

# Chapter 1

## STUDENT PREPARATION

### INTRODUCTION

1. The purpose of this publication is to give you a starting point to begin your training on a taildragger aircraft for the purpose of towing gliders for the Air Cadet Gliding Program (ACGP). The types of aircraft used by the ACGP are the Cessna L-19 Birddog and the Bellanca Scout.

2. There are some misconceptions about taildragger flying that exist in the ACGP. It is a fact that the taildragger is harder to handle on the ground than a tricycle gear due to the fact that the pilot must cancel all sideways motion with respect to the ground at the moment of touchdown. However, all you need is good training and enough supervised practice to hone your newly acquired skills in a variety of wind conditions.

3. The main difference between taildraggers and tricycle-gear aircraft is nothing more than a matter of geometry. This geometry refers to the placement of the landing gear with respect to the centre of gravity. In the tricycle gear aircraft the C of G is ahead of the main wheels. If the airplane drifts after touchdown, the momentum of the forward C of G causes the aircraft to pivot about the main gear in the direction of the drift and the aircraft straightens out. However, in the taildragger, the C of G is aft of the main gear. Given the same drift situation, the momentum of the aft C of G makes the aircraft want to switch ends. This desire is not only dramatic; it is the genesis of the ground loop. The rotation will be further compounded by the weathervaning effect of the crosswind striking the tail. Thus, the combination of the weathervaning and drift forces combine in the undesired direction, and the gear geometry can be said to have provided a de-stabilizing effect. In the case of the tricycle gear, these two forces are in opposite directions thereby having a significant cancelling effect.



"Only the very best pilots can handle a taildragger."

"Any pilot can learn to fly a taildragger. All you need is good training and practice and the ACGP Course will give you that."



4. The theory on taildraggers is available in many different publications and you are encouraged to read up on it before you begin your course.

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## AIRCRAFT OPERATING INSTRUCTIONS

1. Aircraft Operating Instructions (AOI) is a manual containing all the essential information relative to one particular aircraft. Review the AOI frequently.
2. The Operating Checklist is extracted primarily from the AOI. The checklist

must be carried in a readable position on every trip. During the initial stages of your training, the Checklist will be opened to the appropriate page, but as your training progresses, your instructor may allow you to complete the various checks from memory.

## FLIGHT SAFETY

1. The overriding factor in all aspects of flying is safety. On the ramp you must keep a good look-out for aircraft, especially those just starting. Always walk behind aircraft to avoid the propeller.
2. Before take-off, make sure that all the necessary checks are completed. Careless pilots are not only a danger to themselves but also to the occupants of other aircraft. Remember that **ANY ITEM OMITTED ON A CHECK CAN EASILY BECOME THE MOST IMPORTANT OMISSION IN YOUR LIFE.** Do not take your responsibility lightly. For your own safety, as well as for that of others, get into the habit of thoroughly completing your checks.
3. An important flight safety requirement during your training is a clear and positive understanding of who has control of the aircraft. The procedure for handing over control to the student is:

Instructor: "You have control."

Student response: "I have control."

When the instructor wishes you to relinquish control, the order is given over the intercom:

Instructor: "I have control."

Student response: "You have control."

Additionally, the pilot taking control should shake the control column. Control must never be relinquished until the order and the response has been given.



Never be in  
doubt as to  
who is doing  
the flying!

## LOCAL FLYING REGULATIONS

1. Besides the general flying rules covered in this publication, specific regulations are in effect at each gliding centre/school. These regulations are published in National, Regional and Local Flying Orders, Pilot Information File, and School Directives; they cover such subjects as flying areas, traffic rules and patterns. These regulations are written to ensure safe, efficient flying operations and must be adhered to. Copies are available at the gliding centre/school and must be read on a regular basis and thoroughly understood.



Rules are only for young, inexperienced pilots, not for pilots of my stature.



Most rules have been written in other people's blood. They are for your safety and the safety of others.

## PERSONAL LIMITS



I've got over 3000 hours in fighters. I don't need all this training.



When it comes to taildragger flying, everyone is a rookie.

1. Always give thought to your own limitations. Bear in mind that, even though your flying time may add up to several thousand hours, you are still a rookie as far as the taildragger is concerned. While these years of experience may help you learn more quickly, the learning process must still be experienced. Thus, you must look at this training through the eyes of a student.
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## PERSONAL EQUIPMENT

1. You are required to wear proper flying clothing while flying the towplane. This includes flying suit with proper under clothing, flying boots and gloves. This clothing provides fire protection to the pilot in the event of a fire in the cockpit.

## Chapter 2

### GROUND HANDLING

#### PRE-EXTERNAL CHECK

1. The pre-external check begins as you are walking out to the aircraft. Inspect the taxi route and propwash area to ensure that they are clear of obstructions. Note any obvious abnormalities.
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#### EXTERNAL CHECK

1. Carry out the External Check as detailed in the AOI and your Checklist.
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#### STRAPPING IN

1. Adjust the seat to the required position before getting into the airplane (you should sit in the airplane prior to your first trip to find out where the seat should be).
  2. Climb into the aircraft and position yourself comfortably in the seat. Strap yourself in as demonstrated by your instructor.
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#### PRE-START CHECK

1. The Pre-start Check covers essential items in the cockpit as listed in the Aircraft Operating Checklist and the AOI.
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#### GROUND HAND SIGNALS

1. If you are flying on a military base there may be a requirement for a start crew. Therefore, you should be familiar with the basic hand signals most frequently used during ground handling. These are detailed in the Air Cadet Gliding Program Manual and the A.I.P. Hand signals used in towing operations will be covered in a later chapter.
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## START

1. Become familiar with the start procedure as it is detailed in the Checklist. Start the engine in accordance with the Checklist and be prepared to take the correct action in case of a starting malfunction such as an engine fire.
  2. The first major difference in procedure, which the new taildragger pilot will encounter when transitioning from the tricycle-gear, is the positioning of the controls on engine start. Hold the stick in the rearward position (with knees or elbows if necessary) while the hands are occupied with the starter and throttle. The reason for this is to prevent nose-over in the remote event that the engine should catch at a higher throttle setting than anticipated with the stick forward.
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## POST -START CHECK

1. Carry out the post-start check as detailed in your Checklist.
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## TAXIING

1. Taxiing a tail-dragger requires more attention than a tricycle-gear airplane. The rudders, brakes and throttle are all used together to successfully manoeuvre the aircraft on the ground. You must use only enough power to start the airplane moving, and then retard the throttle to achieve a speed no greater than a fast walk. To use more power may require excessive use of the brakes to slow the airplane with consequent overheating of the brakes. More importantly, taxiing at excessive speed will aggravate the airplane's tendency to rock from side to side as the wheels hit small bumps. On a windy day, this rocking motion may cause a wing tip to rise just enough to allow the wind to get under that wing.
2. Winds greatly effect the movement of a tail-dragger on the ground and it is extremely important that the control surfaces are placed in the proper position when taxiing. Even if winds are calm or light you should get into the habit of observing the windsock and putting the controls in the proper position for the winds.



Holding the stick back at all times is a must.



Ace is misinformed. The proper control positions in crosswind conditions are essential in preventing aircraft upset.

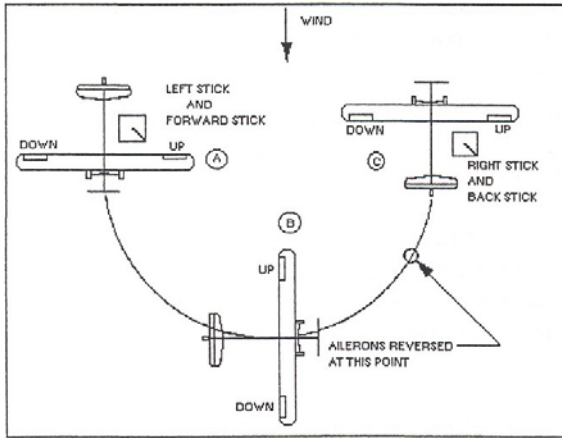


Figure 2-2 Use of Ailerons in taxiing turn to upwind

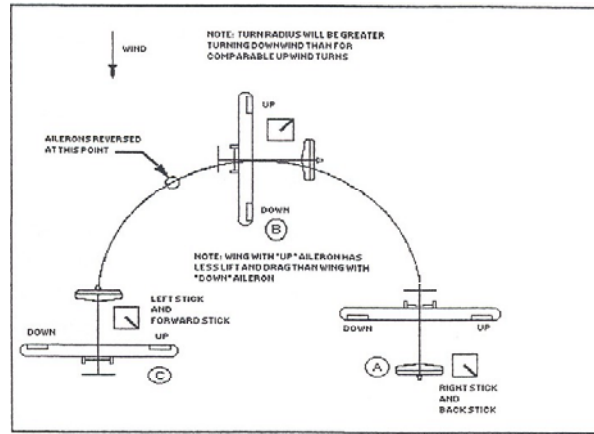


Figure 2-3 Use of ailerons in taxiing turn to downwind

3. A certain pattern of control use can make taxiing easier and safer and can make the difference between a rough day and a catastrophe when operating in high winds.

**Elevators** - The elevators should be up, control column back, when taxiing upwind and positioned down, control column forward, when taxiing downwind. The latter step is usually forgotten. It is important, however, since a sudden gust of wind while taxiing downwind with the elevators up could very easily pick the tail up and result in a very quick conversion to a roto-tiller.

**Ailerons** - When taxiing crosswind, the control column should be "into the wind". When taxiing upwind or downwind the ailerons are held in the neutral position until a turn is anticipated. At that time, the aileron into the wind will be used to lead the turn, and the aileron will then be reversed as soon as the airplane passes the crosswind position. See Figures 2-2 and 2-3.

## TAXIING TECHNIQUE

1. Request taxi clearance; note the runway-in-use and the wind. Take a good look around for any obstructions and ensure that your propeller and propwash will not harm personnel or equipment. Release the park brake and hold the brakes. Release the brakes and roll straight ahead. Apply the brakes to test their effectiveness and then continue to taxi to the run-up area.

### CAUTION

When making small radius turns, ensure that the area behind the aircraft has sufficient room for the tail to swing into position.

2. You should use large-radius turns as much as possible, reserving small radius turns for parking the aircraft or manoeuvring in congested areas. Small - radius turns may require an increase in power to keep the aircraft moving. Throttle movements should be positive, but smooth. You must avoid pivoting on the inside wheel when turning. This causes serious wear on the tires and can shorten the life of the tire significantly. All turns must be made in a slow and controlled manner.

3. Probably the first question you will ask when you sit in the airplane is, "how do you see out of this thing?" Taildraggers in general tend to have a reputation for poor visibility. Because of the poor visibility (which is also dependent upon your height), the need for S-turns while taxiing may arise. The need for S-turns is another reason why taildragger taxiing is usually performed at lower speeds.

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## THE TAIL WHEEL

1. The tail wheel is of the steerable type, which can be steered via the rudder pedals through a range of plus or minus 16 to 25 degrees of tail wheel deflection. If the tail wheel is deflected beyond that range, either by wind or by braking action, it will become full swivel and can then turn through a full 360 degrees. When it has gone beyond the limits of the steering range, it becomes non-steerable. It can be returned to the steerable mode by the simply taxiing forward

enough to bring the tail wheel back close to neutral.



One good thing about taildraggers is that I can swing that tail around easily and get into some really tight spaces when I park.



Ace is right, the taildragger is very manoeuvrable on the ground, but you have to be careful because you can't see that tail when it swings, so you have to be sure the area is clear.

2. The important factors to keep in mind with respect to the tail wheel are twofold. First, you should attempt to keep the turns wide enough so that the tail wheel remains in the steerable range. Secondly, you should remember to re-centre the tail wheel to return it to the steerable mode as soon as possible. For example, if you turn onto the runway with the tail wheel in full swivel and don't centre it before applying power, you are an accident waiting to happen. Until the tail wheel centres itself you have lost tail wheel steering and thus handicapped yourself right from the beginning.

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## BRAKES

1. The recommended use of brakes in taxiing can be summarized as follows:
  - a. use only an amount that is absolutely necessary;
  - b. don't use them abruptly; and

- c. don't turn with one brake completely locked.
2. In the early stages of training, you will find that you will use more brake than is necessary to manoeuvre. This should not cause alarm since there are two good reasons why it consistently happens:
- a. you have been spoiled and picked up the bad habit while flying tricycle gear aircraft; and
  - b. you haven't learned how much can be accomplished using rudder and tail wheel nor have you picked up the skill and confidence required to do it.
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## THROTTLE

- 1. The throttle is one control that is used very differently in a taildragger than in a tricycle-gear airplane.
  - 2. The throttle is normally advanced to start the airplane rolling. Usually a bit more power is needed than in a tricycle gear because of the increased friction of the smaller tail wheel. By the same token, the throttle will be retarded more as soon as the airplane starts moving, due to the slower taxiing speed of the taildragger. In addition to this normal throttle usage, you will find that with experience, the throttle is a very useful addition to rudder and brakes for turning.
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## SAFETY PRECAUTIONS WHILE TAXIING

- 1. There are many factors that affect the direction of movement of an aircraft while it is taxiing (i.e. - wind, ruts, a low tire). Be ready to counteract any adverse turning tendency while taxiing. Tail-wheel steering and/or brakes can control these variations in direction.
- 2. Avoid the propwash of other aircraft. Foreign Object Damage (FOD) can cause structural damage to the airframe, propeller or engine.
- 3. Do not turn the aircraft so that the tail wheel goes beyond the hard surfaced area.
- 4. Maintain a continuous listening watch with the appropriate ground or tower frequency.
- 5. If you are taxiing in a strong wind, hold the control column firmly in the

appropriate position. "CLIMB INTO THE WIND, DIVE AWAY FROM THE WIND."  
Taxi slower than normal in a strong wind, especially when changing directions.

6. While taxiing, scan the area on each side as well as in front of the aircraft by using small S-turns. If you have any doubt about the clearance of the wing tips, stop and get someone to guide you. Use common sense and adjust the taxiing speed to suit the prevailing conditions.
  7. When stopping the aircraft, go to power idle before applying brakes and stay at idle until completely stopped. Then advance power to recommended idle RPM.
  8. THE CAPTAIN IS ALWAYS RESPONSIBLE FOR THE SAFETY OF THE AIRCRAFT! There is no excuse for a taxiing accident.
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## RUN-UP

1. As you know the run-up is done prior to take-off to ensure that all required aircraft systems are operating properly at high RPM's. The run-up should be carried out in accordance with the AOI's and the approved Checklist for your aircraft.
  2. Before starting the run-up ensure that the area behind the aircraft is clear of anything that may get damaged or blown around by the propwash. Also ensure that when swinging into the wind that the tailwheel does not leave the prepared surface so as not to come into contact with taxiway lights or other objects hidden in the grass.
  3. The parking brake must be set prior to increasing the RPM. After increasing the power to the required RPM ensure that the aircraft is not creeping forward prior to diverting your attention into the cockpit.
  4. Most run-up procedures no longer include a static full power check, but unless this is carried out nothing in the normal check will ensure that full power is actually available. Normally this check is carried out during the take-off roll, but for a short field take-off do a full power check to ensure that full power is available.
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## POST-LANDING CHECK

1. When you have taxied well clear of the active runway, stop the aircraft, set the parking brake, and carry out the Post-Landing Check in accordance with your Checklist. Get the necessary radio clearances before crossing active runways

and proceeding back to the ramp. Stay alert and taxi with caution; avoid any tendency to relax your vigilance because you are on the ground. The flight is not complete until the aircraft is parked with the engine shut down.

**CAUTION**

When using park brakes while performing aircraft checks, ensure that the aircraft is not creeping forward prior to diverting your attention to inside the aircraft.

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**SHUT-DOWN CHECK**

1. Shut down the aircraft in accordance with the AOI and your Checklist.
2. Ensure that the aircraft is parked into wind, the wheels are chocked or the parking brake is set, and the controls are locked or tied back.

## Chapter 3

### AIR HANDLING - GENERAL

#### PRE- TAKE-OFF CHECK

1. Complete the Pre-Take-Off Check in accordance with the AOI and your Checklist.
  2. Just before obtaining take-off clearance, listen out and have a good look for other aircraft on final approach. If another aircraft is on approach, delay your request for take-off until the aircraft is past the threshold.
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#### TAKE-OFF

1. Taxi onto the runway centreline. Allow the aircraft to roll forward slightly to ensure that the tail-wheel is straight and come to a full stop. Advance the throttle smoothly to full power and start the take-off roll.
2. Maintain directional control with tail-wheel steering and/or differential braking until the rudder becomes effective. Initially, you may have to make large rudder movements to keep the aircraft straight, but as speed increases, the rudder corrections will become smaller. During the initial take-off roll, the airplane will typically swing to the left, if left to its own devices, and will require much more rudder deflection to keep it rolling straight than a tricycle gear would. This is for the following reasons:
  - a. The taildragger evidences more torque in this phase than the tricycle gear (see note); and
  - b. the tailwheel is farther away from the main gear than the nose wheel is in the tricycle gear, and is therefore less effective than a nose wheel as a steering device.

Note: *The tai/dragger has more torque than the tricycle gear because it is in a three-point attitude (tail wheel on the ground) and the propeller plane of rotation is not perpendicular to the plane of motion. Instead it is tipped slightly - usually about 10 degrees or so, hence the propeller is asymmetrically loaded. This results in torque that is usually absent in the tricycle gear because it performs this portion of its take-off roll with the tail raised in a near level flight attitude. Therefore, right rudder pressure is required to counter act the gyroscopic effect of the propeller. The rudder pressure required will increase once the tail is lifted off the ground, as the*

*tail wheel is no longer effective in maintaining directional control.*

3. Hold the control column full aft initially. Progressively ease the control column forward as the aircraft starts rolling until the tail-wheel is just off the runway. It is to the advantage of the beginner to raise the tail slowly, thereby creating a level of torque that can be easily controlled. The faster you raise the tail, the more torque has an adverse effect on the aircraft and more rudder is required to maintain directional control. Maintain the level attitude with whatever pressure is necessary. At the take-off point, ease back slightly and allow the aircraft to fly into the air.

4. If too much backpressure is applied, the aircraft can be forced into the air just above the stalling speed. If insufficient backpressure is applied, the aircraft will start to skip down the runway as airspeed increases.

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## TAKE OFF REVIEW

1. The following summarizes the control movements during the normal take-off:

- a. advance the throttle to full open while applying the necessary amount of right rudder to keep the airplane straight;
- b. move the control column slightly forward to raise the tail while momentarily adding more right rudder to compensate for the gyroscopic precession of the propeller; and
- c. ease the control column back and add a small amount of right rudder while the airplane flies itself off the ground.

2. In a taildragger, because of the necessity to raise the tail during the take-off run, the pilot instantly knows the speed reached by the sensitivity of the elevators transmitted through the control system. Hence, you do not normally check the airspeed indicator prior to lifting off the ground because you already know the speed - you can feel it! You can devote your full attention outside the cockpit where it is better spent in maintaining a straight course.

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## CROSSWIND TAKE-OFF

1. A crosswind affects the aircraft during take-off. As you taxi to the take-off position, check the windsock so that you can recognize and anticipate a crosswind.
2. The initial take-off roll is the same as for a normal take-off, except that the control column is held into the wind at the start of the take-off roll. The upward aileron deflection compensates for the adverse effect of the crosswind. The control column should be held in this position until the ailerons become effective.
3. As the airspeed increases, progressively reduce the into-wind control column pressure, but maintain some into-wind pressure throughout the take-off roll. The upward aileron deflection is necessary to prevent the into-wind wing (which develops more lift) from rising before the out-of-wind wing.
4. If the into-wind wing rises the aircraft may start to skip. A series of small bounces may develop, caused by the aircraft attempting to fly on one wing and then settle back onto the runway. During these bounces, the crosswind causes the aircraft to skip sideways, thereby imposing severe stress in the landing gear. If the into-wind wing does rise you must use positive control movements to get it down before the aircraft starts to move off the centreline.
5. Maintain directional control with tail-wheel steering and/or differential braking and then rudder. Lift the tail-wheel slightly higher than normal so that the airplane can accelerate to a higher speed before lift-off. The lift-off should be definite to keep the aircraft from skipping.
6. As the wheels leave the runway, the aircraft will start to drift with the wind. Keep the wings level and remove the rudder input. Begin a smooth coordinated turn into wind to keep the aircraft tracking the runway centreline.
7. This corrective action will be more effective when taken in anticipation rather than after the fact.

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## SHORT FIELD TAKE-OFF

1. To maximize aircraft performance in these situations you will need to configure the aircraft to allow a safe lift-off at a slow speed. You will also have to accelerate as quickly as possible to this lift-off speed. The AOI will help you determine how to proceed.

2. Maximum acceleration is accomplished by ensuring before the take-off begins that maximum power is being produced. With brakes applied on a firm surface, the maximum power you can obtain should compare with figures provided in the AOI. If the engine is developing full power, release the brakes.
  3. For the shortest ground roll, keep the tail down and allow the aircraft to lift off at minimum speed. Once airborne, allow the aircraft to accelerate to the desired speed and climb away. To clear an obstacle climb at the best angle-of-climb speed.
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## INITIAL CLIMB

1. The aircraft will accelerate rapidly after becoming airborne. When the aircraft has climbed through 200 feet AGL, retract the flaps. Re-trim as required for the appropriate climb speed and complete the Post- Take-Off Check.
  2. After establishing the climb heading, set the initial climb attitude utilizing outside references. In the proper attitude the airspeed will increase to the normal climb speed. As the airspeed approaches the climb speed, adjust the attitude accordingly. Re-trim to eliminate all control pressures. Hold the attitude constant using outside references and monitor the performance with occasional reference to the instruments.
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## CLIMB TO ALTITUDE

1. Throughout the climb to altitude, the same crosscheck techniques are used as in the initial climb. Because the nose high attitude in the climb leaves a blind spot in front of you, you must do climbing turns to maintain a good look-out. During the turns, the loss of vertical lift becomes greater as the angle-of-bank is increased; therefore, gentle climbing turns are used.
  2. Roll in and roll out of climbing turns smoothly and at a constant rate. Pause after each climbing turn to cross-check attitude and airspeed and then, clear the area for the next turn. Most of your time should be spent looking out for other aircraft.
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## LEVEL-OFF

1. To level off at a desired altitude, use the altimeter as a guide to start the level-off. At approximately 50 feet below the desired altitude, commence the

level-off. Lower the nose gradually to the level-flight attitude and re-trim. Reference to the horizon, with an occasional cross-check of the flight instruments, will assist you in maintaining the proper altitude.

2. When the airspeed is approximately 5 mph below the desired cruising speed, reduce power to cruising RPM and re-trim.
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## STRAIGHT-AND-LEVEL FLIGHT

1. To fly the aircraft straight-and level, choose an attitude using outside references and then, confirm your references with a cross-check of the flight instruments. This method of controlling attitude will result in precise aircraft control.
  2. During look-out and cross-check, you should frequently check engine instruments and fuel. *The thoughtful pilot has a mechanic's appreciation of an engine and a miser's concern for fuel.* Do not compromise aircraft control and look-out when carrying out aircraft checks by focussing your attention in the cockpit for too long a period of time.
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## TURNING

1. The three classes of turn for the tow aircraft are gentle, medium and steep:
  - a. Gentle - The gentle turn is one up to and including 20 degrees of bank. This turn is primarily used when towing gliders.
  - b. Medium - The medium turn is one over 20 degrees up to and including 45 degrees of bank.
  - c. Steep - The steep turn is any turn over 45 degrees of bank. It is used for rapid changes of direction; clearing turns for stalls and spins, etc.

Note: Climbing turns are normally gentle turns, while descending turns can be gentle, medium or steep.

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## DESCENDING

1. Gliding - An aircraft descending at a constant airspeed and attitude without

power, or with the throttle in idle position, is said to be gliding. For maximum range, the best gliding speed depends on factors such as aircraft configuration weight, and on the wind.

2. When doing a gliding descent the pilot must be aware of the dangers of shock cooling of the engine. Because of shock cooling (rapid cooling of engine parts due to low power settings and high airspeeds) and the associated damages that can occur (cracked cylinders) it is highly recommended that you keep power on throughout your descent. This keeps the engine warm and counteracts the effects of the ram air cooling. Your instructor will discuss safe descent techniques with you throughout your course.

3. Levelling Off From a Glide - When the aircraft is being leveled off from a glide, the power must be increased during the level-off if you wish to maintain airspeed. If you wish to level off at a higher speed, increase the power before leveling off, so that the aircraft's momentum will help to increase the airspeed. Remember to trim.

4. Power-on Descent - A power-on descent is used when precise control of the rate of descent and distance attained is desired. It also prevents shock cooling of the engine by keeping the engine warm with increased RPM. This method of descent is more appropriate for the ACGP operations as the engines develop high temperatures during the towing phase and the engine must be cooled slowly to avoid damage.

5. To enter a power-on descent from cruise flight:

- a. reduce engine power to an RPM setting judged (or predetermined) to give a desired airspeed and rate of descent;
- b. allow the airspeed to decrease to that desired airspeed;
- c. lower the nose to an attitude that will give the desired rate of descent; and
- d. trim to maintain this attitude.

6. Any variation of airspeed and rate of descent may be combined to obtain the effect desired. Proper trim is the key to a smooth and accurate transition from one attitude or airspeed to another.

7. With air tow operations the transition is one from climbing to descending. Therefore in step two above the nose is lowered vice raised to achieve the

desired descent airspeed. This lowering of the nose is achieved with the descending left turn, which will be discussed further in the section on glider towing.

## Chapter 4

### TRAFFIC PATTERNS AND LANDINGS

#### INTRODUCTION

1. This chapter describes aircraft handling with VFR pattern procedures, which generally includes the following phases of flight:
    - a. traffic pattern (controlled and uncontrolled environments);
    - b. final approach;
    - c. landing; and
    - d. low approach and overshoot.
  2. Published traffic patterns and procedures (local flying orders or Canada Flight Supplement) ensure the orderly flow of aircraft around an aerodrome or runway.
  3. For clarity, this publication defines the following phases of flight:
    - a. **Traffic Pattern.** The flight profile (normally a rectangular pattern) as defined in the A.I.P. Canada, RAC 4.3 - 4.5 inclusive. Local flying orders may dictate a modification to the traffic pattern to accommodate glider operations.
    - b. **Landing Phase.** That segment of flight immediately following the final approach phase where:
      - ( 1 ) the decision has been made to land; and
      - (2) the airspeed is purposely reduced below final approach speed in preparation for landing.
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#### JOINING THE TRAFFIC PATTERN

1. Before entering tower controlled air space, ensure that you have received the latest ATIS information (if available) and have requested and received landing instructions. From the information given, you can then plan your entry to the traffic pattern.

2. The primary method of joining the circuit is via one of the established legs of the traffic pattern (see Figure 4-1). Entry to the traffic pattern shall be made in such a manner as to avoid "cutting off" other aircraft, conforming as closely as possible to the altitude (normally 1000 ft AAE), speed and size of the pattern being made by other traffic.
3. When joining the traffic pattern, ensure that the descent to pattern altitude is completed far enough from the traffic pattern to permit the aircraft to be stabilized in straight-and-level flight prior to entry.
4. The Pre-Landing Check should be completed prior to joining the traffic pattern or, in the case of continuous circuits, early in the downwind leg.

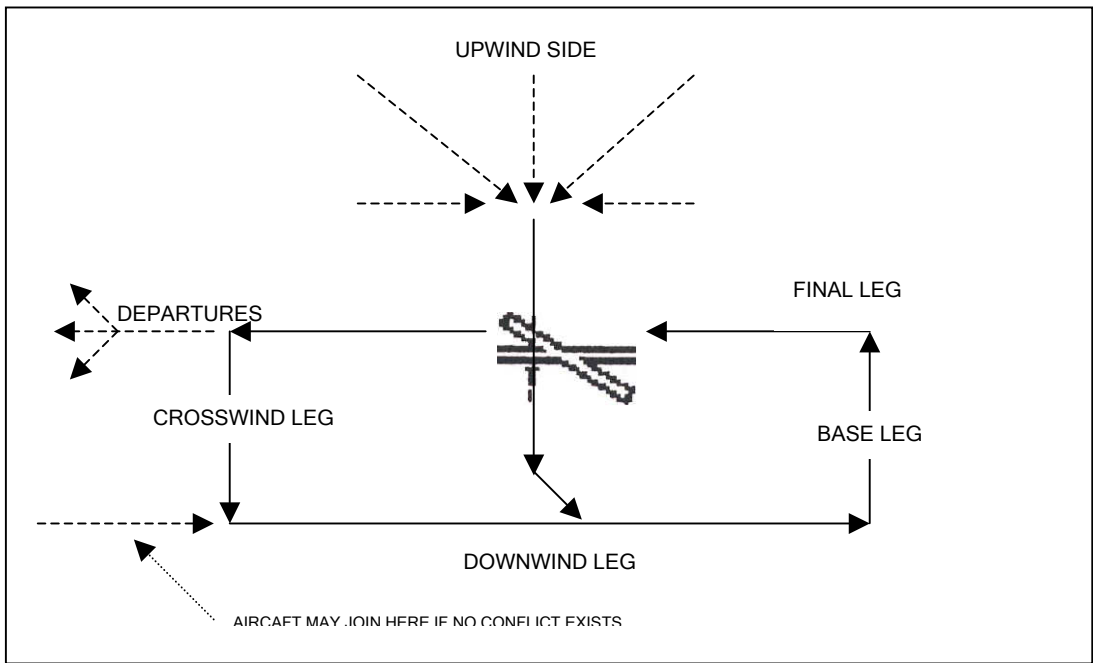


Figure 4-1 Circuit joining procedure

## UNCONTROLLED AERODROMES

1. The ACGP operates primarily out of uncontrolled airfields across the country. It is imperative that all ACGP pilots are totally familiar with TC procedures at these airports. RAC 4.5 covers the procedures governing aircraft operations at uncontrolled aerodromes.
2. The following is an excerpt from RAC 4.5. It must be noted that CAR's supersedes any regulations published in this manual and it is the responsibility of all pilots to ensure that they comply with all published TC regulations and procedures:

*Pilots are expected to approach and land on the active runway. The active runway is a runway that other aircraft are using or are intending to use for the purpose*

of landing or taking off. Should it be necessary for aircraft to approach to, land, or take off on a runway other than the active runway, it is expected that the appropriate communication between pilots and/or the ground station will take place to ensure there is no conflict of traffic. Circuits are normally flown at 1,000 feet AAE. If a right-hand circuit is required in accordance with CAR 602.96, the opposite of Figure 4-1 is applicable.

### Joining of the Circuit

Landing and takeoff should be accomplished on or parallel to the runway most nearly aligned into the wind. However, the pilot has the final authority and responsibility for the safe operation of the aircraft and another runway may be used if it is determined to be necessary in the interest of safety. Unless otherwise specified or required by the applicable distance from cloud criteria, aircraft should join the downwind leg, or enter the crosswind at an altitude of 1,000 feet AAE. When joining from the upwind side, plan the descent to cross the runway in level flight at 1,000 feet AAE or the published circuit altitude. Maintain that altitude until further descent is required for landing.

If it is necessary for an aircraft to cross the airport prior to joining the circuit, it is recommended that the crossover be accomplished at least 500 feet above the circuit altitude. All descents to circuit altitude should be made on the upwind side or well clear of the circuit pattern.

Aerodromes not within an MF area: Where no MF procedures are in effect, aircraft should approach the traffic pattern from the upwind side, or, once having ascertained without any doubt that there will be no conflict with other traffic entering the circuit or traffic established within the circuit, the aircraft may join the circuit on the downwind leg (Figure 4-1).

Aerodromes within an MF area: Where MF procedures are in effect and airport and traffic advisory information is available, aircraft may join the circuit pattern straight in or at 45 degrees to the downwind leg, or straight in to the base or final approach legs (Figure 4-1).

Continuous Circuits Aircraft performing a series of circuits and landings should, after each takeoff, reach circuit altitude before joining the downwind leg.

### Departing the Circuit or Airport

Aircraft departing the circuit or airport should climb straight ahead on the

*runway heading until reaching the circuit traffic altitude before commencing a turn in any direction to an en route heading. Turns back toward the circuit or airport should not be initiated until at least 500 feet above the circuit altitude.*

## THE LANDING PHASE

1. The landing phase begins when the airspeed is purposely reduced below final approach speed. The speed reduction may be accomplished using a combination of flaps, pitch and/or power adjustments.
  2. Flap Selection. It is a matter of judgement as to when to lower full flap in preparation for landing. You will develop this judgement through experience.
- 

## LANDING

1. There are two basic landing types used in taildraggers, each of which has distinct advantages and disadvantages. The two types of landings are the three point landing and the wheel landing.
2. The *three pointer* is generally used in the following circumstances:
  - a. Training - during early training, the pilot must learn the three pointer because it is easier to learn than the wheel landing;
  - b. Short Field - The shortest possible landing in most taildraggers can best be accomplished with the three pointer. It allows a slightly lower approach speed to be used.
  - c. Soft Field - Again, the landing at the lowest possible speed is made with the three pointer.

Note: The three pointer is the landing type most often used by the ACGP because it is easier to master and the majority of our landings are on soft and/or short fields.

3. The wheel landing is the preferable choice when the winds are high and/or gusty, especially if the wind is across the runway as well. It gives the pilot much more control at the instant of touchdown. The price of wheel landings is a slightly longer landing run due to the slightly higher approach speed required.
-

## THREE POINT LANDING

1. The following is the sequence for a typical tail dragger three-point landing:
  - a. the approach is no different whether the airplane is tricycle geared or taildragger;
  - b. the airplane is gradually flared out close to the ground - within a foot or so;
  - c. as the aircraft slows, a gradual easing back of the control column is required to maintain the three-point attitude;
  - d. at touchdown, control direction with rudders and brakes (if necessary) throughout the landing roll;
  - e. the control column must be held full back and not released as is typical of tricycle gear landings; and
  - f. brakes should not be applied unless needed, and then only sparingly.
  
2. If a bounce should occur at touchdown hold the control column all the way back and ride it through the bounce. The common error is that the pilot relaxes the backpressure during the bounce. The tail rises, tail wheel steering is lost, and the airplane heads for the weeds.
  
3. In both the Scout and L-19 relaxation of the backpressure causes the tail to bob up and down. If left unchecked it will worsen and some serious porpoising will ensue. To recover, simply pull the control column all the way back.

## BOUNCE RECOVERY

1. It is very important that you learn the proper recovery procedure for the bounced landing attempt. If you take no remedial action and attempt to ride through the bounce, the result will be a very hard landing that is likely to damage the airplane.
  
2. Depending on the height of the bounce, the air speed and the pilot's skill, a couple of choices exist:
  - a. application of full throttle for an immediate overshoot;

- b. let the airplane descend and flare again when close to the ground. This will be accomplished safely only if sufficient air speed exists, probably because the original approach and flare were attempted at excessive speed; or
- c. if insufficient air speed exists for choice b. above, the pilot may apply sufficient power to prevent stall, allow the airplane to descend and flare again for landing.

NOTE: In choices a or c, the throttle must be advanced "smartly", which means quickly but not abruptly. There is no time for hesitation on the part of the pilot. Yet abrupt throttle use must be avoided because:

- a. This is no way to treat an engine; and
- b. the L-19 (and probably many other types) has been known to snap-roll when treated in this manner. (*Health and Welfare Canada says that snap-rolls in the flare may be dangerous to your health.*)

## TAIL FIRST LANDING



Never touch down tail first. Only hacks do that.



A tail first landing is not ideal; however, it is no big deal if it happens.

1. New taildragger pilots are often concerned about the danger of making a stall landing during which the tail wheel strikes the ground before the mains. The answer is simple: there is nothing wrong with this manoeuvre because it is not likely to create a bounce.
2. It is not a recommended procedure because it can generate a "crow-hop" down the runway (bouncing on the tail wheel). Relaxing backpressure on the control column can aggravate this hop. The way to ride through such a crow-hop

without incident is to maintain the control column full back.

3. A second and probably the most obvious is that tail first landings are abusive to the equipment. The tail wheel is not designed for this type of shock and damage could occur to the tail section with repeated tail wheel landings.

---

## WHEEL LANDING



Wheel landings are the only way to go. Of course you must be a superior pilot to even attempt wheel landings.



Ace needs a bit of educating. He doesn't understand that each type of landing has its purpose and that even wheel landings can be mastered by any pilot, given the proper training.

1. The wheel landing is without a doubt the most difficult manoeuvre to learn. This type of landing is not normally used by the ACGP but it does have an important place in your arsenal of skills. There are many days when wind conditions will render the wheel landing necessary because the stall landing may result in a bent airplane. These wind conditions are high and gusty winds as well as gusty crosswinds.

2. The advantages of the wheel landing are as follows:

- a. maximum controllability of the airplane through the touchdown point;
- b. reduced susceptibility to being blown about by wind gusts;
- c. improved visibility during the landing run;
- d. ability to set the airplane on the ground at any speed desired (within reason) above the stall speed;
- e. ease of transition from one taildragger type to another; and
- f. safety in the face of unknowns such as:

- i) night landings in poor visibility; and
- ii) airplane iced up such that exact stall speed is unknown.

Hence the wheel landing is not a luxury; it is a basic necessity and should be approached as such.

3. The procedure for the wheel landing is as follows:
  - a. Perform a normal approach at normal approach speeds. Increased approach speed is only necessary on days when there are strong or gusty winds.
  - b. In the early part of the flare, let the main wheels contact the ground with minimum downward velocity. It may be advisable to carry some power until the touchdown point.
  - c. Immediately apply forward control column to keep the airplane on the ground. Ease off the power.
  - d. Continue increased application of forward control column to keep the tail up until it descends of its own accord with full control column forward.
  - e. Once the tail has lowered to the ground, apply full control column back to keep the tail wheel on the ground.

4. The tail wheel's height above the ground after touchdown is not extremely important. In light taildraggers it is only important that the tail be raised a positive amount in a firm motion. The object of lifting the tail is to reduce the angle of attack and lift in order to keep the airplane on the ground. In a perfectly executed wheel landing, the amount the tail is actually raised may not even be noticeable to the passengers.

---

## SHORT FIELD LANDINGS

1. The short field landing in a taildragger is similar to one in a tricycle-gear airplane. The approach is generally the same. On a short field approach power is required to more accurately control descent. Leave power on until the landing flare is completed. Check the AOI for recommended approach speed.

2. The landing is usually three point since this ensures the lowest possible speed at the time of contact. As soon as the airplane is rolling on the ground, the control column is held fully back and the brakes can be applied. If the airplane shows signs of nosing over, releasing the brakes and/or a blast of power will often rectify the situation and force the tail down. The flaps are raised as soon as possible after touchdown to increase the weight on the main wheels.

---

## SOFT FIELD LANDINGS

1. The soft field landing is performed like the short field version except that the application of brakes is omitted. Some power is carried because it allows the airplane to be flown at its lowest possible speed.

2. Flaps are not retracted until the aircraft has stopped. Should the tail come up inadvertently due to the soft ground, judicious application of power with full back control column should force the tail back down.

---

## OVERSHOOT



A top-notch pilot, such as myself, never needs to overshoot. You can always salvage a landing.



Poor Ace, he doesn't realize that a timely decision to overshoot can prevent an accident. Even the very best pilots must overshoot on occasion, especially taildragger pilots.

1. An overshoot is carried out when you have decided to discontinue an approach or landing as a result of: a poor approach, conflicting traffic, instructions by A TC or a poor landing.

2. Use the following procedure when overshooting:

- a. advance the throttle to full power (carb heat closed);
- b. when flying speed is attained, raise the nose of the aircraft to establish a climb; and

- c. when above 200 feet AGL and climbing, retract the flaps and carry out the Post-take-off Check.

3. If you overshoot on final, parallel the runway, watch for conflicting traffic, advise the tower of your intentions and rejoin the circuit as you would after takeoff.

---

## GROUND LOOPING

1. The following information is paraphrased from the Air Cadet Gliding program Manual. It is required that all tow pilots in the ACGP read the entire section on ground looping in the aforementioned manual (Chapter 2, Article 282, p.2-88).
2. Taildragger pilots must have an extensive working knowledge of the ground loop phenomenon as it applies to taildraggers. The purpose of this requirement is not to produce aerodynamicists or physicists but rather to produce competent pilots, because in the final analysis, the pilot causes the overwhelming majority of ground loops.
3. A swing is defined as an undesirable but controllable turn during ground operation of an aircraft; whereas, a ground loop is defined as a violent uncontrollable turn resulting from failure to correct (or overcorrecting) a swing. It follows, therefore, that a ground loop can be prevented as long as the pilot maintains directional control by countering a swing in both a timely and correct manner.
4. The causes of a swing are several and most have been discussed previously in this manual in the take-off and landing sections. The ACGP Manual details these further.
5. **Preventing the Ground Loop.** The easiest and simplest way to prevent a ground loop is to never allow a swing to develop. Therefore, after touch down, the aircraft must be kept straight by immediate and correct reaction to every directional change, regardless if the swing is assumed or perceived to be minor.
6. Ground loops do not always happen on the runway. Many ground loops have occurred during taxi because the pilot started an intentional turn at too high a speed. This is one major reason to keep taxi speeds slow and controllable. You must *fly* the aircraft from the time the engine is started until the aircraft has come to a complete stop with the engine off.

7. The taildragger pilot must use all available controls to keep the aircraft straight (rudder, aileron and full back control column) after land and during deceleration and taxi. The following are some important aircraft handling points:

- a. approach any turns on the ground with caution;
- b. be prepared to apply brakes; and
- c. be prepared to apply power.

8. Ground Loop Prevention. The following is the order of control inputs used to prevent a swing from developing into a ground loop. More details are available in the ACGP Manual.

- a. if a swing starts, respond immediately with rudder and aileron;
- b. if the swing continues, use brakes immediately;
- c. if the swing still continues, use power immediately; and
- d. reduce the power as soon as the swing is eliminated.

Note: Application of controls, brakes and power must occur very rapidly and will probably occur simultaneously as the severity of the swing increases.

9. The majority of ground loops are caused by the pilot. With skill and knowledge, a pilot should be capable of successfully countering directional control problems. Remember the following:

- a. a swing is an undesirable but controllable turn during the ground operation of an aircraft; and
- b. a ground loop is a violent uncontrollable turn resulting from overcorrecting or failing to correct a swing.

Note: Amplified ground loop procedures and information is available in the Air Cadet Gliding Program Manual (A-CR-CCP-242), Chapter 2, Article 282, pp. 2-88 to 2-94 inclusive. This section is mandatory reading for all ACGP tow pilots.

## CHAPTER 5

### STALLS AND SLOW FLYING

#### INTRODUCTION

1. You are well aware of the theory of stalls and of basic recovery from stalls and slow flight. The purpose of this chapter is to review stalls and slow flight to ensure standardization of procedures.
  2. There are four important things you must know about stalls. You must be able to:
    - a. recognize the symptoms of a stall;
    - b. recognize the stall itself;
    - c. take the recovery action; and
    - d. take action to prevent stalls.
- 

#### STALL RECOVERY

1. The aim in stall recoveries is to recover with a minimum loss of altitude or performance. The following is the standard recovery procedure for stall recovery:
  - a. release sufficient back pressure to unstall the wings;
  - b. simultaneously apply FULL power;
  - c. level the wings with aileron, if necessary;
  - d. raise the nose sufficiently to prevent a further loss of altitude and establish a climb as soon as possible; and
  - e. once a positive rate of climb is established, retract the flaps in stages.

## CAUTION

If there is a wing drop, do not attempt to raise the dropped wing with aileron until you have first unstalled the wings.

2. Normally, you will initiate recovery action as soon as any of the stall symptoms become evident. During DUAL practice, however, you may allow the stall to fully develop so that you can learn and understand the whole recovery procedure as well as get the feel of the aircraft.
3. As you become more proficient you will recover from stalls in various attitudes, airspeeds and power settings.

---

## THE PRE-STALL, SPIN CHECK

1. Before you practice stalls, spins or slow flight, do the pre-stall, spin check (ASCOT check). This check is outlined in your checklist but it is detailed in the following table.



ASCOT  
check? I  
use my own  
checks, why  
should I  
learn a new  
one?



The ACGP is a  
military flying  
operation and as  
such, we try to  
ensure  
standardization  
in as many areas  
as possible.

WHAT	HOW	WHY
Altitude/Area	Ensure that there is sufficient altitude for the exercise.	Minimum recovery altitude for stalls is 1,500 feet AGL. For spins 2,000 feet AGL.
Straps	Ensure your straps are tight and locked.	Safety precaution.
*Cockpit	Ensure doors and windows closed, fuel sufficient, temps and pressures in the green, carb heat and mix set.	Safety precaution.
Objects	Check the cockpit and your personal equipment.	To ensure everything is properly stowed and nothing can jam the controls.
*Traffic	Clearing turns.	Last-minute check to ensure that the area is clear of cloud and other aircraft.

Note: Once the ASCOT check has been completed the first time only the starred (\*) items are required for subsequent manoeuvres.

---

## CLEAN STALL

1. **Entry** - During your look-out reduce the power to idle and reduce the airspeed. To enter the stall, raise the nose slightly above the horizon and keep the wings level with aileron. Maintain altitude by increasing the back pressure on the control column to increase the pitch attitude and re-trim as required. The stall horn operates at approximately 10% above the stalling speed.
  2. **Recovery** - When the aircraft stalls, use the standard recovery procedure outlined above. Do not allow the nose to drop too far or the aircraft will lose excessive altitude. The ideal recovery is accomplished by releasing only enough backpressure to unstall the wings and fly the aircraft out just above the stall horn airspeed.
-

## THE LANDING ATTITUDE STALL

1. **Entry** - Enter this stall in the full landing configuration, i.e. power idle, full flap. Allow the airspeed to decrease into the white arc before lowering flap. The stall characteristics are similar to a clean stall, except that the stalling speed is lower. The entry procedure is the same as for the clean stall.
  2. **Recovery** - When the aircraft stalls, use the standard recovery procedure.
- 

## SLOW FLYING

1. Slow flying acquaints you with the handling characteristics of the aircraft at low airspeeds and illustrates the importance of smooth control coordination. This manoeuvre enables you to experience aircraft operation behind the power curve and the inherent characteristics of flight there. While operating in this region, you will find that large power changes have relatively small effect on the aircraft performance. It also simulates the control pressures and the flight conditions usually encountered during the early stages of an overshoot or touch-and-go.
2. To enter slow flight, reduce the power to 1500 RPM and lower the flaps when the airspeed is in the white arc. Gradually raise the nose to maintain altitude as the airspeed decreases. Smoothly apply sufficient power to maintain level flight as the airspeed approaches the stall warning speed or as your airspeed approaches a speed predetermined by your instructor. Your prime reference to maintain level flight during this manoeuvre is the horizon. As the airspeed decreases, the nose must be raised higher, until the proper angle-of-attack is reached, to generate the required amount of lift to maintain level flight. You must rely on feel throughout this exercise. Trim the aircraft as necessary throughout these changing flight conditions.
3. **Look-out.** Because of the relatively high nose attitude, forward visibility is decreased; therefore, you must maintain a good look-out before and during slow flying. Practicing turns will enhance your look-out and improve your low airspeed aircraft handling. At low airspeed, a shallow angle-of-bank will result in a relatively high rate of turn. Use only gentle turns, as the aircraft will stall at comparatively low bank angles. A slight increase in power may be necessary during the turn to maintain airspeed.
4. On completion of this exercise, recover by adding full power and accelerating while maintaining altitude. Raise the flaps in stages and reduce power when cruise airspeed is reached.

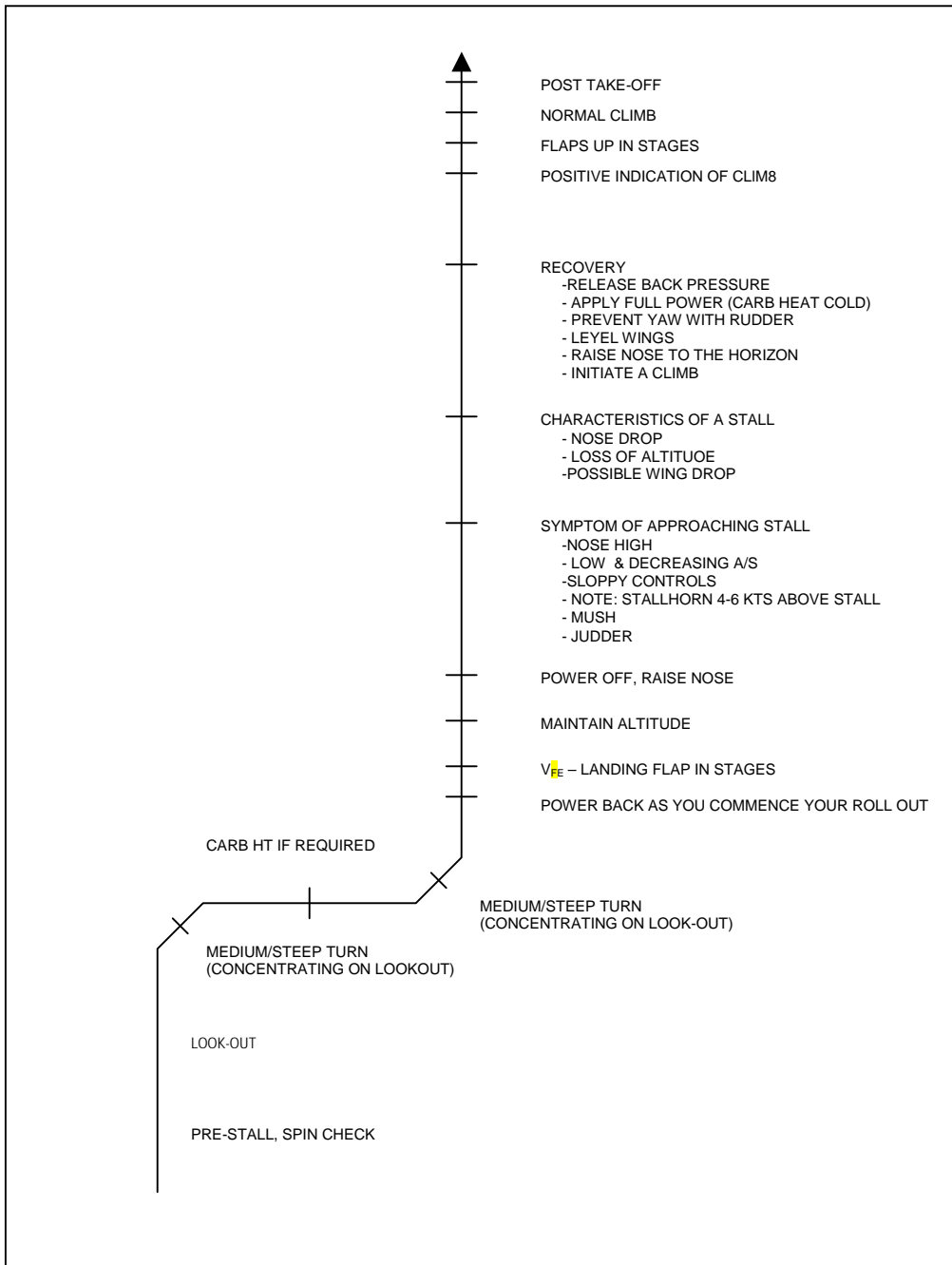
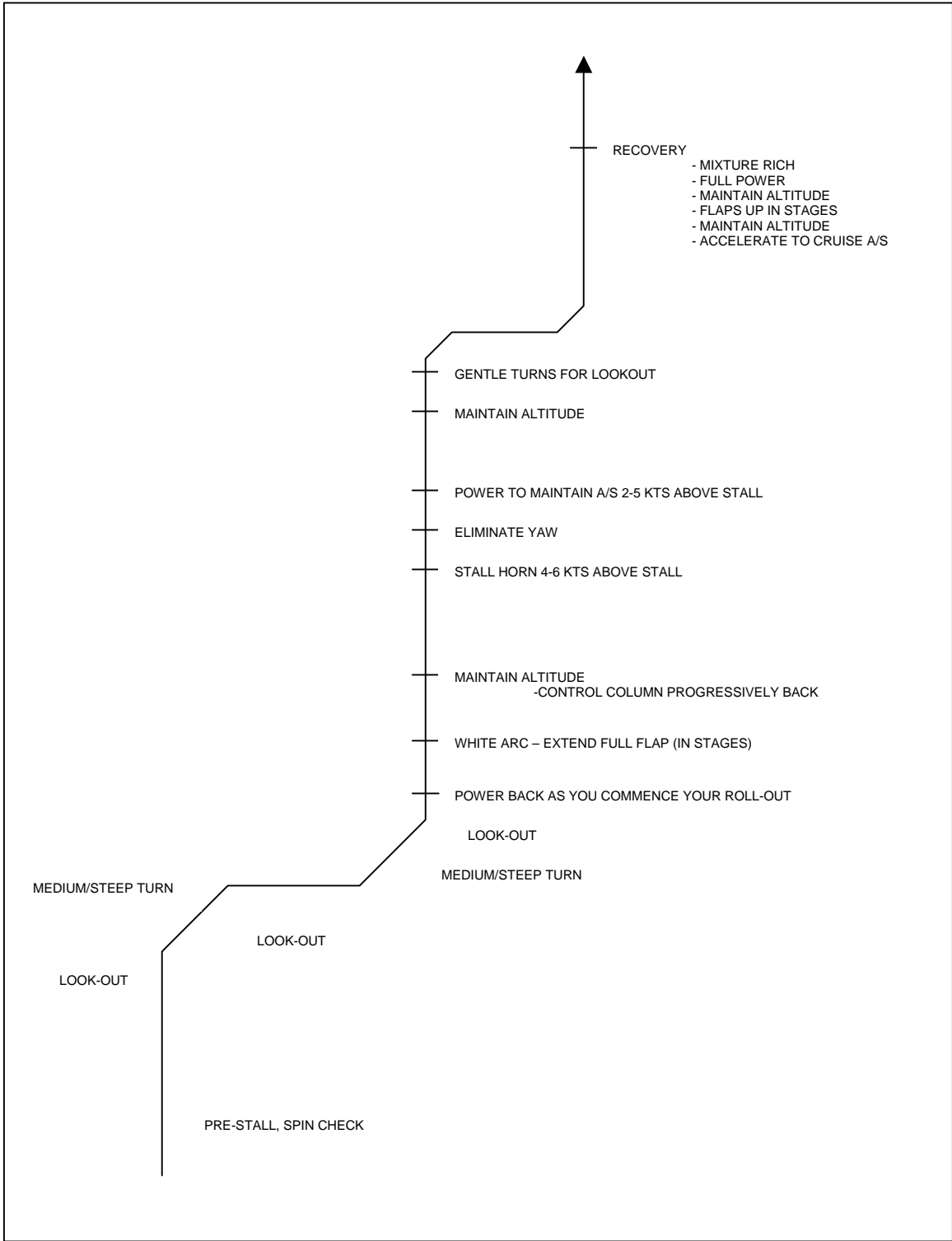


Figure 5-1 Landing Attitude Stall



## Chapter 6

### **SPINNING & SPIRAL DIVES**

#### INTRODUCTION

1. Spins are prohibited in the Scout and therefore are not to be practiced by those regions using the Scout. However, you must be totally familiar with the recovery procedures should the aircraft inadvertently enter into a spin. Spins are practiced in the three regions using the Birddog.
  2. Incipient Stage - This is the transitional period between a stall and autorotation of a fully developed spin; it may be the result of failure to recover from a stall.
  3. Usually, the warning symptoms are obvious enough for you to recognize the incipient stage in time to recover before the aircraft goes into a fully developed spin. Immediate centralization of the controls (primarily the release of back pressure to un-stall the wings) usually results in recovery from an incipient spin to a stabilized condition of flight.
- 

#### SPIN RECOVERY

1. There is a standard spin recovery, based on rudder correcting the yaw and elevator un-stalling the wings. An intentional or unintentional spin can be entered from any attitude and with any power setting. Power aggravates a spin and causes the aircraft to lose more altitude on recovery; therefore, it is necessary to reduce the power to idle.
2. To recover from any spin:
  - a. centralize the controls; and
  - b. analyze the condition of flight.

Once it is ascertained that the aircraft is indeed in a spin take the appropriate corrective action:

- c. throttle to idle;
- d. if time permits, retract the flaps;

- e. apply full opposite rudder to the direction of rotation and simultaneously apply nose down elevator to break the stall;
- f. neutralize the ailerons; and
- g. when rotation stops, neutralize rudder and elevator and bring nose up smoothly.

3. Recovery action should be positive. Do not apply aileron at any time in the spin: if the ailerons are deflected when the aircraft goes into the spin, return them to the centralized position. Centralize the rudder as soon as the spinning stops to prevent the aircraft from entering a spin in the opposite direction.

---

### PRE-STALL, SPIN CHECK

1. Before putting the aircraft into an intentional spin, complete the ASCOT Check as outlined in the checklist. Climb to a minimum altitude of 3,000 feet AGL and ensure that you adequately clear the area.

---

<p>WARNING</p> <p>INTENTIONAL SPINS IN ACGP TOW AIRCRAFT ARE PROHIBITED!</p>
--

### SPIN ENTRY

1. On completion of the ASCOT Check, enter the spin without delay. Raise the nose to approximately 30 degrees of pitch. When you hear the stall horn, apply full rudder in the direction of the intended spin and simultaneously move the control column fully aft.
2. Check the instruments to ensure that the aircraft has stabilized in a fully developed spin. During the spin, hold the control column fully back without applying aileron and, at the same time; maintain full rudder in the direction of the spin until commencement of the recovery procedure.
3. To recover from an intentional spin, follow the spin recovery procedure.

Develop the habit of using all the steps given for recovery, because there is a tendency for a pilot to automatically apply rudder opposite to the known direction of spin entry. By following the entire procedure, you will quickly recognize the type of spin and will be able to take the appropriate recovery action should you ever enter an unintentional spin.

4. To simulate the situation where you may have become disoriented, or did not recognize the symptoms of a spin, and allowed a fully developed spin to occur, your instructor may enter a stabilized spin and then give you control. Your immediate action will be to centralize controls, analyze the cockpit and visual indications, and then take appropriate recovery action. If the spin is confirmed and the aircraft is still spinning, carry out the remainder of the spin recovery procedure.

---

## SAFETY FACTORS

1. During the spin, sit erect and observe the ground through the windscreen. **DO NOT MOVE YOUR HEAD UNNECESSARILY:** this may induce vertigo and/or sickness.

2. Your instructor will tell you when to recover from a spin by using the single word "RECOVER". Should the intercom fail during a spin, your instructor will give you the standard levelling-off hand signal to indicate when you should recover. The signal is a horizontal sideways movement of the hand, palm down. There is no need to reply, since your instructor will see you begin the recovery.

3. Recovery must be completed by 2, 000 feet AGL in accordance with Canadian Aviation Regulations.

4. While the aircraft is spinning, you have little control over it until you begin recovery action. You must observe the following rules when you practice spins:

- a. do the ASCOT Check before starting the exercise;
- b. ensure flaps are retracted;
- c. clear the area well and enter the spin without delay;
- d. use the standard spin recovery;
- e. if the spin is not entered correctly, you may get high and increasing airspeed. If either of these conditions exist, recover immediately; and

- f. if the aircraft does not respond to the normal recovery technique, re-check the turn pointer to ensure that correct rudder is applied.
- 

## SPIRAL DIVE

1. The outside attitude references in a spiral dive are similar to those of a spin. The most noticeable difference is the airspeed, which is high and increasing in a spiral dive. The other characteristics of a spiral dive include bank, a high rate of rotation axis and a pronounced nose-low attitude, which tends to increase as the spiral develops.

2. During spiral-dive recoveries you will have to overcome your natural tendency to pull back on the control column. Increased backpressure will only tighten the spiral rather than bring the nose to the horizon. The aircraft recovers immediately from a spiral dive when the wings are levelled and the nose is brought to the horizon.

3. If you suspect that you are in a spiral dive, take the following recovery actions:

- a. centralize the controls and analyze your condition of flight;
- b. reduce the power to idle;
- c. roll the wings level - if necessary, reduce the back pressure to prevent an increase in G beyond the rolling-G limits;
- d. ease out of the dive;
- e. confirm your attitude of flight; and
- f. carry out a cockpit check.

4. A spiral dive is a condition of flight that may cause you to become disoriented and, consequently, it should normally be avoided.



Why bother with all this upper air work. We do all our flying in the circuit, take-offs and landings are all that matter.



Upper air work improves overall aircraft handling, not to mention the safety aspects of recognizing stall symptoms.

## CHAPTER 7

### FORCED LANDINGS

#### INTRODUCTION

1. A successful forced landing depends on skills acquired through practice, good judgement and adequate pre-landing considerations. Although there is only a remote possibility of you experiencing an engine failure/malfunction in flight, there have been, nonetheless, several forced landings performed in ACGP aircraft.

---

#### TAKE-OFF PHASE

1. A pre-take-off briefing, which details your actions in the event of an engine failure during the take-off phase, is strongly recommended so that you can react instinctively and positively with minimum delay during this critical phase of flight. Observing possible landing areas throughout the take-off and climb-out is always recommended.

2. In the event of an engine failure/malfunction during take-off only a slight turn is advisable to reach an obstruction-free landing path. Do not worry about checks, but rather, concentrate on lookout while trying to make a safe landing. Any attempt to turn back (dumbbell) to the take-off runway is not recommended due to reduced manoeuvrability resulting from higher fuel weight, lower airspeed and proximity to the ground.

---

#### THE FORCED LANDING PATTERN

1. In the event of an engine failure at altitude a pilot must have a plan on how to get the aircraft safely on the ground. The forced landing pattern and procedure that is outlined here is a tried and true method used extensively by the Canadian Forces.

2. The pattern is a descending, 360-degree turn beginning into the wind. This pattern keeps the aircraft within gliding distance of the landing area at all times and if the pilot should misjudge the descent rate, the field could still be made by cutting corners.

3. The pattern is broken down into key positions that are used to give the pilot an indication of the descent rate and if the field is going to be made. The position and the corresponding altitudes are as follows:

- a. High key - at least 1, 000 feet AGL;
  - b. Low key - 600 feet AGL; and
  - c. Final key - 400 feet AGL.
4. The forced landing pattern and procedure is outlined in Figure 7-1.

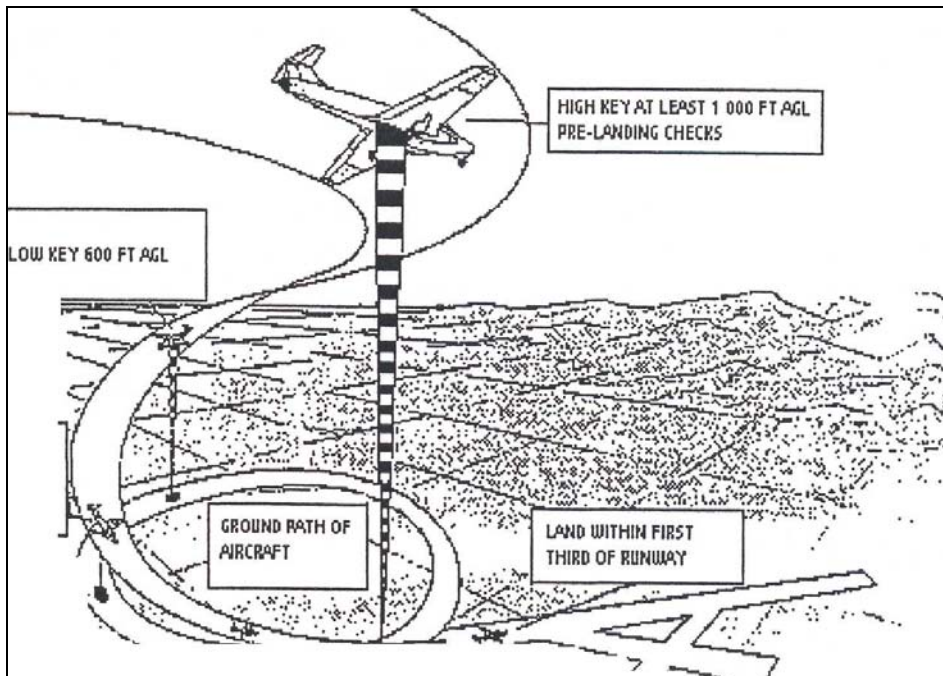


FIGURE7-1 The Forced Landing Pattern

## ENGINE FAILURE/MALFUNCTION

1. Usually an engine failure/malfunction is caused by fuel starvation, mechanical malfunction, cracked cylinders, carburetor ice or throttle/aircraft mishandling. Indications of engine failure are: loss of thrust and a drop in RPM. In the case of a cracked cylinder a combination of RPM drop and vibrations will be present. Before initiating any action in response to a possible engine malfunction, the pilot must take time to analyse the symptoms in order to avoid an improper response during a possible critical phase of flight.
  2. The malfunctions described above are covered in the AOI/CheckList. Your immediate response to a suspected engine failure/malfunction is to maintain positive aircraft control while analyzing the situation. Once the problem has been identified, the correct response can then be carried out as detailed in the AOI/CheckList.
- 

## PROCEDURE FROM ENGINE FAILURE TO HIGH KEY

1. The following are the initial actions following an engine failure:
  - a. establish best glide speed;
  - b. turn into wind; and
  - c. select most suitable field.
2. As you are heading for the field, carry out the following steps:
  - a. determine if you have sufficient altitude to reach high key maintaining best glide speed;
  - b. declare a MAYDAY and advise ATC of your position, altitude, nature of the emergency and your intentions;
  - c. time permitting, carry out cause check and re-start procedures;
  - d. monitor glide while proceeding to high key. Strong headwinds could adversely affect your glide, making it necessary to proceed directly to low key or final key; and

- e. initiate the Forced Landing Check prior to reaching high key, if time permits.

### **CAUTION**

Never reduce your airspeed below the recommended gliding speed in order to stretch your glide. Below this speed, the aircraft is in the area of reverse command (behind the power curve) and the increased drag causes a higher rate of descent.

---

## SELECTING A SUITABLE FIELD

1. If you cannot reach an airfield, the best area for a forced landing is a level, long smooth field with no high objects on the approach path nor, preferably, anywhere near it. However, since there is no guarantee that you will be near a suitable field when you have an engine failure, you must be able to pick out the best available field.
2. Cut hay and crop fields with no bales are by far the best. They are smooth and free of large rocks. Cultivated fields are good but they will be soft and rough. Pastures are not recommended because they are usually rife with large holes and rocks. Avoid fields that are crossed by power lines, ditches, or have trees and other natural hazards. If you have a choice, select a field near habitation or at least near a road. A road may also be an option but be aware that gravel roads can be quite narrow with steep ditches and roads are often paralleled and crossed by power lines.
3. When choosing a suitable forced-landing field, take length into account. If there is a strong headwind, the distance needed for the landing is comparatively short; however, in a calm wind, the landing distance is extended and the field must be proportionally longer.
4. If possible, land into wind. Nature has many ways of disclosing the direction and strength of the wind, smoke being the most reliable. If smoke rises slowly and drifts away, the wind is light; if it rises and then drops down close to the earth, the wind is strong and gusty. Grass and grain ripples in the direction of

the wind and dust drifts with the wind. If you are unable to decide which way the wind is blowing, use the direction at the time of take-off. If you are unable to land into wind because of a lack of altitude or a lack of suitable field into wind, do a crosswind landing or, as a last resort, a downwind landing. Aim to touch down as soon as the aircraft crosses the approach end of the selected field.

---

## DITCHING

1. Decide as early as possible that ditching is inevitable so that you have time to prepare the aircraft and the crew. Reports on slow, fixed-gear aircraft that have been ditched indicate that the main gear tends to dig in during the initial impact and prevents the aircraft from skipping. The aircraft simply decelerates rapidly and the nose burrows only slightly. This may differ somewhat for a taildragger as the main gear is farther forward.
  2. Wedge open or jettison the cabin door to reduce the possibility of jamming. Fasten seat belts, secure loose objects and ensure that all equipment needed for flotation and the prevention of hypothermia is available at hand.
  3. Attempt to determine the wind speed and direction by observing the surface conditions. Land into the wind if the water is smooth or smooth with a very long swell. In some situations such as large waves or swell, or swells with short spacing, it may be advisable to land parallel to the swell and across the wind. The danger of nosing into large waves or swell is greater than the danger of landing crosswind. When ditching on a river, unless a strong wind dictates otherwise the landing should be made downstream to reduce impact speed.
  4. Contact the water with a nose high attitude. DO NOT STALL prior to touchdown. Be prepared for a double impact. The second and greater impact will occur when the nose hits the water. The aircraft may also swing violently to one side if one wing touches the water before the other.
  5. Release seat belts when certain the aircraft has stopped and evacuate the cabin as quickly as possible. If the door cannot be opened immediately, do not panic. It may be necessary for a considerable amount of water to enter the cabin before the pressure equalizes and the door can be opened. Unless it is badly damaged, the aircraft will not sink immediately.
  6. Review the procedures for ditching outlined in the AOI's for your particular aircraft.
-

## FLYING THE PATTERN

1. The aircraft will lose approximately 800 feet in a 360-degree rate-one turn at the minimum glide speed. The ideal high key altitude is 1000 feet AGL. The extra 200 feet provides an increased measure of safety and permits the pilot to use flaps and roll the wings level on short final. The pattern is shown in Figure 7-1.
2. On reaching high key, start a turn using approximately 30 degrees of bank in the direction of the selected low key position. Your next checkpoint is low key, which is at 180 degrees of turn, at 600 feet AGL.
3. At 270 degrees of turn, final key, the aircraft should be at 400 feet AGL. In normal wind conditions, half flap is lowered at final key and full flap is selected once the landing is assured. Select an initial touchdown point, which is one-third of the distance along the runway. Once this touchdown point is assured, the actual touchdown point can be brought closer to the threshold by selecting full flap. Maintain the minimum glide speed until lined up with the runway and cross the threshold at the short field landing speed.
4. The Effect of Wind on the Pattern. The forced landing pattern is designed to be circular under zero wind conditions. A strong wind has considerable effect on the aircraft's ground track, and the pattern will be shifted downwind, as shown in Figure 7-2, unless there is some compensation for wind.

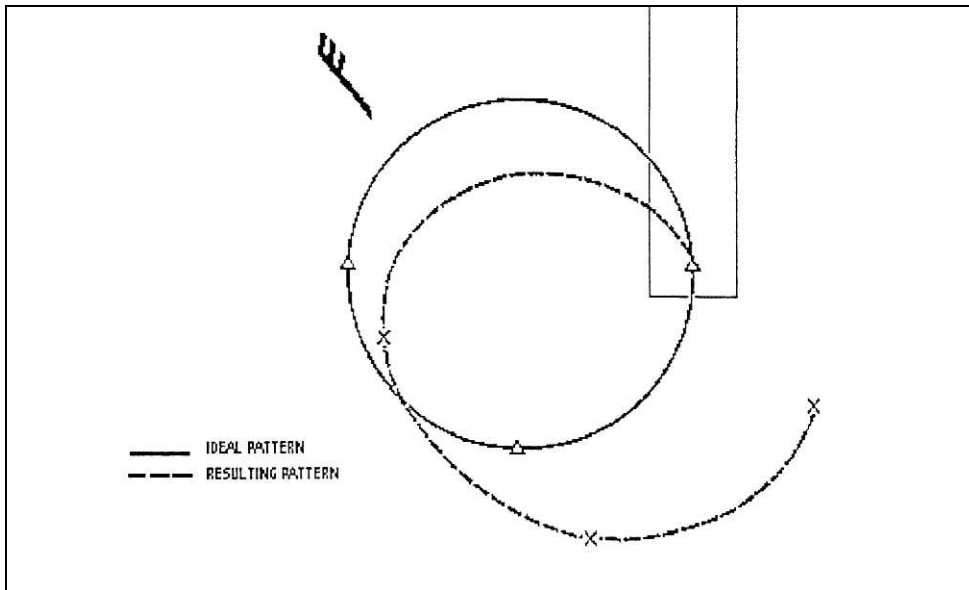


Figure 7-2 Effects of a Strong Wind

5. If there is a strong wind straight down the runway, delay the turn at high key so that the aircraft arrives upwind of the ideal position (Figure 7-3). If you do not delay the turn, you will arrive at low key altitude past the end of the runway and will not have enough energy to make it back to the landing field.

6. A strong crosswind has an even more adverse effect. For example, if you use 30 degrees of bank a strong crosswind from the direction in which you orbit will cause low key to be too close to the runway. If this is not corrected, the shorter path remaining to the end of the runway will cause the aircraft to overshoot the centreline of the runway, or be unacceptably high on final. Thus, you must vary the turn by using less bank so that the aircraft ends up at the correct low key position (Figure 7-4). Also, you must use more bank on the final turn so that the aircraft does not overshoot the extended centreline. Should the crosswind be from the other side, thus causing the aircraft to drift away from the runway, use more bank in the first half of the turn and less in the second half. Avoid the requirement to use excessive bank on final, at low airspeed, in an attempt to line up on the runway centreline.

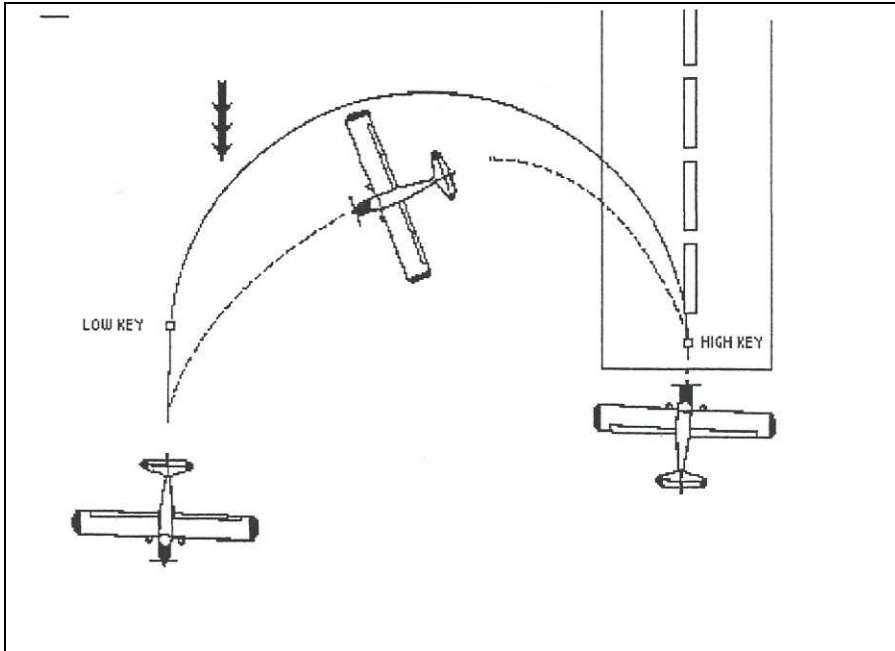


Figure 7-3 Effects of Strong headwind

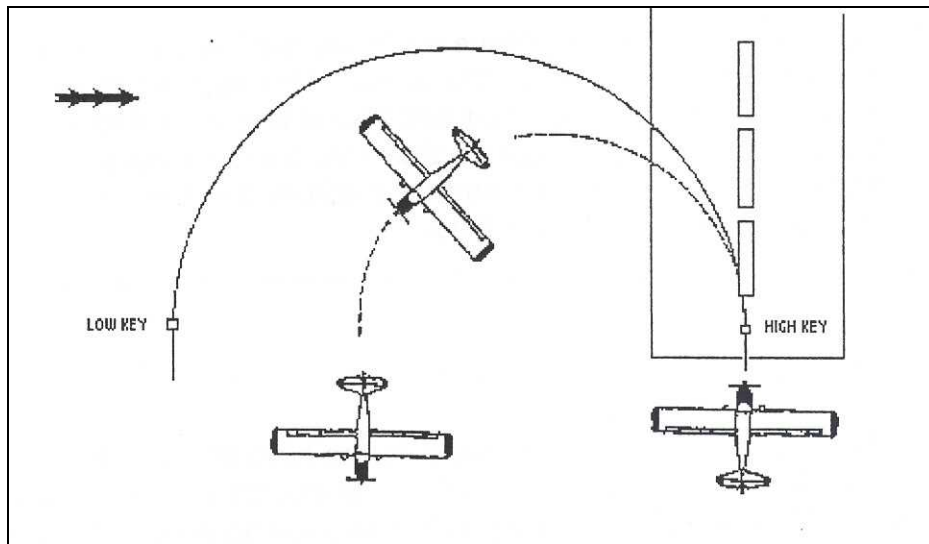


Figure 7-4 Effects of Strong Crosswind

7. While the above paragraph outlines the procedures for crosswinds from both directions, you should plan your low key position into the crosswind. Thus, when you get to high key, you commence your turn into the crosswind. The aircraft is then drifted toward the field and in the event that you miscalculate your bank angles you still are within gliding distance of the field.
8. Variations to the Pattern. You cannot always fly the ideal pattern. There may not be sufficient altitude to allow the aircraft to glide to high key by 1000 feet AGL. Remember that the pattern is designed to allow you to be reasonably sure of making a successful forced landing, provided that the aircraft reaches one of the key positions, at the correct altitude and on the correct heading. If you cannot reach high key, fly directly to low key. If you are doubtful about reaching low key, go directly to final key. Avoid making large heading changes, if possible, when aligning yourself with the appropriate key position. Instead, go to the reachable key position that is most directly aligned with your current heading.
9. There are two methods used to compensate for a crosswind, each depending on the wind's strength:
  - a. **Light Crosswinds.** Vary the bank during the pattern so as to fly over the same key positions as for light winds. You will then, in effect, fly a greater time through the air during half of the pattern which will cause you to lose more altitude into wind; conversely, during the other half of the pattern, you will spend less time and lose less altitude while flying with a tailwind component.

- b. **Stronger Crosswinds.** Move each key position into wind so that your touchdown point remains the same. This technique would be used with very strong winds, but because it is very difficult to judge precisely, it is recommended that you combine both methods and move the keys into wind and then adjust the pattern by varying bank as required to land in the field.
- 

## HIGH KEY ADJUSTMENT

1. When the aircraft is higher than ideal at the high key position, continue along the path until you have lost one half of the excess altitude, then begin the turn to low key. This technique is very effective as long as you have reached high key between 1000 and 2000 feet AGL, but is not recommended if you are outside these parameters. **DO NOT INCREASE THE RADIUS OF THE ORBIT TO LOSE EXTRA ALTITUDE.** This requires fine judgement and invalidates the remainder of your checkpoints.

2. Many diverse scenarios may be forced upon you due to unforeseen circumstances. Your instructor will discuss these with you and have you practice variations to the ideal pattern. Remember your best gliding speed. Never attempt to gain more distance by raising the nose and reducing airspeed: this is termed 'stretching' the glide. Should you be low on final because of an error in judgement, maintain the best glide speed until short final in order to cross the threshold at the short field landing speed. This procedure will give you maximum gliding distance.



I have no need to learn this method. I have a procedure that works just fine.



Ace needs to be reminded that the purpose of teaching one way of doing a manoeuvre is for standardization.

## Chapter 8

### GLIDER TOWING OPERATIONS

#### GENERAL

1. The primary role of the taildraggers used by the ACGP is for towing gliders. Also, because the ACGP is a gliding program the role of the tow pilot is a support role. Thus it is the responsibility of the tow pilot to safely and effectively tow the glider to the appropriate position, at the appropriate altitude for release so that the glider's mission may be carried out. Failure on the tow pilot's part to do this can hamper the completion of a glider mission and even put the glider in danger of landing out.
  2. This chapter will discuss towing procedures in general terms. Tow patterns and procedures may differ at various locations due to local restrictions such as ATC requirements, geographic and topographic features or the glider mission being performed. Ensure that you are totally familiar with local SOP's before towing at any gliding site.
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#### GROUND SIGNALS

1. There are only three signals given on the ground exclusive to towing operations: take up slack, all out and stop. The tow aircraft signaller relays the signals from the signaller at the glider. The tow aircraft signaller should be positioned ahead of the tow aircraft on a line of 45 degrees and at least 50 feet to one side of the take-off path.
  2. **Take up slack.** The signal consists of movement of the arm in front of the body in a sweeping motion of 180-degree arc below the waist. This signals the tow pilot to slowly take up the slack in the towrope.
  3. **All Out.** The signal consists of movement of the arm in a continuous 360-degree circular motion in front of the body. This signals the tow pilot to advance power for take-off.
  4. **Stop.** This signal consists of open palms with the arms held high. Upon receiving this signal the tow pilot shall immediately retard the throttle to idle, apply the brakes and stop.
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## AIRBORNE SIGNALS

1. Most communication in the air is done with the radio. However situations will arise that a visual signal is the quickest and most effective way of relaying information to the glider pilot.
  2. **Wing Waggle.** Produced by vigorously rocking the wings of the tow plane from side to side. This signals the glider pilot to REALEASE IMMEDIATELY.
  3. **Rudder Wiggle.** Produce by vigorously wiggling the rudder from side to side. This signals the glider pilot to ensure that his spoilers are closed. Usually used by the tow pilot if climb performance is unusually poor.
  4. **Glider Moves Left and Rocks Wings.** This signals you that the glider is unable to release. Tow the glider to a suitable release area and release the rope.
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## TAKE OFF AND CLIMB

1. After obtaining take-off clearance and been given the all-out signal by the tow plane signaller, apply power very smoothly keeping the aircraft straight and rolling down the runway.

Note: The flaps should be set according to local SOPs.

2. Allow the airspeed to increase until there is positive rudder control before lifting the tail off the ground. At rotation speed, lift-off and accelerate in a gentle climb to glider towing speed of 65-70 mph.
  3. Having set up a steady climb, plan turns, considering the rate of climb and wind direction and velocity so as to reach the release area at the assigned altitude. Use approximately 15 degrees of bank in turns when towing gliders.
  4. Plan the tow circuit to ensure that, in the event of towrope or engine failure, the glider and tow plane are within gliding distance of a safe landing area.
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## AIR TOW PATTERN

1. The air tow pattern is designed so that the tow pilot can effectively and safely tow the glider to the proper release area at the proper altitude. Ensure that you are totally familiar with the local tow pattern before going flying.
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## AIR TOW RELEASE PROCEDURE

1. The responsibility for releasing rests with the glider pilot. You, as a tow pilot are in a support role and if the glider pilot deems that he is unable to release you must attempt to get to a position that he is more comfortable with. Nevertheless, regional SOPs may have the tow pilot initiate the release by verbally and/or visually advising the glider pilot. In either case, you must not commence a post-release descending left turn until visually confirming that the glider has released.
2. Once you have confirmed that the glider has released, commence a descending, medium turn to the left to provide separation. Violent manoeuvres such as wingovers, peel offs, etc are unnecessary and PROHIBITED. These constitute aerobatic manoeuvres and are hard on ACGP equipment.
3. The procedure from this point on will be detailed in local SOPs. Note however, that on the final approach a steeper than normal power-on approach shall be carried out to allow for adequate clearance between the trailing tow rope and approach path obstacles.

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## EMERGENCY PROCEDURES WHILE TOWING GLIDERS

1. All towing emergencies are detailed in the ACGP Manual Chapter 2, Section 10. Ensure that you are completely familiar with these procedures and review them regularly.



I must say, son, that after reading this manual I have learned a few things that will make me a better taildragger pilot.



That's good to hear, Ace. If you can learn something new, anyone can!