APPROVAL FOR OPERATION OF LAA PERMIT TO FLY AIRCRAFT IN IMC, UNDER IFR OR AT NIGHT

TL 2.27
Draft B
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IMPORTANT NOTE:

THIS 'DRAFT B' IS PUBLISHED AS PRELIMINARY INFORMATION ONLY, AS EARLY GUIDANCE FOR POTENTIAL APPLICANTS. AT THE CURRENT TIME, THE FINAL DETAILS HAVE YET TO BE AGREED WITH THE CAA AND ARE THEREFORE SUBJECT TO CHANGE. APPLICATIONS ARE NOT YET BEING ACCEPTED.

INTRODUCTION

This Technical Leaflet explains the philosophy behind LAA aircraft operation at night and/or in Instrument Meteorological Conditions (IMC), how to apply for the day-Visual Flight Rules (VFR) limitation to be removed from your aircraft's Operating Limitations document and the process that will be followed to assess the aircraft. TL 2.28 provides details of the standards that aircraft must meet and should be read in conjunction with this Technical Leaflet.

BACKGROUND

In the early days of amateur built aircraft in the UK, it was reasonable to limit amateur built aircraft to day-VFR operations as such aircraft were generally very basic types with minimal equipment. Reflecting that situation, the Air Navigation Order includes a general limitation to restrict Permit to Fly aeroplanes to day-VFR operation, although it also enables the CAA to grant permission for other types of operation.

In recent years much more capable aircraft have become available to the amateur constructor and many builders have chosen to install instrument fits that provide the capability to fly in non-Visual Meteorological Conditions (VMC). At the same time many factory-built, ex-certified aircraft which were previously night/IMC approved have transferred to a Permit to Fly but have automatically lost that facility due to changing to a Permit regime.

Day-VFR aircraft are cleared by the LAA using a variety of different approaches, in which formal compliance with a design code is often not fully demonstrated. To be granted permission for more demanding IMC/IFR and night operations, the CAA has determined that LAA Permit aeroplanes must be individually re-investigated and must comply with the applicable ANO requirements for night and/or IMC/IFR flight and as far as is practicable with the relevant requirements of EASA's CS23 design code, this being the least prescriptive EASA certification standard that allows instrument flight.

LAA aircraft are operated for non-commercial, private purposes only, and are typically flown by their owners. On this basis it's reasonable to assume that the people flying in the aircraft are informed participants and have an awareness of the risks involved. In these circumstances it is reasonable to allow some latitude in the strict interpretation of the rules that apply to Type Certified aircraft.

Recognising that some Permit aircraft are capable of flight in other than in day time or VMC, the LAA has developed the rules described here to ensure that aircraft seeking the removal of the day-VFR limitation are appropriately equipped. Several in-depth analyses have been carried out to derive standards that are appropriate for the LAA fleet, which have been agreed with the CAA.

However, flying single engined aircraft in IMC or at night is a higher risk activity than flying those same aircraft during the day in VMC, as the consequences of any failure, especially engine failure, are less predictable. Each individual owner seeking night or IMC/IFR clearance should understand the risks and ensure the aircraft is equipped to as far as possible mitigate these additional risks, and that the pilot is qualified and appropriately experienced. Whatever equipment is installed, flight in known or forecast icing conditions will be forbidden as will operation in, or in the vicinity of, thunderstorms.

APPROVAL FOR OPERATION OF LAA PERMIT TO FLY AIRCRAFT IN IMC, UNDER IFR OR AT NIGHT

Each individual Permit aircraft has an Operating Limitations document issued by the LAA alongside the original Permit to Fly. At initial issue all Permit aircraft are limited to day-VFR operation. For some types these limitations are disproportionate to their potential capabilities. For the types listed below LAA will consider, on a case-by-case basis, removing the day-VFR limitation subject to certain airworthiness, maintenance and equipage requirements being met. This Technical Leaflet provides an overview of the steps required to apply for the removal of the limitation and the process that will be followed to assess the aircraft.

Not all LAA types are suitable for night or IMC/IFR flight. Types listed in Appendix 2 Table 1 have already been evaluated and found suitable so further examples should be straight forward, depending on individual configurations. For those types listed in Appendix 2 Table 2, a more involved process is required. In either case you will need to show that your individual aircraft's systems and chosen instrumentation fit are suitable for night or IFR operation, and that a level of system failure can be tolerated without the loss of flight-critical information.

In this Technical Leaflet, flight that is not under VFR will be referred to as IFR, whether that is in IMC or VMC. Night has the same meaning as in the ANO. Aircraft types that have been operated on a Certificate of Airworthiness will be referred to as 'Previously Type Certified' (PTC) aircraft.

PHILOSOPHY FOR LAA AIRCRAFT REMOVAL OF LIMITATION TO DAY VFR

Where an aircraft can be shown to meet a broadly similar level of safety to a certificated aircraft, then a case will be considered for the Operating Limitations to be amended. This will require the following areas to be shown to meet a broadly similar level of safety (and hence reliability):

1. Powerplant and propeller
2. Instrumentation power supply duplication and effects of failure
3. Flight guidance instrumentation
4. Communications and navigation equipment for role sought
5. Aircraft handling
6. Cockpit and external illumination (night only)
7. Guidance for pilots on operation of the aircraft and its systems
8. Continued airworthiness of systems proportionate to the more rigorous operation intended by this change to the limitation

While this is not meant to preclude any novel or new approach, clearly it will be easier for the LAA to assess any system if it is either similar to a certificated or has a long history of reliable use.

Any LAA member wishing to achieve this approval must assemble a body of evidence which supports this case. TL 2.28 describes the information required and includes a form on which to list it.

The privilege to approve certain individual LAA Permit aircraft for IMC/IFR/Night operation should not be taken for granted. Unlike other countries which operate an 'Experimental' airworthiness category and whose statutes do not prohibit such aircraft from IFR operation, UK legislation gives the CAA power to issue a national Permit to Fly 'subject to such conditions relating to the airworthiness, operation or maintenance of the aircraft as it thinks fit' and is under 'no obligation to do so unless that application is supported by reports from approved persons'. In other words, it is in everyone's interests that UK LAA Permit aircraft that are not limited to day-VFR are operated to the highest levels of safety. While LAA will have satisfied itself that the initial and continued airworthiness of each night/IFR-approved aircraft is acceptably safe, it is up to the pilot to ensure the aircraft is operated and maintained in such a manner as to maximise that safety especially during IMC/IFR/Night operation. This privilege has been hard won: we must do all we can to safeguard it for the future.

THE APPLICATION PROCESS

LAA must ensure adequate levels of initial and continued airworthiness for all LAA Permit aircraft. More onerous requirements will be applied to aircraft seeking removal of the day-VFR limitation than for the majority of the LAA fleet. The standards to be applied will be appropriate and proportionate to the privileges sought and the non-commercial, private nature of the permitted operations and have been derived from detailed analyses of the risks that must be mitigated

Appendix 1 contains a flowchart illustrating the process.

PREVIOUSLY TYPE CERTIFIED AIRCRAFT

This process has been designed to address the needs of amateur-built aircraft. PTC aircraft that have been certified for night and/or IMC flight will already have completed some of the stages. The owner will be required to submit the data requested by TL 2.28 focusing on any changes made from the type certified configuration. The depth of the evaluation in stage 4 will depend on the scope of any changes made. The rest of this Technical Leaflet is primarily written for amateur-built aircraft or PTC aircraft that have been significantly modified from their type certified configuration.

CHARGING

LAA will publish the cost of applying for this approval separately. Assessors may also may a charge for their time and expertise (to be agreed between the owner and the assessor). If the owner is unable to provide the data requested in a coherent form, or a very in depth investigation is required, the owner may be asked to fund the additional work. Also there is no guarantee of a successful outcome from any assessment. The payment of the fee is no guarantee that an IMC/IFR/Night clearance will be provided.

It is suggested that if there is any unusual feature that an initial assessment is carried out before any significant time or money has been expended to minimise the potential for disappointment later on.

APPLYING FOR AN IFR PERMIT TO FLY

This is a 4 stage process:

1. Assessment of the suitability of the aircraft type
2. Application for approval
3. Assessment of the data provided and the aircraft
4. Final approval and potential re-issue of the Operating Limitations document

Stage 1 – Assess type suitability

Taking into account a number of factors such as design strength, stability, performance, wing-loading and powerplant type, LAA considers the types in the Appendix 2 to be potentially suitable for removal of day-VFR limitations, subject to individual application and assessment. This table will be reviewed and updated from time to time, however it is unlikely that LAA would support a recommendation for removal of day-VFR limitations for a type which has a wing loading less than 60 kg/m^2. Clearly any aircraft not on the list will take significantly longer than a previously approved type. It is recognised that many LAA types have a lighter wing loading than 60kg/m^2, including some PTC aircraft. This limit may be reviewed as more experience is gained in assessing aircraft.

An assessment process is required before an aircraft type will be moved to the table of LAA Permit aircraft types already approved for night/IFR operation. Aircraft types that are considered for the removal of the day-VFR limitation will be evaluated both technically and in flight, broadly against requirements of CS23. This evaluation is probably required only once for each type and is known as the 'First-of-Type' (FOT) evaluation. Subsequent examples might on

the other hand merit equally in-depth evaluations if the FOT evaluation showed the aircraft type to be marginally acceptable or it had critical features that might cause individual examples of the same type to behave differently in flight.

Stage 2 – Owner applies for approval

The process starts with the aircraft owner completing the form contained within TL 2.28 and returning it to LAA Engineering. This will describe the build and modification history of the aircraft and should initially include information that is easily available to the owner. LAA Engineering will appoint a technical assessor to review the aircraft and agree with the owner where further detail is required. Owners should not go to any great expense before this initial assessment is carried out.

If your aircraft type is one the LAA has not yet assessed, your aircraft will be required to undergo an objective flight evaluation to assess if the type's flying qualities make it suitable for IMC/IFR/Night approval.

It is suggested that no great expense on new equipment is incurred until the aircraft type has successfully completed the FOT assessment. If your aircraft is a type not already equipped for IFR, LAA strongly recommends the type successfully complete the FOT evaluation process before proceeding with the costly business of equipping it for IFR operation.

Where the FOT assessment is not successful, LAA will not be able to progress further applications for that type. LAA will assist wherever possible with IFR applications, however owners should realise at the outset that this is not a 'rubber-stamping' exercise and that not all types and not all examples of each type are suitable candidates for IFR operation.

LAA recognises that the process of approval could be complex and possibly costly. In order to give owners an indication of the potential outcome of the process, the initial application form should be submitted with the data available to the owner without any significant expense being incurred.

This initial assessment will be able to provide guidance on any necessary re-equipment that may be required. It will be the owner's responsibility to meet any costs associated with any assessment required by this process.

Stage 3 – Assessment of data and aircraft

Once the required data has been provided, the assessor will evaluate the aircraft and is likely to need to visit to the aircraft. Main areas of study will be the equipment fitted, the design of the electrical system and the standard of its installation. A flight test may be required: this should be within the current Permit operating envelope and so will not require a specific permit to test. The assessor will make a report to LAA Engineering on the suitability of the aircraft.

Where approval for night operation is requested, a night lighting evaluation will be required, which many include an evaluation flight. Any evaluation flight will be outside the current permit operating limitations and will require a specific permit to test, issued by LAA Engineering.

Where an aircraft is found to be unsuitable for IFR approval, the LAA assessor will report that to LAA Engineering and the owner. The assessor may be able to work with the owner to modify the aircraft's equipment or behaviour, but also may report the deficiencies that require correction and leave those activities to the owner using the normal LAA modification processes.

Stage 4 – Final approval

Once all of the required data is available, LAA Engineering will consider it and determine if the aircraft can be cleared for IMC/IFR/Night operation.

Please note that the process described here appears to be entirely sequential, but the assessor nominated by the LAA may choose to carry out the stages in a different order or may combine stages. The aim is to collect all the data required to enable the final approval to take place.

AIRCRAFT OPERATION

Generally, PTC aircraft will already have an approved Flight Manual or Pilot's Operating Handbook (POH). Amateur-built aircraft are required to collect together data systems operations and emergency procedures for immediate reference of the pilot. A generic template is available. A POH will be required to be submitted with the IFR Checklist.

CONTINUED AIRWORTHINESS

Scheduled maintenance and Permit revalidation requirements for IFR-approved Permit aircraft are somewhat more involved than for day-VFR and will involve a suitably qualified LAA inspector specifically approved by LAA for overseeing these tasks; this reflects the increased complexity of their systems and their greater operational privileges.

Unless a specific schedule is otherwise mandated, aircraft cleared for IMC/IFR/Night will have to be maintained to the LAA Generic Maintenance Schedule, see TL 2.19, which is based on the CAA's LAMS/P. This schedule will have to be tailored to the needs of the individual aircraft in discussion with the aircraft's inspector. A tailored maintenance schedule will be required when the IFR Checklist is submitted.

MODIFICATIONS

Although in some circumstances it may be possible to make changes to aircraft instrumentation or electrical systems on a day-VFR aircraft without reference to LAA Engineering, this is not the case for IMC/IFR/Night approved aircraft as those instruments now form the baseline against which the day-VFR limitations were removed. The LAA day-VFR Permit to Fly is issued on the basis of the build status of the airframe and powerplant at the time of its initial Permit Application; any proposed changes to the airframe or powerplant from that build state require LAA to approve a suitable modification. In a similar manner, an IMC/IFR/Night approval is based not simply on the airframe and powerplant, but also the instrumentation, power supply system, and other IMC/IFR/Night mandatory equipment installed at the point of application. Once the aircraft's revised Operating Limitations document is received, you must think carefully if you wish to revise any part of the mandatory IFR fit, or the power systems on which the aircraft relies. The day-VFR limitation was removed based on the information supplied in your original IMC/IFR/Night application. You will have to show that any subsequent modification does not adversely impact your original application.

DOCUMENTATION REQUIRED

To identify documentation produced to support the Permit IFR process, the following numbering scheme will be used for all documents submitted (the "Body of Evidence"). This table also shows who is expected to compile and authorise each document. The owner may choose to contract a suitably qualified person or organisation to compile reports for him.

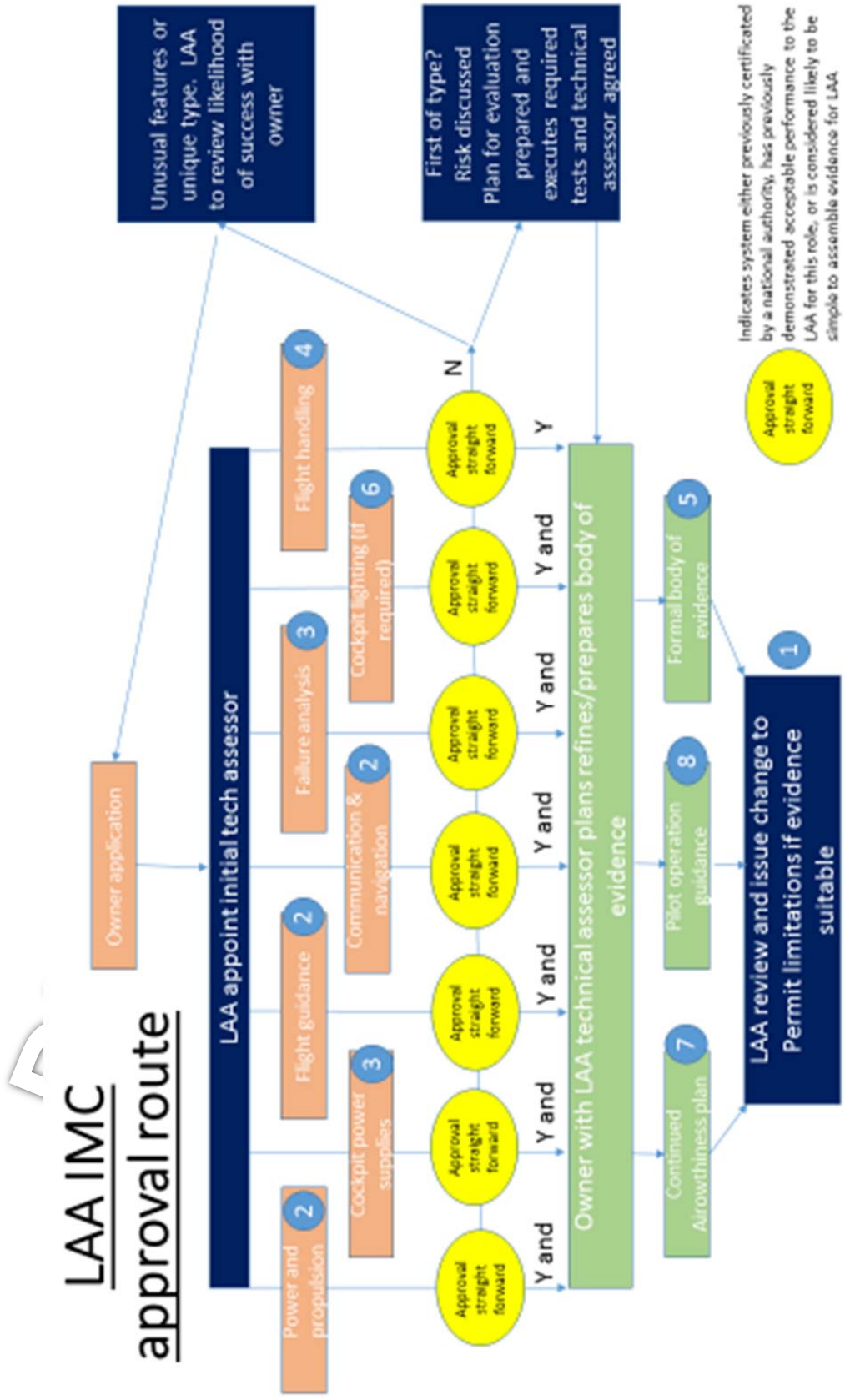
The basic number scheme is G-XXXX/IMC/Y iss Z (even if only night flying is being applied for). Y indicates the document number in the table below. Z indicates the issue number of the document. It is suggested that draft versions are identified by letters (draft A, etc) prior to being signed off. As an example, the 2nd issue of the Electrical Load Analysis for G-ABCD would be in report G-ABCD/IMC/2 iss 2.

The following documents will be required (see corresponding sections in TL 2.28):

Doc No.	Title	Required at initial application	Required at full submission
0	Summary Report	No	Yes, prepared by LAA assessor assisted by the aircraft owner or his agent
1	TL 2.28 section 1 Aircraft systems design, build and operation history	Draft by owner and LAA inspector. Should pay particular attention to any non-standard features such as an uncertificated or modified engine. It is suggested that functional tests such as 1.3.12 are not completed at initial application, and any non-conformances such as to 1.3.15 are simply recorded. Do not modify the aircraft to seek complaince with TL 2.28.	Yes, prepared by LAA assessor assisted by the aircraft owner or his agent
2	Electrical power, load analysis and instrument power system(s) fault tolerance report – contained in TL2.28	Draft describing both normal and fault condition load analysis, and battery-only electrical endurance. Fault tolerance report not required at initial draft. System description and fault tolerance approach by aircraft owner. Do not carry out simulation test as detailed in TL 2.28 section 2.2 at this time.	Yes, prepared by LAA assessor assisted by the aircraft owner or his agent. Where the system warrants a detailed fault tolerance evaluation, this will be agreed with the LAA assessor.
3	Flight test report(s)	No	Flight testing as required will be carried out under agreement of LAA and assessor. Individual flight test reports will be numbered G-XXXX/IMC/5 A, B issue r etc.
4	Weight & balance	Basic aircraft weight and balance, plus basic flight loadings achievable or sought by owner to be supplied on initial application.	For final application, demonstration that the weight and cg for which approval is sought represents a reasonable IFR operating envelope.
5	Night flying report	On initial application, owner should indicate type of external and internal lighting installed only.	Evaluation will be developed as required with the LAA assessor.

6	Tailored Maintenance Schedule	If a schedule is already used, a copy should be supplied with the initial application.	A maintenance schedule appropriate to the equipment fit and aircraft design will be developed in discussion with the assessor and submitted to the LAA.
7	Pilot's Operating Handbook	If a POH or checklist is available for the aircraft, a copy may be supplied.	As a minimum, an LAA 'POH lite' will be completed for the aircraft as the minimum practical to operate the aircraft in IFR.
8	Modification summary	Any know modification from the "type norm" or IFR first of type to be supplied on initial application.	Any modifications developed in order to achieve an IFR compliant standard will be documented.

APPENDIX 1 – PROCESS FLOWCHART



APPENDIX 2 – TYPES APPROVED/LIKELY TO BE APPROVED

Table 1 – Aircraft types examples of which are expected to be able to be cleared for IMC and/or night operation, subject to assessment of individual examples:

All ex CofA types that have been previously certified for IMC or night operation	
Vans RV-6, 7 - includes nosewheel variants	all with a restricted aft cg limit

Table 2 – Aircraft types that are likely to be suitable for night/IMC clearance subject to further investigation of the type and assessment of individual examples:

Cozy MkIV	
Europa, XS & Liberty XL-2	
Falco F8L	
Glasair I, II & IIS (RG, FT & TD)	Glasair 1 subject to restricted aft cg limit
Glastar	
Harmon Rocket II	
Lancair 320	
Linnet 2	
Long-Ez & Varieze	
MCR-01 Club	
Piel CP301, CP 301S, CP328 Super-Emeraude	
Scintex CP1310, 1315, 301	
Tecnam P2002 Sierra, P92-EA Echo	
Vans RV-4, 8/8A, 9/9A, 10	

Note that it is likely the list of eligible aircraft types will be expanded over time as more types are evaluated, and these tables will be moved to the LAA website once this process is fully established.