Federal Aviation Administration

Memorandum

Date: March 7, 2007

From Manager, Project Support Branch, ACE-112

To: Manager, Small Airplane Directorate, ACE-100

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

Subject: Review and Concurrence, Equivalent Level of Safety to JAR 22.207(c), Amendment 6, "Stall Warning" for the DG Flugzeugbau DG-1000T Powered Glider, ACE-07-01

This memorandum documents concurrence for the subject finding of an Equivalent Level of Safety (ELOS). We request your office to review and concur with the proposed ELOS finding to JAR 22.207(c), Amendment 6, "Stall Warning." The proposed ELOS will allow for the compliance to the regulation to be accomplished via aerodynamic buffeting.

Background:

The DG Flugzeugbau DG-1000T is a self-sustaining, two-place, high performance motorglider with a retractable powerplant suitable for basic and aerobatic training and cross-country flying. It is available with two different wingspans: 18m and 20m. Water ballast in the wings and fin are optional with the 18m span and standard with the 20m span. A ballast box is installed in the tail fin and can be used to compensate for the weight of the rear pilot and to aid in trim for heavy pilots.

Applicable Regulation:

The applicable regulation is JAR 22.207(c), Amendment 6, which states:

> 22.207(c): The stall warning must begin at a speed between 1.05 V_{S1} and 1.1 V_{S1} and must continue until the stall occurs.

Compensating Features:

The German civil airworthiness authority, Luftfahrt Bundesamt (LBA), has approved an equivalent level of safety for the DG Flugzeugbau DG-1000T stall warning requirement of JAR

22.207(c), Amendment 6. This equivalent level of safety, based on the EASA's Notice of Proposed Amendment (NPA) 22B-73, establishes an alternative to the initiation of the stall warning set forth by JAR 22.207(c). NPA 22B-73 for 22.207(c) states:

"The stall warning shall begin:

1) At a speed between 1.05 V_{S1} and 1.1 V_{S1} or;

2) Between 2 and 5 seconds before the stall occurs when longitudinal control is moved at a pace corresponding to 2 km/h (1.08 knots, 1.24 mph) per second rate of reduction of speed and shall continue until the stall occurs".

This NPA was incorporated in the first issue of European Aviation Safety Agency (EASA) Certification Specifications for Sailplanes and Powered Sailplanes (CS 22).

As for most modern sailplanes, the DG-1000T does not fulfill the original JAR 22.207(c) requirement. The stall warning does not begin at a speed between 1.05 V_{S1} and 1.1 $V_{S1,}$ but rather at a speed of 1.04 V_{S1} and is demonstrated through aerodynamic buffeting, which starts between 2 and 3 seconds before the stall occurs, when the longitudinal control is moved at a pace corresponding to the 2 km/h (1.08 knots, 1.24 mph), per second rate of speed reduction. This buffeting continues until the stall occurs.

Additional stall conditions are as noted:

Stall warning with the powerplant extended:

1. With the engine running at full power, the rolling motion can be controlled during the stall. No uncontrollable wing dropping occurs. The natural buffeting of the DG-1000T during stall is noticeable.

2. With the engine running at idle, the stall characteristics are similar to the condition of the engine retracted. The engine vibrations overlay the natural buffeting of the sailplane during stall, but the natural buffeting can still be noticed.

3. With the engine stopped, stall characteristics are similar to engine retracted configuration. The buffeting due to the vortexes of the powerplant overlays the natural buffeting of the sailplane during stall. The natural buffeting can hardly be noticed.

FAA Position:

We concur with the findings of the LBA that the DG Flugzeugbau DG-1000T as configured meets the stall warning requirements of NPA 22B-73, 22.207(c)(2) and an

Equivalent Level of Safety (ELOS) to JAR 22.207(c), Amendment 6, is established as required per 14 CFR 21.21(b)(1).

Concurred by:

William J. Timberlake *3-1-07*
Manager, Project Support Branch, ACE-112 Date

Pat Mullen for *3-2-07*
Manager, Standards Office, ACE-110 Date

David R. Showers for *3-7-07*
Manager, Small Airplane Directorate, ACE-100 Date