CSTMG01 Special Condition 02 in accordance to Part 21A.16 B (a) (1);
Sailplane Parachute Rescue System

1. Introductory note:

The hereby presented Special Condition has been classified as an important Special Condition and as such shall be subject to public consultation, in accordance with EASA Management Board decision 02/04 dated 30 March 2004, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

2. Background

The applicant has applied for an EASA Type Certificate for a powered sailplane. The CSTMG01 will be equipped with a Sailplane Parachute Rescue System (SPRS) and CS-22 does not contain safety standards for SPRS.

The Sailplane Parachute Rescue System (SPRS) is a novel and unusual design feature for an aeroplane certified under CS 22. It has to be defined that the applicable airworthiness requirements do contain adequate or appropriate safety standards and if additional requirements have to be applied for this project. A Special Condition will be applied to ensure a level of safety equivalent according to Annex I of the basic regulation 216/2008. A public consultation is needed according to EASA procedures.

3. Identification of issue

The powered sailplane CSTMG01 will be equipped with a Sailplane Parachute Rescue System (SPRS).
The SPRS shall not be used for substantiation or relief of requirements defined in CS-22. The powered sailplane shall be certified according CS 22 for flights with and without a SPRS on board with the maximum MTOW.

The SPRS is intended to recover the aeroplane in emergency situations such as mid-air collision, loss of aeroplane control, severe structural failure, pilot disorientation, or pilot incapacitation with a passenger on board. The SPRS, which is only used as a last resort, is intended to prevent serious injuries to the aeroplane occupants by parachuting the aeroplane to the ground. SPRS is not intended to replace the emergency personnel parachute.

a. EASA position

The Sailplane Parachute Rescue System as intended for the CSTMG01 is an additional safety feature. It is not intended to be part of the minimum equipment or to compensate any deviation from CS 22. The detailed requirements of the ASTM standard ”F 2316-06, Standard specification for Airframe Emergency Parachutes for Light Sport Aircraft” shall ensure that the installation itself and the procedures for operation and maintenance do not have an adverse effect on safety.

As the CSTMG01 exceeds the standard range of Light Sport Aircraft, additional requirements based on ”LBA, Vorläufige Ergänzungsforderungen für den Einbau von Gesamtrettungssystemen in Segelflugzeugen und Motorseglern, Ausgabe 1994”, [6] were defined.

3. Proposed Special Condition

3.1 General

The ASTM standard ”F 2316-06, Standard specification for Airframe Emergency Parachutes for Light Sport Aircraft”, [1], is the basic requirement for the Sailplane Parachute Rescue System and the installation in the powered sailplane CSTMG01 with the following deviations and supplements:

3.2 Flight

3.2.1 Speed

The maximum allowed operating speed (v_{PD}; parachute deployment) of the SPRS will be defined to cruise speed v_C.
v_C is proposed to be taken from CS-23; where the upper limit is
defined in CS23.335(a)(3):
v_C need not be higher than 0.9 times v_H at sea level.
For CSTMG01 v_H is set to 300km/h EAS, therefore is $v_C = v_{PD}$ = 270km/h EAS

3.2.2 Opening conditions, opening shock, sink phase

Required opening conditions are defined in [6], specially for sailplanes and powered sailplanes.
It is to be shown that the system operates safely under the following flight conditions:
a) During a stall at minimum speed
b) In a static spin after at least one turn
c) In stabilized turning flight at V_A with 2 g
d) During dives at V_{NE}
e) During a negative 90° arc initiated with the aircraft first in horizontal flight at V_s

The extensive research work of Fachhochschule Aachen, Germany, Prof. W. Röger, [4], will be used for substantiation of the behaviour of the SPRS during opening and stationary sink phase. According to [4], Chapt. 14.2, 2.2b, page 183, a zero speed, ground ejection test with increased
mass of the rescue system according to maximum limit load factor n is required. This ground ejection test will cover all specified opening conditions according to [6]. Provided that the installation of the SPRS is similar to the recommended installation of this report, no in-flight tests will be required.

3.2.3 Sink rate

The maximum allowable sink rate is 8 m/s, according to NPA-2007-12, which was accepted for CSTMG01 in connection with special condition CSTMG01.

3.2.4 Landing conditions

Extensive research work of T¨UV Rheinland, [5], and Fachhochschule Aachen, [2] and [3], showed that a pitch angle of -20° to -40° together with crashworthiness requirements of special condition 01 for CSTMG01 and an appropriate restraint system according to AMC 22.785(f) (Hip-point) gives optimal occupant protection.

3.3 Tests

The following tests will be performed with the aircraft, provided that the installation of the SPRS is similar to the recommended installation in [4]:
a) Ground extraction test (zero speed), according to [4].
b) Static strength test of parachute attachment to the airframe up to ultimate load.

3.4 Strength

The SPRS and the harness shall fulfill the strength requirements of ASTM standard ”F 2316-06, Standard specification for Airframe Emergency Parachutes for Light Sport Aircraft”, [1].

3.4.1 Loads from normal flight operations and emergency landing conditions
The SPRS may not affect the safety during normal flight operations defined in CS-22 and emergency landing conditions defined in special condition 01.

3.4.2 Transfer of parachute deployment loads to the aircraft
Provisions have to be made, to transfer the parachute deployment loads to the aircraft structure, so that the functionality of the SPRS is not affected. It has to be shown, that the loads according to ASTM standard ”F 2316-06, Standard specification for Airframe Emergency Parachutes for Light Sport Aircraft”, [1] does not affect the structural safety of the aircraft structure, which is relevant for the functionality of the system. Especially the safety of the load attachment points together with the cockpit structure is of importance.

3.4.3 Landing impact
The static emergency landing conditions of NPA-2007-12 (special condition 01) have to be met to provide adequate structural safety for the cockpit structure under the prescribed landing conditions.

4. Bibliography
[1] ASTM F 2316-06
Standard specification for Airframe Emergency Parachutes for Light Sport Aircraft
[2] W. Röger, et. al.
Verbesserung der Insassensicherheit bei Segelflugzeugen und Motorseglern durch integrierte Rettungssysteme
Forschungsbericht Fachhochschule Aachen, im Auftrag des Bundesministeriums für Verkehr, 1994
[3] W. Röger, et. al.
Insassensicherheit bei Luftfahrtgerät
Forschungsbericht Fachhochschule Aachen, im Auftrag des Bundesministeriums für Verkehr, 1996
[4] W. Röger, et. al.
Entwicklung von Nachweisverfahren für die Verkehrssicherheit von Segelflugzeugen und Motorseglern
Forschungsbericht Fachhochschule Aachen, im Auftrag des Bundesministeriums für Verkehr, Bau- und Wohnungswesen, 2002
[5] M. Sperber
Untersuchungen des Insassenschutzes bei Unfällen mit Segelflugzeugen und Motorseglern
Forschungsbericht T¨UV Rheinland, im Auftrag des Bundesministeriums für Verkehr l-2/93 - 50112/92, 1998
[6] LBA
Vorläufige Ergänzungsforderungen für den Einbau von Gesamtrettungssystemen in Segelflugzeugen und Motorseglern, Ausgabe 1994
[7] FAA
Special Conditions: Ballistic Recovery System Cirrus SR-20 installation
Docket No. 136CE, Special Condition 23-ACE-88

…… Comments are invited on those special conditions and should be sent by mail or electronic mail (preferred means), before 22 May 2008, to:

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