

Converting to a New Type

Statistics show that for LAA aircraft the transition of a new pilot onto the type is a frequent source of accidents, more so than the aircraft's initial test flying phase.

This TL has been written to explain what the rules are about transitioning to a new type and why the rules exist, but also, more importantly, to give practical guidance about a prudent approach to checking out on a new type. A careful approach to familiarisation flying adds to the enjoyment of flying as well as benefitting safety.

If you've just got the chance to fly a new kind of aircraft, you're sure to be eager to find out how it performs for yourself, and probably, to show it off to family and friends too. Do remember though that even after a dual check-out, a pilot's first few flights on type create a high-risk scenario that, just like the aircraft's initial test flying, needs carefully managing and attention to risk mitigation. Sadly, each year a number of LAA aircraft get damaged or even destroyed either during the period a new pilot is converting onto it or later, due to the type conversion process and any required differences training having been rushed, inadequate or even non-existent.

The rules say that before flying any type or variant of aircraft which you've not flown before, within the Single-Engine Piston (SEP) class, you must complete 'familiarisation training'. This is the correct modern terminology for what would previously be described as being 'checked out' on a new type.

In addition, when first transitioning to flying types or variants of aircraft which include various specific more demanding or unusual features, that he or she has not previously experienced as pilot in command, a pilot must also have differences training with a qualified instructor to teach them to safely deal with the feature or features concerned.

The LAA Pilot Coaching Scheme provides a nationwide team of coaches, all qualified instructors, who can provide differences training and 'dual' familiarisation training in your aircraft. See the LAA website for details of the coaching scheme.

Familiarisation training requires the acquisition of additional knowledge, either through self-study of appropriate material about the aircraft such as the Pilot Operating Handbook, pilot's notes, etc, training with a suitably qualified instructor, or, particularly in the case of a single seater, a verbal brief from a pilot already familiar with the type. With multi-seaters, while the rules don't mandate having a dual check, it's clearly sensible to do so whenever possible, particularly when the aircraft differs markedly from what you've been flying recently, or you're not too current, or all your experience before has been on just one or two aircraft types. After all, there's reasons why many flying clubs require a 'refresher' dual check-out on a club machine even if their members haven't flown it for a few months – we all get rusty after a surprisingly short lay-off. How much more appropriate then, to have some 'dual' in a machine of a type that you've not flown before ?

While it is strongly recommended that you seek a trustworthy mentor to help you through the transition period, and fly with another pilot already familiar with the type, pilots should note that only qualified instructors are authorised to provide training, including familiarisation training and this could lead to difficulties if an accident were to occur that was supervised by any pilot other than a qualified instructor. If you fly with another pilot who isn't an instructor, you must sort out between you who is going to be P1 for the flight, and not create a situation where this demarcation becomes blurred or the other pilot could be accused of providing training that he or she lacked the qualification to provide.

Even the most experienced pilots research a new aircraft type before flying it for the first time, and where possible, prepare by flying in it accompanied by a pilot experienced on type. Thanks to the internet, the research phase is much easier these days than in times past, and googling the aircraft type can often bring up pilot's notes, magazine reviews and forums devoted to the type. These days, through the internet it's easy enough to get in touch with other owners of the

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same type of aircraft, to chat over their impressions of the type and gain some useful tips. Beware though - other pilots will have come upon the type through a different route than yours, and their impression of it will be swayed by what aircraft types they are used to and of course, their own experience level. One man's 'pussycat' is another's 'tiger by the tail' !

However exciting, (or dull, for that matter) the prospect of flying it, any aeroplane needs to be approached in a mature manner at the initiation phase, or risk a bad experience, or worse, an accident - if not at the time, then possibly later. Pilots naturally tend to take seriously the transition to a heavier or more complex type of aeroplane than they're used to, and of course, in that case we often find ourselves led down the path of righteousness by having to comply with the dictates of the aircraft's insurance company. However insurance brokers don't always appreciate the nuances of moving to a new type of aircraft and pilots shouldn't take the lack of specific check-out requirements on the policy as encouragement that no familiarisation or difference training are needed. A particular folly is to think that moving to a smaller, lighter, and outwardly simpler aeroplane is going to be easy - it may not be. There's as much if not more to learn when transitioning from a Cessna single to an MW, Kitfox, Rans, etc than going from a Cessna to a Mooney, Bonanza, Cirrus etc. Suggestions that 'if you can fly an Extra you can fly anything' are particularly misleading - not least because a pilot used only to brutal high-performance aircraft which can happily climb away at 45 degrees may have no appreciation of the accurate flying and sensitive touch needed to coax a low-powered microlight, Luton Minor or suchlike into a positive rate of climb and get it safely over the trees at the end of the runway.

Lightweight types like the Eurofox, Rans S6, Eurostar etc are fine flying machines, with unique capabilities, but you have to learn how to adapt to them. On take-off, a traditional GA trainer typically takes 20 seconds or more from opening the throttle to leaving the ground, giving you time to make a radio call, scan the instruments, check your watch and perhaps give an encouraging nod to your passenger while waiting for the aircraft to gather speed. Many of today's microlights and lightweight aircraft are airborne and climbing away in less than a quarter of that time, and seemingly can be off the ground before the throttle touches the full power stop - it's a whole different experience. Pilots progressing from a GA trainer or typical club machine to a lightweight LAA and BMAA type will probably have to adjust their mental gain settings on such things as the secondary effects of controls, gust responsiveness and windshear all of which tend to be emphasised in these machines compared to heavier types - and almost without exception, with lightweight types you have to know how to use your feet to keep the slip ball centred. Lightweight aircraft are also likely to use radically different powerplants and instruments to the GA club machine, to have significantly lighter control forces in flight, and more variation in things like the location of trim controls and flap levers - largely standardised on heavier aircraft.

Even within what might seem quite a specialised class of aircraft, there can be marked differences in handling characteristics. Within the microlight category, for example, even if you exclude the obviously 'different' flex-wing group and oddities like canards and tandem wing machines, the handling of modern microlights like the C42, Eurostar and Foxbat are a world apart from that of older designs such as the Rans S6, X'Air, Kolb Twinstar and Thruster. Transitioning within either of these microlight groups is not a great step, but moving from one group to the other (either way) is something that's going to need significant training to fully understand the different issues involved. In the world of SEP aircraft, there are similar contrasting groups such as the Luscombe/Piper Cub/Aeronca/Taylorcraft and the Jodel/Condor/Emeraude, as compared to for example the RV series or the low wing Zenair models.

Very often when problems occur during a check-out it's not one single cause that's responsible but rather an accumulation of small factors which can create a combined 'cocktail' effect greater apparently than the sum of its parts, putting the pilot into a situation that requires skills that he or she hasn't got or turning the pilot's rational brain seemingly to porridge (mental overload)

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and creating an irrational response to the situation. Either often leads to disaster. A particular pilot might be able to handle a demanding-handling aeroplane on a good day, but add a combination of one or more negative factors such as an unfamiliar strip, a crosswind, a frightened passenger, a misfiring engine or a different EFIS format, or a door that comes unlatched in flight, and statistics show that things can very soon get out of hand. Risk mitigation is all about reducing the number and severity of the things that might stack up against you. The risk assessment table provided in Appendix 1 shows one model of how the combined effect of different factors might be totted up.

Another essential point is to LEARN THE AIRCRAFT'S SYSTEMS. There probably isn't a pilot's operating handbook describing all the systems, so you will have to cast more widely for information. Don't assume, especially if it is a homebuilt, that the systems are the same as other examples of the same basic type, for no two homebuilts are alike. Be prepared to trace out the run of fuel pipes, vent lines, wiring, control cables and suchlike to work out just how this particular example has been plumbed, wired and rigged. If it has a retractable gear, consider having the aircraft jacked up to get used to the operation of the undercarriage, including the emergency systems. There's many times an aircraft has been belly-landed (or worse) for the lack of a simple piece of knowledge on the pilot's part.

Even for aircraft suited to farm strip flying, we particularly recommend against operating into and out of a narrow farm strip until experience has been gained operating the aircraft over a reasonable period of time and under a variety of different weather conditions from an airfield with more space to play with, decent approaches and some safety margin should the aircraft run off the side of the runway. Even nosewheel aircraft can get into trouble in this way, particularly if a brake starts to drag, the crosswind gets up during the flight or if there's the slightest cross-slope on the runway. If it's a taildragger, assume that during your familiarisation period you will go off the side of the runway at some point – if that means encountering a ditch, fence or a ploughed field, consider the likely consequences.

It's also worth considering what will be appropriate flying clothing when you transition to a new type. There's a certain satisfaction, bordering on smugness, that comes with being able to fly frequently, which can drive you in the direction of wanting to fly in everyday clothes to emphasize the ordinariness and accessibility of the experience. This is misplaced, for flying frequently makes it more, not less, important to take all possible safety precautions to keep your overall life 'risk index' under control. A casual attitude to clothing is something to resist - proper choice of garb can make a significant difference to safety as well as comfort. The cockpit of many modern production light aircraft are decked out like cars with padded upholstery and smooth panelling hiding 'the works', but many microlights, homebuilts, vintage and ex-military types lack such creature comforts, presenting the pilot with enough hard edges, bolt ends, pipe fittings, levers and springs to give any health and safety expert kittens. Moving parts of the control systems may be exposed, ready to snag on loose clothing or to be jammed by coins and suchlike dropping from unzipped pockets. For this type of aircraft, wearing a flying suit makes sense as a means of mitigating these risks.

No one likes to contemplate the effects of a fire in a small aircraft - the terrible complications you can suffer from wearing everyday synthetic clothing in a fire are well known. Many flying accidents would likely have had much less serious outcomes if the pilot and crew had been wearing fireproof flying suits rather than normal clothing. Checking out on a new type might just signify your transition to flying those types of aircraft that merit wearing a flying suit, or as the trigger for making this change when it's already overdue. Likewise, particularly with the more exotic types such as Formula One racers, aerobatic, ex-military or open cockpit aircraft, should you be wearing a bone dome? Numerous studies show the life-changing benefits of doing so. Even many 'regular' LAA types have instrument panels that you'd not want to head-butt in a crash, and particularly if engaged in the more dangerous kinds of operation such as farm strip flying into challenging sites, a lightweight crash helmet would be far from out of place.

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A parachute ? This is going too far, surely ? But in fact there are some LAA aircraft that have seats configured specially to fit a parachute, (eg Chipmunk) where it would be impractical not to wear one – so your brief needs to include how to strap it on properly – if by chance you had to actually use it, you'd not want to find it was on upside down, after all ! Watch out also for aircraft (usually gliders) with recesses in the seat back to take a back-pack chute – you might think that flying one of these without a chute would be just uncomfortable, but sadly doing just this has caused pilots to break their backs in what would otherwise have been modest heavy landings – not properly supporting the lower part of your spine can be fatal in any kind of downward impact.

The checklist shown in the Appendix 2 to this TL is included as a quick means of running through relevant issues when preparing to be checked out on a new type, allowing the pilot to think over the means to mitigate as many risk factors as possible. Some of these relate equally to any flight, really, but are worth emphasising when flying a new type, both to maximise safety and allow you to concentrate on the learning experience and enjoy the flight without that niggling fear of some important detail perhaps having been forgotten.

AS described above, familiarisation will have started with a research phase, taking time to absorb as much as you can about the aircraft and its foibles. If you can, do your research and get a chance to sit in the aircraft a day or two before you first fly in it, so that you have time to assimilate what you learn and fix it in your subconscious. Sitting in the cockpit, it's well worth spending as long it takes to memorise the position of the controls and indicators so you can put your hand on each one without having to think about it or read the label. Be especially careful of aircraft with ergonomic traps waiting to catch you out, like for example, the cabin heat and the mixture push-pull controls having identical knobs located next to each other on the panel. Make sure you understand the fuel system and how it is supposed to be used, and even such apparently mundane things as which end of the fuel selector knob is the pointer and which is the handle – we still see aeroplanes where this is ambiguous, despite it being a known 'gotcha'.

If the engine Ts and Ps, or the ASI aren't marked with coloured cautionary ranges and limits, it helps to study the gauges beforehand and make sure you can picture in each case where the needles would be pointing on the scales at, say, the RPM 'red line' or the Vne. Otherwise, in flight it's easy to misread unfamiliar instruments with, for example, combined scales in knots and miles an hour, or confuse Fahrenheit and Centigrade scales. Check whether the gauges are calibrated in the same units as the limitations in the POH, or Permit operating limitations document – if not you'll need to make some conversions – again, best done before flight rather than doing mental arithmetic while airborne.

Once the aircraft's out on the field, an important point to check, especially with taildraggers, is the 'picture' seen from the cockpit – in particular the attitude (where the horizon cuts the engine cowling) and height – you don't want to land the thing ten feet up or to touch down before you've rounded out. Burn that picture into your brain so it's there when you come to make your first landings. If it's a taildragger, It's not a bad idea to sit in the cockpit and absorb the picture when the aeroplane's in the level attitude too, to get the right position for the latter stage of the take-off run and know roughly what to expect when in level flight. Have the tail lifted on a stable trestle or what-have-you so you can absorb the new perspective at leisure.

As to the content of the familiarisation flights, it's important to explore not only the primary effect of the controls at different speeds but very importantly, the secondary effects too. Learning to bank the aircraft right and left while keeping the nose on a set heading and the slip ball centred is a very quick way to get your feet accustomed to the amount of rudder needed to counter adverse yaw with aileron, best started off at cruise speed and then explored at the approach speed which tends to exaggerate the effect. Being able to keep the

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aeroplane in balance when turning helps greatly in reducing the likelihood of an in-flight emergency leading to an inadvertent stall/spin.

The behaviour at different power and flap settings may differ markedly, and the trim changes should be explored when changing flap and power settings. Some aircraft pitch up when the flaps are lowered, others pitch down. Aircraft with unusually high propeller thrustlines (seaplanes and pod and boom types, typically) naturally tend to nose down as you increase power and nose up when power is cut back, which, until you get used to the characteristic, can have a dramatic effect during a go-around (you may have to apply a significant backward stick force to prevent arcing down into the ground) and also if the engine should fail on take-off, when the unwanted pitch-up effect exaggerates the inevitable rapid loss of airspeed and high stall/spin risk.

Any familiarisation flying should include a look at the pre-stall warning and stall characteristics of the aeroplane. It's well worth getting the feel for the aircraft in the approach configuration at altitude, rather than during your first actual approach on type – not least because, particularly with manually operated flaps, you don't want to be getting the knack of working the flaps and coping with the resulting trim changes when you're at a low height or when concentrating on following a prescribed approach path and trying to keep a look-out for unannounced circuit traffic.

Naturally, essential elements of any familiarisation flying are the unavoidable take off and landing elements of the flight. To begin with, it's sensible to make it easy on yourself by only choosing conditions which are near-on ideal, without any troubling crosswind to cope with, a relatively quiet circuit etc. But remember that if your familiarisation training is only undertaken in ideal conditions, there's still a lot to learn about how to cope with it in everyday use when conditions are more challenging. If you were a concert pianist, you'd not want to try to play the difficult twiddly bits of a concerto for the first time during your first live public performance, but as pilots we do tend to find ourselves committing to that first serious crosswind while arriving at a fly-in where the weather has turned out worse than expected at our destination, and we haven't the patience (or the fuel) to turn tail and return to base. All the more reason to practise cross wind landings as part of your familiarisation flying before straying away from base, but always keeping a nearby alternative into-wind runway in mind in case it turns out to be more challenging than you expected.

Some aircraft behave markedly differently depending on how they are loaded, and with these types the familiarisation flying should include a representative variety of different load conditions. The RV10 for example 'feels' quite nose heavy when flown with the rear seat empty, and needs a strong 'pull' in the flare to land. In total contrast, fully loaded, the rearward shift in the centre of gravity makes it much more sensitive to the elevator and a gentle touch is needed in the flare to prevent it ballooning. This is where a careful prior study of the weight and balance schedule helps understand how much the centre of gravity moves with variations in loading – four-seat, and tandem two seaters being particularly susceptible. With typical light aircraft layouts, CG shifts more than an inch or two create significant handling effects, just as weight increases affect performance and stall speeds. Your familiarisation training isn't complete if you've not yet explored different load cases.

If the aircraft you're checking out on is a homebuilt or vintage aircraft, even though the aircraft has a Permit to Fly, the test flying carried out up to this point will probably have only brushed the surface of what there is to learn about it and there may be precious little down on paper charting its performance or describing its characteristics. Consider getting to know the aircraft further by carrying on the good work by exploring such things as the rates of climb at different speeds and weights, the cruise fuel consumptions at different power settings and altitudes, and the distances required to comfortably take off and land at different weights. All this information will help you operate the aircraft more efficiently in the future and understand just what it can – and can't – do. The time to find out what distance your aircraft needs to take off isn't after

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landing at a short airstrip ! Consider creating a set of pilot's notes with performance charts to express this data – after all, it's cost a great deal of time and money getting to this stage so it doesn't make sense not to have any meaningful performance data to go with the aircraft.

Above all, remember that a type conversion isn't just a few minutes of upper air work followed by a single landing. Even once you get to the stage of soloing your pride and joy, that's only the first stage of the learning process – to be proficient you need to learn how to handle it under all sorts of different conditions.

Differences Training

Features which, when first experienced require differences training under EASA regulation and the UK Air Navigation Order are:

- turbo-charged or super-charged engines
- variable pitch and constant speed propellers
- tailwheel undercarriage
- retractable undercarriage
- cabin pressurisation
- EFIS
- single power lever control (SPLC)
- microlights

Additionally, for the UK National Private Pilot's Licence (NPPL) SSEA class rating, differences training is required for aeroplanes with a cruise speed in excess of 140 knots indicated airspeed.

Differences training requires the acquisition of additional knowledge and training on an appropriate training device or on the aircraft. Differences training requires both ground and flight training and must be endorsed as having been completed by a suitably qualified Flight Instructor or Class Rating Instructor.

While the concept of differences training is a good one insofar as it recognises the additional training required to deal with particular aircraft attributes and systems, difference training in a particular attribute should not be regarded as giving carte-blanche access to all aircraft with that particular feature. For example differences training carried out on a constant speed propeller that's hydraulically controlled won't give much read-across to operating common types of electrically controlled constant speed or variable pitch propeller. Tailwheel training on a Jodel or Emeraude, both of which have a fairly 'flat' ground attitude, won't cover a lot of the points that would be involved in dealing with a Tiger Moth or Stampe, where a three point landing involves reaching the full stall attitude. The manually operated retractable undercarriage on the Monowheel Europa, which is mechanically connected to the flaps, has quite different issues to the hydraulic, pneumatic or electrically operated systems used in most retractables. Turbo-charger installations vary widely and may be very different in a certified Lycoming or Continental than in a Rotax.

Training should include both normal and non-normal operation of these differences. Where only familiarisation training is required, a pilot should take time to consider the non-normal aspects and review any associated checklists and procedures.

As ever, the LAA Pilot Coaching Scheme is provided by a team of very experienced pilots happy to take time with pilots wishing to differences training, convert to a new type, or just to brush up on their flying skills. All LAA coaches are either FI or CRI, and most have completed all differences themselves applicable to LAA types, so they can provide your differences training or familiarisation training - though naturally, before doing so they will need the opportunity to fly the aircraft sufficiently to familiarise themselves with the individual aircraft concerned.

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Microlight flying

In the early days of microlighting the CAA used to allow the holder of an SEP class rating to operate any three axis microlight. However, as the CAA have recently affirmed, pilots holding a UK PPL or EASA PPL must now carry out differences training before flying a microlight, this is applicable to the SEP class rating, not the SSEA class rating. Pilots holding a UK NPPL with SSEA class rating must obtain a microlight class rating before acting as PIC in a microlight, they can't just complete differences training in microlights and then go and fly a microlight as PIC. (Jon Cooke, LAA's Head Coach, explains that this is because, for the NPPL only, the class ratings are mutually exclusive. Therefore the SSEA class rating does not include the microlight in the same way as a SEP class rating, and the NPPL holder must obtain a microlight class rating in accordance with CAP 804 Section 5 Part A Appendix 1 or the guidance on the NPPL website).

Remember, the LAA Pilot Coaching Scheme is there to help ! There's a whole team of very experienced pilots available to help you transition to a new type.

Further Reading

For a more in-depth treatment of this subject we strongly recommend the FAA document AC90-109A 'Transition to Unfamiliar Aircraft' which can be downloaded here:

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-109A.pdf

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APPENDIX ONE

RISK ASSESSMENT TABLE FOR FAMILIARISATION FLIGHTS

How do you score ?

Answer the questions and ring the corresponding numbers in the two right hand columns.
Total up the ringed numbers in the two columns to come up with your risk score.

11 KEY QUESTIONS - ARE YOU.....	Yes	No
Experienced on similar types of aircraft in the same class ?	+5	-1
Experienced on many different types of aircraft of other classes ?	+1	-1
In frequent current flying practice ?	+1	-1
Focused, free from health problems, business and domestic worries ?	+1	-1
Wearing optimum flying kit ?	+1	-1
Familiar with the airfield and its procedures ?	+1	-1
Good weather ?	+1	-1
Familiar with engine type ?	+1	-1
Familiar with instrumentation (EFIS etc ?)	+1	-1
Do you have experienced, supportive crew ?	+1	-1
Free from audience ?	+1	-1

Total risk index	
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+15 = low risk
-11 = very high risk

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APPENDIX TWO

FAMILIARISATION PRE-FLIGHT CHECKLIST

Does the aircraft type have any special features to be aware of, eg complex retractable gear, complex electrical system, unusual layout ?	
Does googling on the aircraft type and a review of available magazine articles and other literature yield any useful information about the history of the type, and its characteristics. If this was the Mk1 how did the Mk 2 differ ?	
Does the type have an accident history ? (5 minute search on AAIB website)	
Have you read the POH ? Do you know the operating limitations, Ts and Ps etc ? Has the engine any special operating procedures, eg carb heat, rpm avoid band, slow acceleration ? Normal speeds to be flown, engine settings ? Aircraft handling issues or special procedures ?	
Do you have an appropriate pilot license and up-to-date medical ? Do you need additional differences training for any complex features of this aircraft ?	
Have you flown aircraft in this class before with a similar weight, wing loading, performance and layout ? Are you familiar with the engine type ?	
Have you familiarised yourself with the controls, and the operation of EFIS or other complex equipment so that you can operate it inflight without it causing a distraction ? Similarly for any alarms or warnings, emergency systems etc.	
Have you checked that the aeroplane's Permit/CofA is valid and in date ? Aircraft insurance in place and covers you as PIC on it ?	
Have you checked the weight and balance and made sure you'll be in limits ?	
Do you need special flying kit, for example a flying suit or helmet ?	
Is a headset or crash helmet necessary, and if so, if electric is it compatible with the aircraft intercom and mic/tel sockets ?	
What will be your source of fuel and oil ?	
What are your fuel state requirements ? What will be your safe endurance ?	
What weather minima apply ? Crosswind limit ?	
What runway(s) are available and are they suitable ?	
What comms are available ?	
What are the airspace limits ?	
If you're unfamiliar with the airfield, do you need to liaise with the tower beforehand to find out if the airfield has any special procedures you need to be aware of, noise abatement, soft ground etc ?	
If you being checked out by another pilot, is he or she suitably qualified and themselves experienced on type ?	
If flying with another pilot, is it clear whose to be P1 for the flight and have you discussed the protocol to be followed when transferring control between one handling pilot and the other ?	
Do you (and your instructor, where applicable) have a plan as to what you're going to do, and pre-briefed accordingly ? Kneepad notes prepared ?	