94 FTS OI, AM-251 USAFA Basic Soaring Manual

April 2016

This is the Soaring Manual given to Cadets to learn basic glider skills and to achieve solo by the 12th flight. It's used in conjunction with a detailed AM-251 Syllabus.

NOTE: *As you review, you may be surprised to see no mention of 'soaring' or 'thermalling.' I was a little confused until a senior officerexplained:* ***First we teach how to fly a 'glider', they solo, and then we teach how to fly a 'sailplane.'*** *Recall the old combat gliders: towed into position, let go, glide, and make a survivable landing. Learning to glide teaches a lot of fundamental skills and provides a quick path to a confidence-boosting-enthusiasm-increasing solo.*

The Air Force emphasis at USAFA and for all flight training is that it be accomplished with consistent quality, safely, quickly and with minimum use of resources. It may seem counter-intuitive, but the strict tracking and 'paperwork', allows this to be done with high satisfaction for both instructors and students.
John Murtari, john@murtari.org

NOTE: When viewing the PDF, you can click on the entries below to jump to that section of the manual. Take a look at Figure 14, Daily Lesson Objectives – it lays out exactly what needs to be studied and what will be performed.

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BY ORDER OF THE COMMANDER
94th Flying Training Squadron (FTS)

94 FTS OI AM-251

24 April 2016

Flying Operations

AM-251 BASIC SOARING MANUAL

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: This publication is available digitally on the 306th Flying Training Group (FTG) SharePoint at https://eim.usafa.edu/unit/306ftg/ftgv/frst/default.aspx.

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(Lt Col Adam Ressler)

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This instruction provides basic principles and knowledge to enable Airmanship (AM) 251 students to learn basic glider skills in a TG-16A. File a copy of all approved waivers with this instruction. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using AF Form 847, *Recommendation for Change of Publication.* Send AF Forms 847s through 94 FTS/CCV to 306 FTG/FTGV, 9206 Airfield Drive, Suite 1, USAF Academy, CO 80840.

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SUMMARY OF CHANGES

This document has been substantially revised and must be reviewed in its entirety.

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Chapter 1

INTRODUCTION

1.1. SAFETY. Safety is critical in all Air Force flying operations including the United States Air Force Academy (USAFA) Soaring Program. All of the procedures described in this manual are designed with safety as the primary consideration. Safe flying is not a "spectator sport"--we need your help and participation. If you have questions, ask your Instructor Pilot (IP). If you have suggestions or observations to improve safety practices, let a staff officer know. If everyone involved in the Soaring Program (including you) comes to the flight line with attentiveness and the desire to follow procedures we will continue to have a safe operation.

1.2. WHAT TO EXPECT.

1.2.1. Before flying, you will receive ground training which will cover much of the content in this manual. You will receive ground school training from the soaring squadron prior to the start of your AM-251 Basic Soaring (AM-251) block. A familiarity with this manual will help your training flow smoothly and efficiently. You will have a better time if you arrive at the flight line with an understanding of the concepts introduced by this publication.

1.2.2. Our primary goal is to get you flights during your lesson periods. You will also have the responsibility to help with ground operations. You are a critical element of a smooth running ground operation. Expect to push airplanes, hold wings and learn rope runner duties.

1.2.3. It is important for you to realize that the Soaring Program is designed to provide each cadet the opportunity to pilot a sailplane. This manual is written with an emphasis on the things you need to know to safely accomplish your flight training. There is an AETC syllabus that drives your training. If you are curious and would like to review this syllabus your IPs can show and explain it to you.

1.2.4. This manual uses the terms "glider" and "sailplane" interchangeably.

1.3. ATTENDANCE POLICY.

1.3.1. **Like an academic class at USAFA, attendance at AM-251 is mandatory**. If you are going to miss AM-251 for an excused activity (such as a sponsor trip, sports tournament, temporary duty (TDY), altitude chamber, etc.), you must request the excusal through your cadet flight commander at least two lessons prior to the day you will miss training. Give your name, AM-251 period, date of expected absence, reason, and Scheduling Committee Action (SCA), if required. Your cadet flight commander will then notify the AM-251 Program Manager for final approval of your absence if necessary, just as your academic instructors must approve absences from class (if the SCA so designates). Any unexcused absences result in forfeiture of Cadet Soaring Wings. Bottom line: your cadet flight commander must know where you are if you are absent. The emphasis here is proper communication and SCA coordination.

1.3.2. If sick, go see the flight surgeon at the Cadet Clinic, who will determine whether or not you are sick enough to be grounded. If so, the flight surgeon will put you on Duties Not Including Flying (DNIF) status. He/she will also put you on bed rest if necessary. In the case of bed rest, you are, of course, excused from AM-251. If not on bed rest, you will come down to help run ground operations on the flight line. Notify your soaring cadet flight commander that you are DNIF. Bring your DNIF status AF Form 2992, *Medical Recommendation for Flying or Special Operational Duty,* from the flight doctor to the airfield and turn it in to the Duty Officer. To be removed from DNIF status and fly again

Figure 1: Introduction - expectations.

you must see the flight doctor again to be approved for a Return to Flying Status (RTFS). Inform your cadet soaring flight commander that you are RTFS, bring your RTFS AF Form 2992 to the airfield, and turn it in to the Dispatcher or Squadron Aviation Resource Manager.

1.3.3. **Crew Rest**. According to Air Force Instruction (AFI) 11-202, Volume 3, *General Flight Rules*, Air Force aircrews require at least 10 hours of continuous restful activities including an opportunity for at least 8 hours of uninterrupted sleep during the 12 hours immediately prior to the flight duty period. As an example, if you had your last official duty at 2000 hours and your first official duty the next morning was before 0800, **you did not have 12 hours off, and therefore you cannot fly that day.** If you do not have crew rest, you will still come down to the airfield when scheduled. You must identify yourself as not having crew rest so the IPs will know you cannot fly. If you are not sure whether or not you have crew rest, ask your cadet flight commander or a staff officer.

1.3.4. **Physiological Factors**. Good hydration and nutrition will help you succeed during AM-251. It is imperative that you are well hydrated. Even when the temperature is not high, it is easy to become dehydrated, so you should drink water before you feel thirsty. Also, nutrition will play an important role in your performance. Eat a balanced meal the night before you fly and do NOT skip breakfast.

1.4. ABOUT THE TEXT. Except where noted as "technique" or a similar term, this manual is directive in nature for AM-251 operations. If questions arise about procedures in this manual, consult your IP, the cadet flight commander, the AM-251 Program Manager, or higher authority for guidance.

1.4.1. This manual is organized in a logical sequence. It begins with basic flight concepts, introduces the aircraft you will fly, describes ground operations, and then moves through takeoff, basic flight maneuvers, and so on. It is vital that you read and understand the material before you fly. This saves everyone time and effort and ensures that you receive the best possible training.

1.4.2. Objectives are listed in the beginning of each chapter. These objectives describe the main ideas you should absorb from the reading. Read each lesson objective (Attachment 4) before showing for class and be prepared to answer or explain the corresponding general knowledge/emergency procedure topics.

1.4.3. As you progress toward your solo flight, read the final chapter, "Considerations for Solo."

1.4.4. If you have any suggestions for this manual, please contact the AM-251 Program Manager, 333-1133.

1.5. MISCELLANEOUS INFORMATION.

1.5.1. Soaring at USAFA is a military operation with a chain of command. Keep your cadet flight commander informed of any issues you may have. If you have a problem, tell your cadet instructor, cadet flight commander, the Operations Supervisor (Ops Sup), or Soaring Control Officer (SCO). **LET SOMEONE KNOW.**

1.5.2. **Call 333-9400 for a prerecorded message on the current airfield/flying status**. If you do not hear otherwise, get on the bus and come down.

1.5.3. If you have any questions about the absentee policy, crew rest, DNIF procedures, uniforms, or anything mentioned in this manual or during ground training, ask any IP.

1.5.4. If you are late and miss the mass briefing at the airfield, you must receive a briefing from the Ops Sup prior to performing crew duties.

1.5.5. Personnel will not be on the flight line (outdoors) when lightning is observed within 5 miles. Seek shelter and remain indoors until the flight commander advises otherwise.

Chapter 2

AIRCRAFT DESCRIPTION

2.1. OBJECTIVES. Be familiar with the general aircraft description, features, and instruments for the TG-16A Sailplane

2.2. TG-16A SAILPLANE.

2.2.1. The TG-16A is a two-seat high performance sailplane for training, cross-country flying and aerobatic training. The aircraft carries a civilian designation of DG-1001 Club and is manufactured by DG Flugzeugbau of Germany. It is constructed from Glass and Carbon Fiber Reinforced Plastic (GFRP/CFRP).

2.2.2. Here is a look at the TG-16A:

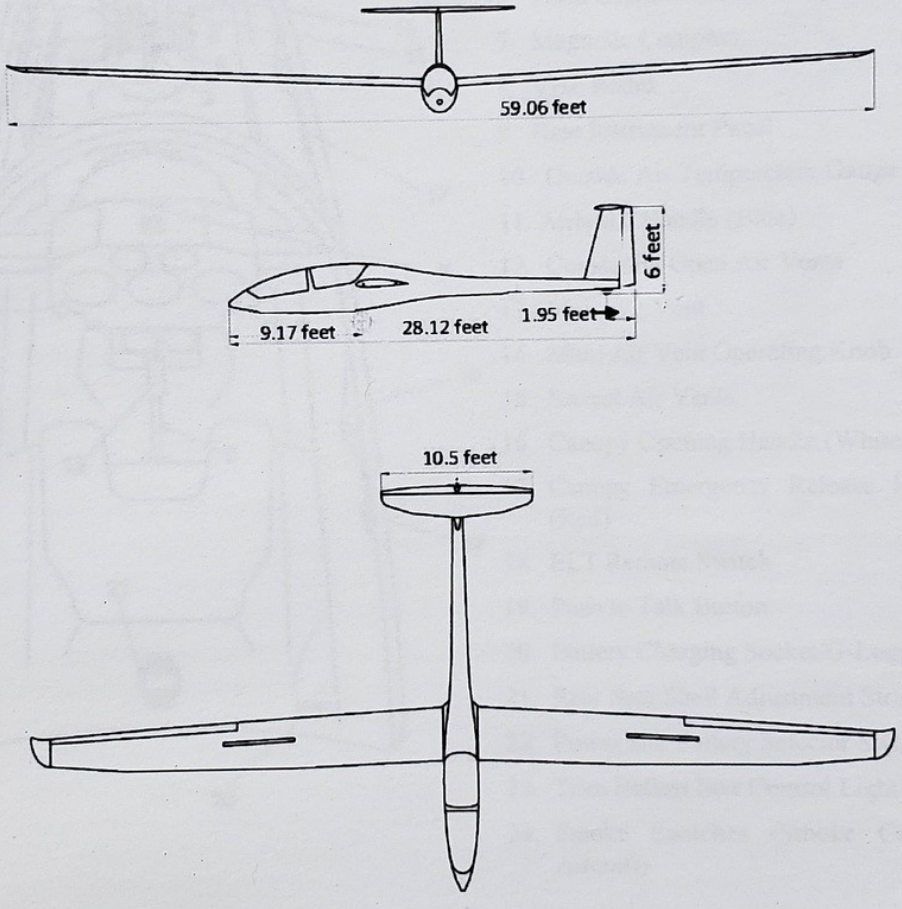


Figure 2.1. TG-16A

Figure 2: Aircraft Description (DG-1000 Club / USAF TG-16A)

2.2.2.1. The TG-16A has the same flying characteristics as most airplanes.

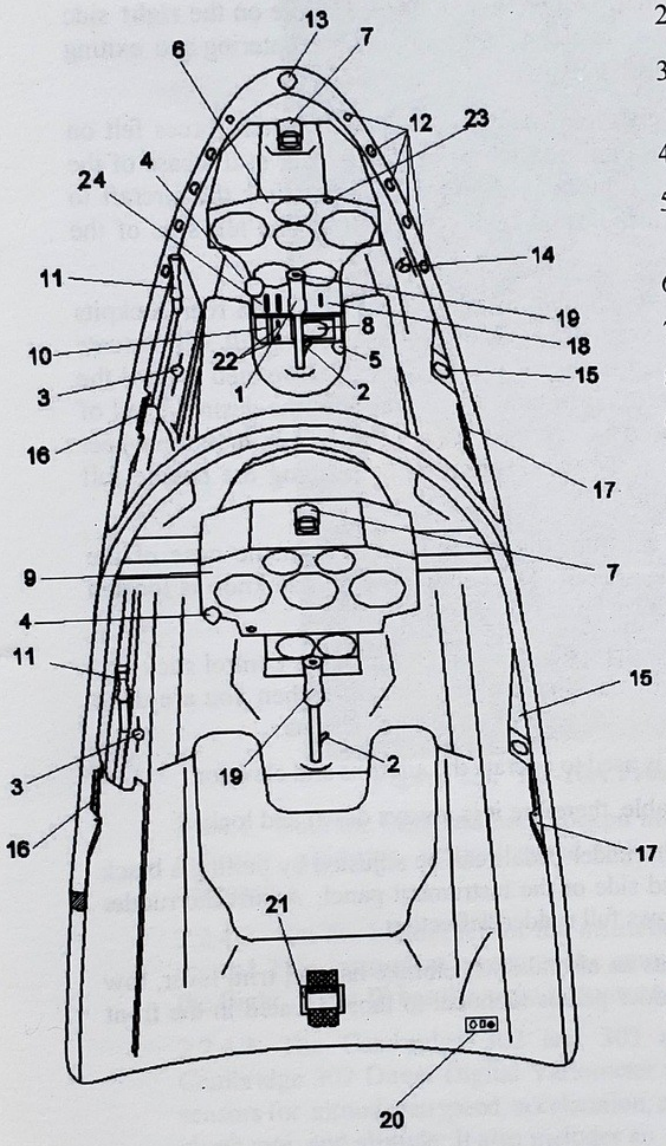
2.2.2.2. You fly in the front seat.

2.2.2.3. Don't apply excessive force to the canopy frame or Plexiglas.

2.2.2.4. The tow hook in the nose is where the tow rope is attached.

2.2.2.5. The landing gear consists of a nose, main, and tail wheel in a tandem configuration. The main gear is a spring mounted fixed main wheel with a manually operated hydraulic drum brake. The rear of the fuselage has a fixed tail wheel that is reinforced to absorb light ground contact.

2.2.3. **Inside the TG-16A Cockpit**:



1. Control Column
2. Trim Release Lever
3. Trim Position Indicator and Pre-selection Lever
4. Tow Release Knob (yellow)
5. Rudder Pedal Adjustment Knob (Front Cockpit, black)
6. Front Instrument Panel
7. Magnetic Compass
8. VHF Radio
9. Rear Instrument Panel
10. Outside Air Temperature Gauge
11. Airbrake Handle (Blue)
12. Constantly Open Air Vents
13. Main Air Vent
14. Main Air Vent Operating Knob
15. Swivel Air Vents
16. Canopy Opening Handle (White)
17. Canopy Emergency Release Handle (Red)
18. ELT Remote Switch
19. Push to Talk Button
20. Battery Charging Socket/G-Logger
21. Rear Seat Shell Adjustment Strap
22. Power and Battery Selector Switches
23. Trim Ballast Box Control Light
24. Smoke Switches (Smoke Capable Aircraft)

Figure 2.2. TG-16A Cockpit

2.2.3.1. The main drum brake is activated by the airbrake handle when approaching the fully extended position. Abrupt or excessive application of the wheel brake may result in the sailplane nosing over.

2.2.3.2. The white Canopy Release Handle on the **left** side of the cockpit is used for normal canopy operations. The red Canopy Emergency Release Handle on the **right** side of the cockpit is used only in emergency situations. Use caution when entering and exiting the cockpit to avoid bumping the Canopy Emergency Release Handle.

2.2.3.3. There is an elevator trim system that reduces aerodynamic pitch forces felt on the control stick. Control stick forces are relieved when the green lever at the base of the control stick is squeezed and released. Squeezing the green handle trims the aircraft to the position of the stick. A green trim indicator knob is located on the left side of the cockpit under the airbrake handle.

2.2.3.4. The airbrakes are actuated through blue handles in the front and rear cockpits below the left side canopy rail. Rotating the handle inward and pulling aft will actuate the airbrakes. After pulling the airbrake handle aft, the handle can be rotated toward the cockpit wall to engage in one of four notches to hold the airbrakes in the desired level of extension. On the ground this can be used to lock the airbrakes open or to lock the wheel brakes. The air brakes can be locked in the closed position by pushing the handle full forward to engage an over-center mechanism.

2.2.3.5. The tow release mechanism activates the safety tow hook in the nose of the aircraft to release the tow rope from the aircraft. The yellow tow release knob is located on the left of the control pedestal in both cockpits.

2.2.3.6. To make a radio call, press the microphone button on top of the control stick and talk into the microphone connected to the right side of the cockpit. When you are done transmitting, release the microphone button to receive radio transmissions.

2.2.3.7. The control column or —stick‖ is used to operate the ailerons and elevator.

2.2.3.8. The landing gear is non-retractable, therefore it is always down and locked.

2.2.3.9. The position of the front cockpit rudder pedals can be adjusted by pulling a black adjustment knob on the lower right hand side of the instrument panel. Adjust the rudder pedals to a comfortable distance that allows full rudder deflection.

2.2.3.10. In the rear cockpit, your IP has an airbrake/wheelbrake handle, trim lever, tow release knob, microphone, stick, and rudder pedals identical to those located in the front cockpit.

2.2.4 **The TG-16A Instrument Panel**:

Figure 2.3. TG-16A Front Instrument Panel

2.2.4.1. Both the front and back cockpit instrument panels are equipped with an airspeed indicator, altimeter, vertical speed indicator/variometer, accelerometer (G-meter) and compass.

2.2.4.2. On the bottom left of the instrument panel, you have an accelerometer or —G-meter.‖ This instrument measures the amount of G‘s the aircraft has experienced during the flight. Your IP has the same instrument on the rear cockpit instrument panel.

2.2.4.3. The Cambridge 302 and 303 are flight data/navigational computers. The Cambridge 302 Direct Digital Variometer is in the center of the instrument panel. It has sensors for altitude, airspeed, acceleration, and temperature. It displays climb rate, average climb rate, and altitude. It also includes an integral global position system (GPS) receiver that generates secure flight logs. The Cambridge 303 Navigation Display Unit works in conjunction with the Cambridge 302 and is located on the bottom right of the instrument panel. It combines GPS-based navigation, wind measurement, and final glide calculation on a set of screens. Your IP will go more in depth on the operation of these two instruments.

Chapter 3

BASIC FLIGHT TERMS AND CONCEPTS

3.1. OBJECTIVES. Understand the basic flight terms and concepts listed below.

3.2. LIFT. Lift is produced by the pressure difference between the top and the bottom of an airplane's wing. The top surface of the wing is more curved than the bottom surface; the distance along the top of the wing is greater than along the bottom. Hence, air passing on top moves faster than air under the wing. This difference in speed results in a difference in pressure (faster air puts less pressure on the top of the wing). The greater pressure on the bottom surface pushes the wing up, producing LIFT. The *amount* of this lift depends on the size of the wing, the wing's speed through the air, and its angle of attack. We will talk about "angle of attack" shortly.

3.3. RELATIVE WIND. The relative wind is the airflow coming at the airplane opposite the direction the aircraft is moving. If the plane flies straight and level, the relative wind blows back level. In a descending glide along a sloping flight path, the relative wind blows opposite that flight path (i.e. the wind would feel as if it is coming from below and in front of the aircraft passing over the top of the canopy).

3.4. THREE AXES. All movement of an aircraft is made about three axes of rotation. These three axes intersect at the aircraft's center of gravity and are mutually perpendicular (Figure 3.1).

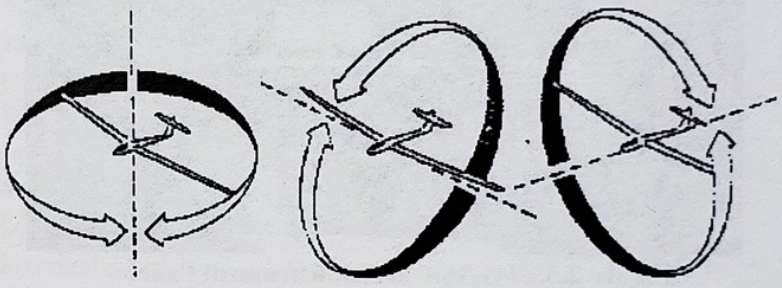


Figure 3.1. Three Axes

3.5 ANGLE OF ATTACK (AOA). This is the angle between the wing and the relative wind. (Note: The angle of attack is different from the aircraft's *pitch* angle, which is the angle between the longitudinal axis and the horizon). In most cases, when the angle of attack increases, lift also increases. In normal flight, changes in angle of attack roughly correspond to changes in pitch angle. When you raise the nose of the sailplane in normal flight (increase the pitch angle), you will also increase the angle of attack, causing increased lift, causing the sailplane to climb—at least for a short while. Raising the nose will also cause the airspeed to begin to *decrease*, resulting in an eventual *decrease* in lift.

Figure 3: Basic Flight Terms & Concepts

3.6. STALLS. Although lift increases as angle of attack increases, it does so only up to a certain point. That point is called the critical angle of attack. Exceeding the critical angle of attack will cause lift to decrease instead of increase. This occurs because the wing meets the relative wind at too sharp an angle and air passing over the wing ceases to flow smoothly, breaking up into turbulence. This turbulence causes the loss of lift, which is called a stall. The stall causes the aircraft to descend, possibly very rapidly, depending on the severity of the stall. A similar phenomenon happens when you stick your hand out from a fast moving car. With palm flat and slightly angled into the wind, your hand acts as a wing, and you can feel lift. But if you angle your hand sharply into the wind, the lifting force disappears as the air flowing over the top of your hand causes your hand to stall. Eventually, you feel a force pushing your hand in the same direction the wind is moving. This force is a form of drag, which is the next topic of discussion. For now, you must understand the basic concept of a stall. Your IP will thoroughly explain this concept, and you will practice stall maneuvers in flight. This understanding is vital to the safe operation of any aircraft.

3.7. DRAG. When any object moves through a fluid or gas, it experiences a retarding force parallel to the relative wind. This retarding force is called drag. An airplane in flight experiences two types of drag: **parasitic drag** and **induced drag**. Parasitic drag is caused by friction along the skin as the bulk of the airframe moves through the air. The amount of parasitic drag increases with airspeed. Induced drag is caused by the production of lift. During flight, a component of the lifting force is parallel to the relative wind and retards the motion of the airplane. Unlike parasite drag, induced drag decreases as airspeed increases. The total drag acting on an airplane is the sum of the parasitic drag and the induced drag. Note that total drag is at a minimum at a certain speed. While this is true for any airplane, it is especially important for sailplanes. This is because that is the speed at which the sailplane glides most efficiently.

3.8. BEST L/D SPEED. Pronounced "Best 'L' over 'D'", this speed minimizes drag, resulting in the highest lift to drag ratio. Flying best L/D airspeed allows your sailplane to glide the greatest distance with the minimum altitude loss. It is important to understand that best L/D speed varies with gross aircraft weight and wind. Thus, best L/D speed for a TG-16A with two pilots on board (dual) at approximately 1389 lbs. is 61 knots, and with a solo pilot is 54 knots (no wind – see Attachment 2 for additional information). At these speeds the glide ratio is approximately 40:1, meaning the plane will glide 40 feet for each foot of altitude loss, not counting the effects of wind. Flying at speeds greater or less than best L/D will reduce glide performance.

3.9. MINIMUM SINK SPEED. While flying minimum sink airspeed, a glider loses the least amount of altitude over a given time period. Therefore, if you want to stay airborne for the longest possible time, and do not care how far you travel during that time, this is the airspeed to fly. Min sink speed usually varies with gross weight. However, for all practical purposes, the TG-16A min sink speed is 50 knots at 1389 lbs. (dual), and 45 knots solo.

3.10. PITCH PICTURE. A pitch picture is a visualization of ground and sky drawn in front of the pilot's view to maintain certain airspeed. You will hear the terms "half ground, half sky" and "two thirds ground, one third sky". Figure 3.2. depicts approximate airspeeds associated with certain pitch pictures.

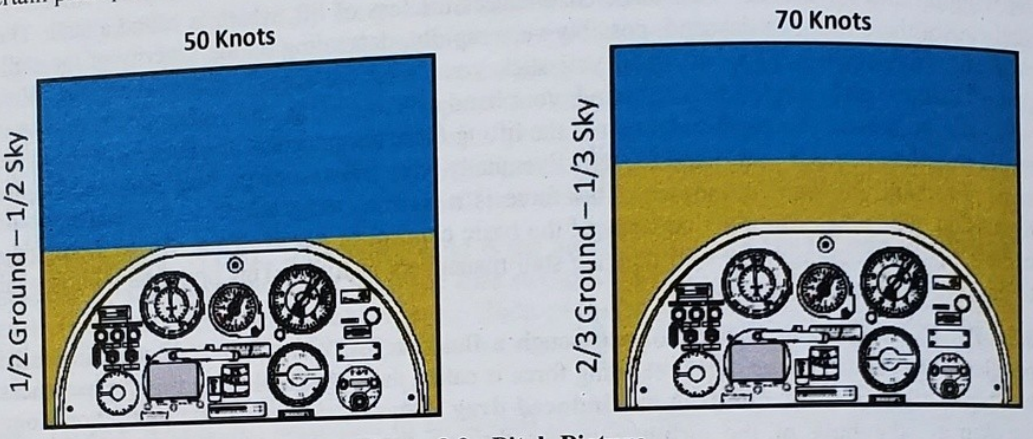


Figure 3.2. Pitch Picture

3.11. ADVERSE YAW & COORDINATED TURNS.

3.11.1. When an aircraft begins to bank (roll about the aircraft's longitudinal axis), the aircraft's nose will tend to yaw away from the direction of the rolling input. This is called adverse yaw. Proper rudder application in the direction of the turn during aileron inputs counteracts the adverse yaw and allows for a coordinated turn. Once the bank angle you desire is established, take out the control input.

3.11.2. The yaw string is a short length of yarn attached to the front part of the canopy which will indicate the relative wind; it shows if you are flying in a coordinated manner. When the entire length of the yaw string is centered on the canopy you are flying coordinated.

3.12. CENTER OF GRAVITY (CG). CG is the point on the aircraft where you can consider the mass of the aircraft to be centered. This point, which varies with aircraft loading, must fall within a safe range for flight. If the CG is out of limits, the aircraft will be unstable or unresponsive. Consideration of the aircraft's center of gravity is important on every flight, because the sailplane's CG is greatly affected by the weight of the crew and/or ballast weights. Every time you fly, you and your IP will ensure the aircraft is properly loaded for flight. More information concerning Center of Gravity is found in Chapter 6.

3.13. PRIMARY FLIGHT CONTROLS. Three primary flight control surfaces direct aircraft movements about the three axes of rotation. Move the ailerons, which are connected to the wings near the wing tips, by left and right movement of the control stick. They bank or roll the aircraft. The elevator is hinged on the rear of the horizontal stabilizer and is controlled by backward and forward movement of the stick. It changes the aircraft's pitch angle. The rudder is connected to the vertical stabilizer and is controlled by depressing the left or right pedal. The rudder yaws the aircraft's nose left and right. With the ailerons, elevator, and rudder, you can rotate an aircraft respectively about the longitudinal, lateral, and vertical axes.

3.14. AIRBRAKES. Airbrakes are installed primarily for glide path control. The effect of opening the airbrakes is an increase in the aircraft's descent rate. The airbrakes are activated with a blue handle on the left side of the cockpit. In the TG-16A sailplane, the airbrakes handle slides aft to open the airbrakes. Controlling the descent is particularly important during the pattern and landing phase of flight, so you can touchdown and stop at the desired point on the airfield.

3.15. RADIO USE. In the military, call signs are often assigned to particular aircraft or individuals. In the TG-16A, we will use the "Thunder" call sign with the two-digit tail number. For example, a tail number of 02 will be "Thunder Zero Two."

3.15.1. You will need to make several radio calls on a typical sailplane sortie. There can be only one transmission made at any one time; simultaneous transmissions interfere with each other. Before making your call know what you want to say and make sure no one else is talking. It is also important to monitor the radios to determine if anyone else has made a request and is waiting for an answer, don't talk in the middle of someone else's conversation.

3.15.2. A radio call generally consists of three parts:

3.15.2.1. Who you are addressing.

3.15.2.2. Who you are.

3.15.2.3. Your message or request. For a response or advisory call that does not require an answer, you sometimes leave out who you are talking to.

3.15.3. Examples of radio calls are as follows:

3.15.3.1. Takeoff – "Skytrain, Thunder zero two, request area tow."

3.15.3.2. One minute to Auto or Pen – "Thunder zero two, one minute to Auto (or Pen)" (advisory call, do not expect or wait for a response)

3.15.3.3. Over Auto or Pen – "Thunder zero two, Auto (or Pen)" (advisory call)

3.15.3.4. Downwind Entry Point – "Skytrain, Thunder zero two, downwind."

3.15.4. Skytrain will respond to each radio call (except for most advisory calls). Read back their instructions exactly as they are given to establish the required confirmation of your intended action.

Chapter 4

GROUND OPERATIONS

4.1. OBJECTIVES. Describe and understand the following ground operations.

4.2. KEY FLIGHT LINE PERSONNEL.

4.2.1. **SCO**. The Soaring Control Officer ("The SCO") is a staff officer who oversees soaring flying activities. The SCO, call sign "Overlord", is located in the tower.

4.2.2. **Ops Sup**. The Operations Supervisor is an officer located in the Logger Box with the Logger. He or she supervises all soaring operations, determines the weather status, gives solo briefings, and briefs the cadet flight commander on necessary information for flying operations.

4.2.3. **Skytrain Controller**. The air traffic controller who controls takeoffs and landings as well as all movement of traffic on the center and west runways is called "Skytrain." He or she sits in the tower, located at the midpoint of the Academy Airfield's center runway.

4.2.4. **Marshaller**. The SCO's primary representative on the flight line is an IP or upgrader in the role of the marshaller. He or she wears an orange vest, controls aircraft and pedestrian traffic on the west runway, and implements various instructions from the SCO or tower in order to keep the flight line running safely and smoothly.

4.2.5. **Rope Runner**. The rope runner is a person who visually checks the tow rope and hooks the rope to a sailplane awaiting aerotow. You will need to be trained by an IP on how to perform the rope runner duties and must have the space on the back of your grade card signed off showing you have had the appropriate training.

4.2.6. **Logger and Chainsaw**. Each sailplane sortie is recorded on a computer located in the midfield building. A person on the flight line, call sign "Chainsaw", gets the tail number, IP name, student name, mission profile, and ORM number for each sortie and then radios this information to the computer operator, call sign "Logger".

4.2.7. **Wing Runner.** The wing runner is a person who raises the aircraft's wing and signals to the tow plane that the sailplane crew is ready for takeoff.

4.3. SOARING FLIGHT LINE.

4.3.1. The Soaring Flight Line consists of: a Midfield, Center and West Runway, Sailplane Landing Area (SPLA), the Academy Tower, Ramp and Taxiway, and Midfield Staging Area

4.3.1.1. The immediate area around the tower is called "Midfield." It is a dynamic, sometimes noisy area congested with people, sailplanes, and tow planes and encompasses the hangar, control tower, parking lots and the main building. Once at the midfield area, you have access to the flight line. Follow established procedures, the SCO, Skytrain, and other knowledgeable flight line personnel for safe flight line operations. Listen carefully to the SCO or Skytrain's verbal instructions, which are often broadcast over the loudspeaker system, called "Big Voice."

4.3.1.2. Center Runway (referred to as "16 Center" or "34 Center"). The direction of the prevailing wind determines whether we take off to the north or south.

Figure 4: Ground Operations

4.3.1.3. West Runway (referred to as "16 Right" or "34 Left"). This narrow runway west of the center runway is used for some sailplane landings. You will normally land west of this runway in the sailplane landing area.

4.3.1.4. Sailplane Landing Area (SPLA). This wide, aviation turf field on the west side of Midfield can accommodate several simultaneous sailplane landings. After landing, sailplanes are ground handled (pushed/towed) back to the line.

4.3.1.5. Academy Tower (call sign "Skytrain"). Controls soaring operations and the SCO supervises all soaring operations from this elevated structure.

4.3.1.6. Ramp and Taxiway. These areas are generally off limits. They are often congested with tow planes. The only exception is crossing the ramp immediately in front (west) of the midfield facility to get to or from the sailplanes on the runway.

4.3.1.7. Midfield Staging Area. The yellow lines encompassing the East Crossing Box and bordering the caution area covering Taxiway Hotel, the staging area is used by sailplanes and personnel waiting to cross 16C/34C.

4.3.1.8. Gators. The 94 FTS has two vehicles called "Gator 1" and "Gator 2." They are used to drag sailplanes to and from the flight line. No AM-251 student will operate a Gator.

4.3.2. **Crossing Taxiway Hotel (H)**. Taxiway Hotel runs North/South and is immediately to the west of the midfield and hangar buildings. Powered aircraft have the right of way on Taxiway Hotel. A siren sounds to warn you that there is an aircraft using the taxiway. If the siren is sounding, DO NOT CROSS THE TAXIWAY. If you do not hear a siren, carefully look both ways for powered aircraft before proceeding across Taxiway Hotel with caution. Your IP will demonstrate this procedure the first lesson before you start flying.

4.3.3. **Crossing the Runway**. If you are crossing Runway 16C/34C **westbound**, you will proceed across Taxiway Hotel as stated above and move into the Midfield Staging Area. There is a small yellow striped box painted on the ground called the "East Crossing Box" at the western side of the Midfield Staging Area. Move into this box, then turn around and look at the red and green stoplight attached to the building outside the logger box. The light is normally red. When the light turns from red to green, **those people actually IN the East Crossing Box** are cleared across the runway to the West Crossing Box. Once you arrive in the West Crossing Box, you must get permission from the Marshaller to cross 16R/34L to the artificial turf "Beach". If you are crossing Runway 16C/34C **eastbound**, you must get clearance from the Marshaller to cross 16R/34L into the West Crossing Box. Look up at the red and green stoplight attached to the building outside the logger box. The light is normally red. When the light turns from red to green, **those people actually IN the West Crossing Box** are cleared across the runway to the East Crossing Box. Once across the runway and in the Midfield Staging Area, apply the process outlined in Paragraph 4.3.2. above to cross Taxiway Hotel.

4.3.4. **Sailplane Launches**. Each sailplane begins its takeoff from the wide white line at the center of the runway. As the lead sailplane on the line prepares for takeoff, the Marshaller marshals a tow plane to taxi into position in front of the sailplane. When the crew finishes the Before Takeoff Checklist, the rope runner hooks the tow rope to the sailplane. The crew then obtains takeoff clearance from Skytrain, signals the wing runner to raise the sailplane

wing (with a "thumbs up"), and signals the tow pilot and wing runner to begin the takeoff with a rudder wag. Each remaining sailplane is moved up one spot, and the process repeats. A relight is an immediate launch after landing with the same crew. **No AM-251 student will help with relights off the center runway without the direct supervision of an IP.**

4.3.5. **After Each Flight**. After landing in the sailplane area, the crew drags the sailplane back to the line. This is when everyone appreciates help. An extra person or two speeds up sailplane retrieval, which makes the aircraft available sooner for flight, and also gives the crew more time to debrief and fly again.

***** **WARNING** *****

The combination of sailplanes and tow planes makes the midfield area of the west runway very congested. You must strictly follow all established rules to prevent any accidents or injuries during ground operations. Stay aware of <u>all</u> aircraft near you, including taxiing and landing aircraft, so you do not inadvertently walk in front of an airplane or drag a sailplane into an airplane.

4.4. SAILPLANE GROUND HANDLING.

4.4.1. A sailplane that is not tied down or hangared is always guarded by at least one person against unexpected gusts that would otherwise move it. There is always at least one person guarding a sailplane's *upwind* wing tip when the plane is stationary, or "static". (This is because the upwind wing might be lifted by the prevailing wind.) If the wind is calm, you may guard either wing tip. When guarding a wing tip of a "static" sailplane, lower the upwind wing tip to the ground and maintain physical contact with it so that you can immediately restrain it against a strong gust. Do not sit or kneel on the wing tip. Airbrakes should be open and locked on the ground to the max extent possible. **Never leave the upwind wing tip unguarded**. In a strong wind, two or more people may be called on to secure a sailplane. Turn the nose of the aircraft into the wind during strong wind conditions.

4.4.2. **A sailplane IP must personally supervise the ground handling of any sailplane.** Two people are required (preferably three) to move a sailplane. To move a sailplane, one person holds the upwind wing tip off the ground as the instructor pilot forces the nose down and pivots the airplane on its main wheel. Once the aircraft is properly aligned the people on the wing root push the aircraft. An available fourth or fifth person can also position himself or herself on the wing root to aid in pushing the aircraft back to the takeoff area. Unless someone is in the cockpit guarding the canopy, keep the canopy closed and locked on the ground as much as possible to prevent damage.

4.4.3. Improper ground handling can cause damage to the sailplanes, especially while moving sailplanes in the hangar. Always look before moving a sailplane and when raising or lowering a wing. Listen carefully to IP instructions and stop the movement if you are unsure how much room or clearance you have.

Chapter 5

TAKEOFF

5.1. OBJECTIVES. Describe, understand and apply the following takeoff procedures.

5.2. CHECKLISTS.

5.2.1. Checklists summarize the things you must perform to accomplish tasks safely and efficiently.

5.2.2. There are checklists you will use during a normal sailplane sortie: the Before Takeoff check, the Before Landing check, and the After Landing check. We'll discuss the first one now, and the last two in later chapters. Each of these checklists is included in your AM-251 Unit Developed Checklist (UDC) and you are encouraged to have that available for reference while you're flying until you've memorized the checklist steps.

5.2.2.1. The "Before Takeoff Check" is the first of four checks you will perform regularly. You must know what each item entails and each item should be accomplished in the order listed. Most pilots use the technique **CBSITCAL** (pronounced "CB SIT CALL") to remember the order of this checklist. The rope runner will hook you to the tow plane only after you have accomplished all steps of this checklist. Each item in quotes ("") is a "challenge and response" checklist item. This means that whoever is running the checklist performs the prescribed actions and then challenges the other crewmember to perform the same. A "challenge and response" item is not complete until the other person responds positively.

5.2.2.1.1. **C - CONTROLS**: Check. Ensure that the elevator, ailerons, and rudder work freely, fully, and correctly and are properly adjusted. If the control surfaces cannot be seen from the cockpit, a spotter must be used to check their movement. ***CAUTION:*** To avoid hitting the rudder stops, do not over control the rudder during the control check.

5.2.2.1.2. **B - BALLAST**: "Checked." Ask the other pilot his or her weight and ensure aircraft is within proper weight and balance limitations. Your IP will show you how to reference the weight and balance table in the back of each aircraft's forms binder (AF Form 781). Install or remove ballast weights as required.

5.2.2.1.3. **S - STRAPS**: "Secure." Ensure that belts and shoulder harness straps are secure and tight. If solo, rear cushions and straps must be secure and clear of the controls.

5.2.2.1.4. **I - INSTRUMENTS**: Check. Ensure the battery is on. Ensure the radio is on, check for proper frequency, and adjust the volume. Ensure the Cambridge 302 and Cambridge 303 are turned on ("On" button at the top left of the Cambridge 303 will turn on both instruments). Check both the internal and fin batteries for at least 12 volts using either the radio or the Cambridge 302 display. Set the altimeter to 6,500' mean sea level (MSL), the field elevation of the runway you will take off from. Reset the accelerometer (G-meter).

5.2.2.1.5. **T - TRIM**: Set. The trim setting for takeoff is normally in the center (neutral) position as shown on the Trim Position Indicator on the left side of the cockpit.

Figure 5: Takeoff

5.2.2.1.6. **C – CANOPY**: "Closed and Locked." Ensure the canopy is closed and locked. Visually confirm the Canopy Release Handle is flush with the cockpit sidewall. Do ***not*** push up or out on the Plexiglas to see if the canopy is securely closed. It is a good idea to check that your yaw string is not tangled at this point.

5.2.2.1.7. **A - AIRBRAKES**: "Closed and Locked." Ensure that airbrakes work freely and together, and that they are closed and locked. Always notify the other crew member before you open the airbrakes from the closed position. ***CAUTION:*** Failure to ensure airbrakes are closed and locked before hooking up the tow rope may lead to inadvertent opening of the airbrakes during takeoff with significant degradation in climb-out performance. During launches with high density altitude conditions, inadvertent opening of airbrakes may make safe takeoff and climb-out impossible.

5.2.2.1.8. **L - LOOKOUT**: Clear area. Check the wind direction/speed and inspect the tow rope/cable. Check that there is no one in front of any part of the sailplane and that the runways/taxiways are clear of vehicles and/or taxiing aircraft.

5.3. HOOKUP. As you are doing the Before Takeoff check, the marshaller directs a tow plane in front of you. After the tow plane taxis into position the rope runner picks up the rope and inspects it for frays or excessive wear. He or she will inform the marshaller if the rope appears damaged in any way. The rope runner then holds the sailplane end of the rope in front of the cockpit and asks the crew, "Straps, canopy, airbrakes, checklist complete, aircrew logged, ready for hookup?" At the same time, he or she visually checks these items and confirms that the airbrakes are closed. If you are ready, your response should be, "Ready for hookup." Next, the rope runner holds up the rope in plain view and asks "Confirm good rope?" If the rope is acceptable, you reply "Affirmative." If it is not, reply "Negative," and coordinate for a new rope. The rope runner then kneels down, puts the tow rope ring into the metal latch and says, "Open, close, check, close." With his or her free hand the rope runner simultaneously signals with an open hand while saying "open" and "check", and with a fist for "closed." With your left hand, you must pull and release the yellow tow release knob at these commands to allow the rope runner to hook up the rope and to confirm that the release mechanism is working properly. After the hookup, the rope runner firmly tugs on the rope to physically check the release and then runs clear of the sailplane (behind the yellow line aft of the sailplane's tail).

5.4. OBTAINING TAKEOFF CLEARANCE. You cannot takeoff without obtaining takeoff clearance from Skytrain. Before calling for takeoff clearance, look around the sailplane again to make sure no one except the wing runner is forward of the yellow line behind the sailplane. Listen to the radio to be sure no one else is transmitting. If you would like an area tow to 9,000' MSL you would key the mike and say "Skytrain, Thunder (tail number), request area tow." If you want an area tow to any other altitude, state that altitude at the end of the radio call. For a pattern tow say "pattern tow" instead of "area tow". **When you hear Skytrain clear you for takeoff, you must read back your takeoff clearance (e.g. "Thunder Zero One, cleared for takeoff, Runway 16 Center"). Only then are you cleared to proceed. Also, listen well for the wind speed and direction announced by Skytrain with your takeoff clearance in order to anticipate what the winds will do to the aircraft during the takeoff roll as well as to have a plan in the event of a rope break**. Then give the wing runner a "thumbs up" and he or she will raise the wing. This signals the tow pilot to take up the slack on the rope. When the rope is straight, wag your rudder prominently to tell the wing runner you are ready for takeoff. Do not

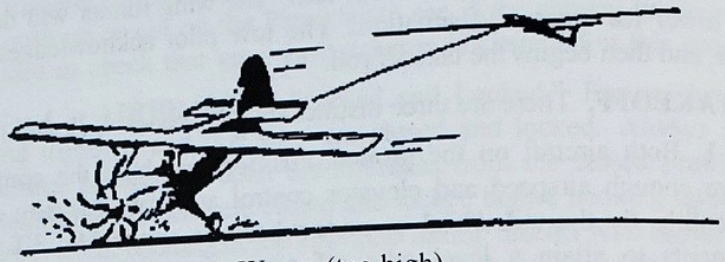
bang the rudder on its stops. The wing runner will signal the tow pilot you are ready for takeoff by making a large circular motion with his or her arm. The wing runner will then hold the wing level, or slightly lower for crosswind situations. The tow pilot acknowledges by wagging the tow plane's rudder, and then begins the takeoff roll.

5.5. NORMAL TAKEOFF. There are three distinct takeoff phases: I, II, and III.

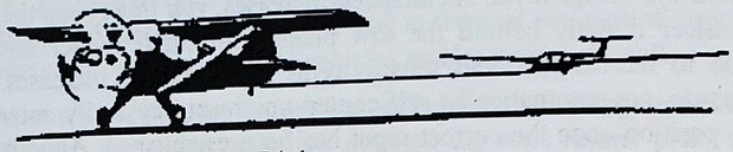
5.5.1. **Phase I**. Both aircraft on the ground. Position and hold the control stick neutral. Once you have enough airspeed and elevator control authority (usually only takes a few seconds), smoothly fly the tail wheel or nose wheel, as applicable, off the ground using small pitch inputs to attain a level take off pitch picture. Maintain this pitch picture throughout the takeoff roll. The aircraft is very pitch sensitive, use caution against over-controlling the elevator. During the first few seconds of the takeoff, the wing runner continues to hold the wings level. As airspeed increases, ***you*** must keep the wings level with aileron inputs. Steer directly behind the tow plane with small rudder inputs. Avoid over-controlling due to increased rudder sensitivity as your airspeed increases. Also, be aware that the rudders do not automatically self-center; you must physically move the pedals back to the neutral position once the correct input has been established. Anticipation and smooth control movements are critical.

5.5.2. **Phase II**. Sailplane airborne, tow plane on the ground. As you accelerate, the controls become more effective, and smaller corrections are needed. As the tow plane accelerates on takeoff roll, you will quickly have enough airspeed to balance the sailplane on the main wheel with the elevator controls (control stick). Once the sailplane reaches approximately 43 knots, allow the sailplane to fly off the ground. Slight back stick pressure may be needed, but **do not pull the sailplane off the ground.** During Phase II, you are airborne, but the tow plane is not (his main wheels are still on the ground). It is very important during this phase to **stay low** (within a few feet of the ground) to avoid pulling the tow plane's tail higher than normal (Figure 5.1). Avoid large pitch corrections, which could result in a potentially dangerous pilot-induced oscillation (PIO). **Use crosswind controls to maintain position directly behind the tow plane (see paragraph 5.6 for instruction on crosswind controls).**

5.5.3. **Phase III**. Both aircraft airborne. In a short while, the tow plane also becomes airborne. During Phase III, you are flying aerotow at a very low altitude. As the tow plane climbs out, match the tow plane's climb. Use stick inputs as necessary to superimpose the tow plane's **wheels on the horizon** (See Figure 6.1).



Wrong (too high)



Right

Figure 5.1. Normal Takeoff

5.6. CROSSWIND TAKEOFF. A crosswind during takeoff requires you to apply crosswind controls to avoid being blown off the runway.

5.6.1. **Phase I**. Just as in a normal takeoff, hold the stick in a neutral elevator position and use small pitch corrections to bring the nose or tail wheel off the ground. A crosswind does not really change how you use the elevator. However, you must use the ailerons to keep the upwind wing slightly lower than normal during Phase I of takeoff. Initially, the wing runner should hold the upwind wing lowered into the wind. For example, in a left crosswind, the wing runner should hold the left wing tip lower than usual. You want to maintain this wing-low attitude by deflecting the ailerons into the wind (left stick). As this happens, reduce the deflection to keep a constant bank angle. Also, since the sailplane is still rolling on the ground, you must do one more thing—apply appropriate rudder inputs to keep the sailplane directly behind the tow plane (right rudder in this case). Take care not to over control. This combination of "cross controls" (left ailerons and right rudder) during a crosswind takeoff is one of the few times you will want to intentionally fly the sailplane uncoordinated.

5.6.2. **Phase II**. As the sailplane becomes airborne, neutralize the ailerons and —crabl the sailplane into the wind (Figure 5.2.) by applying the appropriate rudder (most likely the upwind rudder). This will keep you from sliding away from the runway centerline. Stay directly behind the tow plane (same ground track) on runway centerline and, again, **stay low** without descending back to the runway.

5.6.3. **Phase III**. As both the tow and sailplane climb away from the ground, it is no longer required that you fly a straight ground track behind the tow plane. Allow the aircraft to crab naturally into the wind as depicted in Figure 5.2.

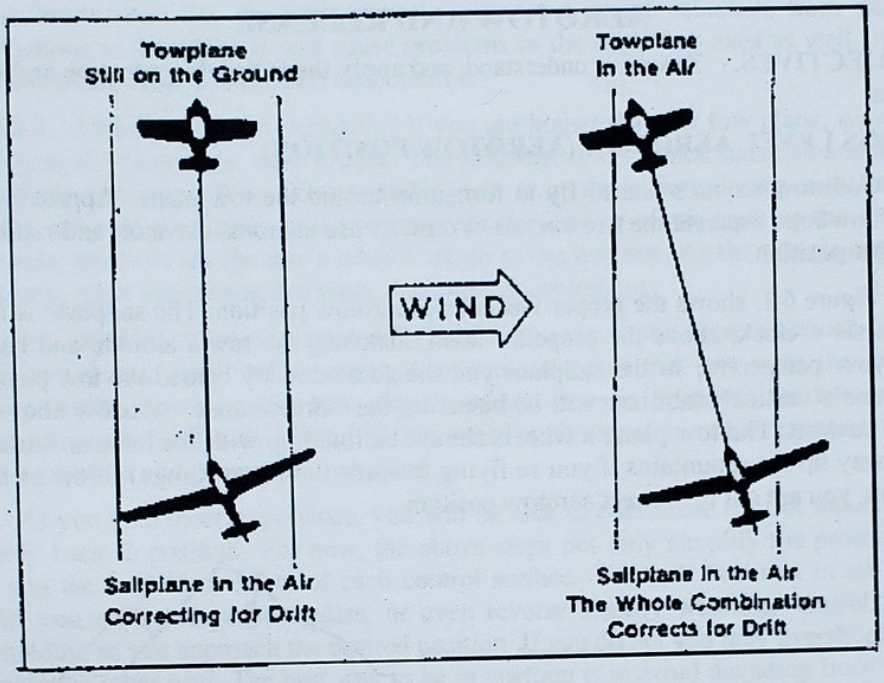


Figure 5.2. Crosswind Takeoff

Chapter 6

AEROTOW AND RELEASE

6.1. OBJECTIVES. Describe, understand, and apply the following aerotow and release procedures.

6.2. WINGS LEVEL AEROTOW (AEROTOW POSITION).

6.2.1. Aerotow requires you to fly in formation behind the tow plane. Approximately 200 feet of tow rope separate the two aircraft. You will use ailerons, elevator, and rudder to stay in proper position.

6.2.2. Figure 6.1. shows the proper wings level aerotow position. The sailplane is at the tow plane's six o'clock, above the propeller wash, matching the tow's altitude and bank angle. From your perspective in the sailplane you should be directly behind the tow plane and the tow plane's vertical stabilizer will be bisecting the "Greenhouse" window above the tow pilot's cockpit. The tow plane's wheels should be lined up with the horizon (or about 1/3 of the way up the mountains if you're flying towards the Front Range). If the picture looks different, you are out of correct aerotow position.

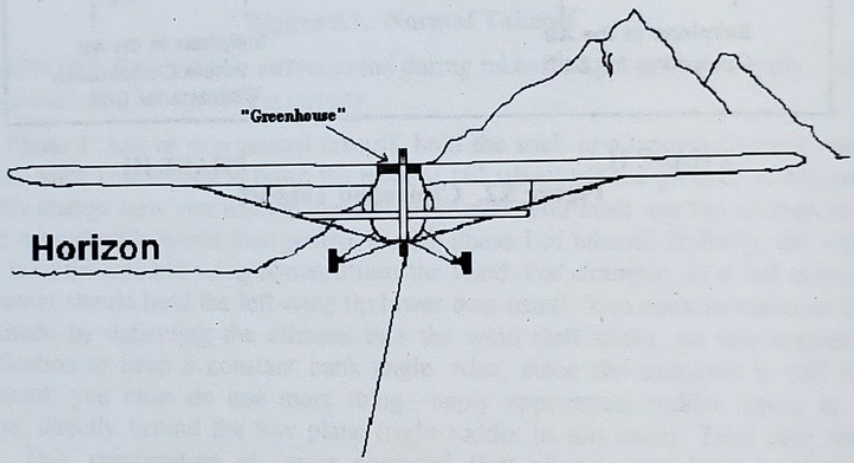


Figure 6.1. Wings Level Aerotow Position

6.2.3. Factors including turbulence and pilot inattention may cause you to deviate from a proper position. When a deviation occurs, correct it. Remember, when you are flying, you control the aircraft. Do not let the aircraft control you! Significant deviations from proper aerotow position have a negative impact on the controllability of the tow plane on takeoff (See Figure 5.2.) and during aerotow. For example, getting too high during aerotow may cause the tow plane to have difficulty climbing since it may not have the elevator authority to overcome the upward force the sailplane exerts on the tail. The tow plane can have similar controllability issues when the sailplane grossly deviates to the side or gets too low during aerotow. If excessive deviations occur, it may be appropriate to release early. Your instructor will discuss techniques for determining when to release based on improper position. For minor deviations, use stick and rudder simultaneously to steer back to the proper aerotow position. If you are getting significantly out of position, one technique you may use to simplify the process of getting back in position is the "WAR" acronym. "WAR" stands for Wings, Altitude, and Rudder.

Figure 6: Aerotow and Release

6.2.3.1. Wings. (Stabilize) Use your ailerons to match your bank angle with the tow's bank angle. Fix this deviation first to prevent a worse situation from developing. Deviations in the roll axis will cause problems in the other two axes as well. Recognize the deviation, remain calm, and take control.

6.2.3.2. Altitude. (Correct vertically) If you are higher than the tow plane, *ease* the stick forward; if you are low, *ease* it back. The sailplane is very pitch sensitive and significant problems can result from abrupt pitch inputs (e.g. slack lines, losing sight of the tow plane, etc.). As you make this correction to descend or climb back to the tow plane's altitude, you will see the tow's wheels return to the horizon. As the wheels approach the horizon, relax your corrective input to prevent an overshoot.

6.2.3.3. Rudder. (Correct horizontally) Once you are at the correct altitude (relative to the tow plane), apply rudder pressure on the same side that you want the sailplane to move **while matching the tow plane's wings.** As you approach the tow plane's six o'clock position (directly behind it), smoothly apply opposite rudder pressure to remove the correction and prevent an overshoot.

6.2.4. As you gain more experience, you will be able to coordinate control inputs to correct smoothly back to position. For now, the above steps not only simplify the process but also show you the individual effect of each control surface. You will find that in all corrective actions, you must reduce, neutralize, or even reverse slightly whatever control inputs you were holding as you approach the desired position. If you do not you may overshoot and have to correct the other way. The best way to be in position is to avoid deviating from the proper position in the first place. Anticipation, smoothness, and confident control inputs make for good aerotow.

6.3. AEROTOW TURNS.

6.3.1. An aerotow turn involves following the tow plane around an arc, much like following a car on a curved road. Therefore, you must start your turn at the same "point in space" as the tow plane. As a technique, wait one second after the tow plane has banked into the turn before banking your sailplane. Rolling into the turn requires use of ailerons and rudder in the same direction to keep the yaw string centered (pointing at you). As you approach the tow plane's bank angle, relax some aileron and rudder inputs so you do not over-bank. Once established in the turn you may even need opposite rudder and aileron inputs in order to match the tow plane's bank, maintain the proper arc and not slide to the inside of the turn. When your bank matches the tow's bank, he will stay stationary in your windscreen. Placing the tow plane's vertical stabilizer on the outside edge of its greenhouse is a good reference for proper lateral position. Figure 6.2. shows how an aerotow turn should look.

6.3.2. The tow plane's outside wing appears above the horizon; the other wing is below the horizon. Split the horizon between the main wheels. (Remember: when you are pointed at the mountains the horizon is approximately 1/3 the way up the mountains.)

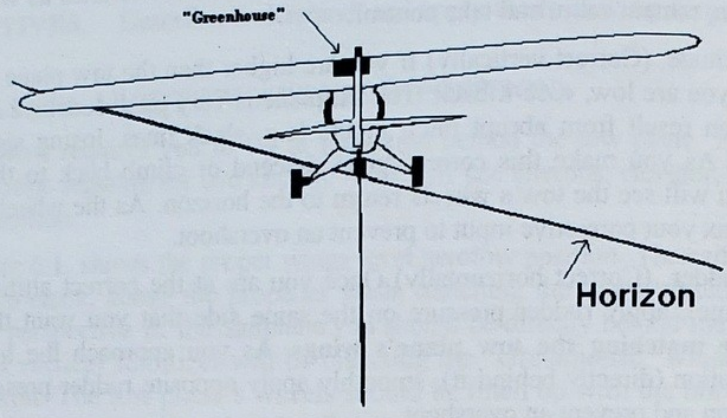


Figure 6.2. Proper Aerotow Turn Sight Picture

6.3.3. If you get out of position during the turn, use the same corrective WAR acronym. In a turn, correcting horizontally requires use of the rudder and ailerons. If you are inside the turn, reduce your bank angle and apply a little bit of "top rudder" (using the rudder pedal on the outside of the turn). If you are outside the turn use a little rudder inside the turn. Remember to keep the horizon between the main wheels as you do this.

6.3.4. Rolling out of a turn involves reversing the steps of getting into a turn. When the tow plane begins to roll out, wait one second before applying coordinated ailerons and rudder. Relax these inputs as you approach wings level flight.

6.3.5. Any time you are on tow, and especially when you are turning, **clearing remains a primary concern** for you and your IP. Don't focus solely on the tow plane. In fact, if you actively clear on aerotow, you not only see other traffic better, you may find the flying easier and more relaxing because the horizon supplements the tow plane as your attitude reference.

6.4. SLACK LINE. A slack line in the tow rope occurs anytime the sailplane is flying faster than the tow. A slack line can result from turbulence, slowing of the tow plane, poor aerotow position/corrections, or when intentionally setup by your IP (AM-251 students are prohibited from setting up slack lines). If not properly corrected, slack lines can worsen and become hazardous. What follows is the most common technique for slack line recovery:

6.4.1. **Freeze It**. When a slack line in the tow rope is recognized, it is important to stop the slack from worsening. Do this by concentrating on the tow plane and stopping its movement with respect to the horizon (freeze the tow plane's position in the canopy, e.g. level off.) Opening airbrakes slightly and smoothly may be appropriate with a very large slack line. Exercise caution using airbrakes to prevent large deceleration of your sailplane.

6.4.2. **Face It**. Using rudder (primarily) and ailerons, point the nose of the sailplane toward the tail of the tow plane. This aligns the rope and minimizes the eventual pull from the tow as the slack comes out. Always maintain sight of the tow rope (do not use so much rudder that the sailplane nose prevents sight of the rope).

6.4.3. **Fix It**. Ideally, when the slack comes out, you want your sailplane's airspeed to match the tow plane's airspeed. Because your "Freeze it" step included a deceleration (level off) – you must accelerate back to the tow plane's speed. A common technique is to use a slight nose-down pitch input to speed up. Timing this maneuver (dipping the nose) depends on the rate at which the rope is straightening.

6.4.4. If at any time during the slack line recovery you lose sight of the tow or you question your ability to safely recover the slack line (e.g. the loop moves aft toward your wing), pull the release and move away from the rope and the tow plane's last known position. If your initial slack line recovery is not perfect a secondary slack line may occur. If it is large, re-accomplish the steps above – "Freeze it, face it, fix it." If the loop in the rope is shallow, simply maintain a normal (maybe slightly nose low) aerotow position until the tugs dampen out. For small slack lines, you can also use the technique of "yawing away" (rudder input away from the tow plane) to remove the slack and maintain tension on the tow rope. Smoothly move back to the normal aerotow position after the slack is recovered.

6.5. BOX THE WASH. During normal aerotow, you fly above the propeller wash, a region of turbulence behind and below the tow plane emanating from the tow's propeller. When you "box the wash," you fly a rectangular pattern around the prop wash. You will not fly this maneuver, your IP will demonstrate it to show you how precisely the glider can be flown on aerotow.

6.6. RELEASE. When you reach the desired altitude and you are in the proper location it is time to release from tow.

6.6.1. Throughout this program, we will remind you to clear ***low left and high/level right*** before releasing from tow. It is paramount to clear extremely well before and after releasing, as tow plane and sailplane will be making significant heading and altitude changes after release. First, inspect the left quadrant (nine to 12 o'clock) from the horizon to the ground. Your tow pilot will turn and descend in this region. Then inspect the entire right side (12 o'clock and aft), especially on and above the horizon (e.g. clear for aircraft above, below and level to your direction of turn). If all is clear, pull the release handle fully. You should see the rope falling away. Begin a turn to the right establishing the pattern airspeed pitch picture, and change your heading by at least 90 degrees. If you released in a right turn, maintain the turn and the tow plane will turn left away from you. On all pattern tows and/or if you release at an altitude other than planned, make a radio call to alert the tow pilot and the air traffic controllers ("Skytrain") that you have released ("Thunder XX, off tow").

6.6.2. For a pattern tow release, you must still clear ***low left and high/level right*** before releasing from tow. Once you pull the release handle and the rope falls away, establish the pattern airspeed pitch picture while simultaneously making a slight right turn "lane change" to ensure clearance from the tow plane and rope. Once clear, return to a heading that will parallel the runway.

6.6.3. Your IP will teach you some other common practices concerning the release. For example, being in good aerotow position, not releasing in sinking air, and being upwind of the entry point in a position to safely glide to the landing area are good things to check prior to release. One technique many IPs use to remember the above items is the acronym ALPC:

6.7.3.1. **A** – Area -- Identify where you are in the area in relation to the circles of safety.

6.7.3.2. **L** – Lift -- Ensure you are not in sink.

6.7.3.2. **P** – Position -- Ensure you are in good aerotow position.

6.7.3.3. **C** – Clear -- Clear low left and level/high right.

Chapter 7

SAILPLANE AREA ORIENTATION

7.1. OBJECTIVES. Describe, understand, and apply the following sailplane area procedures.

7.2. SAILPLANE AREA AND PATTERN OVERVIEW.

7.2.1. AM-251 sailplanes generally operate between the Academy airfield and the Rampart Range, from North Gate Boulevard to approximately the "north gravel pit," a large, excavated area on the mountainside just north of the Garden of the Gods. You must remain within safe gliding distance of the airfield. Sailplanes normally work upwind and west of the entry point for the runway in use and remain clear of the No-Transgression Zone below 8,000'. While in the area plan on working generally west to east so as you descend you're moving closer to the airfield.

7.3. AREAS TO AVOID. Within and near the sailplane areas are some areas to avoid. These areas are blocks of air with defined lateral and vertical boundaries. They may be used for parachuting, aerobatics and spin training, and tow plane routing. Sailplanes may not enter these areas without explicit approval from Skytrain.

7.3.1. **Parachute Airspace**. Figure 7.1. shows an area around and above the airfield designated for parachuting training. Expect extensive UV-18B (Twin Otter) and parachuting activity in the Parachute Airspace. Under parachuting airspace, gliders on tow and recovering will remain below 8,000' MSL. Gliders should remain as far west of the western border of parachuting airspace as conditions permit (sink, winds, performance, etc.). Clear aggressively for jumpers west of the jump pit compensating for winds.

7.3.2. **No Transgression Zone**. Figure 7.1. also shows an area just west of the airfield often congested with aerotow traffic. Tow plane pilots fly through this zone as they climb to the area. The four corners of the no transgression zone are the Non-Commissioned Officer (NCO) Club (NW), Stables (SW), North Entry Point (NE), and South Entry Point (SE). Do not fly in this zone of airspace off tow below 8,000' MSL.

7.3.3. **Aerobatic Areas (when active)**. Figure 7.2. shows three areas designated for aerobatic and spin training. Remain well clear of these areas when Skytrain declares them active.

7.4. BASIC AREA PLANNING. A primary assumption underlying everything you do in a sailplane is that you must always be in a position to execute a safe pattern and landing at the airfield.

7.4.1. **Situational (Position) Awareness (SA)**. Always know where you are in relation to the airfield. In the air, your IP will often ask you to point out the airfield and, more specifically, the entry point. Situational awareness also means being aware of your altitude, sink rate, atmospheric conditions, conflicting traffic, and everything affecting your ability to return for a safe landing. Your flight training will occasionally demand a great deal of concentration on one particular task. However, never completely divert your attention away from two things: **maintaining aircraft control and knowing where you are.** If you are flying solo and have any doubt about your location or if you have any problem whatsoever, call the tower (Skytrain) ASAP! The tower, tow pilots, and other pilots will do everything possible to help you perform a safe landing.

Figure 7: Sailplane Practice Area Orientation

7.4.2. **Sink**. Most of the time, the air is dynamic, full of motion and changes. Atmospheric disturbances may be localized or widespread and may be good or bad for pilots. The most common concern for soaring pilots is sinking air, or simply "sink." In stable air, the TG-16A has a descent rate that varies with the airspeed you hold:

7.4.2.1. 50 KIAS= ~ 125 feet per minute (fpm) down on VSI

7.4.2.2. 60 KIAS = ~ 150 fpm down on VSI

7.4.2.3. 70 KIAS = ~ 175 fpm down on VSI

You can read the descent rate on the vertical speed indicator (VSI) and variometer. At a particular speed, if the actual descent rate is less than normal, you are in rising air, or "lift." If it is more than normal, you are in sink. Your IP has different techniques for taking advantage of lift and dealing with sink. As a rule, fly slower in lift, fly faster in sink. See Chapter 10 for a more detailed discussion of sink.

7.4.3. **Flying Toward the Airfield**. After release, you should steadily work back to the airfield. Flight maneuvers will force you to change heading frequently, but the idea is to fly closer to the landing area as you descend. Your flight path should "funnel" you into the respective entry point. However, because the entry point is a high traffic area, you should remain clear of that area until you are ready to enter the pattern. Always plan for possible sink, but never rely on lift! You are much better off arriving in the pattern higher than normal, versus lower. It is much easier to lose altitude than to gain altitude but you must not arrive at the entry point above 8,000' MSL because you will be in parachuting airspace.

7.4.4. **"Circles of Safety".** The circles drawn in Figure 7.3. show the limits of how far away from the airfield you can fly, assuming you have the minimum indicated altitudes. Within these circles you should have no problem returning to land assuming average conditions. Unfavorable soaring conditions effectively shrink these "circles of safety."

7.4.4.1. 7,800' MSL circle of safety points:

7.4.4.1.1. Santa Fe Trail Red Roofs

7.4.4.1.2. Pine Valley Baseball Fields

7.4.4.1.3. Falcon Stadium

7.4.4.2. 8,200' MSL circle of safety points:

7.4.4.2.1. Blue Townhome Tennis Courts

7.4.4.2.2. Mount Saint Francis

7.4.4.2.3. USAFA Hospital

7.4.4.2.4. USAFA Cemetery

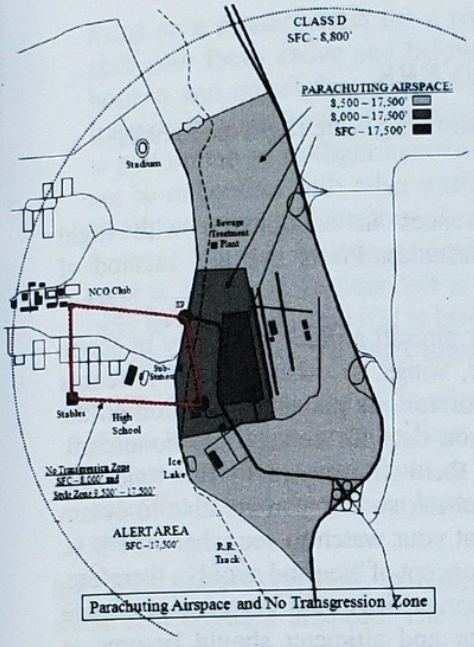


Figure 7.1. Para Airspace & No Transgression Zone

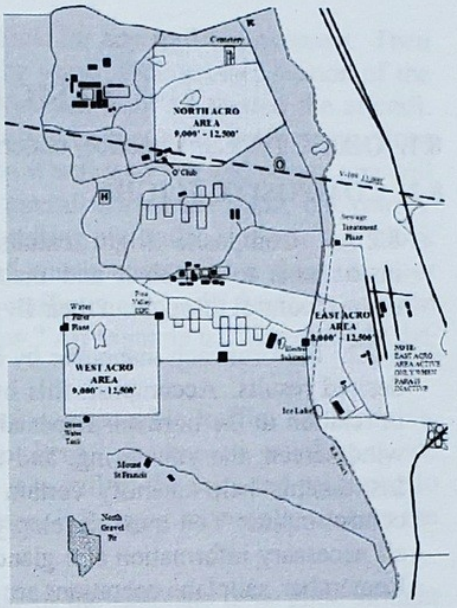


Figure 7.2. Aerobatic Areas

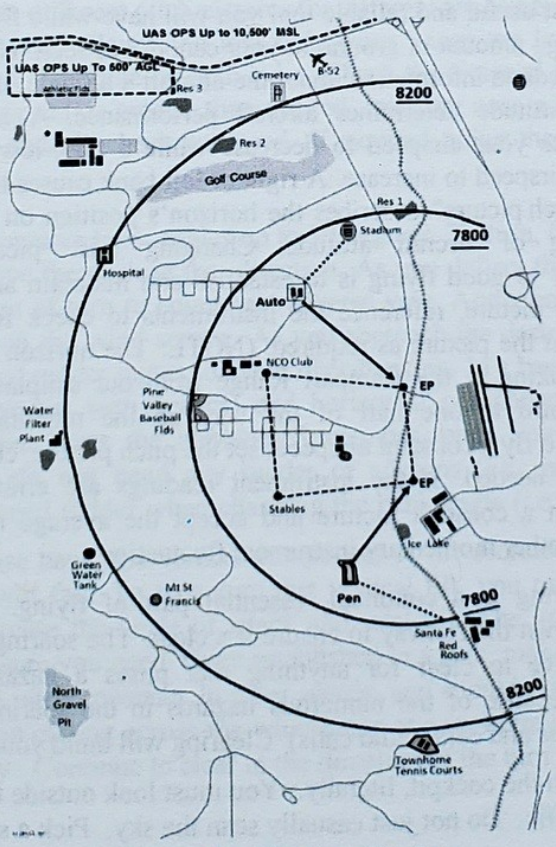


Figure 7.3. Circles of Safety

Chapter 8

BASIC FLIGHT MANEUVERS

8.1. OBJECTIVES. Describe, understand, and apply the following basic flight maneuvers.

8.2. COMPOSITE FLIGHT.

8.2.1. Composite flight entails using outside references in conjunction with flight instruments to establish and maintain desired flight attitudes. Pilots use this method of aircraft control throughout their flying careers.

8.2.2. Perform each maneuver by establishing the proper aircraft attitude necessary to obtain desired results. Accomplish this by positioning the nose, wings, or other aircraft references in relation to the horizon. Especially in sailplanes, the horizon, its perceived position on the wind screen, the yaw string, and the wind noise give you data for controlling the aircraft. Instruments help quantify certain data and referencing them allows you to fine-tune your control inputs. You must develop your composite cross-check so that you are able to obtain all necessary information at a glance, similar to looking at your watch to see what time it is. Remember, sailplane operations are conducted under the concept of "see and avoid"; therefore, we must concentrate most of our attention outside. However, it is vital to maintain a safe airspeed; therefore, cross-checking the airspeed indicator and altimeter should become a routine part of your habit pattern.

8.2.3. By far the most useful and reliable tool you will have while flying is the horizon. The horizon's position (e.g., amount of ground in your canopy) as seen relative to the wind screen gives direct and immediate information about the aircraft's attitude, the combination of pitch and bank. Aircraft attitude determines aircraft performance. A nose-high attitude (less ground visible) causes your airspeed to decrease while a nose-low attitude (more ground visible) causes your airspeed to increase. A right or left bank causes the airplane to turn right or left. The term "pitch picture" describes the horizon's position on the wind screen and is an unerring reading of aircraft attitude. Changing this "picture" changes aircraft performance. The key to good flying is to establish and maintain an appropriate "picture." Once you establish a picture, reference the instruments to check for desired performance (airspeed). Then adjust the picture as required. (NOTE: The horizon is where the sky meets flat terrain. When looking at the Rampart Range from our sailplane area, the horizon is approximately one third to one half of the way up the mountainside). Do not chase instrument readings. To fly a constant airspeed; set the pitch picture, check the airspeed, then adjust the picture as needed. If the instrument readings are erratic from turbulence or other causes, maintain a constant picture and accept the average reading. Do not chase airspeed, VVI, or any other momentary instrument fluctuation.

8.3. CLEARING. Clearing is a continual, essential part of flying. It begins even before takeoff, when you look down the runway to ensure it's clear. The soaring area is tiny relative to the traffic in it. You have to clear for anything that poses a hazard: vehicles, airplanes, parachutists, birds, etc. Because of the numerous hazards in the soaring area, it is crucial to actively clear with your eyes and ears (radio calls). Clearing will build your situational awareness.

8.3.1. Be "heads up" in the cockpit, literally. You must look outside the majority of the time to actively look for traffic. Do not just casually scan the sky. Pick a segment of the horizon,

Figure 8: Basic Flight Maneuvers

focus on a distant object for a couple of seconds and look for any traffic movement. Then shift your focus above and below the horizon and do the same. Pick another section of the horizon and repeat the process systematically so that you can clear all around the aircraft. Intersperse your focused scanning with quick glances inside to check the instruments. Prior to performing an in-flight maneuver, look in the direction it will take you and ensure you will not be in conflict with other traffic. If you see another aircraft during the flight, tell your IP what you see and where it is. A common technique for calling out traffic is to use the "clock system." For this technique, anything straight ahead of you is always 12 o'clock, to your right is 3 o'clock, to your left is 9 o'clock, etc. If the traffic is above the horizon, you can refer to it as "high" and if it is below the horizon it is "low." An example traffic call might be, "Traffic, tow plane, 2 o'clock high."

8.3.2. Listening to the radio allows you to focus *attention* on possible traffic. For example, if you hear, "Thunder Nine Four, one minute to Auto (or Pen)," you know a sailplane is one minute from being over Auto or Pen. That means that it is still in the area and preparing to enter the pattern. Since you know its approximate location, it is easier to visually acquire the traffic.

8.4. STRAIGHT GLIDE. Among the first things you do in the sailplane is to glide straight ahead at a constant airspeed. The aircraft's wings have to be horizontal, and the nose has to point below the horizon. You should see the horizon cut straight across and approximately one-third the way up the windscreen. Your sitting position determines the exact picture that you see, ask your IP to demonstrate different pitch pictures for different airspeeds so you can identify what they should look like for you. Glance left and right, your wings are level if the distance from wing tip to the horizon is the same on both sides. Check the airspeed indicator. It should be a constant speed. If the airspeed is greater than desired, raise the nose a bit. The horizon will be lower in the windscreen now. Recheck the speed. If required, adjust the pitch picture again.

8.5. NORMAL TURN.

8.5.1. Normal turns involve bank angles up to 30 degrees. To turn, first clear in the direction of the turn. Then move the stick in that direction. As you deflect the ailerons, smoothly add rudder in the direction of turn to counteract adverse yaw. Apply enough rudder to keep the yaw string centered on the wind screen. As you approach the desired bank angle, you must remove the aileron and rudder inputs to avoid over-banking. In a bank, the total lift produced by the wings is a vector with vertical and horizontal components. It's the horizontal component of lift that turns the airplane. Remember, once you establish yourself in a stabilized turn, you **do not** need any rudder or ailerons (i.e., neutralize the rudder and ailerons). You only need rudder when changing the bank angle (i.e. moving the ailerons.)

8.5.2. As you increase bank, the vertical component of lift decreases. Since weight remains the same, the nose will fall. To recapture this vertical lift, you must apply and hold more back pressure to increase the angle of attack and total lift. The greater the bank angle, the more back-stick pressure you need. Once established in a turn, make small inputs as required to hold the bank and pitch constant. In other words, you should fly a picture. In a turn, you should see the horizon cutting across the windscreen at a constant angle and there should be more ground than sky. Continue to clear in the direction of the turn.

8.5.3. Roll out of the turn by using the same procedure for getting into a turn. Be sure to clear first, then use coordinated ailerons and rudder, keeping the yaw string centered. Rolling out of a turn requires smooth application of ailerons and rudder. As you roll out you regain vertical lift, so you must smoothly release some back-stick pressure to keep the pitch attitude constant.

8.6. STEEP TURN. A turn using 45° to 60° of bank is considered a steep turn. A steep turn lets you make a heading change quickly (e.g., to avoid other traffic or make adjustments to area orientation), but it requires more coordination and puts the aircraft closer to a stall. When you practice a steep turn, you will find that it takes more ailerons and rudder to bank, more back-stick pressure to keep the nose from dropping, and more airspeed to avoid getting into a stall. Because of stall speed and energy considerations, a good airspeed for entering and performing steep turns is 70 knots.

8.7. SLOW FLIGHT. During the landing phase of flight, the airspeed slows and the aircraft begins to handle sluggishly. To simulate this phase of flight at altitude, we practice a maneuver called slow flight at a speed slightly above stall speed. Clear around your immediate area, then from a straight glide, slow the aircraft by raising and holding the nose at a landing attitude (instrument panel on the horizon). As the airspeed approaches stall speed, turbulent air flow from the wings hits the airplane's fuselage and tail to create a vibration called the "buffet," or "buffeting." This must be accomplished no lower than 1,500' AGL. You can feel the buffet through the entire airframe and especially the control stick. When you first recognize the buffet, note the airspeed. Then lower the nose slightly to hold 3 to 5 knots faster than the airspeed where the buffet began (choose a specific airspeed and fly it--do not fly a range of airspeeds). This is slow flight airspeed, which may vary with each individual sailplane or crew. Continue the slow flight practice by holding a stable straight glide for a few seconds. Note the reduced wind noise during slow flight. Next, roll into a coordinated turn using a shallow bank. Then reverse the direction of the turn and return to the original heading using shallow bank. You will find that all control surfaces seem sluggish in slow flight. In flying this maneuver, you will realize that establishing a proper pitch attitude is the key to maintaining a stable airspeed and flying good slow flight.

8.8. STALLS. Practicing stalls teaches you to recognize the indications of a stall and the procedure for recovering from a stalled condition. This knowledge will hopefully prevent you from getting into a real stall, especially close to the ground. We practice three different stalls: turning stall, landing attitude stall, nose high stall. The turning stall and landing attitude stall may be used to simulate "traffic pattern stalls", because they simulate potential traffic pattern mistakes. We practice all three of these stalls no lower than 1,500' AGL, as a technique you can use 7,000' MSL (on the altimeter) as a base altitude in the areas. Prior to practicing a stall, **clear well** for other traffic, especially below your aircraft.

8.8.1. As we said in Chapter 3, a stall occurs when the wing exceeds its critical angle of attack. Several warning indications almost always precede a stall. The following are common indications of an impending stall:

8.8.1.1. Nose high attitude (most of the time).

8.8.1.2. Decreasing airspeed.

8.8.1.3. Decreasing wind noise.

8.8.1.4. Sluggish controls.

8.8.1.5. Buffeting.

Loss of control accompanies a full stall.

8.8.2. Recover from an impending or full stall using the following procedure:

8.8.2.1. **Relax** back-stick pressure, and ensure your airbrakes are closed. This reduces the angle of attack below the critical value. Relaxing back stick pressure does not mean "dumping" the nose. Doing so on a real stall recovery close to the ground may mean hitting the ground.

8.8.2.2. **Roll** wings level using rudder primary and then ailerons as required. The rudder is more effective to roll wings level than the ailerons since the wing has stalled, the airflow over the wing is not sufficient for the ailerons to be effective. With the wings level, the lift vector is greatest and altitude loss will be minimized.

8.8.2.3. **Recover** back to a safe flying airspeed. Normally, safe flying airspeed will be your pattern speed. However, if you recover from the stall low to the ground (i.e. near a normal landing flare altitude) you may want to recover to a slower speed to preclude "nosing over" into the ground. Take care not to apply nose-up elevator too soon or too abruptly and getting into a "secondary stall."

8.8.3. **Turning Stall**. This stall demonstrates what could happen in a turn in the traffic pattern or in any turn (in the area) where you allow the airplane to approach the critical angle of attack. From a straight glide, enter a shallow turn. Then raise and hold the instrument panel on the horizon. Again, do whatever it takes to hold a constant attitude. Observe the signs of the impending stall. When you feel the buffet, recover using the three-step procedure as described above. **Relax** the back stick pressure and allow the nose to drop just below the horizon. **Roll** wings level with rudder (primary) and ailerons (secondary). Once the sailplane is flying again, **Recover** to a pattern airspeed pitch picture. The practice turning stall is not a full stall, since you recover at the first indication of an impending stall. If you do not recover at the first indication and continue to hold back stick pressure until the aircraft fully stalls, it is possible to put the aircraft into a **spin**! This could be fatal at low altitudes.

8.8.4. **Landing Attitude Stall**. This stall simulates a stall in the landing phase of the flight. In a straight glide, open the airbrakes approximately a quarter to one half. Then raise the nose to a landing or flare attitude (instrument panel about on the horizon). Hold this attitude and observe the signs of the impending stall. When you feel the buffet, execute the recovery procedure. **Relax** the back stick pressure to the slow flight pitch picture and simultaneously close the airbrakes. **Roll** wings level with rudder (primary) and ailerons (secondary) if necessary. Once the sailplane is flying again, **Recover** to your landing pitch picture and airspeed, minimizing the altitude lost. It is particularly important during this recovery not to dump the nose. You are simulating a stall very close to the ground and if you dump the nose, you will impact the ground extremely hard. Like the turning stall, the practice landing attitude stall is not a full stall.

8.8.5. **Nose High Stall**. Nose high stalls are performed so you can experience a full stall and practice recovering from it. Clear for other traffic, and from a straight glide, smoothly raise the nose 20-30 degrees above the horizon (picture your calves on the horizon). Hold this attitude and then begin to increase back stick pressure as the airspeed decreases. Keep the wings level with aileron and rudder inputs. When you have full back stick pressure and the nose falls or a wing drops uncontrollably, you have fully stalled the aircraft. When this

happens, recover using the three step procedure. **Relax** the back stick pressure and allow the nose to drop below the horizon. **Roll** wings level with rudder (primary) and ailerons (secondary) if necessary. Once the sailplane is flying again, **Recover** from the dive smoothly but quickly to the normal glide picture avoiding excessive airspeed buildup.

8.9. SLIP. A slip is a maneuver used to lose altitude rapidly. Your IP may demonstrate this maneuver and discuss its potential use in other aircraft. AM-251 students will not perform slips. Airbrakes are effective enough for any loss of altitude required.

8.10. SPIN PREVENT. A spin is a stall aggravated by yaw (normally rudder) input causing autorotation (the aircraft rotates under the influence of spin forces). It is impossible to enter a spin without yaw. If you stall and yaw the aircraft close to the ground, you may enter a spin and not have time or altitude to recover. We will discuss the procedures for recovery from a spin in Chapter 10. Part of your training will include recovering from a spin entry. This is required so that you will recognize when you are entering a spin and know how to recover before it develops. Your IP will set up the maneuver for you and allow you to shadow them on the controls. After an uncontrollable wing or nose drop and the first indication of rotation, your IP will tell you to "**RECOVER.**" Simultaneously and at the same rate apply forward stick to break the stall and opposite rudder to stop the rotation. Once the stall and yaw are broken, use control inputs as necessary to recover the aircraft to wings level without entering a secondary stall.

8.11. TRANSFER OF AIRCRAFT CONTROL. During most of your flying, an instructor will sit behind you. It is critical to know who is flying the airplane at all times. Without proper transfer of aircraft control, a situation could develop in which no one is flying the airplane or you are fighting each other, both trying to fly. The universally approved procedure is for the person assuming aircraft control to say, "I have the aircraft," while shaking the stick slightly (side to side). The other pilot acknowledges by saying, "You have the aircraft" as he or she relinquishes all controls, including the rudder pedals and airbrake handle. **When in doubt as to who has control, ask immediately.** As a technique, your IP may ask you to hold up your hands when relinquishing control of the aircraft.

Chapter 9

PATTERN AND LANDING

9.1. OBJECTIVES. Describe, understand and apply the following pattern and landing procedures.

Your ability to fly a good, safe pattern and landing is a primary consideration in your IP's decision to send you up solo. Read this chapter thoroughly and ask questions about anything that is not clear. Refer to Figure 9.1 and Figure 9.2. as you read this chapter for a depiction of the pattern.

9.2. ONE MINUTE TO AUTO (or PEN). When you are one minute from 45 to downwind, you will make a radio call to let other aircraft know you will soon be entering the pattern through VFR reporting points. The call is as follows: "(*your Call Sign*), one minute to AUTO (or PEN)." This call, normally made at approximately 7,800' MSL (500 feet above pattern altitude), helps other pilots to clear for you and sequence their pattern entry ahead of or behind you. If you are planning a low pattern or know you will be low, add "(intentional) low pattern" to your radio call. This gives Skytrain time to ensure parachuting airspace is clear of conflicts if your pattern takes you into their airspace.

9.2.1 **VFR REPORTING POINTS.** Under normal conditions, sailplanes will sequence into the pattern through VFR reporting points, AUTO or PEN. In the North area, point AUTO is the Auto Hobby Shop located north of Community Center Drive. In the South area, point PEN is a horse pen bordered by a white split rail fence with a green-roofed building approximately 0.5 statute miles southwest of Ice Lake. When turning over AUTO or PEN make the following advisory call: "(*your Call Sign*) AUTO (or PEN)".

9.3. BEFORE LANDING CHECK.

9.3.1. You must complete the Before Landing Check before landing. Your IP will challenge you to complete this checklist even before you enter the pattern. It is a good habit to run the checklist at 8,000' MSL before making the "one minute to Auto (or Pen)" call. This should give you enough time to accomplish the following steps:

9.3.2. You may use the acronym **SCWAAAG** (pronounced "squaw-gee") to remember the steps of the Before Landing Check. Remember that an item marked with quotations is a challenge and response item. It is in your best interest to memorize the checklist to minimize the need to divert your attention from clearing and flying.

9.3.2.1. **S - STRAPS**: "SECURE." Ensure that seat belts and shoulder harness straps are fastened securely for each crew member.

9.3.2.2. **C - CLEAR**: Look and listen for other traffic and check the landing area. Be especially vigilant for tows and sailplanes approaching the entry point.

9.3.2.3. **W - WINDS**: Determine the speed and direction of the surface wind by listening to Skytrain's transmissions.

9.3.2.4. **A - AIRSPEED**: Determine the speed to fly in the pattern based on the wind conditions. Use the last winds you heard until you receive an update.

9.3.2.5. **A - AIMPOINT**: Identify the appropriate aimpoint for landing.

Figure 9: Pattern and Landing

9.3.2.6. **A - AIRBRAKES**: Check that they work freely and together.

9.3.2.7. **G – G Meter**: Check that the plane was not over-G'd.

9.3.3. Clear well near the entry point. There could be other sailplanes entering the pattern. Aerotows also converge over the entry point as they climb out, when they do, the tow pilot will make the radio call, "Tow entry (high or low)." If they say "high" they are approaching the entry point above 7,300' MSL. "Low" means below 7,300'. Do whatever it takes to safely sequence your aircraft into the pattern, including using airbrakes to increase your descent. You may even use the radio to advise the other pilot of your position or intention in order to avoid a conflict. Clear well and take positive action to prevent an unsafe situation.

9.3.4. Flying a proper airspeed in the traffic pattern is a must! Start with a slightly nose low one-third ground, two-thirds sky pitch picture, this will give you approximately 54 knots. **PATTERN SPEED IS 54 KNOTS PLUS ½ MAX WIND. THE MINIMUM PATTERN SPEED IS ALWAYS 54 KNOTS!**

9.4. THE SAILPLANE PATTERN. (Figure 9.1 and Figure 9.2)

9.4.1. **Downwind Entry Point**. The downwind entry point is a prominent landmark that you must fly over in order to enter the rectangular traffic pattern. The **south entry point** (for Runway 16R) is a small loop in a paved road north of the Service and Supply area. The **north entry point** (for Runway 34L) is the three-way intersection of Pine Drive, Stadium Boulevard, and Southgate Boulevard near the bridge. As you are about to enter the pattern, you should be upwind and west of the entry point and above 7,300' MSL (800' AGL).

9.4.2. **Pattern Entry**. Plan to fly over the downwind entry point at approximately 7,300' MSL. Recovery from AUTO (or PEN) places you on a 45 degree intercept to the downwind leg. Clear extremely well for traffic converging toward the downwind entry point.

9.4.3. **Downwind Leg**. From the entry point, you need to turn downwind to fly parallel the runway and landing area (you will land in the grass area west of the paved runways). Compensate for any crosswind at altitude by angling or "crabbing" into the wind so that your ground track parallels the landing area. Normal downwind should be displaced west of South Gate Blvd over the creek to avoid parachuting operations. As a rule of thumb, the runway should be half way between the wing tip and the canopy rail, or one fist/coke can above the canopy rail depending on seating height.

9.4.4. **On downwind make this call**: "Skytrain, (*call sign*), downwind." Skytrain will respond with the wind reading and your landing sequence. "Number one" means that you will be the first one to land. Any other number means that there is at least one other aircraft ahead that will land first, and you must visually acquire the traffic and avoid a conflict with them. Acknowledge with your call sign and landing sequence: "Thunder Niner Four, number two for the grass." Do not alter your pattern to fit in behind a tow plane. They can go around and try again. You can't!

9.4.5. **Aimpoint**. The aimpoint is the spot in the landing area you would impact if you did not flare the airplane for landing. You will aim at this spot, touch down somewhere beyond it, and finally stop the plane on the ground even further down the runway or the Sailplane Landing Area (SPLA). Plan on choosing one lane (#1-4) and rolling out on the centerline of your lane. Figure 9.3. shows the normal aimpoints for both runways . You must perform a flare and landing that allows you to stop at the desired stopping point (usually abeam the takeoff stripe on the runway). Aimpoints indicated in the landing area are chosen

to keep you from landing in rough terrain and potentially damaging an aircraft during the landing phase. Your aircraft may roll past the midfield stripe depending on winds.

9.4.6. **Base Leg.** Turn from downwind to base leg when you reach approximately 45° beyond the aimpoint (you may need to turn earlier with strong tailwinds on downwind). In the cockpit, when you can see the aimpoint 45° behind your shoulder, it is time to turn to the base leg (adjust your base turn in order to be at least 200' AGL on final). Use approximately 30 degrees of bank (not to exceed 45 degrees of bank). On base, crab into the wind if necessary to keep your ground track perpendicular to the runway/landing area. Check the wind socks near the landing area. Determine if you are higher or lower than optimum and use the airbrakes accordingly.

9.5. FINAL APPROACH AND LANDING.

9.5.1. A good landing starts with a good final approach, which begins as you roll out on final at least 200' AGL. On final approach, guide the sailplane to an "aimpoint" using airbrake inputs and then "round out" to arrest the descent rate and allow the sailplane to settle, and smoothly roll on the landing surface.

9.5.2. The two most important considerations during the final approach are airspeed and aimpoint. The ideal final approach is one in which your aircraft flies a perfectly straight, constant speed path to the aimpoint prior to the round out. The aimpoint should remain stationary in the windscreen throughout the final approach. If it appears to be shifting up or down, you are deviating from a straight glide path.

9.5.3. As always, control airspeed with the aircraft's pitch (e.g. forward/back stick inputs). Holding a good —pitch picture‖ helps you maintain a constant speed. Remember, the calculated pattern speed is the minimum speed! **This speed should not change until you start to round out.**

9.5.4. Control the descent rate (or glide path) with airbrakes. It will take some experience for you to recognize whether you are above, on, or below the optimum glide path. If you are high (aimpoint moving down in the windscreen), open your airbrakes more. If you are low (aimpoint moving up in the windscreen), close them more. With each change in airbrake setting, you will also have to adjust your pitch *slightly* to maintain a constant approach speed. Ideally, you should be able to fly the pattern so that you roll out on base or final with airbrakes at ¼ to ½ deflection on the wing, and fly to the aimpoint with very small corrections. Starting out with ¼ to ½ airbrake deflection on the wing allows you to correct either way. If you are very high, use ¾ to full airbrakes until your aimpoint is corrected. If you are very low, leave the airbrakes closed and accept a short (but on-speed) approach and landing. Do not attempt to "stretch out" the glide on a low approach by raising the nose (you will slow down!). At 50 feet above the ground, set your airbrakes and accept the aimpoint that setting will give you. This will prevent PIO and help **minimize airbrake changes during the flare.**

9.5.5. As you approach the aimpoint, begin your round-out at about 10 to 15 feet off the ground by smoothly applying back pressure to decrease (not stop) your rate of descent. Many people find that shifting their gaze to the horizon at this point helps by allowing the peripheral vision to sense how quickly the plane's settling to the ground. Avoid changing the airbrake position significantly or aggressively at this point. When flown properly, the aircraft is established in a flare with an appropriate landing pitch attitude at approximately 2 to 5 feet

above the ground. After establishing the landing attitude, the main and tail wheels should touchdown simultaneously. It is permissible for the tail wheel to touch down slightly before the main wheel. To avoid a long ground roll, touch down at normal touchdown speed (approximately 45 KIAS). Proper pitch picture is the key. After touching down, continue flying the airplane because even though the sailplane is on the ground, it should literally be flown to a stop with use of all controls. Use ailerons to hold the wings level and the elevator to hold the landing attitude pitch picture, steering straight ahead with the rudder. Slight aft stick pressure and use of air brakes will help keep the main and tail wheels in contact with the ground, keeping the tail wheel in contact with the ground is important because it allows you directional control with the rudder. If you only have one point of contact the sailplane may weathervane into the wind and not stay on centerline. The airbrakes may be used to help slow the aircraft. As the aircraft slows, the tail wheel (if not already on the ground) or nose wheel, depending on CG, should be lowered to the ground just prior to the loss of elevator authority. Air brakes and wheel brakes are available to manage the aircraft's energy after touchdown. The wheel brake is actuated by fully opening the air brakes. As best you can, fly a wing tip (preferably the upwind wing) gently to the ground before releasing the controls.

9.6. CROSSWIND LANDING. A crosswind affects all segments of the pattern, but it is especially important to apply appropriate crosswind controls on the final approach and landing.

9.6.1. On downwind, crab into the wind so that your ground track, the path that your airplane makes over the ground, is parallel to the runway. Check the wind socks periodically. On base leg use crab to keep your ground track perpendicular to the runway.

9.6.2. On final, everything we have said with respect to airspeed and aimpoint holds. A crosswind on final tends to make your aircraft weathervane, crabbing the aircraft into the wind. **Do not touch down in a crab.** Once established on final approach, remove the crab and use the wing-low method (described below) to compensate for crosswinds. Failure to remove the crab may result in a ground loop upon landing. In the wing-low method, use the rudder to align the fuselage with the landing direction and hold the upwind wing lowered into the crosswind. Maintain this wing-low input throughout the flare, touch down, and roll out. This is the same cross-control procedure used in Phase I of a crosswind takeoff.

9.7. AFTER LANDING CHECK. After you land and come to a complete stop push your glider off the SPLA and accomplish this check before handing the aircraft off to a new crew.

9.7.1. G-Logger - Checked

9.7.2. Data Collection Power Switch (If Installed) – Confirm ON

9.7.3. Main Power Switch - Off

9.7.4. Radio - Off

9.7.5. Airbrakes/Flight Controls – As Required

9.7.6. Canopies – Closed and Locked

9.7.7. Upwind Wing – Secure

9.7.8. AFTO Form 781 - Complete

(Note: On your solo flight you will remain in the aircraft with the power switch on and airbrakes open until an IP arrives).

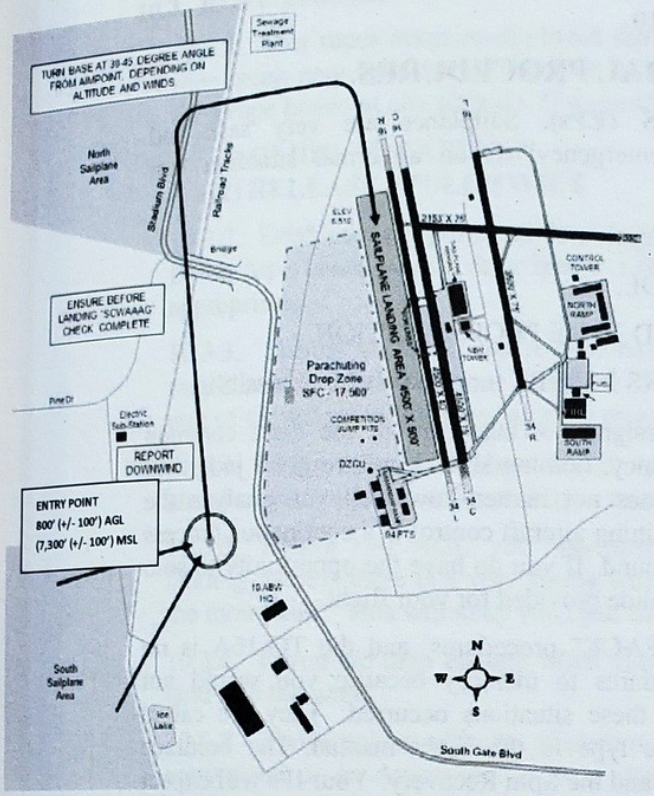


Figure 9.1. Runway 16 Pattern

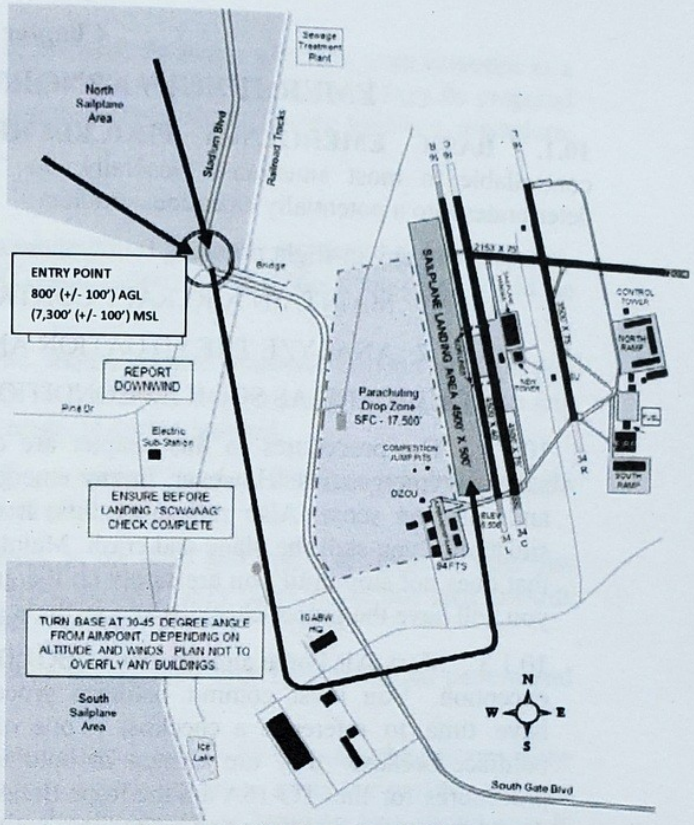


Figure 9.2. Runway 34 Pattern

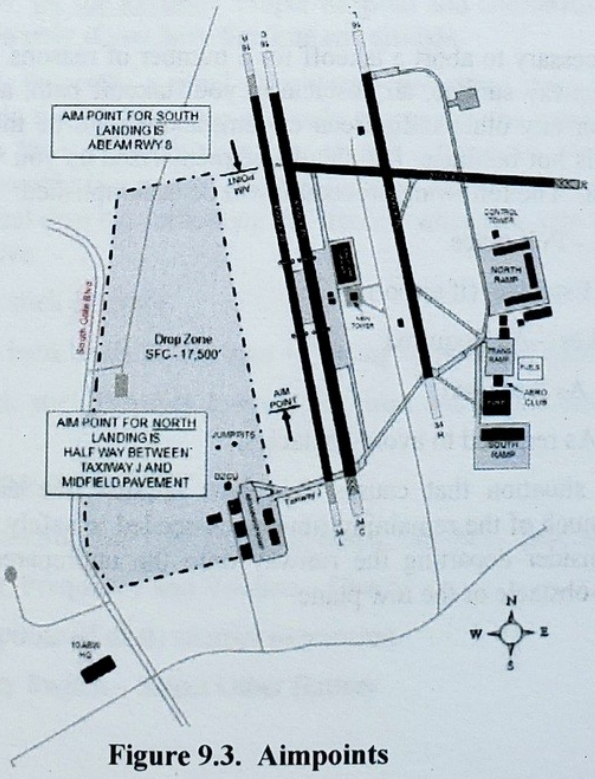


Figure 9.3. Aimpoints

Chapter 10

EMERGENCY / ABNORMAL PROCEDURES

10.1. BASIC EMERGENCY PROCEDURES (EPs). Sailplanes are very safe and controllable in most situations. Generally, an "emergency" is an abnormal situation that deteriorates into a potentially hazardous problem.

10.1.1. For any in-flight problem, follow these steps:

10.1.1.1. MAINTAIN AIRCRAFT CONTROL.

10.1.1.2. ANALYZE THE SITUATION AND TAKE PROPER ACTION.

10.1.1.3. LAND AS SOON AS CONDITIONS PERMIT (on the airfield, if possible).

10.1.2. The procedures in this chapter are designed to take care of the most common sailplane emergencies. However, in any emergency, nothing should replace good judgment and common sense. Also remember this: It does not matter how well you analyze the situation if you stall the plane and crash. Maintaining aircraft control is a continuous process that does not stop until you are safely on the ground. If you do have the opportunity to solo you will have the proper checklist and in-flight guide provided for your flight.

10.1.3. Most Air Force aircraft have "**BOLDFACE**" procedures, and the TG-16A is no exception. You must commit boldface procedures to memory because you would not have time to reference a checklist if one of these situations occurred. They are called boldface because they are written in boldface type in the flight manual. The boldface procedures for the TG-16A are the Rope Break and the Spin Recovery. Your IPs will expect you to memorize boldface and recite them verbatim, not as a student "hazing" process, but so you will be able to safely handle these EPs.

10.2. ABORT.

10.2.1. It may be necessary to abort a takeoff for a number of reasons. Impending or actual departure from the runway surface, an obstacle in your takeoff path, a rope break, the tow plane losing power, or any other unforeseen circumstance could be the cause of the abort. The abort procedure is not boldface, but should be memorized as you will not have time to reference the checklist. The following procedure will be accomplished:

10.2.1.1. Release – Pull twice.

10.2.1.2. Glide – Establish (if airborne).

10.2.1.3. Air Brakes – As Required

10.2.1.4. Brake – As Required

10.2.1.5. Steer – As required to avoid obstacles.

10.2.2. Unless the situation that causes the abort requires the aircraft to be stopped immediately, use as much of the remaining runway as needed to safely bring the aircraft to a stop. You should consider departing the runway onto the unprepared surface as a better option than hitting an obstacle or the tow plane.

Figure 10: Emergency / Abnormal Procedures

10.3. ROPE BREAK.

10.3.1. Tow ropes occasionally break during aerotow. At lower altitudes, your response to a rope break may be a critical factor in effecting a safe landing. As such, always be prepared for a rope break, at any altitude. If it does happen, perform the following boldface procedure:

(1) GLIDE - ESTABLISH
(2) RELEASE - PULL TWICE

10.3.2. Establishing a proper glide picture and speed is especially important at low altitudes. If the rope break occurs at or below 1,000' AGL, establishing pattern airspeed would be appropriate.

10.3.3. Pulling twice on the release handle should release whatever section of rope that might be dangling from your sailplane. This will prevent it from being entangled with any part of the sailplane, or from catching on an obstacle during landing.

10.3.4. If the rope breaks below 150' AGL on takeoff, land in the front quadrant straight ahead of you, making only small turns to avoid obstacles.

10.3.5. Above 150' AGL, you may turn back to the field and make an opposite direction landing. Unless there is a very strong wind from the east (very rare), make this turn towards the mountains. This will keep you clear of other traffic.

10.3.6. If you are high enough when your rope breaks, you may fly a modified pattern and land into the wind.

10.3.7. Above pattern altitude, attempt to fly a normal pattern by entering the pattern at the entry point or on downwind. If your altitude is not sufficient to enter the pattern over the normal entry point, fly directly to a point on the downwind or base leg that allows you to land safely. Clear aggressively.

10.3.8. In all cases, fly the airplane! Proper airspeed and coordination are imperative. Call the SCO or Skytrain only if you have the time and altitude.

10.4. SPIRAL DIVE. Basically, a spiral dive is an over-banked steep turn in which additional back stick pressure fails to raise the nose and only aggravates the spiraling condition. A spiral dive is often mistaken for a spin but there are several differences. First, in a spiral dive, the airspeed is high and possibly increasing. Second, because the airspeed is high, the wind noise is very loud. Third, a spiral dive has increasing "G" forces, whereas a spin has low "G" forces. To recover from a spiral dive:

10.4.1. Relax back stick pressure

10.4.2. Reduce the bank angle to less than 45° using coordinated rudder and aileron

10.4.3. Apply back stick pressure to raise the nose and regain normal flight attitude and airspeed.

10.5. RADIO FAILURE (NORDO).

10.5.1. Before concluding that your radio has failed, run these three steps.

10.5.1.1. Power, Frequency and Volume – Check.

10.5.1.2. Both pilots (if dual) attempt to transmit.

10.5.1.3. Battery Switch – Select Other Battery

10.5.1.4. If on aerotow use radio-out signals.

10.5.1.5. Refer to LANDING WITH RADIO FAILURE CHECKLIST

10.5.2. On the ground, if you think the radio or battery is dead (i.e., no one is answering you), check that the Master Switch is on, and that the frequency is set correctly. If the problem is not solved, ask the Marshaller or your IP for help.

10.5.3. In the air, if you have made several calls with no response, or you have not heard anyone on the radios, accomplish all the steps above. If your radio still does not work:

10.5.3.1. Continue to make radio calls "in the blind." You may not be able to hear them but they could potentially hear you.

10.5.3.2. CLEAR!

10.5.3.3. Enter pattern at proper altitude and on downwind rock your wings several times to tell Skytrain that you are —radio out.‖

10.5.3.4. Land in Lane 4 of the SPLA (avoid the jump pit!).

10.6. SPIN RECOVERY.

10.6.1. It is unlikely that you will ever enter a spin in a TG-16A. However, you will practice a spin prevent and the procedure to recover from it.

10.6.2. Since a spin is a stall aggravated by a yaw (rudder) input, it is impossible to enter a spin with the yaw string centered. However, if you stall and yaw the aircraft close to the ground, you may enter a spin and not have time or altitude to recover. A spin is a stall (loss of control, low airspeed, low wind noise) coupled with autorotation (the aircraft rotates under the influence of spin forces). Recover from a spin using the following boldface procedure:

(1) AILERONS - NEUTRAL

(2) RUDDER - FULL OPPOSITE DIRECTION OF SPIN AND HOLD

(3) STICK - STEADILY FORWARD UNTIL SPINNING STOPS

(4) CONTROLS - NEUTRAL AND RECOVER FROM DIVE

10.6.3. The first step prevents you from aggravating the spin. The second step helps stop the rotation. Adding forward stick pressure breaks the stall by increasing airflow over the control surfaces. Neutralizing the controls before pulling out of the dive reduces the chance of over-stressing the aircraft or inadvertently entering another spin during the recovery.

10.7. SEVERE SINK (Abnormal Procedure).

10.7.1. The normal descent rate of the TG-16A flying at best glide speed is about 175 fpm. Severe sink is any sink approaching 1,000 fpm down while flying near L/D max speed. If you do not deal with severe sink correctly, you may find yourself landing on the Silver Course of the Eisenhower Golf Course. The best way to deal with sink is to: (1) leave the area of sink immediately and (2) fly directly toward the airfield. The best way to get out of sink is to lower your nose to increase your airspeed. Lowering your nose may seem unnatural when you are sinking, but it is the only way to increase your airspeed so you can exit the sink. Be aware that as you speed up, your descent rate will increase, adding to your overall descending trend. Also, remember to turn directly toward the airfield while lowering your nose. You will know you have exited the sink when your VSI returns to an appropriate value for your speed (e.g. for 70 KIAS ~ 2 knots down).

10.8. RUNWAY CHANGE (Abnormal Procedure). The runway change scenario is not an actual emergency, but it is important for a solo student to understand (do not declare an emergency for a runway change).

10.8.1. A runway change is caused by a shift in the winds from one direction to another, which impacts all takeoff and landing operations. This is especially important if you find yourself airborne during this time. The steps below outline safe recovery procedures.

10.8.1.1. If on tow, remain on tow and transition to the opposite flying area.

10.8.1.2. Once established in the opposite flying area and Skytrain has declared the new runway in use, you may release from the tow plane and continue normally.

10.8.2. If a runway change occurs while airborne and you have already released from the tow plane, you may do either of the following:

10.8.2.1. Return to the pattern immediately for a normal landing in the sailplane landing area.

10.8.2.2. If altitude and conditions permit, transition to the opposite area being careful not to violate the No-Transgression Zone.

10.8.2.3 Students on initial solo will return immediately to the pattern.

10.9. WEST LANDING (Abnormal Procedure). Unexpected strong west winds sometimes force all sailplanes to land to the west. If you hear Skytrain calling for west landings, you must know what to do. The area you are in determines the pattern you fly for a west landing. See Figures 10.1. and 10.2. Clear aggressively and be aware of buildings and other aircraft. Sailplanes will plan on landing in the grass. Aircraft will adjust their patterns as necessary to land safely.

10.9.1. West Landing from South Entry (See Figure 10.1). Enter the pattern at 7,300' MSL at the south entry point. Turn east onto downwind and north onto base at a point 30-45 degrees forward of the aim point for west landings as depicted in Figure 10.1. Aircraft performing west landings are authorized to overfly Runway 16C and 16L. The first aircraft will line up final abeam the A-10 static display. Remaining aircraft will stack south. Adjust as necessary to roll out on final no lower than 200' AGL, lined up with the proper landing spot appropriate for your landing sequence and with at least one wing span clearance from other sailplanes on the field (two wing spans for a solo student). Again, watch your altitude

on base and final. Use appropriate airbrakes to descend, land, and come to a stop east of the jump pit. After landing, leave the airbrakes full open, the radio on, and stay in the cockpit with the stick full aft until assistance arrives.

10.9.2. West Landing from North Entry (see Figure 10.2). Enter the pattern at 7,300' MSL at the north entry point. Turn east onto downwind and south onto base at a point 30-45 degrees forward of the aim point (the western edge of Runway 16R) for west landings, as depicted in Figure 10.2. Aircraft performing west landings are authorized to overfly Runway 34C and 34R. The first aircraft will fly so as to line up final with the north end of the midfield hangar. All other aircraft will stack north to avoid over flying previous aircraft finals. Adjust as necessary to roll out on final no lower than 200' AGL, lined up with the proper landing spot appropriate for your landing sequence and with at least one wing span clearance from other sailplanes on the field (two wing spans for a solo student). A very common error is having insufficient altitude on base and in the final turn. Avoid this mistake. Use appropriate airbrakes to descend, land, and come to a stop east of the jump pit. After landing, leave the airbrakes full open, the radio on, and stay in the cockpit with the stick full aft until assistance arrives.

10.10. EAST LANDING (Abnormal Procedure). Unexpected strong east winds sometimes force all sailplanes to land to the east. If you hear Skytrain calling for east landings, you must know what to do. The area you are in determines the pattern you fly for an east landing. See Figures 10.3. and 10.4. Clear aggressively and be aware of buildings and other aircraft. Sailplanes will plan on landing in the grass. Aircraft will adjust their patterns as necessary to land safely.

10.10.3. East Landing from South Entry (See Figure 10.3). Enter the pattern at 6,800' MSL over the south entry point. Turn north to fly a base leg and turn final as appropriate. The first aircraft will line up on final north of the Thunderbird overlook. Subsequent aircraft will stack to the south. Stop short of the west runway.

10.10.4. East Landing from North Entry (see Figure 10.4). Enter the pattern at 6,800' MSL over the north entry point. Turn south to fly a base leg and turn final as appropriate. The first aircraft will line up on final south of the Thunderbird Overlook. Subsequent aircraft will stack to the north. Stop short of the west runway.

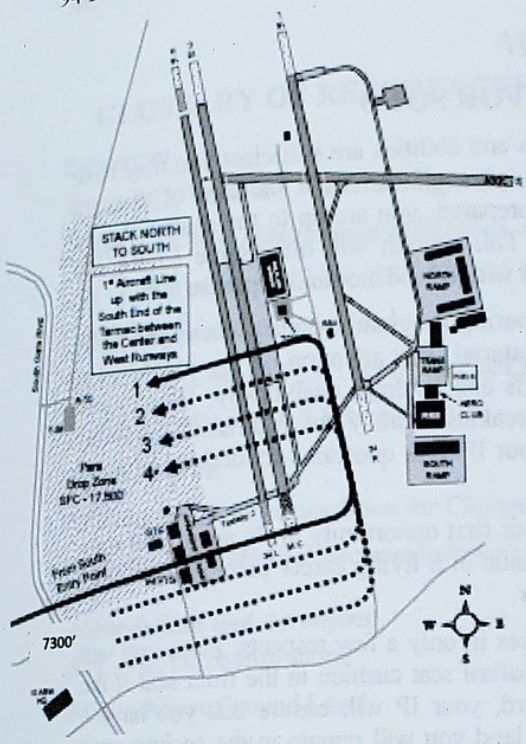


Figure 10.1. West Landings From South Area

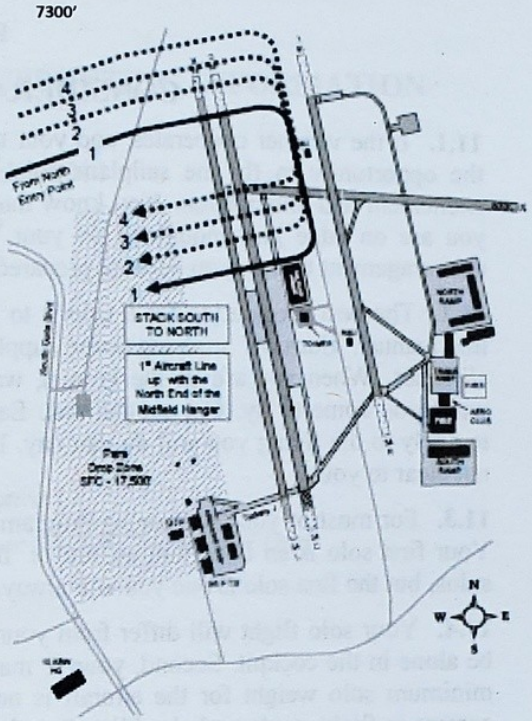


Figure 10.2. West Landings From North Area

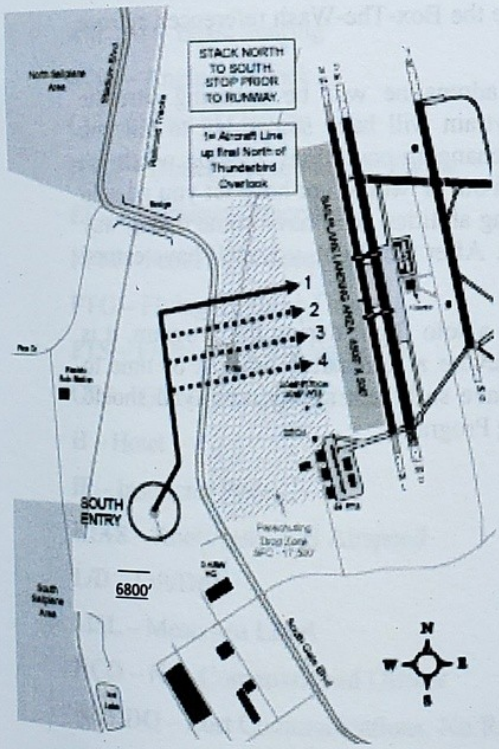


Figure 10.3. East Landings From South Area

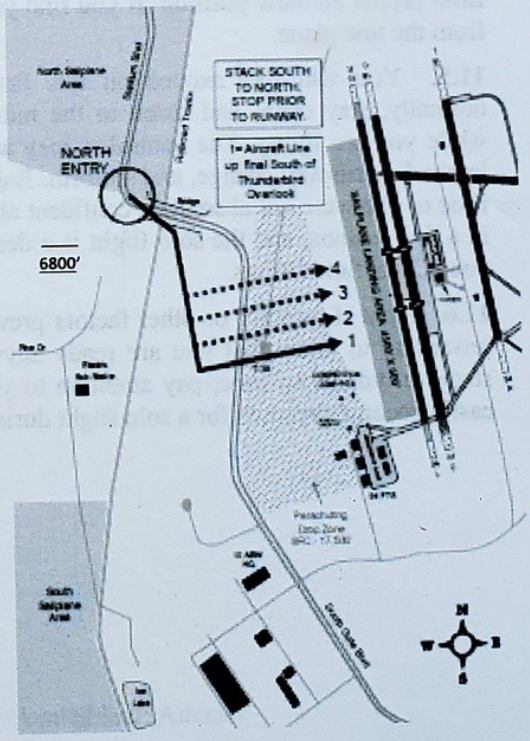


Figure 10.4. East Landings From North Area

Chapter 11

CONSIDERATIONS FOR SOLO

11.1. If the weather cooperates, and your own desires and abilities are sufficient you may have the opportunity to fly the sailplane solo. Flying by yourself can be a moment of pleasant excitement and anticipation. You know that you are prepared, you are up to the challenge, and you are on edge just enough to do your very best. This section will offer some advice and encouragement to help you become prepared to fly solo with confidence and expertise.

11.2. The best preparation for a solo is to take the Soaring Program seriously. Read and study this manual. Consider studying some supplemental material. Pay attention on the flight line at all times. When you are on the ground, watch takeoffs and landings analytically. Be prepared when you come to fly. Get enough rest. Eat a good breakfast. Study the material that is likely to apply to the flying you will do that day. Listen to your IP. Ask questions about things that are not clear to you.

11.3. For most of you the Soaring Program will be your first opportunity to fly an aircraft solo. Your first solo is an important milestone. If you continue in a flying career there will be more solos, but the first solo is one you will always remember.

11.4. Your solo flight will differ from your other sorties in only a few respects. First, you will be alone in the cockpit. Second, your IP may place a ballast seat cushion in the front seat if the minimum solo weight for the aircraft is not met. Third, your IP will ensure that you have a current in-flight guide and checklist. Fourth, after you land you will remain in the cockpit until assistance arrives. Fifth, the aircraft will fly a little bit differently with only one person in it versus two. Finally, it is now your responsibility to determine when you have deviated too far from proper aerotow position. If you find yourself outside the Box-The-Wash references, release from the tow plane.

11.5. You will feel excited on this first solo. The adrenaline will be pumping. Breathe normally, stay calm, and listen to the radio. Often, Skytrain will have something to tell you while you are flying. The controller may advise you of changing conditions, gusting winds, an impending runway change, and so forth. Enjoy the ride. Your IP would not have let you go solo if he or she were not absolutely confident about your flying abilities. You have come a long way in a few lessons, and the solo flight is a deserved reward. After the flight, you will have earned your Cadet Solo Wings.

11.6. Even if weather or other factors prevent you from a solo flight during the program, it is rewarding to know that you are ready anyway. If you devote a reasonable amount of time to study on your own time, pay attention to your IP, and have sufficient ability, then you should easily become prepared for a solo flight during the Soaring Program.

Figure 11: Considerations for Solo

Attachment 2

TG-16A SAILPLANE SPEEDS

The following numbers are important to know in the operation of the TG-16A. Your IP will often ask you to recite them. All speeds are in knots.

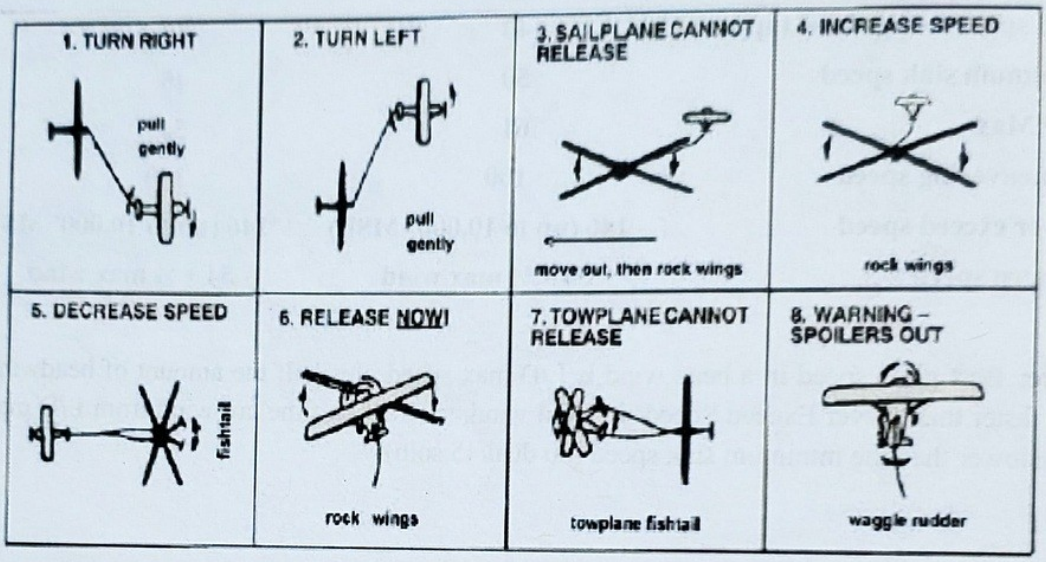
	DUAL	SOLO
Stall speed, wings level (approx.)	**40**	**36**
Minimum sink speed	**50**	**45**
L/D Max	**61**	**54**
Maneuvering speed	**100**	**100**
Never exceed speed	**146 (up to 10,000' MSL)**	**146 (up to 10,000' MSL)**
Pattern speed	**54 + ½ max wind**	**54 + ½ max wind**

Note: Best glide speed in a head wind is L/D max speed plus half the amount of headwind, but not faster than Never Exceed Speed. In a tail wind, subtract half the tail wind from L/D max, but not slower than the minimum sink speed (50 dual/45 solo).

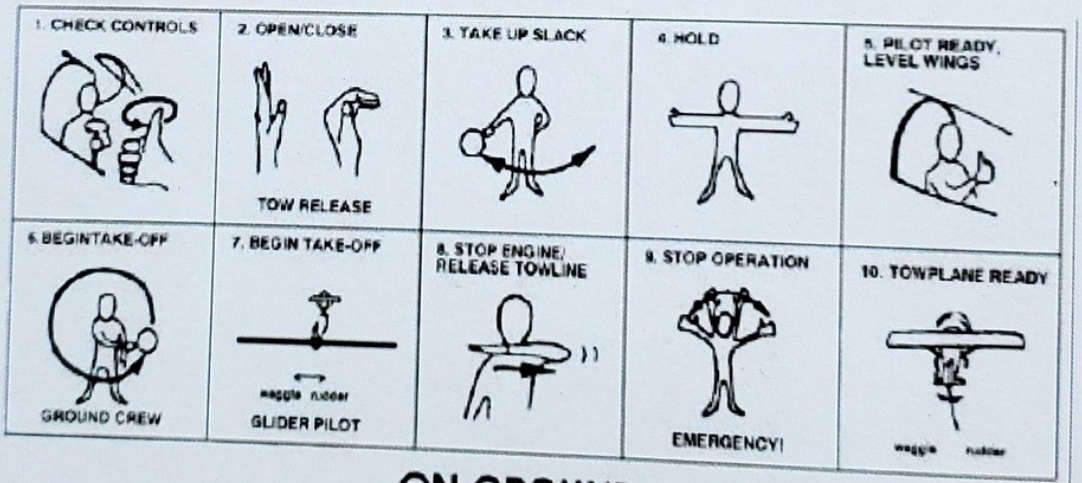
Figure 12: TG-16A Sailplane Speeds

Attachment 3

SAILPLANE VISUAL SIGNALS



IN AIR



ON GROUND

Figure 13: Visual Signals

Attachment 4

DAILY LESSON OBJECTIVES

A4.1. Lesson 1 Objectives

A4.1.1. Become familiar with the Basic Soaring Manual.

A4.1.2. Read Chapter 2 (Aircraft Description).

A4.1.3. Read Chapter 3 (Basic Flight Terms and Concepts).

A4.1.4. Study Chapter 4 (Ground Operations).

A4.1.5. Study Chapter 5 (Takeoff).

A4.1.6. General Knowledge Topic: Explain the Key Flight Line Personnel: Marshaller, Rope Runner, Logger, Chainsaw. *(Chapter 4)*.

A4.1.7. Emergency Procedure Topic: Basic Emergency Procedures *(Paragraph 10.1)*.

A4.2. Lesson 2 Objectives

A4.2.1. Review Chapter 3 & Chapter 4.

A4.2.2. Study Chapter 5 (Takeoff).

A4.2.3. Study Chapter 6 (Aerotow and Release).

A4.2.4. Study Chapter 7 (Sailplane Area Orientation).

A4.2.5. General Knowledge Topic: Radio calls - What should your radio call be for takeoff, when you are at 7,800' MSL [one minute to Auto (Pen)], when you are over Auto (Pen), and when you fly over the downwind entry point? (Paragraphs 5.4, 9.2, 9.4.4).

A4.2.6. Emergency Procedure Topic: Abort *(Paragraph 10.2)*.

A4.3. Lesson 3 Objectives

A4.3.1. Review Chapter 5, Chapter 6 & Chapter 7.

A4.3.2. Study Chapter 8 (Basic Flight Maneuvers).

A4.3.3. Study Chapter 9 (Pattern and Landing).

A4.3.4. Study Attachment 2 (TG-16A Sailplane Airspeeds).

A4.3.5. General Knowledge Topic: TG-16A sailplane airspeeds & pattern entry altitude: Max L/D, Minimum Sink, Pattern Airspeed, Wings level Stall Speed. *(Attachment 2 & Paragraph 9.4)*.

A4.3.6. Emergency Procedure Topic: Rope Break *(Paragraph 10.3)*.

Figure 14: Daily Lesson Objectives

A4.4. Lesson 4 Objectives

A4.4.1. Review Chapter 8 & Chapter 9.

A4.4.2. Study Attachment 3 (Sailplane Visual Signals).

A4.4.3. Memorize TG-16A Takeoff & Landing Checklists *(Paragraphs 5.2 & 9.3)*.

A4.4.4. General Knowledge Topic: Aerotow: Wings level and turning. *(Paragraphs 6.2 & 6.4)*.

A4.4.5. Emergency Procedure Topic: Spiral Dive *(Paragraph 10.4)*.

A4.5. Lesson 5 Objectives

A4.5.1. Review all Flying Operations.

A4.5.2. Memorize Sailplane airspeeds & visual signals.

A4.5.3. Memorize TG-16A BOLDFACE procedures *(Paragraphs 10.3 & 10.6)*.

A4.5.4. Read Chapter 11 (Considerations for Solo).

A4.5.5. General Knowledge Topic: Expected VSI Readings and Severe Sink. *(Paragraphs 7.4 & 10.5)*.

A4.5.6. Emergency Procedure Topic: Radio failure (NORDO) *(Paragraph 10.5)*.

A4.6. Lesson 6 Objectives

A4.6.1. Chair fly a normal sortie from takeoff thru landing.

A4.6.2. Practice TG-16A BOLDFACE, both written and aloud.

A4.6.3. General Knowledge Topic: Minimum Maneuver Altitudes: Stalls & Slack Line *(Paragraphs 8.8 & 6.5)*.

A4.6.4. Emergency Procedure Topic: Spin Recovery *(Paragraph 10.6)*.

A4.7. Lesson 7 Objectives

A4.7.1. Take Pre-Solo Quiz.

A4.7.2. Have all emergency procedures signed on the back of your gradecard.

A4.7.3. Review all Area Maneuvers *(Chapter 8)*.

A4.7.4. General Knowledge Topic: Sailplane Visual Signals. *(Attachment 3)*.

A4.7.5. Emergency Procedure Topic: Severe Sink *(Paragraph 10.7)*.

A4.8. Lesson 8 Objectives

A4.8.1. Review Takeoff, Pattern, and Landing.

A4.8.2. Review Emergency Procedures.

A4.8.3. Review Airspeeds.

A4.8.4. Review Sailplane Visual Signals.

A4.8.5. FLY and hopefully solo!

A4.8.6. General Knowledge Topic: Circles of Safety: Be able to name all points. *(Paragraph 7.4, Figure 7.3).*

A4.8.7. Emergency Procedure Topic: Runway Change *(Paragraph 10.8).*

A4.9. Lesson 9 Objectives

A4.9.1. Review Takeoff, Pattern, and Landing Airspeeds

A4.9.2. Review Emergency Procedures.

A4.9.3. FLY and hopefully solo!

A4.9.4. General Knowledge Topic: No Transgression Zone: Be able to name the four points. *(Figure 7.1).*

A4.9.5. Emergency Procedure Topic: West Landing Procedures *(Paragraph 10.9).*

A4.10. Lesson 10 Objectives

A4.10.1. Fill Out Student Critique Form, FLY and hopefully solo!

A4.10.2. General Knowledge Topic: Solo Maneuvers: What maneuvers can you perform on your solo flight? *(Steep Turns and Slow Flight).*

A4.10.3. Emergency Procedure Topic: East Landing Procedures *(Paragraph 10.10).*

Attachment 5

AM-251 UNIT DEVELOPED CHECKLIST

AM-251 Unit Developed Checklist (Ref: T.O. 1G-16(T)-1, 1 Jan 12, Ch1 30 Sep 13) 8 Oct 2015
List of Effective Pages: Page 1...Change 0, Page 2...Change 0 AETC Approved 13 Oct 15 v 1.0 1

BEFORE TAKEOFF CHECK (CBSITCAL)

1. Flight Controls (C) – Check
2. Ballast – "Checked"
3. Straps – "Secure"
4. Instruments – Check
   a. Main Power Switch – ON
   b. Navigation System – On/Set
   c. Altimeter and Cambridge 302 – Set to Field Elevation
   d. G-Logger and G-Meter – Checked and Reset
   e. Radio – On, Frequency Set and Volume Adjust
   f. Battery – Check
5. Trim – Set
6. Canopies – "Closed and Locked"
7. Airbrakes (W) – "Closed and Locked"
8. Lookout – Clear Area

BEFORE LANDING CHECK (SCWAAAG)

1. Straps – "Secure"
2. Clear – Traffic and Landing Zone
3. Winds – Check
4. Airspeed (W) – Determine
5. Aim Point – Determine
6. Airbrakes – Check
7. G Meter – Check

AFTER LANDING CHECK

1. G-Logger – Checked
2. Data collection Power Switch (If installed) – Confirm ON
3. Main Power Switch – OFF
4. Radio – OFF
5. Airbrakes/Flight Controls – As Required
6. Canopies (C) – Closed and Locked
7. Upwind Wing (C) – Secure
8. AFTO Form 781 – Complete

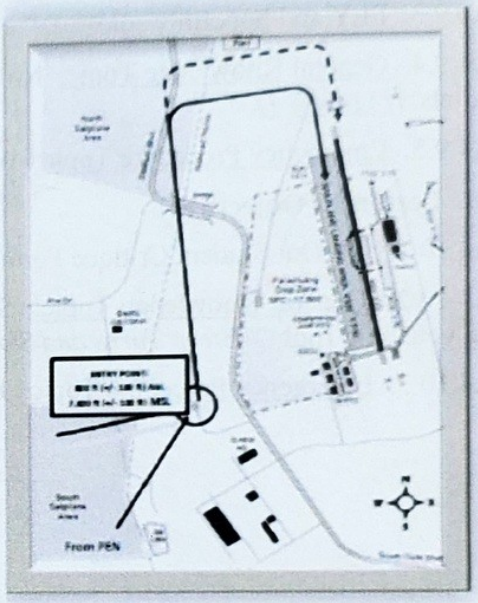
TG-16A AIRSPEEDS (@ 1389lb / Solo)

Max L/D – 61 / 54
Min Sink – 50 / 45
Maximum Maneuvering Speed (V_A) – 100
Pattern A/S – 54 KIAS Min + ½ Max wind velocity (excluding tail winds)
Never Exceed (≤ 10,000 ft MSL) – 146

WIND LIMITS TG-16A

Dual Crosswind	16	Max Wind	25
Solo Crosswind	10	Tail Wind	N/A

RWY 16



RWY 34

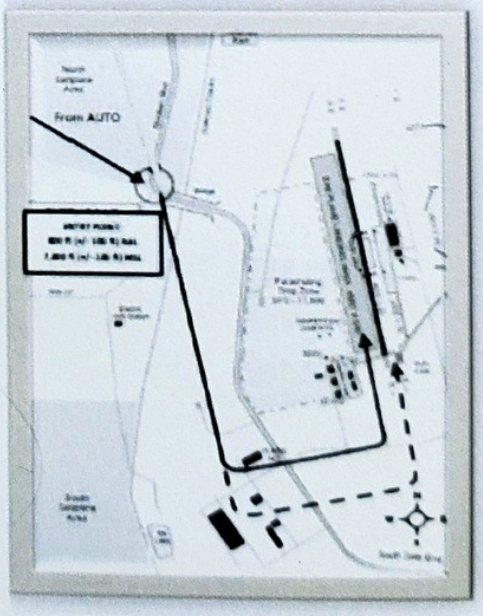


Figure 15: Local - Checklists / Charts/ Procedures

AM-251 Unit Developed Checklist (Ref: T.O. 1G-16(T)-1, 1 Jan 12, Ch1 30 Sep 13) 8 Oct 2015
2

AEROTOW	SLACKLINE	BEFORE RELEASE
W - Wings	Freeze It	A – Area
A - Altitude	Face it	L – Lift
R - Rudder	Fix It	P – Position
		C - Clear

CIRCLES OF SAFETY

7,800 MSL, Santa Fe Trail Red Roofs, Pine Valley Baseball Fields, Falcon Stadium

8,200 MSL, Blue Townhome Tennis Courts, Mt Saint Francis, Hospital, USAFA Cemetery

NO TRANSGRESSION ZONE

NCO club, Stables, South Entry PT, North Entry PT

Surface to 8,000 MSL

MANEUVER RESTRICTIONS

Slips – Not Authorized Below 100 AGL.
Slack line & Box the Wash – 1,000 ft AGL min (8,000 ft MSL USAFA)
Stalls and Spiral Dive Recoveries – 1,500 ft AGL min (8,500 ft MSL USAFA)
Slow Flight – 1,000 ft AGL min / ID stall speed at 1,500 AGL (8,000/8,500 ft MSL USAFA)
Spin Prevents – Enter and recover no lower than 2,000 ft AGL (9,000 ft MSL USAFA)

SAILPLANE VISUAL SIGNALS

1. Sailplane Rocks Wings in Position - Tow Plane to Speed Up
2. Sailplane Fishtails in Position - Tow Plane to Slow Down
3. Tow Plane Rocks Wings - Tow Plane Pilot wants Sailplane to Release
4. Sailplane Moves out to the Left Side - Sailplane cannot Release
5. Tow Plane Fishtails Aircraft - Tow Plane cannot Release
6. Sailplane Moves to the Side of the Tow Plane - For Tow Plane to Turn
7. Tow Plane Wags Rudder - Tow Warning to Sailplane (Problem or Spoilers Out)

NOTE: This airborne signal indicates a problem with the sailplane such as spoilers out. When you see it, immediately check spoilers or look for a problem with the glider.

VFR CLOUD CLEARANCES – Below 10,000 MSL

Visibility – 3 Statute Miles	Below – 500'
Above – 1000'	Horizontal – 2000'

Attachment 6

TG-16A OPERATING LIMITATIONS AND BOLDFACE (Change 2)

SPIN RECOVERY (Upright)
1) AILERONS – NEUTRAL
2) RUDDER – FULL OPPOSITE DIRECTION OF SPIN AND HOLD
3) STICK – STEADILY FORWARD UNTIL SPINNING STOPS
4) CONTROLS – NEUTRAL AND RECOVER FROM DIVE

ROPE BREAK
1) GLIDE – ESTABLISH
2) RELEASE – PULL TWICE

PROHIBITED MANEUVERS
- IMC Flight
- Night Flight

Wind Limitations (kts)	TG-16 & TG-15
Max Wind for Takeoff*	25
Max Crosswind Component	16
Max Gust Factor for Takeoff*	10

LAW 11-2SailplaneV3

PATTERN AIRSPEED TG-16A: 54 KIAS Min + ½ Max wind velocity (excluding tailwinds).

G LIMITS	TG-16A Pos / Neg
G Limits at V_A & V_{NE}	7.0 / -5.0 (≤ 1389 Acro)
G Limits at V_A	5.3 / -2.6 (>1389 Utility)
Symmetric G Limits at V_{NE}	4.0 / -1.5 (>1389 Utility)
G Limits Airbrakes Extended	3.5 / 0

AIRSPEED LIMITATIONS (KIAS)	
Maximum Glide or Dive – V_{NE}	146 (<10,000 MSL) 138 (≤13,000 MSL)
Maneuvering Airspeed – V_A / Rough Airspeed – V_{RA}	100
Max Aerotow – V_T	100

AIRSPEEDS (KIAS)	Dual @ 1389 lbs
Max L/D	61
Minimum Sink Speed	50
Stall Speed – Wings Level – V_{SO}	40