

## INTRODUCTION

One of the privileges of operating under an LAA Permit to Fly is the freedom it grants the owner to design modifications and have them approved by LAA Engineering rather than the CAA.

Prototype mods are treated as one-off modifications applicable only to the aircraft referred to in the application. If the modification is simple and/or sufficiently repeatable, members may apply to incorporate an already-approved Prototype mod on subsequent aircraft as a Repeat mod (see [TL 3.07](#)). Where a modification has very straightforward instructions for embodiment, they can be converted into Standard Modifications which are then published on the LAA's [website](#). Owners need then only follow these instructions precisely, often with no need to involve LAA Engineering.

For Prototype modifications, an initial modification proposal form ([LAA/MOD2](#)) is used to enable applicants to outline the basic principles of the change and submit to LAA Engineering for assessment. A unique number is then assigned to the mod which is used for all future correspondence. If the proposal seems viable, the applicant will then be invited to submit further, more detailed information.

The LAA's role in the process is firstly to understand the detail of what is proposed and secondly to verify that the airworthiness of the aircraft to which it is applied is not adversely affected. It is important therefore to ensure that any drawings and descriptions are clear and understandable: remember the LAA Engineers do not have the aircraft in front of them. It is also important to think about how aspects of the airworthiness may be affected by the proposed change. This includes ensuring the strength reserves are maintained and that the performance and handling are not significantly degraded. Whatever the modification, it should be coherently presented and supported with justification from the applicant as to why he or she considers that the aircraft will still be as safe as it was before the modification was fitted. Full details of what is being fitted/modified, where and how must always be included.

We are well aware that many builders may have little experience of the paperwork side of aircraft design, this but this need not be a problem. Included is a list of individuals who are keen to carry out design work on LAA aircraft and who might be able to help with detailed drafting or stressing of your mod if required. Unfortunately, LAA Engineering is unable to create mod descriptions or substantiation on behalf of applicants. This would not only overwhelm LAA resources in a way which would be unfair to other members, but it would also compromise the LAA's regulatory responsibility to independently check design submissions.

You will need to discuss your ideas with your inspector before submitting the initial proposal: he or she will often be able to give sound advice and help you avoid common pitfalls. There is usually then a period of correspondence with LAA Engineering to establish if the mod is viable and clarify the definition and substantiation activities. It is important to wait until you obtain approval from LAA Engineering before permanently installing the mod to your aircraft. This will avoid costly re-working if we subsequently find the proposal unacceptable and will also avoid your aircraft being unnecessarily grounded: once the aircraft is modified, it mustn't be flown until LAA Engineering issues permission to test or approves the modification. The drawings and calculations submitted by you will form the basis by which your inspector can eventually sign off the workmanship and conformity of your mod. For this reason, it's very important that you retain copies of all the application forms and correspondence between yourself and LAA Engineering and have them available for your inspector to consult.

It is also normal to expect modifications to have been approved by the original designer of the aircraft – most homebuilt designers are happy to look at other builders' suggestions and pass comment. Designers are naturally upset if they find examples of aeroplanes flying around bearing their names as designer but the aeroplane looks nothing like what they drew in the first place and they have had no input in the design of the modification.

For changes to engines and/or propellers, refer to [TL 3.02](#).

For avionics installations, refer to [TL 3.03](#).

For repair approvals, refer to [TL 3.05](#).

For Standard Modifications, refer to [TL 3.06](#).

For Repeat modifications, refer to [TL 3.07](#).

For details of where modification approvals aren't required, refer to [TL 3.10](#).

## CHARGES FOR APPROVAL OF MODIFICATIONS

Provision of services such as this where Engineering resources are deployed to support a specific LAA member are subject to additional fees. These are published on the website ([www.laa.uk.com](http://www.laa.uk.com)) and in each issue of *Light Aviation*. There is no fee payable on submission of the initial modification application (form [LAA/MOD2](#)); subsequently, however, a fee is chargeable depending on the amount of engineers' time spent approving it. Following the initial assessment, LAA Engineering will advise you of the likely number of hours that will be required to approve the modification and invite you to submit further information and the initial fee (the greater of £60 or half the estimated cost). At this stage you'll be given the opportunity to stop the application from going any further at no charge. Once further work starts, you'll be charged a fee even if you subsequently abandon or cancel the modification.

All applications attract a minimum fee of £60 which covers up to 2 hours of engineers' time. Subsequent hours are charged at £30/hour, in £10 (20 minute) increments. We'll keep track of engineers' time spent to the nearest 5 minutes, but the final charge will be rounded down to the nearest 20 minutes. For instance, if we logged 4:35, we'd charge  $4 \times £30 + 1 \times £10 = £130$ .

Any outstanding fees must be paid before final issue of the modification approval. All fees should be paid via the LAA's webshop using your aircraft registration (or serial number if a registration is not yet issued) and mod number as the reference, e.g. 'G-ABCD 14100' or '009-12345 14100'. If LAA Engineering becomes aware that the modification will take significantly longer than initially estimated, this will be communicated to you as soon as possible.

At the Chief Engineer's discretion, fees may be waived or reduced if the modification is clearly of great benefit to the wider membership, e.g. a design change that resolves a significant safety issue that otherwise grounds a number of aircraft.

If you convert your modification into a Standard Modification leaflet of an acceptable standard, then LAA will refund you the difference between the total fee for the modification and the initial fee (e.g. if the total fee for your modification was £100, we will refund you £40). Note that not all modifications will be suitable for converting into Standard Modifications and LAA Engineering should be consulted before starting to draft a Standard Modification leaflet. The website gives examples of the quality of leaflet required.

## THE PROCESS FOR APPROVING A MODIFICATION APPLICATION

Essentially there are two stages to a mod application. The first step is to outline the basic proposal on an [LAA/MOD 2](#) form. LAA Engineering aims to review this proposal within a month of receipt. If it is agreed as feasible, you will be provided with an estimate of the engineering hours expected to complete the project. If you decide to proceed, you will be asked to provide a full description on an [LAA/MOD 3](#) form along with the initial application fee: you will be advised as to what this fee will be. There usually follows an exchange of correspondence to clarify the details and recommend any changes. Once all issues have been resolved, including any inspections or ground/flight testing, you will be advised of any outstanding fees due. A modification approval note will then be issued which you will need to retain with your aircraft's records. The flowchart in Appendix 1 illustrates the typical process.

Note: once an aircraft has been modified, it may not be flown until it has been approved. In the case of a Prototype mod, this requires LAA Engineering to either issue a PFRC to enable flight testing or a mod approval document. In both cases, an inspector needs to sign a PMR in the aircraft's logbook before flight, having checked the modification for conformity with the modification details, audit of work carried out and satisfactory form and function.

## CHECKLIST FOR AIRCRAFT MODIFIERS

Owners should bear in mind that modified aeroplanes will inevitably take longer to have their Permit-to-Fly issued or reinstated than aircraft which are 'standard', due to the fact that they need detailed study by LAA Engineering rather than simply a routine paperwork check. This may prove a major irritation when your aeroplane is ready to fly but you have to wait for weeks or months to be granted clearance to fly it.

It must also be said that many times we have come across cases where, at the end of a long (and sometimes surprisingly expensive) process of getting a modification tested and accepted, the builder concludes that the aeroplane's designer knew best after all and he should have left the design as standard. Builders who do not have aircraft design experience should remember that aircraft designers do!

Care should be taken when considering applying for a modification, to prevent falling into a number of common pitfalls. Here is a simple check-list to use before starting to seriously consider applying for a modification to your aircraft:

1. The major consideration, certainly before considering making major aerodynamic or structural changes, is whether you feel it is wise to second-guess the aircraft designer. For example the designer may not have added an inspection hole in the structure to look at a control idler for a very good reason. Would this hole interrupt a major structural component? Remember that very little of the aircraft structure is there for no reason.
2. Will the proposed modification take the aircraft over its gross-weight with the maximum number of occupants on-board, even with minimum fuel?
3. Will the modification take the aircraft outside of its centre-of gravity envelope in any sensible loading conditions? Degradation of an already critical centre-of-gravity range is obviously a bad idea.
4. Will the proposed modification hamper construction further along the line? You definitely want to avoid starting a chain of extensive modifications simply because of a minor modification in the first-place.
5. How easy will the modification be to analyse and/or test? The worse the basic design of a mod scheme, the more expensive will be the analysis to prove it adequate or not. If the design is bad, then the analysis cost will probably be wasted proving it so.

To substantiate a modification it is usual to have to show compliance with the requirements of an appropriate design code, e.g. BCAR Section S (microlights), CS-VLA (aeroplanes) and BCAR Section T (Gyroplanes), and with normal aviation practice for the aircraft category in question. Modifications should therefore be designed to meet these standards from the start. These design codes can be downloaded from the links from the LAA web site ([www.laa.uk.com](http://www.laa.uk.com)).

The level of detail provided in the form LAA/MOD3 should enable someone to replicate the modification on another aircraft. This means that all the nuts, bolts, wires, rivets, etc, need to be specified and sufficiently detailed sketches/drawings/marked up photographs included to show where and how each item is installed. Materials, dimensions and processes (e.g. the type of welding process used) also need to be provided.

Pilots undertaking any check or test flying need to be suitably experienced for the task in question. Where no adverse effect is anticipated on aircraft handling or performance, then a pilot with a minimum of 100 hours Pilot in Command and at least 10 hours on type (or similar type)

will generally be permitted to perform the checks/tests. Where there is a more significant effect on the aircraft, the LAA may require a more experienced pilot or one with particular skills.

## EXAMPLE MODIFICATION SUBMISSIONS

Appendix 2 gives an examples of forms LAA/MOD 2 and LAA/MOD3. An LAA/MOD 2 is to be used to give notice of a proposed modification so that LAA Engineering can advise on the required minimum content of the Modification Application. An LAA/MOD3 gives full details of how the modification has been/is to be implemented.

## DESIGN CONSULTANTS

The people listed below have offered to help LAA members with technical matters, either on a voluntary or consultancy basis. Their appearance on this list does not imply any recommendation by the LAA.

### Design/Stressing

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## APPROVAL OF PROTOTYPE MODIFICATIONS

TL 3.01  
ISSUE 8  
1 MAY 2015

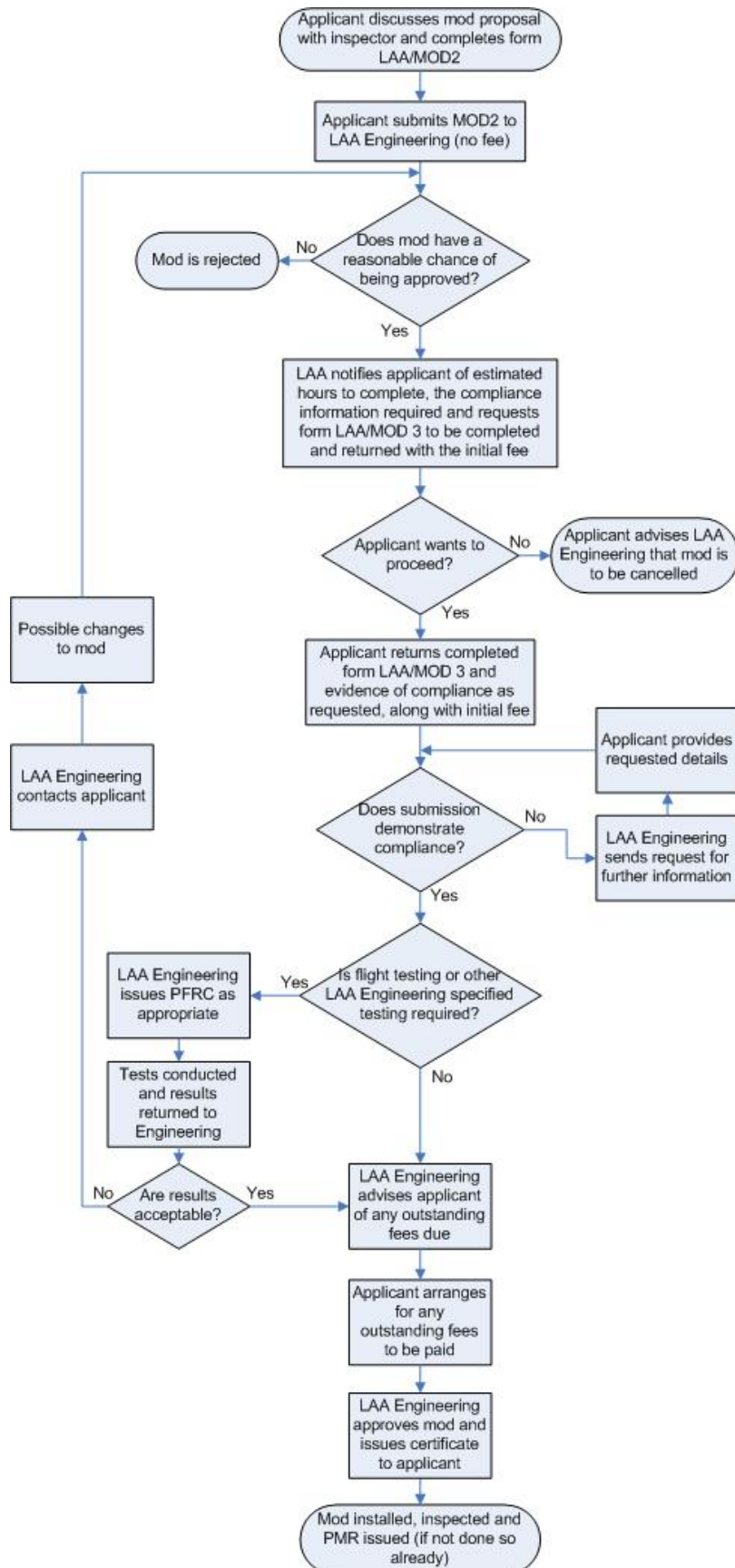
### **Certification of New Aircraft Projects for Commercial Production**

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Please report any errors or omissions to LAA Engineering: [engineering@laa.uk.com](mailto:engineering@laa.uk.com)

## APPENDIX 1 PROCESS FLOW CHART





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TL 3.01  
ISSUE 8  
1 MAY 2015

## APPENDIX 2 EXAMPLE COMPLETED APPLICATION FORMS

[Example application forms to follow]