SOFTFIELD OPERATIONS: EASY DOES IT NOW

Jon Cooke explains how to cope with the water-logging and mud that afflicts many grass airfields at this time of the year

THIS winter has been unusually wet with significant snow and rainfall, which has led to soft field conditions lasting for a much longer period than previous years. Soft field techniques apply equally to soft mud, long wet grass, snow or slush covered operations.

It should be noted that the techniques for nosewheel and tailwheel aircraft differ slightly. Whilst I provide generic guidance here, you must consult your Pilot Operating Handbook in the first instance for the recommended technique for your aircraft type. Most Pilot Operating Handbooks seem to give guidance on Short Field techniques but omit guidance on Soft Field take-offs and landings.

PRE-FLIGHT

Operation from soft surfaces will require additional pre-flight actions which primarily consist of checking the condition of the aircraft, taxiways and runway, together with making an assessment as to the effect on taxiing, take-off, and landing performance. It may be necessary to walk the full length of the runway to make an assessment of which areas are useable, and which areas would be best avoided.

Consider the suitability of aircraft fitted with spats, or other fittings which may be affected by mud or contaminant adhering or being flung off.

Guidance on decision making is detailed in CAA Safety Sense Leaflet 23, and states:

"There are two serious threats to the use of this judgement: The pilot may have an excessively optimistic view of the situation or of his own ability; or he may be persuaded by other people to proceed with a flight against his better judgement."

Other pilots operating from the strip may cause you to reach the conclusion that it is safe for you and your aircraft. You and you alone must make this decision whether to go, whilst taking into account all of the factors. As is always the case in aviation: if there is any doubt, there is no doubt!

If you are flying into a farm strip, make sure you receive adequate briefing from the owner or operator, and if in doubt then visit by car beforehand. Conditions mid-summer may be significantly different to those experienced in the winter. For example, the airstrip where my Auster was hangared has a clay sub-soil, which has poor drainage in the winter and provides challenging soft-field conditions for even the experienced aviator.

'It may be necessary to walk the full length of the runway to make an assessment'

TAXIING

It is important whilst taxiing on soft fields to ensure the aircraft is not allowed to stop on soft ground, since the power required to move the aircraft from a standstill will be significantly more than that required to keep the aircraft moving. This requires more forward planning than you may be used to.

Use a firm area on the airfield to perform your power checks and pre-take-off checks. If the aircraft does become stuck, it may be necessary to shut the aircraft down and manoeuvre it by hand - if this happens, consideration should be given as to the expected take-off performance and a reviewing of your go/no go decision.

TAKE-OFF

During the take-off roll, soft surfaces may reduce the aircraft's acceleration to such an

Keep it straight! Soft field operations require thorough knowledge of the strip.

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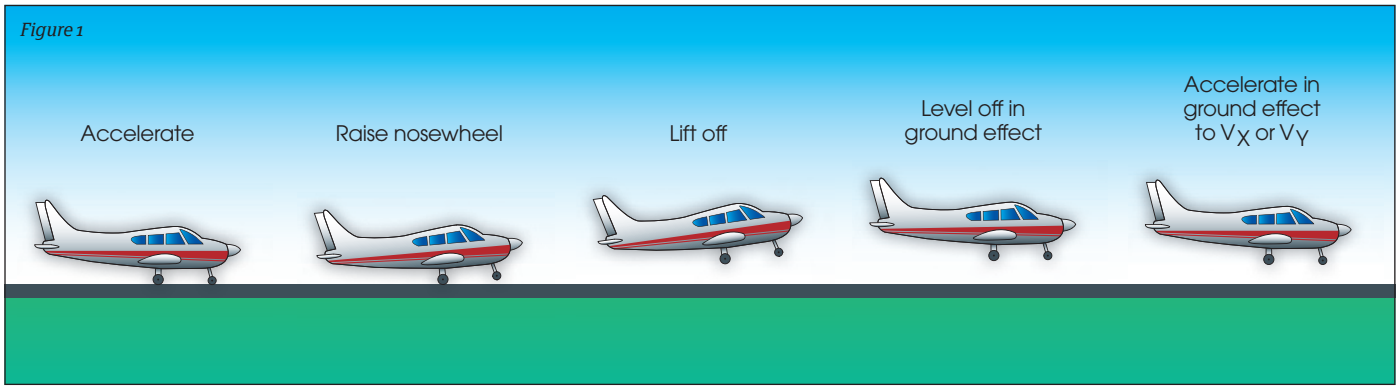

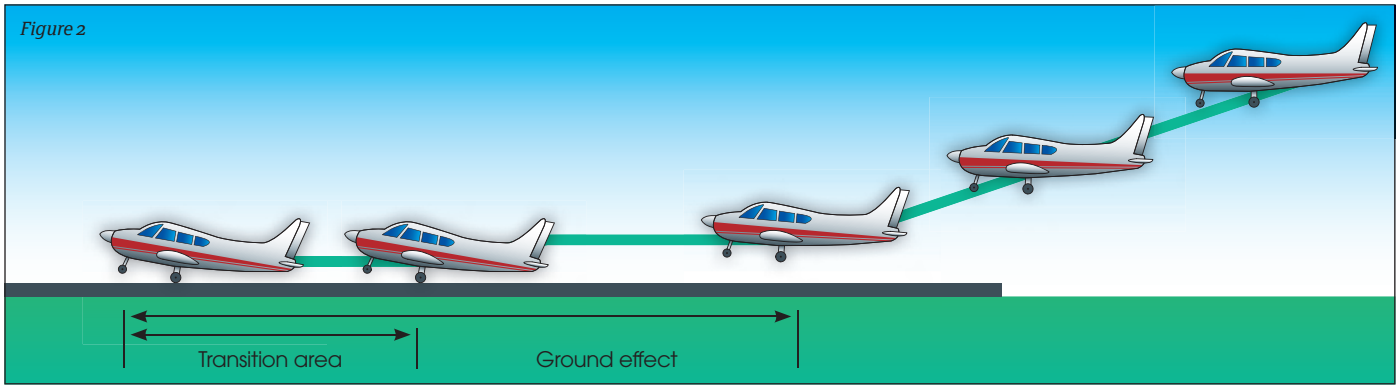

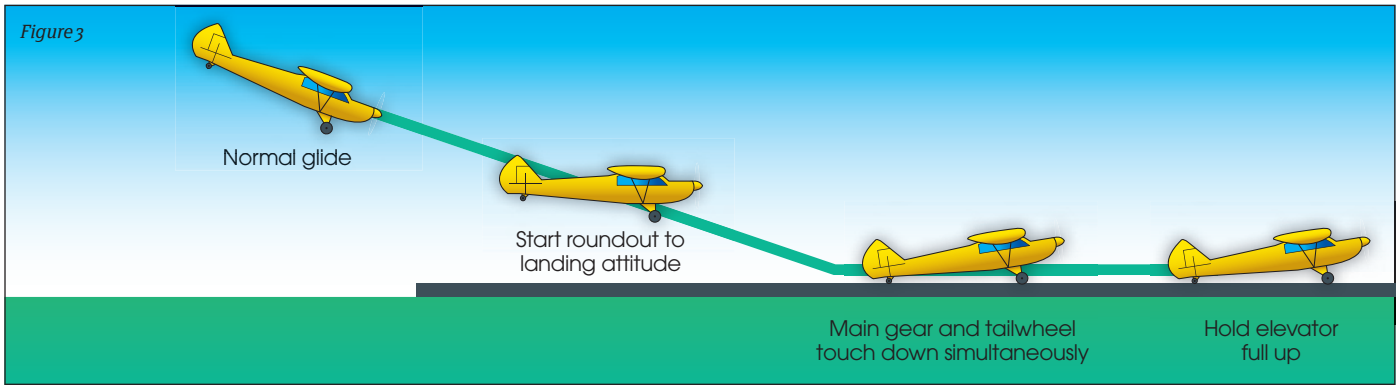

extent that if normal techniques were used, the aircraft would not get airborne. The aim of the soft field technique is to get the aircraft airborne as soon as possible. This eliminates the drag which is generated by soft mud, sand or long grass. The aircraft is then accelerated in ground effect to the climb speed.

The same techniques apply to rough field operation where you might wish to get the aircraft airborne to avoid damage to the landing gear. It should be noted that soft field techniques differ significantly from, and must not be confused with, those used for short fields.

If recommended by the manufacturer, flaps should be used for take-off.

The aircraft should not be allowed to stop whilst lining up, to prevent the aircraft from becoming bogged down, and once aligned take-off power should be applied smoothly whilst maintaining directional control. Enough elevator should be used in order to establish a positive angle of attack and to reduce the weight supported by the nosewheel. Maintaining this attitude will progressively reduce the weight on the main wheels as the aircraft accelerates, thereby reducing the drag generated by the wheels. If you are unable to maintain directional control, then abort the take-off. Also, an 'acceleration check' point should be used along the runway, from which you can stop if sufficient speed has not been achieved.

'Soft field techniques must not be confused with those used for short fields'

Using the soft-field technique, the aircraft will become airborne at a speed marginally above the stall speed, and at a high angle of attack. This attitude should be immediately adjusted to allow the aircraft to be accelerated in ground effect to the best angle or best rate of climb speed. See Figure 1.

Since the aircraft is at a high angle of attack just after lift-off (thus the wing is generating significant induced drag), then attempting to climb out of ground effect before sufficient speed is gained may result in the aircraft being unable to climb further, even with full power.

This technique requires very fine control of the elevator whilst accelerating in order to prevent over controlling in pitch. Over pitching may result in the aircraft touching down again, or climbing too steeply after lift-off.

Good understanding of the technique will assist in enabling you to perform the exercise safely. I have seen videos of light aircraft where this technique has been attempted unsuccessfully. This was caused by not accelerating in ground effect, and resulted in the aircraft crashing just off the end of the runway.

If obstacles must be cleared, then climb initially at best angle of climb speed, before transitioning to best rate of climb speed. It may be appropriate to delay retraction of the gear. Flaps should be retracted in the normal manner once the aircraft has achieved best rate of climb speed.

APPROACH AND LANDING

The aim of the soft-field landing is to touchdown as smoothly as possible, with the lowest speed possible. In order to minimise drag after touchdown and prevent damage to the landing gear, the pilot must try to use the flying surfaces to keep the weight off the main wheels whilst the aircraft decelerates during the landing roll.

A normal approach is flown to the point where the aircraft reaches the round out. During the hold-off phase of the landing, the aircraft is held about 1 to 2 feet off the ground in order to reduce landing speed, and allow

the aircraft to touch down gently at minimum speed. Power may be used, allowing the aircraft to be flown onto the ground, achieving a gentle touch down at minimum airspeed, with the weight supported by the wings.

Touchdown is with the aircraft in a nose-high pitch attitude. Sufficient elevator is then used to keep the nosewheel above the surface. A combination of power control and elevator control permits the pilot to transition the weight from the wings to the wheels (called the transition area). When the surface is firm in some areas, and less so in others, it may be necessary to control where transition takes place. See Figure 2.

Consideration should also be given to the go-around: ensure you allow a significant safety margin for field length required and obstacle clearance. Note that these will not be the same as when the surface is firm, and a safety margin will need to be added to figures extracted from the performance section of your Pilot Operating Handbook. The point at which the nosewheel is lowered would be an appropriate point to decide to go-around or commit to completing the landing roll.

Poor power management and poor elevator control will result in an unstable approach or firm landing. Practice is required in controlling the aircraft at slow speed, with slipstream over the elevator making elevator control more sensitive than is experienced during a normal landing.

Use of flaps should be as per the Pilot Operating Handbook. Be aware that low wing aircraft will suffer from mud, snow or slush impacting the flaps and lower wing surface. However, I recommend that flaps are not retracted during the landing roll, since there is more likelihood of damage due to loss of control than due to mud impact.

'As always with tailwheel aircraft, remove any drift prior to touchdown'

Brakes should be unnecessary, since the soft field will provide the necessary retardation. Transitioning to taxiing will usually require power to be added in order to prevent the aircraft from stopping, and an awareness of where the firm ground is will assist in planning a taxi route. If the aircraft does become stuck, do not be tempted to power it out; shut the aircraft down and manoeuvre by hand.

Now, the theory behind the soft-field landing is all well and good, but you usually find that not only is it a soft field but a short field also, making it unsafe to use the technique exactly as described. Please be aware that it is up to you, the pilot, to determine what is safe, even if that means landing elsewhere.

TAILWHEEL TAKE-OFF

Clearly the techniques described above needs to be adapted for tailwheel aircraft. The aims substantially remain the same for the take-off and the landing, but need to be altered to encompass the different configuration of the undercarriage.

During the take-off roll, the tail should be kept low in order to maintain a high angle of attack. This also prevents the tail getting too high in the event of a soft area causing a nose-down pitching moment about the main wheels.

Whilst maintaining a nose-high attitude, the aircraft is accelerated during the take-off roll allowing the wing to remove weight from the main wheels. The aircraft will get airborne in this attitude, and must then be accelerated in ground effect to the climb speed.

TAILWHEEL LANDING

Aim to touchdown as slowly as possible - sound familiar? The landing is therefore a normal three-point landing for tailwheel pilots, although you should also aim to settle onto the ground as smoothly as possible (Don't you always?). Once on the ground, the elevator should be held in the full aft position allowing maximum directional control whilst preventing any nose-down pitching moment due to drag on the main wheels. See Figure 3.

As is always the case with tailwheel aircraft, the pilot should aim to remove any drift prior to touchdown. Sideways drift will produce a pivoting moment, which will make directional control even more difficult. As with nosewheel aircraft, I recommend that the pilot concentrates on the landing rather than consider configuration changes during the landing roll.

SUMMARY

As a part of your initial Private Pilot Licence training, you should have received training in operations from soft fields. Sound knowledge, understanding and skills will allow you to operate your aircraft safely from soft fields when and where required. The techniques, whilst not difficult, should be practiced under the guidance of a qualified instructor such as an LAA Coach if you have not performed them for a while. I have set up a hyperlink to help you find your nearest LAA Coach: www.tinyurl.com/laacoach

Maintain recency in these techniques as they form part of your basic skill set as a pilot.

Van's RV7 gets nosewheel off ground as soon as possible in take-off roll.

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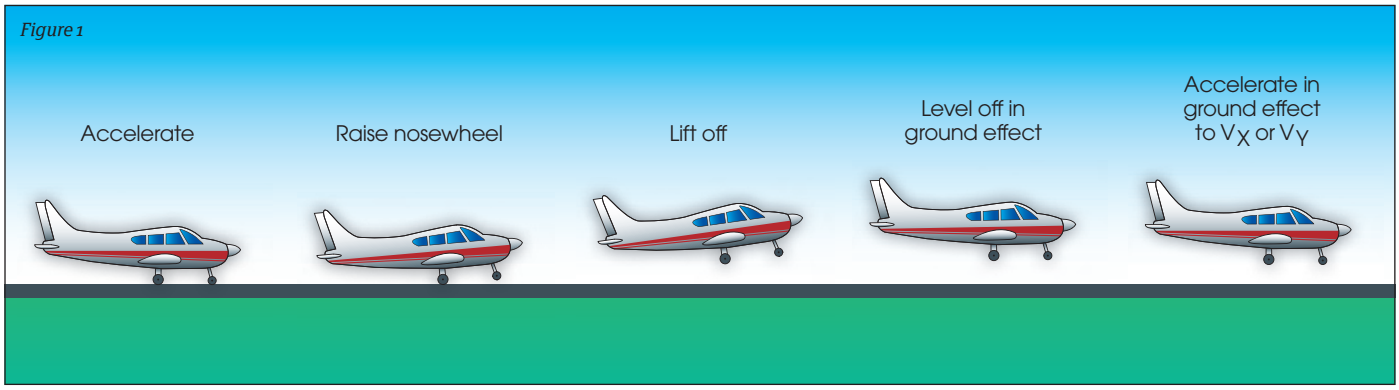

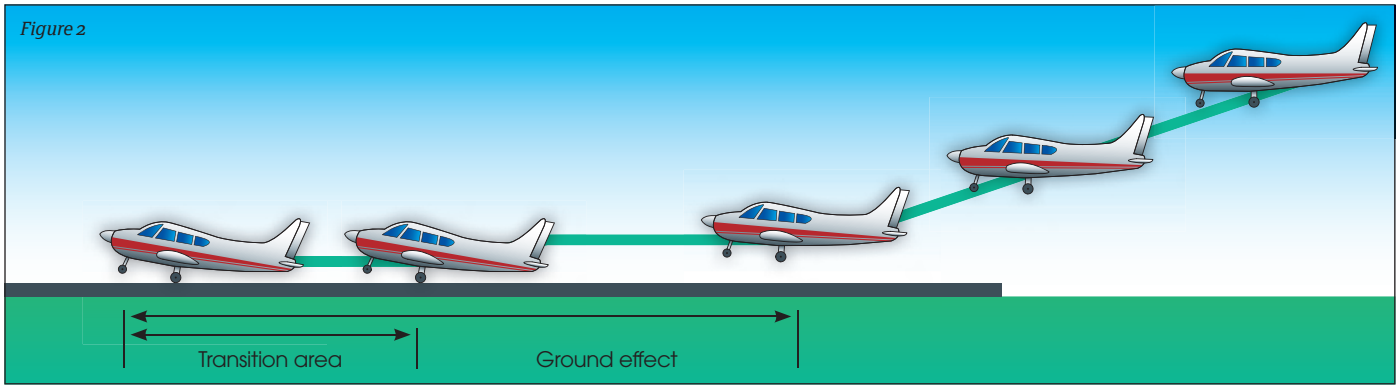

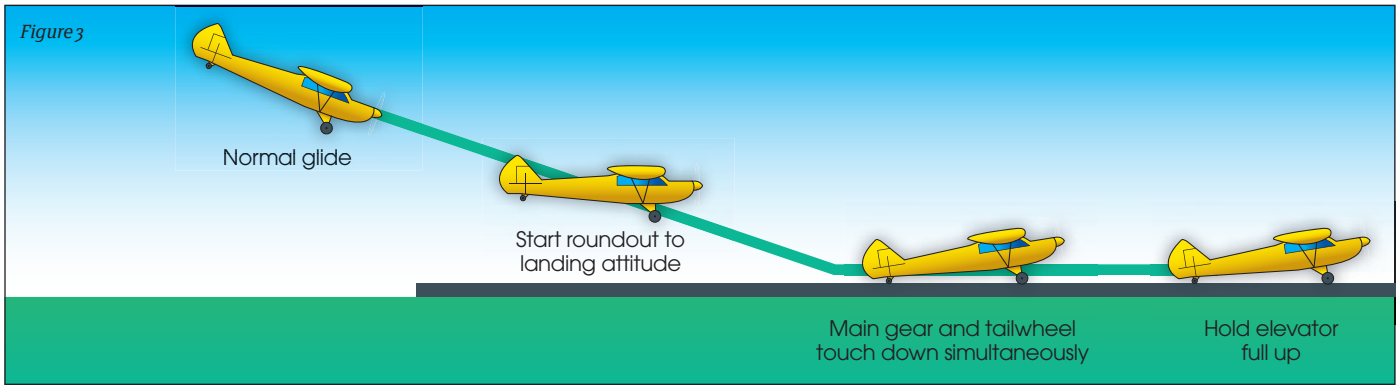

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