



# Federal Aviation Administration

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## Memorandum

Date: July 22, 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 Duo Discus T to JAR 22.1093, Change 5, ACE-08-13

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

### Background:

The Schempp-Hirth "Duo Discus" is a two-seat, powered (non self-launching) sailplane with an extending/retracting power plant. Its two-stroke SOLO engine type "2350 D" 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.

In order to prevent any ice accumulation in the induction system, Joint Aviation Requirement (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  $-1^{\circ}\text{C}$  ( $30.2^{\circ}\text{F}$ ), of increasing the intake air temperature by  $50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ ) 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 Duo Discus T 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 equivalent level of safety 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  $-1^{\circ}\text{C}$  ( $30.20^{\circ}\text{F}$ ), of increasing the intake air temperature by  $50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ ) 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 equivalent level of safety to those parts.

#### Schempp-Hirth's Position:

For the substantiation that the above assumption (as stated in the background) is justified, the field operation experience of over 500 self-sustaining powered sailplanes 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 every Duo Discus T. These flights are performed not only under good soaring conditions but also under poor weather conditions without any malfunctions related to icing of the induction system.

#### LBA's Position:

The LBA agrees to the manufacturer's position and has done so before in certifying the Duo Discus T for Germany with an equivalent level of safety on this subject. The equivalent level of safety 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 Duo Discus T 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 Duo Discus T engine induction system provides an equivalent level of safety 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:

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Manager, Project Support Branch, ACE-112

7-21-08  
Date

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

7-22-08  
Date

Kim Smith  
Manager, Small Airplane Directorate, ACE-100

7-23-08  
Date