



# Federal Aviation Administration

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## Memorandum

Date: February 24, 2010

To: Manager, Small Airplane Directorate, ACE-100

From: Manager, Project Support Office, ACE-112

Prepared by: Peter Rouse, Regulations and Policy Office, ACE-111

Subject: Extension of Equivalent Level of Safety (ELOS) to 14 CFR part 23, § 23.1145, Ignition Switches, for the Diamond Aircraft Industries for the DA-42 M-NG Airplane.

ELOS Memo#: ACE-05-05B

Regulatory Ref: 14 CFR, part 23, § 23.1145

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Diamond Aircraft Industries (DAI) requests extension of an existing ELOS, ACE-05-05A, for the use of Full Authority Digital Engine Control (FADEC) power switches to accomplish the requirements of § 23.1145 to the model DA-42M-NG airplane.

### **Background:**

The DA-42 M-NG is a derivative model airplane to be included on type certificate A57CE, along with the prior certificated model DA-42. The FAA is currently validating two nearly identical model airplanes (DA-42 NG and DA-42 M-NG). FAA has issued an ELOS for the currently certificated model DA-42 and for the model DA-42 NG. The model DA-42 M-NG is identical to the model DA-42NG except for the following design changes:

- Cockpit Canopy - The canopy provides more headroom and improved visibility to the sides of the airplane without any appreciable effect on the performance and handling qualities.
- Mission Equipment Electrical Bus - This system provides provision for mission equipment electrical power supply. This system is installed as a provision only and no equipment is permitted to use this electrical bus.
- Nose Cone - This nose cone installation uses an adapter ring that provides the capability to remove the cone. The nose cone approved for this model airplane has the identical loft lines of the DA-42NG nose cone; therefore having no effect on the airplane performance or flight characteristics.

The FAA has made a determination that the design differences listed above do not affect any areas of consideration for the ELOS granted for the model DA-42 NG. Therefore, the FAA has made the determination that it is acceptable to grant an extension of the ELOS issued for the model DA-42 NG to the model DA-42 M-NG.

The remainder of this ELOS memorandum provides the background information and justification for the original approval of ELOS ACE-05-06 to the model DA-42 that has been extended to the DA-42 NG and that is requested to be extended to the DA-42 M-NG:

The model DA-42 M-NG will allow for the utilization of FADEC power switches in place of the function provided by ignition switches as described in § 23.1145. The major change with respect to this amended type design replaces the Thielert Model TAE 125-01 diesel engines with the Austro Model AE300 diesel engines; however, the FADEC power switch design is fundamentally identical for the requested ELOS extension to that of the original ELOS.

The Diamond Aircraft Industries (DAI) DA-42 aircraft is a new fully composite, four place, twin-engine airplane with retractable gear, cantilever low wing and T-tail. The airplane was certified by EASA on type certificate number A005, dated May 13, 2004. The airplane is powered by two Thielert Aircraft Engines GmbH (Thielert) TAE 125-01 aircraft diesel engines (ADE), type certificated in the United States, type certificate number E00069EN. The Thielert engine is a diesel cycle engine, and does not have or require an ignition system. However, it is controlled by a Full Authority Digital Electronic Engine Control, FADEC. Controlling electrical power to the FADEC has the same effect on the Thielert as using ignition switches on a conventional engine. The engine can be shut off by shutting off FADEC power, which accomplishes the same task as required for ignition switches by § 23.1145. Under the Bilateral Airworthiness Agreement (BAA) between the USA and the Austrian Exporting Civil Aviation Authority (ECAA), the Austro Control GmbH (ACG), an application for U.S. Type Certification of Diamond Aircraft Industries (DAI) model DA-42 was made on August 2, 2004, by the DAI through the European Aviation Safety Agency (EASA).

**Applicable Regulation:**

Section 23.1145, Ignition switches, requires the following:

*§ 23.1145 Ignition switches*

- (a) Ignition switches must control [and shut off] each ignition circuit on each engine.*
- (b) There must be means to quickly shut off all ignition on multiengine airplanes by the groupings of switches or by a master ignition control.*
- (c) Each group of ignition switches, except ignition switches for turbine engines for which continuous ignition is not required, and each master ignition control must have a means to prevent its inadvertent operation.*

**Regulations Requiring an ELOS Finding:**

14 CFR, part 23, § 23.1145

**Description of Compensating Design Features:**

The Thielert TAE-125 reciprocating diesel engine uses a FADEC to control engine operation and, by its nature, does not require the associated ignition systems and switches. However, the FADEC can be shut off, which will stop the engine, and a switch provides such a feature. This feature meets the intent of § 23.1145. To ensure an ELOS to the intent of § 23.1145, the installation in the Diamond Aircraft Industries DA-42 meets the requirements of § 23.1145, when the regulation is re-characterized to mean "FADEC power switch" in place of "ignition switch," and it meets all requirements as specified in § 23.1145. This provides an equivalent level of functionality and safety as intended by the rule for conventional ignition systems as used on gasoline engines.

Based on the functional identity of the respective design, we concur with the requested extension of this ELOS for the Austro AE300 engine installation's use of the FADEC power switches to accomplish the requirements of § 23.1145.

**FAA Approval:**

The Small Airplane Directorate concurs with the extension of ELOS ACE-05-05A for the DAI model DA-42 NG to the model DA-42 M-NG. The DAI model DA-42 M-NG is granted ELOS number ACE-05-05B.

*James E. Jackson for*

Manager, Small Airplane Directorate  
Aircraft Certification Service

*2-24-2010*

Date

ELOS Originated by: Small Airplane Directorate	Project Support Branch Manager: William J. Timberlake	Symbol: ACE-112
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