

Sanford Soaring Club Private Pilot Glider Syllabus

Syllabus adapted from one on the Skyline Soaring Club, Inc. website.

Lesson	Name	FAR Requirement	PTS Area	Instructor Sign-Off and Date
1	Ground Lessons			
1a	Preflight Planning / Overview	61.87(i)(1)	I	
1b	Aeromedical Factors Discussion		I(E)	
1c	Use of Controls		PTS p8	
1d	Cockpit Familiarization			
1e	Positive Control Check	61.87(i)(1)	II(C)	
1f	Release Mechanisms			
1g	Ground Handling	61.87(i)(1,2)	II(B,C))	
2	First Flight Lessons			
2a	Pre-Takeoff Checklist	61.87(i)(1)	IV(A)	
2b	Attitude Flying / Scanning	61.87(i)(6)		
2c	Glider Preflight / Daily Inspection	61.87(i)(1)	I, II(C)	
2d	Airport Procedures	61.87(i)(5)	III(A,B,C)	
2e	Cockpit Management		II(D)	
2f	Aerotow Release	61.87(i)(11)	IV(F)	
2g	Visual Signals	61.87(i)(11)	II(E)	
2h	Normal Takeoff	61.87(i)(3)	IV(B)	
2i	Normal Aerotow	61.87(i)(12)	IV(C)	
2j	Straight Glide	61.87(i)(4)	VII(A)	
2k	Shallow, Medium, Steep Turns	61.87(i)(4)	VII(C)	
2l	Normal Landing	61.87(i)(16)	IV(Q)	
3	Core Flights			
3a	Before-Landing Checklist	61.87(i)(16)	IV(Q)(8)	
3b	Traffic Pattern	61.87(i)(10,16)	IV(Q)	
3c	Minimum Controllable Airspeed	61.87(i)(8)	V(A), IX(A)	
3d	Turns to Headings		VII(B)	
3e	Forward Stall	61.87(i)(14)	IX(B)	
3f	Turning Stall	61.87(i)(14)	IX(B)	
3g	Spirals, Descents	61.87(i)(15)		
4	Advanced Skills			
4a	Collision, Windshear & Wake Turbulence Avoidance	61.87(i)(6)	IV(G)	
4b	Radio Procedures	61.87(i)(1)	III(A)	
4c	Minimum Sink	61.87(i)(8)	V(A)	
4d	Slips	61.87(i)(7)	IV(R)	
4e	Best L/D, Speed to Fly	61.87(i)(8)	V(B)	
4f	Boxing the Wake	61.87(i)(12)	IV(C, E)	
4g	Crosswind Takeoff	61.87(i)(3)	IV(B)	
4h	Crosswind Landing	61.87(i)(16)	IV(Q)	

4i	No-Instrument Landings	61.87(i)(9)	X(A)	
4j	Precision Landings/Stops	61.87(i)(16)	X(A)	
4k	Slips to Landing	61.87(i)(17)	IV(R)	
5	Soaring Techniques			
5a	Thermal	61.87(i)(1)	VI(A)	
5b	Ridge	61.87(i)(1)	VI(B)	
5c	Wave	61.87(i)(1)	VI(C)	
6	Unusual Attitudes and Emergencies			
6a	Slack Line	61.87(i)(9,19)	IV(D)	
6b	Aerotow Emergency Procedures	61.87(i)(9,19)	IV(G)	
6c	V-Speeds	61.87(i)(8)	V	
6d	Rope Breaks	61.87(i)(9,19)	IV(G)	
6e	Pilot Induced Oscillations			
7	Finishing Touches			
7a	Downwind Landing	61.87(i)(16)	IV(S)	
7b	Taxiing and Clearing Runway	61.87(i)(2)	XI	
7c	Postflight Inspection		XI(A)	
7d	Assembly / Disassembly	61.87(i)(13)	II(A), XI(A)	
7e	Pre-Solo Written Test	61.87(b)		
7f	Checkride Rating Endorsement		PTS p5	

Note that almost all of the above items are also required (in addition to required endorsements and student pilot certificate!) prior to student solo. All items except 4b, 4c, 4i, 4j, 5b, and 5c (and 7f) must be covered during training prior to solo.

1a. Preflight Planning/Overview

Lesson Objective

During this lesson, the student will become familiar with the preparation required before walking out to the flight line. This includes weather preparation, understanding weather services, go/no decision, required documents for the pilot.

Regulatory Requirement

Pre-Solo pilot (Student Pilot and Transition Pilots): [§61.87\(i\)\(1\)](#)

Private Pilot Test Candidate: [PTS](#) Area of Operation IA, IB

Content

- Collecting information required for this flight
- Weather Information systems
- Required Documents in possession of the pilot

Completion Standards

When complete, the student will

- use DUATS and/or WX-BRIEF to obtain a weather briefing
- be able to make a go/no-go decision based on weather briefing information
- be able to explain the hazards associated with flight in the vicinity of thunderstorms
- understand different types of Aviation Weather services, as defined in AC [00-45G](#)
- exhibit knowledge pertaining to required documents when acting as a pilot in command (pilot license, photo ID).

Prerequisite Study

- [AC 00-45G Aviation Weather Services](#)
- Glider Flying Handbook, pages 9-25 through 9-40
- 14 CFR §61.3 Requirement for certificates, ratings, and authorizations.
- 14 CFR §91.103 Preflight action.

Required Homework

- Register as a user for one of the approved pre-flight briefing services, and get a briefing for the day you will fly, such as the Lockheed Martin Flight Service site, (<https://www.lmfswb.afss.com/Website/>)
- Dial in to 1-800-WX-BRIEF and get a standard VFR weather briefing for a local flight for the hours you plan to be flying.
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1b. Aeromedical Factors Discussion

Lesson Objective

The instructor and student will have a candid discussion of Medical, Psychological, and Physiological factors related to safe aviation. Glider pilots may not fly while under the influence of certain medications or while suffering from certain physiological issues. The discussion must include a review of illnesses, acute and chronic, and the pilot's current medications.

Regulatory Requirement

- All pilots: [§61.53](#) Prohibition on operations during medical deficiency.
- Private Pilot Test Candidate: [PTS](#) Area of Operation I(E)

Content

- Altitude and motion sickness
- Prescription and illicit drugs
- Alcohol use
- Hypoxia (*Hypoxic, hypemic, stagnant, histotoxic*) and carbon monoxide poisoning
- Pre-existing medical conditions that make the pilot unfit to fly
- Anti-Depression Medication
- Effects of absorbed gasses when scuba diving

Completion Standards

When complete, the student will understand and explain all of the topics above

Prerequisite Study

- [14 CFR §61.15](#) Offenses involving alcohol or drugs.
- [14 CFR §61.16](#) Refusal to submit to an alcohol test or to furnish test results.
- [14 CFR §61.23](#) Medical certificates: Requirement and duration.
- [14 CFR §61.53](#) Prohibition on operations during medical deficiency.
- [14 CFR §91.13](#) Careless or reckless operation.
- [14 CFR §91.17](#) Alcohol or drugs.
- [14 CFR §91.211](#) Supplemental oxygen.
- [AIM section 8-1-1](#) Fitness for Flight. (Includes IM SAFE checklist)
- [AIM section 8-1-2](#) Effects of Altitude.

Other Resources

The FAA has a list compiled of approved and non-approved medications. This list is on [the AOPA website](#) (AOPA members only). A free list can be found at <http://www.leftseat.com/medcat1.htm> .

1c. Use of Controls

Lesson Objective

During this lesson, the Instructor will present the use of the controls in the cockpit and their effect on the control surfaces. In addition, any time there is an exchange of controls, the student and instructor must use the FAA-approved method of "Positive Exchange of Controls."

Regulatory Requirement

Private Pilot Test Candidate: [PTS](#), Page 8, "Positive Exchange of Controls"

Content

- Positive Exchange of Controls
- Ailerons
- Elevator
- Spoilers / Dive brakes
- Tow hook release
- Rudder
- Wheel brake
- Trim-tab
- Empennage
- Different types of flaps

Completion Standards

When complete, the student will

- use the "Positive Exchange of Controls" procedure whenever command of the aircraft changes
- understand and explain the functions of all above items
- describe the movement of the stick and how the control surfaces react to the stick movement.
- describe the use of the rudders
- describe the use of the spoilers
- describe the means of locking the spoilers / dive brakes

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), Chapter 2; pages 2-1 through 2-10

1d. Cockpit Familiarization

Lesson Objective

The instructor will teach the components of the cockpit, instruments and seating.

Content

- Use of Instruments
- Seating positioning
- Use of seatbelt harnesses
- Use of air vents
- Adjustment of rudder pedals
- Ballast weight

Completion Standards

When complete, the student will

- Understand and explain all of the equipment above

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), Chapter 4; pages 4-1 through 4-18
- [SGS 2-33 GFM/POH](#)

1e. Positive Control Check

Lesson Objective

The instructor will teach the procedure of the "Positive Control Check"

Regulatory Requirement

- Pre-solo pilot: [§61.87\(i\)\(1\)](#)
- Private Pilot Test Candidate [PTS](#) II-C

Content

- Purpose of the positive control check
- Relation to aircraft assembly
- Aileron check
- Spoiler check
- Elevator check
- Rudder check

Completion Standards

When complete, the student will be able to demonstrate a satisfactory positive control check

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), Chapter 6 and Appendix A
- Soaring Safety Foundation's Wing-Runner Course "[Positive Control Check](#)"

1f. Release Mechanisms

Lesson Objective

The instructor will teach the student the function of the tow release, including the differences in the Schweizer and Tost release mechanisms

Regulatory Requirement

- Pre-solo pilot: [§61.87\(i\)\(1\)](#)
- Private Pilot Test Candidate [PTS](#) II-C

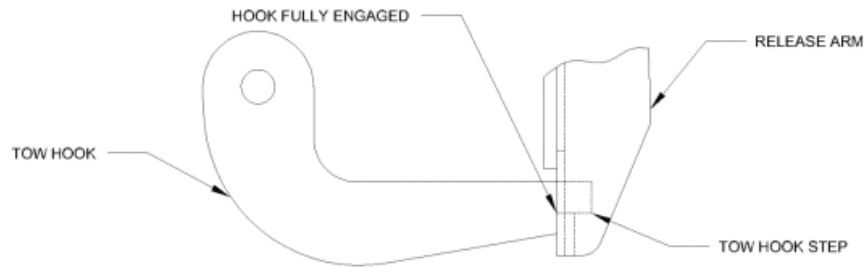
Content

- Nose hook/CG hook
- Schweizer release
- Tost release
- Back-release function of CG hooks
- Maximum and Minimum towline strengths
- Use of weak links (towplane end, glider end)
- Hazards of hooking Tost rings onto Schweizer hooks
- POH maximum line strength vs the 200% rule

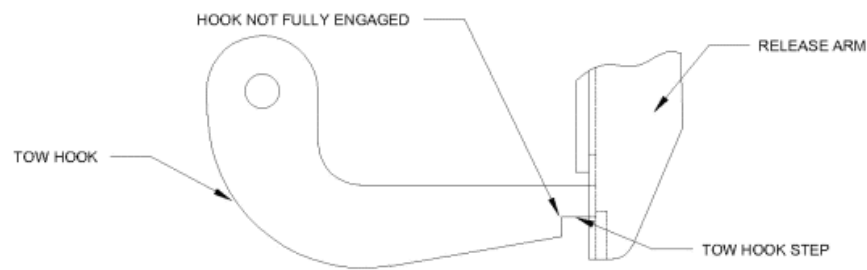
Completion Standards

The student must be able to

- Calculate the appropriate towline strengths
- Describe the proper use of weak links
- Recognize the correct usage of Schweizer or Tost rings for the appropriate aircraft
- Recognize the correct engagement of the Schweizer tow hook for Schweizer aircraft

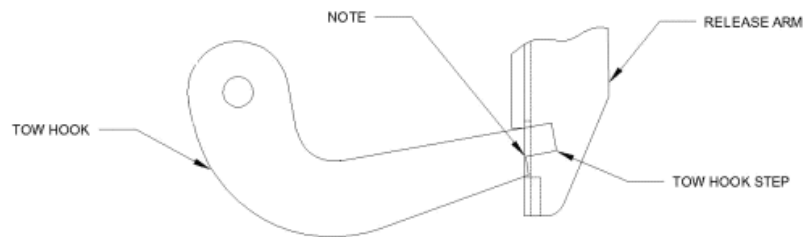


VIEW A – PROPER ENGAGEMENT



VIEW B – IMPROPER ENGAGEMENT

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VIEW C – IMPROPER ENGAGEMENT

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), Page 6-6
- [Glider Flying Handbook \(2013\)](#), Page 7-11, figure 7-13
- [14 CFR § 91.309](#) Towing: Gliders and unpowered ultralight vehicles.

1g. Glider Ground Handling

Lesson Objective

The instructor will teach the student the proper procedures for moving the aircraft safely.

Regulatory Requirement

- Pre-solo pilot: [§61.87\(i\)\(2\)](#)
- Private Pilot Test Candidate [PTS](#) II-B

Content

- Towing, including communication with tow vehicle driver
- Appropriate number of ground personnel
- Appropriate method of turning the glider around turns

Completion Standards

The student must be able to perform

- safe transit of the glider from the tiedown to the flightline

The student must be able to explain

- the appropriate locations to grasp the aircraft
- the hazards of handling the canopy
- the appropriate position of the spoiler handle in the SGS 2-33
- proper securing techniques

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), Chapter 6

Recommended Study

- [Soaring Safety Foundation Wingrunner Course](#)

The student must be able to explain

- the hazards of handling the canopy
- the appropriate position of the spoiler handle in the SGS 2-33

Prerequisite Study

[Glider Flying Handbook \(2013\)](#), Chapter 6

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2a. Pre Takeoff Tasks

Lesson Objective

During this lesson, the student will learn the procedures for a successful preflight review of the aircraft and pre-takeoff checklist, including the importance of each item on the checklist.

Regulatory Requirement

- Pre-solo pilot: [§61.87\(i\)\(1\)](#)
- Private Pilot Test Candidate [PTS](#) IV-A

Content

- The importance of a Pre-Takeoff Checklist
- The difference between a "Check" list and "Do" list
- Use of seatbelts and seat harnesses

Completion Standards

The student must be able to perform the club standard checklists without prompting from the instructor

The student must be able to explain

- the importance of a pre-takeoff checklist
- each of the items on the checklist, in order

Prerequisite Study

- [14 CFR §91.107](#) Use of safety belts , shoulder harnesses
- [Glider Flying Handbook \(2013\)](#), Figure 6-15, "Prelaunch Checklist" (which differ slightly from the SSC checklists)
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2b. Attitude Flying/Scanning

Lesson Objective

During this lesson, the student will understand the need for proper scanning for aircraft, using attitude to judge and determine speed and bank.

Regulatory Requirement

- Pre-solo pilot: [§61.87\(i\)\(6\)](#)
- Private Pilot Test Candidate [PTS](#), pages 5-7

Content

- Empty-field myopia
- peripheral vision
- narrow-field vision
- proper field scanning techniques
- pitch angle references
- bank angle references

Completion Standards

When complete, the student will

- understand and explain proper scanning techniques
- understand and explain narrow-field versus peripheral vision
- be able to explain the relationship between attitude and airspeed
- be able to achieve and maintain airspeed primarily by reference to attitude

Prerequisite Study

- [Vision in Flight AIM section 8-1-6](#)
- [Judgment Aspects of Collision Avoidance AIM section 8-1-8](#)
- Soaring Safety Foundation's FIRC presentation [Collision Avoidance](#)
- AOPA's Safety Advisor [Collision Avoidance Strategies](#)
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2c. Preflight / Glider Daily Inspection

Lesson Objective

The student will learn the importance of the glider daily inspection, the correct procedure and habits of a successful preflight.

Regulatory Requirement

- Pre-Solo pilot (Student Pilot and Transition Pilots): [§61.87\(i\)\(1\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation I, II(C)

Content

- Purpose and Procedures of Preflight
- Use of Preflight Checklists
- Required aircraft documents
- Critical Assembly Checklist
- Weight and Balance
- Impact of frost

Completion Standards

- know the role of the aircraft preflight procedure
- know how to use the POH/GFM to discern proper preflight procedures
- use loading charts to determine weight and balance limits
- understand the importance of proper weight and balance
- use appropriate checklists during preflight
- know what documents are required in the aircraft for legal flight
- know the roles of the Airworthiness and Registration Certificates

Prerequisite Study

- Glider Flying Handbook, pages 6-4 and 6-5.
- [14 CFR §91.3](#) Responsibility and authority of the pilot in command.
- [14 CFR §91.7](#) Civil aircraft airworthiness.

Recommended Study

- Pilot Operating Handbook for the [SGS 2-33](#)

2d. Airport Procedures

Lesson Objective

During this lesson, the student will learn the appropriate airport procedures, including the shape of the traffic pattern. The student will learn the airport markings, and procedures for avoiding runway incursions. Candidates for the Practical test will be expected to know about Land and Hold Short (LAHSO) procedures at controlled airports.

Regulatory Requirement

- Pre-Solo pilot (Student Pilot and Transition Pilots): [§61.87\(i\)\(5\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation III(A,B,C)
- Local procedures and policies of management of KSFM and SSC

Content

- Airport markings
- Runway markings
- Taxiway markings
- Pattern shape
- Adjustment of pattern shape to fit the immediate need
- Powered Air Traffic Operations

Completion Standards

When complete, the student will understand the role and function of the pattern, and most importantly the complete flexibility of the pattern. The student will also understand that the pattern is not the goal, getting the aircraft on the ground is the goal. The student will be able to explain:

- The mechanics of the pattern
- Differences between the powered traffic pattern versus glider traffic pattern
- Range of flexibility in the pattern
- General altitudes for beginning the pattern.
- Judgment of angles during pattern approach

Prerequisite Study

- SSC Operations guidelines
- [Airport Operations AIM 4-3-1, 4-3-2, 4-3-3](#) , and [4-3-4](#)
- [Glider Flying Handbook \(2013\)](#), Chapter 7
- FAA Advisory Circular [90-66A](#)
- FAA Pilot's Handbook of Aeronautical Knowledge (PHAK) entitled, Runway Incursion Avoidance. [Appendix 1](#)

Recommended Study

- Taxiway Lights [AIM 2-1-9](#)
- Airport Pavement Markings [AIM 2-3-2](#)
- Runway Markings [AIM 2-3-3](#)
- Taxiway Markings [AIM 2-3-4](#)
- *Displaced Threshold Markings* [AIM Figure 2-3-4](#)
- Runway Boundary Line [AIM Figure 2-3-33](#)

Further Study

- [Runway Markings \(FAA\)](#)
- [AOPA Runway Safety Trainer](#) (Cool!)
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2e. Cockpit Management

Lesson Objective

Cockpit management relates to the organization of items in the cockpit, the briefing of passengers on the cockpit controls and use of seat harnesses. The PTS requires that candidates demonstrate the ability to brief passengers in the use of seatbelts and seat harnesses, as well as the ability to manage loose items in the cockpit.

Also of critical importance, the student will learn the appropriate actions to be taken if the canopy opens while in-flight.

Regulatory Requirement

- Private Pilot Test Candidate: [PTS](#) Area of Operation IID

Content

- Use of seat harnesses
- Passenger briefing
- Placement of objects in the cockpit
- Hazards of unsecured objects in turbulent conditions
- Appropriate use of written checklists
- Use of cell phones in-flight
- Canopy opening while in-flight

Completion Standards

When complete, the student

- Exhibits knowledge of the elements related to cockpit management procedures.
- Organizes and arranges material and equipment in a manner making items readily available.
- Briefs passengers on the use of safety belts, shoulder harnesses, and emergency procedures.
- Utilizes all appropriate checklists.
- Explain the hazards and remedies of a canopy opening in-flight.

Prerequisite Study

- [14 CFR § 91.107](#) Use of safety belts, shoulder harnesses, and child restraint systems.
- [47 CFR § 22.925](#) Prohibition on airborne operation of cellular telephones.

2f. Aerotow Release

Lesson Objective

The instructor will teach the student the appropriate procedure for aerotow release.

Regulatory Requirement

- Student Pilot: 14 CFR [§61.87\(i\)\(11\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation IV(F)

Content

- Proper scanning before release.
- Release from aerotow.
- Confirmation that the rope has been released before starting the turn.
- Proper separation between the towplane and glider.

Completion Standards

When complete, the student will be able to:

- clear the area before release
- especially for a pattern tow, makes sure that no other traffic will immediately conflict (without jeopardizing the stability of the aerotow)
- release with no slack in the rope
- release in the high-tow position
- confirm that the rope is away before beginning the separation turn.
- perform a *level right turn* after release.
- perform the release at the appropriate altitude.

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), pages 7-8 through 7-11.

2g. Visual Signals

Lesson Objective

The candidate must know all of the ground signals used by the line crew for different circumstances such as take up slack, open and close the tow hook, hold, begin takeoff, stop, release towline, and emergency stop. The candidate must also know all of the SSA standard signals used between the glider and towplane.

Regulatory Requirement

Student Pilot: 14 CFR [§61.87\(i\)\(11\)](#)

Private Pilot Test Candidate: [PTS](#) Area of Operation IIE

Content

The student will know:*The following hand signals:*

- Open Towhook
- Close Towhook
- Raise Wingtip
- Take up Slack
- Hold
- Begin Takeoff
- Stop Operation Immediately!

The following in-flight visual signals:

- Something wrong with glider (Close Airbrakes!)
- Towplane, please turn (left, right)
- Towplane, increase tow airspeed
- Towplane, decrease tow airspeed
- Glider! Release immediately!
- Towplane, the glider can not release!
- Glider, the towplane can not release!

Completion Standards

When complete, the student will know and be able to demonstrate all of the signals listed above.

Prerequisite Study

- Hand Signals: [Glider Flying Handbook \(2013\)](#) page 7-2, Figure 7-1
- In-flight Aerotow Visual Signals: [Glider Flying Handbook \(2013\)](#) page 7-3, Figure 7-2
- [14 CFR § 91.309\(5\)](#) Towing: Gliders and unpowered ultralight vehicles.

Additional Study

- Soaring Safety Foundation Wingrunner's Course -- [Launching the Glider](#)

2h. Normal Takeoff

Lesson Objective

The student will learn the procedures and skills necessary for a takeoff on aerotow. This includes the initial rollout to the beginning of the climb-out.

Regulatory Requirement

- Student Pilot: [§61.87\(i\)\(3\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation IV(B)

Content

- Beginning of the takeoff roll
- Glider airborne, towplane on ground
- Initial towplane climbout

Video Example

Here is an illustration of a normal takeoff, a high-definition video running 1:26. [The Takeoff](#).

Completion Standards

When complete, the student will:

Before the glider takes off:

- avoid dragging a wingtip on the ground
- maintain directional yaw control on roll-out
- prevent the glider from ballooning on takeoff

Before the towplane takes off, and after the glider is airborne:

- maintain appropriate position above the ground while the towplane is still on the ground

After the towplane is airborne:

- establish appropriate position on tow once the towplane is airborne.

Other factors to safe take-off

- explain the relationship between temperature and takeoff performance
- explain the hazards of ballooning
- explain the go/no-go point to continue the aerotow while towplane is still on the take-off roll
- explain the hazards of takeoff performance on high density altitude days

Prerequisite Study

- [Glider Fying Handbook \(2013\)](#) pages 5-2 through 5-7; *Factors Affecting Performance*
- [Glider Fying Handbook \(2013\)](#) pages 7-2 through 7-5; *Takeoff Procedures and Techniques*

2i. Normal Aerotow

Lesson Objective

The candidate must learn the correct procedures for safe conduct of normal aerotow procedures.

Regulatory Requirement

- 14 CFR [§61.87\(i\)\(12\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation IV(C)

Content

The candidate will learn:

- knowledge of the elements related to high-tow (slightly above the wake) positions during various phases of aerotow.
- how to make smooth and correct control applications to maintain vertical and lateral positions during high tow.
- how to maintain proper tow position during turns.
- how to use rapid and appropriate responses to maintain position during turbulent flight and prevent slack rope.

Completion Standards

When complete, the student will

- demonstrate appropriate high-tow position during level flight
- demonstrate appropriate high-tow position during turns
- respond rapidly and correctly to any atmospheric disturbances
- explain the elements related to proper aerotow positions.

Note to students: This will take several lessons to accomplish.

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), *Aerotow Climb-out And Release Procedures*, page 7-2 through 7-11.

2j. Straight Glide

Lesson Objective

The candidate must be able to fly the glider on a specified heading, and continually maintain that heading, at a desired airspeed. The candidate must do so with smooth control inputs, so that the glider is in constant coordinated flight.

Regulatory Requirement

- Pre-solo: 14 CFR [§61.87\(i\)\(4\), \(15\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation VII(A)

Content

The student will learn the elements of straight flight, which include

- relationship of attitude to airspeed
- the skill of tracking toward a landmark or heading at the instructor's choosing
- the skill of maintaining wings level without inadvertent yawing motions
- the ability to adjust to atmospheric disturbances
- maintaining a specific heading and airspeed
- the selection of the appropriate amount of crab to counteract any winds aloft

Completion Standards

When complete, the student will

- exhibit knowledge of the elements related to straight glides, including the relationship of pitch attitude and airspeed
- track toward a prominent landmark at a specified airspeed
- demonstrate the effect of dive brakes in relation to pitch attitude and airspeed
- exhibit smooth, coordinated control, and planning.
- maintain the specified heading, +/-10 deg, and specified airspeed, +/-10 kts
- when tracking to a point, select the appropriate amount of crab in crosswinds

Note: The criteria for evaluation in this section are taken directly from the [PTS](#).

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), *Straight Glides*, page 7-27.

2k. Shallow, Medium, Steep Turns

Lesson Objective

The candidate will learn the elements related to turns, specifically; shallow, medium, and steep turns. Included in this lesson plan is the relationship of dihedral effect to shallow turns, and the effect of the overbanking tendency on steep turns. It is critical that the candidate be vigilant for air traffic, and will look for air traffic before initiating any turn.

Regulatory Requirement

- Pre-Solo: 14 CFR [§61.87\(i\)\(4\),\(15\)](#)
- Private Pilot Test Candidate: [PTS](#) Area of Operation VII(C)

Content

The candidate will learn:

- the effect of the overbanking tendency
- the effect of dihedral
- the definition of shallow, medium, and steep banked turns
- the appropriate application of aileron, elevator, and rudder to perform coordinated turns
- the appropriate use of elevator and pitch control to maintain the desired airspeed during turns
- the relationship of bank angle and load factor
- the relationships of bank angle and airspeed versus turn radius

Completion Standards

When complete, the student will

- *clear the area before each and every turn entry*
- exhibit knowledge of the elements related to steep turns, including load factor, effect on stall speed, and overbanking tendency
- establish the recommended entry airspeed
- for steep turns, enter a turn maintaining a bank angle of $45^{\circ} \pm 5^{\circ}$
- for all turns, enter a turn with smooth and coordinated control applications
- maintains desired airspeed, ± 10 knots
- recovers with smooth and coordinated control application within 10° of the desired heading

Note: All criteria for evaluation are taken directly from the [Private Pilot Practical Test Standards](#).

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#), *Turns*, page 7-28 through 7-32
- [Private Pilot Practical Test Standards for Gliders](#), page 7
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21. Normal Landing

Lesson Objective

During this lesson the instructor will demonstrate a normal landing. The student will perform supervised landings, and when proficient will be able to execute a normal landing without coaching or intervention. This will take many lessons.

This lesson plan indicates benign atmospheric condition, and does not include crosswind, tailwind, or landing in strong headwinds.

Regulatory Requirement

- Pre-Solo: 14 CFR [§61.87\(i\)\(16\)](#)
- Private Pilot Test Candidate: [PTS](#) IV(Q)

Content

- Line up with the landing area
- Flare at the appropriate height
- Use of speed / dive brakes
- Runway centerline alignment
- Smooth touchdown
- Appropriate speed on final approach and touchdown
- Hazards of landing at too high an airspeed
- Hazards of approaching the runway at too low an airspeed

Video Example

Here is an illustration of a reasonable pattern and landing. It's not perfect but provides the view of a stabilized approach and flare. [A Normal Landing](#).

Completion Standards

When complete, the student will

- be able to execute a normal landing without coaching from the instructor
- execute a landing in which the successful outcome is never in doubt
-

3a. Before-Landing Checklist

Lesson Objective

The student will be able to recite and properly execute the pre-landing checklist prior to entering the traffic pattern.

Regulatory Requirement

- [§61.87\(i\)\(16\)](#)
- Private Pilot [Practical Test Standard](#) IV-(Q) (8)

Content

- The student will learn the necessity and procedure for the memorized checklist executed before entering the pattern.

Completion Standards

The student must be able to perform

- The FUSTALL checklist *before* entering the pattern
- All items on the checklist with smooth transition between the steps and authority.

The student must be able to explain

- The purpose of the FUSTALL checklist
- The reasons why Flaps and Undercarriage are included, even though the aircraft lacks flaps and a retractable landing gear

Prerequisite Study

- [Learning to Fly Gliders](#), page 58, "The landing checklist"
- **FUSTALL:**
 - Flaps -- Set to the landing setting.
 - Undercarriage -- down and locked (down and welded)
 - Speed -- Set to the landing speed.
 - Trim -- Set to maintain the landing speed.
 - Air brakes -- Verify they work before you need them. Open and symmetrical deployment.
 - Lookout -- Look to the traffic pattern to ensure proper separation
 - Landing -- Look to the landing runway to ensure it is clear

3b. Traffic Pattern

Lesson Objective

The student will learn the shape, go ahead-points, and most of all, the flexibility of the pattern.

Non-Goals

The student will **NOT** focus on rigid adherence to specific altitudes at certain points in the pattern.. Every pattern is a tool to the primary and ultimate goal -- getting to the runway safely.

Regulatory Requirement

- [§61.87\(i\)\(10\),\(16\)](#)
- Private Pilot [Practical Test Standard](#) IV-Q

Content

- Entry point
- Entry altitude
- Downwind leg
- Base leg
- Final approach
- Flexibility in pattern construction and TLAR
- Ground tracking with reference to the aiming point

Completion Standards

The student must be able to perform

- A pattern to the satisfaction of the instructor, without aid from the instructor.

The student must be able to explain

- That the primary ultimate goal of the pattern is to reach the runway!
- The procedure for a normal pattern
- The situations when a pattern is not appropriate
- The means of abbreviating a pattern

Prerequisite Study

- [Learning to fly Gliders](#), pages 60-62
- [Glider Flying Handbook](#), pages 7-34 through 7-36

3c. Minimum Controllable Airspeed

Lesson Objective

The student will learn how to fly the glider on the cusp of a stall -- without allowing the glider to actually stall. Also, the student will be expected to perform shallow-banked turns while flying in Minimum Controllable Airspeed (MCA).

Regulatory Requirement

- [§61.87\(i\)\(8\)](#)
- Private Pilot [Practical Test Standard](#) V-A
- Private Pilot [Practical Test Standard](#) IX-A

Content

- Performance of the glider at MCA in level flight.
- Performance of the glider at MCA during turns.
- Performance of the glider at MCA without causing the aircraft to stall.
- Performance of the glider at MCA while showing the six signs of a stall (without stalling).

Completion Standards

The student must be able to perform

- Appropriate clearing turns before the maneuver
- MCA in level flight
- MCA in turns

Prerequisite Study

- [Glider Flying Handbook](#), page 7-27, "Signs of an impending stall will include..."
- [Learning to Fly Gliders](#), page 25
- [Glider Flying Handbook](#), page 7-26
-

3d. Turns to a Heading

Lesson Objective

The student will learn the procedures for turning out on a heading. The student will also learn the different types of error with a magnetic compass.

Regulatory Requirement

- **Private Pilot:** Private Pilot [Practical Test Standard](#) VII-B

Content

- The candidate will clear the area before turning
- The student will be able to turn to any heading described by the instructor
- Magnetic deviation (the compass in the aircraft is deviant)
- Magnetic variation (the variation varies from place to place)
- Compass acceleration error (ANDS)
- Turning error (UNOS)
- relationship of turning error to latitude

Completion Standards

The student must be able to perform

- Turns to any desired heading from the instructor

The student must be able to

- explain compass dip error
- explain turning error
- show differences between magnetic deviation and variation.
- identify magnetic variation on an aeronautical sectional.

Prerequisite Study

- [Glider Flying Handbook](#), pages 4-11 through 4-14
- [Learning to Fly Gliders](#), pages 74 and 75

Further Study

- National Geophysical Data Center's [world map of magnetic declination](#) (variation)

3e. Forward Stall

Lesson Objective

The student will learn what causes a stall, how to perform a stall, how to recover from a stall. This lesson includes stalls with brakes open but does not include turning or cross-controlled stalls.

Regulatory Requirement

- [§61.87\(i\)\(14\)](#)
- Private Pilot [Practical Test Standard](#) IX-B

Content

- Stall as related to a critical angle of attack
- stall as related to airspeed and/or pitch
- stalls at low G loading
- stalls at high G loading
- recovery from stall
- imminent stall
- hazards at low altitude
- hazard of stalls in the pattern
- use of spoilers during a stall, stall speed as related to spoiler deployment

Completion Standards

The student must be able to perform

- A normal, forward stall and appropriate recovery
- A normal, forward stall with air brakes open, and appropriate recovery.

The student must be able to explain

- the hazards of a stall
- the definition of relative wind and angle of attack
- the difference between angle of attack and pitch angle
- relationship to airspeed and loading
- relationship to angle of attack

Prerequisite Study

- [Glider Flying Handbook](#), pages 3-14, 7-26, 7-27, 3-11, 3-14
- [Learning to Fly Gliders](#), pages 23 and 27

3f. Turning Stall

Lesson Objective

The student will learn the entry and recovery from a stall with and without airbrakes

Regulatory Requirement

- [§61.87\(i\)\(14\)](#)
- Private Pilot [Practical Test Standard](#) IX-B

Content

- hazards at low altitude
- hazard of stalls in the pattern
- use of spoilers during a stall, stall speed as related to spoiler deployment
- appropriate recovery from a turning stall
- direction of wing drop vs turn direction or yaw

Completion Standards

The student must be able to perform

- A turning stall and appropriate recovery
- A turning stall with air brakes open, and appropriate recovery.

The student must be able to explain

- relationship of the rapidness of a stall to the angle of bank

Prerequisite Study

- [Glider Flying Handbook](#), pages 3-14, 7-26, 7-27, 3-11, 3-14
- [Learning to Fly Gliders](#), pages 26 and 27

3g. Spirals, Descents

Lesson Objective

The student will learn the hazards of the "Graveyard Spiral", the benefits of the "benign spiral", entry and recovery techniques from spiral descents.

Regulatory Requirement

- Student Pilot Candidates: [§61.87\(i\)\(15\)](#)

Content

- Spiral turn entry
- Recovery from spiral turns
- Benign spiral setup

Completion Standards

The student must be able to perform

- a spiral descent with and without air brakes
- the appropriate recovery from steeply-banked turn with nose low attitude
- the hazards of inappropriate recovery from spiral dives.

The student must be able to explain

- the hazards of spiral descents
- the differences between spiral descents and spins
- the recovery technique from a spiral descent
- the *incorrect* techniques for recovery from a spiral descent
- the benefits of a benign spiral

Prerequisite Study

- [Learning to Fly Gliders](#), pages 76 and 77
- [Glider Flying Handbook](#), page 7-25

Recommended Study

- [Skylines, June 2005](#) "Stay Safe in Wave", article about benign spirals.
-

4a. Collision, Wind Shear & Wake Turbulence Avoidance

Lesson Objective

The student will review scanning techniques. The student will learn of the hazards of wind shear; the student will learn the hazards of wake turbulence.

Regulatory Requirement

- [§61.87\(i\)\(6\)](#)
- Private Pilot [Practical Test Standard](#) IV-G

Content

- Wake Turbulence Generation, Strength, Behavior, Problem Areas and Avoidance
- Wind Shear, definition and impact on aircraft performance (especially on final!)
- Collision avoidance, see and be seen
- Thermalling with another glider
- Review scanning techniques [lesson 2b](#)

Completion Standards

The student must be able to perform

- Appropriate scanning techniques throughout every flight
- Appropriate situational awareness of windshear and wake turbulence

The student must be able to explain

- Risk factors in midair collisions (especially as related to gliders)
- Collision avoidance technology
- the factors that create wake turbulence
- the factors that create the strongest wake turbulence
- how to avoid wake turbulence
- what wind shear is, and how it relates to aircraft performance.

Prerequisite Study

- [Collision Avoidance in Gliders, SSF](#)
- [Advisory Circular AC90-48C](#) Collision Avoidance (1983)
- [AIM 7-1-25](#) Wind Shear PIREPS
- [AIM 7-3-1](#) Wake Turbulence -- General
- [AIM 7-3-2](#) Vortex Generation
- [AIM 7-3-3](#) Vortex Strength
- [AIM 7-3-4](#) Vortex Behavior

- [AIM 7-3-5](#) Operational Problem Areas
- [AIM 7-3-6](#) Vortex Avoidance Procedures

Recommended Study

- [Flight Maneuvers](#), Soaring Safety Foundation -- Describes the effect of wind and wind shear on a final approach.
- [Pilot and Air Traffic Controller Guide to Wake Turbulence](#) (www.FAA.gov)
- [Sporty's Video Tip: Wake Turbulence Avoidance](#)
- 747 landing into fog, showing wingtip vortices ([YouTube](#))

4b. Radio Procedures

Lesson Objective

Our soaring environment requires us to use the correct radio procedures to interact with the Unicom, ground, and communicate with the tow pilot.

Regulatory Requirement

- Private: [PTS](#) III-A.

Content

- Phonetic Alphabet
- Radio calls in the pattern
- Communication with the Tow Plane
- Awareness of ATC Light signals

Note: Even though most glider pilots will *never* see ATC light signals in practice, the PTS requires that instructors teach ATC light signals to Practical Test candidates.

Completion Standards

The student must be able to perform

- Preflight radio check
- radio announcements when taking the active runway (staging for takeoff)
- *while in the air* -- the student must announce each portion of the landing pattern, without stumbling or impacting focus on flying the glider
- pre-takeoff radio check with tow pilot
- All radio communication should not be at the cost of flying the aircraft

Prerequisite Study

- [§91.125](#) ATC Light signals. (See note above)
- [AIM section 4-2-1](#) Radio Procedures, General.
- [AIM section 4-2-2](#) Radio Technique.
- [AIM section 4-2-3](#) Contact Procedures.
- [AIM section 4-2-4](#) Aircraft Call Signs
- [AIM section 4-2-7](#) Phonetic Alphabet
- [AIM section 4-2-8](#) Figures
- [AIM section 4-2-9](#) Altitudes and Flight Levels
- [AIM section 4-2-10](#) Directions

Further Study

- APOA's "[Say It Right](#) " Mastering Radio Communication. Free with registration.

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4c. Minimum Sink

Lesson Objective

The lesson will learn the minimum sink speeds, how they relate to bank angle, and the importance of using the correct minimum sink speeds.

Regulatory Requirement

- **Pre-Solo:** 14 CFR [§61.87\(i\)\(8\)](#)
- **Private Pilot Candidate:** [PTS](#) V(A)

Content

- Minimum sink speed for each club aircraft
- Minimum sink speed for differing bank angles
- Glide ratio at minimum sink. Compare with glide ratio at Max L/D
- Minimum sink speed at the minimum pilot weight (solo) and at the glider's maximum gross weight

Completion Standards

The student must be able to perform

- Straight and Level flight at minimum sink speed
- 30° bank turns at minimum sink speed
- 45° bank turns at minimum sink speed

The student must be able to explain

- The effect of bank angle to minimum sink speed
- The effect of aircraft loading to minimum sink speed

Prerequisite Study

- [Glider Flight Manual](#), "Minimum Sink Airspeed" Page 7-33
-

4d. Slips: Forward, Side, Turning (w/ & w/o airbrakes)

Lesson Objective

The student must learn and demonstrate proper slip technique before solo. The student will also learn when the use of a slip is and is not appropriate.

Regulatory Requirement

- **Pre-solo Candidate:** [§61.87\(i\)\(7\)](#)
- **Private Candidate:** [PTS IV](#) (R)

Content

- Difference between a slip and a skid
- Hazards of slipping
- Hazards of skidding
- Why slipping is safer than skidding

Completion Standards

The student must be able to perform

- Turning Slips (no airbrakes)
- Turning Slips (with airbrakes)
- Forward Slips (no airbrakes)
- Forward Slips (with airbrakes)
- Side Slips (no airbrakes)
- Side Slips (with airbrakes)

The student must be able to explain

- the differences between slips and skids
- the benefits of slips
- when it is appropriate for a turning or side slip

Prerequisite Study

- [Glider Flying Manual](#) - Figure 7-26 "Slipping Turn" -- Page 7-25
- [Glider Flying Manual](#) - Figure 7-27 "Skidding Turn" -- Page 7-25
- [Glider Flying Manual](#) - "Slips" page 3-12
- [Glider Flying Manual](#) - "Forward Slip" page 3-13
- [Glider Flying Manual](#) - "Side Slip" page 3-13



4e. Best L/D; Speed to Fly

Lesson Objective

The lesson will learn the concept of speed to fly -- the most appropriate speed given lift, headwind, tailwind or sink and depending on desired outcome/situation.

Regulatory Requirement

- **Pre-Solo:** 14 CFR [§61.87\(i\)\(8\)](#)
- **Private Pilot Candidate:** [PTS](#) V(B)

Content

- Best L/D in still air for each aircraft
- Skills to calculate the best L/D for a given headwind, tailwind, lift or sink
- Compare with glide ratio at max L/D versus slower and faster speeds
- Effect of the aircraft's weight and the glide ratio of the glider
- Effect of the aircraft's loading and the max L/D speed

Completion Standards

The student must be able to perform calculations using a flight polar to find best L/D airspeed for:

- still air
- 10, 20, 30 knot headwind
- 10, 20, 30 knot tailwind
- 5 knots sink
- 5 knots lift
- Combinations of lift/sink and headwind/tailwind

The student must be able to explain

- The effect of loading and the max L/D speed

Prerequisite Study

- [Glider Flight Manual](#), "Best L/D" Page 7-34
- [Glider Flight Manual](#), "Speed-to-Fly" Page 7-34
- [Glider Flight Manual](#), "Glider Polars" Page 5-6
- [Glider Flight Manual](#), "Effects of Water Ballast" Page 5-13

Further Study

- Glider Polars and Speed-to-Fly; Wander Books (Available through the club, and [online](#))
- [Online tutorial](#)

4f. Boxing the Wake

Lesson Objective

The lesson will allow the student to demonstrate maneuvering behind the tow plane to different established positions with regard to the tow plane's wake. The maneuvers will be done in a fashion that is described by the FAA's Practical Test Standards: "Maneuvers the glider, while on tow, slightly outside the towplane's wake in a rectangular, box-like pattern."

Regulatory Requirement

- [§61.87\(i\)\(12\)](#)
- Private Pilot [Practical Test Standard](#) IV(E)

Content

- Positions of the glider behind the towplane
- High and Low-tow positions (also see lesson plan 3a -- [High-Low Tow Transition](#))
- Low-left, low-right, high-right, high-left

Procedures

There is no rush for this procedure. It is more important to take your time and get to all of the points on tow in a controlled and precise manner.

- Before starting, as a courtesy, call the tow-plane on the radio
- Wait until the towplane has begun straight and level flight.
- Perform transition through the wake into low tow position.
- Proceed to low left tow position. Hold for three seconds.
- Proceed to high left tow position. Hold this position for at least three seconds.
- Proceed to high right tow position. Hold for three seconds.
- Proceed to low right tow position. Hold for three seconds.
- Proceed to center low tow position. Hold for three seconds.
- Return to normal high tow position, going back through the wake.

The maneuver can be in either a clockwise or counter-clockwise direction.

Completion Standards

The candidate must

- Exhibit knowledge of the elements related to boxing the wake (maneuvering around the wake).
- Maneuver the glider, while on tow, slightly outside the towplane's wake in a rectangular, box-like pattern.
- Maintain proper control and coordination.

Prerequisite Study

- Glider Flying Manual -- "Boxing the Wake" page 7-10.
 - Although note that Figure 7-12 can be misleading. High tow is where the towplane is lined up with the horizon. There is no horizon on this figure.

Hints

- You have gone out far enough to the side when the tail-wheel and the main wheel line up.
- A common error is to not maintain the horizontal position when moving from low-left to high-left and vice-versa. Give a little bank to prevent getting pulled back to the center

Video Illustration

- HD Video (1:58) of a normal boxing the wake maneuver: [Boxing the Wake](#) .

4g. Crosswind Takeoff

Lesson Objective

The student must be able to take off with slight to moderate cross-winds. During the takeoff roll, and after take-off, but before the towplane has left the ground, the candidate must crab into the wind to maintain runway centerline. After the towplane is in the air, the glider should resume normal high-tow position. During this maneuver, the candidate must maintain appropriate position at all times.

Regulatory Requirement

- Pre-Solo Candidate: [§61.87\(i\)\(3\)](#)
- Practical Candidate: [PTS IV-B](#)

Content

- Take-off in cross-wind conditions
- Wing-runner positioning of the wing during take-off
- Positioning of the glider on the runway in especially windy conditions (slightly downwind of the centerline)

Completion Standards

To determine that the applicant:

- Exhibits knowledge of the elements related to normal and crosswind takeoff, including configurations and tow positions.
- Uses proper signals for takeoff.
- Lifts off at an appropriate airspeed.
- Maintains proper position until towplane lifts off.
- Maintains directional control and proper wind-drift correction throughout the takeoff.
- Maintains proper alignment with the towplane.

Prerequisite Study

- [Glider Flying Manual](#), "Crosswind Aerotow Takeoffs", page 7-3
- [Glider Flying Manual](#), "Crosswind Correction for Takeoff", Figure 7-4 on page 7-4
-

4h. Crosswind Landing

Lesson Objective

The student must be able to land with slight to moderate cross-winds. The pilot must exhibit control to maintain runway centerline on approach, flare, and touchdown. On landing and roll-out, the candidate must maintain runway centerline, despite the crosswind.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(i\)\(16\)](#)
- **Private Practical Candidate:** [PTS IV-Q](#)

Content

- Side-Slip to correct for crosswind
- Crab to correct for crosswind

Completion Standards

To determine that the applicant:

- Exhibits knowledge of the elements related to normal and crosswind approach and landing
- Adjusts flaps, spoilers, or dive brakes, as appropriate
- Maintains recommended approach airspeed, +10/-5 knots
- Maintains crosswind correction and directional control throughout the approach and landing.
- Makes smooth, timely, and positive control application during
- the roundout and touchdown
- Touches down smoothly in the designated landing area, with no appreciable drift, with longitudinal axis alignment, stopping short of and within 200 feet of a designated point
- Maintains control during the after-landing roll
- Completes appropriate checklists

Prerequisite Study

- [Glider Flying Handbook](#), "Side-Slips" page 3-13
- [Glider Flying Handbook](#), "Winds" page 5-3
- [Glider Flying Handbook](#), "Crosswind Landing" page 7-36
- [Glider Flying Handbook](#), "Slips", page 7-36
- [Glider Flying Handbook](#), "Side Slip" Figure 7-34, page 7-37
-

4i. No-Instrument Landings

Lesson Objective

The student will learn what to do if some of the flight instruments become inoperable or if over terrain of unknown altitude. The student will use visual cues to determine altitude and guide the glider to a safe landing. If the airspeed indicator stops working, then the candidate will use reference to attitude and slipstream noise to judge airspeed.

The student should be able to explain the situations which could lead to instruments failing.

Regulatory Requirement

- Pre-Solo: [§61.87\(i\)\(9\)](#)
- Private Pilot Candidate: [PTS X-A](#)

Content

- Landing with the altimeter covered.
- Landing with the airspeed indicator covered.

Completion Standards

The student must be able to perform

- A safe landing with the altimeter covered.
- A safe landing with the airspeed indicator covered.

Prerequisite Study

- [Glider Flying Manual](#), "Flight Instrument Malfunctions", page 8-10
- [Glider Flying Manual](#), "Airspeed Indicator Malfunctions", page 8-10
- [Glider Flying Manual](#), "Altimeter Malfunctions", page 8-10
- [Glider Flying Manual](#), "Variometer Malfunctions", page 8-11
- [Glider Flying Manual](#), "Airspeed Indicator Malfunctions", page 8-11
-

4j. Precision Landings and Stops

Lesson Objective

This lesson will show the student the ability to land on a specific point, and stop within a specified distance, determined by the instructor. This is training for the event of an unplanned off-airport landing.

Regulatory Requirement

- Pre-Solo: [§61.87\(i\)\(16\)](#)
- Private Practical Candidate: [PTS](#) X-A

Completion Standards

The student will complete this task when he/she exhibits knowledge of the elements related to a simulated off-airport landing, including selection of a suitable landing area and the procedures used to accomplish an off-airport landing. The precision touch-down and stops can be evaluated with markers in the grass.

Prerequisite Study

- [Glider Flying Manual](#), "Off-Field Landing Procedures", page 8-7

Further Study

- Landing Out: [The Final Four Minutes](#) , Don Ingraham
-

4k. Slips to Landing (w/ & w/o airbrakes)

Lesson Objective

This lesson is to have the student demonstrate the ability to use either a side or forward slip (previously practiced at altitude in [Lesson 4d](#)), on the final approach. Use the forward slip primarily for altitude loss, and the side slip for runway alignment or lateral re-positioning.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(i\)\(17\)](#)
- **Private Pilot Candidate:** [PTS](#) IV(R)

Completion Standards

The student must be able to perform

- A forward slip on the final leg of the approach to landing
- A side slip on the final leg of the approach to landing

Prerequisite Study

- [Glider Flying Handbook](#), "Side-Slips" page 3-13
- [Glider Flying Handbook](#), "Winds" page 5-3
- [Glider Flying Handbook](#), "Crosswind Landing" page 7-36
- [Glider Flying Handbook](#), "Slips", page 7-36
- [Glider Flying Handbook](#), "Side Slip" Figure 7-34, page 7-37

Also See

- Lesson 4d: "[Slips, forward, side, turning, with and without airbrakes](#)"
- Lesson 4h: "[Crosswind Landing](#)"

5a. Thermal Soaring

Lesson Objective

This lesson plan introduces thermal soaring techniques, predicting thermal behavior, and gives the candidate the ability to locate and use thermal lift.

Regulatory Requirement

- [§61.87\(i\)\(18\)](#)
- [Private Pilot Practical Test Standard](#) VI-A

Content

Completion Standards

Practical Test Standards for Thermal Flight:

- Exhibits knowledge of the elements related to thermal soaring. Recognizes the indications of, and the presence of, a thermal
- Analyzes the thermal structure and determines direction to turn to remain within the thermal
- Exhibits coordinated control and planning when entering and maneuvering to remain within the thermal
- Applies correct techniques to re-enter the thermal, if lift is lost
- Remains oriented to ground references, wind, and other aircraft
- Maintains proper airspeeds in and between thermals

The student must be able to perform

- The ability to locate and exploit thermal lift

The student must be able to explain

- Hazards associated with thermalling in gaggles
- Use of meteorological signs
- Use of visual cues, such as birds, gliders, smoke streamers

Prerequisite Study

- Glider Flying Handbook,
 - "Thermal Soaring Weather", page 9-4
 - "Thermal Shape and Structure", page 9-5
 - "Atmospheric Stability", page 9-6
 - "Understanding Soundings", page 9-8
 - "Air Masses Conducive to Thermal Soaring", page 9-11
 - "Cloud Streets", page 9-11

- "Thermal Soaring", page 10-1

Recommended Study

- "[The art of Thermalling... Made Easy](#) " -- Bob Wander book available on-line
- "[Thermals](#) ", Rolf Hertenstein -- available for purchase online.
- "[Climb Performance Handicapping](#) ", Judah Milgram. This article discusses climb performance, how much to bank in what kind of thermals.

Further Reading

- COMET program -- a good course for learning more about how to interpret Skew-T Log P diagrams <http://www.meted.ucar.edu/mesoprim/skewt/>
-

5b. Ridge Soaring

Lesson Objective

Most students do not get to experience ridge soaring, even at our club. This lesson will cover the topic as a ground lesson. Further instruction should be obtained before attempting ridge soaring.

Regulatory Requirement

- [Private Pilot Practical Test Standard](#) VI-B

Content

- Slope Soaring Techniques
- Hazards associated with ridge soaring
- Techniques for entering and leaving the ridge lift.
- Other lift sources that combine with ridge lift (thermal, wave)
- Transitioning between ridges
- Passing other gliders / right of way

Completion Standards

Practical Standards for Ridge Soaring:

Objective. To determine that the applicant:

- Exhibits knowledge of the elements related to ridge and slope soaring
- Recognizes terrain features and wind conditions which create orographic lift
- Enters the area of lift properly
- Estimates height and maintains a safe distance from the terrain
- Exhibits smooth, coordinated control, and planning to remain in the area of lift
- Uses correct technique to re-enter the area of lift, if lift is lost

Prerequisite Study

- Glider Flying Handbook
 - Weather for Slope Soaring, page 9-18
 - Ridge and Slope Soaring (Techniques), 10-9
 -

5c. Wave Soaring

Lesson Objective

Wave Soaring is not common throughout the United States, especially in the flatlands. During this lesson plan, the student will learn the basics of wave formation, techniques of soaring in wave, and the hazards associated with rotor turbulence and the extreme sink of the lee side of the wave.

Regulatory Requirement

- **Private Pilot Candidate:** [PTS](#) VI-C, C1(j)

Content

- Wave Soaring Techniques
- Wave lift formation
- Oxygen systems
- Hypothermia
- Hypoxia

Completion Standards

Practical Test Standards:

Objective. To determine that the applicant:

- Exhibits knowledge of the elements related to wave soaring.
- Locates and enters the area of lift.
- Exhibits smooth, coordinated control, and planning to remain within the area of lift.
- Uses correct technique to re-enter the area of lift, if lift is lost.
- Remains oriented to ground references, wind, and other aircraft.
- Recognizes and avoids areas of possible extreme turbulence.
- Maintains proper airspeeds.
- Coordinates with ATC, as appropriate.

The student must be able to explain

- Mechanics of lee-wave formation
- Meteorological conditions that produce wave lift
- Hazards of wave flying

Prerequisite Study

- [§91.211](#) Supplemental oxygen.
- [§23.1447](#) Equipment standards for oxygen dispensing units.
- [Wikipedia article on Lee Waves](#)
- [Wikipedia article on Lenticular Clouds](#)

- [Wikipedia article on Föhn Winds](#)
- [Potential Dangers in Wave Soaring](#)

Recommended Study

- [Skyline Soaring Club's Wave Window](#)

Further Reading

- **Practical Wave Flying**, Mark Palmer -- [available on-line](#)
- **SKYLINES**, [July 2009](#) , written by George Hazelrigg.
- <http://www.meted.ucar.edu/mesoprim/mtnwave/> COMET program -- a good course for learning more about downslope wave meteorology



6a. Slack Line

Lesson Objective

Inevitably, the glider pilot may be faced with the situation of slack line in the tow rope. These situations happen especially during gusty conditions, during towplane malfunctions (decelerating), getting terribly out of position, rapid towplane bank, or just flying cross-country on aerotow. The instructor may call the tow pilot and ask to reduce the rate of climb, and will demonstrate getting into slack rope situations, and how to deal with them smoothly.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(i\)\(2\)](#)
- **Private Pilot:** [PTS IV-D](#)

Content

- There are at least four recovery modes of slack rope:
 - Do nothing (only suitable for momentary slack situations)
 - Yaw away from the slack (not very useful on CG hook equipped gliders)
 - Pull dive-brakes (especially suitable for cross country aerotow, or over-run situations)
 - Release (most desperate act for the unrecoverable situation)
- Failure to recover from significant slack correctly can cause the rope to break
- Entanglement of the rope around the glider's fuselage or wing is unacceptable, and the procedure must be aborted before this situation can develop.
- Release if the slack in the rope ever gets to the wing, to avoid wing entanglement

Completion Standards

Practical Test Standards:

Objective. To determine

- Exhibits knowledge hazards, and
- Recognizes smooth corrective situations.

The student must be able to perform

- Slack line recovery as described above and in the Glider Flying Handbook.

The student must be able to explain

- Hazards of wing or fuselage entanglement
- Hazards of unexpected rope break
- Correct technique for slack line recovery for various situations

Prerequisite Study

Glider Flying Handbook, "Slack Line", page 7-10

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6b. Aerotow Emergency Procedures

Lesson Objective

Aerotow emergency procedures include: glider can not release, towplane can not release, towplane power failure (at various times in the flight), abort of take-off near the ground, rope breaks. During this lesson segment, the student will learn the tools of recovery from these situations.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(i\)\(2\)](#)
- **Private Pilot:** [PTS](#) IV-D

Content

- Tow-plane wave-off
- Spoilers opening on tow
- Tow-plane signal "something is wrong with the glider"
- Towplane abnormal power on takeoff or climb
- Inadvertent release from tow
- Glider release failure
- Towplane release failure

Completion Standards

Practical Test Standards:

Objective. To determine that the applicant:

- Exhibits knowledge of the elements related to aerotow abnormal occurrences, such as
 - towplane power loss during takeoff.
 - towline break.
 - towplane power failure at altitude.
 - glider release failure.
 - glider and towplane release failure.

The student must be able to perform

- Successful recognition of towplane power loss on takeoff or climb-out
- Successful rope break recovery.

The student must be able to explain

- Appropriate signals on aerotow for
 - Glider can not release
 - Towplane can not release

- Something is wrong with the glider
- Procedure for the double-release failure scenario (however unlikely)
- Hazards of moving the glider too high on aerotow.

Prerequisite Study

- Glider Flying Handbook, Takeoff Emergency Procedures, page 7-4
- Glider Flying Handbook, Aerotow Abnormal Procedures, page 7-8
- YouTube Video -- Canopy opening in flight <http://www.youtube.com/watch?v=r0I75OZmA-0>



6c. V-Speeds

Lesson Objective

The candidate will learn the differences between Maneuvering Speed (V_A), Normal Operating Speed (V_{NO}), and Never-Exceed Speed (V_{NE}). The candidate will identify what hazards are associated with each airspeed. The instructor and student will fly together in dual practice, and accelerate to V_A , for at least a few moments, to get a feel for the stick sensitivity at this speed.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(i\)\(8\)](#) "Flights at various airspeeds"
- **Private Pilot:** [PTS](#) - V

Completion Standards

The student must be able to:

- recite the maneuvering speed for the club gliders
- explain the differences between Maximum Structural Cruising Speed and Maneuvering Speed
- explain the hazards with rapid, excessive control movement **below** V_A
- explain the hazards associated with rapid control movement above V_A
- explain the influence of aircraft loading on the speed of V_A and V_{NO} .
- explain the relationship between V_{NE} and altitude.

Prerequisite Study

- [§ 1.2](#) Abbreviations and symbols.
- Glider Flying Handbook "Maneuvering Speed", page 4-3
- [V-Speeds](#) -- Wikipedia article on V-Speeds
- [FAA Special Airworthiness Bulletin](#) dated January 18, 2011 -- clarification of V_A
- [The Myth of Maneuvering Speed](#) -- Flying Magazine

Further Study

- Wing Flutter Videos
 - RC Sailplane with Flutter ([YouTube](#))
 - Boeing 747 Wind Tunnel Flutter testing ([YouTube](#))
 - [Fluttertest](#) From the DG Website
 -

6d. Rope Breaks

Lesson Objective

During the normal course of operating gliders on aerotow, the rope occasionally breaks before the pilot desires to release from the towplane. The aim of this lesson is to immediately react to the rope break and land the glider in a safe manner. The term PT3 (Premature Termination of The Tow) is often used instead of "rope break" to include all modes of failure included in this lesson plan. Ideally, the candidate will have performed at least three PT3 flights, each one in a different mode of flight. At around 50 feet (with straight ahead landing). At or around 200-300 feet, for a 180 return-to-base, and above 300 feet for an abbreviated pattern.

Regulatory Requirement

- Pre-solo Candidate: [61.87\(i\)\(9\),\(19\)](#)
- Private Candidate: [PTS IV\(G\)](#)

Content

- Rope breaks below 50 feet, at 200-300 feet and above 300 feet

Completion Standards

The student must be able to

- discuss the actions taken during a rope break and stop below 50 feet
- perform a simulated rope break between 200 and 300 feet (and safe return to the field)
- perform a premature termination of the tow above 300 feet, landing where appropriate
- make radio calls, as appropriate
- maintain a safe speed and bank angle during the return to the field
- judge heights and lands the aircraft safely without instructor intervention.

Prerequisite Study

- Glider Flying Manual, [Takeoff Emergency Procedures](#), page 7-4

Recommended Study

- Joe Parrish, "Rope Breaks: Lessons Learned from the Space Shuttle", SOARING, April 1998 page 22, [Freely Available on-line](#)
- Soaring Safety Foundation: [Premature Termination of the Tow](#)

6e. Pilot Induced Oscillations

Lesson Objective

It is common for new pilots to experience Pilot-Induced Oscillations, usually in the pitch axis. The PIO can happen in any phase of flight, but the most dangerous is in the final moments of flight, or during the ground roll-out. The instructor will discuss strategies with the student on minimizing the probability of having a high-energy landing turn into a PIO that can damage the tail boom.

Content

- Pilot Induced Oscillations on Launch (pitch)
- Pilot Induced Oscillations on Landing (pitch)
- Pilot Induced Oscillations in flight (dutch roll)
- PIO prevention strategies
- Forcing the glider back onto the runway at too high of a speed
- Minimum energy landing strategies

Completion Standards

The candidate must be able to consistently land the glider at minimum energy (with spoilers deployed).

Prerequisite Study

- [Glider Flying Handbook \(2013\)](#) Pilot-Induced Oscillations, page 8-2
- <http://www.soaringsafety.org/briefings/grobpio.html> Soaring Safety Foundation article on landing PIO.
- <http://tinyurl.com/Glider-PIO> Video clip of student landing (too fast) in Grob-103, which turns into PIO. Review this with an instructor!
Also <https://www.youtube.com/embed/cX4oFDEK94>

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7a. Downwind Landing

Lesson Objective

Occasionally, the glider must be landed with a tailwind. On downwind approaches, a shallower approach angle should be used, depending on obstacles in the approach path. Use the spoilers/dive brakes and perhaps a forward slip as necessary to achieve the desired glide path.

Regulatory Requirement

- [§61.87\(i\)\(16\)](#)
- Private Pilot Practical Test Standard IV(S)

Content

- Uses shallower approach path than normal
- Uses spoilers and slips as necessary to attain desired glide path
- Judges angles and descent rates correctly
- Corrects for increased ground speed and loss of control effectiveness

Completion Standards

The student must be able to perform

- a satisfactory downwind landing.
- maintains positive control of the glider on landing and roll-out.
- judges angles correctly, and uses brakes or slip as appropriate

The student must be able to explain

- effect of a downwind landing on the glide ratio
- effect of a downwind landing on the loss of controls at higher ground speeds
- hazards of landing in excessive tail winds.

Prerequisite Study

- Glider Flying Manual, Downwind Landings, page 7-34
-

7b. Landing Roll-out and Clearing Runway

Lesson Objective

This lesson focuses on the portion of the flight after touching down on the runway. While operating at KSFM, it is critical to maintain a roll-out along the runway's center-line due to the extra hazard of runway lights and signage.

Regulatory Requirement

- [§61.87\(i\)\(2\)](#)
- [Private Pilot Practical Test Standard II-B](#)
- [Private Pilot Practical Test Standard IV-Q](#)
- Club and FBO rules
- 14 CFR [§91.113](#) requires that pilots observe right-of-way rules that include timely clearance of an active runway after landing, so as to not interfere with an aircraft trying to land.

Completion Standards

The student must be able to perform:

- Taxiing the glider after touch down to the midfield runway, remaining sufficiently close to the centerline as to avoid striking run way lights with the glider
- Expeditiously clearing the active runway after landing, with or without assistance
- When landing in the grass area, to demonstrate avoidance of obstructions during roll-out and control of the roll-out direction of the glider
- Proper positioning of the flight controls for crosswind conditions
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7c. Post-Flight Inspection

Lesson Objective

After the glider is done flying for the day, it needs to be inspected to see if any new damage has happened during the flying day. Also, it is important to wash the wings with clean rags and water to remove any dead bugs that have accumulated on the wing surfaces

Regulatory Requirement

- **Pre-Solo:** *none*
- **Private Candidate:** [PTS XI\(A\)](#)

Content

- Inspection of the glider after flying it for the day
- Correct procedure for cleaning the glider
- Correct procedure for cleaning the glider's canopies

Completion Standards

The student must be able to perform

- satisfactory post-flight inspection
- satisfactory cleaning of the wings and flight surfaces

The student must be able to explain

- importance of keeping a clean glider.
-

7d. Assembly / Disassembly

Lesson Objective

For most privately-owned gliders, assembly and disassembly are a daily part of the glider flying ritual. The student will learn how to do this properly for an available glider and learn how to handle it and store in its trailer correctly using checklists, tools, and crew appropriately.

Regulatory Requirement

- [§61.87\(i\)\(13\)](#)
- [Private Pilot Practical Test Standard II\(A\)](#)
- [Private Pilot Practical Test Standard XI\(A\)](#)

Content

- The safe and correct disassembly of a glider, using appropriate tools, checklists, and crewmembers.

Completion Standards

The student must be able to perform

- Exhibits knowledge of the elements related to after-landing and securing procedures, including local and ATC operations, ramp safety, parking hand signals, shutdown (if appropriate),
- securing, and postflight inspection
- Selects a suitable parking area while considering wind and safety of nearby persons and objects
- Taxies to parking area and performs engine shutdown, if applicable.
- Services the glider, if applicable
- Secures the glider properly
- Performs a satisfactory postflight inspection
- Completes the prescribed checklist

The student must be able to explain

- the hazards of an incorrect installation into the trailer
- the hazards of an incorrect hookup during assembly
- the hazards of distractions
- the importance of a positive control check

Prerequisite Study

- Glider Flying Manual, [After-Landing and Securing](#) page 7-38
- [SGS 2-33 Flight Manual](#) , rigging and de-rigging section, page 42
- Glider Flying Manual, [Assembly Techniques](#), page 6-1

7e. Pre-Solo Written Test

Lesson Objective

Students are required by 61.87(b) to pass a written test prior to solo flight. The test must address the student pilot's knowledge of applicable sections of parts 61 and 91 of this chapter; airspace rules and procedures for the airport where the solo flight will be performed; and flight characteristics and operational limitations for the make and model of aircraft to be flown.

Regulatory Requirement

- **Pre-Solo:** [§61.87\(b\)](#)
- **Private Pilot Candidate:** *None*
 - *Even though Private Pilot members who do not hold a glider category rating are not required to pass a written solo test by 61.87(b), club rules dictate that all transition pilots still need to pass the written test.*

Content

- The pre-solo pilot will successfully complete a different written test for each glider to be soloed.
- Incorrect answers will be reviewed with the instructor and student
- Once the Pre-solo test is completed, the instructor will give an endorsement similar to:

Presolo aeronautical knowledge: section 61.87(b).

I certify that (First name, MI, Last name) has satisfactorily completed the presolo knowledge exam of section 61.87(b) for the (make and model aircraft).

/s/ [date] J. J. Jones 987654321CFI Exp. 12-31-05

Recommended Study

- Soaring Safety Foundation, "[Bronze Badge Study Guide](#)"

7f. Checkride Rating Endorsement

Lesson Objective

The objective of this lesson is the completion of training for the Private Pilot certificate with a glider category rating and instructor sign-off for the practical test.

Regulatory Requirements

- For Private Pilot: Part [14 CFR Part 61 Subpart E](#) (§61.102 through §61.113)
- For Commercial Pilot: [14 CFR Part 61 Subpart F](#) (§61.121 through §61.133)

Content

The instructor will certify completion of all training requirements by verifying that all lesson elements are completed to the Rating level.

The instructor will verify that the student has passed the required knowledge test.

The instructor will conduct a minimum of three flights with the student preparatory for the practical test, covering the required elements of [§61.107](#) for the Private Pilot certificate or [§61.127](#) for the Commercial Pilot certificate.

The instructor will verify that the student's logbook contains signoffs for aero tow, glider assembly/disassembly, and solo flight in the glider to be used for the practical test, and verify that the student's student license is correctly endorsed.

The instructor will assist with the Application using IACRA (<https://iacra.faa.gov/iacra/>)

Required Endorsements

- Current solo endorsement for glider category, in the glider to be used
- Aerotow launch procedures endorsement
- Written test report, and instructor logbook endorsement indicating training has been given for the missed question area
- Endorsement for the practical test