INTERNATIONAL AUSTER CLUB

TAILWHEEL CONVERSION NOTES

FOR AUSTER AEROPLANES

These notes are a digest of knowledge acquired over many years of operating Austers. They are provided in good faith, for the benefit and guidance of members of the International Auster Club. Nothing stated within this document is intended to amend or supersede the manufacturers operating documentation in any way.

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INTRODUCTION

The Auster is a classic aeroplane, with character, designed before the Second World War. It was used extensively both by the Army during that War and as one of the most common club and training aeroplanes in the late 1940s and 1950s. The Army mainly used them as a platform for finding enemy targets and controlling guns to bear on them. They were known as Air Observation Posts (AOP Marks 1 to 9).

Nowadays, it has a deserved reputation for being one of the more difficult light tailwheel aircraft to land, particularly because it has a very bouncy and undamped undercarriage. However, it cannot be that difficult, because thousands of non-professional pilots learned to fly in one during the early post-war period. One of the most important things you will need to learn, as a new Auster pilot, is when to allow a landing bounce to settle down and when it is the time to pour on the power and fly another circuit.

The International Auster Pilot Club (as it was then known) was started by Jim Sime at a meeting in November 1973. The Club is now recognised as a valuable asset to all Auster owners, with contacts on technical advice, original working drawings, spares, training, fly-ins, the magazine and general camaraderie.

The first Club Training Notes were written in the early 1980s by the Club's Honorary CFI, Mike Stapp. Sadly, Mike is no longer with us to update these notes. His last flight was in Auster G-ARLG, when his ashes were scattered on the South Downs. I had the great good fortune to learn to fly with Mike in an Aeronca Champion in 1980. The following year, together with three others from the Champ group, we bought the Auster D4/108, G-ARLG. Some forty years later that Group still exists and I'm privileged to help the present owners with check-outs and renewals. For most of that time I was a member of the Group, until my own Auster, G-AJXC, flew following major restoration in 2014. As an Instructor and Examiner with over 2,000 Auster hours and 40 years' experience, the Club has asked me to update Mike's notes, so here goes.

The notes are really aimed at those who already hold a pilot's licence and who learned in a nosewheel aeroplane. Therefore, they will need Tailwheel Difference training, as well as conversion to the Auster.

Tailwheel Difference training is now a legal requirement, to be signed off by an instructor. However, you are not required to undergo any further training to fly tailwheel aeroplanes of different types, or manufacture.

It would be very unusual nowadays for anyone to learn to fly in an Auster but, if they do decide to enjoy that experience, then these notes should be particularly useful.

Perhaps because of their reputation as being more difficult to land, Austers do not attract the same resale prices from which some other tailwheel types benefit. However, that makes them particularly good value for individual, or group ownership. Whatever attracts you to the Auster, it is strongly recommended that you fly with an experienced Auster instructor, as the aeroplane may hold a few surprises for you.

Many tailwheel instructors have never flown an Auster, so don't use one who just thinks he may be able to cope. In the back of the Club magazine, there is a list of experienced Auster instructors and, hopefully, you can find one, who lives near your aeroplane.

PREPARATIONS

The first job is to read any Flight Manual that is available to you, as you should with any new aircraft type. However, many Austers do not have modern flight manuals and you should, therefore, read any paperwork that came with the aeroplane. Also anything appropriate that you can find on the internet and through the International Auster Club website and through talking to other Auster pilots. As a member of the IAC, you may log in to the Member Area, where you will find a list of useful downloads.

Make sure you are familiar with the pre-flight “walk-round” for your aeroplane. It may be very different from what you’ve been used to. The instruments are likely to be black-and-white, it may have external venturis. The engine may be a De Havilland Gipsy, or Blackburn Cirrus, which look very different from the flat-four Lycoming or Continental engines, which you may be more used to. The aeroplane will be fabric-covered. The tank(s) may not be in the wings. Many have a tank behind the instrument panel and some have an additional belly tank. Do the tyres look evenly-inflated ? A soft tyre will create unwanted drag to one side, exacerbating the other difficulties of controlling a tailwheel aeroplane.

Sit in the cockpit and become thoroughly acquainted with the layout of the instruments and the position of all controls. It is very likely that the instrument layout is, at best, haphazard. A few Austers have the standard six blind-flying panel instruments, but many pilots have to work with an Altimeter, an Airspeed Indicator and an old-fashioned Turn and Slip indicator, with some engine gauges. In particular, ensure you understand how the flap mechanism works – note that it will feel very different when in the air and subject to air loads.

Before attempting to move the aeroplane, even to taxi, ensure that you have full rudder control deflection. Austers do not have adjustable seats, so the pilot must adjust. If you cannot reach the rudder and brakes ***comfortably***, you will need cushions, or possibly need to remove existing upholstery, if you are tall.

Make sure that you are fully briefed on the electrical and radio systems of your aeroplane. Some have generators, some alternators, some have air-driven generators, some require ground/flight switches and it is difficult to go anywhere, if you don’t know which is the master switch.

Do you understand the fuel system ? Most Austers have a scuttle tank behind the instrument panel, or either one or two wing tanks. The single scuttle tank normally holds 15 UK gallons. The wing tanks are usually of 16 gallon capacity each.

The scuttle tanks have a gauge on top of the instrument panel, which is fairly accurate, provided it moves with the motion of the aeroplane. This might allow only two hours of flight, with a small reserve, but you must know your aeroplane's fuel consumption.

The wing tanks have a gauge in the wing root. They are a bit difficult to read, until you are used to them, especially the one in the port wing, nearest the pilot. These gauges are mechanical and, provided you see them move, they are generally accurate. They are operated by a mechanical float mechanism, with a magnetic link to the needle. It is important that they ***move,*** as the aeroplane manoeuvres, a stuck gauge is only going to mislead you ! Note also that the readings differ from tail-down to tail-up. The white numbers are tail-up (i.e. in flight) and the red ones on the ground. The red numbers are particularly difficult to read. The white numbers over-read on the ground, but the difference is small, until there is less than a half a tank of fuel.

A few (lucky) owners of aircraft with scuttle tanks also have a belly tank, fitted underneath the cockpit. These are not fitted with an internal fuel gauge. They should not be used when taking-off or landing. Careful fuel management is required. You need to know the amount of fuel in the tank and your particular aeroplane's fuel consumption. However, this will double the useable range. Note that to get full use out of a belly tank, it needs to be filled slowly towards the end, otherwise you can't achieve full capacity.

FLAPS

Until you get the hang of the use of the Auster flap lever in the air, it can be ***very*** frustrating. I'm talking here about the majority of Austers which have the flap lever to the left of the pilot's ear, mounted above the door. The flaps are released and locked by a ratchet mechanism operated by pulling on the end of the lever, or squeezing a trigger. Neither of these is easy to operate ! The former military Mark 6 aeroplanes have a flap lever between the seats with a spring-loaded push button to release the ratchet (like a Piper Cherokee). A few Austers have a lever mounted centrally in the cabin roof.

On the ground, gravity is trying to pull the flaps down, so you must : first push up on the lever to reduce the load on the ratchet; pull the end of the handle out, or squeeze the trigger (dependent on which variant you have); start to lower the flap, whilst releasing the pressure on the trigger, so that the ratchet clicks into the first flap position. This should be the only setting you will need on the ground – that is for take-off from grass runways, whether soft field, short field, or the normal, bumpy, grass runway. You should be stationary when setting flaps for take-off, so this is easily practiced. After landing you will, of course (!), stop after leaving the runway in order to clean-up flaps and carry out other post-landing checks. Again, on the ground with no air-loads, you will need to push up slightly, to take the weight of the flaps, to disengage the ratchet.

In the air, to raise flaps you need the opposite technique to that on the ground : pull the lever down slightly, to relieve the air load pressure on the ratchet; release the trigger; and then control the movement upwards of the flaps, which will try to fly up due to that air load. However, it is unlikely that the flaps will retract fully on their own and you will probably need a further push upwards to re-engage the ratchet.

Lowering the flaps in the air is awkward, until you get used to it, particularly if you have the sort of ratchet that involves pulling out along the line of the flap lever. Releasing the ratchet when you think you are close to the correct position will enable the ratchet to engage automatically, when the position is arrived at.

There is absolutely no option but to practice lowering and raising the flaps in the air, well away from any circuit flying. Even if you become proficient at setting flaps, you will find that, under the pressure of circuit flying, you will try to rush it and that is when it all goes pear-shaped. When that happens, and it will, fly the aeroplane (number one priority, as always), and start again more slowly to operate the flaps. If you've had to struggle with the flaps for too long, throw the approach away and go around the circuit again, when it is probably worth taking the flaps a bit earlier.

When to take the flaps, is a matter of choice for you and for your instructor. I've seen so many pilots struggle with these flap mechanisms that I now teach that they take full flap in one go on base leg, Your nosewheel training would probably have involved taking partial flap on base leg (possibly even first stage at the end of downwind), but not adopting full flap until established on final. If you do take full-flap in one go, then be ready for the ***BIG*** attitude change. The joystick must be moved forwards by a significant amount, as the flaps are lowered, to maintain airspeed. Remember that the flap limiting speed for most Austers is 70 mph, which does not give you a large margin above your approach speed, dependant on the speed you adopt.

One little surprise, that your Auster might give you, can occur when you have rushed setting the flaps and do not realise that the ratchet is not fully-home in the detent. All of a sudden, following a small increase in air load, the flaps may bang up noisily, in one go, giving you a significant surprise and a big change in attitude and trim to deal with. If this happens, fly the aeroplane and either fly another circuit, or if you have time, take the flaps again and resume the approach.

A number of early Austers – Taylorcraft Plus D/AOPI, J/2 Atom, J/4 Archer, do not have flaps, which makes life slightly easier. However, if you will be flying one of these types, you will need to brush up on your side-slipping skills and remember that the landing rolls will be longer.

ELEVATOR TRIM

The trim control (which on most marks looks like an old car window-winder centrally mounted in the roof, close to the pilot's head) is ***exceptionally*** sensitive and is connected to a trim tab on the port elevator. It adjusts by rotating the window-winder about the vertical axis. Most of these trim controls are unergonomic in that they operate in the reverse sense to the outcome required – that is to say you move the trim handle back for nose-down trim and vice versa. Some aeroplanes have been modified to work in the correct direction by moving the trim handle through 180°. Clearly, you need to understand your aeroplane's trim system, before you start to fly it.

Please excuse me for saying this again – the trim control really is very, very sensitive. In the cruise, the lightest tap is the best technique for adjusting the trimmed airspeed. However, if the aeroplane is trimmed for the cruise, the out-of-trim loads at lower speeds and for configuration changes are manageable. Having said that it is always best to trim for the approach speed, especially when you are new to any aeroplane.

Early Austers – Taylorcraft Plus D and AOP Mark III – do not have a trim tab on the elevator, but there are two vanes, connected together, either side of and under the tailplanes. The adjustment of the trim is by a short lever positioned centrally on the aircraft shock truss directly beneath the forward seats and operated vertically up and down.

This vane-operated, trim-mechanism was continued with the Auster AOP Mark IV, except that the control was moved to the cockpit roof-mounted "car window-winder" variety. This combination was found to be unsatisfactory for the heavier Mark IV. From the AOP Mark V and most post-war Austers, a trim tab on the port elevator and the rotary window-winder control became the standard. Many Mark IVs were later modified with the elevator tabs.

The Auster J/2 Arrow and J/4 Archer (neither of which have flaps) had a trim control lever positioned above the port door mounted vertically and operating in a fore and aft sense.

The military Mark 6, Mark 7, Mark 10, civilianised Mark 6s and the Terrier series (i.e. much-modified ex military Mark 6s) had trim tabs on both elevators for these heavier aeroplanes. The operating mechanism was a horizontal lever positioned on the upper forward cabin roof and operated horizontally fore and aft. The trimmer on these aeroplanes is connected to the flap mechanism to automatically counteract the trim changes associated with flap selection of the remote "Junkers" type slotted flaps. The same trim operating lever is to be found in the Beagle D5/180 Husky.

Whilst these notes will cover most Austers, as built, please be aware that nowadays many Austers have been modified and you may find differences on your own aeroplane

BRAKES

Almost all Auster variants have heel brakes, quite different from the now common toe-brakes, which most pilots will have experienced. These are cable-operated, drum brakes. They are adequate if properly-maintained and are not operated any more than really necessary. Drum brakes tend to fade (the friction material becomes less effective as the brake temperature increases) and, thus, they should be used intermittently. If fading is experienced, then the aeroplane should be stopped and turned into wind to allow the brakes to cool. The most common reason for brake fade is through a long taxi across the wind, with the pilot having to use a lot of brake on one side to keep straight.

If the brakes fade, or fail, when taxiing on a hard surface, then try pointing the aeroplane onto the grass, or into longer grass to slow it down.

Many Austers do not have a steerable tailwheel and the pilot will have to rely on using the brakes for steering. He should use them as little as possible. It would be a good idea to modify such an aeroplane by fitting a steering mechanism. As Austers now operate on Light Aircraft Association Permits to Fly, permission for well-engineered modifications will usually be readily approved.

The small brake pedals are positioned on the floor nearer to the pilot than the rudder pedals and in line with them. Generally speaking when steering, a pilot should be using the rudder before bringing the brake into action. As the rudder pedal moves forward, the pilot's heel will naturally come into contact with the brake pedal. The operation is then a little awkward, as the rudder must still be pushed forwards, whilst slightly rotating the heel joint to apply pressure to the brake pedal with the heel.

Braking in a straight line, requires both brakes to be applied evenly. If the direction of travel starts to yaw from side to side, then it may be best to come off the brakes and re-apply them again more evenly. Clearly, this will depend on what is in front of the aeroplane at the time ! It is noticeable that an Auster under very heavy braking appears to oscillate from side to side, as both steering and braking is being “controlled” simultaneously.

Beware of wearing trainers, or any footwear with large ridges on their soles. It is easy inadvertently to catch one of these ridges on the brake pedal and apply the heel brakes unexpectedly. On two occasions, I saw a pilot almost depart from one side of the runway, before I could catch it, until I realised what had caused the problem.

An unusual modification to be found on a few Austers is for them to be fitted with disc brakes, hydraulically-operated through toe controls.

FIRST AUSTER FLIGHTS

Most Austers only have brake pedals on the left-hand side. Therefore, your instructor will almost certainly sit in the left seat and fly the first take-off, local flight and rejoin to land. Carefully note everything that you can about this flight, most particularly the tail-up attitude during the take-off roll and the landing flare and hold-off. Whilst in the air, you should be given a chance to handle the controls to get a general feel for the aeroplane.

At the start of your next opportunity to fly, the instructor should give you more time on the controls, particularly to practice flying in balanced turns, and to examine exercises like steep turns and stalling. Also practice the use of the ***very*** sensitive trimmer, by trimming for different speeds.

This trip will probably be with you sitting in the right-hand seat. You will probably not be used to this seat, but it is important that the instructor has the use of the brakes and flap-lever for these early flights. Most flap-levers are to the left of the P1 position, above the door, and almost impossible to operate from the right-hand seat.

Before allowing a trainee to sit in the left seat in flight, instructors should be sure the trainee can reliably operate the brakes safely and the instructor must brief them about the difficulty of operating the flaps. As an instructor, I would be happy to fly in the right seat, provided I felt that the trainee was confident in the use of the brakes. I would also want to be sure that there was enough runway length to land the aeroplane flapless, if the trainee couldn't manage to operate the flaps in the air. Some Auster flaps are very awkward to operate, so don't underestimate the difficulty of this task.

If you have not previously flown a high wing aeroplane, then be ready to lift a wing slightly to lookout before making a turn.

ENGINE STARTING

Some Austers do not have an electric starter. You must be properly taught to hand-start an aeroplane and I'm not going to try to teach you on paper, save as to say that the pilot is ***<u>NOT</u>*** in charge at this point. You should make sure the wheels are chocked, the handbrake firmly on and the joystick held tightly back. As the pilot, you must obey every instruction of the person who is swinging the propeller and whose life may be seriously affected by any lack of attention on your part. If there is any ambiguity about any instruction, you should not switch the magneto switches on, until you are absolutely certain that is the correct thing to do.

If you have to hand-start the engine on your own, then always ensure the wheels are chocked and braked, never just rely on the handbrake. Also tie the control stick back and consider whether to tie the tail down to a stake. Make sure the throttle is only cracked open, before attempting the start. This is essential after blowing-out, when the throttle will have been opened wide. Aircraft have been known to jump their chocks and fly on their own, following a hand start with an incorrect throttle setting. By the way, blowing-out is a procedure used to clear the cylinders, before priming. Often needed when starting a hot engine by hand.

If your Auster is blessed with an electric starter, then make sure that you have the brakes on and the stick held firmly back, before you go through the start-up checks that you were taught when learning to fly. I have a bit of a thing about pilots who mumble “Clear Prop”, as they press the starter button (note: most Austers don’t have a key to turn). Please make sure that you shout ***loudly***, out of the window, whilst you look-out all around, then make sure you wait a few seconds before pressing the starter. This is just in case there is someone that you can’t see, who needs to get out of the way. Remember, propellers are potentially very dangerous.

You need three hands to start a tailwheel aeroplane (!), for the stick, throttle and starter button. Some people hook their arm around the stick to hold it back and then have two hands for the other controls. I prefer to hold the stick back between my legs, have one hand on the throttle and the other for wherever the magnetos and starter-button are situated. As always, once the engine has started, check the oil pressure has come up and the starter warning light (if fitted) is not illuminated.

It is unlikely that you will have a printed checklist available, so create your own, based on something like a Cessna 152, or Piper Cherokee. Use it until you are completely familiar with all the checks to be made on the ground.

TAXIING

After the engine has warmed-up and you are ready to taxi, then close the throttle, release the handbrake and, as you slowly increase the power, allow the aeroplane to move off. Let's assume for this exercise that you are at a grass airfield. However, extra care will be required when taxiing on hard surfaces, as the aeroplane will roll more quickly and be more affected by side-winds. Always taxi a tailwheel aeroplane more slowly than you might for a nosewheel type, especially if there is any amount of wind about.

It is well-worth spending part of an hour just taxiing around to give you practice on the use of the brakes. This may give you the experience of brake fade, particularly if taxiing across the wind. If that happens, stop and allow the brakes to cool. You will probably never have experienced heel brakes and they will take some getting used to. Each mainwheel is braked by a separate pedal. If the aeroplane has a steerable tailwheel (many Austers don't) use the brakes, as little as possible for steering. Always use the rudder first. Even at low speed there will be a little aerodynamic assistance from the Auster's large rudder when ***fully*** deflected. Avoid prolonged use of the brakes, as drum brakes fade quickly, if over-used. Unless you own a classic vehicle, you are unlikely to have driven anything without disc brakes. The best technique with drum brakes is to use them as little as is safely possible and anticipate slowing down by using grass surfaces, rather than the brakes.

If your aeroplane has tailwheel steering, you will need large rudder deflections to cause the tailwheel to follow, as the rudder and tailwheel are connected by springs. You are likely to notice a big difference in the difficulty of directional control, compared with a nosewheel type. However, tailwheel aeroplanes can be considerably more manoeuvrable than nosewheel types, by adding brake to the inside of the turn.

The instructor should demonstrate how tightly a tailwheel aeroplane can be turned using a combination of rudder, brake inside the turn and a burst of power to start the aeroplane rotating about that inside wheel of the turn. However, avoid locking that brake. Once the turn has been established, the power can be reduced slightly and less brake will be required. Some Austers have steerable tailwheels that steer up to plus/minus thirty degrees of movement and then break away to be at right angles to the fuselage. This break-away point is quickly reached once a sharp turn has started and that is why less power and braking is then needed. Most Austers were built with a tailwheel that simply castors and many have not been retro-fitted with a steerable tailwheel, thus these will enter a sharp turn more quickly.

When initiating a sharp brake/power-induced turn, make sure you know where the tail will be going, before you hit a hedge, or another aeroplane. Also, you will need to anticipate when to stop the turn, as there will be considerable angular momentum ready to continue the turn past the desired direction. Reducing the power and rudder deflection in the turn will allow the aeroplane to slow as it approaches the direction you want to go towards.

The instructor should teach you to turn by rudders alone, then add some braking and finally the sharp turns just described, until you are fully confident to control the aeroplane promptly. What this is leading up to is for you to be able to quickly control the aeroplane, without thinking, when it deviates from the straight and narrow. This will particularly be the case in a cross-wind landing, just as the aeroplane runs out of rudder effectiveness – much more of this later.

An important teaching point, when manoeuvring on the ground, is that you should weave the aeroplane's nose from side to side, in order to see what's directly ahead. You will probably be used to taxiing a nosewheel aeroplane, as if it is a car from the point of view of visibility. The pilot of some light tailwheel aeroplanes can see over the nose and don't need to weave. However, if you do not have a good view forwards, when sitting in the aeroplane, you ***must*** weave to determine a clear way ahead.

Most of the time the trainee should always taxi with the stick held firmly back and with some aileron into wind. The exception is when taxiing in a strong wind (see below). These control inputs are to increase the down force on the tail and reduce the risk of the aeroplane "nosing-over", or the wind getting under the wing. Even in light winds, it is a good habit to hold the stick back and into wind.

Although nosing-over whilst taxiing is very unlikely, it could happen if the aeroplane is being taxied too fast and hits the edge of a concrete area, or a rabbit hole, or is braked very hard, at low speed, such that the brakes lock. The aeroplane's forward momentum is immediately turned into a nose-down rotation about the stopped wheels.

There is one situation for which holding the stick back is a possible disadvantage, particularly when stationary. If a large aeroplane, or helicopter taxies behind your aeroplane and the slipstream, or jet efflux, is directed towards your tail, then it would be better to hold the stick forwards to minimise the risk of the tail being lifted. This might also be caused by a strong wind gust from behind. However, if you feel the tail starting to lift at any time, the best thing you can do, provided nothing is in front, is to simultaneously release the brakes, pull the stick back and give the engine a burst of power. This will produce a slipstream flow over the elevator and tailplane, which will generate a down force. Good luck with that one, it will probably happen more quickly than you can think and react.

Should you find yourself taxiing in a significantly strong wind, you have already got something wrong. Austers aren't really designed to fly in strong winds, at least not given the level of experience of most leisure pilots. If you feel that handling the aeroplane on the ground is becoming difficult, the best option is to put it back in the hangar.

If you find yourself taxiing in a modest wind strength of above ten knots, then the position of the stick needs careful thought. Relative to the aeroplane, the wind direction changes every time the aeroplane's direction changes. When taxiing in such a wind coming from anywhere in front of the wing, you should hold the stick back and towards the wind, as normal. This will hold the tail down and also raise the aileron towards the wind to reduce the effect of any gust trying to lift that wing.

If the wind is coming from anywhere behind the wing, then the ***opposite*** applies, hold the stick forwards and away from the wind. You could also think of this as, when there is a strong wind from behind you, "let the wind blow the stick". You might also think of this as the stick position for a climbing turn towards a strong wind, or a descending turn away from a strong wind.

As you should be well-used to holding the stick back and into wind on most occasions, the stick position when taxiing with a strong wind behind you will feel very unnatural.

If you are taxiing with that strong wind approximately at right angles to your direction of travel and wish to turn towards a downwind position, the pressure on the side area of the fuselage behind the wheels will try to resist the turn. The best solution is to turn towards the wind initially and use power, brake and momentum to turn through 270 degrees, rather than continue to attempt the turn through the 90 degrees you were intending.

TAKING-OFF

When you complete the pre-take off vital actions from your (home-made) check list, pay particular attention to the check of the idle rpm. Anything above 700 rpm is likely to make landing more difficult, or require a much longer runway. Check the circuit for traffic, enter the runway and pull forwards a short distance to ensure the aeroplane is lined-up, with the tailwheel straight.

Do not turn quickly onto the runway with power applied, as it will be easy to cause a ground-loop. Particularly when a British-engined Auster is turning right onto a runway, with a cross-wind from the right, when you will probably depart the runway edge from whence you came. The opposite applies for an American-engined type, when turning left with a cross-wind from the left.

Open the throttle smoothly, when you will experience the normal tendency of a British-engined Auster (i.e. Blackburn, or De Havilland) to yaw to the right and an American-engined (i.e. Lycoming, or Continental) one to yaw left. This is a broad generalisation, but your instructor should make you aware of which way to expect the swing to start. The more powerful the engine, the more slowly you should open the throttle, so as to be able to control the yawing moments.

Normally these yawing moments are due to the slipstream and torque reaction, which also apply to a nosewheel aeroplane. A taildragger adds asymmetric blade effect (P factor), because the plane of the propeller rotation is not at right angles to the direction of travel. There will also be gyroscopic precession, as the tail is raised. All of these effects work to increase the yaw in the same direction and you must be ready for that gyroscopic precession. The more powerful the engine, or the more quickly the stick is moved, the more noticeable the precession will be.

For the technically minded, asymmetric blade effect is caused by the down-going blade generating more thrust than the up-going one, because it is at a higher angle of attack. It also moves forward faster, relative to the motion of the up-going blade, as the aeroplane itself moves forward into the airflow. Gyroscopic precession is the movement of the apparent force, which raises the tail, being moved through a right angle, in the direction of rotation of the propeller, thus causing a yaw. Note that an aeroplane with a metal propeller will experience a greater gyroscopic force than the same aeroplane with a wooden propeller (metal is heavier than wood, so the gyroscope has more inertia).

Ensure that the aeroplane is running straight down the runway, before raising the tail to an attitude which approximates to the normal flying attitude and minimises the drag. If the airfield is bumpy, then raise the tail slightly higher to make sure the aeroplane is not jumped into the air before you are ready. Grass airfields are not as level as they look and the springy Auster undercarriage will quickly react to a bump in the ground.

As the aeroplane accelerates, move the stick forwards steadily, not quickly, as the quicker the tail is raised the larger will be the swing. Now note that, without the ground contact of the third wheel, the aeroplane becomes less directionally stable, especially as the Centre of Gravity is behind the wheels.

Once the tail is up, very tiny rudder movements will be required to keep the aeroplane running straight down the runway. Look well ahead towards the end of the runway to notice any yaw, as quickly as possible. As the aeroplane accelerates from rest to the lift-off point, the rudder will become more and more effective. Thus, large rudder movements will be required in the first few seconds of the take-off roll, which must then be decreased in line with the increasing speed of the aeroplane. The best technique is to constantly push evenly against both rudder pedals and then push slightly less/more to counteract any unwanted yaw.

However, do not assume that you will need rudder in only one direction to counteract the swing-inducing events described earlier. You will need to “dance” on the rudder to keep the aeroplane straight. As a trainee, you are likely to over-control when making a correction, thus needing another correction the other way. Also, the swing-inducers will be varying with speed and wind changes, which will require additional corrections. Once the tail is up and aeroplane running straight, only tiny rudder movements should be needed to maintain this.

Remember to use aileron into wind and maintain wings level whilst accelerating. If a wing lifts, the ground contact is reduced and this is another possible swing-inducer.

Very quickly the aeroplane will become “buoyant” and ready to fly. However, maintain the forward pressure on the stick, until the speed reaches 40 mph (Austers don’t normally fly in knots). As the speed passes 40, smoothly pull back on the stick and continue to pull until the aeroplane has lifted off cleanly. If you don’t adopt this technique for a low-powered tailwheel aeroplane, it is likely to flop back onto the ground briefly before bouncing and then starting to climb. This ground contact will make for an untidy take-off.

If you are interested in why this happens, read on, otherwise skip this paragraph : as the aeroplane leaves the ground the moment arm from the mainwheels to the centre of pressure of the tailplane/elevator instantly reduces to the moment arm from the aeroplane’s Centre of Gravity to the tail centre of pressure, because the CoG is behind the wheels. You need to continue the elevator movement to increase the elevator down-force, to counteract the loss of moment arm, thus preventing the wing angle of attack from reducing and the aeroplane dropping back onto the runway. You may have noticed that, when you take-off with a nosewheel aeroplane, you have to check forwards once the aeroplane leaves the ground for the opposite reason – i.e. the CoG for a nosewheel aeroplane is in front of the mainwheels, so the moment arm increases as the wheels leave the ground and the elevator becomes more effective.

Most Austers can be made to leave the ground at about 35mph, but the ailerons are noticeably more effective with that extra 5 mph. Indeed, it is worth noting that Auster ailerons generally are not as effective, as one might like. Indeed, for such large ailerons they are heavy and are best described as sloppy at low speeds. They also need noticeable side-pressure on the stick, for more than ordinary roll rates, at medium airspeeds.

The majority of Austers were built with a wing-span of 36 feet. However, the original 119 Aiglet Trainers (J/5F and J/5L) have a 32 feet span, which gives an improved roll rate, but requires a slightly higher touch-down speed, as the smaller wing area produces less lift.

As soon as the aeroplane is comfortably in the air, you may need to lower the nose slightly, whilst the aeroplane accelerates in ground effect. Then adopt the nose attitude for the climb, with an airspeed between 65 and 70 mph for a normal climb-out.

For most aeroplanes, the short field take-off technique involves a lower airspeed, which reduces the rate of climb, but steepens the angle of climb to avoid obstacles in the climb-out. The Army's technique with the Auster was to use one stage of flap and climb at 40 mph, which significantly increases the angle of the climb-out.

ABANDONED TAKE-OFFS

If during the take-off roll a problem arises, such that you decide to abandon the take-off, this is not as straight-forward as with a nosewheel aeroplane. If the tail is down, then careful braking and steering is all that is needed, whilst holding the stick firmly back. However, if the tail is up, the natural instinct is to lower the tail and this might result in the aeroplane leaving the ground, when you intend the exact opposite. Reduce the power to idle smoothly, not quickly. Note that any resulting swing will be in the opposite direction to normal.

The correct technique then is the same as for a wheeler-landing. That is, with the throttle closed, hold the tail ***up***, until the speed drops. This will require gradual movement of the stick ***forwards***, until you feel that the tailplane/elevator is losing lift. Then allow the tail to descend under control, until it is back on the ground and you can hold the stick back. There will be a small gyroscopic precession effect, as the tail is lowered. This will be very small, as the propeller should be turning slowly and the force, generated by the lowering of the tail, will also be small, assuming the tail is lowered gently. There will be an increase in asymmetric blade effect, but this will not be noticeable, as the throttle will be closed with little power being produced.

Whilst the tail is up and you are gradually moving the stick forwards, you must also maintain directional control with rudder. Avoid using the brakes until the tail is down unless a fence, or obstacle, is rapidly approaching. When braking with the tail up, it is difficult to apply the heel brakes evenly, which then makes directional control very much more difficult.

If you have to abandon the take-off in a cross-wind, or need to brake whilst the tail is still up, there is a distinct risk of a ground-loop – more of this in the landing section.

CROSS-WIND TAKE-OFFS

Cross-wind take-offs are relatively straightforward, as against cross-wind landings, which are demanding. The take-off should be as for a normal take-off, but with much more attention to keeping the wings level with aileron and minimising yaw with the rudder. Initially, at low speed, use maximum into-wind aileron deflection and, as the aeroplane accelerates, ensure that the out-of-wind wing does not lift, by reducing aileron deflection as required. It is also useful to hold the aeroplane on the ground a little longer than normal, so that it lifts off cleanly and with slightly better aileron authority.

Because of the cross-wind the out-of-wind wing will produce less lift than the into-wind one, making the into-wind wing more likely to lift unexpectedly, particularly from a wind gust. If the into-wind wing lifts, then it will have a higher angle of attack, generate more lift and induced drag, which causes the aeroplane to swing towards the wind. (Note that, because the wing is no longer horizontal, there is now a horizontal component of the lift vector - acting through the wing's Centre of Pressure. This acts behind the Centre of Gravity, which contributes to any swing towards the wind). These effects add to the main cross-wind problem of the larger fuselage side area behind the wheels acting like a sail.

As the aeroplane lifts off, allow it to bank towards the wind and then level the wings to provide a drift angle to maintain the extended runway centre line, as you climb out.

Although the large Auster rudder becomes aerodynamically effective at very low speed, you should be ready to use a brake application, in a strong cross-wind, to keep the aeroplane straight. As the aeroplane accelerates, keep the tail down, until you have definite rudder control. There is also an advantage to start the take-off run from the downwind edge of the runway. This will enable the aeroplane to be angled more towards the wind than the runway centre line. Be ready to straighten-up the take-off path, as the rudder becomes more effective.

The worst cross-wind for take-offs is from the right, for a British-engined example, and the left, for those with American engines, as these wind directions will add to the normal swing-inducers.

GENERAL FLYING AND UPPER AIR WORK

With regard to control effectiveness, most Austers have sensitive elevators and powerful rudders, but heavy ailerons. The trimmer, as mentioned above, is extremely sensitive.

The Auster was derived from a design by Taylorcraft in America before the Second World War. In order to turn cleanly, it is necessary to use aileron with rudder, in the direction of the turn, in order to achieve a co-ordinated "balanced" turn. Adverse aileron yaw may be demonstrated with an Auster - that is, if the ailerons are deflected quickly, then the nose starts to yaw in the wrong direction, before the roll takes over and the aeroplane turns. Adverse aileron yaw is caused by the down-going aileron producing more induced drag, from its higher angle of attack, than the up-going one and before the extra lift has time to produce a roll.

Unlike most nosewheel aeroplanes, tailwheel aeroplanes generally require the use of rudder at all times to keep "the ball in the middle". It will take some time to get used to the feel of the slip, or skid, through your seat. Frequent glances at the slip needle, or ball, will be necessary in the early days, especially when power, or attitude, is changed, or the aeroplane turns.

Provided you pay extra attention to the use of the rudder, an Auster flies like any other aeroplane when flying most of the air exercises required in the PPL syllabus. Your instructor is likely to persuade you to fly some steep turns, particularly as a co-ordination exercise. If your aeroplane has a Perspex roof, then turning more steeply, can greatly improve lookout.

When it comes to spinning (if your aeroplane has aerobatic seats), or stalling, the aeroplane is quite benign. What you do need to know is that there is no stall warning of any kind that you might be used to – no airframe buffet and no audible stall warner.

As with all aeroplanes, the airspeed, quietness and nose-high attitude should give you a clue that all is not right. Every new pilot on type should experience a number of different stalls and must be given the opportunity to unstall the Auster themselves. Unless the aeroplane is not rigged correctly, you should not experience a significant wing drop, but the only way to find out, with a new aeroplane, is to stall it at a reasonable height.

Unstalling is simple, using the standard stall recovery. Reduce the angle of attack, increase to full power and use sufficient rudder to prevent yaw. Normally, rather than make a positive stick movement forwards, you will only have to relax a little on the stick, assuming the aeroplane is trimmed for a higher airspeed. Full power should be applied smoothly and almost simultaneously and with sufficient rudder deflection to stop any yaw. Remember that it is essential to pitch down and reduce the angle of attack to recover from any stall. The power will help with an increased airflow, to unstall the inner part of the wings, and to accelerate the aeroplane to a safer speed.

The ideal stall recovery is to minimise height loss, so pitch forwards only until the nose is on the horizon and allow the full power to accelerate the aeroplane in level flight. As soon as the airspeed reaches climb speed, raise the nose and climb away. Always stall your new aeroplane at a good height in case it drops into a spin. Spin recovery is straightforward, provided you remember the sensitive elevator (even more than usually sensitive at the higher speeds at which you are likely to find yourself once the spin has stopped and you are in a dive). Ease the stick back gently until the nose is high and the speed reducing towards normal climb speed. As you reach climb speed, you can then apply power to climb the aeroplane.

The standard spin recovery is to close the throttle and centralise the ailerons, as you apply full rudder in the opposite direction to the rotation and move the stick forwards to break the stall (i.e to reduce the angle of attack). You can expect an Auster to stop spinning quickly, so be ready to centralise the rudder promptly, as soon as the spin stops, and gently ease back on the stick. Please don't try this on your own. If you've never spun an aeroplane and yours has aerobatic seats, then make sure you ask a qualified flying instructor to demonstrate, before you have a go under their supervision.

All the normal caveats apply when attempting to fly in poor weather conditions (i.e. mainly don't try it). However, be aware that most Austers don't have pitot heaters, that venturis can ice up, that an old windscreen can be more difficult to see through when the sun is low, or the windscreen scratched, or crazed. Remember also that landing late in the day, into a westerly wind, in the Autumn may mean that, as you flare, you are suddenly looking straight at the sun. Most Austers do not have sun visors, which is why many Auster pilots wear a peaked cap to quickly cut out that low sun by lowering their head.

Austers can be flown without doors, but it is very cold and noisy and not an experience you may wish to repeat often. Beware the loss of maps and light objects. Indeed, a map can disappear out of the large, sliding, Auster window if care is not taken (I've done it).

NORMAL LANDINGS

If there is such a thing as a normal landing with an Auster - just so long as you can walk away from it (as the old joke goes). I'm sure instructors in the past have said to you that "good approaches make good landings" and that is undoubtedly very true. Particularly whilst converting onto an Auster, you will need a nice stable approach, with very few, minor, adjustments in pitch, or power, as you try to fly a near constant angle of the approach.

During your pre-landing checks, make sure the hand-brake is off as, getting this wrong, would have a more dramatic effect than with a nosewheel type. Always fly in balance – ball in the middle, or turn & slip needle vertical - this needs more attention than when flying a nosewheel aeroplane.

This next bit is more controversial. At what speed should you fly this stable approach ? Mike Stapp taught me and the others in our group to fly at

60 mph. The advantage of this is that the ailerons still work fairly well and you have plenty of time to learn the flare and hold-off to practice a good landing attitude. I still teach this until the pilot is proficient at landing, before trying slower approaches. At the other extreme, qualified Army pilots were taught to fly at 5 mph above the stall (i.e. about 35 mph for most Austers with flaps) when making landings into short fields, particularly on the battle-field. The standard advice for the final approach speed of any aeroplane is 1.3 times the stalling speed, or 40 mph in most flapped Austers. Whilst this is feasible on a nice day, those sloppy ailerons make for very hard work and a not at all comfortable feeling being near the ground. Generally speaking, I would never fly a normal approach at below 50 mph, then only bleeding it back to 40 over the hedge, if the runway is very short. However, remember that most Austers require a longer run to take-off than to land and, although they are excellent strip aeroplanes, this must be born in mind when using short strips.

The flare height for an Auster is that of any light aeroplane – about the height of an upstairs window. As the throttle is closed, the nose should be raised, so that the end of the runway sits on top of the cowling. In the early phase of learning, an instructor might choose to teach the trainee to reduce the power more slowly to gradually lower the aeroplane towards the runway, as it slows down. This technique may be useful for the trainee to have time to observe the changing attitude during the flare, but it potentially uses up a lot of runway. However, if you don't close the throttle completely you will be very surprised by how much this will extend the hold-off. The aeroplane needs very little power to fly in ground effect.

The difficult bit is controlling the trade-off between the remaining height and speed, until the aeroplane is ready to touch down. You have to see this and practice this, it can't be taught in a book. The landing attitude will be much more nose up than you are likely to have experienced with other aeroplanes. You really do need to land nose high (but not too high !), because of the bouncy undercarriage. You will also have to use your peripheral vision once the nose starts to obscure your forward view.

The ideal Auster landing is for all three wheels to touch simultaneously, or even the tailwheel to touch a tiny fraction earlier than the mainwheels. I would describe the noise of this landing as “da-dump”.

Whilst sitting in your Auster stationary on the ground, observe the attitude, but remember that the final landing attitude of the nose needs to be ***higher*** than this, because the bungees are compressed on the ground.

The design of the Auster’s suspension is of four elastic bands mounted vertically. There is a significant difference between the position of the wheels in the air, when the elastic bands are unloaded, and on the ground, when bearing the aeroplane’s full weight. This partly accounts for the nose high landing attitude, but that attitude also needs to be close to the stalling angle to ensure that, once on the ground, an uneven runway will not cause a significant bounce. I reckon that it takes about two seconds longer in the hold-off, than most tailwheel aeroplanes, before an Auster should be allowed to touch-down. If you can achieve this, then the aeroplane will stay down, even if it hits a bump. Believe me two seconds is a very long time, when you are still trying to prevent it from touching down.

Talking of the bounce, you need to realise that, whilst it’s started by the bouncy undercarriage, it then becomes exaggerated aerodynamically. If you have touched down earlier than is ideal, then the reaction of the elastic-band undercarriage will be to jump the aeroplane back into the air. At this point the Centre of Gravity is still trying to go down and, with the CoG being behind the wheels, the aeroplane will rotate nose up. This increases the angle of attack and the lift, so the aeroplane starts to rise more rapidly. However, you should already be close to the stall and, with high drag slowing the aeroplane quickly, that rotation and height increase will continue until the wing stalls, if you don’t react quickly.

You should either apply full power for a go-around, or increase the power, maintain the attitude and lower the aeroplane to the ground by slowly reducing the power. The latter option is only available, if you have a good length of runway left. The characteristics of the bungee undercarriage are that the greater the vertical speed on reaching the ground, the greater will be the ensuing bounce.

Over the years, a number of Austers have been severely damaged by their pilot not recovering quickly from a bounce. The aeroplane rising to perhaps ten feet and stalling. Ground contact may spread the undercarriage and shock-load the engine, through a propeller strike. The moral of this story is to make sure that your instructor allows you to experience a number of different bounces, so that you can distinguish which you can allow to settle-down and which must be acted upon promptly. However, in the early days of ownership, if you have any doubt about the size of the bounce, go-around and fly another approach.

Once you have touched down safely, this does not mean that the landing is over. You must be very vigilant, hold the stick firmly back and keep that aeroplane straight down the runway, until it has rolled to walking speed, when you can turn towards the parking area. In some ways, this is the opposite of the take-off. As the aeroplane slows down you will need bigger and bigger rudder movements to keep the nose pointing straight down the runway. Most importantly, you ***must*** be ready to use those heel brakes, as the rudder runs out of effectiveness. To keep straight you will have to use your peripheral vision more, because the nose will now be in the way of your forward view, or you might look alternately from side to side to observe the runway edges. Don't just look down one side of the cowling, or you are likely to move towards one side. Holding the stick back firmly is important, as hitting a bump at speed may cause the unbalanced elevator to drop, the tail to rise and the stick to jump out of your hands.

If you reach the point where you are using full rudder deflection and the aircraft continues to yaw against the rudder, you must start to use the appropriate heel-brake, ***added*** to holding that rudder deflection, to keep straight. In a cross-wind of above 10 knots, this is very important. The side area of the Auster fuselage behind the wheels acts like a sail and, once the sideways motion becomes established, a ground-loop is not far away. This occurs slightly more quickly if you have a free-castoring tailwheel, but only a fraction later, if you have a tailwheel which unlocks at about $\pm$ 30 degrees deflection. If you don't catch the movement quickly, with the appropriate brake, then the aeroplane is likely to rotate (about the vertical axis) and leave the runway in a very undignified fashion.

If you are really unlucky and ground-loop whilst carrying quite a lot of speed, a wheel could drop into a dip, or a wing tip could touch, with all sorts of unhappy outcomes. If you can think quickly enough, as the ground-loop develops, move the stick towards the centre of the circle to try to keep the wings level, whilst still working the outside brake. Centrifugal force will cause the aeroplane to lean out of the turn, because the CoG will be higher than the wheels. Moving the stick towards the centre of the circle will help to counteract this.

If sufficient space is available, then open the throttle to make the rudder more effective, but be ready to close it, once control has been restored. Ground-loops tend to develop very quickly and may be over before you've remembered any corrective action. The moral of the story is to catch any yaw ***very*** quickly, as the aeroplane slows down after landing. If there's an approaching aircraft on your tail, don't let yourself be bullied into leaving the runway quickly, this might generate the unwanted ground-loop.

As a tailwheel pilot, you really need to stay alert at any time the aeroplane is moving, most particularly if there is any amount of wind about.

It is true that a tailwheel landing isn't over, until the aeroplane has stopped, with the engine turned-off.

GO-AROUNDS

You need to be as good as the proverbial one-armed, paper-hanger in order to either go-around whilst still in the air, or when flying touch-and-goes. As with any go-around you need to provide the maximum power available as promptly as possible.

For a go-around in the air, move the throttle smoothly to the firewall and move the carb heat to cold. Then you will have to change hands to deal with those awkward flaps and remove the unwanted drag. Assuming you were landing with full flap, then you need to get rid of most of that drag by moving the flaps ***slowly*** to the first stage. If you don't control the movement of the lever, or deliberately move it too quickly, then the aeroplane will lose lift and may descend to bounce on the ground. A bounce will only exacerbate your problems, to put it mildly.

If you are on the ground and have enough runway left it is, of course, best to reduce the flap setting before applying full power. However, don't forget to keep the aeroplane straight with rudder, whilst grappling with those flaps.

Whilst learning to land an Auster, you may need to fly many approaches before becoming proficient. As an instructor, I would initially require my trainee to stop and taxi back for another take-off. However, once they have mastered the take-off, it is better to go-around to save time. To do this I would initially take control, open the throttle, whilst raising the tail and keeping the aeroplane straight with rudder. This gives the trainee time to battle with the flap control and move them ***slowly*** to the take-off position. The flaps need to be raised slowly because, in my experience, we are often off the ground again, before the flaps start moving. It is then important not to dump the flaps quickly to avoid sinking back onto the ground again and bouncing. However, eventually you must be able to do this on your own, so practice is needed, until you can operate all of the controls. If in doubt, it is best to finish the landing, stop and taxi back for another take-off.

The J/1 Cirrus powered Autocrat and other low-powered Austers may not be able to climb against full flap, so to practice go-arounds at low level, whilst still in the air, is particularly important.

LANDING WITH LESS THAN FULL FLAP

I would suggest that the normal landing in any aeroplane would be to use the maximum amount of flap that the Flight Manual allows. For most light aircraft, this means full flap. The designers put that into the design and it is there to be used to reduce the landing distance.

There are two situations when a landing with less than full flap might be required. One would be to reduce the amount of flap in a cross-wind and the other to land flapless, because there has been a problem with the flaps.

Flapless landings are often practiced as a part of biennial instructor flights, revalidations, or renewals. They have a value in providing a noticeably different approach and landing technique to broaden a pilot's skills. Rarely, they might actually be needed, if there is a failure of the flap system. This is not very likely with the Auster's simple mechanical flap mechanism but, if it can go wrong, it will go wrong sometime, so it's well worth throwing an occasional flapless landing in for variety and "just in case". As with all flapless landings, it is easy to become too low, or be too fast on the approach, to improve your view of the runway. Make sure you experience some flapless landings with your instructor.

As regards reducing flap in a cross-wind, see the next section.

CROSS-WIND LANDINGS

In my experience, most light aircraft pilots never become very good at cross-wind landings. After gaining their licence, many pilots sensibly avoid noticeable cross-winds, by not flying on unsuitable days.

However, this is the most difficult flying skill to acquire and needs practice to reach a reasonable level of competency. There are two basic methods of carrying-out a cross-wind landing, although both start with the same approach and both require the same care during the landing roll. The two methods are wing-down (i.e. side-slip) and yaw straight.

In the early days of aviation and up to the Second World War, most airfields were just that – fields. The simple and effective method of landing was to choose to land directly into the wind, thus eliminating the problem of the cross-wind completely. During WW2, heavy bombers required paved runways and, hey presto, the cross-wind landing was invented. To minimise this problem, most wartime, paved airfields had three runways, at approximately 60° to one another, which thereby reduced the maximum cross-wind component to one half of the wind strength (Sine 30° = 0.5). The remaining difference was, I believe, then made up by lowering the into-wind wing – i.e. the side-slip, cross-wind landing.

It was not until the middle to late 1950s, that the yaw-straight method was introduced for the Boeing 707. With four underslung engines, the wing-down method produced the potential risk of damage to an expensive outer engine, severely limiting the amount by which the wing might be lowered. The advantage of the yaw-straight method is that the wings stay parallel to the ground during the flare and landing, provided the correct technique is used throughout.

First, let's look at the common elements of the two methods. The approach, until quite close to the ground is the same. The pilot counteracts the wind-drift by heading the aeroplane towards the wind sufficient to align the track with the runway direction. As always, he has to control speed with the elevators and use the throttle to control the rate of descent, thus maintaining a constant approach path (ideally !). Once near the ground, the two methods diverge, until after all three wheels are firmly on the runway. The stick should then be held back and maximum into-wind aileron applied to hold the wing down. However, if the out-of-wind wing starts to rise he must be ready to reduce that aileron deflection. Considerable attention is then required to keep the aeroplane straight down the runway, using both rudder and brakes.

The transition between the approach and the wing-down/side-slip landing is likely to occur no higher than 200 feet above the threshold and no later than the start of the flare. A trainee may prefer to set up a side-slip early, so as not to have to manage too many changes at once. However, to set up the side-slip early makes for a less comfortable ride, as you will feel that you will be slipping sideways in your seat. The amount of side-slip must be judged with the into-wind wing held down slightly and sufficient opposite rudder used to keep the longitudinal axis of the aeroplane aligned with the runway. The ideal is to create a slip sideways, which is counteracted by the force from the cross-wind component of the wind. Only experience will tell you how much side-slip to use. I would argue that it is safer to use slightly too much, than not enough, as this will place the into-wind wing lower and reduce problems from gusts. However, if the nose of the aeroplane is not more or less aligned with the runway direction, you haven't got it quite right. Remember that the wind strength reduces as the aeroplane approaches the ground and the amount of side-slip will need to be adjusted, quite apart from any gustiness of the wind.

If not before, then, as the aeroplane approaches the flare, the into-wind wing must be lowered, with opposite rudder to counteract the yaw and the flare initiated and continued with elevator. The wing ***must*** be held down, until all three wheels are on the ground. Aileron deflection should then continue during the roll-out. It is easy for an inexperienced pilot to either allow the wings to come level, or to keep the wing down and forget to flare. In the first of these situations, the aeroplane may start to move sideways before it touches down. In the other, the aeroplane will contact the ground too early which, in the case of an Auster, will almost certainly mean a significant bounce.

The big advantage of the side-slip landing, properly executed, is that the aeroplane stays aligned with the runway. It will land initially on the into-wind main undercarriage wheel, with no sideways strain. The side-slip also produces some extra drag to counteract the drag lost, because the wind component down the runway has been reduced. (Clearly, if the wind is at right angles to the runway there will be no wind on the nose to help). Soon after the first contact with the ground, the Centre of Gravity, being between the main wheels, will cause the second main wheel to lower. Provided the flare has been properly executed, the tailwheel will be down at about the same time. From then on, both landing methods are the same, with the emphasis on keeping straight with rudder and later brake. This is much more difficult in a cross-wind.

The yaw-straight method of landing in a cross-wind, is much more frequently taught nowadays for PPLs. This is probably because it is simpler to understand and modern tricycle undercarriages are much more robust than most early tailwheel designs. The yaw-straight method requires the pilot to maintain wings level during the flare and, at the point when he is confident that the aeroplane is about to land, to yaw the aeroplane with rudder to align it with the runway. As it straightens and the aeroplane touches down, into-wind aileron must be applied and assiduous rudder and brake control must continue until the aeroplane is at walking speed. The nosewheel pilot has the small advantage that, if he has not judged the yaw straight perfectly, then he can relax the back pressure on the stick slightly and the aeroplane will sink onto the ground. It will then pitch forward to kill the lift. It makes for an untidy landing, but you are down. If the tailwheel pilot tries this technique, it will result in a bounce.

One problem with the yaw-straight method of cross-wind landing is that, if the flare is not continued for long enough and the aeroplane is yawed straight too early, then the aeroplane will continue to fly with wings level and start to move sideways. This will introduce a significant sideways load on the undercarriage, when it makes contact with the ground. However, if the flare continues to the point of stall, before the aeroplane is aligned with the runway, then it also makes contact with the ground sideways. Note that the lighter the aircraft's weight, the more quickly it will be accelerated sideways by the wind and tailwheel aeroplanes tend to be lighter than nosewheel types.

Many modern nosewheel aeroplanes can survive this sort of cross-wind landing as they have a strong undercarriage, but old tailwheel designs, really aren't expected to cope with sideways loads. They were expected to land into wind. I would always recommend the wing-down cross-wind landing, even for nosewheel aeroplanes. In particular, this is the best technique for an Auster, as no one seems to be completely sure when the darned thing will actually touch down !

At the end of the day, whichever method you or your instructor choose, please don't forget that, in a cross-wind, you must not relax for one moment after the aeroplane has touched down. You must be vigilant and keep directional control with the rudder, so long as it is effective, and be ready to come onto the brakes, as soon as the rudder runs out of authority.

One tip that might help a little on grass runways, is to angle across the runway slightly towards the wind, to minimise the cross-wind component. Aim to touch down on the downwind edge of the runway. This may not be possible on short runways, or with awkward approaches, but worth bearing in mind. However, you can only rely on the runway having a good surface between the edge markers.

When discussing flap, it was suggested that one might not use full flap in a strong cross-wind. This is because the wind will not "see" equal areas of flap. Some aileron is then needed to make up the difference. If the flap setting is reduced, then more aileron is available, which may be very useful in a strong gusty wind.

The worst cross-wind for landings is from the right, for a British-engined Auster, and the left, for those with American engines, as these wind directions will add to the normal swing-inducers.

If you ever have the misfortune to be landing in a strong cross-wind, with full into-wind aileron applied and that wing starts to rise, then your best option is to go-around (the alternative is probably to crash). Opening the throttle and accelerating the aeroplane to improve control effectiveness might be your salvation. Again you shouldn't really be flying an Auster in these conditions, but we all make mistakes. Always bear in mind that there will be a more into wind runway somewhere, even if that is not where your car is.

WHEELER LANDINGS

This is an exercise that I have never really come to grips with myself. The principle is straightforward, but the bounciness of the Auster suspension makes it very difficult to move the stick forwards at just the right moment.

The first consideration is why would we want to make a wheeler landing? It uses up a lot more runway, but the higher landing speed gives more authority to those sloppy ailerons and a better view over the nose. This might make a landing in a strong cross-wind more manageable. Once the aeroplane has touched down on its main wheels, it can be pinned to the ground with the elevator, making an awkward bounce much less likely.

The technique is to fly the approach as normal, but not continue the flare to a normal three-point landing. Hold the aeroplane in a slightly tail-low attitude and gradually reduce the power until the main wheels touch. As they do so, promptly move the stick forwards to hold the aeroplane on the ground tail high, as it slows down. Moving the stick forwards will also reduce the angle of attack and hence the lift. Then close the throttle smoothly and, as the speed reduces, move the stick ***gradually forwards*** to maintain the same attitude, until the elevator effectiveness reduces and you feel the tail is ready to come down.

At this point, lower the tail gently, until the tailwheel contacts the ground and then hold the stick fully-back. Whether the tail is up or down, directional control ***must*** be continued with rudder, until the rudder becomes less effective. Then the pilot must be ready to use the brakes. As the aeroplane slows down, the pilot must use larger and quicker rudder movements, as the control effectiveness decreases. Maximum aileron deflection should be used towards the wind, with the pilot being ready to decrease aileron deflection quickly, if the out-of-wind wing starts to rise. Once the tail is down, the aileron deflection should increase, until full deflection into wind is achieved.

If you are even slightly slow in moving the stick forwards when making a wheeler landing, you will already have bounced, but now be returning to the ground for a second time and an even larger bounce.

The yaw-straight method of cross-wind landing is even more problematical, if incorporated with a wheeler landing. If you touch down before yawing straight, the tailwheel aeroplane will bounce, but if you touch down whilst going sideways, the Centre of Gravity moving sideways behind the main wheels will start or exaggerate any swing towards the wind. Remember the aeroplane is more vulnerable to a swing, if the tail is not down.

SIDE-SLIPPING

If you haven't been taught side-slipping and I'm amazed how many pilots are only shown, not taught a side-slip, then make sure you learn. I would argue that this is one of the most important skills a pilot should have in his armoury, most particularly when confronted with a forced landing. This applies just as much to nosewheel aeroplanes, as to tailwheel. Many "modern" instructors think that flaps have replaced the need for side-slipping and that it looks to be a dangerous or at least uncomfortable manoeuvre. It is not, provided speed is maintained and, unless prohibited by the Flight Manual, it is actually most useful in conjunction with flaps.

The side-slip is an efficient way to reduce height, without increasing speed. To enter a side-slip, simultaneously lower one wing and apply opposite rudder, whilst lowering the nose. Immediately check and control airspeed with elevator and ***maintain*** the entry speed, which ideally should not be below normal approach speed for that flap setting. The amount of side-slip and, therefore, the rate of descent, can be varied by reducing or increasing one control deflection, whilst balancing with the other to maintain the same forward direction.

Dependant on the relative effectiveness of aileron and rudder, one control will reach maximum deflection before the other. In the case of an Auster, you might expect the rudder to be at a maximum with some aileron to spare. Direction may then be altered by using less, or more, of this "spare" control, whilst maintaining maximum deflection of the other.

Side-slipping is normally used close to the ground to remove excess height on the approach. The direction of the slip should be aligned with the runway. There is a case for an experienced pilot to be deliberately high on an approach and then to lose that height by side-slipping. It would give him more options in the event of an engine problem.

The side-slip is also known as flying with "crossed controls". Aerodynamically the side-slip creates drag from the opposed ailerons and rudder and from the fact that the fuselage is partly sideways on to the airflow. It also reduces lift, as the effective span has decreased, and the lift vector has tilted over, because of the bank, thus reducing the vertical component of the lift.

Most aeroplanes can be side-slipped with any amount of flap, but you should consult with your aeroplane's handbook in case there are any restrictions. The Auster is a very effective side-slipper, particularly with full flap. The maximum rate of descent will be with full flap, a full-rate side-slip (i.e. with one control fully deflected) and at approach speed. The single most important thing with side-slipping is to maintain airspeed. If you stall, you will spin and, bearing in mind you normally side-slip to loose height near the ground, the outcome doesn't really bear thinking about.

You can side-slip to the left, or right, but it is usually more convenient to side-slip to the left (i.e. left wing down with right rudder), as this moves the nose to the right, improving the view for the pilot in aeroplane which has side-by-side seating. However, if you are approaching near the ground, intending to land with a cross-wind from the right, you should side-slip to the right, as that is the wing that will need to be lowered for the landing.

Most pilots do not use enough rudder in a side-slip. A large deflection may be necessary to induce a useful rate of descent from a side-slip.

Considerable foot pressure is needed against the air-loads. Remember that large rudder deflections are not normally required, except when landing, or taking-off, when the aerodynamic loads are much lighter. It is possible to increase the rate of descent even further by gradually increasing both rudder and aileron deflection until both are at their maximum. This will cause the aeroplane to turn, as one will always be more powerful than the other. This has been used at airshows as a steep descent technique, from a close downwind position, to the runway touch-down point.

It is very important that, when you come out of a side-slip, you do so gently, by removing both deflections in co-ordination, whilst continuing to control the airspeed. A rapid reversal of the rudder will change the side-slip into a steep uncoordinated turn, which might cause the wing to stall. When near the ground, do not leave it too late to remove the side-slip. I would remove it at 50 feet height, unless the wing is required to be low for a cross-wind landing.

There is likely to be noticeable position error from the pitot, no longer being directly into the forward airflow. If the static vent is only on one side of the fuselage, it will also experience an abnormal airflow. It is therefore very important not to allow the speed in the side-slip to reduce further, in case it is already lower than indicated by the ASI. The stalling speed is only slightly higher in a side-slip and this change is not of any consequence, provided the indicated airspeed at entry is maintained.

Usually a side-slip is used to reduce height on an approach to land and is removed for the landing, unless there is a cross-wind. However, particularly if touch-and-goes are being flown and the aeroplane has wing tanks with a low fuel state, it is important to draw the fuel from the tank in the ***higher*** wing. At low fuel state, the fuel in the lower wing can flow away from the fuel pick-off point (inboard on an Auster) and not flow back quickly enough around the baffles once the wings are returned to level. The consequence may be that the engine behaves normally at the start of the go-around, when it uses up the fuel in the carburettor bowl, and then cuts at less than 50 feet above the ground. If you change tanks very quickly, you may expect the engine to pick up again, otherwise be ready for a forced landing, by lowering the nose immediately to retain airspeed.

A few Austers are not fitted with flaps, so a side-slip may be a normal part of any approach to land. Once the throttle has been closed, side-slipping may help to maintain, or return, to the best glide path.

HARD RUNWAYS

Best advice to Auster owners is to avoid hard runways, if possible. The very nature of the animal will cause a much larger version of the bounce, for which Austers are renowned. The "give" in a grass runway allows a little bit more leeway, if you land slightly fast. The drag from the grass also helps the aeroplane to slow down. The advantage of a hard runway is that it is smooth and, once all three wheels are down and staying down, you will not be thrown back into the air from an unexpected bump.

The normal take-off from a hard runway will be without flaps. This removes the small amount of drag from one stage of flap, but increases the stalling speed. Thus, it is better to hold the aeroplane on the ground, until 50 mph is reached, before rotating.

When taking-off on a hard runway, if there is any cross-wind, there will not be any help from the grass/soft ground keeping the tailwheel straight, so it is easier for a swing to start. Be ready with quick rudder movements, particularly once the tail is up, as the aeroplane seems more lively with less drag from the mainwheels. It would be prudent to open the throttle more slowly on a hard runway in a cross-wind, to make sure the aeroplane is running straight, before applying full power.

If you land on a hard runway using the yaw-straight method and yaw straight too early you are now going sideways. When the first wheel contacts the ground, the high coefficient of friction between tyre and concrete, or tarmac, will "grab" the wheel. The Centre of Gravity will be moving away from the wind, which will quickly initiate a swing, probably starting a ground-loop.

There is a further disadvantage with a hard runway in that, if the axis of your tailwheel is not nearly vertical, you are likely to encounter tailwheel-shimmy. This is an unpleasant high frequency vibration, throughout the airframe, best counteracted by braking through it, to a low taxi-speed.

Whilst on the subject of a hard runway, I think the most difficult landing of all is on a hard runway with a cross-wind from the right (with an American engine), or from the left (with a British engine). As suggested earlier, it is better if you use slightly more wing-down than absolutely necessary. The opposite rudder causes the nose to cock-up slightly to the left, whichever of the above engine/wind combinations that you encounter, and this interferes with the pilot's left-seat view. Coupled with the bouncy undercarriage and hard runway, I reckon this taxes the average pilot to his limit.

NIGHT FLYING

The section on Night Flying in Mike Stapp's original Auster Training Notes starts with "It was said that Birds and fools fly, but very few birds fly at night".

An Auster can be used for night flying, but the landing is very much more difficult to judge, especially as most Austers do not have a landing light. The take-off will also be more difficult, because there will be very few visual cues. Once in the air, the Auster should be flown with the standard procedures of any night flying task. However, you will always have to land back and my view would be to avoid this, as the likelihood of bouncing, or ground-looping, will be much higher at night. Do you really want to take that chance with your historic aeroplane ?

The choice is yours – I've made mine. If I want to fly at night, I'll hire a nosewheel aeroplane.

PARKING

It is good practice to park your Auster into wind. If there is a noticeable wind, don't feel obliged to park in nice straight lines along with the nosewheel types. Always apply the hand brake, tie the stick back and chock the wheels. Connecting the seat belt around the stick is an effective way of locking the elevator and aileron controls.

If you have to park outside in inclement weather, or when strong winds are forecast, then, as well as the above normal precautions : carry your aeroplane cover to protect the cockpit from rain leakage; pickets to hold the wings and tail down; and a rudder lock.

THE AUSTER AOP9

Although designed and built by Auster Aircraft Ltd the Army AOP9 is unlike any other Auster. It is larger, has a more powerful engine, has completely different undercarriage and brakes and has ailerons, which droop in conjunction with the lowering of the flaps.

The aeroplane is pleasant to fly and the controls well-harmonised. The ailerons are slightly heavier with flaps down. The rudder is light, but with slow response at slower speeds. As with other Auster marks, the elevator and trimmer are very sensitive at higher airspeeds.

The flaps are operated from a hydraulic pump and a selector lever. The lever is moved down to lower the flaps, which are then hand-pumped. Moving the lever up allows the flaps to retract under the pressure of the air-flow. Take-off flap is marked by a yellow mark on the aileron hinge bracket and can be seen from the cockpit. The disc brakes are hydraulically-operated by toe pedals and, with a fully-castoring tailwheel, the aeroplane is easy to manoeuvre on the ground.

Without passengers and with a low fuel state the aeroplane is close to its forward CoG limit, so particular care is required to avoid a nose-over under heavy braking.

The aeroplane should be ready to leave the ground at 45 knots (note - not mph) and be climbed at 65 knots. For obstacle clearance, use 55 knots, which is also a suitable speed for gliding with flaps up.

Minimum approach speed should be 50 knots (flaps down) and 55 knots without flap. The aeroplane is liable to drop a wing, usually the starboard, if flown too slowly on the approach. This also makes the aeroplane liable to spin if stalled, particularly if the stick continues to be held back.

Potential AOP9 pilots should read the military notes AP.2440H-P.N

INSTRUCTOR TIPS

It is worth spending time in an open grass area for the trainee to practice use of the heel brakes. Until you are satisfied that they are competent, I would stay in the left hand seat (assuming only one set of brakes).

Trainees will probably need a lot of practice at keeping the aeroplane in balance and in using the trimmer accurately and it is worth concentrating on this during early flights.

The flaps of most Austers are notoriously difficult to use in the air, until a proper technique has been established. Practice away from the circuit is essential, both to take flap prior to landing and to remove it quickly for a go-around. Make sure there is sufficient runway length for a flapless landing, until the trainee is competent to take landing flap in the air. It is near impossible for an instructor to take flap from the right seat, if the flap lever is above the port door.

When teaching take-offs it is best to give the trainee practice at the use of only the rudder to start with. Then add throttle to the task and finally the elevator. In the early stages, it may be helpful to cut the power before the tail is raised, so that the trainee can experience keeping the aeroplane straight with rudder/brake, as if after landing.

One tip which some instructors already use is, once the trainee has some experience in the circuit, to cover the altimeter and airspeed indicator with post-it notes, or covers, and let the trainee fly an approach. I've always found it surprising how good they are at maintaining close to the correct airspeed (attitude) and approach path.

If your trainee gets to grips with the Auster very quickly (I've only found one so far who did not create a significant bounce during training), make sure he sees a good bounce by nudging the stick during the flare so that the aeroplane contacts the ground early. Obviously, be ready for the unexpected yourself, particularly if you induced it.

When teaching a trainee to land, consider stop and taxi back, or stop, clean-up and go (if the runway is long enough), before sharing the task of a go-around without stopping. It might also be worth inviting the trainee to initiate go-arounds from a flapless landing, before giving them the complete task. Trainee's should also experience a go-around in the air, without raising the flaps, to observe the poor climb performance, always provided there are no obstacles in the climb-out.

Avoid hard runways, if you can, until the trainee becomes generally competent.

If the aeroplane has a rear seat, make sure the trainee has experienced flying with a rear seat passenger before the conversion is considered to be complete.

ACKNOWLEDGMENTS

The advice and assistance of other experienced Auster pilots in creating this document is gratefully acknowledged. The following have all been helpful with tips and contributions :

Mike Stapp

Alex Allan	Mike Cuming
Trevor Bailey	Will Greenwood
Hamish Bichan	Sheila Helliar-Symons
Dave Cockburn	Ron Neal
Steve Copeland	Adam Wankowski

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