



U.S. Department
of Transportation

Federal Aviation
Administration

Memorandum

Subject: **INFORMATION:** Review and Concurrence. Equivalent Level of Safety for Fuel Cutoff Control for the Eclipse 500 Aircraft (Ref. 14 CFR Part 23, §§ 23.777(d) and 23.781(b) Fuel Cutoff Control)(FAA Project TC3853CH-A) ; ACE-02-19

Date: MAR 15 2002

Reply to
Attn of:

From: Manager, Small Airplane Directorate, ACE-100

To: Manager, Chicago Aircraft Certification Office, ACE-115C

Background: Eclipse Aviation has applied to the Chicago ACO, for an Equivalent Level of Safety Finding (ELOS) to the above referenced 14 CFR Part 23 regulations. The Eclipse Model 500 fuel cutoff is on a four position, rotary knob located on the center, overhead panel (see figure at Attachment 1). The four positions are MOTOR/STOP/RUN/START. The MOTOR position is spring-loaded, so the pilot has to hold it in place to function or it will return to the STOP position. The START position is also spring-loaded, and once the start sequence is started, the pilot releases the knob and it then goes to the RUN position. To go from RUN to STOP (fuel cutoff), the pilot must push in the knob and rotate it to STOP. This is to safeguard against inadvertent fuel cutoff. There are two other push buttons located on the overhead panel used for ignition override. Since push buttons require a different action to initiate, there cannot be inadvertent fuel cutoff with any action used for ignition override. These are the only items located on the overhead panel. The engine throttle system is actuated by electrical sensors, a throttle by wire design. Enabling a mechanical fuel shutoff by an aft throttle movement was deemed unnecessarily complex for this design; therefore, this ELOS was developed. The Eclipse fuel shutoff mechanism does not have a manual shutoff capability; however, the system includes a motor operated ball valve that will not move when electrical power is removed. This motor operated ball valve is energized through the emergency electrical bus. This system is consistent with similar business jet fuel system design standards.

Applicable Regulations and Guidance: The applicant is requesting an equivalent level of safety finding for 14 CFR Part 23, §§ 23.777(d) and 23.781(b), in relation to fuel cutoff. In accordance with § 23.777(d), the fuel cutoff is to be placed in a specific location (right of thrust control for non-propeller driven airplanes), and in accordance with § 23.781(b), the control knobs must conform to specific shapes. The intent of these requirements was to standardize cockpit controls to enhance pilot effectiveness. This was due to pilots inadvertently using the wrong controls on various propeller driven, small airplanes (please refer to FAA Notice 84-12, which provides the basis of the requirements).

Key features that provide an ELOS: As described above, the design of the Eclipse Model 500 fuel cutoff precludes inadvertent cutoff by the pilot. The design also precludes inadvertent action by the pilot of another function. Therefore, the CHI-ACO position is that the design provides a level of safety that exceeds the intent of the requirements for fuel cutoff contained in §§ 23.777(d) and 23.781(b)

Recommendation: Approve request for an ELOS to 14CFR Part 23, §§ 23.777(d) and 23.781(b) Fuel Cutoff Control, based on no other equipment placed on the overhead and the System Safety Assessment per § 23.1309 is acceptable.

If you have any questions, please contact Mr. Mike Keisov at (816) 329-4144, by fax at (816) 329-4090 or by email at Mike.Keisov@faa.gov.

Concur

Signature: [Handwritten Signature]
Manager, Small Airplane Directorate
Standard Staff, ACE-110

Date: 3/12/02

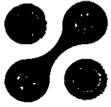
Concur

Signature: [Handwritten Signature]
Manager, Small Airplane Directorate,
ACE-100

Date: 3/12/02

Attachment

Eclipse Equivalent Level of Safety request letter with Overhead Panel Figure.



**ECLIPSE
AVIATION**

November 19, 2001
Reply to ELOS/01/001

Mr. Wess Rouse
FEDERAL AVIATION ADMINISTRATION
Chicago Aircraft Certification Office, ACE-117C
2300 East Devon Avenue, Room 115
Des Plaines, Illinois 60018

1791-2001

116C	115C RECEIVED	AO
(17C)		SECY
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Subject: Request for an Equivalent Level of Safety Finding for 14 CFR Part 23, §§ 23.777(d) and 23.781(b) Fuel Cutoff Control for the Eclipse Model 500 (FAA Project TC3853CH-A)

Dear Mr. Rouse,

In accordance with Small Airplane Directorate Memorandum "14 CFR Part 23/CAR 3 Airplanes; Clarification of Type Certification Process of Single Lever Power Controls" dated Dec 17, 1999, we are requesting an equivalent level of safety finding for 14 CFR Part 23, §§ 23.777(d) and 23.781(b) in relation to fuel cutoff. In accordance with § 23.777(d), fuel cutoff is to be placed in a specific location (right of thrust control for non-propeller driven airplanes), and in accordance with § 23.781(b), be in a specific shape. As discussed in the Small Airplane Directorate Memorandum, the intent of these requirements was to standardize cockpit controls to enhance pilot effectiveness. This was due to pilots inadvertently using the wrong controls on various propeller driven, small airplanes (please refer to FAA Notice 84-12, which provides the basis of the requirements).

The Eclipse Model 500 fuel cutoff is on a four position, rotary knob located on the center, overhead panel (please see attached). The four positions are MOTOR/STOP/RUN/START. The MOTOR position is spring-loaded, so the pilot has to hold it in place to function or it will return to the STOP position. The START position is also spring loaded, and once the start sequence is started, the pilot releases the knob and it then goes to the RUN position. To go from RUN to STOP (fuel cutoff), the pilot must push in the knob and rotate it to STOP. This is to safe guard against inadvertent fuel cutoff.

There are two other push buttons located on the overhead panel used for ignition over-ride. Since push buttons require a different action to initiate, there cannot be inadvertent fuel cutoff with any action used for ignition over-ride. These are the only items located on the overhead panel.

As described above, the design of the Eclipse Model 500 fuel cutoff precludes inadvertent cutoff by the pilot. The design also precludes inadvertent action by the pilot of another function. Therefore, we believe the design provides a level of safety that exceeds the intent of the requirements for fuel cutoff contained in §§ 23.777(d) and 23.781(b). We request the FAA provide concurrence with this finding.

If you wish to discuss any of our comments, please free to contact Julie Pruitt, Eclipse Aviation at (505) 724-1214.



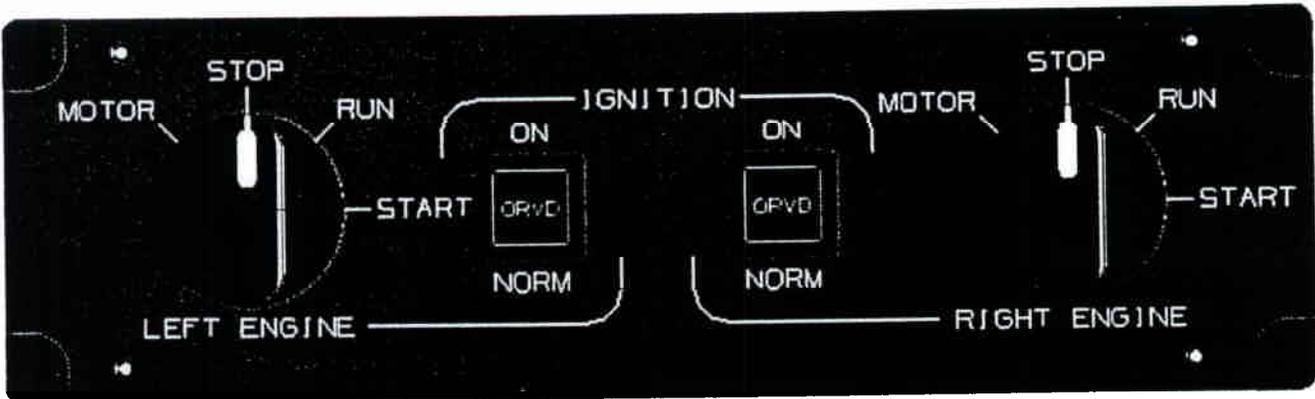
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Best regards,

Randy Griffith
Airworthiness Coordinator
Eclipse Aviation Corporation

Attachment

Cc:
Julie Pruitt, Eclipse Aviation





U.S. Department
of Transportation
**Federal Aviation
Administration**

Memorandum

Subject: **INFORMATION**: 14 CFR Part 23/CAR 3 Airplanes;
Clarification of Type Certification Process of Single
Lever Power Controls

Date: DEC 17 1999

From: Manager, Standards Office
Small Airplane Directorate, ACE-110

To: Manager, Anchorage Aircraft Certification Office, ACE-115N
Manager, Atlanta Aircraft Certification Office, ACE-115A
Manager, Chicago Aircraft Certification Office, ACE-115C
Manager, Wichita Aircraft Certification Office, ACE-115W
Manager, Boston Aircraft Certification Office, ANE-150
Manager, New York Aircraft Certification Office, ANE-170
Manager, Denver Aircraft Certification Office, ANM-100D
Manager, Los Angeles Aircraft Certification Office, ANM-100L
Manager, Seattle Aircraft Certification Office, ANM-100S
Manager, Ft. Worth Aircraft Certification Office, ASW-150
Manager, Ft. Worth Special Certification Office, ASW-190
Manager, Transport Airplane Directorate, ANM-100
Manager, Engine & Propeller Directorate, ANE-100
Manager, Rotorcraft Directorate, ASW-100
Manager, Brussels Aircraft Certification Staff, AEU-100

The purpose of this memorandum is to provide recommendations for certification of single lever power controls (SLPC) installed in Part 23/CAR 3 airplanes. This memorandum supersedes our June 23, 1999 memorandum, which also regarded this subject.

There are airplanes certificated or currently undergoing certification that have combined the features of two or more of the cockpit powerplant controls for power (thrust), propeller (rpm control), and mixture control (condition lever and fuel cutoff for turbine powered airplanes) into a single power lever. The design feature of a SLPC was not envisioned by Part 23/CAR 3. Further, a SLPC cannot meet the standards imposed §§23.777(d) and 23.781(b) as amended by Amendment 23-33. The current amendment level of Part 23 (Amendment 23-53) contains regulations that allow evaluation of a SLPC without the need for Special Conditions (e.g., §§23.777(a)(b), 23.779(b)(1), 23.1309). Since a SLPC was not envisioned at the time Amendment 23-33 was adopted, the question of compliance with §§23.777(d) and 23.781(b) as amended by Amendment 23-33 still exists, however.

Due to recommendations made by the NTSB, Amendment 23-33 provided specific location, height, and shape requirements for a number of cockpit controls, including power, propeller, and mixture controls. With the design feature of a SLPC integrating the functions of multiple controls into a single cockpit control, a nonstandardized design approach for the affected powerplant cockpit controls is used. Additionally, §23.1141(a) states: "Powerplant controls must be located and arranged under §23.777...." However, a SLPC, as described earlier, cannot be arranged in accordance with §23.777; therefore, compliance with §23.1141(a) is not possible.

Notice No. 84-12, which was the basis for Amendment 23-33, described the intent of §§ 23.777 (d) and 23.781 (b). As stated in the notice:

"An effective means of enhancing pilot experience and training would be to require complete standardization in cockpit design. While such action may initially improve the level of safety, it might ultimately inhibit design advancement and result in lower levels of safety than would have evolved without such a total standardization.

An effective and practical means of enhancing the effectiveness of pilot training and enhancing safety would be to require standardization of location, shape, color, and direction of movement of those cockpit controls. This would have minimal adverse effect on design advancement."

From the preceding, it is obvious that the FAA and industry did not envision or address the future use of a SLPC when drafting this rulemaking, but it was intended to allow design advancements that would enhance safety. A SLPC is a design advancement in the public interest and does not adversely affect safety. Therefore, a SLPC will meet the intent, but not literal compliance of §§23.777(d) and 23.781(b) as amended by Amendment 23-33.

We therefore recommend use of an Equivalent Level of Safety finding for airplanes with a certification basis of Amendment 23-33 or later, when making compliance determinations for §§23.777 (d) and 23.781 (b). For these airplanes, Special Conditions are usually unnecessary. In some cases however, the applicable airworthiness standards may not be adequate due to other novel or unusual features of the aircraft and Special Conditions may be warranted.

For airplanes with a certification basis prior to Amendment 23-33, no special considerations will be needed unless they involve other novel or unusual design features not covered by the applicable regulations.

The recommendations made in this memorandum differ from how some Part 23/CAR 3 projects have been processed in the past. This new policy does not apply to certification projects that have begun prior to the date of this memorandum.

We have initiated regulatory action to revise Part 23 to allow incorporation of a SLPC without special considerations. However, until these actions have been completed, the recommendations in this memorandum may be used for certification of a SLPC on Part 23/CAR 3 airplanes.

If you have any other questions or need additional information, please contact Mr. Randy Griffith, Regulations and Policy Branch, at 816-329-4126.



Michael K. Dahl