

Clearance Record Comment Log FAA Technical Standard Order C 90d

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Goodrich	Sect 3 h 'Test Methods'	I wonder if ULD manufacturers should be given more leeway here.	The current NAS3610 leaves this subject pretty much open.	would it suffice to state "The use of AS36100 is acceptable as a basis for establishing test methods...." rather than "...must be used..."	Diverse and sometimes inadequate industry practices have indicated the need for a standard. A deviation per 14 CFR Part 21 Subpart O may be applied for to use an alternate means of testing.
Goodrich	Sect 4 a (5)	"The weight of the article to the nearest pound": It seems a bit silly to be nailing this down to the nearest pound when it covers such a large range of UDL sizes.	Normal manufacturing tolerances would seem to make this impractical.	Suggest rather a percentage of nominal weight, say +/- 2 or 3 % - if needed at all!	The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.
Goodrich	Sect 4 a	The numbering sequence is messed up			Corrected
Driessen Air Cargo Equipment	Page 2, Para. 3.e.	On top of the "Environmental Degradation of Textiles" the same degradation should also be considered for any other non-metallic material used in the design of ULDs	The paragraph and its content is referring only to textiles for which AIR1490B is already providing descent data. But as the industry tendency in ULD designs is going more and more towards "light weight" many other non-metallic materials will be used in the future. These material also might be affected by degradation caused by aging, weathering or UV exposure. Thus this also should be considered in this paragraph	Change the title to "Material Performance". The text should start with: "Environmental degradation due to aging, UV-exposure , weathering etc has to be taken into consideration for any material used in the design of a ULD. Especially for the performance of textiles, pls. see" And from there you can continue with the text as already in para 3..	Incorporated
Driessen Air Cargo Equipment	Page 2, para 3.g etc	"14 CFR Subpart O" should be "14 CFR Part 21 Subpart O"?	Typo in Typo in "14 CFR Subpart O"?	Editorially correct "14 CFR Subpart O" to "14 CFR Part 21 Subpart O"	Corrected

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Driessen Air Cargo Equipment	Page 3, para4.a.(3)-(8)	wrong number sequence starting at no.3	(3) is listed twice	Correct numbering	Corrected
Driessen Air Cargo Equipment	Page 3, para 4.a.(3)	Marking of serial number should be mandatory	Most manufacturers already mark their ULD's with the manufacturer's serial number, which is more important for traceability reasons than the date of manufacture.	Use: "The manufacturer's serial number of the article and optional the date of manufacture of the article." Note: Pls. call it really "manufacturer's serial number" as many airlines use the term "serial number" for the IATA (ID)-Code of the individual ULD	The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.
Driessen Air Cargo Equipment	Page 3, para 4.1.(5)	The (tare) weight of the article should not be part of the TSO marking	<p>1. For operational use the airlines are interested only in the weight of the loaded ULD (Max. Gross Weight). This was already discussed and agreed upon between manufacturers, airlines, handlers and authorities.</p> <p>2. Due to manufacturing tolerances (e.g. for aluminium containers = approx. +/- 5%) the requirement for "nearest pound" is practically no achievable. The currently stated tare weights are "nominal/theoretical" weights</p> <p>3. Actual weights in daily operation will also vary based on the actual environmental condition of the ULD (water, moisture, dirt, dust, garbage inside the ULD).</p> <p>4. In order to further harmonize the FAA and EASA documents the weight requirement should be removed from TSO-C90D as it is also not part of the current ETSO-C90C and probably also not part of a new revision ETSO-C90D.</p> <p>5. SAE also will remove the weight requirement from future revisions of AS36100 if it is removed as a requirement for TSO C90 D marking (in the current document it only was included as it was already part of the existing TSO-C90 requirements).</p>	1. Remove 4.a.(5)	A marking requirement remains to accommodate weight and balance calculations in operations without a scale. The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.

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Driessen Air Cargo Equipment	Page 3, para 4.1.(5)	Requirements for marking of weight of article should be removed also for previous TSO approvals if possible	To avoid confusion and to standardize marking requirements, it would be helpful if this weight marking requirement could also be removed from existing TSO C90 approved ULDs retroactively.	Add statement (new 4.d.?) that requirement for marking of weight of article is removed also for articles granted approval per prior revisions to TSO C90.	There is no means within the FAA regulatory system to allow a manufacturer to work to a later TSO without applying for a new TSOA. The FAA will issue a policy statement that will address the use of a nominal weight marking for earlier versions of the TSO.
Nordisk Aviation Products	Page 1, paragraph 3.a	Reference should be made to the corresponding ISO version of NAS 3610.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	At the end, add "For LODA applications, ISO 8097 is technically equivalent to NAS 3610 Rev.10."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.
Nordisk Aviation Products	Page 1, paragraph 3.b	Reference should be made to the corresponding ISO version of AS 36100.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	At the end, add "For LODA applications, publicly available specification ISO 21100 is equivalent to AS 36100 Rev. A."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.
Nordisk Aviation Products	Page 2, paragraph 3.e.	Reference should be made to the corresponding ISO version of AS 36102.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	Add "For LODA applications, ISO technical report TR 8647 is equivalent to AIR1490B."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being referenced in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.

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Nordisk Aviation Products	Page 2, paragraph 3.e.	Environmental degradation of Textiles should also reference other non-metallic structural ULD materials	Although AIR1490B is referencing materials primarily used for nets only, authorities (primarily FAA and EASA) already require some substantiation of Environmental degradation of other non-metallic structural ULD materials as required by AS 36100 paragraph 4.11. However, paragraph 3.e. may be interpreted as this requirement only being relevant for nets the way it is currently written.	At the end, add "Also note that AS 36100 Rev. A paragraph 4.11. requires that environmental effects shall be taken into account for all ULD non metallic materials, not only nets.	Intent incorporated
Nordisk Aviation Products	Page 2, paragraph 3.g etc	"14 CFR Subpart O" should be "14 CFR Part 21 Subpart O"?	Typo in Typo in "14 CFR Subpart O"?	Editorially correct "14 CFR Subpart O" to "14 CFR Part 21 Subpart O"	Corrected
Nordisk Aviation Products	Page 3, paragraph 4.a.(3)	Marking of serial number should be required	The majority, maybe all, of OEM's already mark all ULD's with serial number, which is a great advantage for traceability reasons.	Replace (3) with "The serial number of the article, with option to add date of manufacture"	The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.
Nordisk Aviation Products	Page 3, paragraph 4.a.(3)-(8)	Typo in number sequence	(3) is listed twice	Should be renumbered (3) – (9)	Corrected
Nordisk Aviation Products	Page 3, paragraph 4.1.(5)	Requirements for marking of weight of article should be removed	1. The need for marking of article weight has been discussed between airlines, OEM's, handlers and authorities, and nobody see any need for this requirement since the need is to know weight of the loaded container for aircraft balance – weight of empty container has no impact on this. 2. Very few ULDs in service are actually marked to the nearest pound weight, both	1. Remove 4.a.(5)	A marking requirement remains to accommodate weight and balance calculations in operations without a scale. The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.

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			<p>due to production variation of materials causing much larger variation from unit to unit than one pound, weight will also be affected during repair. OEM weight marking is usually based on a statistical average.</p> <p>3. Actual weight varies with climate. Just a little water moisture or dew/condensation can add several pounds of weight to an empty container.</p> <p>4. Requirement for marking of article weight in AS36100 was only added due to already existing as requirement TSO C90c. SAE will look into removing this requirement from future revisions of AS36100 if it is removed as requirement for TSO C90 marking.</p> <p>5. This requirement is not part of ETSO C90c, and will presumably not be part of ETSO C90d. Removing it will help harmonizing the requirements between FAA and EASA.</p>		
Nordisk Aviation Products	Page 3, paragraph 4.1.(5)	Requirements for marking of weight of article should be removed also for previous TSO approvals if possible	Due to the previous comment, to avoid confusion and to help standardize marking requirements, it would be highly advantageous if this requirement could also be removed from existing TSO C90 approved ULDs retroactively.	Add statement (new 4.d.?) that requirement for marking of weight of article is removed also for articles granted approval per prior revisions to TSO C90.	<p>There is no means within the FAA regulatory system to allow a manufacturer to work to a later TSO without applying for a new TSOA.</p> <p>The FAA will issue a policy statement that will address the use of a nominal weight marking for earlier versions of the TSO.</p>
Nordisk Aviation Products	Page 3, paragraph 4.c.	Marking of a deviation is not specified.	Although deviations are rare, it would be an advantage to specify how such deviations should be marked as part of the Manufacturer marking. It seems current industry practice is to mark deviation by adding "DEV" after article identification code, but this is not specified and does not give any details.	A deviation should be marked by adding the words "DEV" after the article identification code specified in 4.a.(3), with document reference to deviation specification.	<p>A"DEV" marking has been defined to follow the applicable TSO number. This format is common to other TSOs.</p> <p>The marking has not been made mandatory as the requirement to specify any limitations already covers any special requirements associated with a deviation.</p>

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VRR	Page 1, paragraph 3.a	Reference should be made to the corresponding ISO version of NAS 3610.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	At the end, add "For LODA applications, ISO 8097 is technically equivalent to NAS 3610 Rev.10."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.
VRR	Page 1, paragraph 3.b	Reference should be made to the corresponding ISO version of AS 36100.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	At the end, add "For LODA applications, publicly available specification ISO 21100 is equivalent to AS 36100 Rev. A."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.
VRR	Page 2, paragraph 3.c	The errors and missing figures in NAS3610 Rev.10, principally affecting size F, H and J, should be corrected. Size G and R are now mentioned in the AS36100, and therefore the NAS3610 will not be applicable for these sizes.	The regulations should not refer to a document known wrong without stating the necessary corrections. The FAA should seize this opportunity to correct a wrong situation.	Add "(5) In lieu of NAS 3610 Rev. 10 Figure 31 sheet 87, you must substitute Figure 31 sheet 88. (6) In lieu of NAS 3610 Rev. 10 Figure 31 sheet 88, you must substitute Figure 32 sheet 87 of NAS 3610 Rev. 8 dated April 1987, referred to in TSO C90b. (5) and (6) above are met if reference is made in a LODA application to ISO 8097."	Corrected
VRR	Page 2, paragraph 3.e.	Reference should be made to the corresponding ISO version of AS 36102.	Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.	Add "For LODA applications, ISO technical report TR 8647 is equivalent to AIR1490B."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.

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VRR	Page 2, paragraph 3.e.	Environmental degradation of Textiles should also reference other non-metallic structural ULD materials	Although AIR1490B is referencing materials primarily used for nets only, authorities (primarily FAA and EASA) already require some substantiation of Environmental degradation of other non-metallic structural ULD materials as required by AS 36100 paragraph 4.11. However, paragraph 3.e. may be interpreted as this requirement only being relevant for nets the way it is currently written.	At the end, add "Also note that AS 36100 Rev. A paragraph 4.11. requires that environmental effects shall be taken into account for all ULD non metallic materials, not only nets."	Intent incorporated
VRR	Page 2, paragraph 3.g paragraph 4.a Page 3, paragraph 5.	"14 CFR Subpart O" should be "14 CFR Part 21 Subpart O".	Typo in Typo in "14 CFR Subpart O".	Editorially correct "14 CFR Subpart O" to "14 CFR Part 21 Subpart O".	Corrected
VRR	Page 3, paragraph 4.a.(3)	Marking of serial number should be required	Marking with serial number is a great advantage for traceability reasons. Also date of manufacture should be on the ULD as marking.	Replace (3) with "The serial number of the article and the date of manufacture"	The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.
VRR	Page 3, paragraph 4.a.(3)-(8)	Typo in number sequence	(3) is listed twice	Should be renumbered (3) – (9)	Corrected
VRR	Page 3, paragraph 4.a.(5)	Requirements for marking of weight of article should be removed	1. There is the need to know the weight of the loaded container for aircraft balance – weight of empty container has no impact on this. When an empty container will be loaded, it also will be weighted for W&B. 2. Due to production variation of materials causing much larger variation from unit to unit than one pound it is almost impossible to determine the exact	1. Remove 4.a.(5)	A marking requirement remains to accommodate weight and balance calculations in operations without a scale. The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.

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			<p>weight of the ULD to the nearest pound.</p> <p>3. A large part of the ULD repair is done by patching. This add weight to the ULD. It's almost impossible to replace the marking after each repair.</p> <p>4. Requirement for marking of article weight in AS36100 was only added due to already existing as requirement TSO C90c. SAE will look into removing this requirement from future revisions of AS36100 if it is removed as requirement for TSO C90 marking.</p> <p>5. This requirement is not part of ETSO C90c, and will presumable not be part of ETSO C90d. Removing it will help harmonizing the requirements between FAA and EASA.</p>		
VRR	Page 3, paragraph 4.c.	Marking of a deviation is not specified.	Although deviations are rare, it would be an advantage to specify how such deviations should be marked as part of the Manufacturer marking. It seems current industry practice is to mark deviation by adding "DEV" after article identification code, but this is not specified and does not give any details.	A deviation should be marked by adding the words "DEV" after the article identification code specified in 4.a.(3), with reference to deviation specification.	<p>A"DEV" marking has been defined to follow the applicable TSO number. This format is common to other TSOs.</p> <p>The marking has not been made mandatory as the requirement to specify any limitations already covers any special requirements associated with a deviation.</p>
GPI- France	Page 2: 3.e Textile performance	<p>This paragraph does not give a clear PASS/FAIL technical criteria for evaluation of textile performance when expose to environmental factors.</p> <p>It widely opens evaluation of conformity to interpretations by both applicants and authorities.</p> <p>In this respect it could not guarantee a common minimum performance for products proposed by different applicants and evaluated by different FAA ACO managers.</p>	<p>SAE AIR 1490B data demonstrates that textile performance when exposed to environmental factors is highly depending on fiber (Polyester, Nylon,...), with possibly difference between similar fiber of different performance (dtex value) or different fiber supplier.</p> <p>But tests results also clearly show that weaving design, webbing/rope breaking strength, width, thickness, color, type of dyeing agent, and also coating, have an extreme influence on UV resistance.</p> <p>Problem is that SAE AIR 1490B does not give the detailed technical specifications of the different products</p>	<p>a) Long term solution Consider revising paragraph 3.e to propose uniform PASS/FAIL criteria which is the only way to guarantee a common minimum performance for all products. A simple, clear and unquestionable PASS/FAIL criteria could be to load test the textile material before and after defined artificial weathering.</p> <p><u>(b) Interim action:</u> Understand the above, though more appropriate, is not readily available today, and should be set as a research goal. Yet, the wording of the current §</p>	<p>(a) Long term solution:</p> <p>A common minimum performance is not necessary for safety although it may be desirable for the industry.</p> <p>The criteria for degradation of net material (or any material) are that at the life limit declared by the manufacturer the net (or material) must still meet the minimum performance requirements of TSO C90d.</p> <p>Comments will be forwarded to</p>

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			<p>tested.</p> <p>In these conditions, how could the applicant take into account partial and highly variable technical data to substantiate performance of its own unique textile material ?</p>	<p>also is inappropriate, for the reasons stated. Recommend considering a wording amendment such as:</p> <p>" Non-metallic materials expected performance degradation due to environment shall be substantiated commensurate with the expected storage and service life to satisfy SAE AS 36100 Rev; A, paragraph 4.11.</p> <p>For textile materials, you may [<i>not "shall"</i>] take into account the data in SAE Aerospace Information Report (AIR) 1490B, <i>Environmental degradation of textiles</i>, dated December 2007, inasmuch as applicable to your material. Other environmental degradation data may be used, if you substantiate the data and it is approved by the FAA ACO manager responsible for administering your TSO or LODA."</p>	<p>SAE for review.</p> <p>(b) Interim action:</p> <p>Intent of "Interim action" has been incorporated.</p> <p>Manufacturer's test data may be used to substantiate the requirement is met. The FAA is writing a task request for SAE to develop degradation performance testing requirements.</p> <p>A deviation per 14 CFR Part 21 Subpart O may be applied for to use an alternate means of testing.</p> <p>A marking specification has been added to TSO C90d for life limited parts.</p> <p>Intent incorporated.</p>
GPI - France	Page 3 Para 4.a.3 Serial number or date of manufacture or both	Marking of date of manufacture of the article only does not give a unique identification and traceability code. Continued airworthiness could only be insured if article is identified by a unique traceability code or S/N	Several products may be manufactured on the same day. As a consequence marking with date of manufacture only could not be consider as equivalent to a S/N	To ensure continued airworthiness, article should be marked with S/N Consider following rewording of 4.a.3: "3) The serial number of the article"	The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.
GPI – France	Page 3 Para 4.b.2 Marking of interchangeable subassembly	Corner lashing lines are interchangeable parts of cargo nets. Due to their material and small size these are impossible to permanently and legibly mark.	Due to their function, net corner lashing lines are subject to hard abrasion and hard handling. This make it impossible to permanently mark the product whatever the marking technique might be: <ul style="list-style-type: none"> • ink marking: abrasion will remove marking after a few days/weeks • label: no label will ever survive hard handling 	Technically hard to mark subassemblies should be exempted from this requirement.	The requirement for marking subassemblies for difficult to mark parts will not be removed. Lashing lines need traceability back to the manufacturer /technical standard. Comments will be forwarded to SAE for review. Development and revisions to

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			In addition, it should be consider that conformity to approved definition of interchangeable subassembly is insured by appropriate internal procedures at product operator level, or PART 145 approval at repair station level.		maintenance programs to address abrasion and hard handling is out of scope for C90d. Comments will be forwarded to FAA Flight Standards and IATA.
AmSafe	Page 2 Para 3.e.	Textile Performance: Environmental degradation of textiles aspects should be applicable to all structural non-metallic materials – not just nets. Life limitations on nets, textiles and all ULD made from non metallic materials that degrade should be mandatory for operational adherence - not subject to interpretation of condition by visual inspection.	Due to wording used, where nets are specifically mentioned, paragraph 3e may be misinterpreted as applicable to nets only – but AS36100 Rev A paragraph 4.11 requires environmental effects shall be taken into account for all ULD non metallic materials. There is currently no clear requirement to life limit parts that are known to degrade, nor mark this life limit on the equipment.	Add: Wording to the effect that: This aspect is applicable to nets and all structural non-metallic materials used in a ULD’s construction. For example, fabric container doors, composite panels etc. For these ULD or the non- metallic replaceable components thereof, a life limit shall be specified and marked (see 4.a.(8)).	Intent incorporated. A marking for expiration date has been specified in paragraph 4.a(10) While it is true there is not a specific mandatory life-limit marking required, the degradation performance assessment required will determine if the life is limited. The existing requirement for limitations to be marked per paragraph 4.a(10) of TSO C90d is applicable to the marking of degradation life limits. A format for marking the expiration date has been specified in paragraph 4.a(10) and reinforces the requirement for its marking.
AmSafe	Page 3 Para 4.a.(1)-(8)	Sequencing error in numbering – Para (3) is listed twice.	Para (3) is listed twice	Renumber section 4.a. (1) through to (9)	Corrected
AmSafe	Page 3 Para 4.a.(3)	The Serial number should be mandatory	Serial Number ensures identification and traceability of each article. This also helps to prevent and more easily detect bogus/copied equipment. Date of manufacture can still form part of the serial number if desired, but each article should have a unique identification code.	Change to: The serial number of the article	The manufacturer’s serial number has been added as a requirement. The date of manufacture remains as an option.

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AmSafe	Page 3 Para 4.a.(5)	Remove requirement to mark weight of article to the nearest pound.	<p>The requirement to mark ULD weight to the nearest pound (lb) is not part of ETSO C90c. It is essential these requirements are harmonized.</p> <p>In service the weight of a ULD varies due to climate (water), damage, repair etc. The weight variance is greater than the one pound tolerance.</p> <p>Weight of ULD is of no consequence to the aircraft W&B or loading, and serves no airworthiness or certification role. In practice each ULD inclusive of its cargo must be weighed prior to aircraft installation.</p>	Remove requirement to mark the weight of article.	A marking requirement remains to accommodate weight and balance calculations in operations without a scale. The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.
AmSafe	Page 3, Para 4.a. (8)	<p>Life limitations on nets, textiles and all ULD made from non metallic materials that degrade should be mandatory for operational adherence - not subject to interpretation of condition by visual inspection.</p> <p>A life limit on the nets and non-metallic ULDs is a critical limitation that should be marked.</p> <p>This aspect of limitations and restrictions should be clarified in the TSO marking requirements.</p>	<p>Though it is well known that textile and non-metallic materials degrade over time in service due to environmental factors, it is currently not clear that a life limit is required, nor that it needs to be marked as a 'limitation or restriction' – as demonstrated by majority of current C90c approvals where this is not done.</p> <p>For nets and other equipment that degrades, the design life limit needs to be marked as a limitation.</p>	<p>Add:</p> <p>For nets and other ULD incorporating non-metallic materials and components a life limit shall be specified. The life limit shall be marked. This can either be as an expiry date or as years or months from a date provided (date of manufacture or delivery to operator). e.g. 'Expiry Date: 06 May 2014' or 'Life Limit: 3 yrs from 06 May 2011'</p>	A marking for expiration date has been specified in paragraph 4.a(10)
AmSafe	Page 3, Para 4.b	Clarify this aspect applies to net lashings.	<p>A pallet net lashing line is a component that is easily removable and interchangeable.</p> <p>Though TSO is clear with regards need to mark easily removable components, unless it is clear that this includes pallet net lashings this could be overlooked /misinterpreted in future.</p>	<p>Add:</p> <p>For example, net lashings.</p>	Incorporated

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AmSafe	General Comment / 4.b(2)	Some airlines that refer to 'lashings' are not describing these lashing lines which are a certified part of the net. They are describing additional ropes they use to add further tension in the net - not a necessary addition if net is properly installed/fitted,	... that often involves using unapproved ropes etc - but it's something some airlines do as its an old common practice copied across from military		The issue of unapproved parts is not one of a minimum performance standard and is beyond the scope of this TSO. This is a flight standards issue. Comments will be forwarded to FAA Flight Standards and IATA.
AmSafe	Page 3 Para 4.c.	The method to indicate deviations by markings should be described.	Though deviations are rarely (if ever?) now approved, where they are historically known the practice was to mark by adding "DEV" after the article identification code. This should be specified as a standard method/requirement – otherwise manufacturers, operators and inspectors will not easily identify ULDs with deviations.	Deviations shall be marked by adding "DEV" after the article identification code.	A"DEV" marking has been defined to follow the applicable TSO number. This format is common to other TSOs. The marking has not been made mandatory as the requirement to specify any limitations already covers any special requirements associated with a deviation.
J.J. Machon (expert)	Page 1, paragraph 2.c	Reference should be made to the corresponding international standards for LODA applications.	The authorities of certain countries may prefer to refer to international standards rather than SAE in their original approvals. Recommend this be deemed acceptable for LODA applications.	Recommend adding: " For LODA applications, publicly available specification ISO 21100, <i>Air cargo unit load devices — Performance requirements and test parameters</i> , dated May 2011, may be referred to in lieu of AS 36100 Rev. A, and ISO 8097, <i>Aircraft — Minimum airworthiness requirements and test conditions for certified air cargo unit load devices</i> , dated August 2001, may be referred to in lieu of NAS 3610 Rev. 10."	FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.

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J.J. Machon (expert)	Page 2, paragraph 3.e	Environmental degradation must also be taken into account for all non-metallic materials, other than textiles solely addressed in AIR 1490B.	AIR 1490B provides data concerning textile materials used for nets. The title and contents of § 3.e might be misinterpreted as implying no consideration of environment degradation is required for other materials, contrary to the requirement of AS 36100A § 4.11.	Consider changing title to : " <u>Environmental degradation</u> :" and adding at the beginning: "The effects of environmental degradation on all non-metallic materials shall be taken into account. For textile materials, ... (contd) "	Incorporated intent. Paragraph title changed to "Material Performance".
J.J. Machon (expert)	Page 2, paragraph 3.c	The errors and missing figures in NAS3610 Rev.10, affecting sizes F, H, J and R, which went unnoticed in TSO C90c of 1992 and are still not corrected, should be corrected.	Regulatory material should not refer to a document known wrong without stating the necessary corrections. This opportunity should be seized to correct a wrong situation.	Recommend adding: " (5) In lieu of NAS 3610 Rev. 10 Figure 31 sheet 87, you must substitute Figure 31 sheet 88 (6) In lieu of NAS 3610 Rev. 10 Figure 31 sheet 88, you must substitute Figure 32 sheet 87 of NAS 3610 Rev. 8 dated April 1987, referred to in TSO C90b (5) and (6) above are met if reference is made in a LODA application to ISO 8097, where these errors are corrected. "	Corrected.
J.J. Machon (expert)	Page 2, paragraph 3.g Page 3, paragraph 5	"14 CFR Subpart O" may be ambiguous.	Presumed to really mean "14CFR Part 21 Subpart O"	Consider editorially adjusting to "14CFR Part 21 Subpart O" to avoid risk of misunderstanding.	Corrected
J.J. Machon (expert)	Page 3, paragraph 4.a.(3)	Marking of serial number should be a requirement.	Most if not all ULD manufacturers already mark all ULDs with serial number, necessary for individual unit traceability (a parameter of continued airworthiness).	Replace with "The serial number or <u>and</u> the date of manufacture of the article or both "	The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.

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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
J.J. Machon (expert)	Page 3, paragraph 4.1.(5)	"Weight of the article" does not specify whether individual unit weight or production average. Also, 1 lb accuracy is difficult to achieve (1 kg in ETSO is better in this respect).	Individual unit weight is useless. Production average weight can be safely used, and does not require a 1 lb accuracy. Pounds are seldom used internationally because of the inherent risk of mistake with kg, known to have resulted in incidents.	Recommended changing to: " The <u>production average</u> weight of the article, <u>rounded up</u> to the nearest <u>even figure in pounds</u> or <u>the nearest kilogram</u> ."	A marking requirement remains to accommodate weight and balance calculations in operations without a scale. The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices. A standard format has been introduced for weight requiring both English and Metric units be marked.
J.J. Machon (expert)	Page 3, paragraph 4.c	Marking means for a deviation are not specified, which will result in variety.	A variety of marking methods is unadvisable since it may result in non identification of any specific restrictions possibly associated with a deviation. The source to be checked for any such restriction is the article's TSO authorization.	Recommend changing to: " If the article includes a deviation per paragraph 3.g. of this TSO, the marking should include a means to indicate a deviation was granted <u>the abbreviation "DEV" shall be marked after the applicable TSO number.</u> "	A "DEV" marking has been defined to follow the applicable TSO number. This format is common to other TSOs. The marking has not been made mandatory as the requirement to specify any limitations already covers any special requirements associated with a deviation.
Ancra International		AS36100 and NAS3610 do not address standards for ULD edge rail profiles	A lack of standards for ULD edge rail profiles and dimensions can result in interface incompatibilities between TSO C90 ULD and STC'd cargo loading system causing damage to the cargo restraint devices and jeopardizing the integrity of the cargo system.	Develop standards for ULD edge rail profile to be included in NAS3610 and/or AS36100.	This is out of scope for the TSO. The FAA does not govern what standards are to be developed. Comments will be forwarded to AIA and SAE for review.
ACS	Page 1, Para. 2.c.	Reference should be made to corresponding ISO version (PAS 211000 of AS 36100 in applicable sections of the document.	Coordination of Standards		FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO. An applicant, whether US or international, may request permission to use another standard by applying for a deviation per 14 CFR Part 21 Subpart O.

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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ACS	Page 1, Para. 3.a.	All new type II ULDs not previously specified in NAS AS36100 should be added to the specification document in order to meet the requirements of TSO C90d. This would standardize specification requirements for "certified ULDs".	Slow phase out of Non Certified ULDs		TSO C90d is applicable to AS 36100 Rev. A only and not future revisions of the document. TSO C90 must be reissued as a revision before any changes to the SAE document would be recognized by the FAA in the TSO.
ACS	Page 2, Para. 3.d.	Change to read "Textile or composite materials identified as a permanent part of a ULD shall be tested for environmental degradation in accordance with applicable ASTM, ISO, or SAE standards or alternate documents may be used as approved by the administrator. The manufacturer shall identify test standards used in its request for a TSO and state allowable shelf and in-service life and salvage or disposal requirements for all textiles and/or composite materials in its manuals.	Place responsibility for appropriate environmental tests on the Manufacturer with approval of FAA Administrator.		<p>Intent to expand degradation evaluation to cover additional materials was incorporated.</p> <p>FAA has not reviewed ISO or any other documents, beyond what is already included in the TSO, for acceptable use. This prevents them from being included in the TSO.</p> <p>Paragraphs 7 of TSO C90d identifies the furnished data requirements - paragraphs 5.a. and 5.b. for this TSO and any other data needed for the proper installation, certification, use, or for continued compliance with the TSO of the ULDs. Since a TSO is a minimum performance specification the identification of specific service requirements is out of scope. Comments will be forwarded to FAA Flight standards and IATA.</p>
ACS	Page 2, Para. 3.e.	Add a note that environmental degradation applies to all materials and not just cargo nets. While not directly applicable to all ULD containers, the introduction of environmental degradation factors directly affects polymeric materials, e.g. fiber reinforced polymeric skins and panels.	Re-enforce awareness of environmental degradation and Manufacturer's responsibility to factor into design/serviceability		Intent incorporated.

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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ACS	Page 2, Para. 3.h.	Add "or, an acceptable test method approved by the administrator". This test method should not be a mandatory portion of this TSO. See attached Appendix A- Review of AS36102.	Allow Manufacturer to determine most effective and appropriate test method based upon design.		Paragraph now states a deviation may be applied for to use an alternative test method.
ACS	Page 3, Para. 4.a.(3)	Change to "The serial number of the article, with option to add date of manufacture."	Manufacturing date is an ambiguous term. Does it refer to the date of assembly of parts or to the manufacture of the parts themselves? Serial Number will control and contain link to all relevant dates.		The manufacturer's serial number has been added as a requirement. The date of manufacture remains as an option.
ACS	Page 3, Para. 4.a.(4)	No number is available which is traceable to ACO approval; this is acknowledged currently only by letter.	EASA actually assigns an ETSO number which is unique to that approval, e.g. EASA.IM.210.1155.		The FAA has a database that can be used for traceability back to the approving ACO. No additional markings are necessary
ACS	Page 3, Para. 4.a.(5)	Change to "The weight of the article to the nearest kilogram.	Weight subject to change after manufacture/assembly, cost, carrier responsibility, climate effects, not a standard (NTSB - +/- 1%) and depending on materials, can be too difficult to control.		The marking requirement has been revised to require the "nominal weight" to align more closely with manufacturing practices.
ACS	Page 3 Para. 4.b.(2)	Change to "Each subassembly and its components must be traceable".			A traceability requirement is out of the scope for a TSO. A TSO is for documentation of a technical performance standard. Paragraph 4 defines markings that enable traceability. Comments will be forwarded to FAA Flight Standards and IATA.
ACS	Page 3 Para. 4.b.(2)	Determination of what constitutes a subassembly is ambiguous and subject to inconsistent interpretation.			The requirement is targeted at any part or parts of the ULD that are functionally significant and may become separated from the ULD. "Component" covers both individual parts (i.e. lashing lines) and subassemblies.

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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
					The language has been modified to indicate the requirements are applicable to both subassemblies and components.
ACS	Page 3 Para. 4.b.(2)	Base subassemblies and panels of the ACS ULD are interchangeable and are marked with an appropriate bar coded part number label; however, no marking survives long after assembly.			Permanent marking for ULDs is an industry issue. Comments will be forwarded to FAA Flight Standards, SAE and IATA.
ACS	Page 3 Para. 4.c.	Marking of a deviation is not specified and although deviations are rare, language should be required to specify "DEV" after the article identification code specified in 4.a.(3).	Clear identification of deviation as to follow up to manual.		A "DEV" marking has been defined to follow the applicable TSO number. This format is common to other TSOs. The marking has not been made mandatory as the requirement to specify any limitations already covers any special requirements associated with a deviation.
ACS	Page 4, Para 5.d.	Intro paragraph and items (1) through (6) should be changed to read: Manufacturers are required to be in compliance with the following documents. <ol style="list-style-type: none"> 1. FAA ORDER 8150.1B "Technical Standard Order Program. 2. 14 CFR Part 21, "Certification Procedures for Products, Articles and Parts and its relationship to 14 CFR Parts 1, 43, and 45". 3. 14 CFR Part 21, Subpart O 4. FAA Notice 8150.4 "Non-TSO Functions Integrated into TSO Items". 5. FAA Order 8130.21E "Procedure for Completion and Use of the Authorized Release Certificate, FAA Form 	Clarity of existing requirement references.		The documents identified for inclusion do not pertain to performance standards. The documents are primarily procedural and directed toward the FAA. One document has been canceled. They will not be added to the TSO

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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		8130-3, Airworthiness Approval Tag			
ACS	ACS Letter Dated 5-5-2011 p. 8	AS 36102: A number of concerns were expressed regarding Test Loading, Deflection/deformation criteria and other issues not mentioned ACS comment log	AS seemingly has insufficient guidelines to qualify as an AS for ULD Testing Methods. Continued designation as an would make more sense. More test engineering and evaluation are needed.		FAA has noted the issues ACS has presented and will forward comments to SAE for review.
ACS	ACS Letter Dated 5-5-2011 p. 9	Edge rail profiles are not standard across NA3610, AS36100 and IATA tech manual.	There may be cost implications of if the profiles in AS36100 remain as they are. We are not aware of any strength issues with the current profiles in NAS3610.	Edge rail profiles should be the same unless SAE can justify otherwise.	This is out of scope for the TSO. The FAA does not control the standards that are referenced by TSO C90d. Comments will be forwarded to SAE and IATA.
ACS	<p>Note: In addition to the comment log ACS submitted additional text contained in the 5 pages that follow.</p> <ul style="list-style-type: none"> • The comments in the first 2 pages were reflected in the comment log text to which the FAA responded. • In the remaining 3 pages ACS provided a detailed review of AS36102, which is out of scope for the review of the TSO. Comments will be forwarded to SAE for review. 				

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To: Joan Hughson
Federal Aviation Administration
Aircraft Engineering Division
Technical Programs Branch, AIR-120
950 L'Enfant Plaza, SW: 5th Floor
Washington, DC 20024

Date: 05-05-2011

Ms. Hughson,

This letter contains our comments and concerns for the proposed TSO C90d updates/changes. They include input from F. Truman Williams our Chief Technical Officer, Fred Grahme our Aviation Business Consultant (former head of Cargo Operations at Northwest Airlines) and myself. Comments are included on the SAE source of changes, the proposed TSO changes and other related sources such as IATA and ISO. I have included our comments first as text and as entries in the Document Comment Grid provided starting on page 3. Some general comments have been included at the end of the document that we wish to be considered also.

Text Comment Submissions:

1. Page 1, Para. 2.c. Reference should be made to corresponding ISO version (PAS 211000 of AS 36100 in applicable sections of the document.
2. Page 1, Para. 3.a. ULDs identified and manufactured specific for Boeing 767 airplanes are non-certified since there are no specifications in NAS 3610 or AS36100. Shouldn't the cloud of confusion about design and maintenance requirements for uncertified" ULDs be eliminated by adding them to AS36100 prior to acceptance of TSO C90d. Thereafter there should be a requirement that all new type II ULDs not previously specified in NAS AS36100 be added to the specification document in order to meet the requirements of TSO C90d. This would standardize specification requirements for "certified ULDs" across the entire spectrum of Type II ULDs. NAS 3610 would still be the specification document for TYPE I ULDs.
3. Page 2, Para. 3.d. Change to read "Textile or composite materials identified as a permanent part of a ULD shall be tested for environmental degradation in accordance with applicable ASTM, ISO, or SAE standards or alternate documents may be used as approved by the administrator. The manufacturer shall identify test standards used in its request for a TSO and state allowable shelf and in-service life and salvage or disposal requirements for all textiles and/or composite materials in its manuals.
4. Page 2, Para. 3.e. Add a note that environmental degradation applies to all materials and not just cargo nets. While not directly applicable to ULD containers, the introduction of environmental degradation factors directly affects the use of polymeric materials, e.g. fiber reinforced polymeric skins and panels.
5. Page 2, Para. 3.h. Add Or, an acceptable test method approved by the administrator. This test method should not be a mandatory portion of this TSO. Numerous issues are addressed in attached Appendix A- Review of AS36102.

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6. Page 3, Para. 4.a.(3) Change to "The serial number of the article, with option to add date of manufacture."
7. Page 3, Para. 4.a.(4) No number is available which is traceable to ACO approval; this is acknowledged currently only by letter. EASA actually assigns an ETSO number which is unique to that approval, e.g. EASA.IM.210.1155.
8. Page 3, Para. 4.a.(5) Change to "The weight of the article to the nearest kilogram".
 1. If the weight of the ULD changes, the TSO Data Tag is not designed to record subtle changes in weight nor would it be practicable to do so.
 2. Carriers have automated aircraft weight and balance systems that record and update individual ULD tare weights for weight and balance planning and actual flight operations.
 3. Individual carrier procedures call for weighing empty ULDs owned by other parties or carriers and carriers are mandated to weigh loaded ULDs for weight and balance purposes prior to loading on aircraft.
 4. Few ULDs in service are actually marked to the nearest pound
 5. Actual weight varies with climate
 6. SAE will remove tare weight recording requirement from AS 36100
 7. This requirement is not part of ETSO C90c and it is presumable it will not be part of ETSO C90d. Removal will harmonize EASA and FAA requirements
 8. The use of English Units is inconsistent with other international systems, e.g. SI Units.
 9. Specifying the tare weight of a composite container to the nearest pound requires that each individual unit be weighed and marked appropriately, preventing mass production of engraved name plates with an appropriate weight
 10. Maintaining sufficient process control to manufacture a composite panel comprising, two skin layers and a core to a total weight ± 0.5 lb is extremely difficult. Tare weight can typically range to ± 2.2 lb (± 1.0 kg). The NTSB recommends the total weight of the container at MGW be within 1%
9. Page 3 Para. 4.b.(2). Change to "Each subassembly and its components must be traceable". Determination of what constitutes a subassembly is ambiguous and subject to inconsistent interpretation. Base subassemblies and panels of the ACS ULD are interchangeable and are marked with an appropriate bar coded part number label; however, no marking survives long after assembly.
10. Page 3 Para. 4.c. Marking of a deviation is not specified and although deviations are rare, language should be required to specify "DEV" after the article identification code specified in 4.a.(3).
11. Page 4, Para 5.d. Intro paragraph and items (1) through (6) should be changed to read: Manufacturers are required to be in compliance with the following documents.
 1. FAA ORDER 8150.1B "Technical Standard Order Program.
 2. 14 CFR Part 21, "Certification Procedures for Products, Articles and Parts and its relationship to 14 CFR Parts 1, 43, and 45".
 3. 14 CFR Part 21, Subpart O
 4. FAA Notice 8150.4 "Non-TSO Functions Integrated into TSO Items".
 5. FAA Order 8130.21E "Procedure for Completion and Use of the Authorized Release Certificate, FAA Form 8130-3, Airworthiness Approval Tag

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General Comments:

1. Noted Deficiencies in AS 36102

As noted from a review of AIR 36107, the Testing Methods were originally slated to be documented in an Aerospace Recommended Practice (ARP). Actions taken by the SAE AGE-2A Subcommittee ultimately changed this to an Aerospace Standard (AS). Presumably this adds greater weight and consideration to the document. There was an attempt to establish the right balance between mandatory testing criteria and allowable methods flexibility.

2. Test Loading

Test loads are determined by reference to AS36100A Section 7.2 Table 1 as supplemented by the ULD Configuration. Many of the ULD configurations are required to be tested in conjunction with a downward load equal to the forward load. These loads may be applied with an internal load configuration, a pneumatic bladder or hydraulic frame reacted with struts extending through perforations in the side panels. AS36102 does not indicate in any of the examples the proper method of applying the base load in conjunction with the Forward, Aft or Side loads. This method also contains a bias in favor of a ULD constructed with a separate structural frame as opposed to a composite unit with an integral frame where NAS 3610 allows for flexibility of method tailored to design.

The Down Load as specified in AS36100A would appear to be applicable solely to ULDs that have a subfloor such as that encountered in a forkliftable base or large containers that utilize stringers to produce a sandwich beam plate design with appropriate stiffness. Small lower deck containers with a single base sheet riveted to a set of edge rail extrusions should have no requirement for the specified Down Load since the load acts solely upon the base sheet in the compressive mode. A possible exception to this interpretation involves the base sheet deflection under the down load provided that the cargo deck support roller spacing is defined. Nowhere in the test method does this exception receive comment.

3. Environmental Degradation

The requirement for an Environmental Degradation Factor in computing the Test Load (TL) is understandable; however, no guidelines exist within the SAE Aerospace Standards library. These degradation factors ultimately require stipulation of a ULD service life and more to the point, a reference environment for assessment of degradation.

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4. Deflection under Load and Permanent Deformation

No deflection criteria are offered within this set of test methods. At a much earlier time the author investigated this requirement with the FAA and was advised that any deflection resulting in contact with the aircraft cargo liner was cause for concern. At that time all Boeing cargo liners were approved for “loose” cargo and the requirement for an approved ULD was overkill. Airbus, on the other hand, required the use of approved ULDs for restraint of cargo. The general opinion was that if the deflecting load contacted the airframe then this would constitute justification for obtaining a supplemental type certification which in turn is a significant step upward from the TSO process. Deflections under load are different than permanent deformations.

5. Other Issues

Figure A2-Sidewall Test is potentially one of the most misleading representations of this type of test. The reader will note that an air bladder is used to apply the side load and the figure shows this side load centered on the CG of the load. No requirement for the bladder footprint area is given or shown, yet in this example it is visually approximately equal to one-half of the tested panel area. Coupled with the fact that the AS36100 CG height is given a maximum value only, there is nothing within the standard to prevent a much lower CG. Specifying that the bladder contact area must be some fraction (k) of the exposed panel area would eliminate the problem. To be fair, Section 3.2.4 does stipulate that the bladder shall cover the full panel area; however, there must be some provision for excluding some perimeter zone to account for fasteners that protrude into the interior space. Considerable confusion arises, however, when applying this method to the outboard overhang on an AKE container. Does the “slope” panel receive the same bladder pressure as the vertical portion?

No mention is made relative to the AS36100A Restraint Configuration K to testing in the fore and aft direction for the application of a horizontal force equal to 6 times the forward load (31,500 lbf) applied to the base edge to simulate a possible stack of up to 7 units.

Edge rail profiles are dissimilar in NAS 3610 and AS 36100. There are also profile differences between IATA tech manual, NAS 3610 and AS 36100. Profiles should be the same unless the SAE can justify the differences. There may be cost implications if the profiles in AS 36100 remain as they are. We are not aware of any serious strength issues with the current profiles in NAS 3610.

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6. Review Conclusions

AS 36102 seemingly has insufficient guidelines to qualify as an Aerospace Standard for ULD Testing Methods. Continued designation as an Aerospace Recommended Practice (ARP) would make more sense. As it presently stands there are a number of factors that will require much greater test engineering and evaluation prior to setting a standard. The Environmental Degradation Factor is the most difficult. In the case of an all-aluminum ULD this may be simple; however, for the case of a polymeric composite construction there are sufficient unknowns that may take a great deal of time to establish. This issue is similar to that presently experienced in setting a service life on nets and straps. An initial increase in the test load may have very little to do with the actual service life of the component.

Please advise upon review.

Respectfully,

A handwritten signature in blue ink, appearing to read 'Mark D. Sherrod', is written over a light blue horizontal line.

Mark D. Sherrod
ACS Quality Manager