

EASA	COMMENT RESPONSE DOCUMENT
	Proposed Equivalent Safety Finding to CS 25.251(b) : Vibrating / Buffeting (Applicable to Large Aeroplane category fitted with large <u>radome or antenna fairing on the fuselage</u>)

Commenter 1 : Embraer

Comment #[1] – EASA Safety Equivalency Demonstration proposal

The [ESF is] a listing of four distinct procedures — of which only procedure #4 is a flight testing up to V_{mo}/M_{mo} — that the applicant may choose to perform. Hence, an applicant might legitimately argue that a basic similarity analysis (procedure #1), possibly supplemented by flowfield (procedure #2) and vibration (procedure #3) analyses would suffice for showing equivalent compliance with CS 25.251(b). Nevertheless, while the main ESF text seems to not necessarily require any flight tests (it says "... any suitable combination ..."), the Interpretative Material (Appendix 1), in its two last paragraphs, says "However, flight testing to cover the flight domain up to and including V_{mo}/M_{mo} should be performed..." Furthermore, if the ESF requires a flight test anyway, the main idea behind the ESF seems odd: unlike most ESF's, instead of easing the burden on the applicant to comply with the rule, it makes compliance more time-consuming and difficult. In fact, instead of a single flight test to V_{df}/M_{df} (which, for an OEM-airframe is not an overly risky or complex task), it may require, besides a flight test to V_{mo}/M_{mo}, validated complex analyses. It should be emphasized that for an OEM-airframe there is minimal difference (regarding capital, time and risk) between performing a flight test to V_{df}/M_{df} and a flight test to V_{mo}/M_{mo}.

Comment :

The EASA text seems to have some ambiguity regarding the need of performing (or not) a qualitative flight test up to V_{mo}/M_{mo}. The main ESF text and its Interpretative Material seem to be somewhat contradictory. Furthermore, compliance via the ESF could be even more burdensome to the applicant than literal compliance.
EASA could make it clearer.

EASA response: NOTED

The ESF offers to apply any suitable combination of four items (no. 1 - 4), one of which (no. 4) is flight testing to at least V_{MO}/M_{MO} . This flight testing is intended to support extrapolation (to V_{DF}/M_{DF}) of the (flowfield and vibration) analysis mentioned under items no. 2 and 3. This flight testing may or may not be performed, depending on the need to further support the analysis.

For compliance with CS 25.251(d) however, flight testing to V_{MO}/M_{MO} is requested to be performed as per the note in the Interpretative Material.

Flight testing for CS 25.251(b) and (d) serve different purposes, and the two flight test programs may therefore be different.

EASA's intention via the ESF is to allow the applicant not to perform experimental flight test outside operational domain which may allow applicant only capable of category 1 test flight. Flight conducted under this ESF may be considered as category 2 test flights. Nevertheless, the applicant is free to choose direct compliance rather than the ESF if found more convenient.

Commenter 2 : Boeing Commercial Airplanes

Comment #[1] – Title

It is Boeing's belief that widening the applicability of this ESF to cover modifications other than antenna radome will enhance this document's applicability and usefulness to the aviation community.

Comment :

The current wording :

"Proposed Equivalent Safety Finding on CS 25.251(b) - "Vibration / buffeting" - Applicable to Large Aeroplanes category fitted with large antenna installation"

is proposed to be amended as followed :

Proposed Equivalent Safety Finding on CS 25.251(b) - "Vibration / buffeting" - Applicable to Large Aeroplanes category ~~fitted with large antenna installation~~ external modifications having the potential for excessive vibration"

EASA response: Disagreed

If such a wording is retained, it requires defining "potential for excessive vibration" and means to demonstrate it. In order to improve the definition of the domain of application of the ESF, the term "large antenna installation" is replaced by "large radome or antenna fairing on the

fuselage". EASA's intention is to evaluate limited airframe modification in size, shape, weight installed in locations outside lift providing of flight control devices, which means mainly the aircraft fuselage.

The text of the ESF is amended as follows:

Proposed Equivalent Safety Finding on CS 25.251(b) - "Vibration / buffeting" - Applicable to Large Aeroplanes category fitted with large radome or antenna fairing on the fuselage

Comment #[2] – Statement of Issue (paragraph 3)

As for comment #1, this suggested change will enhance this document's applicability and usefulness to the aviation community.

Comment :

The current wording :

"For design changes installing large antenna covered by an aerodynamic fairing (hereafter referred to as the "antenna radome"), compliance must be shown..."

is proposed to be amended as followed :

*"For design changes ~~installing large antenna covered by an aerodynamic fairing (hereafter referred to as the "antenna radome")~~, **that consist of external modifications with the potential for excessive vibration, such as large antenna radome fairings**, compliance must be shown..."*

EASA response: Disagreed

See response to Comment #[1]

Comment #[3] – Statement of Issue (paragraph 4)

To be consistent with our comments #1 and #2, our justification is similar to the justification and rationale associated with comment #1. We believe this suggested change will enhance this document's applicability and usefulness to the aviation community.

Comment :

The current wording :

“The extent of the airplane modifications, particularly the size and location of the antenna radome with respect to the unmodified airplane, may cause significant changes in the aerodynamic flow field around the airplane at high speed, which may lead to excessive vibration. Potential vibration sources include unsteady flow conditions on the antenna radome, fuselage, tail assembly, or control surfaces arising from shocks, flow separation or other unsteadiness in the flow.”

is proposed to be amended as followed :

*“The extent of the airplane modifications, particularly the size and location ~~of the antenna radome~~ with respect to the unmodified airplane, may cause significant changes in the aerodynamic flow field around the airplane at high speed, which may lead to excessive vibration. Potential vibration sources include unsteady flow conditions on the ~~antenna radome~~ **new or modified**, fuselage, tail assembly, or control surfaces arising from shocks, flow separation or other unsteadiness in the flow.”*

EASA response: AGREED

The text of the ESF is modified accordingly

Comment #[4] – Statement of Issue (paragraph 6)

Wording changes are suggested to make the text more consistent with the standardized FAA ELOS Issue Paper for 25.251(b).

Comment :

The current wording :

“The EASA has determined that if it cannot be shown by an acceptable method that the original compliance finding for this rule remains valid (i.e., no vibration/buffet issues exist due to the change), an equivalent level of safety can be shown. However, if the original compliance demonstration for this rule does not remain valid due to potential effects of the external modification, direct compliance with the rule must be re-demonstrated.”

is proposed to be amended as followed :

*“~~The~~ EASA has determined that if it ~~can~~**not** be shown by an acceptable method that the original compliance finding for this rule remains valid (i.e., no vibration/buffet issues exist due to the change), an equivalent level of safety ~~can~~**has** been shown. However, if the original compliance demonstration for this rule does not remain valid due to potential effects of the external modification, direct compliance with the rule must be re-demonstrated.”*

EASA response: Agreed

The text of the ESF is modified accordingly

Comment #[5] – Statement of Issue (paragraph 7)

Wording changes are suggested to make the text more accurate as this ESF is applicable specifically to CS 25.251(b) 25.251(b).

Comment :

The current wording :

“Unless it can be shown that the modification would not affect the original compliance demonstration to 25.251(b), the applicant must show compliance with CS 25.251 either by flight test...”

is proposed to be amended as followed :

*“Unless it can be shown that the modification would not affect the original compliance demonstration to 25.251(b), the applicant must show compliance with CS 25.251**(b)** either by flight test...”*

EASA response: Partially agreed

In order to improve the readability the text is modified as follows:

“Unless it can be demonstrated, by using the means of compliance proposed (associated with the Interpretative Material in Appendix 1), that the modification would not affect the original compliance demonstration to CS 25.251(b), the applicant must show compliance with CS 25.251(b) by flight test up to VDF/MDF.”

Comment #[6] – Statement of Issue (paragraph 8)

Wording changes are suggested to remove unnecessary word.

Comment :

The current wording :

“For convenience, the full ESF text is presented for this public consultation. However, the Interpretative Materials are provided for the information only.”

is proposed to be amended as followed :

“For convenience, the full ESF text is presented for this public consultation. However, the Interpretative Materials are provided for ~~the~~ information only.”

EASA response: Agreed

The text of the ESF is modified accordingly

Comment #[7] – EASA Safety Equivalency Demonstration proposal (1.)

Wording changes are suggested for keeping appropriate formatting.

Comment :

The current wording :

“1. Similarity to other approved designs. (Consider the size, shape, and location of the respective modification, the airplanes they are installed on, the respective VDF/MDF speeds, and the method of compliance used for the approved designs.)”

is proposed to be amended as followed :

*“1. Similarity to other approved designs. (Consider the size, shape, and location of the respective modification, the airplanes they are installed on, the respective **VDF/MDF** speeds, and the method of compliance used for the approved designs.)”*

EASA response: Agreed

The text of the ESF is modified accordingly

Comment #[8] – EASA Safety Equivalency Demonstration proposal (4.)

Wording changes are suggested for reflecting that only conditions identified as critical need to be tested. These conditions may or may not include specific high lift and/or sideslip configurations. These edits would also make the text more consistent with the standardized FAA ELOS Issue Paper for 25.251(b).

Comment :

The current wording :

“4. Flight testing to a speed from which the analyses described in paragraph (1), (2) and (3) can be used to extrapolate the findings to VDF/MDF. As a minimum, flight testing must include test points to cover the complete flight domain from low speed to speeds up to and including VMO/MMO and covering high lift configurations and sideslips which could be experienced in service.”

is proposed to be amended as followed :

*“4. Flight testing to a speed from which the analyses described in paragraph (1), (2) and (3) can be used to extrapolate the findings to VDF/MDF. As a minimum, flight testing must include ~~test points~~ **the critical flight conditions** to cover the complete flight domain from low speed to speeds up to and including VMO/MMO ~~and covering~~ , **which may include** high lift configurations and sideslips which could be experienced in service.”*

EASA response: Partially agreed

The text of the ESF is amended as follows:

4. Flight testing to a speed from which the analyses described in paragraph (1), (2) and (3) can be used to extrapolate the findings to VDF/MDF. As a minimum, flight testing must include the critical flight conditions to cover the complete flight domain from low speed to speeds up to and including V_{MO}/M_{MO} which may include high lift configurations, landing gear extended and sideslips which could be experienced in service.