

Additional requirements to be considered for Swiss validation and certification of Ecolight Aircraft

(Defined by FOCA in addition to LTF-UL ; 23. Nov. 2005)

Requirement	Remarks
FLIGHT	
<p><u>Stall characteristics:</u></p> <p>Compliance to LTF-UL 201 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slipskid indicator.</p>	<p>This requirement is added to ensure the stall characteristics are acceptable even with some level of sideslip as there is no requirement for spin recovery in LTF-UL.</p>
POWERPLANT	
<p><u>Engine qualification:</u></p> <p>a) If the engine is not certified and is not identical to a certified engine, that engine should be qualified against CS-22 subpart H.</p> <p>b) By way of derogation to paragraph a), documented qualification based on proven service experience and agreed by the Authority can be accepted.</p>	<p>The LTF requirement does not cover all aspects:</p> <ul style="list-style-type: none"> - 50FH without further qualification (vibration test, teardown inspection) is not considered as sufficient to ensure safe operation, - No requirement on the design and construction.
<p><u>Induction system icing protection:</u></p> <p>a) Except as permitted by b), each engine having a conventional venturi carburetor must be provided with a pre-heater capable, in air free of visible moisture at temperature of -1°C, of increasing the intake air temperature by 50°C with the engine at 75% of maximum continuous power.</p> <p>b) Where the intake air is continuously heated, and it is demonstrated that the temperature rise is adequate, a pre-heater need not be provided.</p> <p>c) By way of derogation to paragraph a) and b), other system providing an equivalent level of protection against engine failure due to icing and agreed with the Authority can be accepted.</p>	<p>The requirement LTF-UL 901 requires that the engine operates satisfactorily and can be safely operated within the defined limits.</p> <p>State of the art in the general aviation as ground and flight conditions potentially leading to carburetor icing are not rare and can lead to engine failure.</p>

<p><u>Fuel pumps:</u></p> <p>The requirement defined in VI “Kraftstoffpumpen” of Anhang II to LTF-UL applies for all Ecolight.</p>	<p>Not required for gravity feed system providing sufficient flow rate as defined under LTF-UL 955.</p> <p>State of the art in the general aviation for aircraft whose failure of the main pump can lead to engine failure.</p>
<p><u>Fire protection:</u></p> <ul style="list-style-type: none"> a) The engine must be isolated from the rest of the aeroplane by a firewall. b) The firewall must be constructed so that hazardous quantity of liquid, gas or flame can pass from the engine compartment to other parts of the aeroplane. c) Each opening in the firewall must be sealed with close fitting, fireproof grommets, bushing, or firewall fittings. d) The firewall must be fireproof and protected against corrosion. e) Cowling must be at least fire resistant. f) Each components, line, and fitting carrying flammable fluid, gas, or air in any area subjected to engine fire conditions must be at least fire resistant. 	<p>State of the art in the general aviation as some time should be available for the pilot to perform an emergency landing in case of fire.</p> <p>Firewall materials accepted without tests and test detailed criteria for other materials are identified in FAA AC 20-135.</p>
<p>EQUIPMENT</p>	
<p><u>Warning lights:</u></p> <p>If warning, caution, or advisory lights are installed, they must be:</p> <ul style="list-style-type: none"> a) Red, for warning lights (lights indicating a hazard which may require immediate corrective action); b) Amber, for caution lights (lights indicating a possible need for future corrective action); c) Green, for safe operation lights. 	<p>Standardization of pilot environment.</p>

<p><u>Fuel quantity indicator:</u></p> <p>If a fuel flowmeter system is installed, each metering component must have a means to by-pass the fuel supply if malfunctioning of that component severely restricts fuel flow.</p>	<p>Obvious requirement with no effect if no flowmeter is installed.</p>
<p><u>Electrical system capacity and function:</u></p> <ul style="list-style-type: none"> a) Electric power sources, their transmission cables, and their associated control and protective devices, must be able to furnish the required power at the proper voltage to each load circuit essential for safe operation. b) No failure or malfunction of any electrical power source may impair the ability of any remaining source to supply load circuits essential for safe operation. c) Each electric power source control must allow the independent operation of each source. 	<p>Systems whose failure would lead to an engine failure are considered as essential for safe operation (e.g. electronic ignition, dual electrical fuel pumps).</p>
<p><u>Circuit protective devices:</u></p> <ul style="list-style-type: none"> a) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be so located and identified that it can be readily reset or replaced in flight. b) If fuses are used, there must be one spare of each rating. 	<p>State of the art in general aviation. Required to cover failure of protective device or transient failure in the electric system.</p> <p>Systems whose failure would lead to an engine failure are considered as essential to safety of flight.</p>
<p><u>Master switch:</u></p> <ul style="list-style-type: none"> a) There must be a master switch to allow ready disconnection of all electric power sources. The point of disconnection must be adjacent to the sources controlled by the switch. b) The master switch arrangement must be so installed that it is easily discernible and accessible to the pilot in flight. 	<p>State of the art in general aviation. Disconnection adjacent to the source is required to minimize probability of fire during emergency landing (avoid long electric wiring permanently under load).</p>

<p><u>Powerplant instruments marking:</u></p> <p>In addition to LTF-UL 1549, for each required powerplant instrument, as appropriate to the type of instruments:</p> <ul style="list-style-type: none"> a) Each take-off and precautionary range must be marked with a yellow arc or a yellow line; and b) Each engine or propeller range that is restricted because of excessive vibration stresses must be marked with red arcs or red lines. 	<p>State of the art in general aviation. Standardization of pilot environment.</p>
<p><u>Oil quantity indicator:</u></p> <p>Each oil quantity indicator must be marked to clearly indicate the maximum and minimum quantity of oil that is acceptable.</p>	<p>Obvious requirement. Same intend in LTF-UL 1305/3.</p>
<p><u>Placards:</u></p> <p>The usable fuel capacity in volumetric units of each tank must be marked on the fuel quantity indicator.</p>	<p>State of the art in general aviation.</p>
<p><u>Qualification of altimeter:</u></p> <p>Initial qualification of the altimeter has to fulfill the criteria defined in TM 20.020-20 or equivalent.</p>	<p>Need to ensure the initial qualification of the altimeter is adequate.</p>
<p><u>Qualification of radio and transponder:</u></p> <p>Radio, transponder and ELT shall have a J/ETSO or be validated in the FOCA avionic list.</p>	<p>Required to avoid interference or disturbance to the existing ground and flight equipment.</p> <p>Portable radio equipment are not state of the art.</p>
<p>PROPELLER</p>	
<p><u>Propeller:</u></p> <ul style="list-style-type: none"> a) In addition to LTF-UL subpart J, CS-22 subpart J applies. b) By way of derogation to paragraph a), documented qualification based on proven service experience and agreed by the Authority can be accepted. 	<p>Only general requirement included in LTF-UL.</p>

PARACHUTE RECOVERY SYSTEMS

Placards:

- a) The following placard must be installed adjacent to the release control:

WARNING-EMERGENCY PARACHUTE
(action to be taken)

Unapproved Equipment – see Pilot's Handbook

- b) A warning placard must be placed on the exterior of the aeroplane close to the stored energy device, which is easily distinguishable by the ground personnel, warning of the potential hazard.

Needed as flight test to demonstrate that the recovery system functions are not required.

Integration in the aircraft:

- a) The capability of the parachute recovery system to go through the aircraft structure has to be demonstrated at minimum on the ground with zero speed. This can be shown by representative component test or service experience.
- b) The integration of the recovery system has to be documented.