Chapter 12

Towing

Introduction

Tow planes are the most common way that a glider obtains altitude. *[Figure 12-1]* Winch or automobile tows are being used less and less as they require more crew, are more difficult to set up, and the altitude gain for the glider is just a fraction of what a tow plane can offer. Pilots of gliders and powered aircraft must abide by all federal air regulations listed in the appropriate Code of Federal Regulations (CFR) governing flight. The CFRs that are applicable to pilot certification for towing gliders is covered by Title 14 of the Code of Federal Regulations (14 CFR) part 61, Certification: Pilots, Flight Instructors, and Ground Instructors,"and 14 CFR Part 91, General Operating and Flight Rules. The following sections are also applicable:

- 14 CFR Part 61, section 61.23—Medical Certificates: Requirements and Duration
- 14 CFR Part 61, section 61.56—Flight Review
- 14 CFR Part 61, section 61.69—Gliders and Unpowered Ultralight Vehicle Towing: Experience and Training Requirements.*[Figure 12-2]*
- 14 CFR Part 91, section 91.15—Dropping Objects
- 14 CFR Part 91, section 91.309—Towing: Gliders and Unpowered Ultralight Vehicles *[Figure 12-3]*

Guidance and towing procedures can also be found in the Aeronautical Information Manual (AIM) and pertain to flight in the National Airspace (NAS).

How does a private pilot obtain towing privileges?
CFR, part 61, section 61.69, outlines the requirements for towing privileges.

You must

1. Hold at least a private pilot certificate with the appropriate category rating;
2. Have logged a minimum of 100 hours as pilot in command in the same category aircraft us
3. Have a logbook endorsement from an authorized instructor certifying you have received gro unpowered ultralight vehicles, and is proficient in the areas listed in part 61.69(a)(3)(i)(ii)(iii)
4. Have a logbook endorsement from a pilot that already meets the requirements of part 61.69 the pilot on three flights which has certified them to have accomplished at least three flights in or unpowered ultralight vehicle, or while simulating towing flight procedures; and In the precedi ee actual or simulated tows accompanied by a qualified pilot or has been towed for three flig ight vehicle. In accordance with part 61.52, pilots towing under an ultralight exemption may ltralight vehicles for their towing experience and endorsements.

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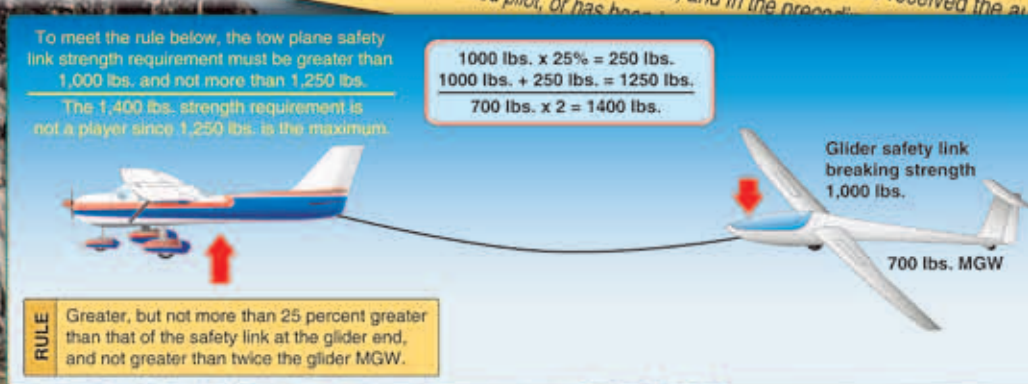

Maximum Aero Tow Speed	MPH	Knots
Blanik L-23	93 mph	81 knots
Blanik L-13	87 mph	76 knots
SGS 2-33	98 mph	85 knots
SGS 1-26	95 mph	83 knots
ASK 21	108 mph	94 knots

Figure 12-1. *Gliders use tow planes to launch and obtain altitude.*

Equipment Inspections and Operational Checks

Tow Hook

There are typically two types of tow hooks used in the United States: Tost or Schweizer. The tow hook must be inspected for proper operation daily and prior to any tow activity. *[Figure 12-4]*

Schweizer Tow Hook

Prior to use, the tow hook and release arm should be inspected for damage, cracks, deformation, and freedom of movement on the pivot bolt. Visually check the tow hook and ensure that the hook properly engages the release arm. Inspect the rubber spacer for general condition and check the condition of the release cable. Inside the cockpit, check to see that the manual release lever is not rubbing against the aircraft seat or any other obstructions, and check the security of the release handle assembly and the cable attachment.

The following operation checks should be performed to the tow hook:

- Attach the tow line to the tow hook and apply tension on the line in the direction of tow.
- With tension on the tow line, have another person pull the release control in the tow plane cockpit and check for proper release of the tow line.
- If the tow line does not properly release, restrict the tow plane from towing duties until repairs can be made.
- Reattach the tow line and apply a moderate tug in the direction of tow.
- Inspect the release assembly to ensure it has remained completely closed.
- If the release assembly has opened, even partially, restrict the tow plane from towing duties and repair the tow assembly.

Tost Tow Hook

Before use, ensure that the release hook opens completely when the cockpit release is pulled to its fullest extent. The release hooks should touch the tow hook ring. If the release mechanism is not working correctly, it should not be repaired by anyone other than the Tost Factory. Inside the cockpit, check to see that the manual release lever is not rubbing against the aircraft seat or any other obstructions, and check the security of the release handle assembly and the cable attachment. When the cockpit manual release lever is released, the tow hook should return to the fully closed position. Before each use, check the tow hook and ensure that

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1. Hold at least a private pilot certificate with the appropriate category rating;
2. Have logged a minimum of 100 hours as pilot in command in the same category aircraft used for towing;
3. Have a logbook endorsement from an authorized instructor certifying you have received ground and flight training in gliders or unpowered ultralight vehicles, and is proficient in the areas listed in part 61.69(a)(3)(i)(ii)(iii) and (iv);
4. Have a logbook endorsement from a pilot that already meets the requirements of part 61.69 (c) and (d), who has accompanied the pilot on three flights which has certified them to have accomplished at least three flights in an aircraft while towing a glider or unpowered ultralight vehicle, or while simulating towing flight procedures; and In the preceding 12 months has performed three actual or simulated tows accompanied by a qualified pilot or has been towed for three flights in a glider or unpowered ultralight vehicle. In accordance with part 61.52, pilots towing under an ultralight exemption may credit experience obtained in ultralight vehicles for their towing experience and endorsements.

You must

1. Hold at least a private pilot certificate with the appropriate category rating;
2. Have logged a minimum of 100 hours as pilot in command in the same category aircraft used for towing;
3. A logbook endorsement from an authorized instructor who has reviewed their logged ultralight towing experience and who has verified their aero tug pilot endorsement card received from USHPA, verifying they have received the authorized training to become a tow pilot of gliders and/or unpowered ultralight vehicles; and In the preceding 12 months has performed three actual or simulated tows accompanied by a qualified pilot, or has been towed for three flights in a glider or unpowered ultralight vehicle.

Figure 12-2. *Excerpt from the Code of Federal Regulations, part 61, section 61.69.*

Title 14: Aeronautics and Space
PART 91—GENERAL OPERATING AND FLIGHT RULES
Subpart D—Special Flight Operations
§ 91.309 Towing: Gliders and unpowered ultralight vehicles

(a) No person may operate a civil aircraft towing a glider or unpowered ultralight vehicle unless—
(1) The pilot in command of the towing aircraft is qualified under §61.69 of this chapter;
(2) The towing aircraft is equipped with a tow-hitch of a kind, and installed in a manner, that is approved by the Administrator;
(3) The towline used has breaking strength not less than 80 percent of the maximum certificated operating weight of the glider or unpowered ultralight vehicle and not more than twice this operating weight. However, the towline used may have a breaking strength more than twice the maximum certificated operating weight of the glider or unpowered ultralight vehicle if—
(i) A safety link is installed at the point of attachment of the towline to the glider or unpowered ultralight vehicle with a breaking strength not less than 80 percent of the maximum certificated operating weight of the glider or unpowered ultralight vehicle and not greater than twice this operating weight;
(ii) A safety link is installed at the point of attachment of the towline to the towing aircraft with a breaking strength greater, but not more than 25 percent greater, than that of the safety link at the towed glider or unpowered ultralight vehicle end of the towline and not greater than twice the maximum certificated operating weight of the glider or unpowered ultralight vehicle;
(4) Before conducting any towing operation within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport, or before making each towing flight within such controlled airspace if required by ATC, the pilot in command notifies the control tower. If a control tower does not exist or is not in operation, the pilot in command must notify the FAA flight service station serving that controlled airspace before conducting any towing operations in that airspace; and
(5) The pilots of the towing aircraft and the glider or unpowered ultralight vehicle have agreed upon a general course of action, including takeoff and release signals, airspeeds, and emergency procedures for each pilot.

(b) No pilot of a civil aircraft may intentionally release a towline, after release of a glider or unpowered ultralight vehicle, in a manner that endangers the life or property of another.

Figure 12-3. *Excerpt from the Code of Federal Regulations, part 91, section 91.309.*

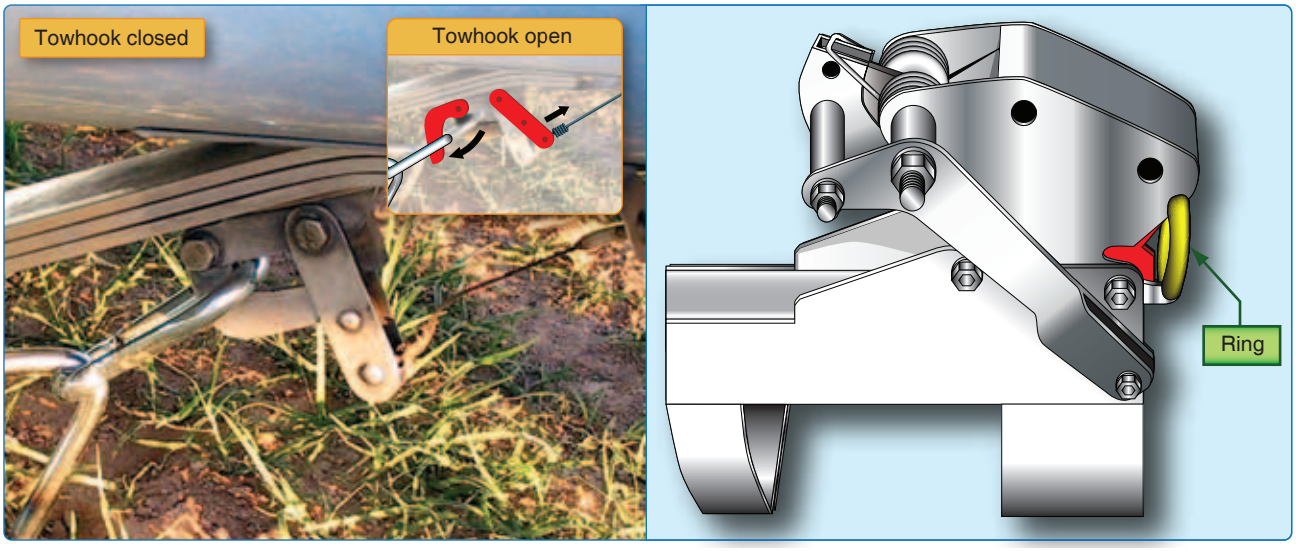

Figure 12-4. *Schweizer tow hook (left) and a Tost tow hook (right).*

it is free of dirt and/or corrosion. It is important to confirm that the tow plane end of the tow rope is fitted with a Tost tow ring.

The following operation checks should be performed to the tow hook:

- Attach the tow line to the tow hook and apply tension on the line in the direction of tow.
- With tension on the tow line, have another person pull the release control in the tow plane cockpit and check for proper release of the tow line.
- If the tow line does not properly release, restrict the tow plane from towing duties until repairs can be made.
- Reattach the tow line and apply a moderate tug in the direction of tow.

- Inspect the release assembly to ensure it has remained completely closed.
- If the release assembly has opened, even partially, restrict the tow plane from towing duties and repair the tow assembly.

Tow Ring Inspection

Tow ring inspection should begin with checking for wear and tear. The rings should not be used if they have deep scratches or dents. Like the tow hitch assembly, there are two types of tow rings: Schweizer and Tost. *[Figure 12-5]* The Schweizer tow ring is two inches in diameter and made of high grade, one-quarter inch steel that has been magnafluxed with good weld. The Tost tow ring is also made of high grade steel and available through most glider supply companies.

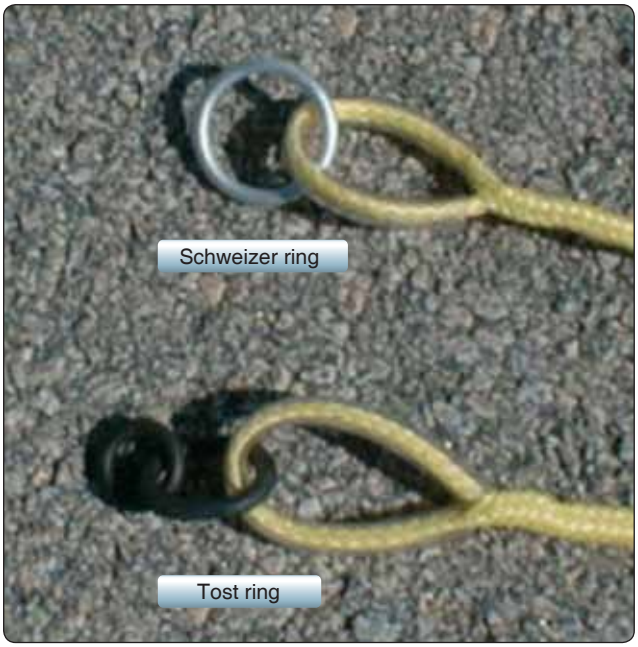

Figure 12-5. *Schweizer tow ring and a Tost tow ring.*

Always ensure that the tow line is configured for the proper type of hitch being used. For example, a Schweizer tow ring will not fit into a Tost tow hitch, but a Tost tow ring can be placed on a Schweizer type tow hitch (with the great possiblility that the Tost tow ring will become stuck in the hitch mechanism making tow rope release impossible).

Tow Rope Inspection

Although the pilot of the glider is primarily responsible for the selection and inspection of the proper tow line, it is also the duty of the tow pilot to confirm that the tow line selected meets the requirements of the Federal Aviation Administration (FAA) Regulations and is acceptable for use. *[Figure 12-6]* The tow line should be inspected as follows:

Figure 12-6. *It is both the tow pilot and glider pilots responsibility to check the condition of the tow rope before flight.*

- Check the entire length of the tow line for abrasions, security of splices, and general condition.
- The tow line should be free from excess wear; all strands should be intact, and the line should be free from knots (knots in the tow line reduces its strength by up to 50 percent and causes a high spot in the rope that is more susceptible to wear).
- Pay particular attention to the ring area to which the glider attaches because this is also a high-wear area.
- Consideration should be given in replacing the tow rope after a period of time due to usage and ultraviolet (UV) exposure from being in the sun and exposed to the elements.
- Ensure tow line strength is appropriate for the glider being towed.

Tow Rope Strength Requirements

Stated in the 14 CFR part 91, section 91.309, the minimum tow rope strength is eighty percent of the gliders maximum certificated operating weight. The maximum strength is twice the maximum certificated operating weight. The maximum certificated operating weight can be found in the specific pilot's operating handbook (POH) for the glider and may be the maximum certificated gross weight at takeoff. *Figure 12-7* shows the strength of some ropes that are typically used. If the tow rope has a breaking strength more than twice the maximum certificated operating weight of the glider being towed, a safety link (weak link) has to be installed at the point of attachment of the glider and the tow plane with the following breaking strength requirements:

Diameter	Nylon	Dacron	Polyethylene	Polypropylene	Polypropylene
			Hollow braid	Monofilament	Multifilament
3/16"	960	720	700	800	870
1/4"	1,500	1,150	1,200	1,300	1,200
5/16"	2,400	1,750	1,750	1,900	2,050

Figure 12-7. *Rope strengths.*

- Safety link (weak link) at the glider end:
  - Minimum strength = eighty percent of the glider maximum certificated operating weight.
  - Maximum strength = twice the maximum certificated operating weight. *[Figure 12-8]*
- Safety link (weak link) at the tow plane end:
  - Strength requirements = greater, but not more than twenty five percent greater than that of the safety link on the glider end, and not more than twice the maximum certificated operating weight of the glider.

Tow ropes and cables are made of many different reliable materials, such as nylon, step-index fiber from Red Polyester, Hollow Braid POLYPRO, Dacron, steel, and Polyethylene. *[Figure 12-9]*

Take Off Planning

After all inspections are complete, compute the takeoff performance for the tow plane using the approved POH. As a rule of thumb, the tow plane is normally airborne in about twice the computed distance. If your tow plane does not have takeoff performance charts, make a normal takeoff without the glider in tow and note the lift-off point. Use this physical point in lieu of computed takeoff data. Pay particular attention to your altitude over the departure end of the runway and the clearance of any barriers.

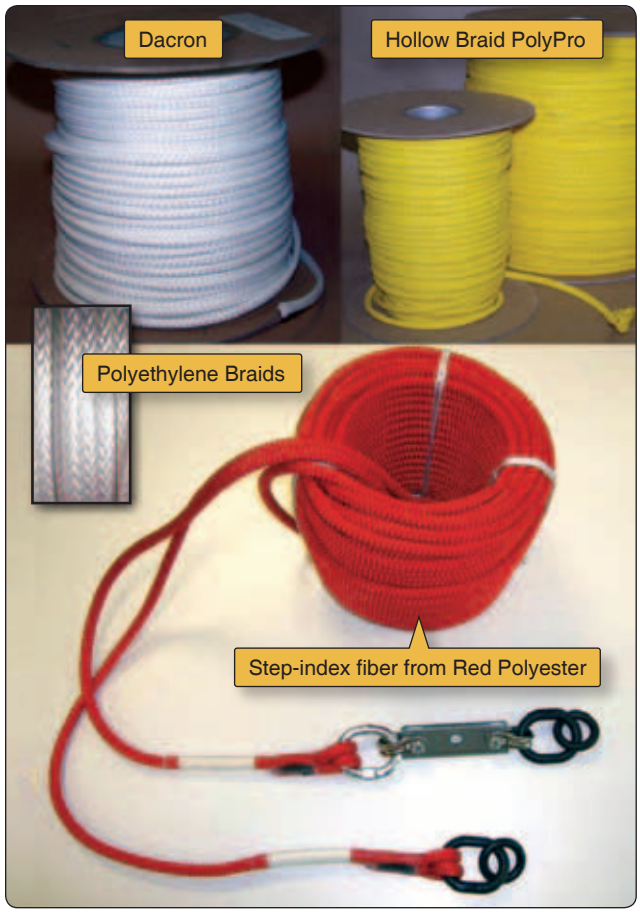

Figure 12-9. *Tow ropes and cables are made of many different reliable materials such as nylon, step-index fiber from Red Polyester, Hollow Braid POLYPRO, Dacron, steel, and Polyethylene.*

Using the computed takeoff data or actual takeoff point, choose a physical abort point on the runway. *[Figure 12-10]* Thoroughly brief the glider pilot on the abort point and abort procedures. If the tow plane is not off the ground by the chosen abort point, the glider should release, or be released, allowing the tow plane to accomplish a normal takeoff.

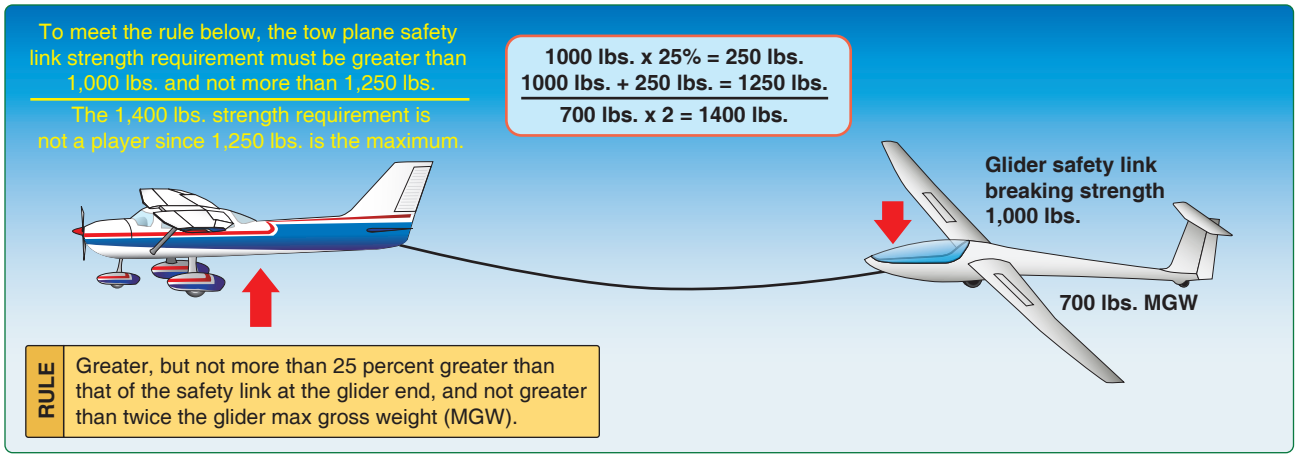

Figure 12-8. *Safety link strength requirements.*

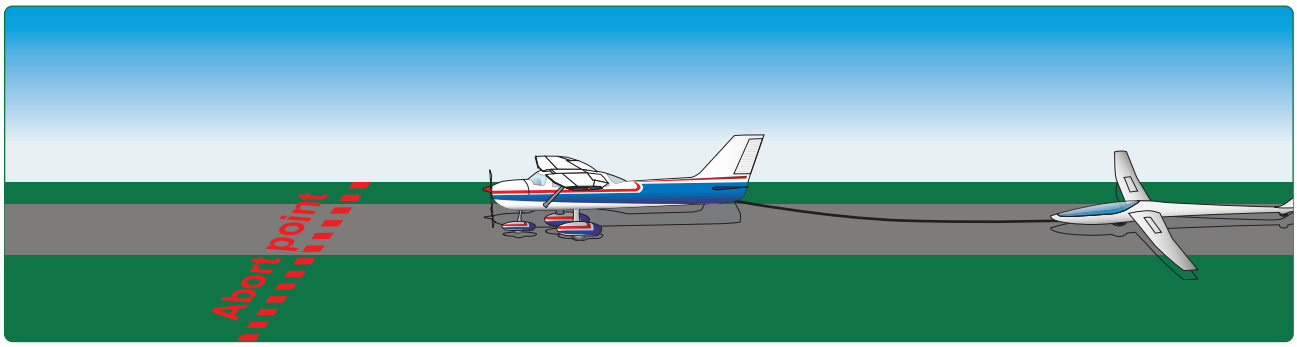

Figure 12-10. *A physical abort point on the runway should be determined and briefed to the glider pilot before starting the towing procedures.*

Since density altitude is perhaps the single most important factor affecting airplane performance, a review of the effects of density altitude is in order. An increase in air temperature and/or humidity significantly decreases power output and propeller efficiency.

The engine produces power in proportion to the weight or density of the air. Therefore, as air density decreases (high density altitude), the power output of the engine decreases. Also, the propeller produces thrust in proportion to the mass of air being accelerated through the rotating blades. If the air is less dense, propeller efficiency is decreased.

The problem of high density altitude operation is compounded by the fact that when the air is less dense, more engine power and increased propeller efficiency are needed to overcome the decreased lift efficiency of the tow plane's wing. This additional power and propeller efficiency are not available under high density altitude conditions; consequently, tow plane performance decreases considerably.

The winds aloft should be continuously evaluated to help determine the glider release area and always attempt to release the glider upwind of the airport. Code of Federal Regulations (CFR), part 91, section 91.309 (a)(5) states, "The pilot of the towing aircraft and the glider have agreed upon a general course of action, including takeoff and release signals, airspeeds, and emergency procedures for each pilot." If there is any doubt that this rule has not been complied with through briefings or published and agreed upon standard operating procedures, ensure both you as the tow pilot and the glider pilot are absolutely clear on all aspects of the upcoming tow.

On the Airport

The tow pilot must develop an awareness of the direction of the tow plane's prop blast. Blasting launch personnel and glider canopies with all sorts of debris is undesirable and potentially dangerous. Whenever possible, turn away from any ground operations. Prior to taking the active runway for tow line hook-up and takeoff, if available, monitor and announce your intentions on the Common Traffic Advisory Frequency (CTAF).

Ground Signals

In most cases, the Standard American Soaring Signals are used to communicate between the launch crew and tow plane. In some cases, however, specific local procedures may be in effect. The tow pilot should be thoroughly briefed on any specific local procedures. The tow pilot may be required to observe these signals through the mirror or through an additional signal relay person positioned safely on the side of the runway adjacent to the tow plane. The ground signals are listed below and are also presented as illustrations in Chapters 7 and 8 of this handbook.

- Take up slack—the take up slack signal is given by the ground crewmember moving his or her lowered arm from side to side. When you receive this signal, slowly taxi the tow plane forward to take up the slack in the tow line. When all the slack has been taken from the tow line, expect to receive the "hold" signal from the ground crew.
- Hold—this signal is given by holding the arms out straight.
- Pilot ready, wings level—when the glider pilot is ready for takeoff, a thumbs up signal is given and the wing runner will level the wing to the takeoff position.
- Begin takeoff—the glider pilot waggles the rudder with the wings level and the wing runner signals with a circular motion of the arm. When ready for takeoff, the tow pilot should broadcast on the CTAF that a glider launch is about to be initiated. For example, "Tallahasee traffic, N12345 taking off Runway 33, glider in tow, Tallahasee." Remember, 14 CFR part 91, section 91.309, requires that before conducting towing operations within Class B, C, D, or E airspace designated for an airport, or before making each towing flight within such controlled airspace if

required by ATC, the pilot in charge (PIC) must notify the control tower. If a control tower does not exist or is not in operation, the PIC must notify the FAA flight service station (FSS) serving that controlled airspace before conducting any towing operations.

- Stop engine/release tow line—this signal is given by moving a hand back and forth across the throat.
- Tow plane ready—prior to takeoff, carefully look at the glider to ensure the glider dive brakes are closed and no one is standing in front of the wings or so close to the launch path to create a hazard. It is important to note, however, that some high-performance gliders may make their initial takeoff roll with spoilers open. Know your gliders and if in doubt, do not be ashamed to question the glider pilot. Better to be a bit embarrassed than to end up in the trees at the end of the runway. Additionally, the tow pilot should ensure that the traffic pattern is clear of aircraft. Once assured that the glider is ready and the briefed departure path is clear, the ready for takeoff signal may be given with a waggle of the tow plane rudder.
- Stop operation or emergency—this signal is given by a waving motion of the arms above the head.

Takeoff and Climb

The takeoff is done by advancing the throttle smoothly and quickly in one motion. *[Figure 12-11]* If the tow plane is allowed to accelerate and then slow down, the glider may overrun the tow line. This may result in the tow line becoming tangled in the landing gear of the glider. The glider may then be unable to release. Accelerate to liftoff speed keeping in mind that during the takeoff phase of flight, ground effect produces some important relationships. The tow plane leaving ground effect will:

Figure 12-11. *The takeoff is done by smoothly and quickly advancing the throttle in one motion so that the glider does not overrun the tow line.*

- Require an increase in the angle of attack (AOA) to maintain the same lift coefficient;
- Experience an increase in induced drag and thrust required;
- Experience a decrease in stability and a nose-up change in moment; and
- Produce a reduction in static source pressure and increase in indicated airspeed.

These general effects should point out the possible danger in attempting takeoff prior to achieving the recommended lift-off speed. Due to the reduced drag in ground effect, the tow plane may seem capable of takeoff well below the recommended speed; however, lifting out of ground effect with a lower than normal lift off speed may result in very marginal initial climb performance.

The glider will normally liftoff first. The pilot of the glider should correct for crosswind until the tow plane becomes airborne.

At this point, the tow pilot must remain extra alert. The tail of the tow plane may be lifted if the glider climbs too high. Should this happen, the application of full-up elevator on the tow plane may not be sufficient to prevent an accident from happening. The tow pilot must be ready to pull the release handle, releasing the glider and regaining control. As a rule of thumb, the use of a 200 foot tow line would require the glider to climb to over 20 feet above the altitude of the tow plane to present a danger of upset.

After liftoff, a constant airspeed climb should be established. The pilot of the glider should establish a position directly behind the tow plane. The pilot of the tow plane should maintain a constant ground track on the initial climb. Upon reaching a safe altitude, a turn may be established to maintain the desired departure path. Bank angle should be limited to a maximum of 15–20°.

Climb at full throttle unless otherwise required by the POH. The fuel/air mixture should be leaned only in accordance with the POH for maximum power. Each specific model of glider has a published maximum aerotow speed, and the tow pilot must be familiar with this speed, which may be very close to the minimum safe speed of the tow plane. *[Figure 12-12]*

The tow pilot should understand that these are maximum airspeeds. Plan to fly at a speed slower than the maximum while maintaining safe tow plane flying speed. When towing a different model of glider for the first time, obtain a briefing from the glider pilot to ensure compliance with maximum

Maximum Aero Tow Speed	MPH	Knots
Blanik L-23	93 mph	81 knots
Blanik L-13	87 mph	76 knots
SGS 2-33	98 mph	85 knots
SGS 1-26	95 mph	83 knots
ASK 21	108 mph	94 knots

Figure 12-12. *Maximum aerotow speeds.*

operating speeds. Also note fiberglass gliders, like the ASK-21, are towed faster than other popular training gliders.

Recommended towing speed is determined by considering stall speed and maximum aerotow speed of the glider, minimum speed for proper engine cooling of the tow plane, and stall speed of the tow plane. Generally speaking, aerotow should be conducted at the slowest speed possible considering these factors and safety. Speed should be at least thirty percent above stall speed of the glider and twenty percent above the stall speed of the tow plane.

Because of the potential for low altitude emergencies, the initial climb must remain upwind and within gliding distance of the airport. If circumstances do not permit an upwind departure, plan the climb to remain in a position that allows the glider to return to the traffic pattern with the existing headwind component.

When towing, expect the glider to practice maneuvers such as "Boxing the Wake," which is explained and illustrated in Chapter 7 of this handbook. A thoughtful glider pilot communicates the intention to maneuver behind the tow plane. However, the tow pilot should remain alert for unannounced maneuvering. Glider pilot's normally begin the "Box the Wake" maneuver by descending vertically from high tow position to low tow position. Once a similar maneuver is detected, maintain a constant heading and a wings level attitude. After the "Box the Wake" maneuver is completed and the glider is stabilized in the hig-tow position, turns can be resumed.

During tow, the glider instructor may demonstrate and practice slack rope recovery procedures. This maneuver normally involves a climb to one side or the other followed by a small dive to create the slack in the tow line. The instructor will then have the student take the slack out of the tow line without breaking the rope. Be alert for these maneuvers and do not mistake the climb and dive maneuver as a release. This maneuver is discussed in further detail in Chapter 8 of this handbook.

Tow Positions, Turns, and Release

Glider Tow Positions

The high tow is normally used for glider tow operations. However, a low-tow position may be used in some instances, a cross-country tow for example. The main goal of both positions is to place the glider in a position that avoids the wake of the tow plane. *[Figure 12-13]*

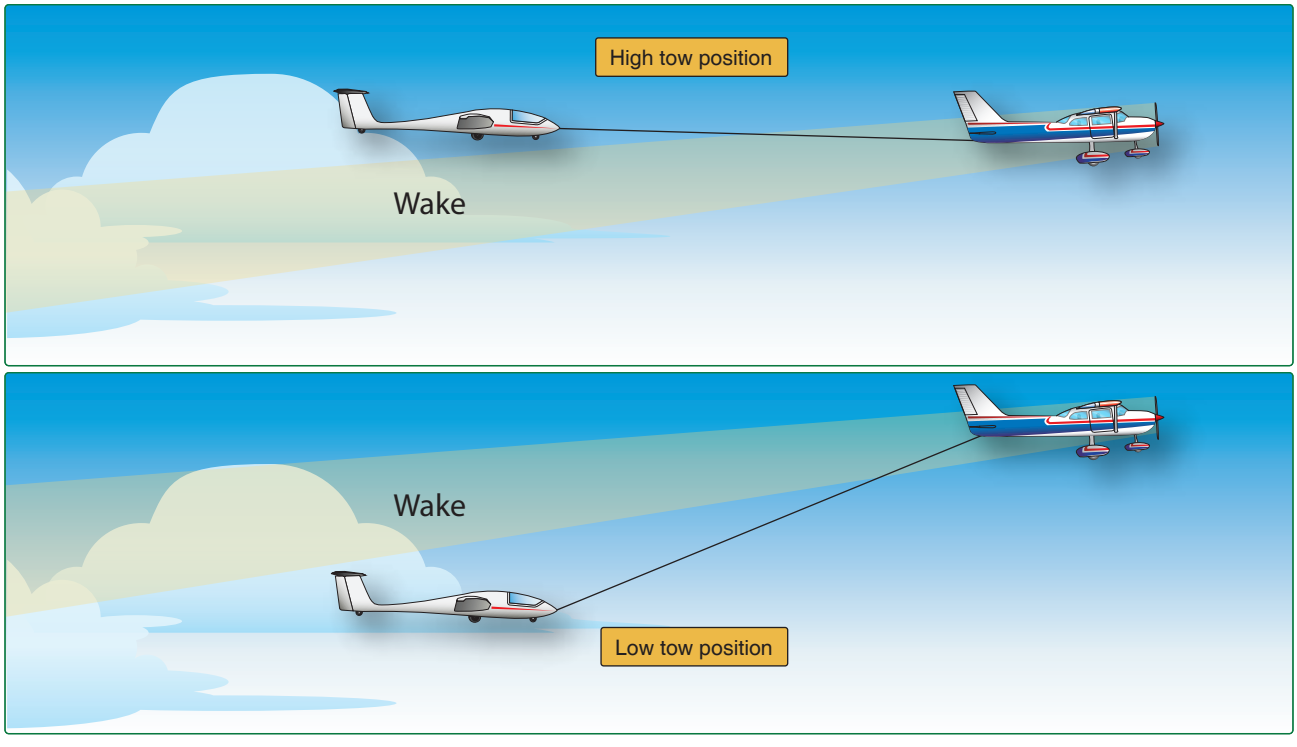

Figure 12-13. *Aerotow climb-out.*

Turns on Tow

All turns should be performed in a gentle and gradual manner. The pilot of the glider will attempt to fly the exact flightpath of the tow plane. To do this, the pilot points the nose of the glider at the outside wing tip of the tow plane during a turn.

Turns may be initiated upon reaching a safe altitude. Consideration should be given to obstruction clearance, terrain, and wind gradient. Turbulence and differential wing speed of the glider during turns are potential sources of problems.

Due to the length of the wingspan, the roll rate of a glider is typically slower than that of the tow plane. Consequently, the tow pilot should plan all turns with the understanding that the angle of bank determines the turn radius. Since the bank angles of the tow plane and glider must match to fly the same path, normally a maximum of 15–20° of bank is used.

Approaching a Thermal

When approaching a thermal, be vigilant of other gliders. Since the first glider in the thermal establishes the direction of turn, any glider joining the thermal is required to circle in the same direction as the first glider. This requires the tow pilot to position the flight in a manner that allows the glider proper and safe entry to the thermal. Be super alert when approaching thermals with circling gliders. Expect other gliders to be inbound to the thermal from all directions. Give the thermal traffic a wide berth. If the thermal appears to be especially crowded, steer clear of the activity.

Release

Standard glider release procedures are as follows *[Figure 12-14]*:

1. The pilot of the glider should ensure the tow line is relatively tight, with no excessive slack, prior to release. This allows the tow pilot to feel the release of the glider. If the tow rope is visible in the mirror, look for the wrinkle in the tow rope after the glider has released.

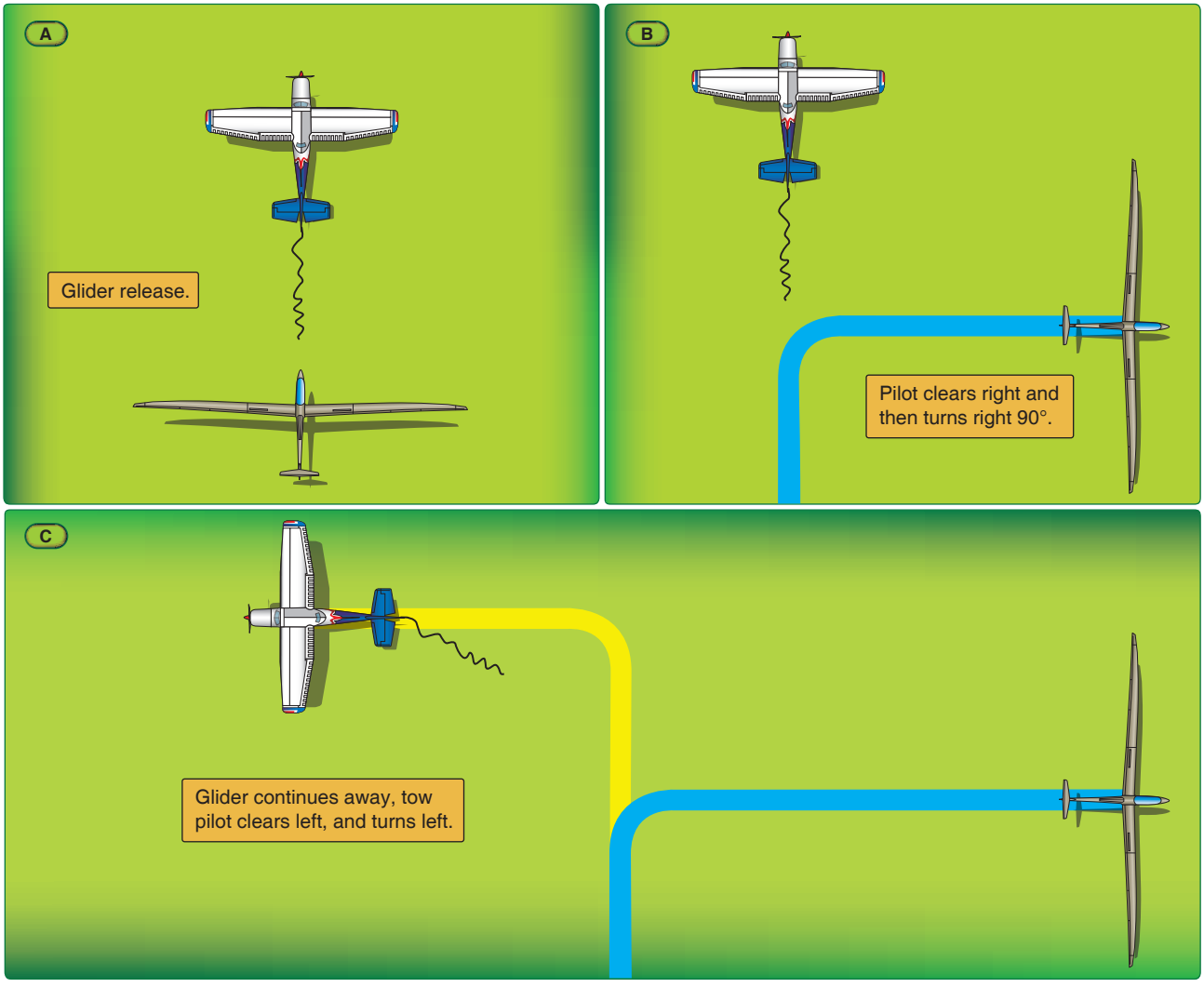

Figure 12-14. *Aerotow release.*

2. Once it has been confirmed that the glider has released and is clear, the tow pilot should clear the airspace to the left and start a medium bank, descending left turn.
3. The glider should turn right after release but may proceed straight ahead a few moments before turning right. Always be alert for non-standard maneuvering by the glider.

When the tow pilot has positively observed and confirmed the release of the tow line (assumption of release is not acceptable), the pilot of the tow plane may begin a left turn and initiate the descent. In some instances, the glider will release with slack in the tow line. This soft release may not be detectable by the tow pilot. If there is any doubt of the release status in the mind of the tow pilot, the tow pilot should continue the tow and confirm the release via radio or visually.

Descent, Approach and Landing

Descent

During the descent, proper engine management is essential. Good engine conservation practices require a gradual power reduction and conservative descent airspeeds. In fact, studies indicate that airspeed may be more critical than power reduction. Therefore, every attempt should be made to avoid airspeed acceleration and power reduction for 3 minutes after glider release. Full flaps or slipping turns can be used to obtain a suitable rate of descent. Closing cowl flaps, if available, further reduces the rate of engine cooling. Realize oil temperature is not as reliable as cylinder head temperature for managing temperature change. Each airplane requires slightly different techniques; however, the goal is to keep the engine as warm as possible while descending at a reasonable rate.

Collision avoidance is always a high priority, since descending flight attitudes increase the potential of a mid-air collision. Consider developing and using specific descent corridors that are void of glider and power traffic.

Approach and Landing

A 200-foot tow line hangs down behind the tow plane at a 30 to 40 degree angle. The altitude of the tow plane must be adjusted to ensure the tow line does not become entangled in obstructions at close proximity to the ground.

Ensure you are thoroughly briefed and familiar with the obstructions around the airport, especially obstructions on the approach end of the runway to be used. Briefings should include a minimum above ground level (AGL) obstruction crossing height and any factors that may influence altitude judgment, such as visual illusions or other airport distractions.

Landing with the tow line attached is not prohibited by regulation; however, the following points should be considered:

1. Obstructions are cleared by more than the tow line length (altimeter lag considered).
2. The field is well turfed. It is simply inviting early tow line failure from abrasion to land with the tow line on hard ground or paved runways. Landing with the tow line should never be attempted unless the field has clear approaches and is at least 2,500 feet in length.

Other situations require the tow line to be dropped, normally in the glider launch area, during short approach to the runway. If the tow line is to be dropped, the tow pilot must be constantly aware of the launch area situation. The tow line drop area must be defined and ground personnel must be briefed and aware of the drop area. Ground personnel must stay clear of the drop area, and the presence of an individual in the drop area requires an immediate go-around by the pilot of the tow plane without dropping the tow line.

Cross-Country Aerotow

Planning is the key for a successful and safe cross-county tow. *[Figure 12-15]* Fuel consumption during any tow operation is high. Plan conservatively, using the maximum fuel consumption for your particular tow plane and also plan for the possibility of a diversion along your route of flight. Study your route of flight on current sectional charts paying particular attention to airspace, both controlled and special use.

Figure 12-15. *Cross-country tow.*

Since a tow line break is a constant possibility, always plan your route of flight over landable terrain and, while in flight, strive to keep the glider over landable terrain. Tow and glider pilot fatigue is a real hazard. Make sure you are properly rested and in good medical condition prior to the flight. If the flight is particularly long, plan rest stops along the way,

if feasible. Think about water requirements to keep hydrated and the inevitable physiological requirement. Use aircraft trim to ensure the maximum tow speed of the glider is not exceeded and to help reduce pilot fatigue.

Two-way communication between the glider and the tow plane is essential during cross-country tows. Ensure portable radios and glider batteries are fully charged prior to the flight and conduct a radio check as part of your pre-flight activities. *[Figure 12-16]*

Figure 12-16. *On a cross-country tow, the tow pilot and glider pilot should have two way communication using portable radios.*

Emergencies

Takeoff Emergencies

The key to ensuring successful emergency management is the development of an emergency plan. Prior to takeoff, an emergency release point should be selected somewhere along the takeoff runway. This release point should leave sufficient room to land straight ahead, using normal stopping techniques, in the event conditions are such that a safe takeoff with the glider in tow cannot be completed.

During the initial climb out, the pilot of the glider will be noting certain altitudes that correspond to actions he or she will take in the event of a low-altitude emergency.

Tow Plane Power Failure on the Runway During Takeoff Roll

The following actions should be taken in the event the tow plane has a power failure on the runway during the takeoff roll:

- The glider should release or be released by the tow plane and, if possible, maneuver right of the runway.
- The tow plane should maneuver to the left of the runway if space is available. (Realize each individual airfield layout and obstacles may dictate an alternate procedure, so take the time to plan your actions prior to takeoff.)
- Survey the abort area carefully and know where you can exit the runway (grass or taxi-way) without causing a hazard. Always have a plan.
- Realize the glider will probably be airborne, therefore try and give the glider as much space as possible to land on the remaining runway and brake to a stop.
- Know the stopping characteristics of the glider you are towing. Some models have very effective brakes, others do not.

Glider Releases During Takeoff With Tow Plane Operation Normal

The pilot of the tow plane should continue the takeoff eliminating a collision hazard with the glider.

Tow Plane Power Failure or Tow Rope Break After Takeoff but Below 200 Feet Above Ground Level

The pilot of the glider will normally release and descend straight ahead or maneuver using slight turns to make a specific forced landing. Because of airport obstructions in close proximity to the airport, the options available for a tow plane or glider land out may be limited. Discuss these options during the pilot briefing or safety meetings. Again, a plan will go a long way in ensuring a successful land out as a result of a takeoff emergency.

Tow Plane Power Failure or Tow Rope Break After Takeoff Above 200 Feet

The glider can more than likely return to the field in the event of engine failure or rope break. Since the tow plane requires considerably more altitude to return to the field in the event of a power failure, the pilot should have a specific plan in mind that includes pre-selected landing areas for each runway.

Glider Climbs Excessively High During Takeoff

The tail of the tow plane may be lifted if the glider climbs excessively high during takeoff. Should this happen, the application of full-up elevator on the tow plane may not be sufficient to prevent an accident. The tow pilot must be ready to pull the release handle in order to regain control of the tow

plane. As a rule of thumb, use of a 200-foot tow line would require the glider to climb to over 20 feet above the altitude of the tow plane to present a danger of upset.

If at any time the nose of the tow plane is pulled uncontrollably by the glider to a dangerously high or low pitch attitude—PULL THE RELEASE.

If a Schweizer tow hitch is being used, it may be possible for the release mechanism to become jammed due to the excessively high position of the glider.

Airborne Emergencies

Glider Release Failure

If the pilot of the glider is unable to release, the tow pilot should be informed by means of the aircraft radio or by the following airborne signal. The glider will move out to the left side of the towplane and rock its wings. *[Figure 12-17]* Be sure not to mistake the wing rock as the beginning of a normal release. Wait a few seconds to ensure the glider's wings are rocking. Once the tow pilot has determined the glider cannot release the tow plane should return to the airfield and release the glider at a safe altitude over the field.

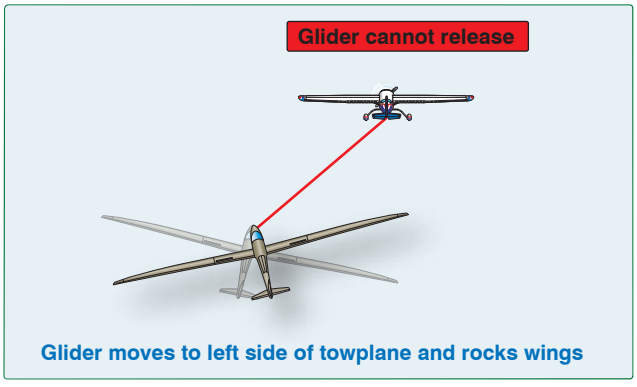

Figure 12-17. *Glider release failure.*

Neither the Tow Plane or Glider Can Release

This is an extremely rare event. Although as improbable as this situation may be, you must be prepared. The pilot of the tow plane should inform the pilot of the glider by aircraft radio or airborne signal. The signal is accomplished by yawing the tail of the tow plane.

The glider should move to the low tow position. Then the tow plane should begin a slow descent toward an airfield of suitable length. Fly a wide pattern ending up on an extended final approach. Set up a very stabilized and gradual (200–300 foot per minute (fpm)) descent. Plan on landing long and allowing sufficient altitude while on short final for the glider to avoid approach obstacles.

Since the glider is lower than the tow plane, it lands first. The glider should not apply brakes until the tow plane has touched down. After touchdown, apply brakes gently or not at all, slowly coming to a stop. Remember, most glider brakes are not that effective, so allow the glider plenty of runway to stop.

While not well defined in soaring literature, some glider pilots are taught to attempt to break the tow rope rather than land behind the tow plane. If the glider does attempt to break the rope, maintain the tow plane in a straight and level attitude in an attempt to reduce the total gravity forces of the glider's maneuver.

Glider Problem

You may notice the glider has a problem that is obviously not being detected by the glider pilot. The most common is the failure of the glider pilot to close and lock the glider's spoilers/airbrakes prior to takeoff, resulting in an inadvertent undetected deployment of spoilers as the glider accelerates during takeoff. If you notice a problem with the glider, inform the glider pilot via radio and visual signal. The visual signal for "Glider Problem" is waggling the rudder while airborne.

Immediate Release

This situation requires immediate action by the pilot of the glider. Should the tow pilot rock the wings of the tow plane, the pilot of the glider must release immediately. Obviously, this would be appropriate during a time critical tow plane emergency, such as engine-failure or fire. *[Figure 12-18]*

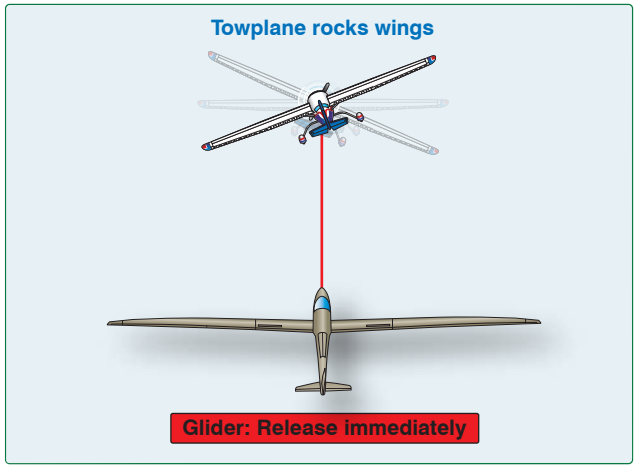

Figure 12-18. *The towplane is telling the glider to release immediately.*