

**Comment Response Document (CRD)  
to Notice of Proposed Amendment (NPA) 10-2006**

**for AMENDING**

**DECISION NO. 2003/14/RM OF THE EXECUTIVE DIRECTOR OF THE  
AGENCY of 14 November 2003 on**

**Certification Specifications, including airworthiness codes and acceptable means  
of compliance for normal, utility, aerobatic and commuter category aeroplanes  
(« CS-23 »)**

**SINGLE ENGINE STALL SPEED**

## **Explanatory Note**

### **I. General**

1. The purpose of the Notice of Proposed Amendment (NPA), dated 12 July 2006 was to propose an amendment to Decision N° 2003/14/RM of the Executive Director of the Agency 14 November 2003 on Certification Specifications, including airworthiness codes and acceptable means of compliance for normal, utility, aerobatic and commuter category aeroplanes (« CS-23 »).

### **II. Consultation**

2. The draft Executive Director Decision amending Decision N° 2003/14/RM was published on the web site ([www.easa.europa.eu](http://www.easa.europa.eu)) on 12 July 2006.

By the closing date of 11 October 2006, the Agency had received 21 comments from national authorities, professional organisations and private companies.

Although NPA 10-2006 is a result of a transposed version of the JAA draft NPA 23-XX, Single Engine Stall Speed, which proposes a limited increase of the maximum stall speed to 65kts, as agreed by the JAA General Aviation Steering Group, the Agency concludes from the comments received that this compromise receives insufficient support to further pursue this proposal as a decision.

In fact only one comment fully supports the present NPA proposal, while the other 20 comments propose changes to the NPA. Most commentators request a full harmonisation with the current FAR23 regulation while others are not in favour of increasing the maximum stall speed.

The Agency has therefore decided that further consultation in accordance with article 7(4) of “The Rulemaking Procedure”<sup>1</sup> is appropriate, and a new NPA will be drafted by the Agency.

The comments received to NPA 10-2006 as indicated in the attached Comment Response Document will be considered in the drafting of this new NPA. The new NPA will propose harmonisation with the current FAR 23.49, FAR 23.67(a)(1) and FAR 23.562 related to compensating emergency landing dynamic condition for aeroplanes that exceed the 113 km/h (61 knots) maximum stall speed.

### **III. Publication of the CRD**

3. All comments received have been acknowledged and incorporated into a Comment Response Document (CRD). This CRD contains a list of all persons and/or organisations that have provided comments and the answers of the Agency.
4. The Agency will issue a new NPA not earlier than at least two months after the publication of this CRD to allow for any possible reactions of stakeholders

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<sup>1</sup> Management Board Decision MB/7/03 from 27 June 2003 concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (“rulemaking procedure”).

regarding possible misunderstandings of the comments received and answers provided.

5. Such reactions should be received by EASA not later than 13 April 2007 and should be sent by the following link: [CRD@easa.europa.eu](mailto:CRD@easa.europa.eu).

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
1.	1.	CS 23.562 Emergency landing dynamic conditions	CAA-CZ	<p>The CAA CZ agrees with the idea of reducing the disharmony between the FAR 23 regulation and the current certification specification CS-23 and therefore supports the adoption of the NPA in question. However, the harmonisation of the FAR/CS-23 as proposed by the NPA is only partial.</p> <p>In the area of determination of occupant protection level during emergency landing, FAR 23 regulation deals with stalling speeds <math>V_{S0}</math> in relevant paragraphs up to 79 kts. The CAA CZ therefore recommends to further increase the scope of the certification specification in line with FAR 23. The CAA CZ proposes to further harmonise the wording of paragraph CS 23.562 in line with FAR 23 regulation and to use uniform criteria.</p> <p><b>JUSTIFICATION:</b> The CAA CZ is of an opinion that the use of different approaches and criteria in CS-23 and FAR 23 regulation in the field of single engine stall speed and occupant protection standards is not appropriate and recommends to further eliminate the existing disharmony.</p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.562.</p>
2.	2.	General Comment	CAA-UK	<p>The title of this NPA (and EASA's 2006 Rulemaking Programme task number 23.001) is "Single engine stall speed", yet the draft proposals also apply to certain "multi-engined" aeroplanes (i.e. those that do not comply with CS 23.67(a)(1)). Furthermore, the justification provided in Section C refers to the "...need to further consider the existing JAA limiting criterion of a 61 knots stall speed on <u>single</u> engined aeroplanes...", and paragraph V.9 (Purpose and intended effect) states that "The aim is to update CS-23 to incorporate new concepts for the <u>single</u> engine stall speed and occupant protection standards". What is the intended applicability?</p> <p><b>JUSTIFICATION:</b> Clarification</p>	<p><b>Noted.</b> The former JAA task title was maintained in order to clearly identify the relation to this earlier task. It is however evident that the content of this task also applied to multi-engined aeroplanes with a <math>V_{S0}</math> between 113 and 120 km/h (61 and 65 knots) at maximum weight of 2722 kg(6000 lbs) or less, that do not comply with CS 23.67(a)(1).</p> <p>The new NPA title will be revised to better reflect the content.</p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
3.	3.	Expl. Note Chapter V, para 12	CAA-UK	<p>The NPA proposes that the loss of safety resulting from increased stall speeds can be compensated by enhanced crashworthiness requirements for seats and restraint systems. However, it is suggested that there are other factors which need to be considered but which have not been addressed by the NPA, most notably the effects of increased operating speeds and higher kinetic energy levels associated with the forced landing scenario:</p> <ul style="list-style-type: none"> <li>- The forced landing speed will increase and this will result in a longer landing distance required for a successful (i.e. safe, with no injuries) outcome. The consequence of this is that the number of areas into which a safe forced landing could be made will be reduced. This effect will be of far greater significance for many European countries where the population densities and topography are far less conducive to this alleviation than the US, where they originated.</li> <li>- The ability to manoeuvre in preparation for the forced landing, and to avoid obstacles in the latter stages of the approach, is degraded due both to the greater visual segment required at higher operating speeds, and to the increase in the radius of turn.</li> </ul> <p>As a result, the risk of overrun and consequential damage to third parties on the ground will increase. Given that the application of this relaxation is in response to the “needs” of high-inertia single engined turboprop aeroplanes, which tend to be operated from significant airports surrounded by large areas of population, it is a particularly unwelcome development.</p> <p><b>JUSTIFICATION:</b> Further technical consideration, not covered in proposal.</p>	<p><b>Noted.</b> The issues raised by this comment will be taken into consideration in the drafting of the new NPA.</p> <p>Comment providers are therefore invited to submit any additional information that will assist the Agency in drafting the new proposal.</p>

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4.	4.	Expl. Note Chapter V, para 12	CAA-UK	<p>It is stated that “a positive economic impact is anticipated because an extended applicability range of CS-23.49 Stalling speed ... will reduce the need for issuing Special Conditions when an aeroplane exceeds the current maximum stalling speed.” This implies that EASA will continue to accept designs which exceed the new upper limit. Is this the case?</p> <p><b><u>JUSTIFICATION:</u></b> Clarification</p>	<p><b>Noted.</b> The Agency’s current acceptance of aeroplane design with a stall speed that exceeds the present upper limit in CS-23 is continued by the adoption of these special conditions into CS-23.</p>
5.	5.	Expl. Note Chapter V, para 12	CAA-UK	<p>It should be recognised that FAR-23.49(d) has no upper limit on the stalling speed, so there is thus a continued possibility that, despite this NPA, EASA will continue to be faced with aeroplanes which exceed its (revised) upper limit in CS 23.49(d). It would be helpful to understand EASA’s intentions with regards to these aircraft, given that the enhanced occupant protection standards in the proposed CS 23.562(d) are only considered to be adequate for stalling speeds up to 65kts.</p> <p>(Note that it was FAR Amendment 23-44, not 23-50 as stated, which originated the disharmony on stall speed limitations between JAR and FAR 23).</p> <p><b><u>JUSTIFICATION:</u></b> Consistency with FAR</p>	<p><b>Noted.</b> FAR 23.49(c) still contains the stall speed upper limit, that may only be exceeded if the compensating features from FAR23.562 are met.</p> <p>Harmonisation with these specifications would provide uniform and equal treatment on this issue.</p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
6.	6.	CS 23.49(d)	CAA-UK	<p>No justification has been provided to explain why the alleviation is also being applied to (certain) “multi-engined” aeroplanes. The FAA’s original 61kt alleviation proposals (contained in NPRM 91-12) stated that they resulted from petitions from manufacturers of single-engined turboprop aeroplanes in order “to obtain the full performance and economic advantages of incorporating the latest turbine-powered design technology in single-engine airplanes, and to provide a higher cruise speed with lower specific fuel consumption”.</p> <p>Whilst single engined aeroplanes are omitted to a forced landing after engine failure, twin engined aeroplanes could be designed with sufficient power so as to minimise this risk, e.g. by complying with CS 23.67(a)(1). It is suggested that the future interests of aviation safety, and the obligations placed on the Agency by EC Regulation 1592/2002, would be better served by discouraging the certification of twin engined aeroplanes which could not demonstrate compliance with the climb gradient of CS 23.67(a)(1), rather than allowing them further alleviation in this way.</p> <p><b>JUSTIFICATION:</b> Suggested technical consideration.</p>	<p><b>Noted.</b> The alleviation is also applied to certain “multi-engined” aeroplanes if:</p> <p>1st They fall within the same scope of kinetic energy in case of an emergency landing. Therefore limited to a MTOW up to 2722 kg (6000 lbs).</p> <p>2nd The likelihood of an emergency landing in case of an engine failure is considered close to single engine aeroplanes when the one-engine-inoperative capabilities of such an aeroplane are not meeting those climb requirements of 23.67(a)(1).</p> <p>Changing the one-engine-inoperative requirements for “multi-engined” is not considered part of this NPA.</p>
7.	7.	CS 23.49(d) and CS 23.562(d)	CAA-UK	<p>The NPA proposes that the new paragraphs CS 23.49(d) and CS 23.562(d) should also apply to certain “multi-engined” aeroplanes. However, CS 23, like JAR-23 on which it is based, is applicable to single and twin-engined aeroplanes only. The JAR-23 specialists at the time recognised that this was a disharmony with FAR 23 but confirmed that it should remain until a complete review of the JAR 23 text could be undertaken.</p> <p>To be consistent with the text of CS 23, the reference to “multi-engined” should be changed to “twin-engined” throughout these proposals.</p> <p><b>JUSTIFICATION:</b> Consistency</p>	<p><b>Noted.</b> Although the applicability of CS-23 does not specifically excludes multi-engined aeroplanes.</p> <p><i>“(1) Aeroplanes in the normal, utility and aerobatic categories that have a seating configuration, excluding the pilot seat(s), of nine or fewer and a maximum certificated take-off weight of 5670 kg (12 500 lb) or less”</i></p> <p>The proposed text in the new NPA will address the stall speed limit only. It is not intended to also cover a complete review of the use of “multi-engined” or “twin-engined” in CS 23.</p> <p>Therefore the wording in the new proposal will be changed to “twin-engined”.</p>

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8.	8.	Original JAA NPA proposal justification	CAA-UK	<p>Compliance with the 61 knot stall speed requirement should not be beyond the capabilities of today's designers. It was argued in NPRM 91-12 that retaining the limit would require future designs to incorporate "larger and more complex high-lift systems" which "may result in a reduction in the low speed flying qualities and lessen the level of safety...". CAA was not persuaded by that argument then, and nothing has changed. Higher wing loadings are the choice of the applicant and all aeroplanes, regardless of the complexity of their high-lift systems, have to meet the same handling certification criteria.</p> <p><b>JUSTIFICATION:</b> Questioning the logic of an original JAA NPA Proposal justification.</p>	<p><b>Noted.</b> The comment addresses the justification of NPRM 91-12, which will be considered in the new NPA.</p>
9.	9a.	CS 23 Subpart B, para CS 23.49(c)	Pilatus Aircraft Ltd	<p>Comment summary: It is strongly recommended to use the exact wording of the US FAA FAR 23.49 (c) and FAR 23.562 (d) as introduced with Amendment 23-44, instead.</p> <p><b>[SEE APPENDIX 1 for full comment]</b></p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>
10.	9b.	CS 23 Subpart C, para CS 23	Pilatus Aircraft Ltd	<p><b>[SEE APPENDIX 2]</b></p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>
11.	10.	Subpart C	GASC	<p>The proposal for improved crashworthiness should be applied to ALL aircraft rather than those with a stall speed between 61 and 65 knots</p> <p><b>JUSTIFICATION:</b> Thanks to the use of modern design techniques and materials, this may only result in a very slight increase in the empty weight of an aircraft, but will be more than justified by future reductions in death and injury. The enormous improvement in structural integrity and survivability in cars has shown what can be achieved.</p>	<p><b>Noted.</b> This comment is not accepted within the context of this rulemaking task that will be restricted to harmonisation of maximum stall speed specifications between CS 23 and the current FAR 23.</p> <p>Introduction of compensating requirements to ALL aeroplanes is not considered for rulemaking at this point of time since this is insufficiently supported by data or research.</p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
12.	11.	CS 23.49	Bob Crowe Aircraft Sales Ltd	<p>The text proposed in the NPA is supported.</p> <p><b>JUSTIFICATION:</b> The previous limit of 61kt was a 'grandfather' figure based on old regulations. An increase is acceptable providing there is an equivalent level of safety for the passengers and crew.</p>	<p><b>Noted.</b> The new NPA will also contain compensating features to provide an equivalent level of safety for the passenger and crew.</p>
13.	12.	Support NPA	ECOGAS	<p><u>The text proposed in the NPA is supported</u>; it is important to limit the increase in stall speed in the landing configuration, as in this EASA NPA. The FAA should be encouraged to harmonise with this proposal in FAR 23.</p> <p><b>JUSTIFICATION:</b> A small increase in stall speed is acceptable providing adequate enhancement of the crashworthiness of the structure is also required to achieve at least equivalent safety. However, a larger increase of stall speed (above 65 knots) would begin to have a significant effect on the ability to manoeuvre in a forced landing to avoid any obstacles prior to touchdown.</p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>
14.	13.	CS23.49 & CS23.562	DGAC-F	<p>DGAC France proposes a full harmonisation with FAR 23.49 and FAR 23.562.</p> <p><b>JUSTIFICATION:</b> This NPA proposes an increase of the stall speed in the landing configuration up to 65Kts. DGAC-F propose not to limit the V<sub>so</sub> and to harmonize with FAR Part 23.</p> <p>At the time the original JAA proposal was established, the need for a consequent increase in the stall speed had not been identified, however recent projects have occurred since which have shown interest for such increase, for instance EASA has certified the Ae270 with a V<sub>so</sub> = 69kts on 12 December 2005, using FAR 23 as certification basis.</p> <p>Furthermore new projects are arriving with V<sub>so</sub> not yet established but likely to exceed 65kts (such as the ATG Javelin with a V<sub>so</sub> = 86kts).</p> <p>DGAC France feel like it would be better to have CS.23 allowing such speeds instead of dealing with the project with special conditions.</p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
15.	14.	CS 23.49	FAA	<p>We are pleased that EASA has reviewed the changes made earlier to 14 CFR part 23 for Stalling Speeds exceeding 113 km/h (61 knots) and agreed to offer the option of higher speeds. We would however offer that for future airplane projects, EASA may want to consider a maximum <math>V_{SO}</math> of 70 knots instead of the proposed 120 km/h (65 knots).</p> <p><b>JUSTIFICATION:</b>                      Top speeds have historically been 3 to 4 times <math>V_{SO}</math> for civil piston airplanes and about 5 to 6 times <math>V_{SO}</math> for smaller civil turbojets with simple flap systems. The airplane market is pushing for faster airplanes with better ride quality. New airplane designs have benefited from better fuselage aerodynamics, but at the same time, manufacturers are reducing the wing areas too, not only for speed, but for better ride quality from a higher wing loading.</p> <p>The natural trend for small single engine piston and turbine airplane manufacturers is to offer more speed and comfort to increase the value of their airplanes. We believe that new technologies addressing crashworthiness are allowing manufacturers to safely increase stall speeds in response to our markets. This is the reason that we made changes to part 23 several years ago.</p>	<p><b>Noted.</b>                      The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>
16.	15.	CS23.49	EADS SOCATA	<p>(c) Except as provided in sub-paragraph (d) of this paragraph, <math>V_{SO}</math> at maximum weight must not exceed 113 km/h (61 knots) for –</p> <p>(1) Single-engined aeroplanes; and</p> <p>(2) <del>Twin-engined</del> multi-engined aeroplanes of 2722 kg (6 000 lbs) or less maximum weight that cannot meet the minimum rate of climb specified in CS 23.67 (a)(1) with the critical engine inoperative.</p> <p>Insert new paragraph CS 23.49(d) following CS 23.49(c)</p> <p>(d) <del>A maximum <math>V_{SO}</math> of 120 km/h (65 knots)</del> A <math>V_{s0}</math> of more than 113km/h (61knot) is permissible for all single-engined aeroplanes, and those multi-engined aeroplanes of 2722 kg (6000 lbs) or less maximum weight, with a <math>V_{s0}</math> of more than 113 km/h (61 knots) that do not meet the requirements of CS 23.67(a)(1), that comply with CS 23.562(d). (see annex)</p>	<p><b>Noted.</b>                      The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c).</p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
				<p><b><u>JUSTIFICATION:</u></b></p> <p>[See APPENDIX 3]</p>	
17.	16.	CS23.562	EADS SOCATA	<p>The CS 23.562 should be harmonised with FAR 23.562 (see annex).</p> <p><b><u>JUSTIFICATION:</u></b></p> <p>[See APPENDIX 4]</p>	<p><b>Noted.</b></p> <p>The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.562.</p>
18.	17.	§ EXPLANATORY NOTE / V) Regulatory Impact Assessment	EADS SOCATA	<p>The EADS SOCATA proposed text in “Annex NPA 10-2006 Comment Form explanatory note” attached is written in order to incorporate clear reference to harmonisation between CS 23 and FAR-23 on the Stall Speed subject.</p> <p><b><u>JUSTIFICATION:</u></b></p> <p>[See APPENDIX 5]</p>	<p><b>Noted.</b></p> <p>The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d). This will also include re-writing of the RIA.</p>
19.	18.	General	EADS SOCATA	<p>EADS SOCATA position is that CS 23.49, CS 23.562 have to be fully harmonised with current FAA regulation.</p> <p><b><u>JUSTIFICATION:</u></b></p> <p>[See APPENDIX 6]</p>	<p><b>Noted.</b></p> <p>The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).</p>
20.	19.	§ ORIGINAL JAA NPA PROPOSALS JUSTIFICATION	EADS SOCATA	<p>The NPA justification should be rewritten considering: - General Aviation context and not JAR25 context, - CS 23 / FAR23 harmonisation and the appropriate level of safety provided by the US regulation, - European General Aviation industry economical interests.</p> <p><b><u>JUSTIFICATION:</u></b></p> <p>See other EADS SOCATA Comment Forms for further justifications.</p>	<p><b>Noted.</b></p>

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Response #	Comment #	Para	Comment provider	Comment/Justification	Response
21.	20.	Subpart B Flight: CS 23.49(d) Stalling Speed – subsection D (Page 6 of 9)	Transport Canada	<p>As provided in paragraph 12 “Foreign comparable regulatory requirements” of this NPA, the purpose of this amendment is to reduce the disharmony between CS-23 and FAR 23. However, it is noted that the proposed CS 23.49(d) does not quite fully harmonize with the corresponding FAR 23.49(d) text, although a minor change to the current proposed wording could have achieved this. Moreover, it is found that the proposed CS 23.49(d) text is somewhat awkward in its composition, particularly towards the end of the sentence. The text could be improved by reverting to a text similar to that of the corresponding FAR, or by modifying the last few words. The following proposal is offered:</p> <p>“(d) A maximum <math>V_{SO}</math> of 120 km/h (65 knots) is permissible for all single-engined aeroplanes, and those multi-engined aeroplanes of 2722 kg (6000 lbs) or less maximum weight, with a <math>V_{SO}</math> of more than 113 km/h (61 knots) that do not meet the requirements of CS 23.67(a)(1), <del>that comply</del> <u>provided that compliance is shown</u> with CS 23.562(d).”</p> <p><b><u>JUSTIFICATION:</u></b> The proposed text is somewhat awkward to read.</p>	<p><b>Noted.</b> The Agency will, in the light of the comments and views expressed by several parties to this NPA, draft a new NPA that will propose harmonisation with FAR23.49(c) and FAR23.562(d).  This will also address this comment.</p>

2. PROPOSED TEXT/ COMMENT:

The text proposed by this NPA-10-2006 for CS 23.49 and CS 23.562 is not supported.

It is strongly recommended to use the exact wording of the US FAA FAR 23.49 (c) and FAR 23.562 (d) as introduced with Amendment 23-44, instead.

Therefore the proposed text for these two paragraphs should read as follows:

**CS 23 SUBPART B FLIGHT**CS 23.49 Stalling Speed

Change existing 23.49 (c) to read as follows:

**(c) Except as provided in paragraph (d) of this section,  $V_{SO}$  and  $V_{S1}$  at maximum weight must not exceed 61 knots for—**

**(1) Single-engine airplanes; and**

**(2) Multiengine airplanes of 6,000 pounds or less maximum weight that cannot meet the minimum rate of climb specified in §23.67(a) (1) with the critical engine inoperative.**

Insert new paragraph CS 23.49(d) following CS 23.49(c):

**(d) All single-engine airplanes, and those multiengine airplanes of 6,000 pounds or less maximum weight with a  $V_{SO}$  of more than 61 knots that do not meet the requirements of §23.67(a)(1), must comply with §23.562(d).**

3. JUSTIFICATION:

Pilatus Aircraft is of the opinion that regulations must only define a framework. Setting details and hard numbers limits the freedom of the aircraft designers and reduces the scope of invention that modern technology can provide. Whilst accepting that regulations must consider safety at the highest priority, stating hard limitations in this manner constitutes a burden to aircraft designers and severely limits technology growth in the Single Engine sector of aviation.

Technology has increased drastically over the last decades which makes it possible today to design aircraft with improved safety even at a higher stall speed. Additionally the increased scope of single engine aircraft will help limit environmental degradation.

The text proposed by Pilatus to allow a higher stall speed has a self limiting feature as the compensating factors required by 23.562 will not allow building an economical aircraft with a stall speed very much above the stall speed proposed because of a drastic weight increase.

The 'open' stall speed requirement of the US FAA FAR 23.49 is now in force for more than 10 years. In that time some new designs utilizing a higher stall speed were established. The experience of these aircraft is very positive and they hold a good safety record.

Every effort should be made to harmonize the airworthiness regulations around the world. A disharmonization is not acceptable to an aircraft manufacturer who is selling and operating globally. It is not anticipated that the FAA will step back and change the FAR 23.49 for harmonization with CS 23.49, specifically not as the experience is only positive. This makes it even more important to harmonize the CS 23.49.

## CS 23 SUBPART C STRUCTURE

CS 23.562 Emergency Landing Dynamic Conditions

Insert new paragraph CS 23.562 (d) and re-designate existing CS 23.562 (d) as CS 23.562 (e).

The new proposed paragraph CS 23.562 (d) shall read as follows:

**(d) For all single-engine airplanes with a  $V_{SO}$  of more than 61 knots at maximum weight, and those multiengine airplanes of 6,000 pounds or less maximum weight with a  $V_{SO}$  of more than 61 knots at maximum weight that do not comply with §23.67(a)(1);**

**(1) The ultimate load factors of §23.561(b) must be increased by multiplying the load factors by the square of the ratio of the increased stall speed to 61 knots. The increased ultimate load factors need not exceed the values reached at a  $V_{SO}$  of 79 knots. The upward ultimate load factor for acrobatic category airplanes need not exceed 5.0g.**

**(2) The seat/restraint system test required by paragraph (b)(1) of this section must be conducted in accordance with the following criteria:**

**(i) The change in velocity may not be less than 31 feet per second.**

**(ii)(A) The peak deceleration ( $g_p$ ) of 19g and 15g must be increased and multiplied by the square of the ratio of the increased stall speed to 61 knots:**

$$g_p = 19.0 (V_{SO}/61)^2 \text{ or } g_p = 15.0 (V_{SO}/61)^2$$

**(B) The peak deceleration need not exceed the value reached at a  $V_{SO}$  of 79 knots.**

**(iii) The peak deceleration must occur in not more than time ( $t_r$ ), which must be computed as follows:**

$$t_r = \frac{31}{32.2(g_p)} = \frac{.96}{g_p}$$

where—

$g_p$  = The peak deceleration calculated in accordance with paragraph (d)(2)(ii) of this section

$t_r$  = The rise time (in seconds) to the peak deceleration.

The existing paragraph CS 23.562 (d) shall be renumbered:

**(d)**

**(e) An alternate approach that achieves an equivalent, or greater, level of occupant protection to that required by this section may be used if substantiated on a rational basis.**

3. **JUSTIFICATION:**

Pilatus Aircraft is of the opinion that regulations must only define a framework. Setting details and hard numbers limits the freedom of the aircraft designers and reduces the scope of invention that modern technology can provide. Whilst accepting that regulations must consider safety at the highest priority, stating hard limitations in this manner constitutes a burden to aircraft designers and severely limits technology growth in the Single Engine sector of aviation.

Technology has increased drastically over the last decades which makes it possible today to design aircraft with improved safety even at a higher stall speed. Additionally the increased scope of single engine aircraft will help limit environmental degradation.

The text proposed by Pilatus to allow a higher stall speed has a self limiting feature as the compensating factors required by 23.562 will not allow building an economical aircraft with a stall speed very much above the stall speed proposed because of a drastic weight increase.

The 'open' stall speed requirement of the US FAA FAR 23.49 is now in force for more than 10 years. In that time some new designs utilizing a higher stall speed were established. The experience of these aircraft is very positive and they hold a good safety record.

Every effort should be made to harmonize the airworthiness regulations around the world. A disharmonization is not acceptable to an aircraft manufacturer who is selling and operating globally. It is not anticipated that the FAA will step back and change the FAR 23.49 for harmonization with CS 23.49, specifically not as the experience is only positive. This makes it even more important to harmonize the CS 23.49.

**1a. COMMENT TO (Specify clearly Part/Chapter Number):**

- Explanatory Note  
 Draft Decision CS-23  
 **Subpart B Flight – CS 23.49 Stalling Speed**  
 Subpart C Structure – CS 23.562 Emergency landing dynamic conditions  
 Original JAA NPA Proposals Justification  
 General Comment(s)

**1b. AFFECTED PARAGRAPH (Specify clearly Paragraph Number):**

§ PROPOSALS / Draft decision CS-23 / Subpart B Flight CS23.49 Stalling speed

**2. PROPOSED TEXT/ COMMENT:**

- (c) Except as provided in sub-paragraph (d) of this paragraph, VSO at maximum weight must not exceed 113 km/h (61 knots) for –
- (1) Single-engined aeroplanes; and
  - (2) ~~Twin-engined~~ multi-engined aeroplanes of 2722 kg (6 000 lbs) or less maximum weight that cannot meet the minimum rate of climb specified in CS 23.67 (a)(1) with the critical engine inoperative.

Insert new paragraph CS 23.49(d) following CS 23.49(c)

(d) ~~A maximum VSO of 120 km/h (65 knots)~~ A Vs0 of more than 113km/h (61knot) is permissible for all single-engined aeroplanes, and those multi-engined aeroplanes of 2722 kg (6000 lbs) or less maximum weight, with a Vs0 of more than 113 km/h (61 knots) that do not meet the requirements of CS 23.67(a)(1), that comply with CS 23.562(d).

**3. JUSTIFICATION:****“Multi-engined” instead of “twin-engined”**

For consistency purpose, “multi-engined aeroplanes” should be used instead of “Twin-engined aeroplanes”.

**General comments on NPA related to Vs0 limited to 65kts**

While the intend of this NPA is to reduce disharmony between CS 23 and FAR23; while one of the options mentioned in the explanatory note is to fully harmonise the CS 23 with the current FAR regulation; while reducing as much as possible disharmony between FAR23 and CS23 is in the interest of the European industry; the proposed limit for Vs0 is still not harmonised with FAR 23.49. Any aircraft with Vs0 of more than 65kts will still be in the same situation than before the NPA. It again puts European aircraft manufacturers in a difficult position to certify there products in the USA as the primary certification authority would not allow certification of those aircraft. This creates a competitive disadvantage for the European products on the US market.

This JAA NPA is not effective as its implementation still requires to obtain a Special Condition to certify an aeroplane with a Vs0 of more than 65kts.

In addition, the “original JAA NPA proposals justification” does not demonstrate the need of a limited increase of Vs0 in order to maintain safety goals. Moreover, no demonstration has been shown to justify the value of 65kts as a relevant limitation. This has to be opposed to FAR 23.49 that does not put any limitation to Vs0 provided that compensating factors are applied. These Compensating factors resulted from an extensive analysis from FAA which was exposed at the NPRM stage eventually leading to the increase in stall speed

Back when FAA introduced Far 23.49 at amendment 44, a commenter proposed to cap the Vs0 (at 70 kts). The FAA rejected this idea considering that compensating factors as introduced in US regulation would provide sufficient level of safety, no matter what would be the Vs0 (see Final Rule. Docket No. 23746; Issued on 07/07/93.).

The position expressed in the proposed NPA is in contradiction with the above but without providing any substantive material.

In consequence we reject the principle of an upper limit to Vs0.

Finally, we have seen that this NPA will still require a Special Condition which introduces the risk of economic unfair competition.

FAR 23 proposes the appropriate level of safety. In the interest of European Manufacturers CS-23 should be harmonised accordingly.

## Appendix to comment 16

1a. **COMMENT TO** (*Specify clearly Part/Chapter Number*):

- Explanatory Note  
 Draft Decision CS-23  
 Subpart B Flight – CS 23.49 Stalling Speed  
 **Subpart C Structure – CS 23.562 Emergency landing dynamic conditions**  
 Original JAA NPA Proposals Justification  
 General Comment(s)

1b. **AFFECTED PARAGRAPH** (*Specify clearly Paragraph Number*):

§ PROPOSALS / Draft decision CS-23 Subpart C Structure CS23.562 Emergency landing dynamic conditions

2. **PROPOSED TEXT/ COMMENT:**

**Preamble:** CS 23.562 should be harmonised with FAR 23.562. Therefore the text below is proposed in order to allow full harmonisation between both FAR and CS, 23.562.

**Proposed text:****SUBPART C STRUCTURE****CS 23.562 Emergency landing dynamic conditions (SEE AMC 23.562)**

Insert new paragraph CS 23.562(d) and re-designate existing CS 23.562(d) as CS 23.562(e)

(d) For all single-engined airplanes with a Vs0 **between of more than** 113 km/h (61knot) ~~and 120 km/h (64 and 65 knots)~~ at maximum weight, and those multi-engined airplanes of 2722 kg (6 000 lbs) or less maximum weight with a Vs0 **of more than** ~~between~~ 113 km/h (61knot) ~~and 120 km/h (64 and 65 knots)~~ at maximum weight, that do not comply with CS 23.67(a)(1);

(1) The ultimate load factors of CS 23.561(b) ~~and 23.787(a) and (b)~~ must be increased by multiplying the load factors by  $1.14 (Vs0/61)^2$ , ~~except that the sideward factor of (b)(2)(iii) must be increased to 3g.~~ **The increased ultimate load factors need not to exceed the values reached for a Vs0 of 146km/h (79 knot).** The upward ultimate load factor for acrobatic category airplanes need not exceed 5.0 g.

(2) ~~A downward inertia factor of 7g must also be addressed in addition to the conditions of CS 23.561(b)(2) and (3)~~

(3) The seat/restraint system test required by sub-paragraph (b)(1) of this paragraph must be conducted in accordance with the following criteria:

(i) The change in velocity may not be less than 9.4 m (31 feet) per second.

(ii) The peak deceleration of 19g must be ~~increased to 21.7g~~ multiplied by  $(Vs0/61)^2$  and must occur in not more than ~~0.044 seconds~~  $tr = 0.96 / (19 * (Vs0/61)^2)$ , where  $tr$  is the rise time (in second) to the peak deceleration. **The peak deceleration need not to exceed the values reached for a Vs0 of 146km/h (79 knot)**

(iii) The peak deceleration of 15g must be ~~increased to 17.4g~~ multiplied by  $(Vs0/61)^2$  and must occur in not more than ~~0.056 seconds~~  $tr = 0.96 / (15 * (Vs0/61)^2)$  where  $tr$  is the rise time (in second) to the peak deceleration. **The peak deceleration need not to exceed the values reached for a Vs0 of 146km/h (79 knot)**

(e) An alternative approach that achieves an equivalent, or greater, level of occupant protection to that required by this paragraph may be used if substantiated on a rational basis.

....

3. **JUSTIFICATION:****Preamble:**

*CRD to NPA 10/2006*

The aim of this NPA is to reduce differences between CS 23 and FAR 23. One of the 3 options exposed in the explanatory note is to fully harmonise the CS 23. This option should be retained as explained in the EADS SOCATA CRD about CS 23.49.

The above proposed text which reflects EADS SOCATA position has been modified accordingly.

**Proposed text:**

(d)(1): reference to 23.787 (a) and (b) should be deleted.

The only point to be considered in 23.787 (a) is the (a)(3) which specifies an ultimate forward inertia load factor of 9g. This applicable factor is a means to protect passengers from injury caused by cargo and baggage located in compartment aft of passenger and separated by a structure.

This 9g factor was 4,5g at amendment 34 of FAR 23.787. FAR 23.787 amendment 36 increased the ultimate forward inertia load factor to 9g to take into account emergency landing dynamic conditions (see FAA Final Rule. Docket No. 25147; Issued on 08/08/88).

This factor, has not been changed since, even when FAR 23.49 amendment 44 was introduced and is not modified by FAR23.562 at the current amendment (i.e. FAR-23 at amendment 50). When FAR 23.49 amendment 44 was introduced, comment was made on NPRM Notice N° 91-12 dated 04/02/90 requesting amendment to 23.787 (c)\* (as regard 9g factor) and was rejected by FAA considering that "*Amendment 23-36 [of FAR23] should meet the intent of the commenter's proposal*" (see Final Rule. Docket No. 23746; Issued on 07/07/93)

Therefore for the purpose of harmonisation with current FAA regulation, no reference to 23.787 (a) should be made.

(\*) FAR 23.787 (c) amdt 36 is equivalent to 23.787 (a)(3) in CS and in current FAR.

As regards 23.787 (b), there is no need to make reference to this subparagraph because it is already addressed in CS 23.562. Indeed, 23.787 (b) specifies that ultimate load factors of CS 23.561 (b) (3) are applicable (which is also equivalent to what is written in FAR 23.787). In the proposed CS 23.562 it is written that in case of Vs0 of more than 61kts, the ultimate load factors of CS 23.561 (b) should be multiplied by  $(Vs0/61)^2$ . This means that applicable load factors of 23.787 (b) are the one of 23.561 on which corrective coefficient  $(Vs0/61)$  is applied.

Therefore making reference to CS 23.787 (b) in the proposed CS 23.562 is redundant and could introduce confusion. In addition, in order to be harmonised with FAR 23, no reference to 23.787 (b) should be made.

(d)(1): reference to a special sideward factor of 3g should be cancelled

This value of 3g is a lot higher than the 1.5g multiplied by  $(Vs0/61)^2$  in the condition of the JAA NPA i.e. with a Vs0 of 65kts (the result is 1.7g). This means that the gap between an aircraft with a Vs0 at 61kts and one with a Vs0 between 61 and 65kts is of 1,5g at the max and 1,3 at the minimum, considering a corrective coefficient of  $(Vs0/61)^2$  to this factor. This is not acceptable and not in line with FAR 23 and introduces an important difference between European and US regulation not in line with the goal of this NPA.

The explanation given in the JAA NPA refers to JAR 25. This is not relevant in the General Aviation context. Small aircraft will never experience sideward acceleration comparable to those that large aircraft could encounter in the aft and forward cabin in case of crash (in same conditions). In addition the dynamic accelerations cover crash cases, ultimate static load factors cover ultimate flight cases. It is important to distinguish both cases (dynamic and static). As an example, if this rule was applied to the forward load factor with Vs0 at 65kts we would obtain 18g (2x9g) instead of the expected 10.22g  $((65/61)^2 \times 1.5g)$ .

Therefore this 3g factor:

- is inconsistent compared to the rules applied to the other compensating factors,
- is not harmonised with FAR 23,
- is not applicable to General Aviation and
- will introduce significant structural modification for aircraft having a Vs0 of more than 61kts compared to those with a Vs0 at 61kts. The economic impact is not in line with the required level of safety.

(d)(2) should be deleted

A downward ultimate load factor of 6g is applicable only for commuter aircraft as per CS 23.561 (b)(2)(iv) and 23.807(d)(4).

The NPA proposes to apply this factor to all aeroplanes (multiplied by  $(Vs0/61)^2$  with Vs0 at 65kts in the condition of the NPA). This means that where aeroplanes with Vs0 at 61kts (or less) do not have to apply this constraint (out of commuter category in particular case) those with Vs0 of more than 61kts will have to comply. This will lead to an economical discrepancy between these two kind of aircraft.

Justification of JAA is also referring to JAR 25 which, within the context of General Aviation, is not relevant.

Finally, FAR 23 does not introduce such constraint for aeroplanes other than commuter category.

Therefore, for the purpose of harmonisation, and in order not to put constraints to aircraft that does not have same context than commuter and JAR25 aircraft, the (d)(2) subparagraph of the EASA proposed new CS 23.562 has to be removed.

(d) (1) and (d)(3) values should be replaced by a formula including the real Vs0 that will provide the corresponding value. This formula found in FAR23 should be used.

All values calculated in this subparagraph are the results of FAR 23 specified formula with Vs0 at 65kts. This is a too conservative approach for aircraft where Vs0 is in between 61 and 65kts and excludes all aircraft of more than 65kts. This conservative approach is reinforced because of results being rounded off in a conservative way.

This introduces an important difference between FAR and CS 23 which is not in line with the aim of this NPA. Moreover this introduces too heavy constraints for aircraft that have Vs0 of less than 65kts and does not cover aircraft with Vs0 of more than 65kts for which Special Condition will have to be addressed (which will be the same situation than before the NPA). These constraints will also have a negative economic impact on the aircraft that should not be subject to a such high level of constraints.

CS 23 is considered too stringent while FAR 23 approach meets the adequate required level of safety.

Therefore CS23.562 (d) should be harmonised with FAR23.

**1a. COMMENT TO (Specify clearly Part/Chapter Number):****X Explanatory Note**

\_\_\_ Draft Decision CS-23

\_\_\_ Subpart B Flight – CS 23.49 Stalling Speed

\_\_\_ Subpart C Structure – CS 23.562 Emergency landing dynamic conditions

\_\_\_ Original JAA NPA Proposals Justification

\_\_\_ General Comment(s)

**1b. AFFECTED PARAGRAPH (Specify clearly Paragraph Number):**

§ EXPLANATORY NOTE / V) Regulatory Impact Assessment

**2. PROPOSED TEXT/ COMMENT:**9) Purpose and intended effect

CS-23 limits the single engine stall speed to 113 km/h (61 knots). To consider new concepts currently applied in other countries (incl. U.S.A) it is proposed to ~~increase this limit to 120 km/h (65 knots)~~ **authorise a Vs0 of more than 113 km/h (61 knots)** provided additional occupant protection standards are introduced as compensating factors. JAA NPA 23-XX proposed means, technically agreed by the Steering Group, how to progress with this issue.

**Even though JAA NPA 23-XX proposed was a step toward incorporating new concepts for single engine stall speed, it introduces specific requirements which make it much more complex to obtain type certification with other authorities which have already addressed this issue.**

The aim is to update CS-23 to incorporate new concepts for the single engine stall speed and occupant protection standards.

10. Options

The identified options for this subject would be to:

- continue using the presently available Certification bases and special conditions as a certification basis,

or

- follow the JAA General Aviation Steering Group advice providing a limited increase in stall speed.

or

- harmonise with the current FAR regulation

11. Sectors concerned

This NPA concerns applicants of new Type Certificates or Supplemental Type Certificates with a CS-23 certification basis for single-engined aeroplanes, and those multi-engined aeroplanes of 2722 kg (6000 lbs) or less maximum weight with a stall speed **of more than 113 km/h (61 knots)** ~~and 120 km/h (65 knots)~~.

12. ImpactsSafety

Safety will not be impacted if the compensating factors are introduced simultaneously with the ~~limited~~ increase of the stall speed limit. It is however beneficial to safety to have, as proposed in this NPA, clear defined specifications for both the extension of the stall speed ~~upper~~ limit, and the compensating factors.

Economic

A positive economic impact is anticipated because:

- an extended applicability range of CS-23.49 "Stalling speed" to type design with a stall speed ~~up to 120 km/h (65 knots)~~ **of more than 113 km/h (61 knot)** will ~~reduce~~ **avoid** the need for issuing Special Conditions when an aeroplane exceeds the current maximum stalling speed.

- **it will reduce the cost of certification for the applicant thanks to a complete harmonisation with FAR 23**

Other aviation requirements outside EASA scope

There are no impacts on other aviation requirements outside the scope of EASA, such as security, Air Traffic Management or airports.

Foreign comparable regulatory requirements

A disharmony has existed between FAR/JAR 23, and therefore CS-23, since the publication of the first issue of JAR-23 in 1994 and FAR Amendment 23-50. This NPA ~~follows~~ **is in the spirit of the JAA General Aviation Steering Group advice that advised** to reduce this disharmony, and proposes a complete harmony with **current FAR 23.**

13. Summary and Final Assessment

Based on this Regulatory Impact Assessment, the proposal of this NPA 10/2006 is considered as having no safety, and a reasonable positive economic impact. Therefore the progress of the proposal is justified.

### 3. JUSTIFICATION:

#### § 9 Purpose and intended effect:

As stated at the beginning of this paragraph the purpose of this NPA is to consider new concepts currently applied in other countries including USA and consequently any countries where FAR 23 is applicable. Current FAR 23 authorises new concept of aircraft in USA with Vs0 of more than 61 knots provided that additional occupant protection standards are applicable as compensating factors to reach equivalent level of safety.

However, FAR 23 does not introduce any limitation to Vs0 while CS-23 does with a Vs0 limited to 120km/h (65 knots). If such a limitation was retained it would be a major difference between CS23 and FAR23, which would not serve aircraft with Vs0 of more than 120 km/h (65 knots).

#### § 10. Options:

The proposed EASA text introduces possible confusion. For the purpose of clarification the wording above is proposed and preferred.

However, assuming that the last part of the sentence in the EASA text "providing a limited increase in stall speed" is related to all options and not only to the last one, we strongly express our disagreement for not considering full harmonisation with FAR 23

Full harmonisation with FAR23 is the option that finally has to be retained. It will be difficult to accept that FAR 23 full harmonisation is excluded as an option.

#### § 11. Sectors concerned

The text proposed by EADS SOCATA is to achieve a full harmonisation with FAR-23 on this subject.

#### § 12. Impacts

##### *Safety:*

The introduction of compensating factor should be, in principle, associated to an increase of stall speed without introducing any limitation to this stall speed. The equivalent level of safety does not come from a limitation in the increase of the stall speed but from the compensating factors. Therefore it is a non sense to declare the limitation of the stall speed in itself as a factor of safety.

*Economic:* All aircraft with a stall speed of more than 120km/h (65 knots) that are certified FAR-23, will be in the same position than aircraft with a stall speed of more than 113km/h (61 knots) before the NPA. Then there will not be any positive economic impact for those aircraft.

On the other hand, the proposed JAA/EASA NPA compensating factors are so different from those of FAR-23 that extensive modification have to be applied to be compliant with NPA unless using Special Conditions. This will be, by nature, the same situation than before the NPA.

This means that the content of the NPA as it is proposed, and at the opposite of the EASA wording for §12 "Economic", is completely missing the intent of this rulemaking and will put manufacturers in the same position than before the NPA.

Therefore, this is why any mention to a limited stall speed had been cancelled from this subparagraph in our proposition.

##### *Foreign comparable regulatory requirements:*

While the spirit of JAA Steering Group is to reduce disharmony with FAR (in particular), the JAA NPA is not in line with this spirit. In contrast, the JAA NPA introduces a difference that will put the European and US manufacturers on the same situation than before the NPA. JAA NPA has been developed with a too conservative approach introducing constraints for all aircraft that is far above the required level of safety. FAR-23 gives sufficient level of safety as demonstrated by experience since introduction of increased Vs0 in the US regulation.

That is why our text proposes to harmonise with FAR-23.

#### § 13 Summary and final assessment:

The text is agreed, but the content of this paragraph is only true if the NPA10-2006 is harmonised with current FAR23. If not, the NPA is introducing too stringent and therefore has not reasonable positive economic impact.

**1a. COMMENT TO (Specify clearly Part/Chapter Number):**

- Explanatory Note  
 Draft Decision CS-23  
 Subpart B Flight – CS 23.49 Stalling Speed  
 Subpart C Structure – CS 23.562 Emergency landing dynamic conditions  
 Original JAA NPA Proposals Justification  
 **General Comment(s)**

**1b. AFFECTED PARAGRAPH (Specify clearly Paragraph Number):**

- § EXPLANATORY NOTE / V) Regulatory Impact Assessment / 12) Impact
- § PROPOSALS / Draft decision CS-23 / Subpart B Flight CS23.49 Stalling speed
- § PROPOSALS / Draft decision CS-23 Subpart C Structure CS23.562 Emergency landing dynamic conditions
- § ORIGINAL JAA NPA PROPOSALS JUSTIFICATION

**2. PROPOSED TEXT/ COMMENT:**

EADS SOCATA position is that CS 23.49, CS 23.562 have to be fully harmonised with current FAA regulation.

**3. JUSTIFICATION:**

The proposed JAA NPA does not solve the current issue faced by US and European aircraft manufacturers. On one hand, European manufacturers will still have to go through Special Condition process which is against the idea of having a single requirement accepted by all among the EU Members states. On the other hand, difference between US and European requirements is still a concern as the NPA does not solve the issue of having differences between FAR 23 and CS 23.

The JAA NPA is inadequate for aircraft with Vs0 between 61 and 65kts due to compensating factors being too conservative. This inadequacy is particularly penalising for the sideward load factor and downward inertia factor as regards the General Aviation context.

In addition, negative economical impact related to the proposed compensating factor is far from being negligible. The structural complexity introduced to comply with the JAA NPA tends to increase the certification requirements to a point way over the FAR with no rationale.

The JAA NPA does not cover aircraft with Vs0 above 65kts and also implies to certify using Special Conditions which will most likely be based on FAR regulation approach. The risk to introduce inequity between two different aircraft certifications still exists. This is not in line with EU economic rules and is not in line with the goal of harmonisation with FAR 23.

All justifications from the JAA NPA are based on FAR 23 formula for which the more severe conditions have been retained (i.e. using a Vs0 of 65kts) or are based on JAR 25 considerations known to be inappropriate to the General Aviation context.

The FAR23 regulation offers a sufficient level of safety proven by fifteen years of experience.

It is damageable for the industry in general, and the European one in particular, not to take the opportunity of a full harmonisation with current FAA regulation (FAR 23.49 and 23.562).

For all these reasons EADS SOCATA asks for full harmonisation of the CS23 with the FAR23 for the Stall Speed requirements and associated compensating factors.