



Federal Aviation Administration

Memorandum

Date: November 13, 2015

To: Manager, Transport Standards Staff, International Branch, ANM-116

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Douglas Bryant, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Throttle Motion during Reduced Thrust (flexible) Takeoff Operations and/or Go-Around for the Airbus Single Aisle New Engine Option Model Airplanes (FAA Project # AT00949IB-T)

ELOS Memo #: AT00949IB-T-P-10

Regulatory Ref.: § 25.779(b)(1)

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate (TAD) on the establishment of an equivalent level of safety (ELOS) finding for the Airbus Single Aisle (SA) New Engine Option (NEO) model airplanes.

Background

Title 14, Code of Federal Regulations (14 CFR) 25.779(b)(1) requires forward motion to increase forward thrust and rearward motion to increase rearward thrust. The design of the Airbus SA NEO model airplanes incorporates features that during certain reduced thrust (flexible) takeoffs and go-around using reduced takeoff thrust a rearward thrust lever motion will result in a forward thrust increase.

The design of a typical transport category airplane has several thrust settings. The maximum thrust setting is referred to as the takeoff setting. A normally used setting below that is the climb setting. Another typical design aspect of a transport category airplane is to incorporate reduced takeoff settings when the maximum thrust available isn't necessary to perform a normal takeoff. This feature is sometimes referred to as a flexible takeoff. This option allows for an optimization of thrust use and a decrease in fuel consumption resulting in a cost savings and a positive environmental impact.

The Airbus SA NEO model airplanes incorporate a reduced thrust (flexible) takeoff, and when it is selected, it can be less thrust than the climb thrust rating. In this case, the climb setting is automatically adjusted (reduced) to the reduced thrust takeoff setting. This design feature is the typical approach for accommodating the § 25.779(b)(1) requirement since it results in no thrust increase (no thrust change) when thrust levers are moved to a position associated with the lower setting.

The SA NEO model airplanes also incorporate a reduced takeoff thrust setting, referred to as a Soft Go-Around function, to prevent strong aircraft acceleration, excessive vertical speed and high pitch angle during a go-around with a lightweight airplane. In certain operations when Soft Go-Around is selected, it can be less thrust than the climb thrust setting. In this case, the climb setting is automatically adjusted (reduced) to the Soft Go-Around thrust setting. So then a rearward motion of the throttle lever from the maximum continuous detent position to the climb thrust detent does not result in an increase in thrust.

However, for each of these design features, when in flight and the thrust lever is reduced to the climb detent (rearward motion), the commanded thrust setting remains at the adjusted climb level for only a given time period (typically a few seconds) and then the commanded thrust setting progressively increases (over another given time period) to the normal (non-reduced) climb thrust level. This results in an increase in thrust following a rearward thrust lever motion. This hesitation logic incorporated by a timer function circumvents the intent of § 25.779(b)(1) by only initially prohibiting the increase in thrust to the normal climb setting.

Applicable regulation(s)

§ 25.779(b)(1)

Regulation(s) requiring an ELOS finding

§ 25.779(b)(1)

Description of compensating design features or alternative standards which allow the granting of the ELOS finding (including design changes, limitations or equipment need for equivalency)

The Airbus SA NEO model airplanes incorporate washout logic that delays the increase in thrust when the thrust lever is reduced to the climb detent for both 1) following a reduced (flexible) takeoff where the reduced (flexible) thrust setting is lower than the normal climb rating and for 2) following a go-around using reduced takeoff thrust (Soft Go-Around) where the thrust setting is lower than the normal climb setting. The washout logic delays any change in thrust initially by automatically reducing the climb rating to be equal to the reduced (flexible) takeoff thrust level. This delay will last for several seconds. The thrust increase from the reduced climb rating to the normal climb rating is gradual, occurring over a period of several seconds. The magnitude of the change in thrust from the reduced climb setting to the normal climb setting is considered small. Additionally, the dynamic effects of the thrust increase do not impact the controllability of the airplane. The duration of the washout and the magnitude of the change will be evaluated through flight test to make sure it is imperceptible by the flightcrew. However, a description of this feature will be included in flightcrew training to provide awareness of this situation.

Explanation of how design features or alternative standards provide an ELOS to that intended by the regulation

Although noncompliant with § 25.779(b)(1), the transparent nature of the washout logic to the flightcrew is considered to provide adequate compensation for not providing a forward thrust motion associated with the increase in forward thrust. Relevant compensating factors include:

- 1) The washout logic gradually introduces the thrust change,
- 2) The low magnitude of the thrust change, and
- 3) Flightcrew awareness of the washout logic is provided in flightcrew training.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in the Airbus SA NEO project Issue Paper P-10, titled “Throttle Motion During Reduced (Flexible) Takeoff Thrust Operations and/or Go-Around.” This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS finding. This ELOS memorandum number should be listed in the type certificate data sheet under the Certification Basis section in accordance with the statement below:

Equivalent Level of Safety Findings have been made for the following regulation(s):

§ 25.779(b)(1), Motion and effect of cockpit controls, Powerplant
(documented in TAD ELOS Memo AT00949IB-T-P-10)

Original Signed by Christopher Parker

Transport Airplane Directorate,
Aircraft Certification Service

November 13, 2015

Date

ELOS Originated by: Transport Standards Staff	Project Engineer: Douglas Bryant	Routing Symbol: ANM-112
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