and the selection of intended touchdown point.

8.10. Abnormal Procedures

- "Stop" signal on the ground.
- Partial power failure, aircraft on the ground & aircraft airborne.
- Glider airbrakes (or tail-chute) open during the ground run or during the climb.
- Signal the glider pilot to release.
- Glider unable to release.
- Glider and tow plane both unable to release.
- Tow plane upset (this must not be practiced).

Note: Section 9.1 provides for separate and additional competencies to be demonstrated for the Dual Towing, Outlanding Retrieve and Competition Towing endorsements.

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9 OTHER ENDORSEMENTS

9.1. Dual Towing Endorsement

9.1.1. Prerequisites

A candidate for a Dual Towing endorsement must have logged a minimum of 30 hours glider towing experience as a tow pilot on the aircraft type that will be used for the dual towing activity before undertaking an assessment to qualify for a dual towing endorsement.

9.1.2. Procedures (refer also to MOSP 2, Section 16.2.11 and Section 18)

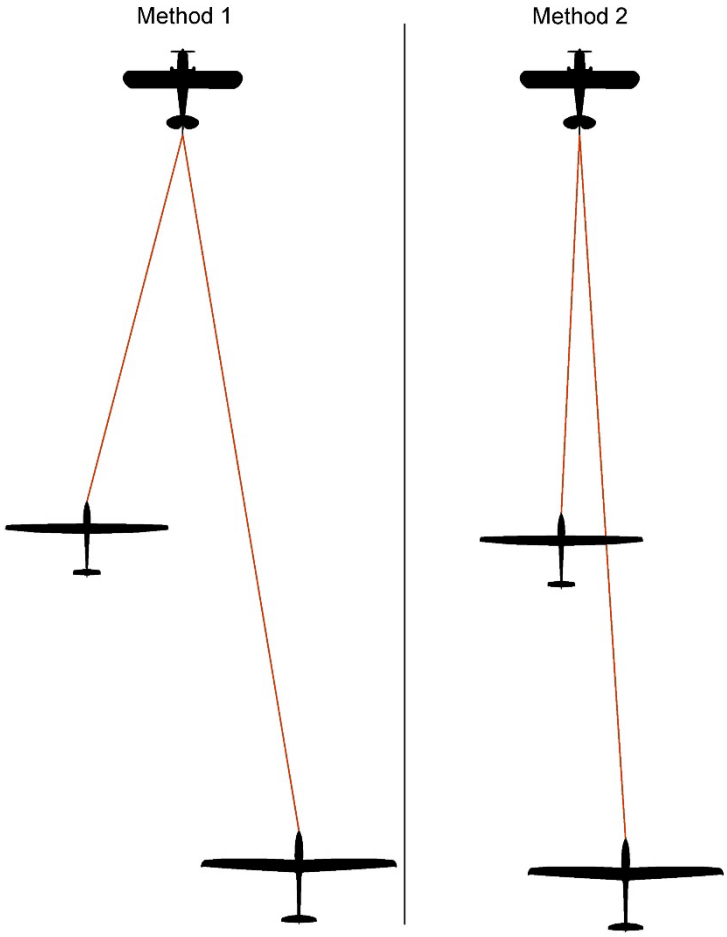
Requirements for a dual towing activity are as follows:-

- Adequate strip length, width and obstacle clearance.
- Wingtip holders to be positioned at outer wings.
- Forward signaller essential.
- Water ballast must not be carried.
- Tow ropes and rings to be set up in accordance with GFA AN 167.

The short rope should not be less than 35 metres long and the long rope must be at least 30 metres longer.

There are two methods that can be used for positioning the gliders:

1. The ropes can be laid on the ground at an angle either side of the tow plane such that the long rope is well clear of the lead glider; or
2. The gliders can be arranged “line-astern” such that the long rope is laid under the wing (about half way) of the glider on the short rope, but well clear of the horizontal stabiliser.



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The gliders should be positioned to eliminate or minimise as much as practicable the taxi distance of the tow plane before both tow ropes are under tension and full power can be applied by the tow pilot.

In light crosswind conditions (i.e. less than 5 knots), the glider on the short rope must be positioned on the upwind 'into-wind' side of the tow plane and the glider on the long rope, to minimise the chance of ground-looping across the front of the glider on the long rope. If the crosswind is strong (>10kts), it is recommended that a dual tow not be carried out.

The glider with the most efficient ground-braking system (skid or wheel brake) shall be placed on the long rope, and the more experienced pilot shall fly this glider, in case the short rope breaks during the take-off run.

Note: The pilot on the short rope should have had some prior practice in flying on a shorter-than-normal rope.

On the ground run using method 1, each glider pilot should attempt to follow the tow plane's nearest wingtip. On the ground run using method 2, the glider on the short rope shall maintain position directly behind the tow plane and the glider on the long rope should attempt to follow the tow plane's nearest wingtip.

The initial acceleration will be much less and more runway will be used on the ground run. Wing tip runners should hold the outboard wing tips and be prepared for a longer ground run. The climb rate of the combination will also be considerably lower than normal.

Regardless of which method of positioning is used, when the combination is airborne, both gliders shall fly directly behind the tow plane, the glider on the short rope flying into high-tow (just above the slipstream), the glider on the long rope into low-tow (just below the slipstream). The tow plane should not turn until both gliders are established in the line-astern position. Airbrakes might be required by the glider pilots to maintain slight tension on the rope and this should be discussed in the pre-flight briefing.

The advantage of Method 1 is that it gives a clearer path for the gliders (particularly the rear glider) in the event of an abort in the early stages of the launch. This is a very important consideration.

The disadvantages of Method 1 are:

- the possibility of the long rope getting on top of the wing of the front glider in the event of an "inside" wing drop by that glider.
- the difficulty of maintaining the lateral spread (for the front glider) during the early part of the ground roll when directional control is being exceeded by the lateral pull component on the tow rope. This problem can be greatly alleviated by having the "spread angle" on both ropes equal prior to launch.

The advantages of Method 2 are:

- the large reduction of the risk of a rope on top of the inside wing of the front glider.
- the easier maintenance of lateral station.

The disadvantages are:

- the less clear path ahead (once again, particularly for the rear glider) in the event of an abort in the early stages of the launch.
- the increased possibility of the long rope fouling the underside of the front glider (during the early launch stages). This could be said to be perhaps a lesser potential hazard than a rope on top of a wing.

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Dual tow in progress. Photo courtesy of Jarek Mosiejewski

At the release stage, the glider in high tow (the one on the short rope) will release first and ensure that an immediate clearing turn is made, maintaining aerotow speed until separation has been achieved.

In the event of a wave-off, the gliders will both release and turn to the respective sides from which they commenced the launch. The tow plane should fly straight ahead until separation of both gliders is confirmed.

In the event of release failure with the glider on the short rope (the one in high tow), the pilot shall communicate this to the tow plane by radio. If this fails he will fly the glider out to the left of the tow plane (remaining in high-tow) to warn the tow pilot and the pilot of the glider on the long rope. Upon receipt of acknowledgment from the tow pilot, the glider on the short rope will return to the normal high-tow position. The glider on the long rope will then release and clear the airspace. The tow pilot will then position the sailplane within easy reach of the landing area and then release the rope. The sailplane pilot will take the precaution of ensuring a high approach over all obstacles to avoid snagging the rope.

If the glider on the long rope is unable to release after the glider on the short rope has returned to the high-tow position, the failure to release procedure is carried out by the glider on the long rope except that this glider remains in the low tow position. The tow pilot will assume that the glider in the low tow position has also failed to release. The tow pilot will make every effort to contact both gliders by radio before releasing the ropes at the tow plane end after positioning the sailplanes within easy reach of the landing area.

Note: If the dual tow ropes have been set up in accordance with the instructions detailed in GFA AN 167, they will separate when they are released by the tow plane.

Pilots flying dual tow in cruise flight must be prepared for marked changes in the dynamics of glider/tow plane performance. A pre-flight briefing is essential addressing how slack in tow ropes will be managed at higher tow speeds, in turbulence, and when descending on tow. Glider pilots must be prepared to use drag increasing devices/measures as necessary.

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9.1.3. Pilot qualifications and operational requirements

Pilots wishing to undertake dual towing must be in current flying practice in glider-towing operations. The foregoing procedures must be strictly adhered to and the tow pilot must receive an adequate briefing from a Tow Pilot Examiner before undertaking dual towing.

9.1.4. Endorsement

Notification that a pilot is approved to carry out dual towing as PIC is by issue of the appropriate endorsement by a Tow Pilot Examiner as per paragraph 4.1.

9.2. Outlanding Retrieve Endorsement (refer also to MOSP 2, Section 18.2.3)

9.2.1. Prerequisites

A candidate for an outlanding retrieve endorsement must have logged a minimum of 30 hours glider towing experience on the aircraft being used for the activity before undertaking an assessment to qualify for outlanding retrieves.

Note: The stipulated 30 hours is the minimum; as experience has shown that considerably more than this is desirable, unless the candidate has special experience relevant to the outlanding retrieve task, such as recent experience as a cross-country glider pilot with associated outlandings.

9.2.2. Ground preparation

- Understanding of Civil Aviation Safety Regulation (CASR) 91.410 and Advisory Circular AC 91-02, which explain the requirements for use of a place that is suitable for the landing and taking-off of aircraft.
- Understanding of the reduced speed during cross-country towing (if applicable) and its effect on fuel consumption and engine parameters, plus an understanding of daylight/darkness graphs and the calculation of local last light.
- Awareness of the effect of local weather conditions and surrounding terrain on the time of onset of actual darkness, as opposed to “official last light”.
- Understanding of normal precautionary search procedures, particularly in respect of assessment of suitability of paddocks with respect to size, slope, surface, stock and surroundings, with special attention given to aerial power lines and the position of the sun/shadows, and their effect on selection of take-off and approach paths.
- Demonstrate knowledge of assessing wind direction and speed without the aid of a windsock - using natural elements (e.g., smoke, water, dust, trees).
- If rope is attached to the tow plane for the outbound trip, dropping of rope for paddock landing. Assessment of adequate length for take-off, using all applicable factors, including "P" Charts if available.
- Experience in taking off without ground crew, using suitable agreed signals. Assessment of length of crop/grass in paddock and an understanding that the tow pilot is not obliged to land in a paddock considered by that pilot to be unsuitable.
- Understanding the impact that different soil types (e.g., friable soil, sandy loam) has on aircraft take–off performance.
- Understanding that total fire bans preclude the possibility of an aerotow retrieve. Understanding of responsibility to landowners.

9.2.3. Endorsement

Notification that a pilot is approved to carry out outlanding retrieves as PIC is by issue of the appropriate endorsement by a Tow Pilot Examiner as per paragraph 4.2.

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9.3. Competition Towing Endorsement

9.3.1. Prerequisites

A candidate for competition towing endorsement must have logged a minimum of 30 hours glider towing experience as a tow pilot on the aircraft to be used for the activity before undertaking an assessment to qualify for a competition towing endorsement.

Note: The stipulated 30 hours is the minimum; as experience has shown that considerably more than this is desirable, unless the candidate has had recent experience as a GFA approved competition glider pilot, at the time of assessment for the competition towing endorsement.

9.3.2. Ground preparation

- Understanding of Civil Aviation Safety Regulation (CASR) 91.410 and Advisory Circular AC 91-02, which explain the requirements for use of a place that is suitable for the landing and taking-off of aircraft..
- Understanding of the safe use of a multiple runway environment for both gliders and tow planes. The potential for conflict is high and can be likened to the flight deck of an aircraft carrier with multiple aircraft parked on the runway, a high volume of pedestrian traffic and simultaneous departures and landings of both tow planes and gliders. Typically, one runway will be declared as the primary runway which allows its full use and any other runways are only available up to the intersection.
- Understanding of effect on fuel consumption and engine parameters of a high intensity operating environment towing unfamiliar and higher performance ballasted glider types.
- The need to be familiar with local airfield operations, the proximity of Restricted/Danger areas and an awareness of the effect of local weather conditions and surrounding terrain.
- Assessment of adequate length for take-off in a competition environment give the many and varied types and weights of gliders that might be launched and will significantly impact on climb performance.
- Demonstrated knowledge of the use of the AFM or POH, including "P" Charts if available.
- Understanding of the various types of towing and circuit patterns used during a gliding competition. Flying in close proximity to other aircraft and the pre-start airspace in a competition is a particularly hazardous situation.
- Consciously demonstrate a high standard of situation awareness by being aware of the likely traffic patterns and any known aircraft in the launch/circuit vicinity, and targeting the scan to the areas of known and potential hazard.
- Be able to critically self-analyse their standard of health for flying. Understand the impact of excessive alcohol consumption and the importance of adequate rest when they know they will be flying in a highly demanding and stressful operational environment the next day. Towing operations are intense and require a high level of concentration. Flights are short, with a high workload, often in turbulent conditions exposed to summer heat and busy CTAF activity.
- Demonstrate an understanding of the term ‘tunnel vision’, in particular ‘cognitive tunnelling’, which occurs when the pilot is too focused on one object and not on the whole environment (e.g. loss of situational awareness). A tug pilot in a high workload environment (competition launching) operates under stress of a continually changing but equally demanding set of primary tasks. The result is that the mind’s allocation of residual capacity to perceptual monitoring decreases as levels of arousal (an extremely high workload environment as more aircraft become airborne) increases. This in turn impairs

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time management, workload management, situational awareness and decision making. Refer also to Section 13.6.

9.3.3. Endorsement

Notification that a pilot is approved to tow in competitions as PIC is by issue of the appropriate endorsement by a Tow Pilot Examiner as per paragraph 4.3.

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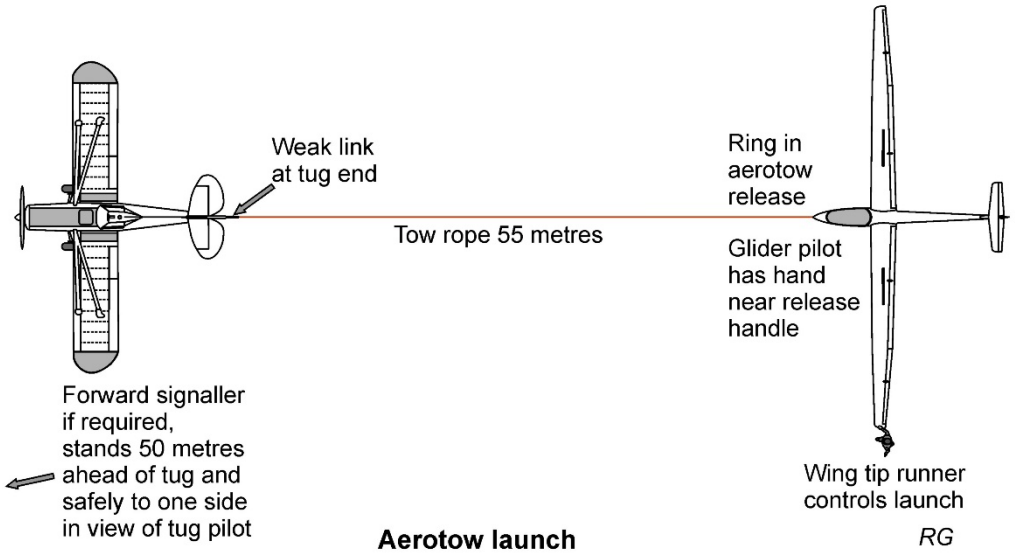
10 GUIDELINES FOR GLIDER TOWING

This section is a “how to do it” expansion of the elements detailed in previous sections of this manual.

10.1. Normal Procedures



Aerotow launch

10.1.1. The purpose of an aerotow

The purpose of an aerotow is to provide the glider pilot with a safe and efficient launch to a nominated height and position. Although this is not difficult, there are many differences between flying around without a glider on the back in comparison with the task of providing the best possible launch for the glider pilot while protecting the club’s asset.

10.1.2. Daily inspection

The normal daily inspection is carried out on the tow aircraft in accordance with the aircraft POH/AFM (if none, use Schedule 5 of the Civil Aviation Regulations 1988), with the addition of the following items:-

1. **Tow-release.** Inspect for integrity of attachment, cleanliness, serviceability and proper activation from the cockpit. Check the serviceability of the release by attaching a rope with the approved rings fitted and releasing it under tension (an assistant will be required). By signing the maintenance release the tow pilot is stating that the tow release has been inspected in accordance with Section 12 at Appendix 1 of Civil Aviation Order 100.5 (General requirements in respect of maintenance of Australian aircraft) 2011 (as amended).
2. **Tow-ropes.** The recommended minimum length for an aerotow rope is 55 metres plus or minus 5 metres. Only GFA approved rings are permitted (refer Airworthiness Advice Notice (AN) 75). Ropes should not be frayed and any doubtful sections replaced or, in the case of joins, re-spliced. Ropes shorter than 50 metres but not less than 35 metres are only permitted for the following purposes:
   - For aerotow retrieves from outlanding paddocks.
   - As the shorter rope of a dual-tow pair.
   - For wave-flying in rotor conditions.

   Ropes longer than 60 metres – up to 100 metres, are permitted for the following purposes:

   - As the longer rope of a dual-tow pair.

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- For Cross-country ferrying.
- Where operationally necessary (e.g. to prevent stones causing damage to gliders during launch).

3. **Weak-links.** A weak link must be fitted at the tow plane end of the rope (except where a TOST tow cable retractor winch with guillotine is utilised). The maximum weak link breaking strength for most tow aircraft is 450 kgs (the Pawnee 235 is rated to 750 kgs).

Note: Check the aircraft's towing supplement.

4. **Mirrors.** It is a requirement (GFA Manual of Standard Procedures, Part 2 subparagraph 16.2.1) that at least one mirror is fitted to a tow plane. It is usual to have two. They may be mounted on wing-struts, on the fuselage sides, or in the cockpit in accordance with approved CASA or Manufacturer engineering orders.

Note: It is normal practice to align one mirror on the high-tow position and the other on the low-tow position. Check them for cleanliness, broken glass and security of attachment.

5. **Cleanliness of transparencies.** Although important at all times, cleanliness of the windscreen and side-windows is of paramount importance for aerotowing. Scratches, bugs and oil-streaks play havoc with detection of other aircraft. Make sure everything is absolutely as clean as possible.

10.1.3. Performance of tow plane/glider combination

When a glider is hooked onto the back of a tow aircraft, the all-up weight of the combination obviously increases. Gliders vary in weight from the lightweight single-seaters of around 400 kgs (or even lighter) to heavy single or two-seat gliders of up to 850 kgs.

The higher all-up weight of the tow plane/glider combination will impact on the tow plane take-off performance and the length of the ground run. There may also be a reduced climb-rate to consider. The combination of the two will result in a reduction in obstacle clearance, which must be taken into account on every launch.

All aircraft approved for glider-towing have AFM[2] supplements for the purpose. Tow aircraft have revised Performance Charts ("P" Charts) for the glider-towing role incorporated into their supplements.

The tow plane "P" Chart, should be used to plan the take-off. If it has not got one, follow the guidelines in the AFM supplement, which typically suggest that the take-off distance to 50 feet without a glider on the back should be factored by 1.5 when towing a single-seat glider and doubled for a two-seater.

NOTE: When considering glider weight, what you see is not necessarily what you get. High-performance gliders carry water-ballast in their wings for enhancing their cross-country performance. Some of them can carry more than 200 kgs of water, or the weight of two big persons. Since there is no means of telling the difference between a "dry" and a "wet" glider by its appearance (apart from a few gliders on which the wings droop noticeably when they are ballasted), it is obviously important to check the weight of the glider by asking the pilot before attempting to tow it. Some high performance, two place ballasted gliders have a MTOW approaching 850kg.

[2] The AFM/POH & Towing Supplement must be carried in the aircraft unless an exemption has been obtained from CASA.

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10.1.4. Awareness of glider limitations

All gliders have a minimum speed for towing. This is usually governed by the wing-loading and not the weight or size of the glider. Gliders with a heavy wing loading will need to be towed much faster than lightly loaded gliders and tow pilots need to get used to the range of minimum speeds of the gliders they tow, and above all to **ask if they don't know**. Tow pilots should always fly the speed requested by the glider pilot (unless it is too slow for the safe operation of the tow aircraft).

Gliders also have a maximum speed for aerotowing. This is a structural limitation established during certification and gliders must be kept below this limit. This means another speed to check and memorise for each type.

The most critical gliders in terms of maximum speed are some of the older designs, where the tow plane may have to reduce power considerably to prevent over speeding of the glider. The margin above the tow plane aircraft's stall speed is reduced. This makes the tow plane more difficult to fly, control responses are degraded and engine cooling often suffers as well. **These speed-limited gliders should only be aerotowed by an aircraft that best matches the performance limitations of the glider (e.g. DH82 Tiger Moth, Super Cub, Auster, etc.) and be flown by an experienced tow pilot**.

TOW PILOTS MUST NOT LAUNCH A GLIDER UNLESS ITS SPEED LIMITATIONS ARE KNOWN!

Although strictly more of a problem for a glider pilot than a tow pilot, some gliders (e.g. Std Libelle and Hornet) suffer considerable speed errors due to the rope occupying the same hole in the nose as the Pitot tube. Just keep it in mind.

Gliders have differing crosswind capabilities. As for the maximum aerotowing speed of a glider, so too is the maximum crosswind capability of the glider a limiting factor during a launch. This must be considered by the tug pilot prior to any launch as it may have a detrimental effect on the performance of the glider/tug combination during the ground run and critical early stage of the launch, especially when towing with a low powered tow plane.

We all know that the maximum demonstrated crosswind component (in knots) in the AFM or POH is the figure at which factory testing has shown that directional control can still be maintained. It is affected by a range of factors including the size of the rudder, its distance from the Centre of Gravity, and the availability of asymmetric braking etc. It is not a legal limitation, but a guide to what limit should be applied to crosswind operations.

To be completely accurate in the calculation of the cross wind component requires basic geometry but a quick and simple calculation on the flight line is useful. The following is one simple and reasonably accurate method to estimate of the strength of the crosswind on any given day using the 'Rule of Sixths". To use this "method" you first determine the relative wind angle, and then multiply the reported wind strength by the appropriate fraction.

So, if the wind is:

- 10° off the nose - the crosswind strength is 1/6th or 20% the wind strength.
- 20° off the nose - the crosswind strength is 2/6ths or 30% the wind strength.
- 30° off the nose - the crosswind strength is 3/6ths or 50% the wind strength.
- 40° off the nose - the crosswind strength is 4/6ths or 70% of the wind strength.
- 60° or greater off the nose can be considered full strength.

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10.1.5. Glider airbrakes

Airbrakes on gliders, used to control the final approach to land, have the potential to adversely impact on the safety of the tow plane/glider combination during a launch. In the closed position, airbrakes are retracted into the glider's wings but they may not necessarily be locked in that position. There is a very subtle difference in appearance between airbrakes which are closed and flush but not locked, and those which are closed and securely locked for take-off. If an aerotow commences and the glider's airbrakes are closed but not locked, they could suck out and remain undetected by the glider pilot. The effect of open airbrakes on the take-off and climb performance of the combination can be dramatic and may compromise the safety of the tow plane/glider combination. The tow pilot must include in their "scan" a visual check of the glider airframe and airbrakes as soon as practicable during the take-off.

NOTE: Some modern high wing-loading sailplanes have poor aileron control at low airspeeds and to counter this glider pilots may use airbrake to spill the airflow over the aileron during the initial stages of launch. In such cases the airbrakes are usually closed and locked by the time the glider is airborne.

10.1.6. Engine failure in tow planes

If well maintained and studiously managed, there is no evidence to suggest that a tow plane engine is likely to fail more often than any other aircraft type. However, a tow plane's engine does lead a hard life. Tow plane engine failure may be attributed to:

1. A large number of hot/cold cycles resulting from a full-throttle climb, followed immediately by a rapid speed increase after glider release accompanied by a large reduction in throttle (power) followed by a high speed, partial-power descent. The climb in particular, because it is often at less than the optimum climb speed for the type, may result in a high thermal load which may result in greater wear of heat sensitive engine components.
2. The use of Mogas (motor car gasoline or a mogas/avgas cocktail) in some tow plane engines, with its higher risk of detonation and the possibility of vapour locking at high ambient temperatures.
3. The tendency of some pilots to skip pre-take-off checks and manage fuel use judiciously on busy days, leading to fuel exhaustion.[3].

Tow patterns used by tow pilots at any gliding facility must be such that the glider under tow is kept within safe glide distance from the airfield at all times. When towing cross country tow pilots must remain vigilant and have a heightened awareness of emergency landing options during all stages of the flight and be very familiar with the tow plane's 'glide' performance.

10.1.7. Fuel Management

Tow pilots must be acutely aware of the high rate of fuel consumption during aerotowing, with the engine operating at full or very high power settings during the climb. A pilot used to reduced fuel consumption at cruise settings may need some time to become accustomed to this. A gliding club's Tugmaster must brief new tow pilots on the fuel flow rates for the various activities and towing configurations used by the Club.

[3] ATSB Aviation Research and Analysis - AR-2011-112 Starved and exhausted: Fuel management aviation accidents; and The Civil Aviation Safety Authority's (CASA) Advisory Circular (AC) 91-15, Guidelines for aircraft fuel requirements..

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Tow pilots should start the day's towing with full tanks, keep a record of the number of tows and time flown, and refuel early rather than late. GFA recommends pilots carry no less than 30 minutes reserve fuel. On aircraft which have recording tachometers or an engine hour meter connected to an air pressure sensor and switch, keeping track of tacho or meter time is a useful aid to fuel management.

Fuel exhaustion incidents are most likely after a change in pilot, where the relief pilot has taken over an almost empty aircraft. In aircraft such as the Piper Pawnee it is difficult to determine the remaining fuel level by visually inspecting the fuel tank. Therefore, it is good airmanship to check the fuel state by reference to at least two separate methods of fuel management upon changing pilots.

10.1.8. Pre take-off checks

The repetitive nature of glider towing may lead to complacency and skimped checks or no checks at all. Normal pre take-off checks apply to tow plane aircraft and are to be completed in accordance with the AFM. Anecdotal evidence suggests that many tow pilots do not do satisfactory pre take-off checks before every flight, as far more tow plane aircraft run out of fuel in flight than any other light aircraft. Before every flight, make a habit of ensuring that you know the location of the tow-release and its direction of operation - you may need it in a hurry.

The only answer to such problems is a proper pre take-off check before each flight. It might seem like a nuisance, but the alternative is worse. During the pre-take-off check, turn on all external lights that will make you more visible to other aircraft in the air and to persons on the ground.

10.1.9. Ground signals

There are usually two signallers for aerotowing, one at the wingtip of the glider and the other positioned forward of the tow plane and to one side (refer MOSP2, paragraph 16.2.7). Looking at the very small image in the mirror that is often distorted by engine/airframe vibration may cause the tow pilot to miss something which might endanger the take-off. Furthermore, looking backwards is awkward and in any case cannot be done in some tow planes because they have no visibility in that direction. It could also be argued, quite reasonably, that asking a pilot to look backwards at all during a take-off is an unacceptable practice.

There are three signals from the ground crew to the tow pilot as follows:-

10.1.9.1. Take up slack

This is an underarm wave signal (no higher than shoulder height) given by the wingtip holder and repeated by the forward signaller. The tow pilot should ignore a take up slack signal given by anyone else.

On receipt of this signal, the tow pilot should taxi the tow plane slowly forward until the slack is taken up. Taxying too fast runs the risk of breaking the weak link, or jerking the glider forward when the slack is taken up. If the latter occurs, there is a strong possibility of the glider running over the rope, which may then wrap itself around some part of the glider's undercarriage or airframe. This is clearly undesirable, so take it easy when taking up slack and keep your eye on the forward signaller (or mirror if forward signaller is not used).

10.1.9.2. All out

This signal consists of an overarm wave. It means that all the slack is out of the rope and the take-off is safe to proceed. Again, the tow pilot should ignore an "all out" signal given by anyone other than the wingtip holder or the forward signaller.

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10.1.9.3. Stop

Self-explanatory. This signal consists of one or both arms held stationary above the head and may also be given by radio. The ‘stop’ signal may be given by anyone who believes that the launch should not take place for any reason. It may be given by the pilot, the wingtip holder, the forward signaller, or by a bystander who sees something which nobody else has noticed.

Note: Be aware that if a stop signal is given, the glider pilot may have released the tow rope.

If the stop signal is given after take-off has commenced (i.e. after the ‘all out’ signal has been given), the tow pilot, as the pilot in command of the combination, will need to exercise their judgement as to whether to stop or continue with the launch in the interest of safety.

When aborting the launch, the tow pilot should roll as far down the runway as is necessary to provide room for the glider to land behind.

10.1.10. Take-off technique

When the "all out" signal has been given, the tow pilot will open the throttle smoothly to full power; keeping in mind any "idle to full throttle - 3 seconds minimum" limitation that may apply. Potential irregularities may be due to winds, slope, rough runways, slack in towropes etc. Note: delays or errors by wing runners and forward signallers may occur in these critical seconds.

If a ‘stop’ signal is given, the specific actions to take are detailed under paragraph 10.2.1.

Once full power is applied the tow pilot will find that acceleration of the tow plane/glider combination is less than they are used to. This is especially true if you are towing a glider with a nose skid, where the initial additional ground-drag of the glider’s nose skid is very high.

Keeping straight during the initial stages of the ground run, even in a tailwheel aircraft, is easier than it is without a glider on the back. This is because of the pull of the rope. However, the pull of the rope also has a tendency to lift the tail of the aircraft. If the tow pilot has cultivated a habit in non-towing operations of using a lot of forward stick to lift the tail of the aircraft, they may find they experience over-rotation at this point and will need to move the stick back a bit. The combined effects of wind, slope, rope, glider position and mass, may affect the pitch and lateral stability of the towplane while accelerating.

The correct technique when towing with a tailwheel aircraft is to start the take-off run with the stick fully back. Once the ground roll has been established the stick should be progressively eased forward to raise the tail into the normal balanced take-off attitude. Appropriate corrections for cross winds, turbulence, slope and rough runways may be needed. A cautionary mindset is warranted where handling errors in the glider, wing drops or large changes in the relative position of the glider may occur; as these events could make for more challenging condtions.

10.1.10.1. Take-off technique - gliders with light wing-loading

A glider with a light wing-loading (say between 20 and 30 kgs/sq. metre) will usually leave the ground before the tow plane. The pilot will position it a few feet above the ground and do their best to hold that position until the tow plane gets airborne. The tow pilot will usually make a positive rotation into the take-off attitude, and the tow plane will then leave the ground and start its climb.

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Some tow pilots then level off and let the speed build up to the full value they are going to use for the tow. This is not a good technique for towing light gliders because it makes life unnecessarily hard for the glider pilot to maintain station behind the tow aircraft as the tow aircraft transitions to the climb attitude. Aggressive transition from ground separation to full climb by the tow pilot as airspeed increases must be avoided. The best technique for the “average” club glider is to let a bit of speed build up, then let the combination climb, even if the combination has not yet achieved the eventual climb speed. The tow pilot can then refine the nose attitude as the combination climbs by very gently accelerating to the full climb speed a few seconds later.

There is a further advantage in letting the tow plane climb early in the take-off if there is a wind-gradient. If the tow plane is held down and then rotated into the climb attitude after the full value of speed has built up and pulls up too steeply, the tow plane will be at a higher elevation in a stronger headwind than the glider and the tug’s ground speed will reduce relative to the glider which will cause the rope to slacken. In a strong wind gradient, it may be advisable for the tug pilot to carry a little excess airspeed through the gradient, until the glider climbs through that airmass. It is not acceptable to just haul back on the stick when best climb speed is attained. A smooth, gradual transition is much safer.

10.1.10.2. Separation technique - gliders with heavy wing-loading

When towing gliders with a high wing-loading (from 30 kgs/sq. metre to a typical value of over 50 kgs/sq. metre for a modern standard class glider full of water), the opposite problem will occur. Heavy gliders may not leave the ground before the tow plane - in fact it is reasonably common to see a heavy glider still on the ground with the tow plane airborne. If the tow plane climbs too early in this case, the glider will either not have flying speed and will have to release before it collides with the upwind fence, or it may have marginal flying speed and get dragged into the air barely above its stall speed and virtually uncontrollable. Neither of these options is attractive.

The solution is to keep the tow plane in ground effect until the known/agreed climb speed has been achieved, then allow the tow plane to separate and enter the initial climb with sufficient speed to give the glider pilot good control.

From the foregoing descriptions of the two extremes of take-off technique, it is obvious that the tow pilot must know the characteristics of the glider about to be towed, especially its weight and safe tow speed. Glider Flight Manuals are a good source of information or, if unsure, ask the glider pilot. Once this is known, the exact technique to be used may be pre-planned and put into practice. It is necessary to go through this exercise prior to EVERY tow.

After separation and entering the initial climb, the glider will be initially in the "high-tow" position, just above the tow plane's slipstream – ***never*** above the tow plane. However, fairly early in the climb, the glider will probably move into the "low-tow" position below the slipstream. The tow pilot will feel the trim-changes occurring as the glider changes position and may need to re-trim the tow plane when the glider has settled down.

The glider pilot may choose to remain in high tow throughout the entire tow. This will almost certainly be the case if the glider pilot is a visitor from overseas or the glider is not fitted with a nose release. **Do not**

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assume anything - wait to see which position the glider pilot selects.

During the take-off, the tow pilot needs to monitor options for any emergency that may occur and choose a take-off path that takes these into account. While it is usual for an aircraft to maintain runway heading until it reaches 500' AGL, the pilot in command of a glider combination may change the track of the tow aircraft while the aircraft is less than 500 feet above the terrain to the extent necessary to keep the tow aircraft and glider in tow within gliding distance of terrain that is suitable for landing.

Note: Where it is necessary to deviate from normal departure procedures, the radio should be used to alert other traffic.

10.1.11. The steady climb

The primary reference for maintaining a steady climb is nose attitude. As in a glider, any tendency to fixate on the airspeed indicator will result in a wavering nose-attitude. This makes life very difficult for the glider pilot. Proper use of elevator trim is vital to maintain steady airspeed.

The ASI should be used only as a trend monitor during the climb. Only if a reasonably long-term trend indicates a deviation from the chosen climb speed should the nose attitude be altered, and even then with care.

Care should be taken to ensure that the slip/skid ball is exactly in the middle when towing a glider. This not only optimises the climb rate (an aircraft flying sideways creates increased drag), but it makes it easier for a glider pilot to position the glider accurately behind the tow plane.

Make all turns shallow, say Rate 1 (i.e. 3 degrees per second), especially with a training glider on the back, and preferably not more than 30 degrees angle of bank.

Do not assume that the glider pilot you are towing is very skilled. Everybody has to learn, and quite a high proportion of glider tows are training flights. Be prepared to work hard to maintain a stable platform for the glider while it swings around on the back trying to hold position - this is where doing some tows at the glider end yourself gives you some empathy for the challenges of learning to aerotow a glider.

Continuously scan the engine instruments when aerotowing, especially oil temperature, oil pressure and (if fitted) cylinder-head temperature. If cowl-flaps are fitted, it may be necessary to adjust these during the climb, although in Australian conditions they will usually be left fully open. Unless the engine has a time limitation on full power, the throttle is usually left wide open during the climb.

The mixture may be leaned on the ground while taxying and taking up the slack. This will assist in the reduction of plugs fouling. For take-off and during the climb the mixture should not be leaned unless density altitude problems cause rough running (refer to the POH or AFM).

Do not climb on a constant heading for long periods of time. All tow aircraft have blind spots and it is essential to ensure that the airspace you are about to occupy is clear. Remember that targets which are stationary in the windscreen constitute the biggest collision risk and perversely are the most difficult to detect. You will need to find a sensible compromise between a good search pattern to eliminate stationary targets as much as practicable, while still maintaining a good stable platform that a trainee glider-pilot will be able to follow without undue difficulty, and keeping the combination within gliding distance of the airfield.

As a general principle, tow into wind. A glider's range if towed downwind is, for the purpose of returning to the airfield, only one-third of its range if you towed it into

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wind. Only tow downwind (or a long way crosswind) if you are asked to, or if controlled airspace or other reasons compel you to. With practice you should be able to fly the combination to a position where, at release, a turn towards the circuit joining area can be made.

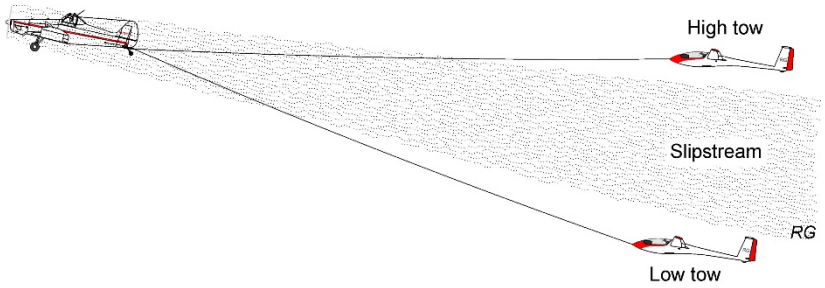
If cumulus clouds are present, read the sky and plan on maximum use of lift during the climb. Avoid rain and close proximity to cloud. Gaggling gliders can be troublesome, but in competitions they are an occupational hazard. When towing in competitions, exercise extreme care near gaggling gliders.

Monitor the mirror(s). The ideal mirror installation for a tow plane is either one large panoramic, slightly convex mirror which covers both high and low towing positions (at the expense of rather high drag), or two smaller mirrors, one aimed at high tow, the other at low tow. These should preferably be adjustable from inside the cockpit.

10.1.12. High-tow and Low-tow

An aircraft in flight generates a “slipstream” behind it. This is a region of turbulent air, originating mainly from large vortices streaming from the wingtips, with small amounts of mechanical turbulence such as propeller wash thrown in for good measure.

A glider pilot may choose to fly either above or below this turbulent slipstream (Refer 10.1.10). Australia tends to favour the “low-tow” position. Other countries prefer “high-tow”.



10.1.12.1. Low-tow

With a glider in low-tow, below the slipstream, the combination tends to be less pitch sensitive and tow pilots have less difficulty in maintaining attitude for a constant air speed and a stable platform for the glider pilot to follow.

10.1.12.2. High-tow

In high-tow, above the slipstream, the combination feels a little more pitch sensitive and tow pilots need to work harder to maintain a constant climb attitude and air speed. The difference is not large and tow pilots should have no difficulty in maintaining a stable platform whichever position the glider pilot chooses.

WARNING: HIGH-TOW IS, BY DEFINITION, ABOVE THE SLIPSTREAM, NOT ABOVE THE TOW PLANE.

There is one important difference between low-tow and high-tow and this becomes apparent if a glider gets out of position vertically (i.e. too high). In low-tow a glider can get very low and still not cause significant difficulty for the tow pilot in controlling his aircraft. Furthermore, out-of-trim forces tend to change at a slow enough pace that the tow pilot has ample time to release the glider if there is any fear that the limits of elevator control might be reached.

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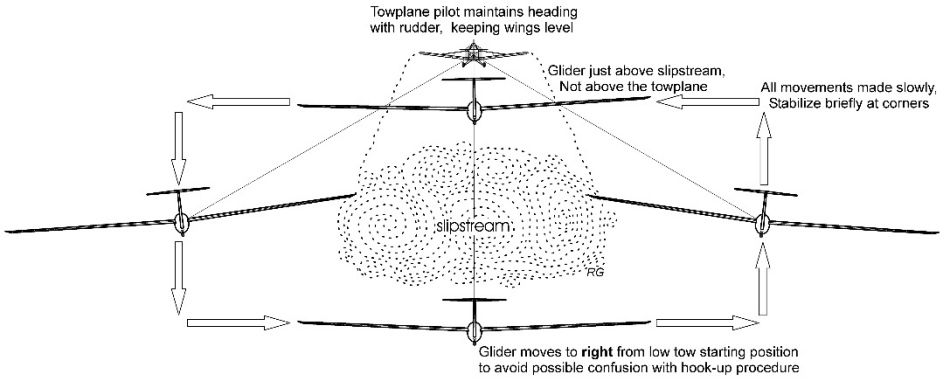
In high-tow, things happen more rapidly and the tow pilot will have less time to react to a glider going too high. If a glider that is out of station in high tow (i.e. too high) is not released immediately, there is a risk of the tow plane being pulled out of control. See Section 10.3 “The tow plane upset”.

Tow pilots need to be trained to tow gliders in both high and low-tow and to experience a glider transitioning between the two positions. To avoid subjective judgements about high-tow and low-tow, the reference for the glider pilot establishing the towing position is always the **slipstream**.

10.1.13. “Boxing the slipstream”

Glider pilots are expected to be capable of successfully completing an aerotow co-ordination exercise referred to as “boxing the slipstream”. The exercise of boxing the slipstream is a useful exercise in co-ordination, understanding of the forces at work on aerotow, and confidence building. The exercise serves to attune the student glider pilot to a range of out-of-station positions to which a pilot might reasonably be exposed to, and helps to consolidate the technique for controlling the glider behind the tow plane.



The exercise is carried out by flying the glider in a box pattern around the tow plane’s `slipstream, initially moving to the right of the slipstream in low-tow where the glider pilot will stabilise in this position for approximately 3 seconds, then move vertically up into the high-tow position, still out to the right, where they will again stabilise and hold in this position for approximately 3 seconds. The glider then slowly transitions from right to left of the slip stream in the high-tow position, stabilises and holds for 3 seconds, then descends vertically to the low-tow position while still out to the left, stabilises and holds for 3 seconds. Finally the glider returns to line-astern in the low-tow position and the exercise is over.

The objective is for the glider to carry out this exercise without contacting the slipstream and the tow pilot’s job is to maintain a constant attitude and heading during this exercise. The tow pilot will be constantly changing control inputs as the glider changes position. Some of these control inputs may be quite large. The most critical point is the transition from right to left in high-tow, where a glider pilot sometimes moves too high or transitions too quickly and gets a lot of slack in the rope as they try to regain station. This may or may not be a problem, depending on where the rope goes in its travels!

As in all phases of an aerotow, if the tow pilot feels they are being taken close to the limits of control, or they have no idea where the glider has gone, they will release the glider BEFORE they lose control altogether.

10.1.14. Releasing from tow

The tow pilot must not commence a descent until they have CONFIRMED VISUALLY that the rope has been released from the glider. If the mirrors are not

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adequate for this purpose, the tow pilot must turn round in the seat (or yaw the plane) to visually confirm that the glider has released the tow rope. **NEVER** assume that a jerk or twang in the rope is the glider releasing and **NEVER** rely on a radio call from a glider pilot to advise that the glider has released. **NEVER** reduce the power until you are sure the glider has released. If in doubt, leave the power on and steadily lower the nose to achieve an airspeed close to but not above the maximum aerotowing speed of the glider. The glider pilot seeing this should immediately release.

10.1.15. The descent

When you have confirmed that the glider has released and that the airspace you are about to occupy is clear, begin the descent. Don't fiddle around maintaining almost level flight while you gingerly reduce power - you will take all day to get down. Begin slowly reducing the power and get the aircraft descending, carefully managing the increase in indicated airspeed. The predominant cause of thermal shock is the rapid increase in airspeed. Use cowl flaps and carburettor heat as required. **DO NOT** accelerate too quickly in the early stages of the descent. Interchange throttle closure with airspeed to achieve a moderate initial descent rate, keeping in mind that too much speed is a bigger factor in cylinder cracking than a large reduction in power. Keep all throttle movements smooth and power reductions gradual.

Although the glider is expected to turn to its right after release, there is no need for the tow plane to turn immediately. Clear the aircraft's blind spots before manoeuvring. Once again, remember the "stationary target" problem.

WARNING: AEROBATIC DESCENTS AFTER RELEASE ARE NOT PERMITTED.

Aerobatics, bank angles greater than 60 degrees, and rapid changes in altitude are not permitted.

Plan the descent profile, maximising the use of any sink you can find. Regularly clear the aircraft's blind spots, avoid other traffic and generally don't make a nuisance of yourself. Remember the rope!

Continue monitoring the engine during the descent, planning to be at your approach power settings by the time you are on base leg. Use the radio to assist with heightened situational awareness. At circuit entry, make any applicable radio calls to assist with threat and error management. As a general principle, position yourself where other airspace users will expect you to be when making a radio call. Know your airfield procedures. If you are in a CTAF operate in accordance with published procedures.

Do not cut gliders off, remember they have no engine to re-position themselves. Do not cut off any other powered traffic established in the circuit. When descending beware of other aircraft below you. On downwind the applicable circuit altitude should be maintained until commencement of the base leg turn. Watch for straight-in approaches. Fly neighbourly and be sensitive to noise abatement procedures.

Reducing the speed to the approach speed when on base leg can assist with ensuring that the turn on to final is at 500' AGL.

Always carry out pre-landing checks, being especially vigilant about fuel management.

10.1.16. Landing

Cavalier flying and low turns on to final are unacceptable. Approach high and land long in preference to cutting it fine over people or objects on the ground. The turn onto final approach should be completed by not less than 500 ft. above aerodrome

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elevation. This should allow sufficient time for pilots to set up a stabilised approach and ensure the runway is clear for landing.

Keep clearing the aircraft's blind-spots. Look for shadows on the ground. If you see more than yours you need to know where the other aircraft is. If it's a glider it has right of way. Until you know if it's above or below you, don't make any drastic changes to your altitude.

Remember the rope and give yourself plenty of clearance over obstacles. Avoid landing over the top of parked gliders.

Check very carefully during the turn onto final that you are not about to conflict with another aircraft. Remember, even if you do avoid a collision by taking last-minute evasive action, your rope is still a hazard. A 55 metre rope hangs about 40 feet below a tow plane at approach speeds.

10.1.17. If in doubt, drop the rope

When the rope is dropped, it loses forward momentum very quickly and ends up dropping almost vertically to the ground. If you have any doubt about obstacle clearance, whether it be buildings, vehicles, parked or taxying aircraft or people (especially people), don't hesitate to drop the rope.

10.1.18. Approaching too low

Hitting the airfield boundary fence with the rope is an all too common occurrence, usually resulting in loss of the rings and delay to the day's activities. Most cases of the rope connecting with the fence are the result of poor judgement or poor airmanship in an attempt to land as short as possible to reduce the need for taxying.

WARNING: A LOW APPROACH WITH A ROPE TRAILING BEHIND IS POTENTIALLY HAZARDOUS TO PERSONS WHO ARE DRIVING OR WALKING ALONG THE AIRFIELD PERIMETER.

10.1.19. Cruising on tow

Occasionally there will be a need to ferry a glider that will require the tow plane/glider combination to cruise in level flight.

THE GLIDER'S MAXIMUM AEROTOW SPEED IS ESSENTIAL INFORMATION FOR THE TOW PILOT TO HAVE BEFORE TAKE-OFF.

The presence of a glider on tow makes quite a difference to the technique you will need to use in certain parts of the flight. For example the "APT" (Attitude, Power and Trim) technique for transitioning from climb to cruise may be used, and it must be applied smoothly and gradually. Otherwise you will risk placing the glider pilot in an unmanageable position resulting in a slack rope and an inevitable 'rope break'.

Know your aircraft, especially its power/weight ratio, and fly it in such a way that you start reducing attitude and power while still in the climb, ensuring the airspeed remains constant. As the climb-rate approaches zero, the nose should be at or very close to the cruise attitude and the speed will build up very slowly. It won't get away from you because the power has already been reduced. The attitude change and rate of speed-change during this manoeuvre will be gradual enough for the glider pilot to adapt to both without getting a lot of slack in the rope. When you are established in level flight and have refined the power setting to get the cruise speed you want, trim the aircraft.

When established in the cruise, with the glider settled in its towing position, it will feel different from the climb. The drag of a modern single-seat glider is very low, in the order of 15 to 25 kgs in level flights at 70 knots or so, and this does not

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provide much pull on the rope. This is not a problem if conditions are smooth and the glider pilot is competent. However, it can be a different story when conditions are turbulent and/or the glider pilot is inexperienced. It may be easier in these conditions if the glider pilot leaves the undercarriage down. If airbrakes are to be used they should be carefully deployed to keep tension on the rope.

In cruise flight do not relax. Monitor the mirrors continuously and concentrate on accurate attitude control. You can expect the occasional tail-wag, as a bit of slack develops in the rope and the glider pilot takes action to correct it. This will be virtually constant if the air is rough. As is the case in any other phase of aerotow operations, if the antics of the glider on the back are taking you to the limits of control, you are entitled to release the glider.

During cruise flight, especially if the air is rough, the glider pilot may find it necessary to use small amounts of airbrake to keep the rope tight. Unlike normal aerotow launching, this is quite normal and is not of concern to the tow pilot.

On a ferry flight find the smoothest air you can in the interests of comfort and safety. If you can get above the thermic layer, things are usually easier.

10.1.20. Descending on tow

This is not normally required on a ferry flight, as the glider will usually release and make its own way into the circuit, leaving the tow plane to do the same. However, a descent on tow may be required from time to time, for example to remain outside of controlled airspace or to avoid cloud. It is also a post-solo training exercise for glider-pilots that must not be attempted unless it has been briefed first.

When transitioning from cruise flight into a descent, the normal APT principle (Attitude, Power and Trim) does not work. If the nose is lowered with cruise power still applied, the speed gets rapidly out of hand and this makes things impossible for the glider pilot. Reduce power slowly and maintain a constant attitude. The combined drag of the glider / tow plane combination will assist with maintaining a constant airspeed and increase the rate of decent. Refine your power-setting and nose attitude as the descent stabilises, monitoring the mirrors for the glider pilot's well-being. Trim as required. The glider pilot should lower the glider's undercarriage to increase drag.

It requires great skill to initiate a descent on tow without getting some slack in the rope, especially in rough air. You can be sure that the glider pilot will be monitoring this as closely as you, and the glider's airbrakes will almost certainly be used to keep this under control. Watch the glider carefully in your mirrors and if it needs to use full airbrake to keep the rope tight, moderate your descent until the airbrakes retract a little. Continue the descent in this fashion until the glider releases. **Keep below the maximum aero tow speed of the glider.**

10.1.21. The Non-Manoeuvring Area (NMA)

Under certain circumstances, such as a low-powered tow plane towing a glider off a fairly short airfield in a light wind, it is possible to get into a situation where, if the rope should break or the tow plane waves the glider off, the glider would be too high to land ahead within the available strip and too low to safely turn back to the strip. This is known as the Non-Manoeuvring Area (NMA).

The NMA does not apply directly to tow planes, as all power pilots know that engine failure is possible at any time and they plan their options accordingly. However we now have a glider to consider and the effect of a NMA on a tow pilot is to focus attention on the glider's situation as well as the tow plane's.

If the rope should break during the initial phase of a launch the tow plane will be unaffected. It is a different story for the glider. The tow pilot must plan the early stage of each take-off such that the best possible options are available to both the

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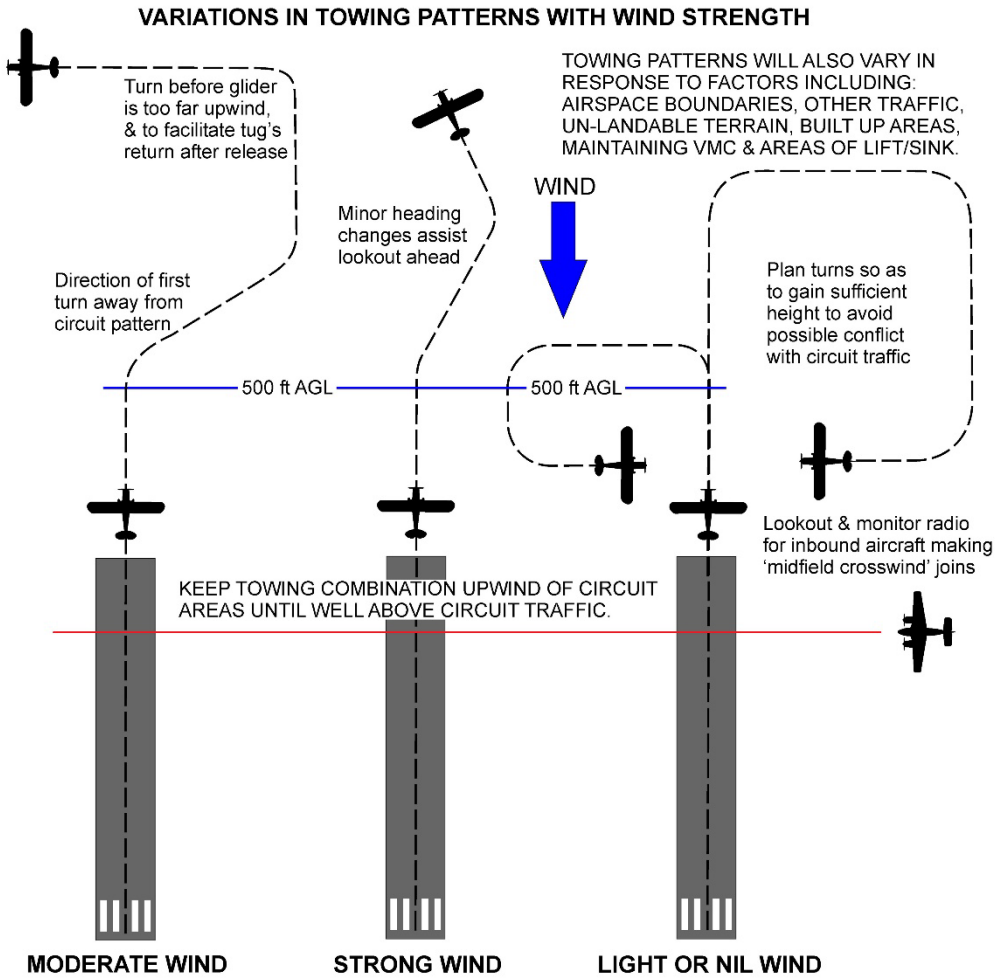
tow plane and the glider. If this is not possible, the tow pilot should at least track over such terrain that the glider will be able to achieve a survivable landing, even though it might be damaged. This is a new concept for a power pilot and is a good example of mature threat and error management. **Note: It is the tow pilot's responsibility to consider the safety of both aircraft at all times during the aerotow.**

10.1.22. Some suggested towing patterns



The towing patterns suggested here are just a few of many possible variations. At all times keep a sharp lookout, continually clear the aircraft's blind spots, and if possible avoid those parts of the sky in which you know traffic will congregate, e.g. circuit joining areas. Tow pilots should, wherever possible, avoid climbing the combination in the downwind leg of the circuit and plan their departure so as to keep the glider within gliding distance of the airfield.

Note: While it is usual for an aircraft to maintain runway heading until it reaches 500' AGL, the pilot in command of a glider combination is permitted to make deviations to maximise safety for the combination during the take-off (e.g. so as to remain over landable terrain).

10.2. Abnormal Procedures

Coverage of items 10.2.1 to 10.2.7 is mandatory. Item 10.2.8 is optional.

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10.2.1. "Stop" signal (or radio call) during launching

10.2.1.1. Early in the take-off run

Release glider. Monitor mirrors. Be aware of possibility of glider running into the back of the tow plane. Keep the tow plane moving and avoid sudden braking.

There is no particular reason to turn after you have released the glider, at least until you are sure the glider has stopped. Get well clear, THEN turn.

10.2.1.2. Later in the take-off run

Release the glider. At this point it may be better to continue your take-off and thereby ensure that you are well out of the glider's way. You may elect to land straight ahead if safe to do so or to execute a low-level circuit. Situational awareness and threat and error management are critical factors. At all times think ahead and prepare for the unexpected.

10.2.2. Engine failure

10.2.2.1. Tow plane on ground

In the case of partial engine failure during take-off, do not assume the engine will "come good". Release the glider. Apply the same philosophy and pilot actions as for a stop signal early in the take-off run, except that it may be more difficult to keep moving if your engine is not developing adequate power. Use whatever power you have to open up the distance between you and the glider or to manoeuvre out of the way. **DO NOT** take-off with a malfunctioning engine. If the engine failure is total, use the tow plane's inertia to get out of the way of the glider as best you can, turning in the direction most appropriate for the prevailing conditions.

10.2.2.2. Tow plane airborne

Treat a partial and a total engine failure the same. Release the glider and maintain safe speed near the ground and/or directional control. If time permits, consider length of strip available and/or the options for the glider pilot, depending on height and position. Land the tow plane in the safest area available. As previously discussed, plan your take-off path to maximise options in the event of an emergency, for both aircraft.

If you have time, go through normal engine-failure drills as documented in the tow plane's AFM/POH.

10.2.3. Glider's airbrakes (or tail-chute) coming open during the ground-run

This is more common than expected. If the airbrakes (or tail-chute) come open or deploy on the ground-run, assess height (if airborne) and remaining runway available. Consider whether to give the rudder waggle signal or to release the glider without signalling. Once released from the glider, decide whether it is best to continue the take-off or conduct a fast taxi down the runway until clear. This is one of the major reasons for having a good mirror installation on the tow plane and monitoring it during the take-off (however, not at the expense of keeping control of the tow plane).

NOTE: Some modern high wing-loading sailplanes have poor aileron control at low airspeeds and to counter this glider pilots may use airbrake to spill the airflow over the aileron during the initial stages of launch. In such cases the airbrakes are usually closed and locked by the time the glider is airborne.

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10.2.4. Glider's airbrakes (or tail-chute) coming open during the climb

Assess height and position. If the combination is in danger (e.g. sinking), release the glider.

If the combination is not in danger, give the "rudder waggle" signal. If possible, signal to be given at a safe height so as to allow for the glider pilot misinterpreting the signal and releasing.

Notes:

1. With a glider's airbrakes open, a Pawnee 235 or similarly powered tow plane has demonstrated to be capable of climbing at a reduced rate in still air, and something of the order of 300 to 400 feet/min can be expected. This gives the tow pilot the option of getting the glider to a safe height and position before giving the rudder-waggle, thus minimising the risk should the glider pilot misinterpret the signal. This option may not be available to lower-powered tow planes (say, under 180 hp), most of which cannot climb at all if the glider's airbrakes come out.
2. The rudder should be waggled at such a frequency that yawing and rolling of the tow plane wings does not result. The signal is a rudder waggle, not an aircraft yaw.
3. Some gliders have a tail-parachute to augment their rather weak airbrakes. These have been known to deploy accidentally on tow. Learn to identify these gliders and watch out for this problem too.

10.2.5. Other reasons for poor rate of climb

The rudder waggle signal really means "rate of climb not normal, check your airframe". The usual cause is accidental deployment of the glider's airbrakes, or in some cases a tail-chute.

There can be other explanations for a poor climb rate and the tow pilot should be aware of them. They include:-

1. Strong sink. Combined with a low-powered tow plane and a heavy glider, strong sink can play havoc with the climb-rate. This is where the ability to read the sky pays dividends, although it is often difficult to do this on a "blue" day with no cumulus clouds to mark the thermals. Deciding whether the climb-rate is abnormal due to environmental conditions or there is something wrong with the tow plane, is one of the more challenging decisions a tow pilot will have to make.
2. Wrong propeller pitch setting. This is unlikely, but it can happen and a pilot is particularly susceptible to it if he/she has fallen into the trap of skimping pre take-off checks.
3. Wrong flap setting, wrong mixture, carby-air selected to hot, or only one magneto switched on. These three problems, all of which have featured from time to time in incidents around Australia, can usually be traced back to the same category as 2 above.

10.2.6. Order to glider pilot to release - the "wave-off" signal

The "wave off" signal should only be given if there is no immediate danger to the combination but there is some urgency associated with the need for the glider to release without delay, e.g. If the tow plane engine is starting to overheat and you would like the glider to release as a precaution.

The wave-off signal consists of a rhythmic rocking of the wings from side to side. A waggling of the ailerons is not sufficient, as such waggling action often occurs in turbulence. The signal must be a clear and coordinated rocking of the wings, with no residual adverse yaw. Use the rudder to keep the tow plane fuselage in a

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straight line while rolling the wings to approximately 30 degrees either side of the horizon. If the glider pilot does not respond, release the glider without any further delay.

IF THE TOW PLANE SUFFERS A SUDDEN AND/OR CATASTROPHIC FAILURE, MAKE NO ATTEMPT TO SIGNAL; YOU ARE QUITE ENTITLED TO RELEASE THE GLIDER WITHOUT WARNING.

Note: There is no such thing as a "practice" wave-off. Every waive-off must be obeyed by the glider pilot, otherwise they will be jettisoned without further ado.

10.2.7. Glider unable to release

If the glider is unable to release the glider pilot should notify the tow plane pilot by radio. If no contact is possible by radio, the glider is to be flown far enough out to the left, in the low tow position, of the tow plane so as to get the tow pilot's attention. The glider pilot will hold this position until the tow pilot acknowledges the glider pilot by a wave of their hand. When the glider pilot receives the tow pilot's acknowledgment, the glider is returned to the line-astern low-tow position and then transitioned into the high-tow position, which is just above the slipstream. At this point, the tow pilot will fly towards the airfield and when the glider is within safe gliding distance, the tow pilot will release the rope at the tow plane end.

When the glider pilot flies out to the left, the tow pilot must resist any tendency for the tow plane to be turned (yawed) by the glider. It may take a considerable force on the rudder pedals to keep the tow plane flying straight ahead with the glider out of station to the left. This force MUST be applied to keep the tow plane straight, as any tendency to allow the tow plane to turn prevents the glider from ever getting into its intended position.

Note1: Radio should be used to communicate these issues in the first instance.

Note 2: Some glider pilots may not transition into the high-tow position. Release anyway once the glider is within safe gliding distance.

10.2.8. Double-release failure - landing on tow (optional - not required to be demonstrated for a glider towing endorsement)

This procedure has its origins in failure to release the rope from either the glider or the tow plane. While such an occurrence is rare, landing on tow is an effective and safe training exercise and valuable as a confidence-builder.

The process is as follows:

1. The tow plane and glider combination should commence a descent in accordance with the procedure described in paragraph 10.1.20.
2. The glider pilot should configure the aircraft for landing and lower the glider's undercarriage at the earliest opportunity; confirming the undercarriage is down and locked when completing the pre-landing checklist.
3. The glider must be flown in the low-tow position throughout the descent and landing. The exercise is considerably more difficult if the glider is in high-tow.
4. As the stabilised descent continues, the glider pilot must maintain sufficient tension on the rope by use of partial airbrake. This is much easier for the glider pilot if the tow pilot does a wide, spacious circuit and avoids steep descents or rapid changes in power settings.
5. When the tow plane enters the base leg, the tow pilot will gradually reduce power for the approach. The glider pilot should apply landing airbrake and/or flap as applicable. This gives the tow pilot a measure of the maximum drag that will be exerted by the glider and enables the power to be adjusted accordingly. The tow plane's flap setting will be decided upon and selected at this stage and the combination stabilised for the final approach.

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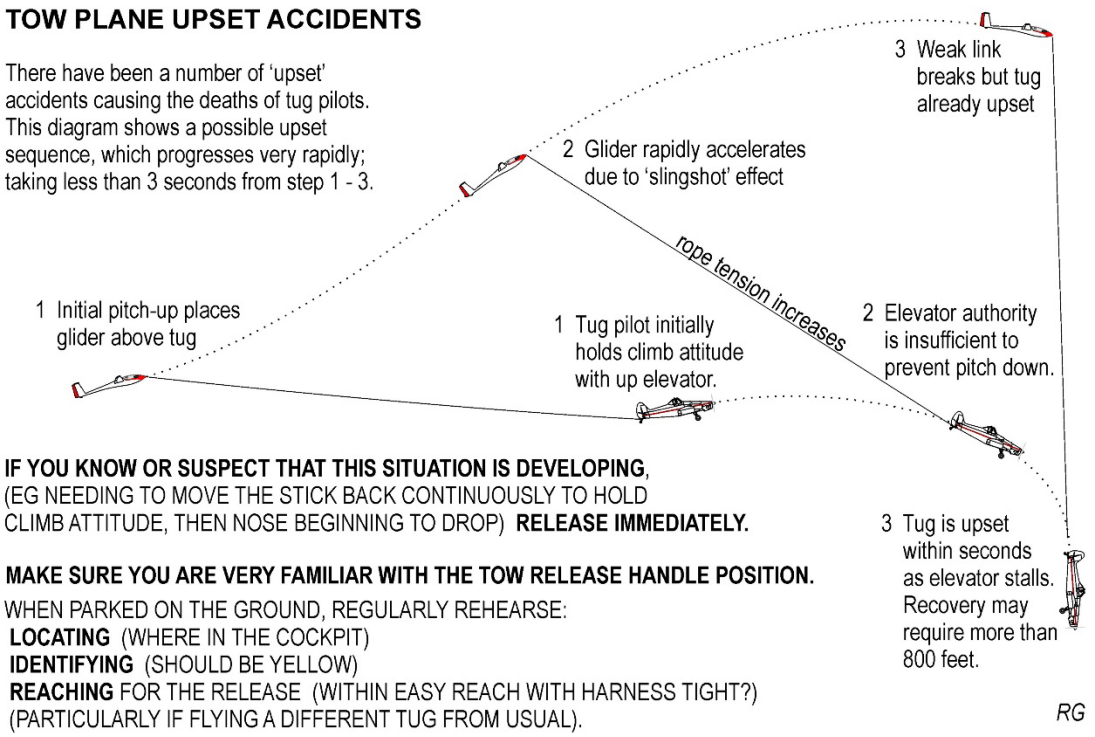
6. On final, the tow pilot will choose an aiming point well beyond the usual spot, as the glider on tow dictates the necessary clearance over obstacles. When this is done, conduct a normal landing.
7. The glider will probably touch down a little before the tow plane, as it is quite a lot lower. The tow pilot should expect to pull back on the elevator just a little bit harder than normal at the flare, as the glider will tend to keep the tail up at this point. The tow may require a trickle of power on during the flare and landing. The rope will tend to hold the tow plane straight.
8. After touch down, **DO NOT USE THE BRAKES**. Let the glider slow the combination down, by using its wheel brake or skid. Monitor the mirrors and be prepared to add a bit of power if the glider appears to be catching you up. Be especially alert in crosswinds. **DO NOT RELAX** until the whole combination has been brought safely to a stop.

10.3. The "tow plane upset"

There are two types of abnormal occurrences that warrant special consideration. Upset occurrences are invariably serious and have the potential to result in a fatal outcome.

The first of the upsets is in the vertical plane, and usually occurs when the glider is allowed to get so high behind the tow plane that the tow pilot runs out of elevator authority and is unable to prevent the aircraft's tail from being lifted. The glider accelerates upward in a "slingshot" manoeuvre, tipping the tow plane nose-down and robbing it of its speed, thereby leaving the tow pilot powerless to prevent the aircraft entering a vertical dive. Refer to the diagram below, reproduced with acknowledgement to the British Gliding Association.



There are a few things to keep in mind about the tow plane upset.

1. When it happens, it happens faster than you would believe possible and it takes a minimum of 800 feet to recover the tow plane to level flight.
2. Under no circumstances should it ever be practised.
3. The chances of a tow plane upset occurring are considerably reduced if the minimum rope length is strictly adhered to. The shorter the rope, the less TIME the tow pilot has to get rid of the glider in an upset situation. It does not take much shortening of the rope for this time-compression to become critical.

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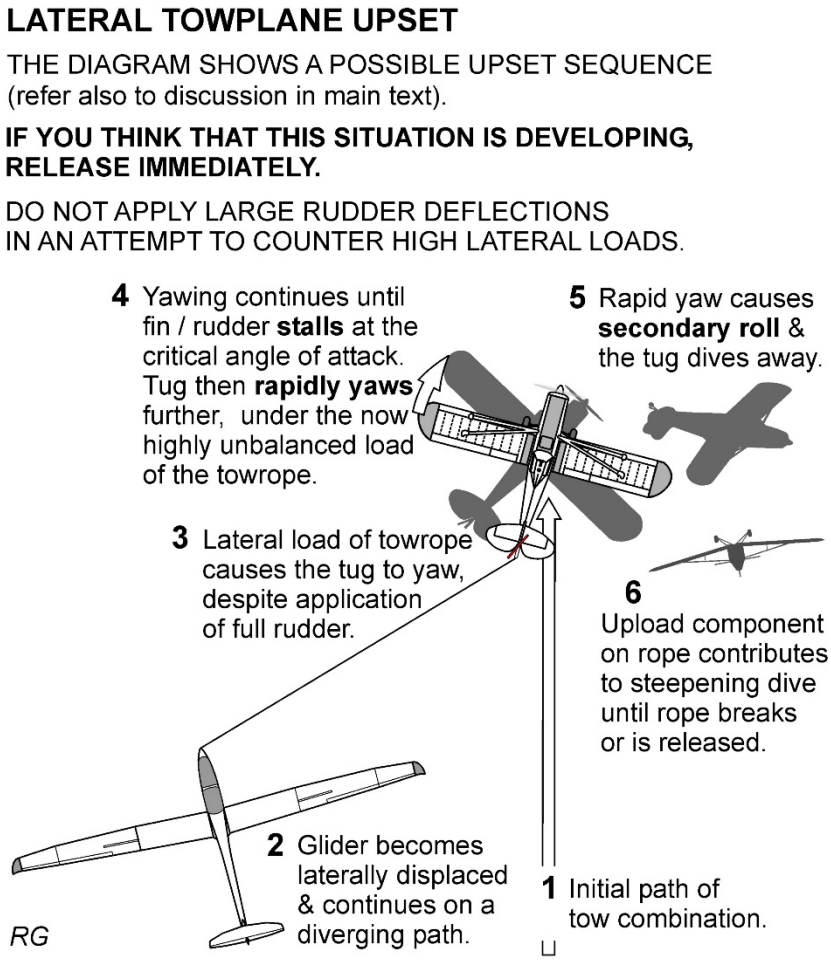
4. If the tow pilot knows or suspects that a tow plane upset manoeuvre is developing, (e.g. stick coming back continuously until it reaches a point where it does not appear to be having any effect), **RELEASE THE GLIDER IMMEDIATELY**. Release it before it gets to that stage if you are in any doubt.

The second of the upsets is in the lateral plane and is usually the result of the glider going out to one side too quickly, or with the rope slack so that when the rope tightens the tow plane is abruptly yawed in the opposite direction. This sudden yaw can cause the tow plane to roll so that the glider and tow plane start to quickly and progressively diverge. This may be beyond the ability of the tow pilot to counter with full rudder and aileron control. The need to release immediately is obvious because if the glider remains attached, the vertical upset scenario will develop, but with the glider and tow plane on diverging headings as well.



Note that a deliberate steady-state (non-diverging) lateral out-of-position by say 10 m (half a glider span) is not a problem - we do it for training, boxing the slipstream, etc. However, arriving at such a position dynamically on a slack rope as a result of turbulence, a poorly corrected and overshot manoeuvre, or inattention, and perhaps on a diverging heading, can induce an abrupt large yaw of the tow plane when the rope comes tight. The tow plane pilot won't have applied rudder to correct the yaw before it happens, and once the yaw/roll couple turns the tow plane onto a further diverging flight path the upset is under way.

The ways in which an upset can start are many:

- the tow plane peeling off abruptly with the glider still on tow;

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- the glider pilot losing sight of the tow plane when being towed into a low sun and climbing;
- the glider getting out of position and the pilot trying to get back too quickly and overshooting;
- turbulence, etc.

Rope or weak link failure when the tow pilot has significant control input, is also a risk. In a vertical upset, it is possible that the tow pilot may not release the back-stick pressure quickly enough to stop the tow plane pitching up violently. A high-speed stall, and spin as a result of engine torque, may result.

A dynamic upset could result if either aircraft is turning, as well as pitching, with the tow rope still connected to both. This situation could occur if the glider completes a climbing turn, which is normal at the end of the tow, without successfully releasing first. Tow pilots should take note of any glider that kites off tow (also referred to as a "slingshot") as the glider pilot cannot see whether the towrope has successfully released and may no longer be in a position to avoid a tow upset even if the situation has been recognised. Any glider pilot who kites or slingshots should be alerted to the hazards to prevent a recurrence.

10.4. Checklist of Do's and Don'ts for Tow pilots

DO **ensure you know the speed limitations of the glider you are towing and check whether it is carrying water-ballast.**

DO ensure you do a thorough pre-take-off check before each take-off and a pre-landing check while in circuit.

DO take up slack slowly to avoid the glider overrunning the rope and monitor the signaller and the mirrors during take-off.

DO open the throttle smoothly when applying full power.

DO be prepared to release the glider if circumstances dictate.

DO follow the most landable terrain during the initial climb and avoid noise-sensitive areas if possible.

DO tow into wind, as far as practicable.

DO use moderate bank angles in turns when towing training gliders.

DO make maximum use of lift during the climb, and sink during the descent.

DO maintain a very careful lookout and be sure to regularly clear all blind spots.

DO close the throttle slowly and smoothly when beginning descent.

DO continue to clear all blind spots regularly during descent.

DO join the circuit in a legal and predictable fashion, and comply with local circuit pattern requirements.

DO take a break for refreshment, to avoid dehydration and fatigue.

DO complete cockpit checks for each launch.

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DON'T tow downwind, unless terrain or controlled airspace dictate, or the glider pilot specifically requests it.

DON'T tow into sun, except for the briefest possible period and then only if unavoidable.

DON'T climb or descend in long straight lines without clearing the aircraft's blind spots.

DON'T do aerobatic descents after the glider has released.

DON'T let the speed build up too rapidly in the initial descent phase.

DON'T do steep turns on tow.

DON'T park a few metres in front of the glider with your engine running while waiting for the next tow - it covers everyone with dust and takes forever to take up slack.

DON'T put the tow plane away at the end of the day without refuelling it.

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11 GUIDELINES FOR OUTLANDING RETRIEVE ENDORSEMENT

11.1. General

Although it sounds simple enough, the task of retrieving a glider from a paddock requires careful consideration and considerable skill. The risks associated with such a retrieval should not be underestimated. Such operations are fertile ground for accidents. For this reason many clubs in Australia do not permit outlanding retrieval.

The difference between an outlanding retrieve and a normal landing back on the home airfield is that a farmer's paddock is just that, a paddock, with no consideration given to the safe operation of an aircraft. Of course there are always exceptions; such as where a glider pilot has managed to find a paddock which is used by a farmer in the operation of his own aircraft or for use by agricultural aircraft. However, never assume a private airstrip complies with GFA requirements.

Recommended Reading: Flight at Lower Levels – Safety in the Circuit - John Freeman, Published by Aviation Theory Centre Pty Ltd, 230 York Street, South Melbourne. www.aviationtheory.net.au

Typical Wimmera paddock. Photo courtesy of Christopher Thorpe

11.2. Preliminaries

11.2.1. Do you have approval?

Landing in a paddock is a high risk activity and requires the approval of all stakeholders before it should be undertaken.

You should not set out on an outlanding retrieve unless you have been assured by the glider pilot, by telephone or radio, that you have the owner's permission to land on the property (refer GFA Operational Regulations, subparagraph 8.1.8).

You will also need the approval of the Club delegate of Competition Director. Most aerotow clubs have a clear policy on the approval process and the conducting of an outlanding retrieve. The tow pilot must know and understand the limitations (if any) placed on this type of activity by their club.

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11.2.2. Is it a Total Fire Ban Day?

Do not carry out an outlanding retrieve if a total fire-ban is in force. Most tow planes have downward-facing exhausts and these can set fire to a paddock very easily and even sideways-facing exhausts are not immune to the problem. The worst thing is that the problem will not show up on the landing, as there is little coming out of the exhaust. It will happen on the subsequent take-off, at full power, and all you do is fly away from the problem!

Don't risk it. You will not be forgiven for starting a bushfire or grass fire and it is quite on the cards that you will be prosecuted. The prosecution will be well deserved.

11.2.3. Paddock Hazards

Make yourself familiar with the glider-pilot's "five S" rule (refer 11.3.5 below) and run through it in your mind prior to departure. Pilots operating into an unfamiliar landing area must remain vigilant and ensure that all the necessary precautions are taken to reduce the risks. Precautionary searches should be conducted initially from a safe height (500ft), only working to low-level once risks have been identified.

11.2.4. Fuel and Daylight

You must be sure that you have (a) enough fuel and (b) enough daylight to complete the retrieve safely and legally. Don't leave home if you can't read a daylight/darkness graph or compute your fuel consumption for an aerotow retrieve. Be sure you know how to do these things properly.

11.2.5. Removing the rope

It is prudent to remove the rope before setting out on an outlanding retrieve. Don't forget to put it in the tow plane! If you are setting out on a retrieve immediately after an aerotow at home base and you therefore have the rope still attached, prepare to drop it at the other end on one of your paddock inspection passes before landing. Under no circumstances should a rope-dropping pass be used as an excuse to do a beat-up - there is more at stake, in terms of gliding's reputation, than the momentary gratification to the pilot of such antics, to say nothing of the risk to any bystanders who might have gone undetected by the pilot.

Some clubs use a rather shorter rope than normal, to effectively increase available take-off distance. Other clubs believe that, if you need to take a few metres into account by using a slightly shorter rope, take the trailer, you have no business aerotowing from that paddock. Both arguments are valid and both have their adherents. You will be expected to adhere to your club's rules on this, as well as other matters.

Whatever size of rope you have, landing with it attached to the tow plane makes no sense when you are going into an unknown paddock. There is too much chance of snagging it on something (or someone) you hadn't noticed. Either carry it in the aircraft or drop it before landing.

11.3. The Landing

If all the preliminaries have been satisfied, we now have to consider what you will be faced with in comparison with anything you have done before. The fact that the paddock is not a dedicated airfield results in the following factors needing consideration when planning an outlanding retrieve. Always conduct a precautionary search before landing (even if it's a private airstrip), starting at a safe height of at least 500 ft. AGL and work down to lower levels.

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11.3.1. Lack of Markings

There will be no markings. No gable markers at the sides, no threshold markers, nothing to indicate where the actual landable strip is. In fact there is nothing to tell you whether the strip is landable or not. A glider pilot is formally trained how to cope with this kind of assessment. So must a tow pilot before attempting an outlanding retrieve.

11.3.2. Obstacles on the Approaches

The approaches will probably not be clear; there is no reason why they should be. You will have to be exceptionally careful in setting up your circuit and approach into the paddock. If it is a long time since you did any precautionary searches with an instructor, book out an aero-club aircraft and do a few. They will stand you in good stead.

11.3.3. Lack of Wind Information

There will be no wind-sock and you will have to rely on raw information like water on dams, dust rising from cars on dirt roads, assessing drift from the cockpit, etc.

11.3.4. Unreliable information and pressure to perform

Glider pilots have little interest in a trailer retrieve if an aerotow is available. Retrieve crews feel much the same way. When you speak to the glider pilot on the phone or radio prior to setting out on the retrieve, you may find quite a lot of pressure applied to get you to come and pick up the glider. For this reason you should regard telephone or radio information about paddock quality as, at best optimistic and at worst downright misleading. Make sure the glider pilot understands that, should you agree to go and pick up the glider, it is your absolute right to refuse to land if you don't like what you see from the air when you arrive overhead. Do not feel pressured into attempting a task if you are not satisfied it is safe.

11.3.5. Apply the glider pilots' five 'S' rule

All the techniques and procedures learned about the circuit, approach and landing work equally well whether it is intended to land on the home airfield or in a paddock for an aerotow retrieve. The basic principles are the same in each case, however, since the outlanding involves an arrival into a paddock of unknown quality, the following basic checklist is used to minimise the risk.

Size. Should be adequate for the landing and subsequent take-off with the glider on the back. Use corner-to corner if necessary. You MUST know the take-off performance of your tow plane with a glider on the back, not just a sketchy "she'll be right" approach, but an intimate knowledge of its performance in various conditions with various gliders on the back.

Slope. If a slope is detectable from overhead or close to overhead, it is almost certainly too steep to attempt a landing. If, by flying off to one side (precautionary search), you assess that there is a slope but it is manageable, plan on landing up the slope and taking off down the slope. To make this feasible, the wind either has to be very light or, if it is a bit stronger than very light, is biased in favour of the downhill take-off. You will then need to decide whether it is best to land down the hill but into wind, or land uphill and accept a tailwind component. Uphill take-offs with a glider on the back must never be attempted.

Surface. A surface which is suitable for a safe landing may not be suitable for a subsequent take-off, especially if it is soft. Rabbit and wombat holes are also a hazard. Remember that you still have the right to refuse to tow the glider after you have landed, if you decide that the surface is so soft that it will compromise the

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acceleration of the combination on the take-off run. Many a nasty outlanding retrieve accident would have been avoided if the tow pilot had exercised this right.

Stock. Large animals are usually obvious, but sheep and kangaroos may be sheltering from a hot sun under a clump of trees. They can be a nuisance if they run out in front of you at the last moment. Cows are curious animals and are often attracted to the cellulose in the finish of fabric covered aircraft.

WARNING: BE CAREFUL IN DROUGHT CONDITIONS, WHEN STOCK COULD BE HAND-FED FROM A MOTOR VEHICLE. IF THEY HEAR A TOW PLANE ENGINE, THEY WILL BE ATTRACTED TO IT!

Note: Ostrich or Emu farms are definitely off limits. Even if you get permission to land on or near one of these farms, which is unlikely, the birds will take fright if you fly near their paddock. At $10,000 per bird, they are expensive creatures to frighten. Under no circumstances should you agree to go on a retrieve "on spec", without owner's permission, from or close to an ostrich farm.

Surrounds. You will need clear approaches to land, but more to the point you will need very good obstacle clearance for your projected take-off path. Trees, telegraph poles and main grid power lines are very obvious and you will be able to make a decision on these items without difficulty.

Single-wire earth return (SWER) lines are a different matter and they have a history of tripping up aircraft and gliders in many parts of Australia. Some parts of the country do not have SWER lines, as the ground is not conductive enough to provide an earth return, but in those parts of the country where they can be used, they are an attractive solution to the provision of electrical power to individual homesteads at low cost. There are thousands of them in rural areas.

Wires are a real danger to aircraft. The poles are skinny and, for environmental reasons are often concealed among trees. A single wire means that there are no cross-arms, adding to the difficulty of finding the poles. In the middle of the afternoon they cast no shadow, further compounding the problem, although you may be luckier in the evening. The poles are often a long way apart, a kilometre being quite common, and the wire itself is impossible to see until it is too late, especially if it has been weathered and corroded over time.

SWER lines do not necessarily follow fence lines. They may cut the corners off paddocks, stretch across at some intermediate distance into the paddock or wander off completely at random. The best guidance is that, if you can see a homestead, assume that there will definitely be a SWER line leading to it. You MUST find it before you attempt a landing.

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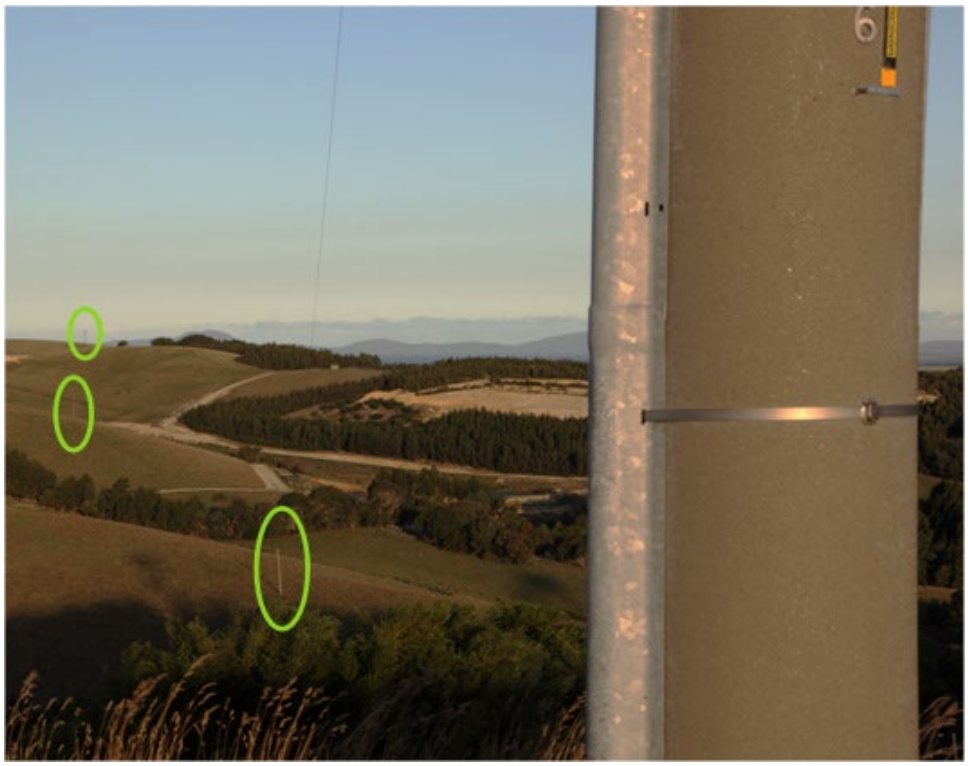

It would be nice if that were the end of it. Unfortunately there are often junctions leading to other parts of the property and you may get a nasty surprise by blundering into one of these just when you thought you had located them all.

11.4. The Take-Off

There is a basic rule to maximise your chances of survival in an aerotow take-off from a paddock - **PACE OUT THE AVAILABLE DISTANCE**. If you're lucky, the glider pilot will have already done this for you before calling in the tow plane.

11.4.1. Pacing out the paddock

Pacing out the paddock has a number of advantages, viz.:-

1. It obviously tells you how long the paddock is.
2. You can check for surface irregularities, soft patches, wombat holes, etc.
3. You can double and triple check for any power lines you may not have spotted from the air.

11.4.2. Factors affecting the take-off

11.4.2.1. Lack of Wingtip Holder

During an outlanding retrieve it is sometimes not possible to find a person to hold the wingtip for the launch. This necessitates a wing-down take-off, which is quite feasible but only if the surface is suitable (See 11.4.2.2 below).

Practice wing-down take-offs at your home site as part of your training for outlanding retrieve approval paying particular attention to the signals between the glider and the tow plane for "take up slack" and "full power". The radio may be used in conjunction with these signals. Cross-country glider pilots need this practice just as much as you do.

11.4.2.2. Long Grass, etc.

There are two considerations with long grass. Firstly there is the effect on take-off acceleration of an overall carpet of long grass. This cannot

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always be taken into account by the tow plane's "P" chart and on the basis of the information provided on the chart, aided by your own Mk 1 eyeball, you will have to decide whether to proceed with the take-off or not.

Secondly there is the effect of patchy areas of long grass or other vegetation such as onion weed or thistles, which do not appear to be thick enough to be a problem for the tow plane. Generally speaking they aren't, but they certainly will be for the glider. Any vegetation over about 10 cms long rules out a wing-down take-off, as the glider pilot will not be able to keep straight due to the drag of the wing in the grass. Don't try it.

Even with a wing-tip holder, you may still be in trouble. Modern gliders often drop wings some considerable time after the wingtip holder has let go, a function of their rather high angle of attack with the tail on the ground, combined with the spiral prop wash from the tow plane. If the wing drops into long grass, a ground loop is a certainty. Don't take chances with long grass and don't drop your guard just because it looks like it's only in small patches. If in doubt, get the trailer.

A final word about wingtip holders. You may find an enthusiastic volunteer from the farmer's family, who would love to run the wingtip for you. Fine, but be sure this person is very carefully briefed, as almost everyone holds back on the wing the first time they do it. This is a problem both the tow plane-pilot and the glider pilot can do without at any time, but especially in a paddock take-off.

11.4.2.3. Soft ground (Sandy Loam or Friable Soil)

This will not necessarily cause the glider to ground-loop, but it may have a dramatic effect on the amount of power that must be used to get the glider/tow plane combination moving, the potential for a rope break if the glider is heavy e.g. a DG-1000 and it has sunk into the soil, the acceleration of the combination in soft or friable soil to the extent that the take-off may have to be aborted. In some cases the combination may stop accelerating at somewhat less than take-off speed.

11.4.3. Take-off technique

Consult the AFM for flap settings during take-off, as each aircraft is different.

When taking off in a paddock, there is no need to open the throttle any more rapidly than normal, as long as it is not too prolonged. If the available take-off distance is so marginal that the rate of throttle-opening is going to make a serious difference, you would be well advised to abort the attempt before you get too far and advise the glider pilot to organise a trailer retrieve.

Once the take-off direction has been decided upon you should decide on a point where if you are not airborne you should abandon the tow. This point should allow the glider room to stop before the far fence. This is particularly important when operating from soft paddocks. If you need to abandon the tow for any reason, release the rope and continue the take-off. If you decide to stop, make sure you do not risk the glider running into the back of the tow plane.

Note: Brief the glider pilot to stay in High Tow (level behind the tow plane) once clear of the ground until the combination is safely climbing away.

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12 THE MANAGEMENT OF ENGINES AND RELATED ITEMS IN THE GLIDER-TOWING ROLE

12.1. Daily inspections

A daily inspection in accordance with the aircraft POH, AFM or Section 1 of CASA Schedule 5 Maintenance must be completed by the PIC before the first flight of the day.

12.2. Air-Cooled Horizontally-Opposed Engines (Lycoming, Continental, Etc.)

Recommended Reading: Lycoming Tech Tips

12.2.1. Run-up and Taxying

Because the engines are air cooled, such air cooling being derived from the aircraft's movement through the air, they receive negligible assistance in directing the airflow around the engine when they are on the ground. It makes little difference to engine cooling whether the aircraft is facing into wind or down wind.

Excessive ground-running may cause overheating and plug fouling that could lead to engine damage if done for longer than the timeframe recommended in the engine Operator's Manual. It is a good practice to lean the engine while taxiing and for prolonged ground running.

As a general rule the lycoming engine operator manual states *"the engine is usually warm enough for take-off when the engine will accept full power without faltering"*. The real threat to an aircraft engine in cold climates is low oil temperature which cause high oil pressure at higher engine RPM. Cold engine oil is thick (not viscous) and if high throttle settings are used in combination with a low engine oil temperature, engine damage could occur.

Some horizontally-opposed engines (e.g. the Lycoming 0-540) have a counterbalance weight on the crankshaft. Rapid opening of the throttle may result in excessive forces being applied to this counter weight, which could cause damage. Engines which have this limitation are usually placarded "Idle to full throttle, 3 seconds minimum".

Whether placarded or not, gentle throttle-handling is a good airmanship. 3 seconds should always be regarded as an absolute minimum from idle to full throttle.

12.2.2. Climbing

Full throttle should always be used for glider towing, unless there is an overriding operational reason for a reduced power operation.

Reasons for operating at reduced power may be:-

1. The engine has a limitation on the amount of time spent at full power (this applies to some engines fitted with constant-speed propellers).
2. A low-speed glider is being towed, where a speed reduction at full power may result in an excessively nose-high attitude and a dangerous reduction in forward visibility.

The reason why full power should be used where possible during towing is that the carburettors fitted to most glider tow plane engines have a power jet fitted to them. This provides an excess of fuel at full throttle, which aids in cooling the engine. Even with everything done properly, climbing at relatively low airspeed and high power settings generates high under-cowling temperatures. The cooling effect of the air varies roughly as the square of the airspeed, so small changes in speed can cause relatively large changes in cooling effect.

WARNING: AS EXCESSIVE HEAT IS THE ENEMY OF AN AIR-COOLED ENGINE, NEVER EXCEED THE MAXIMUM RED LINE CYLINDER HEAD TEMPERATURE LIMIT.

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Maintain mixture control in "Full Rich" position for rated take-off, climb and maximum cruise powers (above 75%). During take-off from high elevation airfields or during climb, roughness or loss of power may result from over-richness. In such a case lean the fuel mixture sufficiently to obtain smooth operation, and if cowl flaps are fitted ensure they are fully open.

12.2.3. Descending

Shock-cooling is the biggest problem on the descent and the number one enemy is speed. We understand the thermal dynamics of an engine climbing at full power and know that the engine is going to be hot by the time it gets to the top of the climb. If the speed is allowed to increase rapidly after release, the heat-soaked engine will be hit with a very rapid rate of cooling, remembering that the rate of cooling varies as the square of the airspeed.

Increasing speed rapidly from, say 65 knots on the climb to, say 100 knots for the descent, causes very rapid cooling, greatly exceeding any cooling of the cylinders which might occur from rapid closing of the throttle.

This is not condoning rough handling of the throttle, nor is it suggesting that clubs should necessarily descend at idle RPM. However, overseas experience indicates that operators using idle RPM for the descent have no greater rate of cylinder cracking than clubs which use our “traditional” descent method of about 2300 RPM and 100 knots (Pawnee 235).

Judicious and smooth throttle handling and a slow build-up of air speed are the answer. You can close the throttle quite a long way and you won’t do much harm, provided the throttle is not closed rapidly and, most importantly, air speed is allowed to build at a moderate rate to the chosen descent speed. Experience would suggest that decent patterns which increase air speed rapidly in the first few seconds after the glider has released, will result in expensive engine damage.

At the other extreme, we are all familiar with the tow plane pilot who uses up huge volumes of sky trying to get the tow plane to come down. There is no need for this - start closing the throttle smoothly, lower the nose and start increasing speed, but do everything in moderation. You will get the descent started, instead of going on a tour of the local countryside, and you won’t be harming the engine.

Monitor the cylinder head temperature (CHT) gauge. If you haven’t got one, the club should get one fitted. Know the maximum permissible CHT for the tow plane you are flying and aim to descend in such a way as to lose 50ºF or less per minute (most American aircraft are in ºF). This can be achieved without difficulty by building up the air speed gradually. When the CHT has decreased to 300ºF, the danger period is over and shock-cooling is most unlikely to occur below that figure, whatever you do with the throttle.

Some tow plane aircraft are fitted with a “shock-cooling gauge”, consisting of a sensor on the engine, a light on the instrument panel and in some aircraft an audible alarm. If the rate of cooling is too high, the light comes on and/or the alarm will sound. The pilot then increases power slightly or (better) slows down a bit, or maybe a combination of both, until the light goes out.

12.3. Air-Cooled In-Line Engines (Antique Aircraft)

As their name suggests, these engines have their cylinders arranged in-line, one behind the other. This places only one cylinder under the direct influence of cooling air, the rest being somewhat in the shadow of this cylinder. These engines may be of four or six cylinders, although only the four cylinder type is known to be in glider-towing service in Australia.

Like the horizontally-opposed engine, reliance is placed upon both air and oil to assist in keeping the engine cool, with oil playing perhaps a slightly more important role in the in-

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line design. In terms of pilot operation, the in-line engine is handled in exactly the same way as the horizontally-opposed engine, only the numbers (RPM, IAS) are different. There is therefore no need for a separate section on handling for this type of engine.

12.4. Liquid-Cooled Engines

In an attempt to reduce the very high overhaul costs of conventional aero engines, various automotive engines have been tried in aircraft over the years.

The major differences between operating an automotive engine and an aero engine in the glider-towing role are as follows:-

1. The engine develops its maximum power at much higher RPM than an aero-engine, typically about twice as fast. A conventional light-aircraft propeller does not take kindly to this level of RPM, as the tips exceed supersonic speed and the propeller produces more noise than thrust. This necessitates some form of reduction drive to slow the propeller down to suitable RPM. In most modern auto-engine installations in aircraft, this is achieved via a toothed belt. This is an additional, and rather unfamiliar, item for pilots to get used to checking.
2. The liquid cooling system is a new feature for almost all pilots to get used to. Coolant temperature, pressure and level are monitored in auto-engined tow planes, as well as usual aero-engine features such as oil temperature and pressure. The end objective is to produce a cooling system which does its job effectively and demands no special treatment.
3. There is no mixture control. A choke is fitted for cold starting, but there is no provision for weakening the mixture to compensate for a changing fuel/air ratio as the aircraft climbs. In tests up to 10,000 feet AMSL, this has not proved to be a problem.
5. No carburettor hot-air system is fitted. This again has not proved to be a problem in a number of flights in carby-icing conditions. Fuel injection systems will eliminate all such problems anyway.
6. Because of the liquid-cooling system, thermal shock is not a problem. After release, the throttle can be closed as rapidly as a pilot wishes, without risk of shock-cooling the engine. However, a note of caution is appropriate here. A Pawnee descending with its throttle closed can achieve a very high rate of descent, something in excess of 2,000 feet per minute. Descending at this rate into a busy circuit area is a highly dangerous practice, for obvious reasons. Regardless of their improved tolerance to rough handling of the throttle, tow aircraft with liquid-cooled engines should be descended in exactly the same way as those with air-cooled engines. This enables the pilot to check his blind spots and also makes the tow plane predictable in its behaviour.

12.4.1. Partially liquid-cooled engines

Aircraft engines are now available in which the block and cylinder barrels are air-cooled, but the cylinder heads are liquid-cooled. The intention is to improve the cooling and stabilise the temperature around the region of the engine most susceptible to extremely high temperatures, i.e. the area around the valves. The concept works very well.

The two best-known examples of this type of engine flying in Australia are the Rotax 912 and 914, respectively normally-aspirated and turbocharged versions of a geared flat-4 design. The engines turn at 5,800 RPM at full throttle, producing 2,470 RPM at the propeller after passing through the 2.27:1 reduction gearbox. Both engines have proven to be reliable.

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12.5. Propellers

12.5.1. Fixed Pitch Propellers

This is the most common type of propeller fitted to glider tow planes. It has the advantage of simplicity, relatively low cost and ease of operation. The disadvantage is that it has to be carefully pre-selected for its intended job.

For glider-towing, a fine pitch propeller is usually fitted to the tow plane, as we are interested primarily in climb performance. For our purposes, a propeller which produces something within about 10% of maximum RPM at about 65 knots at full throttle on the climb is close to ideal.

12.5.2. Variable-pitch and constant-speed propellers

A variable-pitch propeller is a type of propeller with blades that can be rotated around their long axis to change the blade pitch. A constant-speed propeller is a variable-pitch propeller which automatically changes its blade pitch in order to maintain a chosen rotational speed. These types of propeller allow fine pitch to be used for the climb and a coarser setting for the descent.

12.6. Hand-Swinging Propellers

While accepting that for certain vintage aircraft hand starting is the norm, attempting to start an aeroplane engine by hand-swinging the propeller is extremely hazardous. Therefore, before attempting to hand-swing it is vital that one has received proper instruction from a suitably experienced person before attempting the task oneself. It is, however, important that swinging should not be attempted if the AFM, Maintenance Manual or Pilot's Operating Handbook advises against it, so these should be consulted beforehand. Some of those may provide useful guidance, such as the appropriate magneto, mixture and/or priming selections for the operation.

Unless the pilot or otherwise qualified person is sitting in the cockpit with direct control over the throttle and brakes (if fitted), the aircraft may move forward out of control. Brakes may fail, so chocks are a useful alternative/addition. However, a possibly greater danger is posed by the ignition system of virtually all light aeroplanes. Because a broken earth wire in the system will prevent the magneto current running safely to earth when not required, it is always possible that the engine may spark into life at any time if the propeller starts to move (or if an ignition switch is moved). When touching a propeller, or moving any part of one's body within its rotation disc, you must always expect that to happen. "Always treat a prop as live!"

Remember also that if hand-swinging is required due to a flat battery, it takes a long time for an engine to re-charge a battery and in the event of an engine or alternator problem in flight all electrical power is likely to be lost very rapidly. It is much better to delay the flight and remove the battery for re-charging on the ground.

Recommended Viewing: CASA Safety Video – Prop Swinging

WARNING: PROP SWINGING IS A DANGEROUS ACTIVITY. IF YOU HAVE NOT BEEN TRAINED BY SOMEBODY EXPERIENCED IN THE ART OF PROP SWINGING, DO NOT DO IT!

12.7. Cowl flaps

These may be fitted to some aircraft types as an aid to controlling engine cooling and prolonging engine life. They may be fitted externally (e.g. Cessna 180, IMCO Callair) or internally (e.g. modified Pawnee). As a general rule, they are fully opened for the climb and fully closed for the descent.

They are somewhat easy to forget in the busy task of glider-towing, and this error may be either one of forgetting to open them for the climb, or to close them for the descent. Of the two, forgetting to open for the climb is the most likely to cause the engine to overheat.

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12.8. Fuel Requirements, Avgas and Mogas

Most of the aircraft engines fitted to glider tow planes are very basic versions of a common engine type. They are low compression carburetted engines.

Some of these low-compression aircraft engines have a Supplemental Type Certificate (STC) for the use of motor-car gasoline (MOGAS). The STC must be carried in the aircraft at all times when MOGAS is used.

12.9. Ropes, Rings and Weak-Links

12.9.1. Ropes

Ropes are usually of polypropylene or polyethylene, both of these materials being adequately strong and with enough elasticity to give a good ride for the glider pilot without excessive stretch of the rope. Nylon is not satisfactory, as it is too stretchy. Natural fibre (sisal) rope works OK, but lacks durability, in particular abrasion resistance. Wire rope should not be used.

The most common diameter for aerotow ropes is 10mm, which gives a very strong rope with good resistance to abrasion. 8mm rope is strong enough for aerotowing use when new, but wears rather rapidly and thus loses strength.

Splices are ideal for joining pieces of rope together or for making the looped ends into which the rings are inserted. Splices retain most of the rope's original strength. However, splicing is something of a dying art and a relatively small number of people know how to do it properly.

Bowline knots are often substituted for splices at the ends of ropes. These have the advantage that they allow easy replacement of rings and the knots can be easily re-tied if worn by abrasion. Abrasion can be considerably reduced by protecting the bowline with half a squash-ball pushed over the knot. A bowline knot reduces the ropes strength by about 15%.

The recommended minimum length for an aerotow rope for general use is 55 metres plus or minus 5 metres. To remind you why it is in your interests to adhere as strictly as possible to this length, refer back to the section on tow plane upsets. For a number of reasons, mostly related to abrasion and the occasional fence-strike, ropes tend to get shorter before they wear out completely. Tow pilots should watch out for this and refuse to tow with ropes which have become too short, say under 50 metres in length.

Apart from the short rope of a dual-towing pair, a rope shorter than the minimum length may be used for special purposes. Examples of special purposes may be for outlanding retrieves (to increase effective field length) or for towing through extreme turbulence such as wave rotors (to keep both aircraft in the same air mass). Needless to say, such activities will only be tackled by tow pilots of considerable experience and pilots involved in these activities will be very much on the ball to release the rope at the first sign of real trouble.

WARNING: ALL 'POLY' ROPES SUFFER FROM UV DETERIORATION AND TOW PILOTS SHOULD ENSURE THAT ROPES ARE NOT LEFT OUTSIDE AFTER FLYING.

12.9.2. Rings

Tost rings, one oval and one round, must be used in Tost releases and Ottfur rings in Ottfur releases. There are a few tow planes in Australia that use McFarlane/Schweitzer type release mechanisms. These hooks must only use the rings approved by the manufacturer. The type of release fitted is described in the AFM towing supplement.

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NOTE: The latest Tost rings have a slightly larger cross section than those previously sold, and can cause problems on latch type releases if side load is applied. These should not be used at the tow plane end, if anything other than a Tost release is fitted.

McFarlane/Schweizer

TOST

Ottfur

12.9.3. Weak links

Weak links are fitted to aerotow ropes for the protection of both the sailplane and the tow plane. Apart from the Piper Pawnee 235, which specifies a maximum weak link strength of 750 kg, most other tow planes limit the weak link maximum strength to 450 kg.

A sailplane TCDS which specifies a weak link strengths greater than 450 kg must be satisfied with a weaker link than they really need in order that the tow plane may retain its protection. If a stronger weak link than 450 kg is fitted in order to satisfy the sailplane, the tow plane's protection is lost.

If only one weak link is fitted to an aerotow rope, it is fitted at the tow plane end. This retains the protection in the event of the tow plane inadvertently snagging the rope on an obstacle on the final approach. Better to break a weak link than pull the tow plane out of control.

NOTE: a tow plane fitted with a TOST tow rope retraction system will have the weak link fitted at the sailplane end.

Sailplanes requiring a weak link less than 450 kg must replace the 450 kg weak link fitted at the tow plane end with the required rated weak link. An alternative approved method is leaving the 450 kg link at the tow plane end and adding the appropriate weak link at the sailplane. It is however recommended that the GFA preferred method is using the one appropriately rated weak link at the tow plane end.

It is essential the tow pilot inspects the weak link and tow rope for serviceability before the day's operation and also after being subjected to a high jolt or load. It is also required that when that weak link fails, the reserve link must be replaced due to the load sustained on that reserve link.

For tow planes, the weak link requirement will be found in the AFM towing supplement. For sailplanes, this information is found in the TCDS, the sailplane AFM, and cockpit placards.

12.9.3.1. TOST Weak Link System

The TOST weak link system is an engineered and approved system which prevents aircraft overloading in winch, autotow and aerotow operations. By using this system, the operator is assured of maintaining manufactures airworthiness requirements assuring protection to both tow plane and sailplane.

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TOST weak links are colour coded and are available for loads from 80 to 1000 daN with a tolerance of 10%. For conversion from daN to kg, 80 daN equals approximately 80Kg.

The GFA recommends clubs and operators use the TOST reserve insert and sleeved weak link system. This uses two weak links in parallel protected by a steel sleeve. Both weak links have attachment holes at each end and are 8 mm in length. The reserve has oval attachment holes and carries no load in normal operations. If the load exceeds the rating, the weak link will fail and the reserve link will take up the load. If the load is more than a momentary jolt both weak links will fail.

12.9.3.2. TOST Operating Notes

Replace the weak link insert as soon as damage is visible (e.g. necking). Weak link should always be replaced after 200 launches – an insert is a lot cheaper than an interrupted launch

- Replace the weak link insert also after obvious overloading.
- Use the protective steel sleeve
- Use only the correct shackles with special screws of defined shaft length to prevent twisting of the weak link and the steel sleeve leading to an increase in the breaking load
- Never use two equal inserts, e.g. both weak links with round holes would double the breaking load.

Protective sleeves protect the weak link against

- Deformation and thus uncontrolled change of breaking load
- Other damage
- Premature wear and tear
- Protective sleeves are available in single or reserve sizes.

TOST steel sleeves have an inspection hole which lets you check quickly whether you are using the correct weak link (colour), and whether, in the case of the reserve-insert weak link, both inserts are still intact. TOST also offer connectors of different types for winch and autotow applications.

The pilot must ensure that the weak link is the rating that protects the tow plane and the sailplane. It must meet the requirement specified in the AFM and the Approved Towing Supplement.

12.9.3.3. Rope Weak links

There are some clubs in Australia who still opt for the old traditional practice of using a small piece of 6-8mm rope inserted between the main rope and the rings at the tow plane end. The nominal strength of a piece of 8mm with a bowline in it is about 580kg, but quality control on poly ropes is imprecise and there could be wide variations. Because most of the bulk sales of this rope are to either the fishing or telecommunications industry (guy ropes), it is commonly over-strength, as these industries have little interest in weak ropes.

CAUTION: The use of 6-8mm rope as a weak link is not acceptable unless the rope has been tested to determine the breaking strain is within the specified tolerances. Local TAFE colleges may be able to assist with testing.

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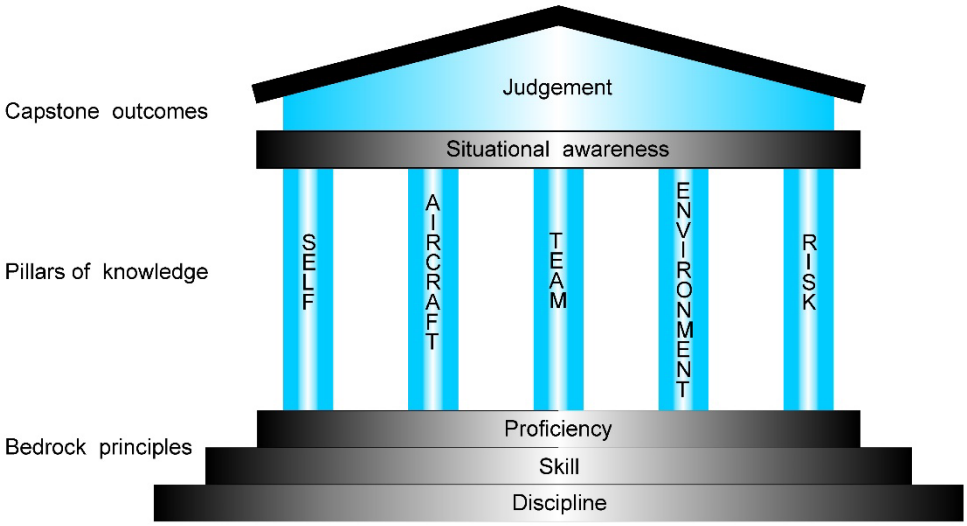
13 HUMAN FACTORS

Pilots must be self-analytical as to their standard of health for flying. Pilots must avoid excessive alcohol consumption and ensure adequate rest when they know they will be flying the next day. Towing operations are intense and require a high level of concentration. Flights are short, with a high workload, often in turbulent conditions exposed to summer heat and busy CTAF activity. Regular breaks are recommended if there is only one tow plane pilot rostered on for the day. The following is a guide to pilots, which should be applied to them to take stock of their physical well-being before stepping into the tow plane

13.1. Airmanship

There are three fundamental principles of expert airmanship: skill, proficiency and the discipline to apply them in a safe and efficient manner. Beyond these fundamental principles, expert pilots have a thorough understanding of their aircraft, their team, their environment, their risks and themselves. With all of these elements in place there is the best opportunity to exercise consistently good judgement and maintain a high state of situational awareness. Total airmanship blends technical and tactical expertise, proficiency, knowledge, skills and attitudes.



Dr Tony Kern's 'Bedrock' approach to airmanship

Dr Tony Kern's 'Bedrock' approach to airmanship

13.1.1. Bedrock principles

The foundations of the structure are the 'Bedrock Principles' consisting of three foundation stones.

Discipline. This is about respecting and applying standard operating procedures, standards, regulations, unless emergency circumstances dictate otherwise.

Skill. This is developed by knowledge, demonstration and practice. Flying must be continually practised to maintain the skill. This can be in the aircraft, the simulator or any ground-based flight training device. Competence will quickly diminish without practice.

Proficiency. Practice and repetition are the key drivers towards competent proficiency. It is more than just clocking up logbook flight hours. Seek to obtain quality, not just quantity.

Once the foundation is firmly established the pillars of knowledge can be erected.

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13.1.2. Pillars of knowledge

There are five 'pillars of knowledge':

Self. This is about knowing your own limitations and having the preparedness to assess and analyse your own flying performance.

Aircraft. This is having a thorough knowledge and understanding of the aircraft, its systems and components, speeds and limitations, including the airworthiness status and all maintenance requirements.

Team. A thorough understanding of what it means to be operating in a team environment, whether it's the ground crew, airworthiness, operations or your Club.

Environment. This includes the physical, regulatory, and organisational elements that you operate within, not just the weather.

Risk. This involves gathering information, and making an assessment, and then a considered decision, based on your knowledge, previous experience and common sense to pursue the safest, least-risk option. You will be required to judge and evaluate the amount of risk you (and your crew/team) are prepared to accept to achieve your goal.

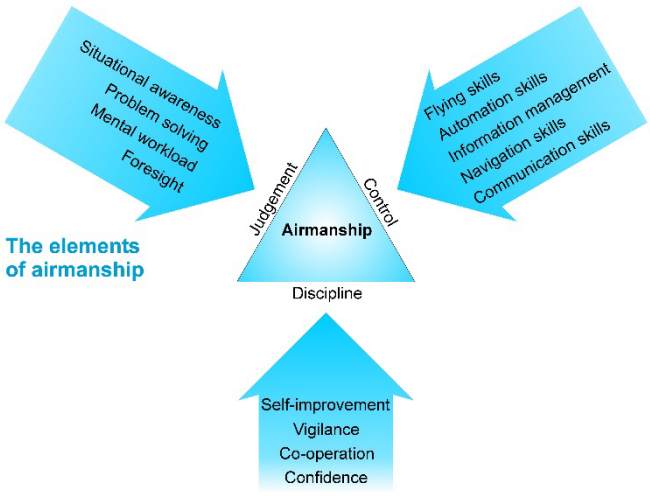
The final structure which covers all the previous building blocks and could be thought of as the pinnacle of this 'airmanship building' - the 'capstone outcomes'.

13.1.3. Capstone outcomes

Capstone outcomes consist of:

Situational awareness. Any pilot is required to have situational awareness. You need to have enough spare mental capacity to be able to take in all the things occurring around you such as: weather, traffic, navigation, aircraft serviceability/defects, what the aircraft is doing and where you want it to go and how you will accomplish that (aviate, navigate, communicate), flight record keeping, potential hazards, terrain and so on, so that you can formulate plans and keep ahead of the aircraft.

Judgement. This can also be referred to as decision making. Using good judgement and making the right decisions are essential to leadership and vital to the safe conduct of any flight. Judgement is used in the broadest sense to emphasise the need for the pilot to make conscious, intuitive, timely and well-founded decisions.



Ebbage and Spencer, Airmanship training for modern aircrew

Ebbage and Spencer, Airmanship training for modern aircrew.

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13.1.4. Guidelines for good decision making

A simple way to remember the guidelines of good decision making is to employ the AVIATE acronym:

A Assess the problem

V Verify information

I Identify solutions

A Anticipate consequences of decisions

T Talk to others regarding decision and rationale

E Evaluate decisions.

Control is used as a reminder to maintain control of an aircraft whilst evaluating a situation, and to execute a planned course of action with precision and accuracy — many good judgements are undone by failures in execution.

Discipline is needed to detect potential errors at the earliest opportunity and to formulate considered judgements and execute controlled actions. The foundations of airmanship are built on a specific set of knowledge, skills and attitudes.

Pilots should ask themselves: '*Am I maintaining a disciplined approach to all procedures—pre-flight, in-flight and post-flight? If I am not, then why? Am I sacrificing discipline (and safety) to save a few dollars or a few minutes?*'

13.1.5. How to Improve Airmanship

Some examples of good airmanship:

- Look out the window when turning to check visually for traffic or visually acquire targets displayed on your FLARM display. In other words, don't just blindly rely on FLARM and radio. The same goes for weather avoidance - look outside and manoeuvre visually around build-ups if possible.
- If there is any doubt - there is no doubt.
- Do not blindly follow standard operating procedures or operations manuals if that course of action will result in greater risk and reduced safety. Standard operating procedures are usually written for routine and standard conditions. If you experience an unusual situation it may be better to do something slightly different (but safer). Of course this should not give you licence to disregard standard operating procedures unilaterally - you need to have a justifiable reason for pursuing an alternative course of action.

Think ahead and have a plan for when things might go wrong. This is about applying basic threat and error management skills, discussed at section 13.2. For example, while you may be waiting for take-off as the crew is getting ready for launch mentally review the actions you would take in the event of a rejected take-off. What might you do in the event of a time critical emergency such as an engine failure?

Treat every landing as a go-around, so that on the day you have to do one for real, you can execute it flawlessly. Strive for excellence in your aviation skills and display leadership for both your subordinates and superiors. Prepare for each and every flight you conduct. Ensure you have good technical knowledge of your aircraft and its systems.

A pilot exhibiting good airmanship will understand the limit of his capabilities and abide by a 'personal minimums checklist'. Checklists ensure you do not just take a brief stock of your personal situation and overlook complicated situations and multiple stressors and simply forge ahead. This behaviour at the least can lead to

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added stress during the flight, and at worst can lead to a mishap—precisely why having a checklist is important.

13.2. Risk Management

Threats and errors occur during every flight, so threat and error management must be integral to every flight, and includes anticipation of potential threats and errors as well as planning of countermeasures. Also included must be the identification of potential threats, errors and countermeasures in the self-briefing process at each stage of flight, and avoiding becoming complacent about threats that are commonly encountered (e.g. weather, traffic, terrain etc.). Ineffective threat and/or error management may lead to compromised situations and reduce margins of safety and are often considered the last stage before an incident or accident.

Threats are generally defined as events or errors that occur beyond our influence, increase operational complexity, and which must be managed to maintain the margins of safety. Threats can be external (e.g. weather, other gliders or aircraft) or internal (e.g. stress, fatigue, complacency, overconfidence, etc.).

Errors are generally defined as actions or inactions by the pilot that leads to deviations from organisational or operational intentions or expectations, reduced safety margins and an increased probability of adverse operational events occurring on the ground and during flight. Unmanaged and/or mismanaged errors frequently lead to undesired states.

Undesired states are generally defined as operational conditions where an unintended situation results in a reduction in margins of safety. An undesired aircraft state can result from pilot induced aircraft position or speed deviations, misapplication of flight controls or incorrect systems configuration associated with a reduced margin of safety.

One common false assumption is that errors and violations are limited to incidents and accidents. This is incorrect - errors and violations are quite common in flight operations, and many are identified and corrected by the pilot (e.g. through the use of check lists).

Threat and error management is of greater importance to glider towing than probably most other operations the aspiring tow pilot has been involved in before. Some examples below are:-

- People on the runway in close proximity to a rotating propeller retrieving the tow line.
- Lower climb performance of combination, more susceptible to downdrafts.
- Decreased manoeuvrability of whole combination.
- You are PIC for whole combination while on tow resulting in higher workload that, can divert attention away from good lookout and airspeed monitoring.
- Distractions, be vigilant, disciplined. Carb heat, fuel management and flaps.
- Time pressure - on the ground (including Launch delays) and in flight;
- Flying in close proximity to other gliders;
- Additional psychological factors, such as optimism bias, overconfidence, or peer pressure.

Strategies for managing threats and errors include:

- Follow normal operating procedures diligently.
- Don’t succumb to time pressure.
- Always fly the aircraft first.
- When fatigued be more careful and conscientious.
- After interruptions, say “Where was I?”
- Always carry out a Situation Awareness review after a period of high workload.
- Set limits and stick to them – particularly with respect to outlanding retrieve decision making.
- Don’t “see what you expect to see” – look for errors.
- Listen to “that little voice” that questions what you are doing.

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Acknowledging your vulnerability to mistakes is actually a sign of strength. In flying, you never stop learning. Every flight, whether you have 50 hours, 500 hours, or 15,000 hours, presents us with the same threats that must be recognised and managed.

On every single flight you need to ask:

- What are my threats today?
- Am I taking unnecessary risks here?
- How will I manage and mitigate the threats I identify?

13.3. I'M SAFE!

I

Illness. We must be free of illness. Most illnesses affect our primary senses and have the potential to cause visual problems and/or balance problems and therefore orientation problems. Ears and sinuses must be clear of congestion to cope with the pressure changes that occur with all flight. Our limbs and muscular system must be fully functional to allow normal control. Don't be tempted to fly too soon after any illness.

M

Medication. Most over the counter medications are not designed with pilots in mind. They work perfectly well on the ground but may have hazardous side effects for pilots. The most common undesirable effects are drowsiness and suppression of primary senses. Check with an Aviation Qualified doctor that any medication you are taking is safe for use as a flying pilot...not just a passenger.

S

Stress. There is an optimum amount of stress for humans. Too much and we suffer undesirable side effects like forgetfulness and irrational decision making...not good in an aeroplane! Don't think going flying is an escape from the stress in your life, especially glider towing; it is supposed to be relaxing but you must start free of stress so you can handle anything that pops up during your flying. When flying, remember that the environment we operate in can be very stressful in terms of heat and cold, so dress appropriately.

A

Alcohol or Drugs[4]. Similar to driving, make sure you are not vulnerable to the side effects of alcohol or drugs. They are particularly bad news for our balance system and erode our judgement and decision making performance. Don't fly with a hangover - and remember, the permitted alcohol level is a concentration of less than 0.02 gms of alcohol in 100 mls of blood (or a concentration of less than 0.02 gms of alcohol in 210 litres of breath).

F

Fatigue. Most of us will be well aware of our degraded personal performance when tired. Towing is a demanding exercise both physically and mentally so we must be well rested, as sleeping on the job can be disastrous!

E

Eating and fluid intake. We are what we eat...eat well and we fly well, eat badly and we fly badly. Ensure you have eaten well and take some food along to eat during the day. ***Take sufficient fluids to avoid dehydration*** and remember the symptoms of dehydration like a dry mouth and lips, and a dull headache. In hot flying conditions fluid replacement may need to be up to 600mls of water per hour! This situation is made worse by intense concentration and continual aircraft handling.

13.4. Pilot Fitness

13.4.1. Dehydration

The tow plane cockpit can be a hot workplace. At the height of a summer's soaring day the tow pilot is working relentlessly in high temperatures. The tow pilot can get

[4] Refer CASA's Drug and Alcohol education resources.

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some relief during the high speed descent, but this is short-lived and the temperatures build again during the turn around on the ground and the grinding climb back out.

Say the air temperature at ground level is 25°, and the average tow is only to 2000', there is no discernible drop in air temperature at the top of the climb - it will still be about 21° outside. Added to this, the tow pilot is sitting behind an engine that is working very hard all day and is pumping out heat that cannot be totally diffused.

The tow pilot is constantly working, both mentally and physically, in this situation and as a result will be losing body fluids at a high rate. It is essential that fluids be replaced during the day to ensure pilot comfort, low stress and good decision making. As previously mentioned (see "I'M SAFE") it may be necessary to replace fluids at a rate of up to 600mls per hour!

Wear a hat to protect the head from long periods of sunlight. Some tow planes have a clear panel over the cockpit that can expose the pilot to radiated heat. Baseball caps are not a good idea since they don't shield the ears and neck, and the big peak obscures upward vision

13.4.2. Rest

It is advisable to take breaks during the day. This will vary from pilot to pilot, however tow pilots are often put under pressure by the gliding operation to keep flying when they would far rather take a break. Tow Masters are encouraged to anticipate this problem and ensure enough pilots are rostered so that no one pilot is forced to fly longer than would be considered sensible.

Take advantage of refuelling time to refuel the body as well. Take a drink, eat something and take a comfort stop if required.

13.4.3. Carrying an Illness

Most ailments such as coughs and sore throats do not present a major risk. With time and rest they will cure themselves. If symptoms persist, it is advisable to see a doctor. If medication is prescribed, ensure the doctor is aware that you are a pilot and discuss any ramifications the medication may have on your ability to fly.

Colds and sinus infections can be a problem for pilots because they are usually associated with blocking of the Eustachian tubes, which will make it difficult or impossible for pressures in the eardrum to be equalised. This can affect balance and lead to a burst eardrum when the air cannot enter the Eustachian tubes during descent.

Many common ailments have a side effect of making the pilot feel drowsy and "not on their game". These feelings can be compounded by the use of typical medications, which are designed to alleviate the symptoms. Reaction times slow and more time is required for decision making than when the pilot is fully fit.

It is recommended that the pilot stand down from flying duties until the illness passes and the pilot is absolutely confident that there are no residual effects. The pilot should not start flying again until it is assured that the Eustachian tubes can be cleared - the pilot can "pop" the ears. The 'Valsalva' technique can be used to test this. When a small pressure differential is present, pinch the nose and force air through the throat until the ears clear.

13.5. Vision

Maintaining an efficient lookout is essential for a tow pilot for a number of reasons:

- The airspace around a gliding site is often congested. Gliders will be seeking an initial climb near the airfield before starting out on a cross-country soaring flight, so they can

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land back for another launch if unsuccessful on the first attempt. Training gliders will stay close to the airfield to maximise their altitude for training exercises.

- With a glider on tow, the combination is not very manoeuvrable. Lookout is the best defence against having to take last minute avoidance action.
- Gliders do not follow much rhyme or reason when attempting to find lift. Unlike a powered circuit, gliders can be expected to appear from anywhere at any altitude.
- Gliders do not present a very big frontal profile. Unless they are turning, they can be extremely difficult to spot.

It takes at least 1.5 seconds for the process of detecting, seeing and recognising to occur. This time can be longer if the eyes have to adjust for the effects of glare and contrast, so the time is rounded up to 2 seconds.

13.5.1. Blind Spots:

Rods and cones transmit their information to the brain via small nerves that are connected to a central nerve, called the optic nerve. The optic nerve departs the eye at the back of the retina, and at this point there is nowhere for rods or cones. Because of this, the eye has a “blind spot”.

The aircraft also creates blind spots. Windscreen post-blind spots combine with the eye’s blind spots to increase the area that is not seen by the eye. These blind spots can only be overcome by a good scanning technique.

13.5.2. Sunglasses:

Pilots should always wear a good quality pair of sunglasses that comply with Australian standards. There is no need to spend a fortune on sunglasses as price does not necessarily relate to quality or standards, however cheap, plastic models are known to have poor optics and should be avoided. Sunglasses are protection from the sun’s UV and glare, which can overload the eye and cause a moment of blindness, not to mention discomfort and long term damage.

It is important that the sunglass frames do not contribute to blind spots and fit well with aircraft headsets. Use sunglasses that cover the field of vision of the eyes.

13.5.3. Windscreens:

Keep the windscreen clean at all times. Dirty or scratched windscreens further restrict the pilot’s ability to see and recognise other aircraft. Always clean the windscreen using vertical strokes, not horizontal or circular motions and place a cover across the windscreen when the aircraft is stored, if it is not hangared, as the sun’s UV damages Perspex and Plexiglas over time.

13.5.4. Corrective Lenses:

Corrective lenses (glasses or contact lenses) must be worn in accordance with the conditions on a tow plane pilot’s flight crew licence medical certificate

13.6. Cognitive Tunnelling

In Human Factors literature the term tunnel vision is generally related to the loss of peripheral vision due to the effects of ‘g’ forces on the cardiovascular system. Another form of ‘tunnel vision’, cognitive tunnelling, occurs when the observer is too focused on one object and not on the whole environment. It usually occurs when a person is under stress and describes a process of attentional, rather than visual, narrowing. In the presence of an attentionally demanding primary task, the mind’s allocation of residual capacity to perceptual monitoring decreases as levels of arousal increase. Or to put it another way, the mind’s capacity to deal with intuitive, fast-thinking tasks and judgements is often impaired by high workload, analytical, slow-thinking tasks and judgements. This in turn impairs time management, workload management and situational awareness.

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Wickens and McCarley (2008) note that there are four primary forces that move the attention of a skilled person to selectively attend or sample sources of information:

- salience (target conspicuity factors);
- effort (the amount of cognitive and physical effort it requires to switch attention to and search for the relevant stimulus, and the amount of spare effort available due to other tasks being conducted);
- expectancy (extent that a particular stimulus is expected to occur or be present at a particular time and place);
- value (importance of the stimulus to the person's tasks at that time).

In a fast-changing, time-limited, complex sensory environment, the mind's ability to prioritise inputs and make appropriate responses may be reduced in a high-effort, stressful situation. Fixation and cognitive tunnelling are more likely in these circumstances; early contingency planning and prioritisation of options are therefore important.

Although collision hazards such as trees in close proximity would have high importance, the effects of low expectancy and low value can mean that an imminent collision problem may not be detected.

Pilots need to take particular care when flying in a competition environment or close to the ground, where workloads are high, time and energy budgets are reduced and the margins for error are low.

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APPENDIX 1 – APPLICATION FOR INITIAL GLIDER-TOWING ENDORSEMENT

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Fixed Wing Aeroplane Hours (including RAAus):		Gliding Hours:

C **Competent** in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: A Glider Towing Endorsement must not be issued until the candidate has demonstrated competency in all elements listed below

INITIAL GLIDER TOWING ENDORSEMENT ELEMENTS OF COMPETENCY

NORMAL PROCEDURES

GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual, Civil Aviation Legislation.	
Pre-flight inspection	
GFA Safety Management System	
Human factors for tow plane pilots	
Threat and Error Management for tow plane pilots	
Situational Awareness and use of radio	
Assessing take-off performance using published information	
Tow Ropes and Weak Links	
Glider speeds and wing-loading variations.	
Pre-launch traffic separation, hook-on, observation of signals and taking-up slack.	
Ground-run and directional control.	
Use of correct take-off technique and grading of initial climb.	
Selection of suitable climb-out path.	
Monitoring mirrors.	
Positive lookout and clearing aircraft's blind spots during climb.	
Accurate attitude and speed control in straight flight and turns.	
Maintaining stable platform with glider out of position.	
Executing appropriate towing pattern taking into account: wind, sun, lift/sink, airspace requirements, tow plane/glider performance and instructor/pilot briefing.	
Positively confirming release of glider before commencing descent.	
Correct engine handling during initial descent phase.	
Positive lookout and clearing aircraft's blind spots during descent.	
Maintaining correct IAS and RPM during descent.	
Correct circuit join, and traffic separation including appropriate radio calls.	
Normal approach and landing with rope attached.	

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ABNORMAL PROCEDURES

Stop signal during take-off run.	
Managing the non-manoeuvring area	
Partial power-failure during take-off run.	
Glider airbrakes open in flight (rudder waggle).	
Engine failure below 500' AGL	
Emergency release (wing waggle).	
Glider unable to release.	
Cruising on tow.	
Descending on tow.	
Landing on tow (optional).	

GENERAL REMARKS (If any)

.....

.....

.....

DECLARATION BY GLIDER TOW PILOT EXAMINER

The applicant has been trained and assessed in glider-towing operations in accordance with the GFA Aerotowing Manual. I have examined the applicant's logbooks and certify that he/she has logged the aeronautical experience recorded above.

I am satisfied that the applicant is **COMPETENT / NOT YET COMPETENT** (*delete as appropriate)* to act as PIC for the purposes of towing a glider and has a the required understanding of all normal and abnormal procedures and limitations for glider-towing operations in accordance with the GFA Operational Regulations, the Manual of Standard Procedures, the GFA Aerotowing Manual and Civil Aviation Legislation.

Examiner's Signature: ..... Date: .....

Name: .....

Pilot Licence: Type: ..... ARN: .....GFA No: .....

PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for the issue of a GFA Glider Towing Endorsement.

Pilot's Signature: ..... Date: .....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Examiner.

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APPENDIX 2 - APPLICATION FOR DUAL TOWING ENDORSEMENT

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Fixed Wing Aeroplane Hours (including RAAus):		
Total Towing Hours:	No. Tows	Total Gliding Hours:

C **Competent** in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: A Dual Towing Endorsement must not be issued until the candidate has demonstrated competency in all elements listed below

Note: There is no in-flight assessment required for this approval.

DUAL TOWING ELEMENTS OF COMPETENCY

Human factors for tow plane pilots	
Threat and Error Management for tow plane pilots	
GFA Safety Management System	
Knowledge of basic requirements for dual towing.	
Knowledge of AFM / POH and aircraft performance charts	
Knowledge of minimum rope-length requirements.	
Knowledge of pre-take-off glider placement.	
Knowledge of all applicable launch emergencies.	
Received specific briefing prior to carrying out a dual tow.	

DECLARATION BY GLIDER TOW PILOT EXAMINER

The applicant has been trained and assessed in dual glider towing operations in accordance with the GFA Aerotowing Manual. I have examined the applicant's logbooks and certify that he/she has logged the aeronautical experience recorded above.

I am satisfied that the applicant is **COMPETENT / NOT YET COMPETENT** (*delete as appropriate)* to act as PIC as a glider tow pilot for dual tow operations and has a the required understanding of all normal and abnormal procedures and limitations for dual glider towing operations in accordance with the GFA Operational Regulations, the Manual of Standard Procedures, the GFA Aerotowing Manual and Civil Aviation Legislation.

Examiner's Signature: ..... Date: .....

Name: .....

Pilot Licence: Type: ..... ARN: .....GFA No: .....

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PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for the issue of a GFA Dual Towing Endorsement.

Pilot's Signature: ..... Date: .....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Examiner.

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APPENDIX 3 - APPLICATION FOR OUTLANDING RETRIEVE ENDORSEMENT

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Fixed Wing Aeroplane Hours (including RAAus):		
Total Towing Hours:	No. Tows	Total Gliding Hours:

C **Competent** in in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: An Outlanding Retrieve Endorsement must not be issued until the candidate has demonstrated competency in all elements listed below

OUTLANDING RETRIEVE ELEMENTS OF COMPETENCY

GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual, Civil Aviation Legislation.	
Human factors for tow plane pilots	
Threat and Error Management for tow plane pilots	
GFA Safety Management System	
Knowledge of CASR 91.410 and AC 91-02 with respect to outlanding retrieves.	
Demonstration of ability to carry out aerial inspection of a selected paddock to determine whether or not a glider could be towed from it.	
Execution of precautionary inspection(s) and dropping rope before landing	
Execution of safe take-off (at home base), towing a glider, without ground-crew and using agreed signals for launch commands.	
Knowledge of obligations to landowner.	
Knowledge of daylight/darkness graphs and conversion of arc to time.	
Demonstration of cruising on tow and knowledge of fuel consumption of tow plane/glider combination at cross-country towing speeds.	

DECLARATION BY GLIDER TOW PILOT EXAMINER

The applicant has been trained and assessed in outlanding glider retrieval operations in accordance with the GFA Aerotowing Manual. I have examined the applicant's logbooks and certify that he/she has logged the aeronautical experience recorded above.

I am satisfied that the applicant is **COMPETENT / NOT YET COMPETENT** (*delete as appropriate)* to act as PIC as a glider tow pilot for the purpose of towing a glider from an unmarked area (outlanding retrieval) and has the required understanding of all normal and abnormal procedures and limitations for glider-towing operations in accordance with the GFA Operational Regulations, the Manual of Standard Procedures, the GFA Aerotowing Manual, Civil Aviation Legislation and Land Owner permission.

Examiner's Signature: ..... Date: .....

Name: .....

Pilot Licence: Type: ..... ARN: .....GFA No: .....

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PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for the issue of a GFA Outlanding Retrieve Endorsement.

Pilot's Signature: ..... Date: .....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Examiner.

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APPENDIX 4 - APPLICATION FOR COMPETITION ENDORSEMENT

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Fixed Wing Aeroplane Hours (including RAAus):		
Total Towing Hours:	No. Tows	Total Gliding Hours:

C **Competent** in in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: A Competition Endorsement must not be issued until the candidate has demonstrated competency in all elements listed below

COMPETITION TOWING ELEMENTS OF COMPETENCY

GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual, Civil Aviation Legislation.	
Human factors for tow plane pilots	
Situational Awareness for tow plane pilots	
Threat and Error Management for tow plane pilots	
GFA Safety Management System	
Knowledge of CASR 91.410 and AC 91-02 with respect to operations at non controlled airfields and the safe use of a simultaneous multiple runway environments for both gliders and tow planes.	
Demonstrated knowledge of the use of the AFM or POH, including "P" Charts for the towing of multiple glider types and weights (with & without ballast) in a competition environment given the many and varied types and weights of gliders that might be launched that will significantly impact on the tug/glider combination's climb performance	
Fuel management - understanding of the effect on fuel consumption and engine parameters of a high intensity operating environment.	
Discuss in detail the execution of safe take-off, airfield and airspace management in a high workload and busy competition launch environment as more aircraft become active.	
Demonstrate a high standard of situation awareness particularly competition launch requirements, airfield and launch traffic patterns and high risk environments in the local airspace and the circuit. Able to discuss the critical elements of lookout and targeted scanning in areas of known and potential hazard.	
Demonstrate an understanding of the term 'tunnel vision', in particular 'cognitive tunnelling', which occurs when a pilot is overly focused on one object and not on the whole airspace environment (e.g. loss of situational awareness).	

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DECLARATION BY GLIDER TOW PILOT EXAMINER

The applicant has been trained and assessed as competent to act as PIC of a glider tow plane during competition glider towing operations in accordance with the GFA Aerotowing Manual. I have examined the applicant's logbooks and certify that he/she has logged the aeronautical experience recorded above.

I am satisfied that the applicant is **COMPETENT / NOT YET COMPETENT** (*delete as appropriate)* to act as PIC as a glider tow pilot for the purpose of towing a glider in gliding competitions and has the required understanding of gliding competition rules and guidelines, normal and abnormal procedures and limitations, human factors, situational awareness and threat and error management for competition glider-towing operations in accordance with the GFA Operational Regulations, the Manual of Standard Procedures, the GFA Aerotowing Manual, GFA Competition Handbook, and Civil Aviation Legislation..

Examiner's Signature: ..... Date: .....

Name: .....

Pilot Licence: Type: ..... ARN: .....GFA No: .....

PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for the issue of a Competition Endorsement.

Pilot's Signature: ..... Date: .....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Examiner.

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APPENDIX 5 - APPLICATION FOR TOW PILOT EXAMINER ENDORSEMENT

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Total Towing Hours:	No. Tows	Total Gliding Hours:

C **Competent** in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: A Tow Pilot Examiner Endorsement must not be issued until the candidate has demonstrated competency in all elements listed below

GLIDER TOW PILOT EXAMINER ELEMENTS OF COMPETENCY

GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual, Civil Aviation Legislation.	
Human Factors	
Threat & Error Management for Tow Plane Pilots	
GFA Safety Management System	
Principles of Adult Learning *(GFA Instructor's Handbook Part 1 – Instructor Training; or the applicants holds a Certificate IV In Work Place Training & Assessment, or a CASA issued Part 61 Instructor rating, or a RAAus issued Instructor rating).*	
Limitations of a Glider Towing Training Endorsement	
General Flying, lookout, Airmanship	
Voice Level, Manner, general communication	
Demonstrations using principals of Demonstrate, Direct and Monitor.	
Handover/takeover	
Assertiveness, Synchronisation	
Sound knowledge of Civil Aviation Legislation, the GFA MOSP & the GFA Aerotowing Manual.	
Clarity of explanations (Use of Patter)	
Fault analysis and providing feedback	
Briefing/debriefing (including use of White Board and Training Aids)	

DECLARATION BY GLIDER TOW PILOT DELEGATE

The applicant has been trained and assessed for the issue of a Tow Pilot Examiner Endorsement in accordance with the GFA Aerotowing Manual. I have examined the applicant's logbooks and certify that he/she has logged the aeronautical experience recorded above.

I am satisfied that the applicant is **COMPETENT / NOT YET COMPETENT** (*delete as appropriate)* to act as a Tow Pilot Examiner for the purpose of assessing and issuing glider towing endorsements and has the required understanding of all normal and abnormal procedures and limitations for glider-towing operations in accordance with the GFA Operational Regulations, the Manual of Standard Procedures, the GFA Aerotowing Manual, Civil Aviation Legislation.

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Delegate's Signature:..... Date: .....

Name:.....

Pilot Licence: Type:..... ARN: .....GFA No: .....

PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for the issue of a GFA Glider Tow Pilot Examiner Endorsement.

Pilot's Signature: ..... Date: .....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Delegate.

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APPENDIX 6 - APPLICATION FOR APPOINTMENT OF TOW PILOT DELEGATE

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Total Towing Hours:	No. Tows	Total Gliding Hours:

C **Competent** in all aspects of the competency to be demonstrated

NYC **Not yet competent**. Requires more training

NOTE: A GFA Tow Pilot Delegate appointment can only be made by the Executive Manager Operations on the recommendation of a GFA Regional Manager Operations. Tow pilot delegate appointments will be made at the discretion of the Executive Manager Operations in order to meet a GFA operational need.

GFA GLIDER TOWING DELEGATE ELEMENTS OF COMPETENCY

GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual, Civil Aviation Legislation.	
Human Factors	
Threat and Error Management for Tow plane Pilots	
GFA Safety Management System	
Principles of Adult Learning *(GFA Instructor's Handbook Part 1 – Instructor Training; or the applicants holds a Certificate IV In Work Place Training & Assessment, or a CASA issued Part 61 Instructor rating, or a RAAus issued Instructor rating).*	
Responsibilities and Limitations of a Tow Pilot Examiner appointment	
Demonstrated high standard of General Flying, Lookout, Airmanship	
Interpersonal qualities and Communications skills	
The ability to demonstrate all towing elements	
Handover/takeover	
Assertiveness, Synchronisation	
Sound knowledge of Civil Aviation Legislation, the GFA MOSP & the GFA Aerotowing Manual.	
Clarity of briefings and explanations	
Use of Training Aids and Fault analysis	
Delivers comprehensive briefing and debriefing	

PILOT ACKNOWLEDGEMENT

I have been debriefed on the assessment of my competency for appointment as a GFA Tow Pilot Delegate.

Pilot's Signature: ..... Date: .....

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REGIONAL MANAGER OPERATIONS RECOMMENDATION

I am satisfied that the applicant has leadership, instructional qualities and operational knowledge supported by a high level understanding of all normal and abnormal procedures and limitations for glider-towing operations as specified in the GFA Operational Regulations, the Manual of Standard Procedures and the Aerotowing Manual and Civil Aviation Legislation.

The applicant has demonstrated instructional ability to a high standard in the training of glider tow pilots in this Region and is recommended as competent for appointment as GFA Tow Pilot Delegate.

RM Operations Signature:..... Date: .....

Name:.....

Region:..... GFA No:.....

This assessment is to be forwarded to the GFA Operations Department by email to returns@glidingaustralia.org. A copy must also be kept by the Glider Tow Pilot Delegate.

OFFICE USE ONLY

Application approved/denied

EM/O Signature:..... Date: .....

Name:.....

If denied, record reasons hereunder:

.....

.....

.....

.....

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APPENDIX 7 – INITIAL TRAINING USING A SINGLE-PLACE TOW PLANE

The GFA recognises that not all gliding clubs have access to a dual place tow aircraft for the purposes of conducting glider tow pilot training. Where no dual place aircraft is available, a single place aircraft may be used providing the following requirements are met:

- The Tow Pilot Examiner must hold a GFA Level 2 (or higher) Instructor rating.
- The tow pilot candidate must be assessed as competent in the operation of the type of aircraft used by the club for aerotowing prior to commencing the aerotow training. This can be done by somebody other than the Tow Pilot Examiner e.g. the club's Tugmaster if different to the GFA Examiner, a CASA Grade 1 or Grade 2 Flying Instructor or a CASA Examiner.
- The tow pilot candidate must be a solo glider pilot in current practice.
- The tow pilot candidate must be a member of the sponsoring club and a current GFA member.
- The EM/O must have received a recommendation from the sponsoring club's CFI and Tugmaster, endorsed by the RM/O of the Region, confirming that access to a dual controlled tow plane cannot be reasonably arranged using the form at APPENDIX 8 - APPLICATION FOR SINGLE PLACE AIRCRAFT TOW PILOT TRAINING APPROVAL.
- Prior to the tow pilot's training commencing the RM/O must have received written approval from the EM/O.

Note: this aspect of the tow pilot candidate preparation is not about issuing a tail wheel endorsement or the glider towing endorsement. The club must be satisfied that the tow pilot candidate is competent in the operation of their tow plane before the candidate is sponsored by the club for assessment as a tow pilot.

Requirements

- A dual seat glider must be used for all tow pilot assessment exercises.
- The Tow Pilot Examiner will occupy the front seat of the glider, which is to be flown by a competent pilot experienced on type, to observe the tow pilot candidate.
- Both aircraft must be equipped with a serviceable VHF radio and are to remain in radio contact for the duration of each assessment flight.
- If radio communication is lost at any stage of the training flight the activity is to be terminated and the glider will release as soon as it is safe to do so (unless in an emergency).
- The Tow Pilot Examiner will brief all pilots and support crew involved in the assessment exercise prior to each flight and will similarly debrief each flight.
- The Tow pilot under training will be in command of the tow plane/glider combination while the tow pilot candidate is being assessed, but will follow all reasonable instructions issued by the Tow Pilot Examiner for the safe conduct of the assessment exercise unless there is an immediate threat to the safe operation of the tow aircraft. Method of Assessment

Method of Assessment

The tow pilot candidate must satisfy the Tow Pilot Examiner that they have the necessary underpinning knowledge of all theory elements in the Tow Pilot syllabus of training prior to commencing any of the following airborne exercises. Where practical, it is recommended that a "heavy" two place glider be used for the aerotowing exercises. A minimum of 5 assessment flights must be completed in order to assess the tow pilot candidate's competency in all aspects of the aerotowing syllabus of training as detailed in Section 8 of this manual. Do not move on until the tow pilot candidate has satisfactorily completed each phase.

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Training Flight Phases (Initial training using a single-place tow plane)

Phase	Exercise
One	**Prerequisite:** 1. The tow pilot candidate must satisfy the Tow Pilot Examiner that they have the necessary underpinning knowledge of all theory elements in the Tow Pilot syllabus of training prior to commencing any of the following airborne exercises. 2. The tow pilot candidate must be able to demonstrate to the Tow Pilot Examiner, while seated in the aircraft on the ground, a level of cockpit awareness (muscle memory[5]), such that they have the ability to control information and react appropriately and selectively to a "verbalised" simulated emergency (e.g. activate the glider release, demonstrate the signal for a glider to release while on tow, in an emergency, or locate and identify a critical flight instrument - oil pressure, cylinder head temp etc.). 3. The tow pilot candidate must be a current solo glider pilot. 4. Both aircraft must have a serviceable VHF radio and remain in contact with each other for the duration of each flying exercise. **Pre-Flight Briefing:** An aerotow launch will be flown to 2,000' AGL using the standard aerotow pattern for the airfield. The tow pilot candidate must ensure the towing combination is kept within safe gliding distance of the airfield at all times. This flight allows the tow pilot candidate to experience the uneventful aerotowing of a heavy glider and demonstrate to the Tow Pilot Examiner safe flight management at all stages of the launch. The Tow Pilot Examiner will assess the candidate's ability to adhere to the briefed launch profile, to manage traffic (if any) and to observe local procedures and noise abatement requirements (if any). Under no circumstances is the tow pilot candidate to attempt to thermal the tow plane/glider combination. The Tow Pilot Examiner will also monitor the tow pilot candidate's flight management, including: the tow pattern ensuring that it is flown as briefed; that speed control in the climb and attitude is well managed; the tow pilot candidate's demonstrations are as briefed; the stable platform for the release, decent, the circuit, radio procedures, and the tow pilot candidate's situational awareness in the air and on the airfield. The flight is to be repeated until the Tow Pilot demonstrates the activity to the satisfaction of the Examiner.
Two	**Prerequisite:** Satisfactory completion and debrief of flight one. Practical recall of all theory learnt and demonstration as appropriate. **Pre-Flight Briefing:** A standard aerotow launch to 2,000' AGL. The tow pilot candidate is to continue to demonstrate all the competencies of flight one. Once the combination is above 1,000' AGL the tow pilot candidate will demonstrate the signal for the glider pilot to check the glider's airframe (e.g. simulated airbrakes open). This exercise is to be repeated until an acceptable standard is demonstrated. When satisfied that the tow pilot's signal is of an acceptable standard and at a safe height above 1,000' AGL the Tow Pilot Examiner will open the glider's airbrakes to demonstrate the impact they have on the combination's climb performance. Upon satisfactory execution of this demonstration exercise and at the agreed height for release of the glider, the tow pilot candidate will give the emergency release signal to the glider pilot to immediately release. This signal must be actioned appropriately by the Tow Pilot Examiner. There is no such thing as a "simulated emergency" release

[5] The retention of motor skills is referred to as muscle memory. When first learning a motor task, movement is often slow, stiff and easily disrupted without attention. With practice, execution of motor task becomes smoother, there is a decrease in limb stiffness, and muscle activity necessary to the task is performed without conscious effort.

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	signal. The Tow Pilot Examiner will monitor the tow pilot candidate's flight management, including: the tow pattern ensuring that it is flown as briefed; that speed control in the climb and attitude is well managed; the tow pilot candidate's demonstrations are as briefed; the stable platform for the release, decent, the circuit, radio procedures, and the tow pilot candidate's situational awareness in the air and on the airfield. The flight is to be repeated until the Tow Pilot demonstrates all elements of the activity to the satisfaction of the Examiner.
Three	**Prerequisite:** Satisfactory completion and debrief of phase two. Continued demonstration of all competencies learnt in phases one and two, and practical, appropriate application of all theory learnt. **Pre Flight Briefing:** Standard aerotow launch to 3,000' AGL. Once the combination is above 1,000' AGL the Tow Pilot Examiner will demonstrate the actions of a glider pilot simulating that the glider is unable to release the tow rope (simulated hook-up). The tow pilot candidate will acknowledge the signal and complete the exercise as briefed with the glider in "high tow". The glider will remain in the high tow position for the remainder of the aerotow. Upon satisfactory execution of this exercise and at the agreed height for release of the glider the tow pilot candidate will give the emergency release signal to the glider pilot to immediately release. This signal must be actioned appropriately by the Tow Pilot Examiner. There is no such thing as a "simulated emergency" release signal. The Tow Pilot Examiner will monitor the tow pilot candidate's flight management, including: the tow pattern ensuring that it is flown as briefed; that speed control in the climb and attitude is well managed; the tow pilot candidate's ability to manage the simulated hook-up activity was as briefed and that the candidate responded as appropriate while maintaining a stable platform and constant climb attitude while compensating for the tendency of the tow aircraft to YAW; stable release, decent, the circuit, radio procedures, and the tow pilot candidate's situational awareness in the air and on the airfield.
Four	**Prerequisite:** Satisfactory completion and debrief of phase three. Continued demonstration of all competencies learnt in phases one, two and three and practical, appropriate application of all theory learnt. **Pre-Flight Briefing:** Standard aerotow launch to 3,000' AGL. Above 1,000' AGL and when safe to do so, the Tow Pilot Examiner will demonstrate "boxing the slipstream". If time permits this exercise may be repeated prior to reaching 3,000' AGL. When the combination is approaching 3,000' AGL, and in anticipation of the approaching cruise altitude, the tow pilot candidate will transition the combination to level flight by managing power and attitude (speed) while ensuring that the safe aerotow speed for the glider is stabilised as briefed (speed should not exceed +/-5kts). The Tow Pilot Examiner will assess the candidate's competency in managing the tow plane/glider combination's attitude, speed and heading. The tow pilot candidate will then position the tow plane/glider combination such that the glider is able to safely release at any time during the Aerotow. The exercise of boxing the slipstream and transitioning to level flight must be repeated until such time as the tow pilot candidate can competently demonstrate maintaining a stable platform while the glider is boxing the slipstream and the smooth transition to level flight with accurate and safe airspeed management. The Tow Pilot Examiner will monitor the tow pilot candidate's flight management, including: the tow pattern ensuring that it is flown as briefed; that speed control in the climb and attitude is well managed; the tow pilot candidate's ability to maintain a stable platform during the boxing of the slipstream and transition to level flight; stable release, decent, the circuit, radio procedures, and the tow pilot candidate's situational awareness in the air and on the airfield. If the Tow pilot Examiner has a need to maintain

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	station or aggressively manage slack in the rope by the use of airbrakes as a result of poor control by the Tow Pilot candidate, the flight is to be repeated until the Tow Pilot demonstrates the activity to the satisfaction of the Examiner.
Five	**Prerequisite:** Satisfactory completion and debrief of phase four. Continued demonstration of all competencies learnt in phases one, two, three and four and practical, appropriate application of all theory learnt. **Pre-Flight Briefing:** Standard aerotow launch to 3,000' AGL. When the combination is approaching 3,000' AGL, and in anticipation of the approaching cruise altitude, the tow pilot candidate will transition the combination to level flight managing power and attitude (speed) as briefed. When airspeed and attitude of the combination has stabilised as briefed (+/- 5kts) the tow plane pilot will commence descending the combination to 2,500' AGL while ensuring that the safe aerotow speed for the glider is stable and not exceeded during the decent. The tow pilot candidate will position the tow plane/glider combination such that the glider is able to safely release within gliding distance of the airfield at any time during the Aerotow. This exercise must be repeated until such time as the tow pilot candidate can competently demonstrate the smooth transition to level flight and the decent of the combination while maintaining a stable platform and accurate and safe airspeed management. The period of the launch between 1,000' and 2,500' may be used to repeat any of the flying exercises in flights 2 to 4 at the discretion of the Tow Pilot Examiner (e.g. boxing the slipstream, simulated hook-up without releasing, check airframe etc.). The Tow Pilot Examiner will monitor the tow pilot candidate's flight management, including: the tow pattern ensuring that it is flown as briefed; that speed control in the climb and attitude is well managed; that transition to level flight with airspeed stable was as briefed; stable release, decent, the circuit, radio procedures, and the tow pilot candidate's situational awareness in the air and on the airfield. If the Tow pilot Examiner has a need to maintain station or aggressively manage slack in the rope by the use of airbrakes as a result of poor speed control by the Tow Pilot the flight is to be repeated until the Tow Pilot demonstrates the activity to the satisfaction of the Examiner.
Final	**Prerequisite:** Satisfactory completion of all theory elements of the GFA Aerotowing Manual and a minimum of five aerotow assessment flights. Demonstration of a competent aerotowing standard in accordance with the elements identified in APPENDIX 1 – APPLICATION FOR INITIAL GLIDER-TOWING ENDORSEMENT during the five aerotow assessment flights. **Final Assessment** The tow pilot candidate must complete a minimum of a further five aerotows under the direct supervision of the Tow Pilot Examiner conducting the assessment flights. All competencies necessary for the issue of a Tow Pilot Endorsement must continue to be demonstrated to a competent standard during the supervised consolidation flying. The Tow Pilot Examiner should continue to brief/debrief the tow pilot as necessary during the supervised aerotowing even if this causes a delay to the club's launch activities. Briefing/debriefing may be done by use of a VHF radio to avoid the need to shut down the tug if the use of the VHF radio is does not interfere with other traffic. After satisfactory completion of the supervised towing requirements and a final debriefing of the candidate, the check list at APPENDIX 1 – APPLICATION FOR INITIAL GLIDER-TOWING ENDORSEMENT can be finalised and the tow pilot endorsement issued.

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APPENDIX 8 - APPLICATION FOR SINGLE PLACE AIRCRAFT TOW PILOT TRAINING APPROVAL

Pilot's Name:		
Licence Type:	CASA ARN/RAAus No:	GFA No:
Gliding Club:		
Fixed Wing Aeroplane Hours (including RAAus):		Gliding Hours:

NOTE: (i) An application for the training of a tow pilot candidate in a single place aircraft must not be submitted by the RM/O unless the recommendation is endorsed by the sponsoring club's CFI and Tugmaster.

(ii) A copy of this application, endorsed with EM/O approval, must be provided to the Tow Pilot Examiner before the flying sequences (Appendix 7) may commence.

CLUB CFI ENDORSEMENT

I certify that above-named is a current solo glider pilot and I endorse training of this pilot in a single place tow aircraft.

CFI Signature: ..... Date: .....

CLUB TUGMASTER ENDORSEMENT

I certify that the abovenamed club has been unable to arrange access to a dual place tow aircraft for the purposes of conducting glider tow pilot training for the following reasons: .....

....

I further certify that abovenamed pilot has completed transition training and has demonstrated competency in the operation of the club's tow aircraft. Single place aircraft tow pilot training of this pilot is endorsed.

Tugmaster Signature:..... Date: .....

Name:..... GFA No ……..….

REGIONAL MANAGER OPERATIONS RECOMMENDATION

I confirm that access to a dual place tow aircraft for the purposes of conducting glider tow pilot training is not reasonablly available. Single place aircraft tow pilot training of this pilot is recommended.

RM/O Signature: ..... Date: .....

Name:..... GFA No ……..….

EM/O Signature …… Approved / Denied

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APPENDIX 9 – SELF-TEST QUESTIONS & ANSWERS

Glider Towing Endorsement – Questions

1. What are the minimum experience requirements for a person to be considered for training as (a) a tow plane pilot and (b) a Tow Pilot Examiner for glider towing and (c) a GFA Tow Pilot Delegate?
2. What is the period of validity of a Glider Towing Certificate?
3. What are the pilot recency requirements for a Glider Towing Endorsement?
4. Name the privileges and limitations of an Initial Glider Towing Endorsement.
5. Can the holder of a Glider Towing Endorsement conduct dual towing, outlanding retrieves or tow in competitions?
6. Does an Initial Glider Towing Endorsement issued by a Tow Pilot Examiner permit a pilot to carry out a cross-country tow between two aerodromes?
7. Can a Tow Pilot Examiner's authority be renewed if the recency requirements of a Glider Towing Endorsement are not met?
8. When referring to "high-tow" and "low-tow", what is the point of reference for the glider pilot?
9. Can the holder of an Initial Glider Towing Endorsement carry out dual tow?
10. What is the minimum recommended rope length for towing a glider in normal operations?
11. What is the maximum breaking strength for a tow planes weak-link and where would you find that information?
12. What action would you take if you were asked to tow a glider which is heavier than the tow plane's approved towing weight?
13. What is the minimum number of mirrors that a tow plane must have to tow a glider and where should they be mounted?
14. Is it permissible to tow a glider with an aircraft which does not have a performance chart for glider-towing?
15. What is the signal that the tug pilot will give to a glider pilot that indicates the rate of climb is less than expected and everything appears to be in order at the tow plane end? What is the usual cause of such a low climb-rate?
16. What pre take-off and pre-landing checks apply to glider tow planes?
17. Describe the three signals for take-up-slack, all-out (full-power) and stop.
18. Who is authorised to give the stop signal to stop a launch?
19. At what pace should the tow plane-pilot take up the slack in the rope, and why?
20. If you are towing with a tailwheel aircraft, what is the risk that you are trying to mitigate against as you apply full power and commence the take-off?
21. What is likely to happen to the glider if the tow plane-pilot holds the tow plane in ground effect to build up speed during the initial phase of the take-off, and then transitions rapidly into the climb?
22. What is the tow pilot's primary reference for maintaining a steady climb?
23. Identify 3 key factors that impact on the safety of an aerotow that the tow pilot must consider and manage during the climb?
24. What must a tow pilot do to assist a glider pilot to maintain station behind the tug during the aerotow?
25. Under what circumstances would a glider be towed downwind?
26. What precautions must always be taken by the tow pilot before commencing a descent after the glider has released?
27. What is the emergency "wave-off" signal and what must a tow plane-pilot do to ensure that a clear, unambiguous signal is given?
28. What is the "glider unable to release" signal and what particular precaution must be taken by the tow plane-pilot while the glider pilot is making the signal?
29. Name at least two practices that will aid a tow pilot search for other aircraft when climbing or descending.
30. What is likely to occur during a descent at moderate or low power settings in conditions of cool temperature (< 15ºC) and fairly high humidity (e.g. quite a lot of cloud)?
31. What is the rather unusual characteristic exhibited by a rope after it has been dropped from a tow plane?
32. Are glider tow planes exempt from compliance with the procedures for operating in the vicinity of non-controlled aerodromes?

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33. What glider limitation does a tow plane-pilot need to know before attempting a cross-country tow?
34. What action is the tow plane-pilot required to take on receipt of a “stop” signal (a) early in the take-off run and (b) later in the take-off run?
35. What is the first priority if the tow plane suffers partial or complete engine failure in flight?
36. For the purpose of getting back to the airfield, by how much is the gliding range of the average training glider reduced if it is towed downwind?
37. What is a “practice wave-off”?
38. When conducting a landing with a glider on tow, what braking procedure is adopted by the tow plane-pilot on the ground after landing?
39. How much height can be lost by the tow plane when recovering from a “tow plane upset”?
40. What form of post-release descent is NEVER acceptable?
41. How much of the tow rope’s original strength is lost if a bowline is used to secure the rings or repair a rope?
42. What kind of rings are permitted to be used (a) on the glider end and (b) on the tow plane end?
43. For what special purposes may a rope shorter than the standard length be used, and what precaution should an operator take in permitting such a rope to be used?
44. Who is the PIC of a tow plane/glider combination during an aerotow?
45. Who gives way to whom in the case of a conflict between a powered aircraft and a tow plane/glider combination?
46. What effect can be expected when aerotowing in conditions of high humidity, or high daytime temperatures, or a combination of both?

Glider Towing Endorsement – Answers

1. (a) Be licenced or certificated to fly the class and design features of aircraft being used for aerotowing gliders and comply with the conditions of their licence or certificate and have a minimum of 100 hours total aeronautical experience, of which at least 40 hours shall be on Australian or Overseas or RAAus registered fixed-wing powered aircraft including touring motor glider types; (b) 175 hours total aeronautical experience, at least 100 of which shall be on Australian or Overseas or RAAus registered fixed-wing powered aircraft including touring motor glider types, with a minimum of 50 hours towing sailplanes in Australia; (c) Must meet the requirements of (b) above, and have a minimum of 100 hours towing sailplanes in Australia.
2. A Glider Towing Certificate is only valid while the holder is a member of the GFA (refer paragraph 2.4.3), and while the pilot’s licence or certificate remains valid and the currency requirements are met (refer paragraph 3.5.1).
3. At least six flights as PIC of an aeroplane towing a glider in the preceding twelve months or be assessed as competent by a GFA Tow Pilot Examiner (refer paragraph 3.5).
4. May tow a single glider in club operations from a Certified, Registered or Military Aerodrome, or Aircraft Landing Area, or from an established and suitably marked gliding site approved by the GFA and which meets the requirements of an Aircraft Landing Area (refer to AC 91-02).
5. Not unless they also hold the additional endorsements for such activities.
6. No, cross-country glider tows between two or more aerodromes or gliding sites are only permitted by a pilot holding a licence or certificate endorsed for cross-country flight.
7. Yes, providing the Tow Pilot Examiner undergoes a recency check with a Tow Pilot Delegate in accordance with paragraph 6.5.1 and is assessed by assessing Tow Pilot Examiner as having successfully completed the recency check.
8. The tow plane’s slipstream (refer paragraph 10.1.12).
9. Not unless the pilot holds a dual towing endorsement (refer paragraph 4.1).
10. 55 metres plus or minus 5 metres (refer paragraph 10.1.2).
11. The figure listed in the AFM, POH or aircraft towing supplement.
12. Decline to tow the glider.
13. One mirror mounted on or in the tow plane such that the tow plane pilot can see the glider in both low tow and high tow.
14. Yes, providing it has a towing supplement confirming it is approved for glider-towing.
15. A rudder-waggle. A lower rate of climb is usually caused by the glider’s airbrakes (or possibly tail-chute) coming open during the tow (refer paragraph 10.2.3).
16. Usual pre take-off and pre-landing checks as described in the tow plane's AFM/POH.

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17. “Take-up-slack”: underarm wave by the glider wingman (and forward signaller where used) no higher than shoulder height. “All out - (full-power)”: overarm wave by the glider wingman or forward signaller (if used). “Stop”: one or both hands held stationary above the head.
18. The stop signal may be given by anyone at the launch point if they see anything that might endanger the launch.
19. Very slowly, to avoid the risk of jerking the glider forward and causing it to over-run the rope, or breaking the weak link (refer paragraph 10.1.9.1).
20. The possibility of a rope break and sudden acceleration of the tow plane. The tow pilot should maintain full back stick as power is applied and the take-off run is commenced, otherwise there is a possibility that the tow plane will tip on its nose if the rope breaks.
21. The glider pilot will be unable to match the rapid change in attitude and higher rate of climb of the tow plane, slack will develop in the rope, and the glider pilot will be left with no option to release as the weak link will almost certainly break when the rope pulls tight again (Refer paragraph 10.1.10).
22. The nose attitude.
23. The answer should reflect a general understanding of the importance of Situational Awareness and Threat and Error Management. An appropriate answer would refer to the loss of situational awareness, the failure to identify threats, and the failure to appropriately assess and manage risks and the likely consequences of such an undesirable state.
24. Maintain a constant attitude and a stable platform for the glider pilot to follow. Do not tow directly into the sun.
25. At the request of the pilot or for the purpose of avoiding terrain or controlled airspace and only when it is safe to do so.
26. Visually confirm that the glider has released the rope. Do not rely on feeling a jerk in the rope, nor on a radio transmission from the glider pilot (refer paragraph 10.1.14). Ensure the airspace you are about to occupy is clear before descending into it (refer paragraph 10.1.15).
27. Rocking the wings, ensuring full aileron/rudder coordination to avoid residual adverse yaw.
28. The glider pilot flies out to the left of the tow plane, in low tow, to attract the tow pilot’s attention. This position is maintained by the glider pilot until the tow pilot acknowledges by a wave of the hand. The tow pilot must ensure that the tow plane is not adversely yawed by the glider and that a constant heading is maintained during the manoeuvre (refer paragraph 10.2.7).
29. Carry out both a targeted and general scan of the airspace, monitor and comprehend radio transmissions from other aircraft, know the number and location of known traffic, and use ground shadows to assist in locating traffic.
30. Carburettor icing.
31. It loses forward speed very quickly and falls almost vertically.
32. Yes, but only as specified at paragraph 2.5. Apart from the exemptions at paragraph 2.5, the usual operational rules apply when operating in the vicinity of an aerodrome (CASR 91.385(1) refers. Also refer to AC 91-10).
33. The glider’s maximum aerotow speed.
34. (a) Release the glider, keep moving to give the glider space to land straight ahead, and manoeuvre off the take-off runway as soon as it is safe to do so. (b) Release the glider and consider the option of continuing the take-off to clear the strip. Always assume that you might get a stop signal on every launch (refer paragraph 10.2.1).
35. Release the glider (refer paragraph 10.2.2).
36. By two-thirds, i.e. it has only one-third of the range it would have if it had been towed into-wind (refer paragraph 10.1.11).
37. There is no such thing as a practice wave-off (refer paragraph 10.2.6).
38. Do not use the tow plane’s brakes at all and let the glider bring the combination to a stop; unless there has been a gross misjudgement of the landing and you are running out of strip fast, in which case self-preservation will guide you to turn off and brake rather than have a colossal pile-up against the far fence (refer paragraph 10.2.8).
39. A minimum of 800 feet (refer paragraph 10.3).
40. Any descent that involves an aerobatic manoeuvre, such as a “half-roll and pull-through”.
41. About 15%.
42. (a) Tost rings ONLY. (b) Rings approved by the manufacturer of the release.

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43. For towing out of paddocks, for use by the lead glider in a dual tow launch, for “rotor” conditions during wave-soaring, or for practicing for dual towing but only by glider pilots of considerable experience.
44. The tow plane-pilot.
45. The powered aircraft should give way to the combination. However it is worth remembering that all pilots are responsible for taking action to avoid an impending collision.
46. A loss of power, as high moisture content in the air means effectively less air entering the engine. A high ambient day-time air temperature means an increase in density height.

Dual Towing Approval – Questions

1. What is the minimum experience requirements for a person to be considered for training for the issue of a dual towing endorsement?
2. What requirements must be met before dual towing may take place?
3. What are the minimum rope lengths to be used for dual towing?
4. Prior to take-off, in light crosswinds, how would you ensure the placement of the short-rope glider in relation to the tow plane, and why?
5. What would you do if asked to carry out a dual tow in a strong crosswind?
6. Which glider should the glider pilot of greater experience fly, and why?
7. What is the earliest point in a dual tow at which the tow pilot may start a turn?
8. In normal circumstances, which glider releases first from a dual tow?
9. If the glider on the short rope flies out to the left and remains in that position, what does this mean and what action should you take?
10. What action should you take if you follow the procedure in answer No 9, but the long-rope glider does not release and more than 10 seconds have elapsed since the return of the short-rope glider to the high-tow, line-astern position?

Dual Towing Approval – Answers (Refer paragraph 9.1)

1. A candidate for a Dual Towing endorsement must have logged a minimum of 30 hours glider towing experience as a tow pilot on the aircraft type that will be used for the dual towing activity.
2. There must be adequate strip length, width and obstacle clearance for the entire combination to be safe. Wingtip holders must be positioned at outer wings. Forward signaller essential and water ballast must not be carried.
3. 35 metres for the short rope. The long rope must be at least 30 metres longer than the short rope.
4. The short-rope glider should be placed on the upwind side of the tow plane, to avoid the possibility of a ground-loop endangering the long-rope glider.
5. A tow pilot should refuse to carry out a dual tow in a strong crosswind. A strong crosswind increases the risk of the glider on the short rope interfering with the glider on the long rope.
6. The more-experienced glider pilot should fly the glider on the long rope, in case of a problem with the short-rope glider on take-off (e.g. a rope break or ground-loop), which needs a rapid reaction and precisely the right actions to prevent a ground incident or collision.
7. Not before both gliders have settled into the line-astern position.
8. The one on the short rope.
9. It means the same as on a single tow, that the glider pilot has tried to release and is unable to do so. The tow pilot’s required action is to acknowledge the glider pilot’s predicament in the normal manner, whereupon it will return to its high-tow, line-astern position and wait until the long-rope glider has released and cleared, then release the short-rope glider from the tow plane.
10. You should assume that the long-rope glider is also unable to release and accordingly you should release the ropes at the tow plane end without further delay. Don’t do this lightly since at least one of the gliders could end up wearing the rope. Try to contact the glider pilot on the long rope first by radio.

Outlanding Retrieve Approval – Questions

1. What is the minimum experience requirements that a tow pilot must have to be considered for training for the issue of an outlanding retrieve endorsement?
2. What permission should be obtained before you even consider setting out on an aerotow retrieve?

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3. In the absence of a windsock, what cues are available to the tow pilot to assess the wind direction and strength at the out-landing paddock?
4. Are you obliged to go ahead with the aerotow retrieve if you believe the paddock in which the glider has landed is not suitable for the purpose?
5. What is the glider pilot's "Five S" rule for out-landing?
6. What would be your plan if the selected paddock has discernible slope along the landing/ take-off path?
7. If the paddock the glider has landed in seems marginal in length for an aerotow retrieve, what options are available to the tow pilot to minimise the risks?
8. What are SWER power lines and what precautions should be taken to minimise the hazard caused by them?
9. What actions would you take to ensure an unfamiliar paddock is suitable prior to landing? What should you preferably do with the rope before setting out on an aerotow retrieve?
10. What is the most essential job to do before attempting an aerotow take-off from a paddock?
11. What is the effect of long grass and what precautions would you take?
12. Under what circumstances would an aerotow retrieve be permissible on a day of total fire ban?
13. What would you do if there were clumps of long grass and no wingtip holder to assist in the paddock take-off?
14. What are the implications of landing at or taking off from a paddock in the lee of a hill?
15. If you have concerns about the safe conduct of the launch when asked to do an outlanding retrieve, what should you do?

Outlanding Retrieve Approval – Answers (Refer paragraph 9.2)

1. A tow pilot must have logged a minimum of 30 hours glider towing experience as a tow pilot on the aircraft to be used for the activity before undertaking an assessment to qualify for an outlanding retrieval endorsement.
2. Obtain the permission of the landowner or a representative of the land owner who is empowered to give such permission.
3. Water on dams (especially wind-shadow), smoke, dust from cars on dirt roads, wind movement on crops, assessing aircraft drift and by making radio contact with the glider pilot on the ground.
4. No.
5. Size, slope, surface, stock, surroundings.
6. Plan on landing up the slope and taking-off down the slope, wind permitting.
7. Land and take-off from corner-to-corner, all other things being satisfactory, or do not attempt to launch the glider.
8. Single Wire Earth Return. Do not land until you have located them all. Every homestead has at least one power line and there may be more than one if there are outbuildings on the property. Beware of tee-offs from the main line. This also applies to all other power lines. They tend to be easier to see, having shorter spans and more (typically 4) conductors.
9. Conduct a precautionary search of the area to assess distance, shape, size and surface of the selected paddock and ensure there are no obstacles that will endanger the approach to landing or take-off prior to landing. Secure the tow rope in the aircraft prior to departing for the aerotow retrieve. If the rope is attached to the tow plane, drop the rope in the selected paddock during one of the precautionary passes prior to landing.
10. Pace out the distance (or if possible drive) the paddock to establish the take-off length available, checking the surface for soft soil and hidden objects or ruts, and checking the surrounding area and the planed take-off paths for obstacles.
11. Long grass could be a hazard on landing with the potential to upset the tug and hide obstacles. It is particularly hazardous for a nose wheel aircraft. Long grass will adversely affect take-off performance and will increase the take-off run of the tug/glider combination. The tug pilot must know the aircraft's performance, either from experience or as determined from the P Chart. If long grass is marginal but just acceptable, ensure you have a properly briefed wingtip holder and be prepared for the unexpected release of the glider by the glider pilot if the glider gets in to trouble during the ground run on take-off.

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12. Only if the glider has landed at a designated aerodrome or on an area specifically prepared for aircraft operations (e.g. a farm airstrip). If the glider is in a paddock, it is not permissible to attempt an aerotow retrieve.
13. The tug pilot should seriously consider if it is safe to land. If the tug pilot has landed and finds the paddock has clumps of long grass that were not previously noticed and would be a hazard to an aerotow launch, they should refuse to take-off with the glider on tow.
14. Roll-over or heavy sink, which will adversely affect climb performance on take-off.
15. If in doubt, decline the aero tow retrieve and let the ground crew retrieve the glider with the trailer.

Competition Endorsement – Questions

1. What Advisory Circular (AC) provides guidance for a tow pilot for operations at an airfield which is not a public or military aerodrome, that is being used for a gliding competition and why is it important for the tow pilot to know?
2. Why is it important for a tow pilot to have a good understanding of the risks of operating in a high aircraft density, multiple runway environment?
3. Why is fuel management an even more critical consideration when towing in a gliding competition?
4. What elements should a competition tow pilot make themselves aware of when operating at an unfamiliar airfield?
5. Why is it important for a competition tow pilot to be experienced on the aircraft type that is used for competition towing?
6. Why is it important for a competition tow pilot to be able to demonstrate sound knowledge of the use of the AFM or POH, (including "P" Charts if available)?
7. Name at least 3 risks or differences in operation while towing at a gliding competition that a tow pilot will be exposed to that are not usually experienced in club-based operations.
8. What do you understand the term cognitive tunnelling to mean?
9. Why is it important for a competition tow pilot to be able to recognise and understand the differences between club towing and competition towing?
10. Why is it important to be able to critically self-analyse their standard of health for flying?
11. Why should the tug pilot avoid aggressive transition of the tow aircraft from ground separation to full climb by the tow pilot be avoided as the tug's airspeed increases?

Competition Endorsement – Answers (Refer paragraph 9.3)

1. Advisory Circular (AC) 91-02 explains the requirements for use of an airfield which is not a public or military aerodrome. These guidelines set out factors that may be used to determine the suitability of a place for the landing and taking-off of aeroplanes. In most cases, application of the guidelines will enable a take-off or landing to be completed safely, provided that the pilot in command: (a) has sound piloting skills; and (b) displays sound airmanship.
2. Understanding of the safe use of a multiple runway environment for both gliders and tow planes is essential because the potential for conflict is high with (a) multiple aircraft parked on the runway, (b) a high volume of pedestrian traffic, (c) simultaneous departures and landings of both tow planes and gliders, and (d) typically at a gliding competition access to all available runways is restricted for operational reasons.
3. Depending on the type of engine/aircraft configuration operated by the tow pilot, experience has shown that towing at a gliding competition with varied types and weights of gliders on tow and set towing and circuit patterns can have an impact on fuel consumption. It is easy for a tow pilot to become distracted from the task of fuel management while operating in an unfamiliar, high intensity, high risk operating environment.
4. Knowledge of local circuit procedures and restricted/danger areas and the effect of local weather conditions and surrounding terrain.
5. The tow pilot must be comfortable in the cockpit so that attention can be directed to flying the aircraft, Lookout, use of the radio for Enhanced Situational Awareness and Threat & Error Management etc.
6. Assessment of adequate length for take-off in a competition environment given the many and varied types and weights of gliders that might be launched and will significantly impact on tug/glider take-off and climb performance and cannot be left to chance.

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7. The need to be aware of and adhere to predetermined launch heights and towing patterns, modified rules for decent after release and competition airfield circuit patterns, flying in close proximity to other aircraft and the potential for congestion (“pre-start airspace”) as the competition start draws close.
8. Cognitive tunnelling, which occurs when the pilot is too focused on one object and not on the whole environment (e.g. loss of situational awareness).
9. A competition tow pilot operates in a high workload environment (competition launching) under stress of a continually changing but equally demanding set of primary tasks. The result is that the mind’s allocation of residual capacity to perceptual monitoring decreases as levels of arousal (an extremely high workload environment as more aircraft become airborne) increases. This in turn impairs time management, workload management, situational awareness and decision making.
10. A pilot who can critically self-analyse their personal standard of health for flying understands the impact of excessive alcohol consumption and the importance of adequate rest when they know they will be flying in a highly demanding and stressful operational environment. They understand that competition towing is intense and requires a high level of concentration. Flights are short, with a high workload, often in turbulent conditions exposed to summer heat and busy CTAF activity.
11. It has the potential to make life unnecessarily hard for the glider pilot to maintain station behind the tow aircraft as the tow aircraft transitions to the climb attitude. The tow pilot finds himself pulling back further and further and the glider pilot is barely able to cope with the rapidly changing circumstances. If the tow plane climbs too early it is possible that the glider will either not have flying speed and will have to release before it collides with the upwind fence, or it may have marginal flying speed and get dragged into the air barely above its stall speed and be virtually uncontrollable.

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APPENDIX 10 – SAMPLE GLIDING TOWING CERTIFICATE

THE GLIDING FEDERATION OF AUSTRALIA INC.

GLIDER TOWING CERTIFICATE

This Glider Towing Certificate authorises a pilot to tow one glider at a time from marked aerodromes and/or established and GFA approved gliding sites only, unless further privileges are endorsed

I **GLIDING FEDERATION OF AUSTRALIA INC. (GFA)**

II **Glider Towing Certificate**

III Certificate No: 12345

IV Name:

IVa Date of Birth:

VI Nationality:

VII Signature of Holder:.....

VIII The privileges of this certificate require compliance with the GFA Aerotowing Manual and to the ...itions at Item XIII.

IX This Certificate shall remain in force until [DATE] unless revoked, suspended or varie...

XI Stamp

X Christopher Thorpe
Executive Manager, Operations

XIII **Conditions/Certificate Remarks**

The holder of a Glider Towing Endorsement ... a r... fi... or oth... em used for towing a glider subject to:

(a) the pilot must drop the rope, fitting or ... with the Aerotowing Manual; and
(b) the pilot must drop the r... fitting or ot... em... minimise the risk of injury or damage to persons, animals or property.

The holder of a Glider Towing En... emen... ot e...rcise the privileges of the endorsement unless they meet the currency requirements deta... he GFA ...

The holder of ...lider Towing Endo... ment must be licenced or certificated to fly the class and design features of aircraft being used for aero...

Cross-country glider tows fro... d to aerodromes or ALAs are only permitted where a pilot holds the appropriate CASA issued licence, or RA AUS issued ... certificate, or GFA issued motor glider endorsement for carrying out such cross-country flights.

The privileges, limita... nd revalidation requirements of GFA Glider Towing endorsements are described in the GFA Aerotowing Manual.

The holder of a Glider Towing Endorsement must be a current member of the GFA in order to exercise the privileges of a Glider Towing Endorsement.

End of Conditions/Certificate Remarks

Glider Towing Certificate Endorsements

Dual Towing
Glider Towing
Competition Towing
Outlanding Retrieve
Tow Pilot Examiner
Tow Pilot Delegate

----------End of Endorsements----------

Created on [DATE]

SAMPLE

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