Clearance Record
DOCUMENT COMMENT LOG

Originating Office:	Document Description:	Reviewer:	Reviewing Organization:	Date of Review:
AIR-133 POC: Joan Hughson	**TSO-C203 Fire Containment Cover**			

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
AmSafe Bridport	Page 6 Appendix 1 – Disregard NOTE 4 in Section 4.2.1 of AS6453	The draft TSO-C203 calls for disregard of paragraph NOTE 4 in AS6453 that specifies the basic type of pallet on which FCCs are to be used. This aspect cannot be disregarded. It is essential for safety. This variable must be adequately controlled to ensure the minimum performance of the system is assured.	The performance of FCCs in accordance with the AS6453 standard have been established through extensive testing. Aluminum pallets meeting flammability requirements 14CFR Part 25 Appendix F Part I Section (a) (2) (iii) and tested in full scale burn tests in accordance with the AS6453 standard have been proven to provide sufficient fire protection and limit the heat transfer to the structure of the aircraft. This is the design basis that has been substantiated and this aspect must be controlled. This aspect cannot be disregarded. It would potentially allow an unsuitable base to be used with an FCC and this could adversely affect fire containment. For example, if FCCs were used with pallets manufactured from cominstallposite materials that do not have the same heat resistance, flammability or heat transfer properties.	Reinstate requirement for NOTE 4 in AS6453	Concur but out of scope. C-203 is for the minimum performance standard of the FCC. Pallet requirements are covered in TSO-C90.

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AmSafe Bridport	Page 6 Appendix 1 – Disregard Section 4.1 of AS6453	AS6453 Paragraph 4.1 should be reinstated. The draft TSO-C203 calls for disregard of paragraph 4.1 in AS6453. This requires that pallet nets used in conjunction with an FCC should be certified in accordance with TSO/ETSO C90d. TSO C90d is a necessary regulatory enhancement to air cargo safety. TSO C90d should be the minimum performance basis for new TSOs that incorporate pallet nets.	There were a number of key changes to the minimum performance standards for pallet nets in TSO/ETSO C90d for the purpose of air cargo safety. These improvements were made to control variables and misinterpretations of the MPS. Aspects found through testing could adversely affect a pallet nets restraint performance and safety. For example the inclusion of necessary degradation substantiation, testing with hooks engaged, and requiring an expiry date be marked on pallet nets. Disregarding this aspect has a number of consequences: 1) The FCC must be marked with an expiry date after which the FCC's performance is no longer expected to be maintained (Section 4.6.5 of AS6453). For Type II FCCs the pallet net and FCC together provide the necessary minimum performance. The two components perform different roles, have different textile properties, different in service degradation profiles and different usable life limits. The net and FCC may be independently interchanged/replaced during service life. For manufacturers to adequately substantiate and control baseline performance and life limits and for operators to ensure in service, there	Reinstate Paragraph 4.1 SEE last sentence 4.1.2	Concur, but out of scope. The TSOA process will be the means by which the FAA will determine the whether or not it deems the adequacy of the applicant's design. The purpose of TSO-C203 is to provide the minimum performance standard for FCCs only. It is agreed that compatible minimum performance standard for FCCs and ULDs are needed, but C90 is the source of minimum performance standard for ULDs and out of scope for C203. For Type II FCCs, the integral net will meet the requirements as specified by C90 paragraph 2. Any new design for a non-attached net will also will meet the requirements as specified by C90 paragraph 2. The pairing of Type I FCCs with nets or pallets is considered installation and is out of scope for either TSO.

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			must be consistent approach on applying the baseline and latest performance and marking standards in the introduction of this new TSO. 2) Improving safety and awareness in Air Cargo has been a major industry initiative in recent years. Examples include the introduction of key changes in TSO C90d, establishing TSO C172 and IATA ULD Regulations. This is greatly undermined if the FAA do not even support that their own current MPS (i.e. C90d) is the minimum performance required for pallet nets when creating the new TSO for FCCs. 3) This highlights that the intent and system of TSO approvals is potentially being exploited/abused if holders are not only manufacturing to an effectively frozen C90c approved design, but able to modify nets to the extent of changing processes, chemistry/materials (i.e. flame retardants) and the originally intended use and limitations without ever changing Part Numbers and applying for new approval against the latest certification		

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			standard. If no regulatory efforts are made, even to extent of applying latest MPS to new TSOs introduced by the FAA, then nets to C90d and further revisions will never be manufactured, and thus minimum performance standards and safety will never be improved.		
AmSafe Bridport	Page 6 Appendix 1 – Disregard Section 4.7 of AS6453	The draft TSO-C203 calls for disregard of paragraph 4.7 in AS6453 which requires that the FCC repair procedures be qualified by flame penetration resistance and full scale burn tests. Test experience has shown that this testing and qualification is necessary to prove that the repair schemes ensure continued airworthiness without compromising fire performance.	FCCs in a Cargo handling environment will be prone to abrasion, damage etc. The repair methods must be qualified by at least 14CFR Part 25 Appendix F Part III flame penetration tests and full scale burn tests to prove that the repair schemes can restore the fire containment performance of a damaged FCC with cuts, holes and tears in fabric. Extensive test experience has shown that these tests are required to ensure performance of the repairs and their effect on complex interactive system as a whole. Other methods of substantiation (i.e. just lab tests, just full scale tests, or through material justification) have proven inadequate to understand the dynamics and assure minimu performance is mainta mined.	Reinstate requirement for paragraph 4.7 in AS6453	Concur, but out of scope. The purpose of the TSO is to provide minimum performance standard for FCCs. Maintenance and repair are not part of the minimum performance standard.
AmSafe Bridport	Page 6 Appendix 1 – Disregard Sections 4.1 and 5.1.3 of AS6453	The draft TSO-C203 calls for disregard of paragraphs 4.1 and 5.1.3 in AS6453 which requires that the pallet nets are required to meet 14CFR Part 25 Appendix F Part I paragraph (a)(1)(ii) flammability requirements.	Pallet nets used on both type I and type II FCCs need to be specially treated or inherently flame retardant in order to achieve requirements of para 6.2.7 of AS6453 i.e. the duration of any flame may not exceed 15 seconds, and drippings, if any, may not continue to flame for more than an average of 5	Reinstate requirement for paragraphs 4.1 and 5.1.3 in AS6453 – for the pallet net to meet 14CFR Part 25 Appendix F Part I paragraph (a)(1)(ii) flammability requirements	Concur but out of scope. C-203 is for the minimum performance standard of the FCC. Net requirements are covered in TSO-C90.

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		These paragraphs must not be disregarded. They are required to adequately control the potential for flaming of material on the exterior surface of the FCC. An aspect that extensive test experience has shown can only be adequately substantiated through testing at full scale and laboratory conditions in accordance paragraphs 4.1 and 5.1.3 in AS6453.	seconds after falling. This is a more severe flammability performance requirement (in comparison to current standard TSO/ETSO certified pallet net horizontal flammability requirements) that originated from extensive test experience. Tests demonstrated that pallet net material burning for longer than the stipulated duration on the exterior of the FCC could potentially affect an adjacent pallet unprotected by an FCC or the aircraft structure. Tests have proven that material used on standard polyester or nylon nets approved to TSO C90 and not required to meet the flammability requirements of 14CFR Part 25 Appendix F Part I paragraph (a)(1)(ii) can continuously burn for more than 15 seconds on average. The behavior of the fire at full scale burn tests cannot be consistently controlled due to numerous variables such as ambient temperature and humidity, airflow, oxygen concentration, differing insulating properties of different FCC fabrics etc and as such the heat transfer to the pallet net and extent of net burning on the exterior of the FCC can vary. Due to these varying conditions two perceivably identical tests, may produce different results for the net material burning – one with the net conforming to paragragh 6.2.7 of AS6453 and one without. To provide adequate control of this important		

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			aspect, the net material needs to meet higher standards than are currently required by TSO C90. This aspect needs to be substantiated by laboratory flammability testing in accordance with 14CFR Part 25 Appendix F Part I paragraph (a)(1)(ii) in addition to the requirements stated in paragraph 6.2.7 of AS6453. In addition, as per paragraph 1.3a of AS6453; type 1 FCC is defined as one which is installed over a pallet's load below a net 'approved for this purpose' and paragraphs 3.2 and 5.1.3 of Standard Specification 70/1 of IATA ULD Regulations 2nd edition states that only a pallet net m00eeting the requirements of 14CFR Part 25 Appendix F Part I paragraph (a)(1)(ii) be used in conjunction with an FCC.		
Independent Pilots Association	5.b.	"airworthiness" is not applicable because the FCC is not required equipment.	All actions required to meet the performance standard must be defined in the applicable manual(s).	Remove "airworthiness" and add "functional performance" Remove "calibration"	Adopted.
Independent Pilots Association	6.b. and 6.d.	This standard would not require calibration or wiring diagrams.	The FCC is not calibrated or wired.	Remove 6.b. and 6.d.	Adopted.

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Independent Pilots Association	Addition to Appendix 1 Table, Section 6.2.3	This section should take into account FCC off gassing.	Volatile organic compounds in FCC coatings can off gas, ignite and cause thermocouple readings to exceed 400°F.	Add to 6.2.3: "Ignition of FCC coating gases causing any thermocouple to exceed 400°F is acceptable, provided there is no breach of the FCC material.	Non-concur. The FAA concurs with AS6543 Section 6.2.3 as written and would consider the test a failure if the thermocouple exceeded 400° F.
Independent Pilots Association	Annex D	This section should remain in the TSO.	An FCC as described in 4.3.5 and 5.2.4 above must not exceed Gas concentrations and optical smoke density.	Remove Annex D from disregarded SAE sections	Non-concur. FAA does not place specific limits on fumes/smoke/vapors/gases released in a fire in the cargo compartment. CFR 14 25.857(c)(3) requires that there are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers
Independent Pilots Association	Appendix 1 Table Section 2	Need to add Japanese JAS 3 to the disregarded references.	JAS 3 is disregarded elsewhere in the Table	Add "JAS 3" to the disregarded references.	Adopted.
Independent Pilots Association	Appendix 1 Table, Section 4.3.1	This section should remain in the TSO.	Materials must be flexible to allow the FCC to collapse with the fire load. Collapse of the FCC reduces space available for the accumulation of hazardous gases and oxygen.	Remove 4.3.1 from disregarded SAE sections.	Concur, but out of scope. Although flexibility is important, the paragraph provides guidance only. There are no actual performance standards defined.

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Independent Pilots Association	Appendix 1 Table, Section 4.3.5	This section should remain in the TSO.	It is possible to have a coated fabric that meets fire containment requirements, but the coating produces hazardous gases as it heats.	Remove 4.3.1 from disregarded SAE sections.	Section 4.3.1: Concur, but out of scope. No performance standards are provided. The material, as written, is guidance which is out of scope for the TSO. Section 4.3.5: Concur, but out of scope. No performance standards are provided. The material, as written, is guidance which is out of scope for the TSO.
J. J. Machon ISO TC20/SC9	**3.a.**	Specifies main deck cargo, in line with AS6453 § 1.2 and NOTE 1. However, this may now not be so obvious, as later Fire Resistant Container discussions evidenced a real airline demand for use in lower decks, and that there was no evidence of it unduly hampering class C detection systems effectiveness. ISO TC20/SC9 agreed that, once the FRC standard (ISO 19281, no number assigned yet by SAE) is finalized, there will be a need to revise ISO 14186 on FCCs (on which AS6453 is based) to allow lower deck carriage – subject of course to Authorities installation approval and any aircraft Weight & Balance Manuals specific requirements.	(a) It is believed testing demonstrated the Halon based fire extinguishing systems are not entirely effective in the event of a Lithium batteries fire, so that FCCs – that were successfully so tested – could be another layer of protection in class C cargo compartments. (b) there is also testing evidence that smoke detection remains within the regulatory 1 min limit when using FCCs, and smoke comes out fast even though fire itself is contained. See e.g. FAA Hughes Technical Center FCC tests records.	Since the exclusive main deck use presently specified in AS6453 appears likely to be revised, and awaiting the confirmation of on-going research, suggest leaving this aspect (which relates to FCC operation, rather than design and approval) aside of the TSO by modifying 3.a. to read: " This TSO's standards apply to equipment intended to be used to cover unitized cargo contained/restrained in an air cargo pallet and net assembly, ~~for loading into aircraft main deck cargo compartments~~ to improve fire protection in aircraft cargo compartments." This would then leave the onus of allowing or not lower deck compartments use on the Authority at installation approval, based on the data submitted by the operator.	Adopted.

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J. J. Machon ISO TC20/SC9	**6.**	Does not specify a requirement for the manufacturer to provide operating instructions nor allowable damage limits (continued performance). AS6453 § 8.2 provides these requirements, but is to be disregarded according to Appendix 1.	There seems to be definite needs for the manufacturer to provide the purchaser with operating instructions and allowable damage limits, to ensure the article's continued performance is not reduced or cancelled by wrong practices.	Suggest adding, based on 8.2 of AS6453, at least: "● storage conditions; ● installation and removal instructions; ● maximum allowable damage limits."	Concur, but out of scope. The purpose of the TSO is to provide minimum performance standard for FCCs. Maintenance and repair are not part of the minimum performance standard.
J. J. Machon ISO TC20/SC9	**App. 1** **6.2.6**	Disregarding " *then with a repaired unit in order to substantiate the retained repair method* " results in prohibiting repairs, since it cannot anymore be substantiated that the repair process maintains the FCC performance.	The absence of approved repairs for articles subject to wear and tear will increase the cost for the airlines, thus contribute to discourage the use of FCCs.	Delete " ~~*Disregard "then with a repaired unit in order to substantiate the retained repair method*~~. "	Concur, but out of scope. The purpose of the TSO is to provide minimum performance standard for FCCs. Maintenance and repair are not part of the minimum performance standard.
J. J. Machon ISO TC20/SC9	**App. 1** **5.1.3**	Requires disregarding AS6453 § 5.1.3, which requires a pallet net with higher fire resistance than allowed by TSO C90 and defines the criteria to be met. As a result, the TSO does not address compatible and safe net requirements, thus – contrary to safety – allows a standard TSO C90 approved net to be used over the FCC, whether type I or type II.	Testing evidence shows a net meeting only TSO C90 flammability requirements burns outside the FCC for a significant time, defeating the FCC's effectiveness. Also, the net cannot be considered a separate article in the case of type II FCCs, where it forms an integral part of the approved cover.	Delete " ~~5.1.3~~ " from Appendix 1.	Concur, but out of scope. The purpose of TSO-C203 is to provide the minimum performance standard for FCCs only. It is agreed that compatible minimum performance standard for FCCs and ULDs are needed, but C90 is the source of minimum performance standard for ULDs and out of scope for C203. For Type II FCCs, the integral net will meet the requirements as specified by C90 paragraph 2. Any new design for a non-attached net will also will meet the requirements as specified by C90 paragraph 2. The pairing of Type I FCCs with nets or

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					pallets is considered installation and is out of scope for either TSO.
J. J. Machon TC20/SC9	**App. 1** **6.1.1.7**	Requires disregarding AS6453 § 6.1.1.7, which defines the enhanced testing requirements for a pallet net to be used outside a FCC without deteriorating its performance.	See previous comment.	Delete " ~~6.1.1.7~~ " from Appendix 1.	Concur but out of scope. C-203 is for the minimum performance standard of the FCC. Net requirements are covered in TSO-C90.
J. Machon TC20/SC9	**6.b.** **6.f.**	Do not see how a Fire Containment Cover can include either a calibration procedure or a wiring diagram.	See comment.	Suggest deleting for clarity: " ~~b. Article calibration procedures.~~ ~~f. Wiring diagrams~~."	Adopted for 6b and 6d.
Keith Stehman UPS Airlines	5.b.	"airworthiness" is not applicable because the FCC is not required equipment.	All actions required to meet the performance standard must be defined in the applicable manual(s).	Remove "airworthiness" Add "functional performance" Remove "calibration"	Adopted.
Keith Stehman UPS Airlines	6.b. and 6.d.	This standard would not require calibration or wiring diagrams.	The FCC is not calibrated or wired.	Remove 6.b. and 6.d.	Adopted.

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Keith Stehman UPS Airlines	Addition to Appendix 1 Table Section 6.2.3	This section should take into account FCC offgassing.	Volatile organic compounds in FCC coatings can off gas, ignite and cause thermocouple readings to exceed 400°F.	Add to 6.2.3: "Ignition of FCC coating gases causing any thermocouple to exceed 400°F is acceptable, provided there is no breach of the FCC material."	Non-Concur. The FAA concurs with AS6543 Section 6.2.3 as written and would consider the test a failure if the thermocouple exceeded 400° F.
Keith Stehman UPS Airlines	Annex D	This section should remain in the TSO.	Gas concentrations and optical smoke density must not be exceeded by an FCC as described in and 5.2.4 above.	Remove Annex D from disregarded SAE sections	Concur, but out of scope. FAA does not place specific limits on fumes/smoke/vapors/gases released in a fire in the cargo compartment. Rather, CFR 14 25.857(c)(3) requires that there are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers
Keith Stehman UPS Airlines	Appendix 1 Table Section 2	Need to add Japanese JAS 3 to the disregarded references.	JAS 3 is disregarded elsewhere in the Table	Add "JAS 3" to the disregarded references.	Adopted
Keith Stehman UPS Airlines	Appendix 1 Table Section 4.3.1	This section should remain in the TSO.	Materials must be flexible to allow the FCC to collapse with the fire load. Collapse of the FCC reduces space available for the accumulation of hazardous gases and oxygen.	Remove 4.3.1 from disregarded SAE sections.	Adopted with clarification.

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Keith Stehman UPS Airlines	Appendix 1 Table Section 4.3.5	This section should remain in the TSO	It is possible to have a coated fabric that meets fire containment requirements, but hazardous gases are produced by the coating as it heats.	Remove 4.3.1 from disregarded SAE sections.	Section 4.3.1: Concur, but out of scope. No performance standards are provided. The material, as written, is guidance which is out of scope for the TSO. Section 4.3.5: Concur, but out of scope. No performance standards are provided. The material, as written, is guidance which is out of scope for the TSO.
Newtex Industries, Inc.	TSO-C203 Section 3b AS6453 Section 6.2.2	Current testing only requires a Class A (paper) type fire. Given all of the different types of cargo being shipped by aircraft, a Class A type fire does not simulate all types of real-fire scenarios.	Testing required in TSO-C203 would certify FCCs against the minimal fire threat possible. Air cargo carriers are requested protection against greater fire threats, such as those caused by Lithium batteries.	Recommend an option to test and certify FCCs for different fire class certifications. FCCs could be classified as different types depending on how they are tested.	Concur, but out of scope. C203 minimum performance standard was developed based on class A fire only. Other fire scenarios were not considered and therefore are out of scope.
Newtex Industries, Inc.	TSO-C203 Section 3c AS6453 Section 4.3.5 & Annex D	Section 4.3.5 & Annex D have been eliminated from AS6453, which removes the requirement that the FCC materials not produce hazardous toxic gases. We do not believe that it is in the best interest of safety to eliminate this requirement..	Many fire retardant coatings used on fabrics have dangerous outgassing. The safety and well-being of the pilots and crew are a top priority. Any smoke produced by the FCC during a fire should be limited and be non-toxic to ensure that good visibility and breathable air be maintained within the aircraft..	Keep requirement of Section 4.3.5 & Annex D.	Concur, but out of scope. FAA does not place specific limits on fumes/smoke/vapors/gases released in a fire in the cargo compartment. Rather, CFR 14 25.857(c)(3) requires that there are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers.
Newtex Industries, Inc.	TSO-C203 Section 3c AS6453 Section 5.2.3 & Section 5.3.2	The current requirement to fire test a full assembly, and then to test a separate full assembly that has been subjected to damage, is redundant,.	If a damaged assembly with air infiltration can pass the full-scale fire test, then an undamaged assembly will pass too, making the testing of the undamaged assembly redundant,.	Run the assembly test on the damaged assembly and if it passes, then full-scale fire testing is complete.	Adopted. Section 5.3.2 will be noted in Appendix as a disregard. The purpose of the TSO is to provide minimum performance standard for FCCs. Maintenance and repair are not part of the

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					minimum performance standard.
FAA	5.2.4	Paragraph 5.2.4 recommends not to exceed the levels of contaminants specified in Annex D coming out of the covered pallet load.	FAA does not place specific limits on fumes/smoke/vapors/gases released in a fire in the cargo compartment. Rather, CFR 14 25.857(c)(3) requires that there are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers	Delete the requirements of 5.2.4	Adopted.
FAA	6.1.1.5	Add the following sentence to the end of this section. "The FAA Aircraft Materials Fire Test Handbook includes an allowance for a brief ignition on the upper surface of the test specimen as long as the 400 degree F requirement is not exceeded."	This points out that brief ignition on the upper surface of the test specimen as long as the 400 degree F requirement is not exceeded will not constitute a failure of the test.	Add the following sentence to the end of this section 6.1.1.5. "The FAA Aircraft Materials Fire Test Handbook includes an allowance for a brief ignition on the upper surface of the test specimen as long as the 400 degree F requirement is not exceeded."	Adopted.
FAA	6.2.1	DOT/FAA/AR-TN05/20 is an incorrect reference.	The cited report was republished with a new report number to correct several errors. The original report is no longer available through FAA websites.	Replace the words in the end of the second sentence "paragraph 4.3.2 of the US DOT/FAA/AR-TN05/20 document (see reference [16] in Bibliography)." with the following, "the bulk load fire scenario section of report US DOT/FAA/TC-TN12/11."	Adopted.

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FAA	6.2.7	This paragraph has requirements addressing net.	Previous references in the SAE standard regarding net flammability were disregarded in the draft TSO.	Disregard 6.2.7.	Adopted.
FAA	8.6.4.7	SAE AS6453 identifies ISO TR 8647 as a reference for environmental degradation data.	The FAA does not recognize ISO TR 8647 as an acceptable equivalent to SAE International AIR 1490C for requirements.	Add a note to SAE AS8453 that SAE AIR 1490B is the recognized resource for environmental degradation data..	Adopted.
FAA	5.3	Allowable damage should not be included in the TSO.	Allowable damage is not a minimum performance criteria.	Disregard 5.3.	Adopted.
FAA	6.2.4	The draft TSO includes requirements for a pallet.	The MPS for the pallet should be part of TSO C90.	Disregard 6.2.4.	Adopted.
FAA	6.2.7	The draft TSO includes requirements for a pallet net.	The MPS for the pallet net should be in TSO C90.	Disregard 6.2.7.	Adopted.