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OUR REF. **2000/01750 SFACT/N.ST**

17th of March 2000

YOUR REF.

To : **Yves MORIER**
Thaddée SULOCKI

JAA Regulation Director
JAA Harmonisation Co-ordinator

copy : Michael COLLINS
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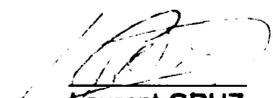
Subject : NPRM 99-18 - SFAR - Fuel Tank Safety

Dear Thaddée, Dear Yves,

According to **PPSG** action **76-06**, please find attached comments from the Authorities members of the **PPSG** on the **SFAR NPRM 99-18** entitled "Transport Airplane Fuel Tank System Design Review, Flammability Reduction, and Maintenance and Inspection Requirements", for submittal to FAA.

Compared to previous comments send on December 10th, 1999 (letter ref. **998302 SFACT/N.ST**), they have been amended to take into account the draft **ACs** released by FAA on January 27th, 2000. At this occasion, the **SFAR** comment period was extended to March 27th, 2000.

Yours sincerely,


Laurent GRUZ
(on behalf of the **PPSG**)

**COMMENTS ON THE FAA PROPOSED RULE FOR 'TRANSPORT AIRPLANE FUEL
TANK SYSTEM DESIGN REVIEW, FLAMMABILITY REDUCTION, AND
MAINTENANCE AND INSPECTION REQUIREMENTS'.
NOTICE 99-18.**

This document gives the comments made by the Authority members of the JAA Powerplant Study Group (PPSG) on the above FAA Rule-making proposal. This proposal includes changes to certification, design and operational requirements for certain types of Transport Category aircraft. The package of requirements is referred to in this comment document as the SFAR (Special Federal Aviation Regulation), although strictly this term only relates to the Part 21 Certification aspects.

It is often the case that the Authority and Industry members of the PPSG are able to combine their comments into a single paper, which is agreed by all. In this case we have decided to contribute separate Authority and Industry comments, as there is not very much time to comment and since the subject of fuel tank safety, especially for in-service aircraft, could have significant commercial consequences.

JAA generally share FAA concern that fuel system was not properly considered in the past. As a consequence, JAA fully support FAA intention to require a safety assessment and the implementation of maintenance programs for the fuel systems of in-service aircraft. However, JAA do not consider this is a valid reason to develop specific requirements applicable only to the fuel system if requirements are already available in part 25. JAA is also concerned that the design requirement are being used to remedy deficiencies in the approval process of STCs, alterations, repairs...

1. Discussions on the process

- 1.a JAA do regret they were not involved in the process of the SFAR elaboration. The PPSG has previously written to JAA Headquarters, strongly recommending that this activity should be carried out in a Harmonised way, together with JAA. This would have been in line the commitment made by both Authorities to develop new requirements under the harmonisation process, in order to avoid creating unnecessary differences. In addition, this might have minimised duplication of work, and facilitated eventual delegation between FAA and JAA National Authorities of the SFAR compliance finding.
- 1.b The SFAR is enforcing requirements that are equally applicable to in-service aircraft and to new aircraft design. It is possible that, by combining the two activities into a single proposal, some potential benefits for future designs will be missed. It is generally well understood that there is a far greater scope for design (safety) improvements, if the improvements can be integrated into the initial design, rather than trying to modify an existing design.

- 1.c The scope of the SFAR remains unclear for one point - the applicability of the SFAR to STC not directly related to the fuel system. For one accident, one potential reason mentioned was the co-routing with FQIS wiring of a wiring to a logo-light implemented under a STC. This co-routage may have resulted in chaffing inducing energy to some FQIS components, creating the fatal spark. This kind of failure mode really mean not only fuel system STC should be reviewed, but really some degree of assessment is needed for all STCs introducing new wiring on aircraft, thus involving much more than the 168 STCs mentioned in the SFAR cost analysis. This is a huge task, and for non fuel system related STCs it could really be completed only if simple criteria are defined.
- 1.d There is a concern than in doing the safety assessment required by the SFAR some compromise will be sought to show in-service aircraft comply. This might result in a general downgrading of the 1309 principles, by either accepting unsubstantiated failure rates, or by accepting some single failures with potential catastrophic cause (typically, is chaffing, then arcing through a conduit a single or double failure ?). The SFAR identifies single failures with potential catastrophic consequences, such as various mechanical or electrical pump failure modes or arcing of pump power cables to the conduit. For any of those, modifications should be implemented, since the non-implementation of modifications will really mean that the interpretation of FAR 25.1309 may have been compromised.

2. Discussions on the proposed requirements

- 2.a 25.981(a)(3) : the requested safety assessment is not consistent with the current (and even the future harmonised) 1309 principles. Specifically, the condition imposed on latent failures in addition with single failures not shown to be extremely remote should be deleted.

While it is recognised the fuel system safety assessment was overlooked in the past, it is JAA position that mandating the current 1309 principles is fully adequate, with some supporting material in a related advisory material (AC 25.981-1 B). § 25.1309 and the related AMJ are proven material, and there is no rational so far showing they will not be adequate to enforce the desired level of safety for the fuel system.

The proposed-§ 25.981(a)(3) makes no reference to FAR 25.1309, despite lengthy discussions on this rule and how compliance may be demonstrated. This may lead to some degree of confusion : is it intended that the safety assessment techniques of FAR 25.1309 may be used for the fuel tank review, or must be used ? To avoid this kind of confusion, JAA is supporting direct reference to 25.901(c) or JAR 25.1309. Ideally, the safety assessment will use the generic principles defined in FAR 25.1309 and the associated Advisory Material, and a specific AC (AC 25.981-1 X) will give some guidance and clarify assumptions on how to perform a safety assessment on the fuel system.

The concern expressed above under § 1 .d is repeated : the part 25 safety assessment principles (irrespective of a direct reference to FAR 25.1309 or not) should not be degraded when finding compliance for the in-service fleet.

2.b 25.981(b) : the requirement to placard or decal fuel system critical wiring is impractical, especially considering retrofit. Other means to record the critical wiring should be used, such as maintenance or wiring manual.

This kind of requirement, dealing with critical design configuration control limitations (such as most of the proposed § 25.981(b)) leave the impression part 25 is increasingly intended to fix deficiencies in maintenance and STC approval process, for instances. If FAA considers either STC, repair or alteration approvals can lead to unsafe situations, the solution should be sought with improvements in the approval process for STC's, repairs and alterations, not with the design of the aircraft. While it is recognised that developing maintenance manuals and instructions for continued airworthiness is the responsibility of the TC holder, it is not considered appropriate to request from the TC holder guidelines and instructions which will allow third parties to develop their own modifications. The revised AC 25.981-1A (AC 25.981-1 B ?) should provide clarification in that area.

JAA therefore support deletion of the second sentence of the proposed FAR 25.981(b) : "Placards, decals or other visible means must be placed in areas of the airplane where maintenance, repairs or alterations may violate the critical design configuration limitations." The reference to critical design configuration limitation should also be deleted from the first sentence of FAR 25.981(b).

2.c 25.981(b) : generally, JAA fully support the implementation of fuel system maintenance program. It is expected those programs will come out of the SFAR. However, on a strict regulatory basis, the explicit requirement to record any maintenance task resulting from the compliance § 25.981 appears redundant with other part 25 requirements such as § 25.1529.

While the concern that in the past fuel system maintenance has been overlooked is shared, we have two different issues here :

- use of the Aircraft Maintenance Manual (AMM) for all aspects of fuel tank safety servicing, maintenance, instructions regarding installation issues (wiring segregation etc), as required by FAR 25.981(b), and
- creation, as necessary, of Certification Maintenance Requirements (CMR) to identify those periodic tasks considered essential to meet the Safety objectives defined in the Safety Assessment. This is the conventional method for enabling the detection of safety significant latent failures which would, in combination with one or more other failures or events, result in a Hazardous or Catastrophic Failure Condition. JAA recognise there may be some need to improve the way CMR are recorded, see next comment about H25.4.

2.d H25.4 : see previous comment about §25.981(b) under § 2.c. A revision of Appendix H is supported to include 1309 CMR in the Instructions for Continued Airworthiness (ICA), in relation with AC/AMJ 25.19, but the proposed text with the exclusive reference to fuel system might leave the detrimental impression other systems than the fuel system are not as important. Actually, JAA did issue some time ago a NPA (NPA 25 H-264) which was aiming at legalising the CMR concept, creating a new paragraph H25.5 for that purpose. The resulting requirement was never released in JAR-25, but this could be a good occasion to complete the task, possibly as an harmonisation effort. This proposed requirement was of course applicable to all systems, but considering the fact the fuel system has been overlooked in the past, the fuel system might be referred to - as a reminder only.

2.e AC25.981-1X : the draft AC on fuel tank ignition source prevention, released on 27th of January 2000, has been reviewed. Generally, the PPSG does consider this document is providing adequate and useful guidance. Note : the AC gives guidelines to requirements not **favoured** by JAA, such as the critical design configuration control limitations. The JAA comments on those are not repeated here, however, it is clear JAA does not support those, in the AC or in the requirements. The PPSG did however notice a few items needing clarification. The most important one are :

1. There is no information in the Advisory Circular (AC), which clarifies how the 'single failure' aspects of the Safety Assessment will be addressed. The AC lists in paragraph 5.d, a number of failures / malfunctions, which have been seen in service, are single failures and which create an ignition source within the fuel tank e.g. "Wear of Teflon sleeving and wiring insulation allowing arcing from wire through metallic conduits into fuel tanks."

Under paragraph 6.c Ignition Source Failure analysis, there is a statement: "(1)(a) Each single failure, regardless of the probability of occurrence of the failure, must not cause an ignition source."

In paragraph 6.c(5)(a)5(aa) Failure Conditions, which describes the Safety Analysis assumptions, it states: "The analysis should be conducted considering the deficiencies an anomalies listed in paragraph 5d of this AC . . ."

These three statements are NOT compatible and compliance with §25.901(c) or §25.1309(b) is NOT possible using these guidelines.

2. In paragraph 6.b(2)(c), there is a mention that AC 25-8 will be revised to delete guidance on the acceptable design features for installing fuel pump wires inside fuel tanks. If there is service experience showing this is not an acceptable design, a revision to the rule should be proposed to make this clear, at least for new designs.

3. More information is required on the proposals for showing acceptably low levels of "Spark Energy Limit" and "Filament Heating Energy Limit" (see paragraph 6.b(2)(a)1 and 2). The term 'voltage spark' is not known. What background is there to the choice of 40 volts and 30 milliamperes as the relevant acceptable limiting values?

In addition, the list of related FARs is not consistent, the list is including several FAR requirements **that** are not found anywhere else (for instance, § 25.863 or 25.1353), whereas FAR 25 paragraphs mentioned in the AC text are not listed (§25.967(e)). ACJ 25.1309 should read AMJ 25.1309 (section 6.c.2). Also, DO160 is referred to at its issue D (related document section), or C (section 6.a).

This last item is of some importance, considering the fact this AC may be used for the retroactive assessment of the in-service fleet. By referring to a given issue of any standard, some **re-testing** might be implied.

For any potential use of the AC material by JAA, some adaptation work might be necessary, such as the inclusion of European qualification standards.

2.f Part 21 – SFAR XX : the proposed delay, one year after the SFAR release, might prove to be short. JAA support the intention, since past experience in similar exercises, such as the thrust reverser audit, have shown the need to put in place firm deadlines. However, the proposed interval might be too short to allow the applicants -

as well as the Authorities - involved in the process to complete the task in a satisfactory manner. It is feared this might be even detrimental to safety, diverting manpower from other essential tasks. JAA would fully support a more reasonable schedule, such as allowing 24 months (instead of 12) to complete the task.

2.g Part 21 – SFAR XX : there is no requirement for flammability assessment (ref. 25.981(c)), although flammability exposure was mentioned as a primary factor in the Centre Wing Tank (CWT) explosion in the TWA800 event. While the issue is probably linked with specific aircraft models, it should be clear any potential unsafe condition of in-service aircraft is being addressed anyway.

There is a significant amount of advice offered in AC 25.981-2X; much of which will assist constructors in their review of flammability aspects of new designs. However the practical implications for Certification are not yet known to JAA and at some stage it could be beneficial to have discussions or receive additional material about the level of 'compliance' expected with the new §25.981 requirement.

2.h Part 21 – SFAR XX, Part 91, Part 121, Part 125, Part 129 : the applicability of the SFAR requirements is set by unique criteria as far as passengers capacity and payload are concerned. We understand it was because of US legal reasons, to avoid impacting small businesses. This is creating a discrepancy in the safety level intended for part 25 products. This is also creating difficulties for other countries with different legal constraints and thus can only result in complexity. JAA support maintaining a common safety level among part 25 products, and therefore all part 25 aircraft should be reviewed. However, for some applicants, with aircraft nearing the end of their operational life, the burden of the SFAR review might be unfair. Therefore, instead of arbitrary pax numbers and payload values, JAA might have preferred some generic criteria concerning the possible SFAR exemption, in line with what is accepted by the ageing aircraft working groups.

2.i Explicit requirements : the design review and lessons learned from the TWA800 accidents have certainly highlighted several design features that are not really adequate. Similarly, it could be that some standards have been identified as providing the desired level of safety. Especially considering future designs, FAA might have proposed implementing more explicit requirements, for instance banning the routing of any power wires through the fuel tank, or even considering the introduction of TSO qualification for some fuel system components.

3. Conclusions

As stated in the introductory remarks, JAA share FAA concerns on the fuel tank safety and generally support the proposed actions. However, the following issues should be addressed :

- The proposed safety assessment in FAR 25.981(a)(3) should be consistent with FAR 25.901(c) / FAR 25.1309 philosophy, by referring directly to those requirements.
- In conducting those safety assessments, great care should be taken not to compromise the rigorous 1309 compliance finding process.

- The proposed AC 25.981-1X is providing adequate guidance on how to perform the safety assessment. Only a few corrections might be necessary, and with some degree of adaptation this AC might well be acceptable to JAA if harmonisation is pursued on the subject.
- Maintenance programs for the fuel system should be implemented, based upon the SFAR results. The Aircraft Maintenance Manual, or equivalent means, should be used to enforce stringent servicing and maintenance instructions for the fuel system. For result of SFAR safety assessment, instead of acting only on the fuel system, JAA support a more global approach, by a revision of Appendix H to legalise and enforce the Certification Maintenance Requirement concept.
- Requirements about the critical design configuration control limitations, such as decaling and / or placarding critical wiring, are not supported : this is simply not realistic, and this is intending to remedy, by aircraft design requirements, to deficiencies in the approval process of repairs, alterations, STCs, etc...
- The SFAR should allow sufficient time to complete the job. JAA would support a 24 months compliance period to perform the design reviews. --
- The nature of STCs to be reviewed should be clearly identified. Potentially, any STC introducing or modifying electrical wiring should be reviewed.
- The SFAR applicability should be based on clearly established technical and economical grounds.
- While JAA accept there is no assessment required of the in-service fleet for flammability exposure, some design have shown undesirable characteristics, and therefore JAA is seeking insurance those designs will be assessed. A case-by-case approach could be acceptable. For new aircraft, the proposed flammability requirement and associated AC require further work before publication in part 25.

JAA Powerplant Study Group
 March 2000