	CERTIFICATION REVIEW ITEM	C- xx
European Aviation Safety Agency	**[Applicant]** (EASA project reference xxxxxxxxx) **Decompression – Small Compartments** **Primary Panel : 03 (Structures)**	**Issue: Draft** **Date: 05.11.2013** **Page: 1 of 4** **Support Panel : ---**

STATUS: **Open**

CATEGORY: **Acceptable Means of Compliance / Interpretative Material**

REQUIREMENTS: **CS 25.365(e)(g)**

ADVISORY MATERIAL: **---**

Next Action: **[Applicant]**

IDENTIFICATION OF ISSUE:

[Applicant] has applied for EASA approval of a (V)VIP Interior Installation. During means of compliance discussions on similar projects it became evident that the definition of the term “small compartments” as mentioned in CS 25.365(e)(2) needs further clarification. The purpose of this CRI is to provide such clarification.

CS 25.365(e)(2) (as introduced by FAR 25 Amendment 71 and JAR-25 Change 14) states that small compartments may be combined with an adjacent pressurised compartment and both considered as a single compartment for openings that cannot reasonably be expected to be confined to the small compartment. It should be noted that this relates to small compartments adjacent to the pressure boundary, in which an opening as defined by CS 25.365(e)(2) is assumed to occur.

Further explanation of this requirement is given in the Federal Register as follows:

(Proposed Rule – FAR 25 Amendment 71)
“Some compartments within the pressurized cabin may be so small and of such a geometry that the specified maximum opening could not reasonably be expected to involve only the one compartment. It is proposed that such compartments be evaluated for the largest opening that can be expected to remain confined within the compartment. For the larger openings, up to the maximum specified, the compartment may be combined with an adjacent compartment and both treated as a single compartment.”

(Final Rule – FAR 25 Amendment 71)
“A special requirement was provided for very small compartments where the required opening of the proposed Section 25.365(e)(2) could not reasonably be expected to be confined to the small compartment. Instead of the computed opening, an opening of the maximum size expected to remain confined in the small compartment would be considered in the small compartment. As a separate condition, the small compartment would then be combined with an adjacent pressurized compartment and both considered as a single compartment for the maximum size opening

specified by the formula. The cockpit would not be considered a small compartment for the purposes of the proposal."

EASA POSITION:

(1) "Small" versus "large" compartments

When defining what constitutes a "small" compartment various parameters such as size, shape and volume of the compartment could be considered. To avoid an overly complicated and perhaps inappropriate assessment model, EASA recommends the following simple criteria to distinguish between "small" and "large" compartments in relation to CS 25.365(e)(2).

The opening size resulting from CS 25.365(e) could be considered as a rectangle. This is based on the rationale that most fuselage structures consist of circumferential frames and longitudinal stringers. Although this may not be true for all aircraft, and the frames and stringer may not be evenly spaced, this is considered as a reasonable approximation. So a 20 square feet opening size (the maximum in accordance with CS 25.365(e)(2)) would become a rectangle of approximately 4.5 by 4.5 feet, or 54 by 54 inches.

Assuming a typical frame pitch of 20 inches, and assuming that the opening can be confined by the next frame on either side, this would mean that "small" compartments would be those compartments that have a width of three frames or less (for those aircraft for which a 20 square feet opening size is applicable).

(2) Opening sizes

For "large" compartments, the opening size is determined by CS 25.365(e)(1)(2)&(3). The pressurisation loads resulting from this opening size must be considered for compliance with the decompression requirements.

For "small" compartments, when complying with CS 25.365(e)(2), these compartments may be combined with an adjacent pressurised compartment and both considered as a single "large" compartment (with the maximum opening size determined by CS 25.365(e)(2)).

It is recalled that, as separate conditions (see text from Federal Register above), opening sizes resulting from CS 25.365(e)(1) and (e)(3) should also be considered in these "small" compartments (without combining this "small" compartment with an adjacent pressurised compartment, except when such combinations follow from application of opening sizes and locations as defined in CS 25.365(e)(1) and (e)(3)). EASA's interpretation of CS 25.365(e)(3), in relation to the maximum opening caused by aeroplane or equipment failures not shown to be extremely improbable, is that the opening size resulting from a skin bay failure (bounded by two adjacent frames and two adjacent stringers) should generally be considered (i.e. is not extremely improbable) as a minimum opening size for these "small" compartments. This opening size is also considered to satisfy CS 25.365(e)(2) too, as "an opening of the maximum size expected to remain confined in the small compartment", see the text of the Federal Register above.

Also important to note is that, as a separate condition, compartments (both "small" and "large") also have to be assessed for decompression loads resulting from an opening arising from compliance with CS 25.365(e) in the pressure boundary of "large" compartments adjacent to the first.

(3) Continued safe flight and landing, and occupant protection

The purpose of CS 25.365(e) and (g) is to provide protection against the effects of a decompression, both at an aircraft level (continued safe flight and landing, in CS 25.365(e)), and on an occupant level (in CS 25.365(g)). As such, any structure, component, or part, the failure of which could interfere with continued safe flight and landing, as well as bulkheads, floors, and partitions in occupied compartments, must be designed to withstand the effects of decompression.

Therefore, every reasonable and practicable design effort should be taken to meet these requirements, including strengthening of structural elements (such as bulkheads, floors, partitions and ceiling panels), providing additional venting, or relocation of interior walls (partitions).

It is however recognized that in some (very limited) cases it may be impracticable to prevent failure of the walls (partitions) and/or ceiling panels of the compartments. This may for example be the case for those compartments that are classified as “large” based on the geometrical considerations explained under (2) above, but that are in fact just meeting the criteria, i.e. are of limited size (in an absolute sense). Another example of compliance difficulty may be associated with a long, but narrow (in longitudinal flight direction) corridor, immediately adjacent to the fuselage pressure boundary, which is classified as “large”, but where high pressure loads may develop in the event of a decompression.

In these rare cases, (partial) collapse/failure of partitions (walls) and/or ceiling panels of “small” or “large” compartments may be acceptable, provided that:

(1) It is shown that is impracticable to prevent collapse/failure of the walls (partitions) and/or ceiling panels of the compartments, e.g. strengthening of walls (partitions) and/or ceiling panels, providing additional venting, or relocation of interior walls (partitions) is not practicable;

(2) Continued safe flight and landing of the aircraft is not affected. The effect of (partial) collapse/failure of partitions (walls) and/or ceiling panels should be carefully assessed, not only from a structural point of view, but also from a systems protection point of view. (Partial) collapse/failure of floors and floor panels would typically not be allowed;

(3) The compartment is not provisioned with safety belts and is not likely to be occupied by the same person for a significant period of time, for example lavatories or corridors. (Partial) collapse/failure of partitions (walls) and/or ceiling panels of other compartments such as crew rests, bedrooms, working/conference/communication areas, or compartments where seats are installed, is not allowed, as these are considered to fall under “compartments for occupants” as per CS 25.365(g). An exception to this may be the partition (wall) or ceiling panel immediately adjacent to the pressure boundary, that is likely to fail under the resulting pressure loads when an opening is assumed to occur in the pressure boundary immediately adjacent to the compartment;

(4) Every reasonable design effort is taken to minimize the probability of parts (debris) becoming detached and injuring occupants, while in their seats, as per CS 25.365(g). This protection could be provided by restraining the parts collapsing, such as doors or dedicated panels, by means of installing lanyards. An alternative approach for occupant protection would be to show that the parts (debris) would depart the aircraft, without endangering continued safe flight and landing of the aircraft;

(5) No (partial) collapse/failure occurs due to decompression loads resulting from an opening size equal to a skin bay failure (bounded by two adjacent frames and two adjacent stringers), considered per CS 25.365(e)(2) as an opening of the maximum size expected to remain confined in the small compartment and as probable under CS 25.365(e)(3) for this type;

(6) These cases are explicitly identified, discussed with and agreed by EASA.

[APPLICANT] POSITION :

CONCLUSION:

EASA PCM