

Proposed Equivalent Safety Finding on CS 25.785(d) : “Installation of Angled Seats”

Applicable to Airbus A350-941

Introductory Note:

The hereby presented Equivalent Safety Finding has been classified as an important Equivalent Safety Finding and as such shall be subject to public consultation, in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

Statement of Issue:

CS 25.785(d) requires that:

“Each occupant of a seat (see AMC 25.785(d)) that makes more than an 18-degree angle with the vertical plane containing the aeroplane centreline must be protected from head injury by a safety belt and an energy absorbing rest that will support the arms, shoulders, head and spine, or by a safety belt and shoulder harness that will prevent the head from contacting any injurious object.”

Depending on customer requests, the A350 may be equipped with passenger seats models installed at angles greater than 18 degrees with the aircraft longitudinal axis without providing an energy absorbing rest or shoulder harness as required by CS 25.785(d).

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– CS 25.785(d) : Installation of Angled Seats –

Design Proposal:

Airbus proposes that the passenger seats installed in the A350 aircraft at angles above 18 degrees with the aircraft longitudinal axis may be considered to ensure an equivalent level of safety to a literal compliance to 25.785(d) if the design of the seat and of the surrounding items is developed to enable the occupant to align with the deceleration vector during the impact.

Justification:

Dynamic developmental tests have shown that for such installations the anthropomorphic test device (ATD) upper torso may behave like in a forward facing impact. This is supported by the design of the seat surroundings, which allows a free forward alignment of the test dummy upper torso during the impact.

As for typical forward facing seating it can be demonstrated that there is no obstruction on the seat occupied or surroundings that either creates a risk to the occupant or imposes to the upper dummy body any severe side twisting effect during the impact.

Development tests have shown that when the seat design allows the ATD upper torso and legs to align with the deceleration vector, the application of an energy absorbing rest for arms, shoulders, head and spine as per CS25.785(d) is not required.

Safety Equivalency Demonstration:

The passenger seats that are installed in the A350 aircraft at angles above 18 degrees with the aircraft longitudinal axis are considered to ensure an equivalent level of safety to a literal compliance to 25.785(d) provided that the design of the seat and the surrounding items is demonstrated to enable the occupant to align during the impact with the deceleration vector specified in CS 25.562(b).

Alternatively, if the occupant cannot realign sufficiently, the installation of an airbag-belt system may be an acceptable design solution to control misalignment. This alternative approach must also include ATD internal force and moment measurements, in addition to those required by CS 25.562 (c), for comparative purposes. These measurements can be taken during dynamic testing and compared with values from tests conducted on a seat installed at less than 18 degrees with respect to the aircraft centreline. It should be noted that this approach cannot at present involve consideration of absolute values as research data do not exist to back this up. Rather, this will involve a check that the values observed are of comparable magnitude and range and will provide confidence that the mitigating factors are achieving the desired outcome.

This ESF is limited to a nominal seat installation angle of up to 30 degrees maximum with the aircraft longitudinal axis.