

INITIAL TEST FLYING OF LAA AIRCRAFT

FLIGHT TESTING

The following points cover a number of issues broadly on the subject of flight testing LAA aircraft. It is aimed at amateur builders whose aircraft are coming close to initial 'roll out' and the experienced LAA pilots who are called upon to get involved in the testing process.

Where to base it

There has been a disturbing trend recently for owners of newly built or restored aircraft to carry out the final assembly at farm strips, and have the initial test flights carried out from the strip. Please think carefully before going down this road because farm strips are not required to meet any safety standards and many are quite unsuitable for test flying, especially for faster types or those with small wheels intended mainly for flying off hard runways. While the local farm field may be desirable from cost, privacy and convenience considerations, owners need to be aware of the increased danger in flying an untested aeroplane from sites which are cramped, have only one runway, poor runway surface, difficult approaches etc. Even brand new modern engines from time to time suffer problems with overheating, dropping oil pressure, fuel vapour lock, rough running etc on first flights due to minor variations in the engine build or (more commonly) installation, and it is not unusual for first flights to have to be cut short almost immediately, with no option of a go-around from the first landing approach. With these kinds of difficulties to contend with, the last thing the pilot wants to be faced with is a land-back onto a short strip surrounded by trees and farm buildings, and possibly out-of-wind. Having a large airfield with multiple runways and clear open space all around takes the majority of the risk from such in-flight emergencies. Ideally the runway length should be sufficient to take off, level and land straight ahead on the runway if a problem develops on first lift-off - you don't want to be committed to a circuit or an out-landing if anything drastic should happen when the aeroplane first reaches flying speed. Remember, aircraft have been landed in ploughed fields and wrecked through such trivial problems as passenger seat harnesses flapping outside doors.

Another consideration is the amount of other air traffic. For the first flights it will be best to avoid an airfield with continuous tyro circuit traffic and radio chit-chat to contend with, or pick a less popular time of day when the circuit is quiet. The pilot needs to discuss his intentions with the people in the tower, let them know that it is a first flight and that he may have to adapt the circuit size or pattern to suit the needs of the moment. If it is an open cockpit aeroplane, warn them that radio communication may not be as clear as they are used to (euphemism for unintelligible). If the airfield operators absolutely insist on your using a circuit that takes ten minutes to fly round, go elsewhere - the pilot needs to keep within gliding distance of the field on the first flight, and feel the aeroplane out in the airfield's overhead, especially if the surrounding areas are built-up.

Another consideration is that there be rescue facilities on hand to help out if anything should go wrong. Fortunately it is almost unheard of to need the airfield or local firefighters, but the possibility nevertheless exists. Much more likely is that some minor emergency will occur where you need help on hand - for example if the engine stops on touchdown leaving you stranded in the middle of the runway, it will be a great help if there is someone on the scene with a suitable tow vehicle and tow rope. If you do end up flying from a farm strip, it goes without saying that at the very least there should be a responsible and properly briefed person on the ground who knows how to open your cockpit canopy, with a vehicle, basic tools, mobile phone and fire extinguisher to hand.

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It is also important to ensure that the airfield has adequate facilities for working on the aeroplane if problems should arise or adjustments are needed. That means access to a well lit indoor space with a proper floor and bench space. It will be no good trying to do jack the aeroplane up on a dirt floor, for example. On the other hand a friendly airfield blessed with an active LAA community will be better than one with acres of immaculate hangarage, rows of bizjets and a 'no private maintenance' rule!

For the initial flight tests of a new homebuilt or restoration, ultimately LAA Engineering have the final say as to whether the test site is suitable or not, as the base airfield has to be stated on the flight test authorisation document. In their excitement, owners do tend to fixate on the prospect of seeing their new aeroplane airborne and take an awful lot of convincing that the site they have chosen is inadequate. Even it means taking the wings off the aeroplane and trucking it somewhere more suitable, the aeroplane has taken a great time and money to build so it's not worth taking needless extra risk with it at this stage. It will be an awful shame to wreck your brand new pride and joy aeroplane for the sake of a few pounds extra hangarage fees.

Flight Test Area

Typically, LAA Engineering specify that the aircraft is only authorised to fly within a 25 Nm range of its base airfield during the test program. It is possible to specify more than one base airfield as long as they are not too far apart, and allow transit between sites at will. The aim of specifying a test area is to keep the aircraft within a reasonable distance of base so that it can return if problems arise. Having said that, there is no prohibition on out landing at other airfields within the flight test area during the test program, at the pilot's discretion. We do not want to encourage the pilot to struggle back to base with a failing engine, or whatever, if there is a perfectly suitable alternative field close at hand.

Choosing your Pilot

The choice of pilots for carrying out test flying is another issue where owners put forward their suggestion and LAA Engineering have to vet the proposal, based on the previous flying experience of the person put forward, currency on aeroplanes of the type concerned, or at least, similar or related types. LAA provide a simple 'check pilot application form' for this purpose.

Fortunately, several highly experienced industry test pilots make themselves available for the more specialised test flying tasks such as the evaluation of new types and major modifications, and these people also do a number of the more routine 'first flights' on already-accepted types of aircraft.

A great many 'first flights' are also done by local pilots known to the builders such as the local club QFI, but remember that many instructors have had little or no exposure to LAA type aircraft and that thousands of hours instructing in a PA28 or C152 will not cut any ice when it comes to flying an aeroplane with quite different handling such as a lightweight taildragger or a high performance 'hot ship'. You need to find an instructor with experience on a wide variety of types, ideally including the exact one you have built. Ideally you would arrange for the pilot to have some familiarisation flying on another example of the type based locally, but this is not always possible especially with a rare type of machine.

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Sometimes builders choose to put forward the owner of another aircraft of the same type to do their test flying. This would suggest a degree of currency and familiarity with the type, but be careful because owning an aeroplane does not ensure competency to fly it. Sadly, many amateur pilots do not have the opportunity to keep properly current or keep in practise with emergency procedures, PFLs etc and a surprising number are not even happy to stall an aeroplane past the point of the first tweet of the stall warner. Remember, by its very nature things may go wrong on a test flight so you need to choose a pilot who will not be phased by one or more snags developing such as an ASI that does not work, cockpit filling with fumes etc. At the end of the day this is where the right choice of pilot may make the difference between a list of snags to sort out and a grovelling letter to your insurance company, or worse.

When choosing the test pilot you need to bear in mind not only whether the person is going to bring your aeroplane safely back in one piece, but also whether he or she is going to be competent to judge whether it is flying properly or not, tell you what adjustments need doing and report accurately in writing on how it performs. The whole point of the test period is to get the aeroplane fine-tuned so it will handle properly in normal use later on. The pilot who shrugs off any defects as trivial, or doesn't notice that the aeroplane isn't flying properly will do you no favours in the long run. An aeroplane which isn't properly rigged or carrying a whole list of defects is a lot less fun to fly than one where someone has gone to the trouble of getting everything 'tickety-boo'.

Commercial Arrangements

The CAA have clarified that it would be illegal for a pilot flying on a PPL or NPPL to charge for carrying out test flights on light aircraft. This includes pilots involved commercially in the manufacture or repair of aircraft, and also LAA inspectors involved in permit renewal or initial flight testing. While it is quite in order to charge for working on the aircraft, preparing the flight test paperwork, writing out the flight test report, travelling expenses etc, no specific charge can be made for the actual flying of the aircraft unless the pilots has a commercial license.

Test Crew

It is illegal to carry passengers on a test flight. LAA policy is not to allow anyone other than the pilot to be on board during the initial flight. Once the aeroplane has been shown to be broadly behaving itself it is acceptable, legal and often desirable for a second crew member to be carried for the purpose of acting as a flight test observer, helping the pilot by managing the test schedule and recording the results in conjunction with the pilot. The crew member can only legally be carried where there is a genuine need however, he cannot go along merely for a 'jolly'. While there is no reason why the pilot shouldn't let the crew member handle the controls in flight if this helps complete some part of the test process, it is not permissible for the aircraft to be flown for the purpose of 'checking out' the crew member while it is only cleared for test flying.

Insurance

These days of course, it is mandatory to have a sufficient level of third party and (single seaters apart) passenger liability insurance in place before any UK registered aircraft flies. Make sure that the details provided to the insurance broker are precise with regard to such things as pilot experience, age etc as there have been cases where insurers have refused to pay out after an

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accident because of apparently quite trivial inconsistencies, for example the pilot only having 1400 and something hours flying experience rather than the 'rounded up' 1500 hours as stated. The CAA also now require owners to send them details of a new aircraft's insurance paperwork before the aeroplane makes its first flight. This obligation is promulgated via the standard letters sent out by the CAA when they issue a new UK registration, and also by the LAA in the letter sent out with initial flight test authorisations.

Flight Test Program

LAA Engineering normally specify a minimum of five hours flying on a newly completed or rebuilt aircraft, to establish a level of reliability. It may well take longer than this in practise, especially with a complex or troublesome machine. Sometimes LAA specify longer test periods, for example when testing a new type of engine, propeller or exhaust system.

The first task with test flying is to ensure that the aeroplane is basically flyable, the engine doesn't overheat, essential instruments work etc and that it is safe to take it out of the aerodrome circuit. Having reached that goal (which may take a number of flights, or be achieved straightaway), the next part is to get the aircraft properly set up and trimmed and check each of the systems, make any adjustments etc. When all is in order, the final stage is to go through the LAA test schedule and fill out a flight test schedule form.

If the aeroplane is modified then a special narrative report is often called for, describing the findings with the modification, any difficulties experienced, compliance with normal airworthiness requirements, adjustments or caveats. Often the test pilot will point out snags with the modification which need to be sorted out before he is prepared to endorse it for LAA acceptance of the modification.

LAA Engineering have put together a completely new flight test schedule for evaluating newly-finished homebuilts, vintage aircraft and repaired and rebuilt aeroplanes. The new form has been introduced to address the fact that many LAA aircraft are very much more complex than in the days when the Luton Minor and Druine Turbulent were the norm, and include features like retractable undercarriages, electric flaps and constant speed propellers. The test form also looks for much more detailed evidence of satisfactory engine cooling and mixture settings than previously, calling for a five minute climb with readings taken every minute, and a more thorough investigation of the stall characteristics and speeds in each configuration. Separate schedules have been drafted to deal with testing specialised kit such as wing levellers and altitude hold, and also to deal with aerobatic testing and propeller changes. The new forms draw on the experience of Andy Draper, our Design Engineer, who has test flown a great many aircraft in his previous connection with the Europa project and has since been heavily involved with testing recent developments on the Tecnam Sierra.

The new schedules are considerably more complex than previously, the basic form having stretched from four sides of A4 to some fourteen sides. This means that it is more than ever important for the pilot to read through the schedule in detail before agreeing to take on the task. If he is the sort of person who has a natural dislike of forms, this is the time to decline the job, rather than get frustrated later. The first step is to enter in various details from the aircraft pilot's operating handbook or engine manual (e.g. engine operating temperature and pressure limits) so that the pilot can familiarise himself with the allowable operating limits when in flight.

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The number of things which the flight test schedule calls for to be checked means that the task probably needs to be spread over more than one flight. Unless he has a very steady hand in flight, the pilot will want to copy the form, fill it out in rough in the air and copy it out neatly later.

Flight Test Records

It is important that records are kept of all flights during the test program in airframe and engine logbooks of the CAA approved type. Where an inflight-adjustable, variable pitch or constant speed propeller is fitted, a propeller logbook is also required. Custom logbooks for LAA aircraft are also available from the LAA booklist. These are particularly recommended because they include the special permit flight release certificate wording appropriate to LAA permit aircraft. CAA style (available through Pilots' shops such as Transair) are intended for C of A aircraft can be used but can be altered for permit aircraft use by adding specially-worded stickers, available from LAA Engineering.

The logbooks need to be marked up with suitable entries relating to any maintenance or adjustments carried out during the flight test program, and all entries signed up by the authorising person, either the pilot/owner (for simple maintenance within the scope of pilot maintenance tasks as defined in LAA document LAA/PM) or for more complex tasks, the LAA inspector who must inspect the work, sign it off in the logbook and certify the work with a Permit Maintenance Release (PMR) either entered in the logbook or on a separate worksheet, cross-referenced in the logbooks.

On Completion

On completion of the flight testing, the flight test reports are sent to LAA Engineering along with copies of the pages of the airframe logbook covering the flight test period. Owners should keep a copy of the finalised flight test report for their own records, and in case LAA Engineering should raise any queries or seek further clarification – we may not be able to read your writing, for example, or some of the entries may have been missed out, or put in the wrong boxes. A common source of delay is when the flight tests have not been carried out with the aircraft anywhere nears maximum gross weight, or outside cg limits, in which case relevant parts of the tests have to be re-flown.

Once all is agreed by LAA Engineering, and there are no outstanding issues, the LAA Engineering staff will be able to make the application to the CAA for the issue of the full Permit to Fly. Once that document has been issued, the aeroplane may be flown freely, restricted only by the conditions and limitations specified on the Permit to Fly and associated LAA 'Operating Limitations' sheet and the validity period stated on the Permit's Certificate of Validity.

Now the fun can really begin! But hold on a minute – before flying the aircraft yourself, please remember that the LAA Pilot Coaching Scheme is there to get you up to speed with flying the aircraft and get the most out of it. After all that trouble taken testing it, we don't want to see it (or you) damaged!