EASA European Union Aviation Safety Agency	**Consultation paper** **Deviation** **Fuel tank flammability reduction means**	Doc. No. : DEV-E25.981-01 Issue : 1 Date : 08 Feb 2021 Proposed ☒ Final ☐ Deadline for comments: 01 Mar 2021

SUBJECT	:	**Deviation to M25.1(a), M25.1(b) and M25.2(b)** fuel tank flammability reduction means
REQUIREMENTS incl. Amdt.	:	**CS 25.981(b)(3) M25.1(a), M25.1(b) and M25.2(b) of appendix M of CS 25 amdt. 15**
ASSOCIATED IM/MoC	:	Yes☐ / No ☒
ADVISORY MATERIAL	:	

INTRODUCTORY NOTE:

This Deviation shall be subject to public consultation in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) 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.*"

IDENTIFICATION OF ISSUE:

The Model 700 wing fuel tanks are main tanks that feed each engine. The tanks were modelled by an inboard portion, which is covered by aerodynamic fairings, and the outboard portion, which is fully exposed to air. There is no physical barrier separating the fuel inside each tank portion.

The Model 700 includes an engine-to-fuel-tank recirculating system that returns hot fuel from the engine to the fuel tank. This could be seen as a non-compliance to CS 25.981(b)(1) that requires to limit heat and energy transfer within fuel tanks as far as practicle. In consideration of some practicality aspects (i.e the return fuel design is intrinsec to the engine) and being not a novel concept (i.e hydraulic fluid cooling; oil cooling) as long as the design meets the CS 25.981(b)(1) criteria (see AMC 25.981(b)(1)), EASA has not identified a specific concern. Nevertheless, in compliance to CS 25.981(b)(2)(i) and Appendix N, the Model 700 exceeded the 3% Fleet Average Flammability Exposure level, therefore Textreon introduced a tank-to-tank recirculation system in each wing to cool the fuel and thereby to reduce flammability. The recirculation system has been considered a flammability reduction means (FRM).

While the Model 700 fuel tanks fleet average flammability exposure levels meet the 3% requirement of CS 25.981(b)(2)(i) and 25.981(b)(3), the flammability does neither meet the 1.8% requirement of M25.1(a) nor the warm-day 3% requirement M25.1(b) and M25.2(b) of Appendix M which is required by CS 25.981(b)(3). For the FAA certification, Textron has obtained Exemption No. 18263 where it was, among the others, recognized that:

- The flammability of the fuel tank design of the model 700 is comparable to a Conventional Unheated Aluminum Wing fuel tank incorporating a dual electric pump engine feed system.
- Due to the timing in the airplane development program, with certification imminent, it was found impractical to incorporate a different type of FRM that would have yield compliance with the requirements of appendix M.

- An intrinsic safety benefit will be realized because the Model 700 will be a new type design certified under modern design standards, replacing business jets that were certified under older regulations.

Textron has requested a Deviation to EASA.

Considering the above arguments which are agreed by EASA, the FAA exemption 18263 and in line with point 21.B.80(a)(3) of Part 21, according to which 'other means' may be accepted by EASA to 'demonstrate compliance with the essential requirements of Annex II to Regulation (EU) 2018/1139', the following deviation is proposed:

Deviation "DEV-E25.981-01" to CS 25.981(b)(3), M25.1(a), M25.1(b) and M25.2(b) ofappendix M of CS 25 amdt. 15 for fuel tank flammability reduction means

1. APPLICABILITY

Textron Aviation Inc. Model 700.

1.1 AFFECTED CS

CS 25.981 (b)(3)

Any active Flammability Reduction means introduced to allow compliance with sub-paragraph (2) must meet appendix M of CS-25.

M25.1 Fuel tank flammability exposure requirements

(a) The Fleet Average Flammability Exposure level of each fuel tank, as determined in accordance with Appendix N of CS-25, must not exceed 3 percent of the Flammability Exposure Evaluation Time (FEET), as defined in Appendix N of CS-25. If flammability reduction means (FRM) are used, neither time periods when any FRM is operational but the fuel tank is not inert, nor time periods when any FRM is inoperative may contribute more than 1.8 percent to the 3 percent average fleet flammability exposure of a tank.

(b) The Fleet Average Flammability Exposure, as defined in Appendix N of this part, of each fuel tank for ground, takeoff/climb phases of flight during warm days must not exceed 3 percent of FEET in each of these phases. The analysis must consider the following conditions.

(1) The analysis must use the subset of flights starting with a sea level ground ambient temperature of 26.7°C [80° F] (standard day plus 11.7°C (21 · F) atmosphere) or more, from the flammability exposure analysis done for overall performance.

(2) For the ground, takeoff/climb phases of flight, the average flammability exposure must be calculated by dividing the time during the specific flight phase the fuel tank is flammable by the total time of the specific flight phase.

(3) Compliance with this paragraph may be shown using only those flights for which the aeroplane is dispatched with the flammability reduction means operational.

M25.2 Showing compliance

(b) The applicant must validate that the FRM meets the requirements of paragraph M25.1 of this appendix with any aeroplane or engine configuration affecting the performance of the FRM for which approval is sought.

1.2 PRE-CONDITIONS FOR APPLICATION OF THE DEVIATION

None.

2. APPLICABLE ESSENTIAL REQUIREMENTS OF REGULATION (EU) 2018/1139 TO BE COMPLIED WITH

Annex II (Essential requirements for airworthiness)

1.3. Systems and equipment (other than non-installed equipment):

1.3.1. *The aircraft must not have design features or details that experience has shown to be hazardous.*

2.3. Product operations must be protected from hazards resulting from adverse external and internal conditions, including environmental conditions.

3. MITIGATING FACTORS

The following mitigating factors shall be met:

- Flammability performance comparable to a Conventional Unheated Aluminum Wing fuel Tank without a FRM (For example a dual electric pump engine feed system) is demosntrated;
- No involvement of external heat exchanger(s) is ensured that could introduce flammable fluid leakage issues in areas outside of the tank;
- The introduction of ignition sources by the FRM into the fuel tank is minimized in comparison to a classic dual electric pumps engine feeding system;
- The time the FRM system is inoperative is limited to an amount to be agreed by EASA.