Federal Aviation Administration

Memorandum

Date: April 26, 2006

From: Manager, Atlanta ACO, ACE-115A

To: Manager, Small Airplane Directorate, ACE-100

Prepared by: Donald O. Young, Propulsion and Services Branch, ACE-118A

Subject: ACTION: Request for Review and Concurrence with an Equivalent Level of Safety (ELOS) to 14 CFR 23.777(d) Cockpit controls and §23.779(b) Motion and effect of cockpit controls for Piper Models PA-28-161 Cadet and Warrior II and III airplanes with Thielert Aircraft Engines, GmbH (TAE) Model TAE-125-01 Aircraft Diesel Engine (ADE). ACE-05-27

This memorandum documents concurrence for the subject finding of an Equivalent Level of Safety (ELOS). We request that your office review and concur with the proposed ELOS finding to 14 CFR § 23.777(d) Cockpit controls, and § 23.779(b) Motion and effect of cockpit controls. The proposed ELOS will allow for the use of one power lever in place of conventional throttle (power), condition and mixture controls, as the Thielert Model TAE-125-01 Aircraft Diesel Engine (ADE) installed on Piper Models PA-28-161 Cadet and Warrior II and III airplanes uses a Full Authority Digital Engine Control (FADEC) to schedule the thrust command to the engine.

BACKGROUND:

The airplanes that the Supplemental Type Certificate (STC) will apply to are the Piper Models PA-28-161 Cadet and Warrior II and III. These are conventional airplanes powered by gasoline engines with conventional controls. The Thielert TAE-125-01 engine installation will eliminate the standard controls and install one control for power. The applicant has requested, by submitting type design data and materials through the Luftfahrt-Bundesamt (LBA) of Germany, an ELOS for the provisions of 14 CFR § 23.777(d) Cockpit controls, and § 23.779(b) Motion and effect of cockpit controls, at Amendment 51. This request for an ELOS finding is the same request and finding applied to Cessna 172K, L, M, N, P, R and S airplanes with the same engine installation.

APPLICABLE REGULATIONS:

The applicable regulations are 14 CFR § 23.777(d) and § 23.779(b), which state:

Section 23.777 Cockpit controls

(d) The control location order from left to right must be power (thrust) lever, propeller (rpm control), and mixture control (condition lever and fuel cutoff for turbine-powered airplanes). Power (thrust) levers must be at least one inch higher or longer to make them more prominent than propeller (rpm control) or mixture controls. Carburetor heat or alternate air control must be to the left of the throttle or at least eight inches from the mixture control when located other than on a pedestal. Carburetor heat or alternate air control, when located on a pedestal must be aft or below the power (thrust) lever. Supercharger controls must be located below or aft of the propeller controls. Airplanes with tandem seating or single-place airplanes may utilize control locations on the left side of the cabin compartment; however, location order from left to right must be power (thrust) lever, propeller (rpm control) and mixture control.

§ 23.779 Motion and effect of cockpit controls.
Cockpit controls must be designed so that they operate in accordance with the following movement and actuation:

(b) Powerplant and auxiliary controls:

Motion and effect

(1) Powerplant controls:

Power (thrust) lever……	*Forward to increase forward Thrust and rearward to Increased rearward thrust.*
Propellers……	*Forward to increase rpm.*
Mixture……	*Forward or upward for rich.*
Fuel……...	*Forward for open. Carburetor, air heat or Alternate. Forward or upward for cold air.*
Supercharger.....	*Forward or upward for low blower.*
Turbo superchargers.....	*Forward, upward, or clockwise to increase pressure.*
Rotary controls……	*Clockwise from off to full on.*

(2) Auxiliary controls:

Fuel tank selector…….	*Right for right tanks, left for left tanks.*
Landing gear……	*Down to extend.*
Speed brakes……	*Aft to extend.*

COMPENSATING FEATURES:

The FADEC will automatically control the thrust from the engine-propeller system thereby alleviating the need for a separate propeller control. The Thielert TAE-125-01 ADE is an excess air, direct fuel injection engine, and does not require a control for fuel mixture. The use of a single power control with the same shape and movement as the

previous conventional gasoline throttle, and deletion of propeller and mixture controls, is consistent with other Single Power Lever (SPL) approvals and provides a consistent and equivalent level of safety to the previous control scheme used on the airplane models affected.

RECOMMENDATION:

We concur that Thielert's substitution of one power lever in place of the traditional levers for power, propeller and mixture controls provides an equivalent level of safety to the regulatory requirements of § 23.777(d) Cockpit controls, and § 23.779(b) Motion and effect of cockpit controls.

Concurred by:

Melvin D. Taylor *2/7/06*
Manager, Atlanta ACO, ACE-115A Date

John Colomy *4/25/06*
Manager, Standards Office, ACE-110 Date

John Colomy *4/26/06*
for Manager, Small Airplane Directorate, ACE-100 Date