Comment Response Document (CRD)
to the proposal of a regulation defining additional Swiss requirements for:

Motorgliders certificated/validated as Ecolight Aircraft.

Section 1

Explanatory Note

I. General

1. The certification and validation of Swiss Ecolight aircraft is based on the requirements established by the German LTF-UL Issue 30.01.2003 and the "Additional requirements" defined by the Swiss Federal Office of Civil Aviation (FOCA). These documents do not contain specific requirements applicable to Motor Gliders to be certificated/validated as Ecolight Aircraft and do not fully address requirements applicable to glider towing by means of Ecolight aircraft.
The purpose of the Proposal was to define a set of requirements to adequately consider the subjects mentioned above.

II. Consultation

2. The Proposal was published on FOCA's web site on 11 Jan 2008 (http://www.bazl.admin.ch/fachleute/01277/01278/index.html?lang=de).
By the closing date of 11 March 2008, FOCA had received 15 comments from National Aviation Authorities, professional organizations and private companies and citizens: a list of the commenters is provided in Attachment 1.

III. Publication of the CRD

3. All comments received have been incorporated in Section 2 of this Comment Response Document (CRD) with the FOCA's responses.
4. In responding to comments, a standard terminology has been applied to attest the FOCA's acceptance of the comment. This terminology is as follows:

- **Accepted** – The comment is agreed by FOCA and any proposed amendment is wholly transferred to the revised text.
- **Partially Accepted** – Either the comment is only agreed in part by FOCA, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
- **Noted** – The comment is acknowledged by FOCA but no change to the existing text is considered necessary.
- **Not Accepted** - The comment or proposed amendment is not shared by FOCA.

The resulting text is provided in Section 3: changes to the proposed rules have been highlighted.

Section 2

Id		
C1	comment 02	One commenter provided the following input: - Auf die Einführung der Additionals sei zu verzichten - Vielmehr sei die deutsche Musterzulassung nach LTF-UL zu anerkennen und das schweizer Validationsverfahren stark zu vereinfachen (z.B. Reduktion auf CSS) - Dem Safety-Gedanken soll nicht durch Erhöhung der Normendichte, sondern z.B. durch ein praxisorientiertes Flugbetriebsaufsichtskonzept nachgelebt werden
	response	Noted *General comment providing little or no contribution of technical nature. It is FOCA intent to introduce additional requirements where gaps in the existing LTF-UL exist for powered sailplane.*
	comment 04	One commenter provided the following input: - Ob die geforderten Spezifikationen angemessen und sinnvoll sind wollen wir nicht beurteilen. - Wir wissen von den in D geltenden Ergänzungen der LTF-UL für Segelflugzeuge in Anlehnung an CS22. Diese Praxis hat sich in D gemäss unseren Informationen bewährt. Wir empfehlen deshalb dringend von einer Schweizer Insellösung abzusehen und diese Zulassung gemeinsam mit den Nachbarländern zu regeln. Die „requirements for Motorglider certified/validated as Ecolight aircraft“ sollen gemeinsam mit den umliegenden Ländern, mindestens aber mit Deutchland gemacht werden.
	response	Noted *No change of the text proposed.* *According to the swiss adopted regulation (EC) No 1592/2002 of the European Parliament the microlight are regulated nationally. However, it is FOCA objective to achieve the highest possible level of consistency with Germany for certification requirement of powered sailplane classified as Ecolight. For this reason, the LBA was involved in the consultation process and FOCA will propose to implement the result of this consultation process in the German requirement for UL powered sailplane.*
	comment 05	One commenter provided the following input: - C.5 Die Forderung C.5(4) wird zu sehr hohen Cockpit-Massen führen, sodass das max. zulässige MTOW der LTF-UL 2003 nicht mehr eingehalten werden kann. - D.3 Wenn das Flugzeug mit einem Gesamt-rettungssystem ausgestatet ist, kann m.E. auch ein komplizierter Haubenotabwurf akzeptiert werden.
	response	Item C.5: Accepted *See also comment 15.* Item D.3: Not Accepted. *FOCA determination is that global recovery system has to be considered as additional system for which no credit can be taken to lower the requirement. This position is driven by the fact that the recovery systems are not fully tested in flight. In addition, a canopy emergency opening*

		system which fulfills the proposed requirement defined in D.3 is feasible without impact on the cost for new design and with minor cost for already design canopy system. *See also comment 15.*
	comment 09	One commenter provided the following input: - Ich bin nicht der Meinung, dass die LTF-UL perfekt für Flugzeuge wie Sinus, Taurus, Apis und Co passt. Nur, da müssen wir uns klar sein, diese Flugzeuge erfüllen diese neuen Anforderungen nicht mehr. Was dann? - Ich würde, falls das noch möglich ist, das LBA bitten, bei einer gemeinsamen Sitzung allenfalls eine Erweiterung der LTF-UL für Segelflug/Motorsegler zu besprechen. Nur mit einseitig erklärten Zusatzforderungen als Schnellschuss kommen wir nicht weiter. - Der Teufel steckt oft im Detail. Und besteht denn wirklich ein Bedarf an zusätzlicher Regulierung? Gibt es Unfälle?
	response	Noted *No change of the text proposed. The LBA and the Sport organization were involved in the consultation process and their comments were evaluated.*
	comment 10	One commenter provided the following input: Document „Erweiterung der Mindestforderung der Lufttüchtigkeitsforderungen für aerodynamisch gesteuerte ultraleichtflugzeuge (LTF-UL) bei der Musterprüfung von Ultraleichtflugzeugen mit Klapptriebwerk und für motorseglerartige ultraleichtflugzeuge mit einer „Klafterbelastung kleiner gleich 3k/m2"". - LFT-UL 335/1 Addition of a criteria for minimum value of $Vd \geq 15*(G/S/C_{wmin})^{(1/3)}$ - New criteria based on weight/span^2 for definition of maneuver load envelope.
	response	*See comment 15.*
	comment 15	One commenter provided the following input based on detailed review of the proposed additional requirements:
	response	The proposed additional requirements were considered as sensible (sinnvoll) except for the following paragraph: - Zusätzliche Forderungen für Wolkenflug nicht notwendig (UL's kein Wolkenflug). Noted *No additional requirement was proposed by FOCA (clouds flying was mentioned for reference in the introduction only).* - B.4. 143 (6) Den Inhalt sehen wir mit den Ausführungen in LTF-UL 134, Absatz 3. bereits als ausreichend abgedeckt an. Accepted. *B.4. 143 (6) deleted.* - C.1 335 zu 3. Die Forderungen aus B.2 73 beugen bereits einer zu niedrigen VD vor. Accepted *After clarification with the commenter, it was concluded that the dive design speed Vd is adequately defined by the condition specified under B.2 and LTF-UL 1505. Therefore, the proposed paragraph C.1 335 3. can be deleted.* *C.1 335 3. deleted.*

		- C.1 335 zu 4. Bereits durch LTF-UL 335, 4. abgedeckt. Accepted. *C.1 335 4. deleted* - C.1 337 Ohne eingehende Betrachtung (Flächenbelastung?) ist eine abschliessende Stellungnahme nicht sinnvoll. Wir gehen davon aus, dass die Böenbelastung dimensionierend wird und das Manöverdiagramm abdeckt. Noted *-The existing powered sailplanes currently in the microlight category have wing loading of the order of 30 to 40kg/m2.The typical speed during thermal cycling is lower that modern sailplane but is not different than older models (e.g K8). Therefore, it is not expected to have significant differences in the maximum load factor reached in operation.* *-with the maneuver load factor kept unchanged, the gust load factor will generally be higher than the maneuver but lower than the maneuver envelope proposed in this requirement.* *Maneuver load factors from sailplane retained as basis.* - C.5 561 / D.1 785 / D.3 807 Grundsätzlich sinnvoll. Da in Deutschland für Luftsportgeräte gemäss §3, abs. 2 der LuftBO ein zugelassenes Rettungsgerät, für UL ein Gesamtrettungsgerät, vorgeschrieben ist, haben wir hier eine besondere Situation, durch die wir eine Kompensation zu dieser Forderung as gegeben ansehen. Accepted for C.5 561 / D.1 785 *- Concerning crashworthiness, the intent would be to protect occupants against serious injury during emergency (outfield) landings and impacts or following recovery from emergency situations close to the ground (survivable crash). It is unlikely that a Global parachute recovery system could compensate for most of those cases. Therefore, FOCA considers that the installation of a Global parachute recovery system would not provide an equivalent level of safety to the proposed additional requirement.* *However, recognizing that current design of powered sailplane approved under the microlight category generally do not fulfill the proposed additional requirement, that it may be difficult to stay within the weight limits of the category and that a higher level of risk associated with crashworthiness may be accepted by the public, FOCA accepts to delete C.5 561 / D.1 785. After clarification with the commenter, the FOCA position concerning the accepted higher level of risk was agreed.* *C.5 561 / D.1 785 deleted.* Not Accepted for D.3 807 *- Concerning canopy opening for emergency evacuation, FOCA determination is that global recovery system has to be considered as additional system for which no credit can be taken to lower the requirement. This position is driven by the fact that the recovery systems are not fully tested in flight. In addition, a canopy emergency opening system which fulfills the proposed requirement defined in C.3 is feasible without impact on the cost for new design and with minor cost for already design canopy system.*

Id		
C2	comment	Many commenters have provided comments of general nature against the introduction of additional requirements on the basis of, just to mention some of them, cost considerations, small size of the Swiss market, non-effectiveness of a Swiss-only regulations, need for a simplification of the existing rules, etc..
	response	Noted These comments have been considered and analyzed. According to the Swiss adopted regulation (EC) No 1592/2002 of the European Parliament Microlights are regulated nationally. However, it is FOCA objective to achieve the highest possible level of consistency with Germany for certification requirement of powered sailplane classified as Ecolight. For this reason, the LBA and the sport organizations were involved in the consultation process (see comments above) and FOCA will propose to implement the outcomes of this consultation process in the German requirement for UL powered sailplane. Therefore the proposed text will not be changed as a result of these comments.
C3	comment	Some commenters have expressed concerns regarding the definition of the Applicability Date of the proposed additional requirements.
	response	Noted The proposed additional requirements apply to all applications for an Ecolight Aircraft Validation/Certification (including Changes and Repairs) submitted on or after the publication date of these additional requirements. It has to be remarked that FOCA may define or adopt mandatory actions to be performed on an aircraft to restore an acceptable level of safety, when evidence shows that the safety level of this aircraft may otherwise be compromised. The content of the mandatory actions shall be determined on a case by case basis.

Section 3
Resulting text

Item	Swiss additional requirements for Motorglider certified/validated as Ecolight Aircraft	Remarks References
	FLIGHT	
B.1	**71 Rate of descent** For a powered sailplane the smallest rate of descent in power-off configuration at maximum weight and most unfavourable c.g. position must not exceed the following limits: (a) with a single-seater powered sailplane, 1·0 m/s; (b) with a two-seater powered sailplane, 1·2 m/s.	Glider operation
B.2	**73 Descent, high speed** It must be shown that the sailplane with the airbrakes extended, will not exceed V_{NE} in a dive at an angle to the horizon of: (i) 30° (ii) less than 30° when a rate of descent of more than 30 m/s can be achieved.	Glider operation Special features not foreseen in LTF-UL
B.3	**75 Descent, approach** It must be shown that the sailplane has a glide slope not flatter than one in seven at a speed of 1·3 V_{S0} with air brakes extended at maximum weight.	Glider operation Special features not foreseen in LTF-UL
B.4	**AMC to LTF-UL 143 Controllability and manoeuvrability** Compliance with 143(2) should include the extension of airbrakes at speeds up to 1.05 V_{NE}. The time to extend airbrakes should not exceed 2 seconds. ~~**Additional requirement**~~ ~~(6) Any unusual flying characteristics observed during the flight tests required to determine compliance with the flight requirements and any significant variations in flight characteristics caused by rain must be determined. In the case of a powered sailplane this requirement must be met with the engine running at all allowable powers.~~ ~~AMC 143 (6) The characteristics to be noted should include stalling speeds and stalling behaviour.~~	Special features not foreseen in LTF-UL
B.5	**145 Longitudinal control** It must be possible, without exceptional piloting skill, to maintain the sailplane in steady straight flight: (1) reserved (2) when retraction or extension of the airbrakes is made at speeds between 1·1 V_{S1} and 1·5 V_{S1}, where V_{S1} is the stalling speed with airbrakes retracted or extended, whichever is the higher, for a given flap position.	Special features not foreseen in LTF-UL
B.6	**153 Approach and landing** The use of air brakes during the approach must not cause excessive variation of control force or control displacement nor affect the controllability of the sailplane, when it is brought into use at any allowable speed down to 1·2 V_{S1}, where V_{S1} is appropriate to the configuration with air brakes retracted or extended, whichever gives the greater value.	Special features not foreseen in LTF-UL
B.7	**161 Trim** For powered sailplanes, retraction and extension of the power-plant or propeller must not produce excessive trim changes.	Special features not foreseen in LTF-UL
B.8	**201 Wings level stall** LTF-UL 201 4. must be considered also with airbrakes retracted and extended	Special features not foreseen in LTF-UL

Item	Swiss additional requirements for Motorglider certified/validated as Ecolight Aircraft	Remarks References
B.9	**203 Turning flight stalls** (a) When stalled during a co-ordinated 45° banked turn, it must be possible to regain normal level flight without encountering uncontrollable rolling or spinning tendencies. Compliance with this requirement must be shown under the conditions of LTF 201 4. that result in the most critical stall behaviour of the sailplane. In any case the landing configuration, with airbrakes retracted and extended, must be investigated.	Glider operation
	STRUCTURE	
C.1	~~**335 Design air speeds**~~ ~~*LTF-UL 335 3. and 4. are replaced by the following paragraph*~~ ~~*3. Design Maximum Speed V_D.*~~ ~~The design maximum speed may be chosen by the applicant but must not be lower than: Vd= 18*(W/S)$^{(1/3)}$/Cd_{min} (km/h)~~ ~~For a powered sailplane, V_D must also not be lower than 1·35 V_H.~~ ~~W/S= wing loading (daN/m2) at design maximum weight~~ ~~Cd $_{min}$ Lowest possible drag coefficient of the sailplane~~ ~~4. Design Gust Speed VB.~~ ~~VB must not be less than VA.~~	Glider operation
C.2	**337 Limit manoeuvring load factors** The limit manoeuvring load factors on the V-n diagram (see CS 22 Figure 1) must have at least the following values: n_1 +5·3 n_2 +4·0 n_3 –1·5 n_4 –2·65	Glider operation
C.3	**345 Loads with air brakes and wing-flaps extended** (a) *Loads with air brakes extended* (1) The sailplane structure including airbrake system, must be capable of withstanding the most unfavourable combination of the following parameters: Equivalent Air speed V_D (EAS) : - Air brakes from the retracted to the fully extended position - Manoeuvring load factor from -1·5 to 3·5 (2) The horizontal tail load is assumed to correspond to the static condition of equilibrium. (3) In determining the spanwise load distribution, changes in this distribution due to the presence of the air brakes must be accounted for. (b) reserved (c) *Speed limiting flaps*. If wing-flaps are to be used as a drag-increasing device for the purpose of speed limitation (air-brake) conditions specified in 345(a) must be met for all wing-flap positions.	Glider operation Special features not foreseen in LTF-UL
C.4	**397 Loads resulting from limit pilot forces** The airbrakes system and supporting points must be designed to withstand as far as to the stops (these included) limit loads arising from the pilot forces of 35 daN.	
C.5	~~561 Emergency landing conditions - General~~ ~~(4) An ultimate load of 6 times the weight of the sailplane acting rearwards and~~ ~~upwards at an angle of 45° to the longitudinal axis of the sailplane acts on~~	Glider operation (field landing)

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	~~the forward portion of the fuselage at the foremost point(s) suitable for the application of such a load.~~ ~~(5) Each sailplane with a retractable landing gear must be designed to protect each occupant in a landing with wheel(s) retracted under the following conditions:~~ ~~a downward ultimate inertia force corresponding to an acceleration of 3 g;~~ ~~a coefficient of friction of 0·5 at the ground.~~ ~~(6) For a powered sailplane with the engine located behind and above the pilot's seat, an ultimate inertia load of 15 g in the forward direction must be assumed.~~	
C.6	**593 Hand forces at the horizontal tail surfaces** A limit hand force of 3% of the design maximum weight of the sailplane but not less than 15 daN must be assumed to act on either tip of the horizontal tail surface: (a) in the vertical direction; (b) in the horizontal direction, parallel to the longitudinal axis.	Glider ground operation (rigging)
	DESIGN AND CONSTRUCTION	
D.1	~~785 Seats and safety harnesses~~ ~~5. Each seat in a sailplane must be designed so that an occupant is comfortably seated, whether he wears a parachute or not. The seat design must allow the accommodation of a parachute worn by an occupant.~~ ~~6. Each seat and safety harness installation must be designed to give each occupant every reasonable chance of escaping serious injury under the conditions of CS 22.561(b)(1). (SeeAMC 22.785 (f))~~	Glider operation (field landing)
D.2	**788 Headrests** a) A headrest must be provided to protect each occupant from rebound injuries in the event of a crash landing. It must be equipped with energy absorbent padding protected against wear and weathering encountered in normal operation. If an adjustable headrest is provided it must be capable of being positioned such that the point of head contact is at eye level. (See AMC 22.788(a)) b) Each headrest must be so designed to minimize the possibility of clothing or the parachute becoming caught when bailing out. (See AMC 22.788 (b)) c) Each headrest in its most critical position must be designed for an ultimate load of at least 135 daN normal to a vertical plane which touches the contact point of the head. d) The width and design of the headrest must not unduly restrict vision from either seat.	Glider operation (field landing)
D.3	**807 Emergency exit** (a) The cockpit must be so designed that unimpeded and rapid escape in emergency situations during flight and on the ground is possible with the occupant wearing a parachute. (b) The opening, and where appropriate jettisoning, of each canopy or emergency exit must not be prevented by the presence of the appropriate aerodynamic forces and/or the weight of the canopy at speeds up to V_{DF} or by jamming of the canopy with other parts of the sailplane. The canopy or emergency exit attachment fittings must be designed to permit easy jettisoning, where jettisoning is a necessary feature of the design. (c) The opening system must be designed for simple and easy operation. It must function rapidly and be designed so that it can be operated by each occupant strapped in his seat and also from outside the cockpit. (d) A canopy or emergency exit jettison system must be actuated by not	Glider operation (in-flight collision) Global parachute recovery system not thoroughly tested is not considered equivalent to a pilot wearing a parachute.

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	more than two controls, either or both of which must remain in the open position. The canopy jettisoning controls must be capable of being operated with a pilot effort of between 5 and 15 daN. If two controls are used they must both move in the same sense to jettison the canopy. If there are controls for each pilot, both controls or sets of controls must move in the same sense. If a single control is used for jettisoning, it must be designed to minimize the risk of inadvertent or unintentional operation towards the jettison position. (e) In order to enable the occupants to bail out under acceleration conditions, sufficiently strong cabin parts, or grab-handles, must be available and suitably located so that the occupants can lift themselves out of their seats and support themselves. These parts must be designed to an ultimate load of at least 200 daN in the anticipated direction of force application.	
D.4	**883 Ground clearance** (a) There must be at least 0.10 m of ground clearance for the tailplane with the wing-tip touching the ground. (b) With the wing-tip touching the ground, the associated aileron may not touch the ground when deflected fully down.	Central landing gear only.
	POWER- PLANT Installation	
E.1	**902 Installation: sailplanes with retractable power-plants or propellers** Powered sailplanes with retractable power-plants or propellers must comply with the following: (a) Retraction and extension must be possible without risk of damage and without the use of exceptional skill or effort or excessive time. (b) It must be possible to secure the retraction (extension) mechanism in the extreme positions. There must be a means to inform the pilot that this mechanism is secured in the fully retracted or extended position. (c) Any doors associated with extension and retraction must not impair extension and retraction and they must be restrained against spontaneous opening. (d) The installation must be so designed as to prevent the heat of the engine from causing a fire or other hazardous condition. (e) Fuel or lubricant must not discharge in dangerous quantities from the engine, its components or accessories, when the power-plant is in the retracted position and during extension and retraction.	Special features not foreseen in LTF-UL
E.2	**1149 Propeller speed and pitch controls** Propellers that cannot be controlled in flight must meet the following requirements: (1) reserved (2) reserved (3) For powered sailplanes capable of extending and retracting the power-plant during a glide at V_{PE} with the throttle closed, the propeller must not permit the engine to achieve a rotational speed of more than 110% of the max. continuous speed. V_{PE} must not be less than 1·4 V_{S1} where V_{S1} is the stalling speed with the wing flaps neutral at maximum weight.	Special features not foreseen in LTF-UL
	EQUIPMENT	
F.1	**1441 Oxygen equipment and supply** (a) Oxygen equipment must be approved. (b) Oxygen equipment must be free from hazards in itself, in its method of operation, and its effect upon other components.	Glider operation

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	(c) There must be a means to allow the crew to readily determine, during the flight, the quantity of oxygen available in each source of supply. (d) Oxygen bottles must be installed so as not to be hazardous in crash landings.	
F.2	**1449 Means for determining use of oxygen** There must be a means to allow the crew to determine whether oxygen is being delivered to the dispensing equipment.	Glider operation
	OPERATING INFORMATION	
G.1	**1513 Power-plant extension and retraction speed** The flight speed range for extension and retraction of the power-plant must be established, together with any limitations associated with it.	Special features not foreseen in LTF-UL
G.2	**1514 Power-plant extended maximum permitted speed** The power-plant extended maximum speed V_{PE} must be established as required by E.2 for powered sailplanes capable of extending and retracting the power-plant.	Special features not foreseen in LTF-UL

Attachment 1

Aero-Club der Schweiz
Deutscher Aero-Club Luftsportgeräte
FOCA-LEUW
LBA Referat T4
Messrs: F. Einführer, A. Gabus, B. Hinz, J. Konrad, P. Von Burg
SFG Biel – Gruope de vol à voile de Courtelary
SFG Freiburg
SFG Zürich
SFVS Segelflugverband der Schweiz
SMF Swiss Microlight Federation
Vol à Voile Club Valais