



Federal Aviation Administration

Memorandum

Date: October 28, 2008

From: Manager, Project Support Branch, ACE-112

To: Manager, Small Airplane Directorate, ACE-100

Prepared by: Gregory Davison, Aerospace Engineer, ACE-112

Subject: Request for Review and Concurrence with Associated Equivalent Level of Safety (ELOS), For the Schempp-Hirth Discus-2cT to Joint Aviation Regulations (JAR) 22.1093 Change 4, ACE-08-18.

This memorandum documents concurrence for the subject ELOS. We request your office to review and concur with the proposed ELOS findings to JAR 22.1093, Induction System Icing Protection.

Background:

The Schempp-Hirth "Discus-2cT" is a single-seat, powered (non-self-launching) sailplane with an extending/retracting power plant. It is an in-line, two-cylinder, two-stroke SOLO engine type "2350", which is started by a windmilling effect of the multi-blade folding propeller (OEHLER system). Throttle and choke mechanisms are not required as the engine is designed to operate at maximum continuous power. The engine air induction system is not connected with the airframe; it is a short rectangular tube that connects both inlet manifolds. The engine is used outside the fuselage in the free air stream.

In order to prevent any ice accumulation in the induction system, JAR 22.1093 requires a pre-heater for engines that utilize a venturi-type carburetor, or a continuously heated air intake that provides a sufficient temperature rise that inhibits ice accretion.

JAR 22.1093, Induction System Icing Protection

- (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 a temperature of -1°C (30.2°F), of increasing the intake air temperature by 50°C (122°F) with the engine at 75% of maximum continuous power.
- (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.

The Discus-2cT does not utilize a pre-heater and Schempp-Hirth assumes, through similar service history, that sufficient heat is generated by thermal radiation from the hot cylinders.

Schempp-Hirth has submitted to the German CAA, Luftfahrt-Bundesamt (LBA), a Substantiation Report 890, page 0.5.22, which states their basis for an ELOS to JAR 22.1093.

Applicable Regulations:

JAR 22.1093, Change 5: Induction System Icing Protection

- (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 a temperature of -1°C (30.20°F), of increasing the intake air temperature by 50°C (122°F) with the engine at 75% of maximum continuous power.
- (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.

14 CFR, part 21, § 21.17

- (b) For special classes of aircraft, including the engines and propellers installed thereon (e.g., gliders, airships, and other non-conventional aircraft), for which airworthiness standards have not been issued under this subchapter, the applicable requirements will be the portions of those other airworthiness requirements contained in parts 23, 25, 27, 29, 31, 33, and 35 found by the Administrator to be appropriate for the aircraft and applicable to a specific type design, or such airworthiness criteria as the Administrator may find provide an ELOS to those parts.

Schempp-Hirth's Position:

For the substantiation that the above assumption (as stated in the background) is justified, the service experience of about 170 powered sailplanes (VENTUS bT, VENTUS cT, Nimbus-3DT, and Nimbus 3T) equipped with this power plant design is taken into account. No single malfunction of the engine operation is known where icing was the reason. Especially meaningful is not only the operators' experience, but also our own experience during the production flight tests with these powered sailplanes. These flights are performed not only under good soaring conditions, but also under poor weather conditions where icing tends to occur. No malfunctions related to icing of the induction system have been found.

LBA's Position:

The LBA agrees to the manufacturer's position and has done so before in certifying other powered sailplanes in Germany with an ELOS on this subject. The ELOS is based on the fact that the engine runs constantly at maximum power, which reduces the risk of carburetor icing to a minimum. Also, the position of the air inlet of the carburetors in the vicinity of the crank case provides a reliable heat source to the system. This may be seen as a constant pre-heater according to JAR 22.1093(b). However, due to the lower temperature level when compared to conventional pre-heaters, this system has not been officially named as pre-heater.

Compensating Features:

The Discus-2cT is a powered sailplane not capable of self launching which, like a glider, must be either launched by winch or aerotow (with its powerplant retracted). The powerplant is not used during takeoff. The engine is a supplemental piece of equipment and is used to extend the glide or to overcome zero lift conditions. The powerplant is not used during landing. Thus, there is no operational safety impact due to the loss of engine operation, whether from induction system icing or fuel exhaustion.

FAA Position:

We agree that the Discus-2cT engine induction system provides an ELOS as a constant preheater, according to JAR 22.1093(b), Change 5, and is within the requirements of 14 CFR, part 21, § 21.17.

Concurred by:

William J. Timberlake
Manager, Project Support Branch, ACE-112

10-27-08
Date

Patrick R. Mullen for
for Manager, Standards Office, ACE-110

10-28-08
Date

James E. Jackson
for Manager, Small Airplane Directorate, ACE-100

10-28-08
Date