

EASA SC-VTOL-01 Comment Response Document

Note: The comments have been grouped by theme or objective and renumbered sequentially. Bookmarks are available to navigate the document.

General type of vehicle

Explanatory Note 1:

The Special Condition (SC) has been developed to cover a new category of person-carrying vertical take-off and landing (VTOL) heavier-than-air aircraft with lift/thrust units used to generate powered lift and control. The vertical take-off and landing capability distinguishes this type of aircraft from aeroplanes. The Special Condition does not intend to cover traditional rotorcraft either but rather aircraft with distributed lift/thrust and it will be clarified that, for the SC to be applicable, more than 2 lift/thrust units should be used to provide lift during vertical take-off or landing. The Special Condition background mentioned “the aircraft may not be able to perform an autorotation or a controlled glide in the event of a loss of lift/thrust” as it is the case for some VTOL aircraft being proposed, however this is not a requirement.

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1	David LoebI, AutoFlightX	Background/Scope	1	“Although hover flight may be possible, the aircraft may not be able to perform an autorotation or a controlled glide in the event of a loss of lift/thrust.” implies that the given SC are not applicable for transition vehicles that can fly also with aerodynamic lift.	Clarify the condition where no glide is possible: “...not be able to perform an autorotation or a controlled glide in the event of a loss of lift/thrust during hover.”	Yes	No	Noted	See Explanatory Note 1
2	Luftfahrt-Bundesamt	VTOL.2005		Certification of small-category VTOL aircraft: <ul style="list-style-type: none">This is more or less a definition and should be better included in VTOL.2000 as an additional sub-paragraphIt is not perfectly clear, to which kind of aircraft this Special Condition shall apply:<ul style="list-style-type: none">Is Vertical Take OFF capability really required?Why is not distributed lift required?Why is not the missing autorotation/glide landing capability required?		Yes	Yes	Partially accepted	The numbering mirrors CS-23 Amendment 5. The applicability is indeed vertical take-off and landing aircraft with distributed lift/thrust and will be clarified in the SC. See also Explanatory Note 1.
3	ACI EUROPE	General comment	General comment	There is no mention in the text of communication between aircraft and between aircraft and the ground/ATC. It is vital for safe operations that small-category VTOL aircraft communicate with one another and that ATC can manage their traffic in proximity to aerodromes. This includes for information on aircraft position/altitude/airspeed, ability to transmit and receive instructions related to traffic information and emergency procedures.	It may be the case that these matters are covered in another regulatory instrument, but it is essential for safe operations that they be treated with primary importance, whether in the present proposed special condition or elsewhere.	yes	no	Noted	It is agreed that the products that will be certified on the basis of this Special Condition will have to carry communication equipment allowing communication between aircraft and between aircraft and the ground/ATC. These aspects are covered as for any other type of aircraft outside the SC/CS.
4	Embraer S.A.	VTOL.2310 VTOL.2500(b) VTOL.2535 VTOL.2555 VTOL.2615(b)		These paragraphs refer to operating rules of an "Aircraft". However, there are only definitions for "Helicopter" and "Aeroplane" in EASA CS-Definitions document and the Regulation (EU) No 965/2012 does not have the correspondent subpart for “Aircraft” in Part-CAT of the Air Operations regulations.	Embraer suggests to EASA for amending the Part-CAT Air Operations rules, Regulation (EU) No 965/2012, to include the operations conditions for Aircraft (VTOL).	YES	YES	Noted	Not in the scope of the SC

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5	Rolls-Royce	Scope	1	Existing regulations can impose flight envelope restrictions to ensure safe operation. This does not appear to be part of the special condition as written. New aerospace companies may not appreciate the importance of this aspect.	Flight envelope regulation could be a useful tool to achieve increased safety levels.	Yes	Yes	Noted	This approach can be proposed within the frame of the SC
6	FNAM	Background/Scope	1	<p>FNAM does not understand the differences between VTOL and rotorcraft or (e)VTOL and certified drones. Indeed, this kind of ‘aircraft may not be able to perform an autorotation’, this means that some VTOL may be able to perform an autorotation.</p> <p>Some rotorcraft operations may therefore be covered by several different regulations: VTOL and helicopter rules. For example, it could be the case of R22, R44 and Cabri G2 helicopters which are lighter than 2000kg. FNAM wonders what will be the regulation applicable when two different regulations are applicable for the same model of aircraft. It may lead to different implementations of European rules. This will impact the European level playing field objective.</p> <p>If the proposed VTOL regulation becomes mandatory for current aircraft model, a significant retrofit work will be mandatory for manufacturers. FNAM fears economic impacts on operators, manufacturers and maintenance organisations will be important for this retrofit.</p>	<p>In order to ensure efficient understanding of the SCVTOL context, FNAM suggests to add a context paragraph presenting the differences between: rotorcraft, certified drones and VTOL. It could be operational and physical characteristics.</p> <p>FNAM suggests EASA to ensure that current aircraft models such as R22, R44 and Cabri G2 helicopters are not covered by this proposed VTOL regulation. If they are, FNAM requests for an economic impact assessment which covers manufacturers, operators and maintenance organisations.</p>	Suggestion	Substantive	Accepted	Scope of the SC will be clarified. See Explanatory Note 1.
7	Volocopter	VTOL.2000(a)		<p>OBJECTION:</p> <p>Section (a) relates to person-carrying VTOL aircraft, while on the other hand already including provisions for remotely piloted or autonomous operation. Comparable CS do not differentiate between purpose as person- or cargo carrying aircraft; either use just makes specific requirements applicable, or not.</p>	Proposed to delete the term “person-carrying”. Person carrying is considered the more demanding operation, requirements for luggage compartments are adequately included and would require consideration for cargo applications.	No	Yes	Not accepted	“person-carrying” distinguishes this class of aircraft from remotely piloted or autonomous aircraft (drones) with no person on board. Cargo-only aircraft are within scope if the pilot is on board.
8	SAFRAN	Background/Scope VTOL.2000(a)	1/26 3/26	<p>It is precised in this document that a VTOL is an aircraft where the powerplant is now mixed with the control system of the aircraft “...with <u>lift/thrust</u> units used to generate powered lift and control. Aircraft subject to this Special Condition are not pressurized.”</p> <p>This term used is unclear. The propulsion of the aircraft is a dedicated function and should not mixed with the lift system if the lift system is understood as to be part of the flight control. It is up to the aircraft manufacturer to use the propulsive system for the control of the aircraft.</p> <p>In addition Safran highlights the case of hybrid/tiltrotor configuration : Powered Lift in T/O and Landing, Classical configuration (fixed wing) for Cruise, for which this definition is only partially applicable.</p>	<p>...with <u>powerplant sytems/units</u> units used to generate powered lift and <u>specifically controlled to obtain flight characteristics</u>. Aircraft subject to this Special Condition are not pressurized.</p> <p>For the rest of the document it is proposed to change “Thurst/Lift” with “Powerplant systems”</p>		YES	Not accepted	Some VTOL configurations will have much tighter integration of engines/motors and flight controls than other types of aircraft and the specificity needs to be addressed. Definitions of lift/thrust unit, lift/thrust system and flight control system will be clarified in the Accepted Means of Compliance (AMC).

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9	SAFRAN	Background/Scope VTOL.2000	3/26	Question for Stakeholders : Can passenger involvement be envisioned in “Safe flight and Landing” capability of an Autonomous Air taxi in Enhanced category? (For example choice of landing area). More generally how is considered “Passenger interface”(for choosing Air taxi destination for example)?Is it considered as cockpit/flight control item, and therefore Passenger as a “unqualified flight crew” with limited flight management capability?	N/A	Yes		Noted	Autonomy is not currently in the SC. See Explanatory Note 3.
10	SAFRAN	Background/Scope VTOL.2000	3/26	Question for Stakeholders : VTOL aircraft with aerobatics capability could be envisioned for some niche market (for example aerobatics flight passenger experience). Since, the specific constraints related to aerobatics are removed from SC-VTOL, Does it mean that aerobatics capability is forbidden?	N/A	Yes		Noted	The VTOL projects that have been brought to the attention of the Agency for possible certification do not foresee aerobatics. This project-oriented Special Condition therefore does not included provisions for aerobatics; however this may be revised if the need arises.
11	Diamond Aircraft Industries GmbH	general		Hybrid configurations – Is this SC only applicable to phases of VTOL operation or the entire flight envelope for hybrid configuration where cruise flight is achieved by wing-lift and the VTOL system is inactive. Or in other words, are the strict requirements for Enhanced Category aircraft also applicable to the conventional systems or would those fall under CS 23?	Please clarify in the introduction or VTOL.2000.	yes	no	Noted	If the aircraft falls within the applicability of the SC, the general objectives apply to all phases of flight
12	ANAC	VTOL.2000(a) VTOL.2000(b) (3) VTOL.2000(c)	3	Is the Special Condition applied to remotely piloted cargo-only aircraft? VTOL.2000(a) refers to person-carrying VTOL, but VTOL.2000(b)(3) talks about cargo and VTOL.2000(c) includes remotely piloted aircraft.	VTOL.2000(c) This Special Condition can apply to aircraft with pilot onboard, remotely piloted or with various degrees of autonomy; flight crew references therefore should be considered “as applicable”. Nevertheless, the aircraft must have the capability of carrying a person (crew or passenger) to be subject to this Special Condition.	Yes	Yes	Partially accepted	“person-carrying” in VTOL.2000(a) is deemed to serve the purpose
13	Airbus Group	2000(a)		It is written in the ‘Statement of issue’ that this SC addresses the unique characteristics of VTOL aircraft which differ from conventional rotorcraft or fixed wing aircraft. Nevertheless we consider that the criterion used in VTOL.2000(a) to characterize these unique VTOL aircraft (‘with lift/thrust units used to generate powered lift and control’) is not enough precise to ensure that this SC cannot be applied for conventional rotorcraft or fixed-wing aircraft.	This SC should not apply to ‘conventional’ rotorcraft eligible to comply with CS-27 or CS-VLR. In this purpose: Complete the criteria used to characterize these unique VTOL aircraft to be dealt by this SC (at least to include the criterion on the non possibility to perform an autorotation or a controlled glide in the event of a loss of lift/thrust) in order to ensure that this SC cannot be applied for conventional rotorcraft, or clearly write in VTOL.2000 that this SC cannot be applied to conventional rotorcraft.		X	Partially accepted	The scope of the SC will be clarified and the distinction with conventional rotorcraft is based on distributed propulsion rather than the capability to perform an autorotation or controlled glide.

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14	UK CAA	General		Some air taxi aircraft configurations may include the tilt rotor concept. Additional requirements would need to be included for this type of aircraft such as consideration of the transition/conversion from VTOL to forward flight mode, etc.	Consider additional requirements applicable for tilt rotor aircraft.	Yes		Partially accepted	Special considerations will be included in the AMC for configurations having tilting elements. Tilt-rotor configurations based on two tilting rotors are however outside the scope of the SC.
15	Sikorsky	VTOL.2000.a	3	Document does not sufficient differentiate a “lift/thrust” unit from a traditional rotor system. Significant differences between proposed language and CS 27 provide opportunity for vehicles performing similar mission in similar geographies to be certified to two different safety standards.	Differentiate that vehicles under this special condition must have a plurality of ‘thrust/lift’ devices.	No	Yes	Accepted	Scope of the SC will be clarified
16	DGAC France	General		The text does not make sufficient distinctions between the many different propulsive formulas VTOLs can have and therefore does not take into account the consequences on their flying abilities and on safety: not all VTOLs will be capable of “hovering”, for example and their trajectories in case of propulsion loss will cover a wide range, from the oblique of a near-glider to the straight downwards fall of a multicopter. Therefore different formulas can not be covered by the same safety “requirements” as there may be a possibility to glide to a safe area in the first case, but none in the other, unless it is flying over a desert.				Partially accepted	The SC sets high level objectives independently from the aircraft architecture, however the AMC may distinguish between different types of configurations
17	DGAC France	General		Moreover, the lack of precise definition of what a VTOL (not to mention a “small” or “enhanced” one) is could easily lead to a temptation for manufacturers of small helicopters or small aircraft to take advantage of this text to avoid more stringent requirements of CS-23 or CS-27 or VLA/VLR regulations. A disclaimer is therefore necessary, to make it clear that no « classical formula aircraft » is supposed to use this special condition.				Accepted	Scope of the SC will be clarified
18	FAA/AIR	2000	2	Does this now cover rotorcraft as well? Do these requirements supersede CS-27 for rotorcraft under 2000 kg? Is “small category” a new subset of normal category? What was the reason for including cargo and mail operations which in turn require enhanced capability?	Clarify the scope of the SC.	Y		Noted	The SC does not intend to supersede CS-27. Scope of the SC will be clarified. The VTOL “small category” matches the rotorcraft CS-27 “small category” limits. “Cargo or mail” are part of the existing Commercial Air Transport definition, however the SC objectives refer to the subset “Commercial Air Transport operations of passengers ”.

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General use of CS-23 / CS-27 / Special Condition

Explanatory Note 2:

Some assumptions present in CS-23 and CS-27 such as operation from runway to runway or autorotation/controlled glide capability may not apply, while expanded types of operations such as urban air mobility or widespread air taxi are being considered for some VTOL aircraft. Applying one set of objectives through a dedicated Special Condition, regardless of the proportion of lift provided by rotating and nonrotating aerofoil(s) during horizontal flight, allows to provide a level-playing field between the different possible VTOL configurations. Additionally, this category of aircraft relies on distributed lift/thrust units to generate powered lift and control, a characteristic that will be specifically addressed by the Special Condition. See also the SC preamble paragraph “Why a Special Condition?”.

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19	Nick Tudor	Focus	2	Given that this is for VTOL aircraft, why wasn’t CS-27 used as the basis instead of CS-23?	Use CS-27 as the basis	Yes	Yes	Partially accepted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.
20	Dewi Daniels	VTOL 2005	3	It is unclear which small VTOL aircraft will not require certification. Regulation (EC) No 216/2008 excludes microlight aircraft, such as single-seater aeroplanes with a maximum take-off mass (MTOM) of no more than 300 kg and two-seater aeroplanes with a MTOM of no more than 450 kg.	Clarify which small VTOL aircraft are outside the scope of this Special Condition.	yes	no	Noted	The SC applies only to aircraft within the remit of EASA thus the overarching limits of Regulation (EU) 2018/1139 apply.

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21	Luftfahrt-Bundesamt			<p>Though the documents states, that “The Agency considers that the current airworthiness standards for aeroplanes or rotorcraft are not adequate to prescribe the standard means to demonstrate compliance of such products with the essential requirements of the Basic Regulation.”,</p> <p>we cannot comprehend, that CS-23 should be the main basis these special condition are established upon.</p> <p>(“The special condition has been established in the spirit of recent CS amendments, such as CS-23 Amdt. 5, namely prescribing performance/objective based technical specifications. CS-23 Amdt. 5 is considered to be the state of the art in terms of safety objective based provisions and for this reason it was selected as the basis for this special condition.”)</p> <p>The Agency introduces a new “kind of aircraft – VTOL” in addition to airplane, rotorcraft and balloon/airship. VTOL are defined as aircraft “with lift/thrust units used to generate powered lift and control”. It is unclear how this definition can be used to decide if an aircraft is a rotorcraft or an VTOL and therefore how to decide if CS-VLR/-27 or this new VTOL-SC is applicable.</p> <p>The general definition of rotorcraft (rotary-wing aircraft) is: “an aircraft whose lift is derived principally from rotating airfoils”.</p> <p>The general definition of helicopter is: “an aircraft whose lift is derived from aerodynamics forces acting on one or more powered rotors turning about substantially vertical axes”.</p> <p>So, using the above mentioned definitions: “multi-copter (aircraft with many mainly vertically acting rotors)” are rotorcraft and helicopters which is a “subclass” of rotorcraft.</p>	The result of these considerations (see “comment summary” column) are that we consider CS-VLR/-27 the better choice to establish these special conditions for VTOL, as the concerned „VTOL aircraft“ are, from a technical point of view, rotorcraft. For that reason, we expect, that the amount of particular special conditions could be reduced by using CS-27.	Yes	Yes	Partially accepted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.
22	Luftfahrt-Bundesamt			We miss some typical rotorcraft certification requirements, such as fatigue evaluation/definition of critical parts, standard parts in critical installations and external loads (NHEC, HEC).	Choose CS-VLR/-27 as basis with SC to define the applicability of paragraphs and to define missing requirements.	Yes	Yes	Partially accepted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.
23	VELICA	General		VELICA considers that the use of the amendment 5 of the CS-23 as a basis for this proposed Special Condition SC-VTOL-01 is a very good choice.				Noted	-

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24	Rolls-Royce	Scope	1	The choice of using CS-23 as the basis for the regulations seems sensible, however, there are surely applicable regulations which could be read across from CS-27 (or rotorcraft regulation more generally) into the eVTOL requirements.	Consider which parts of CS-27 and other rotorcraft regulation may offer useful baselines for eVTOL certification.	Yes	Yes	Noted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.
25	Kopter Group	-	-	General comment: These VTOL aircrafts still are very complex with respect to flight and propulsion control systems. To take the parallel with rotorcrafts, CS-VLR foresees more demanding specifications for features such as (AMC VLR.1) “hydraulic systems, stability augmentation systems, autopilots, pop-out emergency floatation gear, wheeled undercarriages, retracting undercarriages, “Notar style” devices, external lights...”	To ensure a level-playing field with rotorcrafts, the specification should consider the complexity inherent to VTOL aircrafts, in combination with the absence of autorotation capability. This could include further analyses and quantifiable rules with respect to failures of the control systems and/or distributed propulsion systems.	yes	yes	Noted	This is being considered, for example in VTOL.2510. See Explanatory Note 30.
26	Airbus Group		Gal	SC-VTOL-01 important discontinuity in terms of requirements decrease (therefore safety objectives) as compared to CS-27 and CS-VLR: - for VTOLs with a MTOW from 600 to 2000 kg or with more than two occupants, CS-VTOL-01 requirements are much less demanding than for a helicopter of the same weight. - Even for VTOLs with a MTOW below 600Kg there is a significant decrease in the requirements as compared to CS-VLR. -	For VTOL above 600kg or with more than 2 occupants, SC-VTOL-01 should be aligned with CS-27 requirements both for VTOLs of normal and enhanced categories. For VTOLs with a maximum of two occupants and a MTOW up to 600Kg, SC-VTOL-01 should be aligned with CS-VLR both for VTOLs of Basic and Enhanced categories.		X	Partially accepted	Some of the levels have been realigned (see Explanatory Note 9 and Explanatory Note 30) and it should be noted that specific objectives have been introduced that do not exist in CS-27, for example VTOL.2250(c).
27	ADS	Scope	1	The choice of using CS-23 as the basis for the regulations seems sensible, however, there are surely applicable regulations which could be read across from CS-27 (or rotorcraft regulation more generally) into the eVTOL requirements.	Consider which parts of CS-27 and other rotorcraft regulation may offer useful baselines for eVTOL certification.	Yes	Yes	Noted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.
28	ONERA	Background/Scope	1	Need to clarify and emphasize the differentiation of the application domain of this SC. Risk of “unfair competition” if this SC remain evasive on dedicated exigence. We fully understand that VTOL SC should address generic type of aircraft, facing a large amount of architectures. But, this cannot avoid risks of interpretations.	Add at the end that this SC is therefore not applicable to conventional Airplanes or Rotorcraft so that CS-23 and CS-27 remain the reference document for these type of aircrafts. May also singularize these VTOL by the need for no catastrophic failure condition resulting from single failure.	Yes	No	Partially accepted	Scope of the SC has been clarified as well as the “no single failure catastrophic” objective

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29	ONERA	Focus of the consultation	2	<p>“Commenters are invited to focus their comments to these additions/omissions rather than on the source CS-23 Amdt 5 text unless an inconsistency is identified.”</p> <p>First comment is that starting from CS-23 which as the benefit of years of experience gathered in AMCs, is quite dangerous regarding the ambitions of this SC.</p> <p>e.g. “High Levels of Autonomy” will have too low background so that no AMC will be available. Therefore, willing to treat this point is dangerous as its impact over safety and operation is lacking in the document.</p> <p>Coupled with a generic approach of the type architecture means tow ambitious and possibly competitive objectives at the time being.</p>		Yes	No	Noted	AMC will be specifically developed for this Special Condition. The autonomy will not be initially integrated.
30	Sikorsky	VTOL.2000	3	Generic nature of the entire proposed special condition throughout creates no actionable basis for certification. Document admits that acceptable means of compliance must still be developed, placing Special Condition ahead of normal process.	Proceed through certification of these types of vehicles under existing regulations with individual special conditions until standardized, acceptable means of compliance can be developed and implemented, as in CS 27.	No	Yes	Not accepted	See Explanatory Note 2. AMC will be specifically developed for this Special Condition.
31	AEROMOBIL	General		AEROMOBIL considers that the use of the amendment 5 of the CS-23 as a basis for this proposed Special Condition SC-VTOL-01 is a very good choice.				Noted	-
32	DGAC France	General		This Special Condition is presented as derived from CS-23 Amdt 5. France understands this as a way to use the new regulatory philosophy introduced in this last version of CS-23, according to which the authority sets safety objectives and high-level requirements and the industry defines the means of compliance to these requirements and objectives through standards. However, this choice has the major drawback of linking this document to a regulation which has been designed for general aviation aircraft (fixed-wings aircraft with a pilot on board) whereas most VTOL are likely to have very different configurations (multirotor, helicopters derivatives, tilt-rotor) and very different propulsion systems, making the link rather weak and consequently inadequate.				Noted	The original CS-23 text has been modified through the Special Condition to take into account the specificities and variety of VTOL configurations

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33	FAA/AIR	General		These Special Conditions tend to follow the FAA 14 CFR Part 23 re-write regulations. However they tend to be less prescriptive or lower level of safety than the corresponding Part 23. In many cases, Many bilateral standards adopted over a long history with EASA and other authorities common to CFR/CS Part 25, 27, 29 are not specified here. These bilateral standards are well understood by industry and all bilateral authorities, and should be included since VTOL is a combination of potentially all categories of aircraft standards.		Y		Partially accepted	It is not deemed that the Special Condition has a lower level of safety than the corresponding Part 23, e.g. in VTOL.2510. Relevant elements from CS-23, CS-25, CS-27 and CS-29 will be considered for the AMC.
34	FAA/AIR	General		It is unclear how VTOL aircraft are being deemed part 27 centric when the Special Conditions (SCs) developed for them are based on primarily on part 23.		Y	Y	Noted	Relevant elements from CS-27 will be integrated in the AMC
35	FAA/AIR	General		It appears that this Special Condition and EASA's definition of VTOL will dramatically de-harmonize our regulatory requirements as well as our Means of Compliance (MOCs).	This is not a trivial problem . The FAA is committed to working through this with EASA.	Y	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
36	TCCA – Engineering	General	N.A.	The proposed Special Condition appears to form an incomplete set of requirements to fully form the certification basis for a VTOL aircraft. It is believed that EASA's intention is that the certification basis will be formed of SC-VTOL, plus applicable Part 25 CRIs, elements of CS 27, ASTM F44, etc. A review of the SC is difficult without a view of the entire certification basis. TCCA thanks EASA for the opportunity to comment on this SC. However, the rest of the certification basis or means of compliance development is not expected to be subject to a public consultation which will not foster harmonization.	The full certification basis approach needs to be defined to allow a complete review. TCCA would welcome participating in further developments to the certification basis and means of compliance.	Yes	No	Noted	EASA welcomes the offer from TCCA to participate in AMC development
37	GAMA	N/A	General Comment	GAMA believes that EASA should take serious consideration of creating a new vehicle classification 'VTOL' in the design rules. Because the European operating construct considers rotorcraft and aeroplanes, determining a VTOL category of aircraft essentially dooms this industry to decades of special approvals and one-off agreements. Many of the vehicles being considered are essentially highly reliable, green and quiet rotorcraft while others are green, reliable, quiet aeroplanes that have an ability to do vertical take-off and landing.	It is not a tremendous amount of work to include these vehicles in the existing CS-VTOL, with added special conditions to address the unique VTOL aspects of these vehicles. By doing this, EASA allows an industry to flourish in Europe as opposed to stifling it for a decade or more. This issue is truly bigger than just a vehicle certification issue and EASA should really consider putting this industry on the right path for success by utilizing CS-23 and designating these aircraft as 'aeroplanes' whenever possible.	Yes	Yes	Not accepted	Work has started in parallel to develop specific VTOL operational aspects to complement the vehicle certification. See also the SC preamble.

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38	GAMA	N/A	General Comment	One key issue that EASA needs to consider, in light of VTOL, is the way that these aircraft can operate in Europe. It generally takes the better part of a decade to update operational constructs of the magnitude required to formulate an entirely new operating framework and sending VTOL down this kind of dead end, won't be positive for VTOL operations in Europe over the next 10-years.	GAMA believes EASA should pay serious consideration to calling these aircraft either 'aeroplanes' if they fly on wing for portions of flight or 'rotorcraft' if they are always lifted by thrust. It would be appropriate to use the performance based material in the proposed VTOL special condition, but adapted based upon industry comments, for the design criteria but issuing an aeroplane/rotorcraft TC would allow these aircraft to be operated across Europe in the initial small numbers while the European institutions work to create a rule framework which might better allow them to operate at large scale in the future.	Yes	Yes	Not accepted	Work has started in parallel to develop specific VTOL operational aspects to complement the vehicle certification. See also the SC preamble.
39	GAMA	N/A	General Comment	GAMA applauds EASA's decision to base the design specifications for VTOL aircraft in the performance-based framework of CS-23 Amd 5. The strength of these rules are based in the flexibility that is necessary as a result of the broad range of characteristics of VTOL aircraft. Some VTOL aircraft utilize thrust for lift for the entire flight while others are more like aeroplanes except for brief periods of time when they might takeoff or land vertically. Having a baseline special condition and eventually a common rule framework based in CS-23 Amd 5 will be extremely helpful in this regard.	GAMA believes that the means of compliance which has been developed to address CS-23 under ASTM F44 remains extremely relevant to much of the VTOL designs and there are activities underway within F44 to create means of compliance which are specific to VTOL designs. GAMA requests that EASA continue working with ASTM F44 to assure these materials can be globally accepted means of compliance for VTOL designs.	Yes	Yes	Noted	ASTM F44 output is one of the possible sources of material that will be considered for the AMC
40	GAMA	N/A	General Comment	GAMA is concerned that EASA has made several fundamental changes to the baseline CS-23 material which will limit future applicability. The applicability of CS-23 to aircraft weighing up to 8618 kg with up to 19 passengers while EASA has limited the SC-VTOL to 2000 kg and 5 passengers. Limiting the SC-VTOL in this manner will result in significant issue, especially with respect to a 2000 kg limit. Under the CS-23 framework there are several key differentiators (airworthiness levels 1-4, high-speed/low-speed, etc.) that have been used historically.	It would seem more appropriate for EASA to leverage the concept of airworthiness levels 1-4 that were used to define vehicle risk under CS-23. Perhaps EASA should consider creating a new differentiator for VTOL (such as vertical take-off and landing capable) which would allow VTOL aircraft to fit more neatly into CS-23 or would allow an SC-VTOL to include similar differentiators.	Yes	Yes	Partially accepted	Weight and passenger limits have been reconsidered (see Explanatory Note 9) and existing airworthiness levels used with adaptation to the VTOL specificities
41	Aidan Reilly	Background/sc ope		Rotorcraft regulations (such as CS-27) may be more appropriate for some of the proposed configurations, especially during VTOL flight. Basing the new regulation on CS-23 alone is perhaps not the best starting point.				Partially accepted	See Explanatory Note 2. Relevant elements from CS-27 will be integrated in the AMC.

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Generalautonomy/ remote pilot/ cybersecurity

Explanatory Note 3:

The Special Condition has been designed to be compatible with remote piloting or different levels of autonomy so that projects starting with a pilot on board have the possibility to evolve while retaining the same certification basis. The corresponding objectives will however need to be further detailed in additional material, for example to address the command and control link or detect and avoid capability. For this reason VTOL.2000(c) was removed and objectives for remote piloting and autonomy will be added later. It is expected that elements will be used from the UAS regulations being elaborated at international and EASA level.

Guidance will be developed to address some security aspects, such as cyber threats, but initially limited to aircraft with pilot on board. Some other elements of the Accepted Means of Compliance (AMC), for example AMC VTOL.2510, will also initially be restricted to pilot on board configurations.

The Special Condition may in the future be considered as a basis to develop a Certification Specification (CS) and considerations are developed on how to best integrate the different product CS and the remote piloting and autonomy aspects.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
42	THALES	General		What is envisaged for Detect and Avoid capability for Remotely Piloted VTOL?		Observation	Substantive	Noted	See Explanatory Note 3
43	THALES	General		What is envisaged for cyber and physical security related to safety impacts, apparently not included in the present version? This is specifically important for the drone versions.	Elaborate on physical and cyber security, specifically for the drone versions	Observation	Substantive	Noted	See Explanatory Note 3
44	THALES	General		Requirements are missing relatively to the loss of command and control link in the case of remotely piloted aircraft.	Add a requirement on the need to have pre-defined procedure for loss of C2 link if RPAS, and have surrounding aviation system informed about its content and activation, in relation with C2 role in the safety of the operation	Suggestion	Substantive	Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
45	FNAM	Statement of Issue	1	<p>This ‘<i>type of product</i>’ would be really closed to drones in certified category.</p> <p>It is hard to differentiate the following types and categories of aircraft:</p> <ul style="list-style-type: none">• Certified category for unmanned aircraft; and• Category C (equivalent to Certified category for unmanned aircraft in JARUS); and• Autonomous aircraft; and• (e)VTOL. <p>Plus, projects on Drones rules are already under discussions for certified drones among JARUS groups. It is therefore really confusing for all stakeholders to have numerous parallel consultations and groups of discussion (JARUS, EASA unmanned aircraft, EASA VTOL, etc.) and above all on the same subject.</p> <p>Moreover, the almost adopted regulation for drones in open and specific categories has not the same philosophy and structure than the proposed VTOL/certified drones regulation.</p> <p>Consequently, most of drones stakeholders have for sure missed this really important consultation.</p> <p>Finally, since we are not sure to understand the scope of this regulation, we are unable to provide consistent comments.</p>	<p>FNAM suggests to link drones groups of discussion (EASA, JARUS, etc.) to VTOL works. Plus, EASA needs to clarify drones regulation creation.</p> <p>Since we are not sure to understand the scope of this regulation, we are unable to provide consistent comments.</p>	Suggestion	Substantive	Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
46	FNAM	VTOL.2000	3	<p><i>'This Special Condition can apply to aircraft with pilot onboard, remotely piloted or with various degrees of autonomy[...]\'</i></p> <p>It is hard to differentiate the following types and categories of aircraft:</p> <ul style="list-style-type: none">• Certified category for unmanned aircraft; and• Category C (equivalent to Certified category for unmanned aircraft in JARUS); and• Autonomous aircraft; and• (e)VTOL. <p>Drones are equivalent to remotely piloted aircraft. Projects on Drones rules are already under discussions for certified drones among JARUS groups. It is therefore really confusing for all stakeholders to have numerous parallel consultations and groups of discussion (JARUS, EASA unmanned aircraft, EASA VTOL, etc.) and above all on the same subject.</p> <p>Moreover, the almost adopted regulation for drones in open and specific categories has not the same philosophy and structure than the proposed VTOL/certified drones regulation.</p> <p>Consequently, most of drones stakeholders have for sure missed this really important consultation.</p> <p>Since we are not sure to understand the scope of this regulation, we are unable to provide consistent comments.</p>	<p>FNAM suggests to link drones groups of discussion (EASA, JARUS, etc.) to VTOL works. Plus, EASA needs to clarify drones regulation creation.</p> <p>Since we are not sure to understand the scope of this regulation, we are unable to provide consistent comments.</p>	Suggestion	Substantive	Noted	See Explanatory Note 3
47	SAFRAN	Background/Scope VTOL.2000	3/26	<p>Question for Stakeholders :</p> <p>SC-VTOL is said applicable for RPAS and Autonomous Aerial vehicle, but the requirements does not seem to take in account special features of these systems (What about remote control requirements?).</p> <p>How is envisioned combination with other SC/CS dedicated to such systems like CS-UAS (which is supposed to exclude passenger onboard, in contradiction with SC-VTOL).</p>	N/A	YES		Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
48	ANAC	VTOL.2000(c)	3	Remotely piloted aircraft brings additional airworthiness concerns that were not considered in CS-23. For example, datalink for command and control would require dedicated requirements. Subpart G also needs more discussions before becoming applicable to remotely pilot aircraft. For example VTOL.2600(c) should not be considered not-applicable to remotely pilot aircraft. Instead it should consider the failure of a camera or datalink providing the remot pilot vision.	Restrict the Special Condition to piloted aircraft before more discussions on airworthiness requirements to remotely piloted aircraft.	Yes	Yes	Partially accepted	See Explanatory Note 3
49	ANAC	VTOL.2000(c)	3	The text “or with various degrees of autonomy” should be carefully discussed. ICAO does not allow fully autonomous flights. The proposal is not clear about this and implies that the Special Conditions apply to any level autonomy could be accepted. Article 8 of the Convention on International Civil Aviation, signed at Chicago on 7 December 1944 and amended by the ICAO Assembly (Doc 7300) stipulates that: <i>“No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization....”</i>	Restrict the Special Condition to piloted aircraft before more discussions on airworthiness requirements to fully autonomous aircraft.	Yes	Yes	Partially accepted	See Explanatory Note 3
50	W Field LMWL Yeovil	2000 (c)	3	Applicability and definitions “...This Special Condition can apply to aircraft with pilot onboard, remotely piloted or with various degrees of autonomy;...”	Off board pilots and control of more than 1 air vehicle from 1 control should be future developments in line with the plans. The person in charge ie the pilot operator, should be on board the airvehicle at initial implementation. It is acceptable to have higher levels of autonomy on and off the air vehicle. Various degrees of autonomy could be permitted onboard the vehicle or through off off board data collection / processing.	YES	NO	Noted	See Explanatory Note 3
51	W Field LMWL Yeovil	General		What is the current status of the JARUS activities as this seem to be unrelated yet at initial draft includes an option for an off board pilot operator. The CS-UAS from JARUS is based on CS23 Amdt 5, but includes new paras.	Limit this SC to pilot / pilot operator on board.	YES	NO	Partially accepted	See Explanatory Note 3
52	W Field LMWL Yeovil	General		No requirements for consideration of cyber security including for elements that transmit data eg 2555 Installation of recorders that allows transmission and off board storage of data.	It is not expected that this rule should give details on the approach, but should recognise cyber security so that control mechanisms can be developed during the design process. Details of these processes are being developed by specialist organisations.	NO	YES	Partially accepted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
53	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2000 (a)	3	This document is dedicated for a person-carrying VTOL. What regulatory framework will have to be considered for a heavy cargo, unmanned drone? Is there a specific planning associated to such a regulation?	None.	Yes	No	Noted	See Explanatory Note 3 Please also see for more details https://www.easa.europa.eu/easa-and-you/civil-drones-rpas
54	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2000 (b)(3)	3	There should be a differentiation between a cargo drone piloted by a professional pilot, and an aircraft piloted by a professional pilot and transporting passengers, in terms of required safety levels.	None.	No	Yes	Noted	See Explanatory Note 3
55	ONERA	VTOL.2000 (c)	3	This Special Condition can apply to aircraft with pilot onboard, remotely piloted or with various degrees of <u>autonomy</u> ; flight crew references therefore should be considered “as applicable”. This should imply at least a dedicated subpart in the SC to determine the limit and applicability precons of each consideration.	Then think of adding also : « remote pilote, and autonomous systems should be considered “as applicable” » ont the other hand.	Yes	No	Not accepted	See Explanatory Note 3. Additional material will be developed for remote pilot or autonomous systems.
56	UK CAA	Introductory Note		There is no mention of unmanned or remotely piloted aircraft in this preamble text.		Yes		Noted	See Explanatory Note 3. Material has been added in the preamble.
57	UK CAA	VTOL.2000 (c)		This is the only mention of “remotely piloted” in the whole document and seems almost to be an afterthought (see point 1 above). For this CS to include remotely piloted aircraft there would need to be additional consideration of C2 link, remote pilot station, emergency recovery capability, crash containment area etc.	Either remove the text or propose additional requirements applicable for remotely piloted aircraft.	Yes		Noted	See Explanatory Note 3
58	DGAC France	General		As for the scope, France considers that the content of the document, which is most detailed when it deals with structural aspects, does not cover enough the subject of aircraft control/avionics to extend the applicability of this document to autonomous flights or even remote piloted flights as it is written in VTOL.2000 (c). France therefore strongly recommends limiting the scope to piloted VTOLs. This will not harm the industry as all serious VTOL-project owners have announced that their vehicles, in their first versions, will be piloted, as they recognize the insufficient safety levels of autonomous systems in the near to medium-term future.				Partially accepted	See Explanatory Note 3
59	FAA/AIR	2000 (c)	2	The SC applicability includes remotely piloted aircraft. However the SC does not include any airworthiness standards for remote piloting such as remote control radio link data integrity.	Include appropriate airworthiness standards for remote piloting or exclude remote piloting.	Y	N	Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
60	FAA/AIR	2000(c)		This is a great applicability requirement that takes huge strides in allowing more autonomy in aircraft but I am curious if EASA has MOCs developed to allow for remotely piloted or fully-autonomous, passenger carrying aircraft. If they do, I would like to see what they have drafted. If not, do they really want to codify a requirement like this without having MOCs developed?	Recommend harmonizing on the MOCs.	Y		Noted	See Explanatory Note 3
61	TCCA-AVIONICS	VTOL.2000 (c)	3 / 26	The applicability of the Special Condition extends to remotely piloted or autonomous (with various degree of autonomy) aircraft. Yet, parallel international efforts are underway to develop CS-UAS covering the aspects of remotely piloted/autonomous aircraft. It therefore appears inappropriate for this SC to duplicate these. Furthermore, to adequately cover remote operation this SC should have also contained requirements for the Remote Pilot Station (RPS) and the communication path between the RPS and the Aircraft. Specific safety performance objectives should be defined to address remotely piloted/autonomous flight. In its current state this SC does not adequately address features relevant to remotely piloted or autonomous aircraft, so these should be removed from the scope of the SC.	Proposed Text : (c) This Special Condition apply only to aircraft with pilot onboard. ,	No	Yes	Partially accepted	See Explanatory Note 3
62	TCCA (WT O’Gorman)	General Comment		Document seems to have been developed in isolation from similar rule drafting efforts like the CS-UAS proposal.	Effort should be made to align structure of documents and harmonise the content of the regulations.	no	Yes	Noted	See Explanatory Note 3
63	GAMA	VTOL.2000(c)	3	It is smart for EASA to scope SC-VTOL in a manner that addresses the range of piloted and autonomous aircraft which are expected. Including the specific statement on this item that flight crew references should be considered ‘as applicable’ should not be included.	It should not be included as this is how all characteristics are addressed and specifically calling out this one and not the hundreds of other characteristics which are ‘as applicable’ will cause confusion.	Yes	Yes	Accepted	Text will be moved to the preamble. Objectives for remote piloting and autonomy will be added later.
64	CAA NZ	VTOL.2000(c)		As the SC provides scope for certification of a Remotely Piloted VTOL aircraft is there any intention of identifying specific C2 Link and Ground Control Station / Remote Pilot Station requirements if an applicant’s design was aligned with this approach?		Yes	No	Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
65	Aidan Reilly	VTOL.2000		<i>Autonomy</i> The inclusion of autonomous vehicles and the FDAL/safety objectives for vehicles certified under this Special Condition having zero passengers implies that this Special Condition could be used as the certification basis of a large VTOL UAS having quite relaxed safety objectives and FDALs, especially for failures not judged to be catastrophic to the vehicle in isolation. Such failures may have significant impacts upon other airspace users; a passenger aircraft would not be expected to survive a mid-air collision with a 2 tonne UAS. Such an event might have a probability as high as 10 ⁻⁶ per flying hour for a Basic category small VTOL aircraft certified under this Special Condition.				Noted	Please note VTOL.2000 Applicability and definitions (a) This Special Condition prescribes airworthiness standards for the issuance of the type certificate, and changes to this type certificate, for a person-carrying VTOL aircraft. An aircraft in the 0-passenger category in AMC VTOL.2510 would still be carrying a pilot.

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General pressurisation

Explanatory Note 4:

The VTOL projects that have been brought to the attention of the Agency for possible certification are unpressurised. This project-oriented Special Condition therefore does not include provisions for pressurisation; however this may be revised if the need arises. The corresponding objectives will likely build upon the corresponding CS-23 objectives.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
66	Rolls-Royce	VTOL.2000	3	It is unclear why the aircraft covered by this special condition cannot be pressurized. CS-23 permits pressurized aeroplanes. Increased cruise altitude permits greater operational flexibility, and may reduce the risk of mid-air collisions by spreading traffic across more flight levels.	Clarify rationale for non-pressurisation.	Yes	Yes	Noted	See Explanatory Note 4
67	ANAC	VTOL.2000(a) VTOL.2005(b)	3	VTOL.2005, which limits maximum passenger capacity and MTOW, may be a better location to the restriction regarding pressurized aircraft.	VTOL.2005(a) Certification with this small category Special Condition applies to non-pressurized aircraft with a passenger seating configuration of 5 or less and a maximum certified take-off mass of 2 000 kg or less.	Yes	No	Partially accepted	A new dedicated subparagraph will be created under VTOL.2000 Applicability
68	ADS	VTOL.2000	3	It is unclear why the aircraft covered by this special condition cannot be pressurized. CS-23 permits pressurized aeroplanes. Increased cruise altitude permits greater operational flexibility, and may reduce the risk of mid-air collisions by spreading traffic across more flight levels.	Clarify rationale for non-pressurisation.	Yes	Yes	Noted	See Explanatory Note 4
69	FAA/AIR	2000(a)	3	VTOL.2000(a) includes the statement, “Aircraft subject to this Special Condition are not pressurized.” This aligns with the deletion of pressurization system requirements from 23.2320(d). However, the oxygen system requirements were also deleted from 23.2320(e). To be consistent the statement should be changed to “Aircraft subject to this Special Condition are not pressurized and do not contain installed oxygen systems.” Also, VTOL.2325(a)(3) should be revised to eliminate the reference to oxygen systems. It would be preferable to include the requirements for pressurization systems and oxygen systems from 23.2320(d) and (e) in the special condition. Pressurization systems and oxygen systems are well understood and the reason for prohibiting these systems is not clear. This would be consistent with VTOL.2325(a)(3) which references oxygen systems and VTOL.2210(a)(1) which addresses design loads resulting from likely externally or internally applied pressure.	Delete “Aircraft subject to this Special Condition are not pressurized” and include the pressurization and oxygen requirements from CS 23.2320(d) and (e).		Y	Not accepted	See Explanatory Note 4

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
70	GAMA	VTOL.2000(a)	3	Limiting the special condition to non-pressurized aircraft seems to be short-sighted. The baseline regulation, upon which SC-VTOL is being written, deals with pressurized designs on a regular basis. There doesn't seem to be any reason SC-VTOL would need to be limited in this manner as the performance-based framework and the traditional means of compliance for pressurized CS-23 aeroplanes seems perfectly applicable.	While it may be that there are not yet applicants which have projects beyond these levels, using the traditional CS-23 divisions (airworthiness levels) seems logical and applicable and allowing for future designs which might be larger, pressurized, etc. can be addressed via the performance-based standards and means of compliance.	Yes	Yes	Not accepted	See Explanatory Note 4
71	Aidan Reilly	VTOL.2000		<i>Pressurization</i> It is unclear why the aircraft covered by this special condition cannot be pressurized. CS-23 permits pressurized aeroplanes. Increased cruise altitude permits greater operational flexibility, and may reduce the risk of mid-air collisions by spreading traffic across more flight levels.				Noted	See Explanatory Note 4

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General other

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
72	ACI EUROPE	General comment	General comment	General – for ease of use the SC VTOL Aircraft should include an annex with a glossary of terms. Insertion of page numbers would also make referencing easier	Include an Annex to cover: - Glossary of Terms Include page numbers	yes	no	Partially accepted	Page numbers and a Table of Content will be added. Rather than a Glossary of Terms, some definitions will be added to VTOL.2000 Applicability and definitions.
73	THALES	General		Thales appreciate the opportunity to comment this Special Condition that will be applicable to on-going VTOL certification projects, nevertheless considering the short time of consultation, the comments provided here should not be taken as an approval for a proposed regulation. Thales recommend to engage in parallel the adequate rulemaking process to deal with VTOL operations		Observation	Substantive	Noted	This Special Condition is issued within the frame of VTOL certification projects. Rulemaking will continue in parallel in accordance with the European Plan for Aviation Safety (EPAS).
74	Dr. Norbert Lohl	General		EASA's objective to "engage with its international partners in order to work together towards achieving common standards" is highly appreciated	More detailed information about further progress on the coordination with e.g. the FAA and CAAC is kindly requested	yes	no	Noted	EASA will continue to work towards harmonisation with its international partners and will organize events to keep the community informed
75	FNAM	Introductory note	1	FNAM does not understand the type of public consultation offered by EASA for SC-VTOL proposals. Usual public consultations are open on CRT. Why SCVTOL public consultation is not on CRT Tools? The way of communication was also different. This may lead to misunderstanding and some stakeholders may have missed this consultation.	FNAM suggests EASA to communicate on the new ways of consultation in order to explain to all stakeholders how they can provide efficiently their feedbacks and how they can be informed on new consultations.	Suggestion	Substantive	Noted	This Special Condition is issued within the frame of VTOL certification projects and has been published in the regular location for such publications. Rulemaking is using the CRT tool and will continue in parallel in accordance with the European Plan for Aviation Safety (EPAS).
76	FNAM	Background/Scope	2	<i>'Once the Agency has gained more experience with this type of product, the Agency will strive to transpose the special condition into a certification specification dedicated to these products.'</i> FNAM wonders what is the legal status of Special Condition and does not understand why this special condition is not a new proposed CS with a classic NPA consultation. Moreover, this special condition has been established in the spirit of recent CS-23 Amdt 5. Since current aeroplanes cannot achieve VTOL unlike all rotorcrafts models, FNAM wonders why this proposed SC is not established in the spirit of CS-27 regulation instead of CS-23.	FNAM suggests to precise the legal status of special condition comparing to IR, AMC, GM and CS	Suggestion	Substantive	Noted	This Special Condition is issued in accordance with COMMISSION REGULATION (EU) No 69/2014, Annex I, point 21.A.16B and EASA Management Board decision 12/2007
77	EAS/ N Rostedt	Introductory Note	1	Europe Air Sports thanks EASA for the opportunity to participate in this consultation. We commend EASA for the timely development of this Special Condition, which hopefully will enable the growth of a wholly new aircraft category.		Observation		Noted	-

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78	EAS/ N Rostedt	Introductory Note	1	General Note: In many cases, safety is achieved by a combination of appropriate product characteristics and appropriate operational procedures. As this Special Condition addresses only the former, commenting is slightly difficult as we do not yet have “the full picture”.	Ideally the Special Condition draft should be published for consultation together with the appropriate OPS draft for this category of aircraft and the relevant operational categories. As we are not aware of such “OPS-VTOL” requirements, we ask EASA to note that some of our comments may be more appropriate to the Operational requirements, and propose that EASA when developing OPS rules for small VTOL aircraft will consider also the comments given to this SCVTOL.	Observation		Noted	Work has started in parallel to develop specific VTOL operational aspects to complement the vehicle certification
79	Vertical Aerospace	VTOL.2000(c)		Could EASA confirm if the SC has been shared or developed with the FAA? Is there likely to be bilateral acceptance and how does the remotely piloted aspect tie in with the ICAO Convention on International Civil Aviation Article 8 limitation		Observation	N/A	Noted	The SC has indeed been shared with the FAA. See Explanatory Note 3 for the remotely piloted aspect.
80	EVA	In general	N/A	As almost all VTOL will be fully electric or at least hybrid, the electrical component installation and selection seems to be not enough framed like EWIS regulations. Will be in the future a subpart dedicated to the electrical components installation and selection integrated in the VTOL CS?	To take more into consideration the electrical installation and selection to assure the reliability and the safety of the VTOL	YES	NO	Partially accepted	Will be addressed in the AMC

EASA SC-VTOL-01 Comment Response Document

81	Airbus Group		Gal	<p>Airbus is very surprised of the process (Special Condition) and very short timeframe (one month only; deadline: 15 November 2018) used by EASA for the document under consultation, addressing:</p> <ul style="list-style-type: none">- the design certification requirements of person-carrying VTOL aircraft in the small category (2000 kg or less, 5 passengers or less)- aircraft differing from conventional rotorcraft or fixed-wing aircraft by unique characteristics (multi Rotors/Power units, no autorotation or gliding capability)- 'pilot on board', 'remotely piloted' and 'various degrees of autonomy' configurations,- Commercial Air Transport (CAT)- operations over congested areas (cities) <p>Indeed:</p> <ul style="list-style-type: none">- Consistency with the EASA Plan for Aviation Safety (EPAS 2019-2023) is not understood, since SC-VTOL-01 has common topics of applicability with the future CS-UAS, as the certification bases of air taxis flying intensively and at very low altitude over cities. This CS-UAS is still under elaboration by JARUS and a first issue is foreseen to be published by EASA in the second half of 2019 following a formal rulemaking process including focused consultation (Workshops) with Industry,- The consultation period for Industry (one month) to analyse such novel and complex topics is too short,- The Special Condition process foresees direct publication of the Special Condition together with the CRD (Comments Response Document) without any iteration with Industry. <p>Beyond the process aspect, we have identified several important safety issues:</p> <ul style="list-style-type: none">- There are some important less stringent requirements as compared to CS-27 and CS-VLR (e.g. flight performance, flying qualities, inadvertent icing, crashworthiness,...),- The 'remote pilot' and 'various autonomy levels' configurations, claimed under the applicability of this SC, are incompletely and at least not clearly addressed (in particular there is no 'Remote Pilot Station' Subpart),- Because the basis of drafting this SC was CS-23 amendment 5, there is a risk that numerous emerging organizations claim to relax design requirements according to the Safety Continuum principle applied in CS-23. Airbus considers that this CS-23 Safety			X	Partially accepted	<p>This Special Condition is issued within the frame of VTOL certification projects and the public consultation timeframe was increased from the 3-week minimum. A press release was also issued to alert the industry and other stakeholders. Rulemaking will continue in parallel in accordance with the European Plan for Aviation Safety (EPAS). See Explanatory Note 3 for considerations on UAS. EASA will organize events to keep the community informed. Some of the levels have been realigned (see Explanatory Note 9) and it should be noted that some objectives have been introduced that do not exist in CS-27, for example VTOL.2250(c). Scope of the SC will be clarified to distinguish from conventional rotorcraft.</p>
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EASA SC-VTOL-01 Comment Response Document

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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				<p>Continuum principle, which is tailored to aeroplanes typically flying from airport to airport at high altitudes and with a gliding capability, is not transposable in this SC which applies to air taxis flying intensively and at very low altitude above cities. In this respect Airbus agrees with the proposed design safety objectives included in this SC (AMC VTOL.2510) for VTOL aircraft of the category Enhanced, and corresponding to current CS-27/CS-VLR safety objectives.</p> <p>Consequently Airbus position is:</p> <ul style="list-style-type: none">- A longer time consultation period with Industry is needed, including at least a second consultation following incorporation of comments by EASA,- The criteria defining the applicability of this SC have to be more precisely defined so that this SC cannot be used for certification of 'conventional' rotorcraft addressed by CS-27 or CS-VLR,- We fully agree with EASA that the quantitative safety objectives/FDALs for the Category Enhanced (AMC VTOL.2510) have to be kept as proposed and identical to the CS-27/VLR values, as minimum requirements to address air taxis flying at very low altitudes above cities.					
82	Airbus Group		Gal	It does not appear that this SC has been harmonized with the FAA, which has been working on a similar set of rule language modification intended to accommodate VTOL aircraft.	Suggest harmonizing with FAA.		X	Noted	EASA will continue to work towards harmonisation with its international partners
83	Airbus Group				An Explanatory Note fully part of the SC should be made by the EASA in order to provide better explanations following comments received.	X		Accepted	A Preamble will be added to the SC and the present Comment Response Document will include Explanatory Notes
84	ADS	Scope	1	Existing regulations can impose flight envelope restrictions to ensure safe operation. This does not appear to be part of the special condition as written. New aerospace companies may not appreciate the importance of this aspect	Flight envelope regulation could be a useful tool to achieve increased safety levels.	Yes	Yes	Noted	This approach can be proposed within the frame of the SC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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85	ONERA	VTOL.2000 Applicability and definitions	3	<p>In the draft CS-UAS developed by JARUS, it is stated:</p> <p>“CS-LUAS/LURS & AMC or any other existing aviation design standard and associated AMC can be used for a TC containing operational limitations by applying the Operational Risk Assessment. This results in a subset of individual applicable requirements out of CS-LUAS/LURS & AMC or any other existing aviation design standard for the TC.”</p> <p>Since UAM problematics with VTOL aircraft is close to some of the UAS operations dealt by the JARUS CS-UAS (even though weight limitations are different), wouldn't it be relevant to mention as well the possibility to have additional requirements (e.g. operational limitations) coming from an Operational Risk Assessment?</p>	<p>Modify the first sentence of VTOL.2000 as such:</p> <p>“(a) This Special Condition prescribes airworthiness standards for the issuance of the type certificate, and changes to this type certificate, for a person-carrying VTOL aircraft in the small category, with lift/thrust units used to generate powered lift and control. Aircraft subject to this Special Condition are not pressurized. Note that the type certificate may contain operational limitations coming from an Operational Risk Assessment on top of the individual applicable requirements from this SC and its AMC.”</p>	yes	no	Not accepted	This approach can be proposed within the frame of the SC and is not deemed to warrant detailing in the objectives (not present in CS). AMC may however consider acceptable operational limitations.
86	DGAC France	General		<p>France salutes this draft Special Condition as demonstrating EASA's willingness to engage a dialogue with the nascent urban air mobility industry and all its actors, from start-up to major aeronautical companies. Nevertheless, and notwithstanding the precise comments which could be made on each article of this document, France strongly recommends revising and clarifying the scope of this document to avoid misunderstandings or even deliberate misuse and then presenting it again for public consultation, giving a longer time for responses in order for stakeholders to perform a thorough analysis.</p> <p>Before discussing the scope, France would like to share its surprise as to the choice of regulatory text. It is our understanding that a Special Condition has a very specific place in the whole aeronautic regulation framework, - and this is not necessary known from the start-ups without extensive aeronautic background : it is an authorization to deviate, for a given use, from existing requirements applicable to an existing type of aircraft. In that case, there are no existing requirements for this kind of aircraft, next to nothing in terms of accumulated experience in both the industry and the regulator, and even the use is not defined. Furthermore the CS-23 is supplemented by AMC. This draft special condition lacks the technical requirements provided by AMC. As for the use, France protests strongly against any wording that would open flight over cities to these vehicles, as this text does not have a sound regulatory basis (cf. point 1) and its scope is insufficiently defined, leading to potential serious safety problems (cf. point 2).</p>				Partially accepted	This Special Condition is issued within the frame of VTOL certification projects and the public consultation timeframe was increased from the 3-week minimum. A press release was also issued to alert the industry and other stakeholders. Rulemaking will continue in parallel in accordance with the European Plan for Aviation Safety (EPAS). EASA will organize events to keep the community informed. AMC will be developed and will be published for public consultation. The Special Condition establishes airworthiness objectives for aircraft intended for operations over congested areas, however corresponding operational rules still need to be developed.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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87	FAA	General Comment		We encourage EASA to engage in collaboration with the FAA on the airworthiness requirements for these types of aircraft prior to publication. It is important to have a harmonized approach to ensure a level playing field.	The proposed EASA Special Condition introduces a new approach and concepts that will result in significant challenges, confusion, and undue burden to the industry during foreign validation of powered lift/eVTOL/multi-copters/special class of aircraft unless EASA and the FAA work closely to align each other’s approaches to the maximum extent possible. Some of the areas that the FAA and EASA need to work closely together are as follows: 1) alignment of terminology; 2) Safety Continuum for powered lift/eVTOL/multi-copters/special class; 3) the application of continued safe flight as it relates to the safety continuum, including the concept of controlled emergency landing; 4) software and Airborne Electronic Hardware Development Assurance Levels; 5) lightning; 6) bird strike, and others.			Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
88	GAMA	N/A	General Comment	It is of top priority that EASA coordinate the development of VTOL certification standards and means of compliance with the key aviation authorities around the world including at a minimum ANAC, FAA and TCCA.	EASA must prioritize harmonisation with the FAA as the U.S. is a key market for European VTOL manufacturers and there are many VTOL projects which will initiate in the U.S. which will also look to validate with EASA.	Yes	Yes	Noted	EASA will continue to work towards harmonisation with its international partners

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89	Boeing	multiple paragraphs	multiple pages	<p>THE PROPOSED TEXT STATES:</p> <p>There are multiple instances in this Special Condition requirement document where the terms “critical” and “likely” are used and no definition is provided, causing confusion.</p>	<p>REQUESTED CHANGE:</p> <p>We request EASA to provide clear guidance material (GM) and / or acceptable Means Of Compliance (MOC) for each use of the terms “critical” and “likely”.</p> <p>JUSTIFICATION:</p> <p>The terms “critical” and “likely” appear 19 and 39 times respectively in the SC document. These terms have to have different regulatory means depending on the context and where the term is used.</p> <p>Normally, when referring to “critical malfunction of thrust/lift” in regulations or guidance material it is referring to a condition that results in a forced landing (level flight cannot be maintained), but as “critical malfunction of thrust/lift” is used in several places in the SC it cannot have this meaning.</p> <p>For example:</p> <p><i>VTOL.2120(b)(2) - design must comply with minimum climb performance out of ground effect: after critical malfunction of thrust/lift.</i></p> <p>Obviously the phrase “critical malfunction of thrust/lift” cannot have the same meaning in this regulation.</p> <p>There are similar issues with the multiple use of the term “likely” throughout the SC, and not clear definition or guidance is provided which is causing confusion.</p>		yes	Accepted	The terms ‘critical’ and ‘likely’ have been carried over from CS-23. They will however be reconsidered and clarified either in the SC or AMC.
90	CAA NZ	n/a	n/a	Will aircraft certified under this SC be able to operate under current EASA rules or is there need to develop a corresponding operational rule to allow enhanced VTOL aircraft operate over a congested area?		Yes	No	Noted	Operational rules will need to be developed

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VTOL.2000 operating site

Explanatory Note 5:

The Special Condition intended to use ‘operating site’ with the same meaning as Regulation (EU) 965/2012 on air operations, i.e. “‘operating site’ means a site, other than an aerodrome, selected by the operator or pilot-in-command or commander for landing, take-off and/or external load operations.”. Given the comments received, it was decided to introduce instead the dedicated airworthiness term “vertiport” to be defined similarly to “heliport” from CS-Definitions as “‘vertiport’ means an area of land, water, or structure used or intended to be used for the landing and take-off of VTOL aircraft”. This will be detailed in the related AMC and could include flights to aerodromes. The Special Condition and the AMC will not define standards for vertiports but will verify at aircraft level related elements such as minimum area needed or minimum climb gradients/obstacle clearances in normal and degraded modes, as applicable. Such information will then be provided through flight manual data (Aircraft Flight Manual and/or Supplement).

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
91	THALES	VTOL.2000/b/1	3	CSFL : Does “an Operating site” means any site equipped for normal landing of such type of aircraft , and not only the destination one (can it be a diversion landing site at a shorter distance ?)	Add a definition of “Operating site”	Suggestion	Substantive	Noted	See Explanatory Note 5
92	Kopter Group	VTOL.2000(b)(1)	3	Requirements or specifications are missing for a location to be considered as an operating site by EASA.	Please provide a definition of an operating site.	yes	no	Noted	See Explanatory Note 5
93	Vertical Aerospace	VTOL.2000(b)(1)		Can EASA confirm that the AMC will define “Operating Site” in the context of light VTOL aircraft?	Vertical Aerospace interprets an Operating Site in this context as a site designated as suitable to safely land the vehicle and is secured from public access for this purpose. We anticipate that some sites could be designated emergency sites for the purpose of diversion and contingency planning whilst not being an active verti-port/pad.	Suggestion	N/A	Noted	See Explanatory Note 5
94	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2000 (b)(1)	3	Please detail what is considered “an operating site”. An operating site only would be too restrictive since a clear area of given dimensions, approved approach procedures, should be considered as acceptable for a continued safe flight and landing.	Helicopter aeronautical maps indicate the “clear areas” that could be used for a controlled landing. At least, such areas identified by the NAA should be also considered as landing sites in a continued safe flight and landing approach. E.g. see: DGAC/SIA – CTR Paris – Itinéraires Hélicoptères	No	Yes	Not accepted	« clear area » in Regulation (EU) 965/2012 GM refers to certain helicopter Category A procedures: This procedure is analogous to an aeroplane Category A procedure and assumes a runway (either metalled or grass) with a smooth surface suitable for an aeroplane take-off This is not considered a suitable generic term for VTOL aircraft.
95	ONERA	VTOL.2000 (a)(1)	3	« an operating site » used in place of “aerodrome” from CS-23. Fully agreed, but then implies “selected by the operator or pilot-in-command or commander for landing...” as mentioned in the Regulation. Then not properly addressed when autonomy is in question, except if all operating site used by a full autonomous system have all been pre-evaluated before departure.		Yes	No	Noted	See Explanatory Note 3 and Explanatory Note 5
96	Sikorsky	VTOL.2000.b.1	3	‘Operating Site’ not defined sufficiently to provide acceptable basis for certification	Clarify definition.	No	Yes	Noted	See Explanatory Note 5

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VTOL.2000 controlled emergency landing

Explanatory Note 6:

A definition for ‘controlled emergency landing’ will be included in the SC and further details provided in the AMC. A controlled emergency landing must be performed under control, e.g. be able to choose the direction and exact point of touchdown with the remaining lift/thrust units. The objective could thus not be met by non-steerable parachutes. While the objective is similar to a controlled glide or autorotation, it will introduce the possibility to accept some damage to the aircraft to absorb the impact. It is however expected that the landing should not injure the occupants. Particular considerations may be necessary for certain conditions, for example inadvertent icing or degraded visual environment/IMC, and will be detailed in the AMC.

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97	William Branch	VTOL.2000 (b)	3	Part (b) I think a definition for Emergency Landing should be added (it is used in 2005). Emergency landing is allowed in rural areas without defining it. The emergency landing distance from planned flight path should be defined by the reserve time designed in with the main power/thrust failure condition. This allows certain failures to be mitigated by emergency landing, but limits flight paths with emergency landing locations available along the path within the reserve time.	Add (4) Emergency Landing means an aircraft is capable of a controlled decent to a landing point within the reserve flight time allowed by the design with a critical malfunction of thrust/lift.	?	Yes	Partially accepted	See Explanatory Note 6 . A reserve will not be requested for ‘controlled emergency landing’ but for ‘continued safe flight and landing’.
98	THALES	VTOL.2000/b/	3	A definition of “Controlled emergency landing” is missing to better understand the difference between Basic and Enhanced.	Add a definition of Controlled emergency landing . Is it for example any type of landing up to crash and full destruction of the machine but at a place , that even if not equipped for normal landing, has been selected for example because free of people, and with minimum control capability ensured to reach this site? Or is it any type of landing anywhere within a given horizontal distance below the flight path? Or is it a landing at unequipped but selected (empty) places , with minimum control capability to reach them and land there, landing being possibly hard and damaging the machine but still protecting human occupants from injury (or injury precluding egress) ? This definition seems the most consistent when looking at 2270 .	Suggestion	Substantive	Partially accepted	See Explanatory Note 6
99	Rolls-Royce	VTOL.2005	3	Would a landing assisted by a ballistic parachute be considered a controlled emergency landing?	Please clarify	Yes	No	Accepted	See Explanatory Note 6
100	NEOPTERA	VTOL.2000 (b) (1)		It would be useful also to defined what is a controlled emergency landing.		suggestion	substantive	Accepted	See Explanatory Note 6
101	EAS/ N Rostedt	Background/Scope vs. VTOL.2005 Certification of small-category VTOL Aircraft	1, 3	A possible contradiction: The Background/Scope section says that “the aircraft may not be able to perform an autorotation or a controlled glide in the event of a loss of lift/thrust”. But VTOL.2005 (b)(2) requires it to be capable of a “controlled emergency landing” after critical malfunction of thrust/lift. This appears to be a stricter requirement.	In our understanding, a “controlled emergency landing” is either a controlled glide or an autorotation descent. Please clarify VTOL.2005 to remove this contradiction. In case an “emergency descent” by rescue parachute is acceptable, please say so.	Suggestion	Substantive	Partially accepted	See Explanatory Note 1 and Explanatory Note 6

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102	Lilium Gmbh	VTOL.2000 (b)		The definition of ‘Controlled emergency Landing` is omitted	Add. ‘Controlled Emergency Landing’ means and aircraft is capable of performing a pilot initiated or automated descent using systems which have been demonstrated to have an accepted level of reliability.		Yes	Partially accepted	See Explanatory Note 6
103	ANAC	VTOL.2005(b)(2)	3	Controlled emergency landing should be defined (at least in an AMC). For example: can a parachute system provide a controlled emergency landing?	To create an AMC to define controlled emergency landing clearly. ANAC understands that is a lower level definition, but it is difficult to define a position without an understanding of EASA view on this topic.	Yes	Yes	Accepted	See Explanatory Note 6
104	Airbus Group	2005(b)(2)		It is not clear what could be the ‘controlled emergency landing’ to be demonstrated for VTOL aircraft which by definition (applicability of this SC) ‘may not be able to perform an autorotation or a controlled glide in the event of a loss of lift/thrust.’	AMC is missing		X	Accepted	See Explanatory Note 6
105	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2000 (b)	3	Similar to the definition of ‘continued safe flight and landing’, it should be judicious to define in that paragraph ‘controlled emergency landing’, and ‘survivable emergency landing’ which are terms used in the proposed special condition.	None.	Yes	No	Accepted	See Explanatory Note 6. ‘Survivable emergency landing’ will be detailed in the AMC.
106	ADS	VTOL.2005	3	Would a landing assisted by a ballistic parachute be considered a controlled emergency landing?	Please clarify	Yes	No	Accepted	See Explanatory Note 6
107	FAA/AIR	2000(b)	1	No definition of ‘controlled emergency landing’ used numerous times in SC. “Continued Safe flight. . . “ used numerous times and is defined	FAA continues to have conversations on continued safe flight and landing and controlled emergency landing and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it used in safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	Y	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
108	FAA/AIR	General		What are the differences in “controlled emergency landing”, survivable emergency landing, and emergency landing?	Clarification	Yes	No	Partially accepted	See Explanatory Note 6. The other terms will be clarified in the AMC.
109	TCCA-AVIONICS	VTOL.2005(b)(1)&(2)	3/26	While the notion of “continued safe flight and landing” is defined in VTOL.2000(b), there is no definition of “controlled emergency landing”. The notion is critical in the interpretation of the SC, including fundamental distinction between category “enhanced” and “basic” per VTOL.2005(b).	Include in VTOL.2000(b) a definition of “controlled emergency landing”.	No	Yes	Accepted	See Explanatory Note 6

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110	Aidan Reilly	VTOL.2005		<p><i>Controlled emergency landing</i></p> <p>This term is not defined.</p> <p>Rule 5 of the Rules of the Air (2007) was a far more robust regulation:</p> <p><i>5 Low flying prohibitions</i></p> <p><i>(1) Subject to paragraph (2), an aircraft shall comply with the low flying prohibitions in paragraph (3) unless exempted by rule 6.</i></p> <p><i>(2) If an aircraft is flying in circumstances such that more than one of the low flying prohibitions apply, it shall fly at the greatest height required by any of the applicable prohibitions.</i></p> <p><i>(3) The low flying prohibitions are as follows:</i></p> <p><i>(a) Failure of power unit</i></p> <p><i>An aircraft shall not be flown below such height as would enable it to make an emergency landing without causing danger to persons or property on the surface in the event of a power unit failure.</i></p> <p><i>(b) The 500 feet rule</i></p> <p><i>Except with the written permission of the CAA, an aircraft shall not be flown closer than 500 feet to any person, vessel, vehicle or structure.</i></p> <p><i>(c) The 1,000 feet rule</i></p> <p><i>Except with the written permission of the CAA, an aircraft flying over a congested area of a city town or settlement shall not fly below a height of 1,000 feet above the highest fixed obstacle within a horizontal radius of 600 metres of the aircraft.</i></p> <p><i>(d) The land clear rule</i></p> <p><i>An aircraft flying over a congested area of a city, town or settlement shall not fly below such height as would permit the aircraft to land clear of the congested area in the event of a power unit failure.</i></p> <p><i>(e) Flying over open air assemblies</i></p> <p><i>Except with the written permission of the CAA, an aircraft shall not fly over an organised open-air assembly of more than 1,000 persons below the higher of the following heights:</i></p> <p><i>(i) 1,000 feet; or</i></p> <p><i>(ii) such height as would permit the aircraft to land clear of the assembly in the event of a power unit failure.</i></p>				Partially accepted	See Explanatory Note 6
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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
				<p><i>(f) Landing and taking off near open air assemblies</i></p> <p><i>An aircraft shall not land or take-off within 1,000 metres of an organised, open-air assembly of more than 1,000 persons except:</i></p> <p><i>(i) at an aerodrome, in accordance with procedures notified by the CAA; or</i></p> <p><i>(ii) at a landing site which is not an aerodrome, in accordance with procedures notified by the CAA and with the written permission of the organiser of the assembly.</i></p> <p>This more robust regulation, with explicit “land clear” requirements, should form the basis for VTOL certification & operations.</p>					

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VTOL.2000 congested area

Explanatory Note 7:

The Special Condition uses ‘congested area’ with the same meaning as Regulation (EU) 965/2012 on air operations; the definitions have been aligned. It was not deemed useful for the Special Condition to refer to further differentiation, such as hostile/non-hostile or to add further conditions such as open-air assembly of persons or height above ground, however these differentiations and others may be used in future Operational VTOL rules.

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111	ACI EUROPE		3	VTOL.2000 Applicability and definitions (b)(2) Congested area could also apply to airports in the event that a VTOL is used as an air taxi that transports passengers and or goods to/from an airport	VTOL.2000 Applicability and definitions (a) (b)(2) ‘congested area’ means in relation to a city, town, or settlement or airport , any area which is substantially used for residential, commercial, operational or recreational purposes;	yes	no	Not accepted	See Explanatory Note 7
112	THALES	VTOL.2000/b/2	3	This definition is still difficult to use because of “settlement “ and “ substantially”, specifically to understand where Basic flights will be possible	Settlement should be defined by a number of houses for example. Highways and railways should be considered also. “Substantially” should refer to the % of the flight hours over those congested areas, not the purpose of these areas . A minimum horizontal distance or height/distance should be considered for Basic flights versus those areas	Suggestion	Substantive	Noted	See Explanatory Note 7
113	Rolls-Royce	VTOL.2000	3	The definition of congested areas would appear to omit temporary large gatherings of people such as a music festival.	Update the definition to cover these scenarios	Yes	Yes	Not accepted	See Explanatory Note 7
114	Lilium Gmbh	VTOL.2000 (b)		The objective requirement of the congested area definition is related to population as opposed to locations	Revise to read: ‘Congested area` means in relation to a city, town or settlement, any area which is densely populated’	Yes		Not accepted	See Explanatory Note 7
115	EVA	VTOL.2000	3	Does “congested areas” consider as well rural areas or countrysides?	Have a differentiation between congested cities with traffic on the ground and rural areas for which private customers can land in a private spot on their garden for instance	YES	NO	Noted	See Explanatory Note 7. Rural areas outside a city, town or settlement are typically not considered congested areas.
116	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2000 (b)(2) And VTOL.2005 (b)(1)	3	There should be a differentiation in the category enhanced between flying over a densely populated city, or above a rural area. As it is stated, the required safety level is the same. This seems overconstraining.	Use instead the terminology based on COMMISSION REGULATION (EU) No 965-2012 - Air Operations, March 2018: hostile environment, and non-hostile environment. In particular, that document states that “Those parts of a congested area with adequate safe forced landing areas shall be considered non-hostile”. That requirement should be maintained.	No	Yes	Not accepted	See Explanatory Note 7

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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117	FAA/AIR	2000(b)		<p>This section redefines terms in a new way that is not consistent with other parts and later in other sections uses new terms that are not defined.</p> <p>Congested area definition is ambiguous and can be interpreted to mean any single inhabited structure or open area park.</p>	<p>FAA continues to have conversations on the definition of continued safe flight and landing and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it will be used in safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition</p> <p>FAA does not plan on including congested areas in our safety continuum.</p>		Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
118	ADS	VTOL.2000	3	The definition of congested areas would appear to omit temporary large gatherings of people such as a music festival.	Update the definition to cover these scenarios	Yes	Yes	Not accepted	See Explanatory Note 7
119	FAA/AIR	2000(b)(2)	3	<p>Virtually any area could be considered “congested” by this definition. The only place that is clearly not “congested” would be an open field – unless a farmer was operating a tractor in the field. Trying to define “congested” is understood, but probably not a good idea. It will only result in waivers or exemptions later.</p> <p>We would also offer that we have tried to use the term “urban” in UAS programs, but that too is problematic to apply in certification.</p>	The FAA does not intend on using congested in the FAA safety continuum			Noted	See Explanatory Note 7
120	TCCA (B Harvey)	VTOL.2000		“built up area” is commonly used in aviation regulations in Canada. Would this be appropriate vs. “congested area”? Does congested area also cover air traffic?	TCCA suggests to change the term to built-up area.	yes	No	Not accepted	See Explanatory Note 7

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121	Aidan Reilly	VTOL.2000		<p><i>Congested area</i></p> <p>The definition of ‘congested area’ does not include open-air assemblies of people as mentioned in SERA.3105, which states</p> <p><i>Except when necessary for take-off or landing, or except by permission from the competent authority, aircraft shall not be flown over the congested areas of cities, towns or settlements or over an open-air assembly of persons, unless at such a height as will permit, in the event of an emergency arising, a landing to be made without undue hazard to persons or property on the surface. The minimum heights for VFR flights shall be those specified in SERA.5005(f) and minimum levels for IFR flights shall be those specified in SERA.5015(b).</i></p> <p>This exclusion would permit a basic category VTOL aircraft to be used e.g. for transport of VIPs to and from music festivals, which would potentially expose the general public to elevated levels of risk.</p>				Not accepted	See Explanatory Note 7

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VTOL.2000 commercial air transport

Explanatory Note 8:

The Special Condition includes intentionally definitions that are also present in other rules as it is deemed important to have recorded in the certification basis the certification assumptions at the time of certification in case the other rules evolve.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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122	VELICA	VTOL.2000 (b) (2)		VELICA recommends deleting subparagraph (b) (3). The CAT is already defined in the EASA regulation. A so important definition shall never be put in a Special Condition. If the definition evolves at high level, it may create unharmonized wording, or worse, meaning.				Not accepted	See Explanatory Note 8
123	Kopter Group	VTOL.2000(b) (3)	3	Why is the ‘CAT operation’ defined here within an SC for type certification ? Is it not the ToR of the air OPS regulation ?		yes	no	Not accepted	See Explanatory Note 8 and Explanatory Note 10
124	AEROMOBIL	VTOL.2000 (b) (2)		AEROMOBIL recommends deleting subparagraph (b) (3). The CAT is already defined in the EASA regulation. A so important definition shall never be put in a Special Condition. If the definition evolves at high level, it may create unharmonized wording, or worse, meaning.				Not accepted	See Explanatory Note 8
125	FAA/AIR	2000(b)(3)		Why is ‘mail’ specifically called out in this SC? Is mail not considered cargo?		Y	N	Noted	The definition for Commercial Air Transport is identical to the definition from Regulation (EU) 2018/1139. Category Enhanced refers to the subset “Commercial Air Transport operations of passengers”.
126	TCCA – Powerplants	VTOL.2000(b)(3)	3/26	It is not recommended to use the acronym “CAT”, since it is not useful in the text, and can also imply catastrophic failure and could generate confusion.	Remove the definition of this acronym, it doesn’t appear.	Yes	No	Accepted	SC text will be modified accordingly
127	Boeing	VTOL.2000(b)(3) and VTOL.2000(c)	3	THE PROPOSED TEXT STATES: <i>(b) For the purposes of this Special Condition, the following definition applies:</i> <i>(3) ‘commercial air transport (CAT) operation’ means an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration.</i> <i>(c) This Special Condition can apply to aircraft with pilot onboard, remotely piloted or with various degrees of autonomy; flight crew references therefore should be considered “as applicable”.</i>	REQUESTED CHANGE: VTOL.2000(b)(3) provides definition of CAT operation, and VTOL.2000(c) provides the applicability statement for the SC. Boeing requests clarifications whether cargo or mail transportation is within the scope of this SC. JUSTIFICATION: VTOL.2000(b)(3) provides definition of CAT operations. VTOL.2000(c) provides the applicability statement for the SC. It is not clear from VTOL.2000(b)(3) and VTOL.2000(c) if cargo or mail transportation is within scope of this SC, or if it is meant to solely address passenger carrying operations.			Noted	The definition for Commercial Air Transport is identical to the definition from Regulation (EU) 2018/1139. Category Enhanced refers to the subset “Commercial Air Transport operations of passengers”.

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VTOL.2000 other

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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128	Volocopter	VTOL.2000(b)		SUGGESTION: This SC makes use of the terms “normal, operational and limit flight envelope”. These are terms defined at no other related occasion, and the generic intent is required to be defined for technology specific adoption through AMC. It is understood that the definition is intended to be in analogy to FAA AC 25-7D	Recommended including a generic definition for these terms as part of VTOL.2000. Connection to probability of occurrences provides a guideline as to the severity of a malfunction, that may lead to leaving a specific flight envelope. This approach is considered reasonable when considering qualification of Flight Control Systems.	Yes	No	Accepted	High level definitions will be included in VTOL.2000 and will be detailed in the AMC
129	Volocopter	VTOL.2005		OBJECTION: In analogy to CS-23 it is proposed to also utilize the definition of ‘levels’ in relation to passenger seating configuration. As is visible already from the first AMC related to VTOL.2510, such a definition will be utilized frequently on AMC level. A significant bunch of AMC material available from CS-23 and being relevant to VTOL immediately refers to this definition.	requested to define this in the same way here. It has been a very long and detailed discussion on ARC / RMT PART / CS-23, which led to this variant as most reasonable variant. It should not be discarded, here.	No	Yes	Partially accepted	The same limits as Level 1 to 3 in terms of passenger seating are being used in AMC VTOL.2510, however CS-23 AMC available for the different aeroplane certification levels cannot necessarily be used directly as the first categorisation required is between the Basic and Enhanced categories.
130	Lilium Gmbh	VTOL.2000 (a)		..changes to this type certificate	..changes to such type certificate	Yes		Not accepted	Original wording grammatically and semantically correct
131	Lilium Gmbh	VTOL.2000 (a)		In view of the unpressurised restriction the document title should be reviewed	it is suggested that the title be changed to Special Condition for Small Unpressurised VTOL Aircraft.	Yes		Not accepted	The title mirrors the title of CS-27
132	Lilium Gmbh	VTOL.2000 (b)		No definition provided for: Limit Flight Envelope Normal Flight Envelope Operational Flight Envelope Balked Landing Conditions Critical Malfunction of Thrust/Lift	Add the definition of each Envelope or Condition quoted in the Special Condition or include an AMC containing this information	Yes		Partially accepted	High level definitions for the flight envelopes will be included in VTOL.2000 and will be detailed in the AMC. See Explanatory Note 12 for Critical Malfunction of Thrust/lift. Balked landing conditions will be detailed in the AMC.
133	SAFRAN	VTOL.2000	3/26	In several VTOL configurations, energy management (generation, storage...) is a major aspect of flight safety, and is sometime a independent topic from powerplant or lifting functions and items, whereas no dedicated requirement has been considered in this SC, except VTOL.2525 for electrical system supplying energy to equipment. Can you explain this choice?	N/A	Yes		Noted	Energy and energy management will be considered under the lift/thrust system and will be addressed specifically in the AMC
134	Airbus Group	General		No new definitions shall be invented in the SC for VTOL when already established in existing CS.	Established definitions should be taken over from existing CS	X		Partially accepted	In general concepts from existing CS were used, however some definitions vary between CS and particularities of VTOL have to be taken into account

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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135	ONERA	VTOL.2000	3	<p>Need to implement proper definitions of lift/thrust which is used with different adjectives in the rest of the document. lift/thrust :</p> <ul style="list-style-type: none"> - unit : especially if their multiplicity and functions are an argument for differentiation with conventional Rotorcraft and Aeroplanes - system malfunction / system installation / system components - control systems <p>Previously in CS-23 the terms powerplant or control were used with a common understanding of the different stackolders. Need at least to recover proper definitions that are clear for everyone in every case.</p>		Yes	No	Accepted	More details will be provided in the AMC. The introduction of new terms is taking into account the VTOL specificities and in particular that the boundaries between systems may not be as clear as on conventional aircraft.
136	TCCA – Powerplants	General And VTOL.2425(b)	18/26	<p>The definition of what defines a thrust/lift unit is not provided. This may vary by architecture, i.e. each propulsor, or each power source for several propulsors, or generator/APU to all propulsors, etc.). Calling it a thrust/lift unit may also be inadequate, as other functions (e.g. control, stabilization) are to be provided by these units.</p>	Define “thrust/lift unit”.	No	Yes	Accepted	Will be defined in the AMC
137	Aidan Reilly	VTOL.2000		<p><i>Lift/Thrust units</i></p> <p>The regulations here do not differentiate between lift and thrust units. Some designs propose different units for thrust and for lift, e.g. the Aurora Flight Sciences proposal, which has multiple lift units and a single cruise thrust unit. The consequences of the failure of a single lift unit are clearly different from those of the failure of the single thrust unit, and this should be reflected in the regulations. In the case of helicopters, it is common for a tail rotor to be used exclusively for control. Such systems may also be attractive for tilt-wing vehicles (e.g. CL-84, XC-142). Again the failure of a control unit has different consequences from the failure of a thrust unit or a lift unit, and this should be reflected in the regulations.</p>				Noted	The objectives are provided independently from the proportion of lift and thrust a lift/thrust unit is providing. The consequences of a failure can be different and integrated in the analysis.

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VTOL.2005 small category

Explanatory Note 9:

The Special Condition limits were designed to address small VTOL type certification projects presented to the Agency. They were set in terms of weight and passenger seating configuration, similarly to CS-23 and CS-27. Taking into account the comments received it was decided to extend these limits up to the limits of the CS-27 “small rotorcraft” certification specifications, that is maximum weight of 3 175 kg (7 000 lbs) or less and nine or less passenger seats which provides the possibility to align with the CS-23 certification levels 1 to 3. Extending beyond these limits would have required to also consider all CS-29 “large rotorcraft” requirements and acceptable means of compliance.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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138	Tine Tomazic	VTOL.2000 (a)	3	What is "small category"? CS-23 which is referenced recognises Levels (1-4)	Synchronise with nature CS-23 Rev5	yes		Partially accepted	See Explanatory Note 9
139	Tine Tomazic	VTOL.2005 (a)	3	Why the artificial cut at 2000 kg? Realistic VTOLS with 5 pax are more in the order of 2500-3000 kg MTOM. CS-23 recognises Levels, not weight as a determinant of applicable levels of safety.	Leave kg out, simply link to Levels that CS-23 already knows		yes	Partially accepted	CS-23 has also a weight limit (CS 23.2005(a)). See Explanatory Note 9 for the weight extension.
140	William Branch	VTOL.2005 (a)	3	Passenger seating of 5 with a pilot and luggage allotment is a lot heavier than 2000 kg. VTOL aircraft are heavier than similar fixed wing aircraft. Would like to see this increased to at least 3000 kg. And maybe extended to 6 pax for automated aircraft.	Change (a) to: (a) Certification with this small category Special Condition applies to an aircraft with a passenger seating configuration of 6 or less and a maximum certified take-off mass of 3000 kg or less.	Yes	No	Partially accepted	See Explanatory Note 9
141	Cranfield Aerospace Solutions Ltd	VTOL.2005(a)	3	Cranfield Aerospace Solutions Ltd welcomes the introduction of a special condition specific to VTOL aircraft. The comment is a request for background information; we would like to understand the reasoning behind the division between small and large VTOL aircraft being set at 2000 kg. Given many of the operational similarities to rotorcraft, it was partially expected the division would be closer to the division between small and large rotorcraft, which is 3175 kg.	Clarification via CRD or AMC, and an estimated timeline for a 'large VTOL aircraft' special condition would be much appreciated so that we can understand the certification implications of the division.	Yes	No	Noted	See Explanatory Note 9. The limits will be aligned with CS-27. There is currently no estimated timeline for a 'large VTOL aircraft' special condition.
142	Christian Sturm aerocompany	Subpart A VTOL.2005		It is not inline with CS-23 Amdt 5 Level 2. Compare with AMC VTOL.2005 in appendix. See below.	Limit VTOL in current stage to Level 2 with 6 pax?	Y	N	Partially accepted	See Explanatory Note 9
143	ACI EUROPE		3	VTOL.2005 Certification of small-category VTOL aircraft (a) The limitation of a maximum certified take-off mass of 2 000kg or less makes a restriction to 5 pax or less unnecessary as the number of pax will be determined by the maximum take-off mass.	Proposed changes: Certification with this small category Special Condition applies to an aircraft with a passenger seating configuration of 5 or less and a maximum take-off mass of 2 000 kg or less.	no	no	Not accepted	See Explanatory Note 9
144	Andrysek, Zuri.com SE	VTOL.2005	3	MTOW 2000Kg is not sufficient for turbine VTOL	MTOW increase to 2800Kg	Yes	Yes	Partially accepted	See Explanatory Note 9

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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145	Embraer S.A.	VTOL.2005		The VTOL.2005 requirement defines the maximum certified take-off mass of 2000kg or less for the certification of the small-category VTOL aircraft according to this SC-VTOL.	Considering that the “Category Enhanced” classification defined in SC-VTOL has requirements similar to the aeroplane certification Level 4 of the CS-23. Therefore, Embraer suggests to define in SCVTOL the same maximum certified take-off mass (8618kg) applied for CS-23.	YES	YES	Not accepted	See Explanatory Note 9
146	Rolls-Royce	VTOL.2005	3	The basis of setting a weight limit of 2000kg is unclear when CS-27 permits MTOW up to 3175kg and CS-23 significantly more. Many vehicles will fall outside this weight limit	Adjust weight limit to 3175kg to give consistency with CS-27	Yes	Yes	Accepted	-
147	Dr. Norbert Lohl	VTOL.2005 (a)	3	Higher MTOM may be especially required to accommodate for the following key aspects: - Account for current battery technology and the required safety backup (Alternate, Contingency) - Modularity: Enabling different use cases and deep integration into multimodal urban mobility systems	A higher certified MTOM of 2.500kg may be envisaged for safety reasons	yes	yes	Partially accepted	See Explanatory Note 9
148	Dr. Norbert Lohl	VTOL.2005 (a)	3	The Limitation of MTOM without number of passengers may be sufficient for evaluation of safety	Only use of MTOM as limiting factor for failure condition classifications instead of maximum passenger seating configuration	yes	yes	Not accepted	See Explanatory Note 9
149	FNAM	VTOL.2005	3	SC-VTOL proposed disposal defines the concept of ‘small category’. FNAM fears that this new category will be confusing with all different current definitions: -ICAO Definition of small aeroplane (MTOM less than 5700kg); and -Other than complex motor-powered aircraft (MTOM less than 5700kg for aeroplanes and 3175kg for helicopter) ; and -ELA1 aircraft (MTOM less than 1200kg); and -ELA2 aircraft (MTOM less than 2000kg); and -Etc. Plus, the proposed definition (MTOM less than 2000kg) could be an extension of current ELA2 definition. Therefore, aircraft categorized as ELA2 could be also a ‘small category’.	FNAM suggests to base new regulations on current ones in order to not add new definitions and categories to already existing European regulation principles.	Suggestion	Substantive	Accepted	The limits will be aligned with existing CS-27 “small rotorcraft”
150	FNAM	VTOL.2005	3	FNAM does not understand the principle of small category. Proposed disposals require that small category aircraft should be also certified under the scope of “enhanced” and “basic” categories. FNAM does not understand the benefit of this new small category. Plus, the compliance effort required from stakeholders seems to be disproportionate to the benefits that implementing those requirements bring to safety.	FNAM suggests to base new regulations on current ones in order to not add new definitions and categories to already existing European regulation principles.	Suggestion	Substantive	Accepted	The limits will be aligned with existing CS-27 “small rotorcraft”

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151	Arrival Jet Ltd	VTOL.2005(a)	3	<p>The Proposed Special Condition for small-category VTOL aircraft applies to aircraft with a seating configuration of five or fewer passengers and a maximum certified take-off mass (MTOM) of 2,000kg or less.</p> <p>The Aerospace Technology Institute suggests New Urban Air Transport vehicles (eVTOL) will require Rechargeable Energy Storage Systems with a capacity between 100kWh and 300kWh for a 30 mile trip. These figures are based on current helicopter requirements of 550kWh for a nominal 100 mile trip with no divert allowance. This required capacity would equate to a mass of between 400kg and 800kg at battery cell level using current technology. At system level this will equate to between 560kg and 1,020kg mass for an approved battery alone.</p> <p>Taking into account the weight of the chassis, payload and drivetrain with full redundancy, the proposed 2,000kg MTOM is unfeasible without a significant step change in technology.</p> <p>Increasing the proposed MTOM to 4,000kg would allow systems based on evolutions of current technology to be utilised and accelerate small category VTOL aircraft development. Arrival Jet is confident that it will be able to demonstrate a 4,000kg eVTOL based on the current generation of battery technologies.</p>	<p>Maximum take-off mass is amended to 4,000kg.</p> <p>If the above amendment is not accepted, then it is requested that the Proposed Special Condition for small-category be extended to 4,000kg MTOM for unmanned (automated / remotely piloted cargo) vehicles.</p>	Suggestion	Substantive	Partially accepted	See Explanatory Note 9. Please note that the Special Condition is limited to person-carrying VTOL aircraft (VTOL.2000 Applicability and definitions).
152	Manfred Hajek, TUM	VTOL.2005 (a)		The configuration (up to 5 pax, up to 2000kg) is equivalent to CS-27 rotorcraft. Applicability of either SC-VTOL or CS-29 is possible.	Clarify criteria when to apply CS-27 or SC-VTOL.	Yes	No	Noted	See Explanatory Note 2 and Explanatory Note 9
153	Lilium Gmbh	VTOL.2005 (a)		The imposition of a weight and passenger capacity different to the current CS23 limits are not considered relevant to unique VTOL operations.	<p>Revise to read:</p> <p>Certification with this small category Special Condition applies to aircraft with a passenger seating configuration of 19 or less and a maximum certified take-off mass of 8 618 kg (19 000 pounds) or less.</p>		Yes	Not accepted	See Explanatory Note 9
154	Vertical Aerospace	VTOL.2005(a)		The applicability is limited to 2000kg or less. This could be considered inconsistent with CS27.1(a) and the typical Mass for an equivalent CS23 Level 2 aeroplane. It is accepted that this is in line with Commision Regulation 319/2014 Part 1, Table 1.	It is suggested that a MTOM limitation is at 3175 kg in line with CS27.1(a)	Suggestion	N/A	Accepted	SC text will be modified accordingly
155	Karem Aircraft, Inc.	VTOL.2005 (a)	3	The proposed maximum certified take-off mass of 2000 kg is low for vehicles designed to safely operate in urban environments with five passengers, particularly when battery powered.	We propose a maximum certified take-off mass of 3000 kg, which is similar to FAR 27 limit of 7000 lb and FAR 23 Airworthiness I & II limit of 6000 lb.	Yes	Yes	Partially accepted	The limits will be aligned with CS-27
156	W Field LMWL Yeovil	General		Where do the 5 people and 2,000kg limits come from? These do not seem to be consistent with previous regulations.		YES	NO	Noted	See Explanatory Note 9

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157	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	VTOL.2005 (a)	3	A 2000 kg limitation in MTOW is introduced. Is there a projected certification for a category with higher MTOW? What would be the associated planning to develop such a regulation?	None.	Yes	No	Noted	There is currently no estimated timeline for a 'large VTOL aircraft' special condition
158	ADS	VTOL.2005	3	The basis of setting a weight limit of 2000kg is unclear when CS-27 permits MTOW up to 3175kg and CS-23 significantly more. Many vehicles will fall outside this weight limit	Adjust weight limit to 3175kg to give consistency with CS-27	Yes	Yes	Accepted	-
159	ONERA	VTOL.2005	3	“passenger seating configuration of 5 or less and a maximum certified take-off mass of 2 000 kg or less” Where does this limit of mass comes from. 4 to 5 passengers is a huge part of the market identified from many stackolders. So 5 is correct target. But, from actors of this market also, 2000 kg is then a goal maybe just to the limit or even hard to reach in 4-5pax cases. That could imply lower capacity. Is it intended and then why ?		Yes	No	Noted	See Explanatory Note 9
160	Sikorsky	VTOL.2005.a	3	2000 kg gross weight for air vehicles is not sufficient for a five passenger aircraft that includes all necessary safety equipment and design features.	Match definition of CS 27 for weight and passengers for these type of vehicles.	No	Yes	Accepted	-
161	FAA/AIR	2000	2	The FAA and ICAO have two recognized categories of “VTOL”; powered lift and rotorcraft. In addition the FAA doesn’t understand the term small VTOL Rationale: to address possible issues that may arise during validation and to help harmonization of guidance and policy. Avoid locking yourself into a weight limitation	Please clarify what this SC is intended to cover. Please define “VTOL” using recognized regulatory language. Rationale: to address possible issues that may arise during validation and to help harmonization of guidance and policy. Avoid locking yourself into a weight limitation			Noted	The FAA definition of powered-lift is: <i>Powered-lift</i> means a heavier-than-air aircraft capable of vertical takeoff, vertical landing, and low speed flight that depends principally on engine-driven lift devices or engine thrust for lift during these flight regimes and on nonrotating airfoil(s) for lift during horizontal flight. It thus requires the aircraft to be sustained principally by a fixed aerofoil during horizontal flight. In the urban mobility context a number of different distributed-propulsion VTOL designs are being proposed relying to different degrees, and not necessarily “principally”, on fixed aerofoils for forward flight, thus EASA considers necessary to establish a category covering the entire range of architectures to ensure a common safety level.
162	FAA/AIR	2005(a)		Was the rationale for reducing the number of passengers to 5 and the takeoff weight to 2000kg an attempt to address most of the VTOL aircraft so far? Putting it another way, if this is a generic VTOL SC, why restrict future VTOL designs to this weight and number of passengers?		Y	Y	Noted	See Explanatory Note 9. Limiting the weight and number of passengers follows the CS-23/Part 23 and CS-27/Part 27 approach. If the need arises, a “large” category SC can be developed.
163	TCCA – Powerplants	VTOL.2005(a)	3/26	The maximum take-off mass is limited to 2000 kg wich is not much for a 6-seater. If electric powered, the batteries alone could easily represent 1/3 of that mass. The new performance based CS-23 went away from having mass limits. Will this SC or similar SC be required for VTOL aircraft in the category of AW609 tiltrotor (9 pax, 7,620kg)?	Clarify the adequacy or rationale for the 2000kg mass limit.	Yes	No	Noted	CS-23 Amendment 5 has also a weight limit (CS 23.2005(a)). The VTOL category focuses on distributed propulsion (>2 lift/thrust units) thus would not be applicable to the AW609.

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164	TCCA (B Harvey)	VTOL.2005		What is the rationale for the 2000 kg limit?		no	No	Noted	See Explanatory Note 9
165	GAMA	VTOL.2005	3	GAMA is concerned that EASA has made several fundamental changes to the baseline CS-23 material which will limit future applicability. The applicability of CS-23 to aircraft weighing up to 8618 kg with up to 19 passengers while EASA has limited the SC-VTOL to 2000 kg and 5 passengers. Limiting the SC-VTOL in this manner will result in significant issue, especially with respect to a 2000 kg limit. Under the CS-23 framework there are several key differentiators (airworthiness levels 1-4, high-speed/low-speed, etc.) that have been used historically.	It would seem more appropriate for EASA to leverage the concept of airworthiness levels 1-4 that were used to define vehicle risk under CS-23. Perhaps EASA should consider creating a new differentiator for VTOL (such as vertical take-off and landing capable) which would allow VTOL aircraft to fit more neatly into CS-23 or would allow an SC-VTOL to include similar differentiators.	Yes	Yes	Not accepted	See Explanatory Note 9
166	Boeing	VTOL.2005 (a)	3	THE PROPOSED TEXT STATES: <i>(a) Certification with this small category Special Condition applies to an aircraft with a passenger seating configuration of 5 or less and a maximum certified take-off mass of 2 000 kg or less.</i>	REQUESTED CHANGE: Boeing requests to change the passenger seating and maximum certified take-off mass to align with 14 CFR Part 23 / CS-23 limits. JUSTIFICATION: The passenger seating and maximum certified take-off mass seem arbitrary. Boeing would like to understand the rationale for setting the limit at 2000kg and 5 passengers, rather than Part 23 limits.		yes	Not accepted	See Explanatory Note 9
167	CAA NZ	VTOL.2005(a)		Noting that the aircraft classificatiosn differ from CS-23 what is the rationale for selecting a maxiumum of 5 passengers as a cut-off for the applicability of this SC? If an applicant with a design for 6 passengers but was still under the 2000 kg limit, what impact would this have on the safety requirements? (e.g. A piloted aircraft designed for 5 passengers would most probably accommodate 6 passengers if the same aircraft were designed to be be remotely piloted – but it would fall outside of the scope of this SC).		Yes	No	Noted	See Explanatory Note 9
168	Aidan Reilly	VTOL.2005		<i>Size</i> No rationale is given for the changes to seating and mass limits here as compared to CS-23 and CS-27. Without justification, why not use the limits from CS-27 or CS-23 without modification?				Accepted	The limits will be aligned with CS-27

VTOL.2005 [link to type of operations](#)

Explanatory Note 10:

A direct relationship between airworthiness and types of operations already exist, for example when certifying for VFR or IFR operations. Introducing this additional link allows proportionality in safety objectives and enables to apply the highest safety levels of Category Enhanced to protection of third-parties when flying over congested areas and when conducting commercial air transport of passengers. The operational rules can then be built on demonstrated aircraft safety levels and adapted as necessary to local particularities. The limitations will be introduced in the “Basic” Aircraft Flight Manual and in the Type Certificate Data Sheet, documents that are typically re-issued by validating authorities, thus enabling other authorities to deviate from the EASA approach as they wish.

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169	David LoebI, AutoFlightX	VTOL.2005	3	<p>Although we think that the introduction of different categories is reasonable, we are concerned about the hard link between airworthiness requirements and operations problematic since</p> <ol style="list-style-type: none">1) Later changes of operational requirements would require an adaption of the certification basis and the type certificate. This results in considerably more work compared to a change of only OPS. This2) The limitation of CAT only to category enhanced leads to a disadvantage/discrimination compared to commercial rotorcraft operations, where the more stringent category A is only required for operation over hostile congested environment.3) Although this might be a practicable way for EASA member states, this also forces non-EASA contries that follow this SC to also incorporate the related operational requirements, although different boundary conditions would allow for relaxed operational constraints.4) In general, it contradicts the Basic Regulations (EC), that stipulate a separation of airworthiness and operation.	<p>I urge to remove the OPS limitations in the categorization and instead deal with operational requirements in dedicated OPS specifications.</p> <p>“...Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category;”</p>	Yes	Yes	Not accepted	See Explanatory Note 7 and Explanatory Note 10. VTOL aircraft intend to perform operations beyond what rotorcraft are achieving today thus it is not deemed that the increased safety objectives for the Category Enhanced will lead to inequalities.

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170	Philipp Reiß, FSD	VTOL.2005	3	<p>This paragraph contradicts in general with the Basic Regulation (EC) that prescribes a separation of airworthiness and operation.</p> <p>A hard link between airworthiness requirements (EC No 216/2008, Article 5) and operations (EC No 216/2008 Article 8) not good, because</p> <ul style="list-style-type: none"> - This forces non-EASA countries to follow that SC to incorporate the related operational requirements, although this limitation would not be necessary in other countries. - If operational requirements change at a later stage the certification basis, the type certificate and operational requirements need to be updated again. Which is a significant increase in workload compared to, if only the OPS need to be updated. - If this SC is compared to commercial rotorcraft operations this is a discrimination of eVTOLs. For rotorcraft category A is only necessary for operation in hostile congested environment. So for rotorcraft CAT is also possible in category B if the operation is not above hostile congested areas. 	<p>We suggest to remove the OPS limitation</p> <p>“...Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category;”</p>	Yes	Yes	Not accepted	See Explanatory Note 7 and Explanatory Note 10. The certification basis records the assumptions existing at time of certification and does not necessarily need to be updated in front of new operational rules. VTOL aircraft intend to perform operations beyond what rotorcraft are achieving today thus it is not deemed that the increased safety objectives for the Category Enhanced will lead to inequalities.
171	ACI EUROPE		3	<p>VTOL.2005 Certification of small category VTOL aircraft (b)(1) and (2)</p> <p>The proposed categorisation in (b)(1)“enhanced” and (b)(2) “basic” risks the mixing of both product and operational requirements. This should be avoided in order to maintain the required differentiation between product and operational requirements as intended by the New Basic Regulation Reg. (EU) 2018/1139. The separation of both these aspects is also important in order to allow continued development and updating of rules that serve different purposes. Interlinking these purposes – in this case operational and product requirements – might render the development of VTOL/eVTOL aircraft more difficult.</p> <p>A clear separation of product requirements and operational requirements should be maintained. Any operational requirements should be dealt with in a separate OPS AMC or GM part and not in a regulation prescribes airworthiness standards for the issuance of the type certificate.</p>	<p>Proposed change:</p> <p>(b) The aircraft must be certified in one or both of the following categories:</p> <p>(1) Category Enhanced: the aircraft is capable of continued safe flight and landing after critical malfunction of thrust/lift. Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category;</p> <p>(2) Category Basic: the aircraft is capable of a controlled emergency landing after critical malfunction of thrust/lift.</p>	yes	yes	Not accepted	See Explanatory Note 10

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172	Embraer S.A.	VTOL.2005		<p>The criteria of the classification of VTOL categories should be based on the purpose and the specific area of the aircraft operation. An aircraft carrying out commercial operation over congested areas has a different risk acceptance to the community compared to the same aircraft carrying out commercial operation over non-congested areas or carrying out noncommercial operation over congested areas.</p> <p>Embraer believes that the classification of the aircraft as “Enhanced”, both purposes (intended for operations over congested areas and for Commercial Air Transport (CAT) operations) should be required simultaneously.</p>	<p>Embraer suggests to change the paragraph to:</p> <p>(b) The aircraft must be certified in one or both of the following categories:</p> <p>(1) Category Enhanced: the aircraft is capable of continued safe flight and landing after critical malfunction of thrust/lift. Aircraft intended for operations over congested areas and for Commercial Air Transport (CAT) operations of passengers must be certified in this category;</p> <p>(2) Category Basic: the aircraft is capable of a controlled emergency landing after critical malfunction of thrust/lift and:</p> <p>(i) intended for non-commercial operations over congested areas or</p> <p>(ii) intended for Commercial Air Transport (CAT) operations of passengers over non-congested areas;</p>	YES	YES	Not accepted	See Explanatory Note 10. The objectives take into account the risk of particular activity to be conducted by VTOL aircraft, including whether persons other than flight crew are carried on board, and in particular whether the operation is open to members of the public, and to what extent third parties or property on the ground could be endangered by the activity.
173	VELICA	VTOL.2005 (b) (1)		<p>VELICA recommends deleting the sentence “Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category. “</p> <p>This Special Condition is a certification requirement. You cannot imagine what the Operational rule may be in the future.</p>				Not accepted	See Explanatory Note 10
174	Volocopter	VTOL.2005(b)(1)		<p>SUBSTANTIVE OBJECTION:</p> <p>This proposed Special Condition, to be used as Certification Basis for TC projects, includes hard limitations from OPS side. Hard-wiring operational limitations to the Type Certificate of a product within its state of design generates a precedence that goes beyond the area of responsibility of EASA, when the state-of-design TC forms the basis for any international TC validation.</p> <p>In addition, hard-linking OPS to the TC basis establishes inflexibility to a future improvement process. To change this definition a modification of 5 approvals would be required: Cert Basis, TC, TC validations, OPS regulation, OPS approval. Doing it the established way requires to just update local OPS regulations and OPS approval, which is feasible.</p> <p>See attachment to this comment sheet for further detailing.</p>	Strongly requested to delete the second sentence of VTOL.2005(b)(1) ('Aircraft intended for operations ...')	No	Yes	Not accepted	See Explanatory Note 10. The certification basis records the assumptions existing at time of certification and does not necessarily need to be updated in front of new operational rules.

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175	Dr Terry Martin, Project Director, UAV Traffic Management Consortium Singapore	VTOL.2005		OPS requirements vary significantly between the different states. Introducing hard linkages between OPS and TC via the primary TC basis extends this limitation to a significant number of countries beyond EASA member states, and making future adoption to changing operational needs significantly more complex than it needs to be.	See below suggestions		Objection	Not accepted	See Explanatory Note 10
176	Dr Terry Martin, Project Director, UAV Traffic Management Consortium Singapore	VTOL.2005(b)(1)			The VTOL.2005(b)(1) wording “Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category” should be removed from this type certification SC and included in the applicable VTOL Operational Requirements.	Suggestion		Not accepted	See Explanatory Note 10
177	EAS/ N Rostedt	VTOL.2005 Certification of small-category VTOL Aircraft	3	Remove the references in (b) to Operations over congested areas or for Commercial Air Transport.	These operations based limitations should preferably be contained in the relevant OPS requirements rather than the SC.	Suggestion	Substantive	Not accepted	See Explanatory Note 10
178	Vertical Aerospace	VTOL.2005(B)(1)		We disagree that all commercial air transport operations must be certified to Category Enhanced as this is not in line with the types of operations allowed under Commission Regulation 965/2012. Such a move would put these vehicles at a disadvantage to some types of operation with passengers carried out by small CS23 and non-CAT A CS27 aircraft. We fully support that any vehicle intent on operation over congested areas must be Category Enhanced regardless of the type of operation.	It is suggested that the Category Enhanced be limited to “Aircraft to be used for operations over congested areas”	Suggestion	Objection	Not accepted	See Explanatory Note 10. VTOL aircraft intend to perform operations beyond what rotorcraft and aeroplane are achieving today thus it is not deemed that the increased safety objectives for the Category Enhanced will lead to inequalities. Please note that the Category Enhanced relates to commercial air transport of passengers rather than commercial operations at large.
179	Diamond Aircraft Industries GmbH	VTOL.2005		Subparagraph (b)(3): Early applications will be simple cargo delivery systems with limited cargo mass and economic value .	a redefinition of CAT to allow operation with Category Basic aircraft is considered beneficial or remove direct link between CAT and Enhanced Category requirements.	no	yes	Noted	Category Enhanced relates to commercial air transport of passengers rather than commercial operations at large thus the aircraft could be certified in the Category Basic if intending to perform cargo transport over non-congested area.
180	Airbus Group	2005 (b)(1)		It is written ‘Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this (Enhanced) category’. Although this requirement is of an Air Operations nature we consider that it is very important to be kept in order to limit the use of this SC.	Keep this requirement as part of this SC, either under requirement VTOL.2005(b)(1) (as it is) or transferred into a cover explanatory note but still fully part of this SC.		X	Noted	-

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181	Komisarenko A. 21J.416 HoA	Subpart A, VTOL.2005 (b)	---	Basic Regulation provides separation between operational and certification requirements. Independent operational requirements allows to respond flexibly for various options of aircraft operation in various conditions. Requirement VTOL.2005 (b) provides fixed connection between technical type and required type of its operation. This can lead to additional unreasonable effort in type certification. Provision of operational limitations in type certification requirements looks contradictory to the Basic Regulation.	Remove requirement for kind of operation from definition of technical categories to be certified. VTOL.2005 (b): The aircraft must be certified in one or both of the following categories: (1) Category Enhanced: the aircraft is capable of continued safe flight and landing after critical malfunction of thrust/lift. Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category; (2) Category Basic: the aircraft is capable of a controlled emergency landing after critical malfunction of thrust/lift.	no	yes	Not accepted	See Explanatory Note 10
182	Ingo Konrad, Daimler AG	VTOL.2005	3	Much needed flexibility for the continued development of VTOL aircraft and services is taken away by linking operational requirements with the certification basis, i.e. mandating that VTOL need be certified as 'Enhanced' if providing CAT services.	We support un-coupling operational requirements from the certification basis.	no	yes	Not accepted	See Explanatory Note 10
183	AEROMOBIL	VTOL.2005 (b) (1)		AEROMOBIL recommends deleting the sentence "Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category." This Special Condition is a certification requirement. You cannot imagine what the Operational rule may be in the future.				Not accepted	See Explanatory Note 10
184	FAA/AIR	2000(b)(3)	3	Commercial operations are defined in the FAA operating rules and the operating rules are the place for additional requirements on an aircraft because of a specific operation.	FAA continues to have conversations on commercial operations and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it used in safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition		Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.

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185	FAA/AIR	2005(b)	3	Enhanced and Basic appear intended for commercial and personal operations. While we agree with the concept, and the idea that commercial aircraft should provide the safety to fly away after a critical failure; creating new terminology is confusing. Also, these are typically required in the operational rules, not the certification rule for small aircraft.	FAA continues to have conversations on this concept and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it is used in the safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	Y	N	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several levels of the organisation 6 months prior to the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
186	GAMA	N/A	General Comment	GAMA is extremely concerned that EASA has created an 'enhanced' category for commercial operations. The CS-23 materials were developed with specific intention to include both commercial or non-commercial vehicles as type certified aircraft should be eligible for either kind of operation and over the life of an aircraft, it is anticipated that it might operate either commercially or non-commercially. Inferring an operational link in the design regulations is short-sighted and EASA should include any operating concerns in the operating rules under which a commercial operation might be approved. Imposing additional criteria for commercial operations over and above the baseline requirements for CS-23 is a significant concern for GAMA because these baseline rules were already developed with commercial operations in mind.	GAMA believes that EASA should remove the enhanced category and basic category and should instead consider proper means of compliance based on airworthiness levels and VTOL characteristics. GAMA does not believe EASA should link operational details to the design of these vehicles, relevant operating concerns should be taken care of under commercial operational approvals.	Yes	Yes	Not accepted	See Explanatory Note 10
187	GAMA	VTOL.2000(b)(2)-(3)	3	EASA should not mix operational issues with the design specifications. There are many operational issues that need to be addressed, depending on the nature of the VTOL operation and addressing these issues in an operational specific operational context.	EASA should consider a special condition in an EASA OSD format which would contain operational assumptions for the EU environment but which would allow for a clean TC that can allow EU manufacturers to export VTOL around the world. Tying some operational issues within the design requirements will result in an overly complicated regulatory environment and confusing and complicated TC data as the EU operational environment evolves.	Yes	Yes	Not accepted	See Explanatory Note 10

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188	GAMA	VTOL.2005	3	GAMA is extremely concerned that EASA has created an ‘enhanced’ category for commercial operations. The CS-23 materials were developed with specific intention to include both commercial or non-commercial vehicles as type certified aircraft should be eligible for either kind of operation and over the life of an aircraft, it is anticipated that it might operate either commercially or non-commercially. Inferring an operational link in the design regulations is short-sighted and EASA should include any operating concerns in the operating rules under which a commercial operation might be approved. Imposing additional criteria for commercial operations over and above the baseline requirements for CS-23 is a significant concern for GAMA because these baseline rules were already developed with commercial operations in mind.	GAMA believes that EASA should remove the enhanced category and basic category and should instead consider proper means of compliance based on airworthiness levels and VTOL characteristics. GAMA does not believe EASA should link operational details to the design of these vehicles, relevant operating concerns should be taken care of under commercial operational approvals.	Yes	Yes	Not accepted	See Explanatory Note 10. VTOL aircraft intend to perform operations beyond what aeroplane are achieving today thus it is not deemed that the increased safety objectives for the Category Enhanced will lead to inequalities.
189	CAA NZ	VTOL.2000(b)(2)		Introducing the concept that operations over a “congested area” is sufficient to delineate the “Enhanced Category” is agreed with.		Yes	No	Noted	-
190	CAA NZ	VTOL.2005 (b)(1)		Has any consideration been given to separating the “Category Enhanced” considerations of “flight over congested areas” and “commercial air transport” such that a commercial air transport (cargo only) operating over non-congested areas could have reduced safety requirements?		Yes	No	Accepted	The Category Enhanced relates to commercial air transport of passengers
191	Aidan Reilly	VTOL.2005		<i>Intended</i> The term ‘intended’ here is problematic. Designers could intend that an aircraft be used only for category basic operations, but there is nothing here to stop an operator using it other than how the designers intended. It would be clearer to simply state: “only aircraft certified under Category Enhanced will be permitted to be used for CAT and / or operation over congested areas”.				Noted	Work has started in parallel to develop specific VTOL operational aspects to complement the vehicle certification

VTOL.2005 continued safe flight and landing

Explanatory Note 11:

“Continued safe flight and landing” has different meanings in the different CS. For the SC VTOL Category Enhanced, it has been deemed that a sufficient safety level is reached if the aircraft retains the capability to return and land safely at the point of departure or continue and land safely at the original intended destination or a suitable alternate vertiport. The information to be able to accomplish this planning will be requested to be included in the aircraft flight manual. A remaining climb capability will be proposed in the AMC, similarly to what is requested for Category A rotorcraft, as well as some minimum parameters for the “continued” aspect. For Category Basic, it will be sufficient to be able to perform a controlled emergency landing. See Explanatory Note 5 and Explanatory Note 6 for additional considerations.

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192	Sam Bousfield	VTOL.2005 (b) 1	1	if the vehicle is traveling at low altitude within a city, it is unlikely that any loss of thrust/lift would actually allow safe landing in a congested area.	A slow descent with vehicle parachute and audible and visual warnings to people below would seem the more likely way to mitigate these circumstances.	no	yes	Not accepted	Some remaining climb capability will be requested for Category Enhanced
193	THALES	VTOL.2500/c	21	FC preventing CSFL = CAT : Might be overdemanding it if implies to go at the initial destination and landing without inducing injuries to occupants (AMC 25.1309 accepts some "serious or fatal injuries to a relatively small number of occupants" for Hazardous severity).	Detail what "safe flight and landing" means (duration, range , landing site...)	Observation	Substantive	Noted	Minima accepted for “Continued safe flight and landing” will be considered for the AMC
194	Lilium Gmbh	VTOL. 2000 (b)		The definition of ‘continued safe flight and landing’ should not be attached to a landing location, but should continue to ensure that sufficient flight characteristics and systems remain available for the aircraft to be landed in any suitable location determined appropriate at the pilot’s discretion	Revise to read: ‘continued safe flight and landing’ means an aircraft is capable of continued controlled flight and landing possibly using emergency procedures, without requiring exceptional piloting skill or strength;		Yes	Partially accepted	For Category Enhanced, it is deemed that diversion vertiports need to be identified in advance for suitability and the necessary information needs to be included in the aircraft flight manual, similar to established practices in other aircraft categories. It will be also requested that sufficient flight characteristics and systems remain available.
195	Lilium Gmbh	VTOL.2005 (b)(1)		This requirement combines airworthiness and operational considerations.	Revise to read: ‘continued safe flight and landing’ means an aircraft is capable of continued controlled flight and landing possibly using emergency procedures, without requiring exceptional piloting skill or strength;		Yes	Partially accepted	Paragraph VTOL.2005(b)(1) does not include the definition of “Continued safe flight and landing”. See above for the proposed definition.
196	W Field LMWL Yeovil	General		Has the change from the use of “continued safe flight and landing” to “controlled emergency landing” been included to refer to autorotation? This seems to be assuming that the configurations will be unable to operate in plane mode. Where is autorotation and automatic autorotation intended to be covered?	Additional definitions This could usefully be mentioned within the SC. Or is it considered that the types of configurations in this weight category will not include non redundant numbers of lift mechanisms? The term “if applicable” could be used.	YES	NO	Noted	Additional definitions will be included. See Explanatory Note 6 for considerations on autorotation.

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197	Airbus Group	2000(b)(1)		'Continued safe flight and landing' is defined as continued controlled flight and landing at an operating site but operating site is not defined. This has potential to increase the burden beyond current airplane and rotorcraft requirements in that a designated emergency landing zone may not be considered an operating site. This would essentially require that Category Enhanced aircraft are always capable of landing at the target destination or an alternate.	Replace 'operating site' by 'suitable site allowing emergency landing' or 'appropriate site allowing emergency landing'	X		Partially accepted	"operating site" will be replaced by an airworthiness term. See Explanatory Note 5.
198	Sikorsky	VTOL.2005.b.1	3	"Continued safe flight and landing" is not adequately defined. For how long should 'safe flight' be continued, and at what degradation of control capability or altitude? Would autorotation be an acceptable form of 'safe flight and landing' for Enhanced Category certification (current best practice today)?	Clarify definition to include measurable time and control degradation values, and compare against current autorotation standards	No	Yes	Accepted	Minima accepted for "Continued safe flight and landing" will be considered for the AMC
199	GAMA	VTOL.2000(b)(1)	3	Redefining continued safe flight and landing to include a landing at an 'operating site' is far too limiting. Even the CS-25 regulations don't impose this kind of restriction. The definition of continued safe flight and landing which was developed for CS-23 was created with full understanding of the implications to aircraft safety and reliability.	Including such a dramatic limitation, 'operating site', is an unacceptable change. The definition of continued safe flight and landing should be maintained as it was originally defined in CS-23 Amd 5.	Yes	Yes	Partially accepted	"operating site" will be replaced by an airworthiness term. See Explanatory Note 5.
200	Aidan Reilly	VTOL.2000		<p><i>Continued safe flight and landing</i></p> <p>The definition of 'continued safe flight and landing' does not specify whether or not damage to the aircraft is permitted in case of an emergency landing - see CS-23.2000:</p> <p><i>'Continued safe flight and landing' means an aeroplane is capable of continued controlled light and landing, possibly using emergency procedures, without requiring exceptional pilot skill or strength. Upon landing, some aeroplane damage may occur as a result of a failure condition.</i></p> <p>It is unfortunate that the decision to highlight changes naturally hides deletions.</p> <p>If damage to the aircraft is not permitted to occur upon emergency landing, then many tilt-rotor configurations are effectively banned, because failure of the tilt actuators in aeroplane mode for most tilt-rotor configurations would inevitably result in rotor-strike during landing, as tilt-rotor configurations do not generally have sufficient ground clearance to land in aeroplane mode.</p>				Noted	Damage upon landing will be allowed for Category Basic.

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201	Aidan Reilly	VTOL.2000		<i>Continued safe flight and landing</i> The specification that the landing occurs “at an operating site” is unclear. For example, a VTOL aircraft suffering from a transition failure may become incapable of a vertical landing, but remain capable of safe flight and landing like a fixed wing aeroplane.				Noted	Damage upon landing will be allowed for Category Basic.

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VTOL.2005 critical malfunction of thrust/lift

Explanatory Note 12:

The term “critical malfunction of thrust/lift” was introduced to mirror “loss of critical engine” used for other CS. However for VTOL aircraft distributed propulsion results in the lift/thrust system being tightly integrated with other systems, such as the flight control system, which will also affect “continued safe flight and landing” or the “controlled emergency landing”. It was thus decided to remove the term “critical malfunction of thrust/lift” term and drive all objectives through the system objectives, e.g. VTOL.2500 and VTOL.2510, or through the AMC on “continued safe flight and landing” and “controlled emergency landing”.

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202	William Branch	VTOL.2005 (b)	3	Critical Malfunction should be limited to single point failures. I assume this is implied, but maybe should be spelled out.	Either add a dinition for “critical malfunction of thrust/lift” or add the word “single” in front of Critical.	Yes	?	Noted	See Explanatory Note 12. For Category Enhanced, single failures and failure conditions not extremely improbable will need to be considered.
203	Adrian Eves	General		The documents do not define what a ‘critical malfunction of thrust/lift’ actually is in relation to a multi-rotor eVTOL.	Define critical malfunction of thurst and or lift	yes	yes	Noted	See Explanatory Note 12
204	Rolls-Royce	VTOL.2005	3	Critical malfunction of thrust is not defined and is significant in terms of adherence and interpretation of these regulations. It is therefore considered that this definition is required. A helicopter today cannot continue safe flight after a rotor failure so is this condition saying that ALL failures must be tolerated within this requirement?	Add a definition of critical malfunction of thrust	Yes	Yes	Noted	See Explanatory Note 12 and Explanatory Note 20
205	Manfred Hajek, TUM	VTOL.2005 (b)(1)		Critical malfunction is addressing multi-rotor or multi-propeller configuration producing vertical thrust. A malfunction could occur in a propeller/rotor, motor, power line, battery etc. I understand that only “survivable” single failures (no catastrophic failures) are meant.	Clarify	Yes	No	Noted	See Explanatory Note 12. For Category Enhanced, single failures and failure conditions not extremely improbable will need to be considered.
206	Dr Terry Martin, Project Director, UAV Traffic Management Consortium Singapore				The Enhanced and Basic definitions should be changed to better align with the approach taken for CS-23.2005 Amdt 5, which defines <i>certification</i> levels based on number of passenger seats, and <i>performance level</i> based on speed capabilities. They have already defined the certification levels to some extent (via AMC VTOL.2510) and the existing Enhanced and Basic definitions would be suitable performance level definitions (performance based on capability following critical malfunction of thrust/lift).	Suggestion		Partially accepted	Levels in AMC VTOL.2510 will be redefined to better align with CS-23 and take into account the VTOL particularities.
207	Kopter Group	VTOL.2115(c)	5	How is a critical malfunction of thrust/lift defined ? The failure of a critical part typically means that controlled flight and landing is not possible; is this also the case for critical malfunctions?	Please clarify.	yes	no	Noted	See Explanatory Note 12

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208	Vertical Aerospace	VTOL.2005(b)(1)		Could EASA confirm that there will be guidance on the definition of “critical malfunction of thrust/lift”? For an e-VTOL this would be a complete failure of the battery system to provide power, which would be covered by the CAT safety targets. This comment also applies to other sections where this terminology is used.	It is suggested that a clarification of “critical malfunction of thrust/lift” be included. It is suggested that the clarification be similar to “critical engine” as defined in CS definitions.	Suggestion	N/A	Noted	See Explanatory Note 12
209	Embraer S.A.	VTOL.2005(b) VTOL.2115(c) VTOL.2120(b) VTOL.2140(c) VTOL.2435(h)		The paragraphs identified require to consider the critical malfunction of thrust/lift. However, Embraer understands the meaning of the term “critical malfunction of thrust/lift” is not clearly defined.	Embraer suggests to EASA to better define the meaning of the term “critical malfunction of thrust/lift” creating specific AMC.	YES	NO	Noted	See Explanatory Note 12
210	SAFRAN	VTOL.2435(h)	19/26	Please explain what is a ‘critical malfunction’	N/A	YES		Noted	See Explanatory Note 12
211	Karem Aircraft, Inc.	VTOL.2005 (b)	3	“Critical malfunction of thrust / lift” requires definition, and could be overly prescriptive if broadly defined. Critical malfunction or failure of thrust / lift is a recurring theme throughout the SC. This also appears in paragraphs 2115 (c), 2120 (c), 2135 (a), and VTOL.2405 (b)	We propose that, for Category Enhanced, the aircraft must be capable of continued safe flight and landing after a likely, critical malfunction of thrust / lift, such as a motor failure, drive failure, battery back failure, or blade strike / bird strike incident. “Critical malfunction” should not apply to structural components designed to be flight-critical, such as rotors, hubs, and bearings, if it can be demonstrated that required levels of safety are achieved.	Yes	Yes	Partially accepted	See Explanatory Note 12 and Explanatory Note 20
212	Airbus Group	2005(b)(1)(2)	3	“after critical malfunction of thrust/lift” → critical malfunction of thrust/lift on multirotor or distributed propulsion system is not as easily defined as on helicopters where the critical failure of the critical power unit (so the one critical engine over the one or two engines available) is considered.	Further define critical malfunction of thrust/lift on VTOL. One clarification is possible at least in case of isolated thrust/lift systems : it is suggested the following definition: “critical malfunction means the loss or loss of control of one thrust/lift system, if thrust/lift systems are demonstrated to be isolated”	x		Noted	See Explanatory Note 12

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213	Airbus Group	2005(b)(1)(2)	3	critical malfunction of thrust/lift: Critical is usually associated to Catastrophic while here the intention seems just to address the loss of a single engine/motor. Background/scope talk of “distributed lift/thrust units.” So “critical malfunction” should be defined in an absolute manner Same resolution than VTOL.2005 Several instances of “critical malfunction of thrust/lift” appear (VTOL 2120, etc)	reword VTOL.2005(a)(1): critical malfunction of thrust/lift unit Such a rewording would be acceptable for aircraft tolerant to a single failure. Nevertheless some concepts are fitted with many thrust/lift units and are very resilient considering “critical malfunction”. So “critical malfunction” should be defined in an absolute manner Same resolution than VTOL.2005	X	X	Noted	See Explanatory Note 12
214	ADS	VTOL.2005	3	Critical malfunction of thrust is not defined and is significant in terms of adherence and interpretation of these regulations. It is therefore considered that this definition is required. A helicopter today cannot continue safe flight after a rotor failure so is this condition saying that ALL failures must be tolerated within this requirement?	Add a definition of critical malfunction of thrust	Yes	Yes	Noted	See Explanatory Note 12
215	Sikorsky	VTOL.2005.b.1	3	“Critical malfunction” not adequately defined. To what level of loss of thrust/lift would define that term?	Clarify definition to include quantitative loss of lift.	No	Yes	Noted	See Explanatory Note 12
216	FAA/AIR	2000(b)		Critical is used throughout the document. Typically a critical failure or malfunction prevents “continued safe flight and landing”. Is this how they are intending it to be interpreted?	Clarification	Y	Y	Noted	See Explanatory Note 12
217	FAA/AIR	2005 (b)	2	States the following: “(1) Category “Enhanced”: the aircraft is capable of continued safe flight and landing after critical malfunction of thrust/lift . Aircraft intended for operations over congested areas or for Commercial Air Transport (CAT) operations of passengers must be certified in this category; or (2) Category “Basic”: the aircraft is capable of a controlled emergency landing after critical malfunction of thrust/lift .” What is a critical malfunction? Is this any single failure or does it include likely combination of failures.	What would be a critical malfunction of thrust/lift?.	Y	N	Noted	See Explanatory Note 12

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218	Transport Canada – NAC Engineering – F&HM	VTOL.2000(b), VTOL.2005(b)	3/26	<p>The notion of “critical malfunction of thrust/lift” is used in VTOL.2005(b) and throughout the SC, however isn’t defined. Given the integration of thrust/lift function with other aircraft functions (flight control via thrust/lift, power source used for thrust/lift as well as other aircraft functions) it is imperative this notion be defined also in relation with VTOL.2510 definitions of failure criticality, single vs multiple failures, etc. to avoid potential conflicts between standards. For example, is a critical malfunction one which requires an immediate action to land the aircraft or is it a failure which prevents continued safe flight and landing/controlled landing?</p> <p>Noting the flight control is integral to thrust / lift, the notion should extend to flight controls as well.</p>	Add in VTOL.2000(b) or VTOL.2510 a definition of “critical malfunction of thrust/lift”, with due consideration for inherent impact on flight control.	No	Yes	Noted	See Explanatory Note 12
219	Transport Canada – NAC Engineering – F&HM	VTOL - General	n/a	Throughout the SC, there are multiple references to “failures” and “malfunctions”. In other available guidance material, “failures” are usually defined as including both “loss of function” and “malfunctions”. In this SC, the terms “failure” and “malfunction” seem to be used interchangeably, which could create confusion given other industry guidance that has different usage.	Consider revising SC for consistency of usage of the terms “failure” and “malfunction”, and harmonizing with other available AMC material.	No	Yes	Noted	See Explanatory Note 12
220	TCCA (B Harvey)	VTOL.2005		The ASTM standards use the verbiage “critical loss” vs “critical malfunction”. I would propose that this SC use the same verbiage, as the loss of thrust may not be due to a malfunction in the classical sense (ie. bird strike, mid-air collision etc.)	Replace Critical malfunction to critical loss.	no	Yes	Not accepted	In some of the configuration being proposed, the loss of lift/thrust may not be the most critical failure as the lift/thrust unit may also perform a control function. For example a frozen RPM may be more critical. See also Explanatory Note 12.
221	CAA NZ	VTOL.2005 (b)(1)		The rationale for explicitly mentioning “....thrust/lift” in this requirement is not understood. Is the intention to be this explicit or not? If not, and without adversely affecting the intent of the requirement, is it possible to delete text so that it only refers to a “...critical malfunction of thrust/lift .”? Of note is that VTOL.2215(c) refers to “....aircraft system, component or thrust/lift unit.” Could the same text be introduced into VTOL.2005 if it is not intended to explicitly mention “thrust/lift” alone?		Yes	No	Accepted	See Explanatory Note 12
222	CAA NZ	VTOL.2005 (b)(2)		Same comment as for #6 above.		Yes	No	Noted	See Explanatory Note 12
223	Aidan Reilly	VTOL.2005		<p><i>Critical malfunction of thrust/lift</i></p> <p>This is not defined. See earlier comment regarding configurations having separate lift and thrust units.</p>				Noted	See Explanatory Note 12

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VTOL.2005 other

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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224	ANAC	VTOL.2005(a)	3	There should be a limit on aircraft performance, e.g., maximum airspeed such as current Part 23. Looks like the removal of CS 23.2160(b) to (d) in the proposal already considers such a restriction.	VTOL.2005(a) Certification with this small category Special Condition applies to aircraft with a passenger seating configuration of 5 or less and a maximum certified take-off mass of 2 000 kg or less, and maximum airspeed inferior to 250 knots or MMO < 0.6.	Yes	Yes	Accepted	SC will be limited to low speed aircraft
225	Airbus Group	2005 (b)	3	It is written ' <i>The aircraft must be certified in one or both of the following categories</i> '. A requirement to certify an aircraft should not be part of a SC.	Write: ' <i>The aircraft may be certified in one or both of the following categories</i> '.	X		Not accepted	The proposed wording would leave the possibility to certify without having selected a category. To be certified under the SC VTOL, the aircraft must be certified against at least one the categories (i.e. minimum acceptable level is Category Basic).
226	ONERA	VTOL.2005(b)(1)	3	"Category Enhanced: " Seems to cover Rotorcraft Category A like specifications. But then, need to clarify singularities so that no unfair competition can arise. This comment can be linked to N°3 if "thrust/lift" with no adjectives means a global system of thrust/lift including the unit itself but also the systems behind.	Especially, promote a global system isolation capability for exemple ? it is to say not only engine as in cat Enhanced we have VTOL.2405 (b) and VTOL.2435 (h) and VTOL.2510 (a) (1)	Yes	No	Accepted	See Explanatory Note 11, Explanatory Note 12 and Explanatory Note 20
227	FAA/AIR	2005		Category Basic is lacking clear information on its operation limitations. Can this operation over congested areas, but not for hire?	Clarification is required.		Y	Noted	Category Enhanced is intended for operations over congested area, regardless of hiring status
228	FAA/AIR	2005(b)(1-2)		Please define what "critical malfunction of thrust/lift" means. Why was "propulsion system" changed to "thrust/lift system"? I would interpret this to meaning a malfunction associated with the power, motor, inverter, propellers, or tilting mechanism associated with the propulsion system. If this interpretation is correct, why limit the definitions of this part to only propulsion malfunctions? For example, the propulsion system could be operating correctly but the control laws driving them could be flawed resulting in a similar condition that is not addressed.	Suggest using wording similar to VTOL.2135, "with likely flight control or thrust/lift malfunctions".	Y	Y	Partially accepted	Failures have been extended to all system. See Explanatory Note 12.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
229	TCCA (LD Germain)	VTOL.2000(a) & VTOL.2005(a) and (b)		<p>Categorisation</p> <p>The term that EASA suggests to use is ambiguous. The term found in VTOL.2000(a) is “person-carrying VTOL aircraft in the small category. The title of VTOL.2005 states “small-category VTOL”. The term found in VTOL.2005(a) is “small category”. The two possible categories are “category enhanced” and “category basic”.</p> <p>Then, further in the special condition, the terms “category enhanced” and “category basic” are used.</p>	<p>The ambiguity lies in what a “category” is. In this case, “category enhanced” and “category basic” should be “levels”, as they are called in CS 23 amdt 5.</p> <p>TCCA recommends to use the same levels as in CS 23 amdt 5, with the following suggestion in order to keep the “VTOL aircraft in the normal category” and “normal category VTOL aircraft” nomenclature while keeping the overall certification and performance levels philosophy of CS 23:</p> <p>VTOL.2000(a)</p> <p>This Special Condition prescribes airworthiness standards for the issuance of the type certificate, and changes to this type certificate, for a VTOL aircraft in the normal category, with lift/thrust units used to generate powered lift and control. Aircraft subject to this Special Condition are not pressurized.</p> <p>VTOL.2005 title</p> <p>Certification of normal category VTOL aircraft</p> <p>VTOL.2005(a)</p> <p>Certification in the normal category VTOL aircraft under this Special Condition</p> <p>VTOL.2005(b)</p> <p>VTOL aircraft levels are:</p> <p>(1) Level Enhanced: ...</p> <p>(2) Level Basic: ...</p> <p>Other: change category to level in VTOL.2105(a)(2)(ii), VTOL.2115(c), VTOL.2120(b), VTOL.2125(a)(2), VTOL.2240(b) and (e), VTOL.2320(b), VTOL.2430(a)(6), VTOL.2500, VTOL.2510(c) and AMC VTOL.2510, VTOL.2600.</p>	no	yes	Not accepted	The terms “small” and “category” mirror CS-27
230	TCCA (LD Germain)	VTOL.2000(a)		AMC VTOL.2510 states that in the basic category, 0 to 1 passenger may be possible, but VTOL.2000(a) states “for a person-carrying VTOL aircraft”, which makes a 0 passenger aircraft not possible.	TCCA recommends to change the VTOL.2000(a) paragraph to remove the words “person-carrying”.	no	yes	Not accepted	A 0-passenger configuration could be a cargo VTOL with pilot on board. AMC VTOL.2510 uses “maximum passenger seating configuration” similarly to CS-23.

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VTOL.2010 Accepted means of Compliance

Explanatory Note 13:

Accepted Means of Compliance on how to meet the objectives of the SC will be developed and, when considered necessary, the most significant ones may be consulted publicly. They will include relevant material from CS-23 and CS-27. As the SC will be applied project by project, the corresponding means of compliance must also be accepted project by project. The term Acceptable Means of Compliance, associated with certification specifications, will be replaced by accepted means of compliance to convey this aspect.

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231	Christian Sturm aerocompany	VTOL.2010		With my experience with CS-23 Amdt. 5 the AMC are really important and only in combination a final practical assessment on project applicability is possible. There will be probably some “AMCs” from CS-27 Amdt. 5	Publish NPA for AMC to VTOL in near future.	Y	N	Accepted	See Explanatory Note 13. Publication will however not take the form of a Notices of Proposed Amendments (NPA) reserved for rulemaking.
232	Embraer S.A.	VTOL.2150(a) VTOL.2200(a) VTOL.2245(a) VTOL.2260 (d) VTOL.2305(b) VTOL.2310(a) VTOL.2320(b) VTOL.2325(a) VTOL.2400(c) VTOL.2430(b) VTOL.2530(b)(d)		The paragraphs identified refer the terms “sufficient” and “sufficiently”. These terms are too vague and do not clearly state the intent of the requirements.	EASA should evaluate the proposal to issue AMC (Acceptable Means of Compliance) to help the applicant to show compliance with the design requirements.	YES	YES	Partially accepted	The terms come from CS-23. See Explanatory Note 13.
233	Rolls-Royce	VTOL.2010	3	Will acceptable means of compliance be issued for this special condition?	Clarify the EASA intent	Yes	No	Noted	See Explanatory Note 13
234	Rolls-Royce	VTOL.2010	3	Allowing certification on an individual project basis will surely increase the administrative workload for the agency? Do you have sufficient resource to manage this? Will this result in different levels of safety for different projects?	Clarify the intent of the regulations as they develop	Yes	No	Noted	See Explanatory Note 13. AMC can also be introduced at project level but should meet the same objectives.
235	Karem Aircraft, Inc.	VTOL 2010 (a)	3	In order for this proposed standard to enable this new type of vehicle to be certified, as EASA is aware, Acceptable Means of Compliance need to be defined.	As a next step, EASA and industry need to work together on defining an Acceptable Means of Compliance for this class of aircraft.	Yes	Yes	Noted	See Explanatory Note 13
236	ANAC	VTOL.2010(a)	3	We understand EASA concern to avoid a second publication of acceptability of ASTM (or other) standard. However, the MoC are all accepted at the project level (the publication of AMC or NoA) are only a public instrument to give visibility and provide certainty to the applicant about which MoC is acceptable by the authority. As the AMC states, it is not the only means to comply with the requirements. The certification plan is the instrument for it.	VTOL.2010 An applicant must comply with this Special Condition using an acceptable means of compliance (AMC) issued by EASA, or another means of compliance which may include consensus standards.	Yes	No	Partially accepted	See Explanatory Note 13

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
237	Airbus Group	2010(a)		The other means of compliance than the ‘consensus standard’ can be proposed by the applicant at project level. What is the process that EASA will use to communicate these AMC to the public is unclear. Adding ‘at project level’ compared to CS-23 amdt 5 is considered adding confusion.	Clarify the process that will be used to communicate to stakeholders the other AMCs used by applicants. Using a reference in the TCDS is not considered compatible with the AMC by nature. Prior consultation is expected to ensure level-playing field.		X	Noted	See Explanatory Note 13. Specific Means of Compliance can always be proposed at project level, also for CS. EASA will apply best practices from CS-23 projects.
238	ADS	VTOL.2010	3	Will acceptable means of compliance be issued for this special condition?	Clarify the EASA intent	Yes	No	Noted	See Explanatory Note 13
239	ADS	VTOL.2010	3	Allowing certification on an individual project basis will surely increase the administrative workload for the agency? Do you have sufficient resource to manage this? Will this result in different levels of safety for different projects?	Clarify the intentions of the regulations as they develop	Yes	No	Noted	See Explanatory Note 13. AMC can also be introduced at project level but should meet the same objectives.
240	ONERA	VTOL.2010	4	" when specifically accepted by EASA <u>at project level</u> ." Unclear. Does it refer to the lack of AMC (e.g for remote piloted or level of autonomy) so that AMC should be provided but will be further discussed in the future? Or, does it refer to the level of design maturity of the aircraft project, so that AMC could be postponed to a lower level if operation are limited in accordance with the authority?		Yes	No	Noted	See Explanatory Note 3 and Explanatory Note 13
241	Sikorsky	VTOL.2010.a	3	The section (and the whole document) lacks quantifiable qualification criteria. Is it EASA’s intent to allow applicants to use compliance criteria from what ever source they deem appropriate, i.e. CS27, CS29, CS23, to meet these special criteria requirements? If so, aircraft certification criteria and levels of safety under this special condition will vary greatly. It also means the applicant has to spend a great deal of time working with EASA early in a program identifying each criterion.	Reword this section to be very specific as to acceptable sources for where certification criterion can come from.	Yes	No	Noted	See Explanatory Note 13
242	Sikorsky	VTOL.2010.a.1	3	Accepting means of compliance at a project level creates opportunity for non-standard application of certification across various configurations, which is not in the interest of public safety.	Further study required to define standardized acceptable means of compliance. Publish acceptable means of compliance document with revised Special Condition.	Yes	No	Noted	See Explanatory Note 13
243	FAA/AIR	2010	2	What is the timeline for the EASA AMC issuance? Can an applicant propose something other than the EASA AMC or consensus standards?		Yes		Noted	EASA will prioritise publication of the AMC that are the most likely to affect significantly the design. The applicants have always the possibility to propose their own means of compliance, however the Agency will then need to evaluate if they are adequate to meet the high level objectives.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
244	TCCA-AVIONICS	Background/Scope and VTOL.2010(a)	2 / 26 And 3 / 26	<p><i>"The Agency may develop acceptable means of compliance to meet the safety objectives, and those may be subject to subsequent public consultation."</i></p> <p>This special condition has been established in the spirit of recent CS amendments, such as CS-23 Amdt. 5. But the prescriptive requirements of the CS-23 Amdt. 4 were moved into ASTM international "consensus standards", which are defined as acceptable MOC in the AMC/GM to CS-23 Amdt. 5.</p> <p>Extensive guidance material, beyond existing AMC/GM for CS-23 Amt 5 or CS-27, would be necessary to address specific VTOL aircraft features. To ensure consistent interpretation and means of compliance across the industry, it would be highly desirable for the VTOL guidance material to be subject to harmonization between certification authorities.</p>	<p>a) EASA to confirm if there is an intention to create a dedicated VTOL AMC/GM before the VTOL SC becomes effective, or how otherwise the necessary guidance on Means of Compliance will be established for VTOL aircraft.</p> <p>b) EASA to consider arranging harmonization discussions on Means of Compliance for VTOL aircraft.</p>	No	Yes	Noted	See Explanatory Note 13. EASA welcomes the offer from TCCA to participate in AMC development.
245	GAMA	VTOL.2010(a)	3	The path of performance-based standards which utilize more specific means of compliance is optimal.	EASA should leave open a path for acceptance of MoC by EASA in more ways than simply at a 'project level'.	Yes	Yes	Noted	See Explanatory Note 13
246	Boeing	VTOL.2010 (a)	3	<p>THE PROPOSED TEXT STATES:</p> <p><i>(a) An applicant must comply with this Special Condition using an acceptable means of compliance (AMC) issued by EASA, or another means of compliance which may include consensus standards, when specifically accepted by EASA at project level.</i></p>	<p>REQUESTED CHANGE:</p> <p>Boeing requests harmonization between FAA and EASA in regards to accepted means of compliance and the use of industry standards.</p> <p>JUSTIFICATION:</p> <p>The FAA has different opinions or issues with parts of the ASTM standard as an AMOC. Boeing would like to understand EASA's approach relative to accepted means of compliance and the use of consensus industry standards.</p>		yes	Noted	See Explanatory Note 13
247	Aidan Reilly	VTOL.2010		What is "acceptable in this context? "Consensus" is also undefined.				Noted	"Acceptable" means that the means of compliance have been found by the Agency to be adequate to meet the high level objectives. This term is used in existing regulations, such as CS-23, as well as the term "consensus".

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SUBPART B - FLIGHT

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
248	FAA/AIR	Subpart B	4	Supports the use of the term “aircraft” throughout the subpart.		Y		Noted	-
249	Transport Canada – NAC Engineering – F&HM	Subpart B	4/26	Subpart B currently contains no standard addressing envelope protection functions which would typically be embedded into flight/thrust/lift functions.	EASA to clarify how compliance aspects associated with envelope protection functions will be addressed under the proposed VTOL SC and associated means of compliance.	No	Yes	Noted	Envelope protection will be considered for the AMC

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VTOL.2100 Mass and centre of gravity

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
250	William Branch	VTOL.2100 (b)	4	Currently says “Must comply with each requirement of this Subpart...”. But some subparts are not required for some combinations or under Basic category.	Change (b) “Must comply with each <u>applicable</u> requirement of this Subpart...”	Yes	Yes	Not accepted	It is already the case in CS-23 that some paragraphs do not apply to all aeroplanes types. “Requirements” should be considered at high level.
251	Rolls-Royce	VTOL.2100	4	Aircraft may change configuration as part of achieving VTOL.	Add “within the aircraft’s range of <i>flight configurations</i> , loading conditions...”	Yes	No	Partially accepted	Will be considered for the AMC
252	ADS	VTOL.2100	4	Aircraft may change configuration as part of achieving VTOL.	Add “within the aircraft’s range of flight configurations, loading conditions...”	Yes	No	Partially accepted	Will be considered for the AMC
253	Aidan Reilly	VTOL.2100		The centre of gravity of the aircraft may change during flight, due to movement of fuel/other fluids, but also due to configuration changes, e.g. for those concepts which transform in some way between VTOL and cruise modes. There may be different limits as a function of the configuration of the aircraft and its phase of flight. Equally, the achievable centre of gravity may be a function of the configuration of the aircraft. Movement of the centre of gravity may have counter-intuitive effects for some concepts.				Noted	Will be considered for the AMC

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VTOL.2105 Performance data

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
254	William Branch	VTOL.2105 (a) (2)	4	“Ambient atmospheric conditions within the operational flight envelope” is undefined (does this mean wind or temperature or other parameter?). Usually operational flight envelope is either Altitude VS Airspeed, or Airspeed VS Load factor (Vn diagram), so if I have a point in my envelope at 1000 meters and 50 m/s what is “ambient” (standard atmosphere or within my density altitude limit). Also I (i) is reserved because of the part 23 copy...but I would delete it as this is a new part. This comment should probably update part 23 when ready for review.	Change (2) standard day atmospheric conditions throughout the operational flight envelope for: (i) Category Enhanced OR the operational flight envelope throughout the certified density altitude limits for: (i) Category Enhanced	Yes	Yes	Noted	Formatting is currently emphasizing the differences with CS-23 but may be updated in later versions. The ambient atmospheric conditions to consider will be detailed in the AMC.
255	William Branch	VTOL.2105 (b)	4	Seems like (b) covers everything (a) does. (b) (1) has a typo. “operating site altitudes” should be “operating flight altitudes”. Both (1) and (2) could be replaced by one requirement “thoroughout desity altitude”.	Change (b) (2) operating <u>flight</u> altitudes from...	Yes	Yes	Noted	CS-23 construction and wording has been retained except for removing the prescriptive 3 048 m (10 000 ft) airport altitudes requirement
256	William Branch	VTOL.2105 (c)	4	Seems like EASA would define a minimum wind gust or turbulence level that all aircraft must meet. But this requirement does not prevent you from doing that anyway.	Consider a 1.3 G gust or a 25 knot cross wind gust on landing...	Yes	No	Noted	Minima for winds, including gusts, will be considered in the AMC
257	William Branch	VTOL.2105 (d)	4	Not sure why “downwash considerations” is required unless you define the levels. If my design cannot handle a 737 aircraft downwash I will limit the aircraft to not follow aircraft by TBD distance. But as long as you are open to manufactures defining the acceptable levels for their aircraft...	Consider defining “Downwash Considerations” in the definitions, even if the definition is “manufacturer will define the downwash limits”.	Yes	No	Noted	“Downwash” is intended to cover effects from the aircraft on itself and has been introduced in harmonisation with the FAA. It will be detailed in the AMC.
258	Rolls-Royce	VTOL.2105	4	Operating sites may be below mean sea level.	References should be changed to “the lowest altitude at which certification is requested under this Special Condition, or mean sea level, whichever is lower.	Yes	No	Not accepted	It is currently accepted that certifying down to sea level also covers the few regions below sea level
259	Lilium Gmbh	VTOL 2105 (a)(2)		Only aircraft certificated in the enhanced category need performance data for the ‘operational flight envelope’. It is unclear why this discriminator is proposed	Clarification from the Agency requested	Yes		Noted	This offers some level of proportionality in the demonstration between categories Basic and Enhanced, similarly to what was accepted under CS-23 between the different levels
260	Lilium Gmbh	VTOL 2105 (a)(2)		It is unclear as to why performance in the operational envelope is required for the Enhanced Category, but performance in the normal envelope for the Basic category would not be required.	Clarification from the Agency requested	Yes		Noted	This offers some level of proportionality in the demonstration between categories Basic and Enhanced, similarly to what was accepted under CS-23 between the different levels
261	EVA	VTOL 2105	4	Which procedures are used to determine the take-off and landing area for an automated VTOL?		NO	NO	Noted	Will be considered for the AMC
262	EVA	VTOL 2105	4	How we define the maximum altitude, each VTOL design can achieve?	Based on the air traffic, it might be the altitude of flights will be defined according to the flight duration/range. So will a maximum altitude be predefined prior to a flight for each flight?	YES	NO	Noted	A maximum altitude will be certified to define the operational capability

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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263	W Field LMWL Yeovil	2105	4	Performance data It is unclear why only the Enhanced category is required to demonstrate performance within the conditions of the operational flight envelope. This distinction is not made in CS23.	All SC VTOL should be required to demonstrate performance throughout the conditions of the operational flight envelope.	NO	YES	Not accepted	This offers some level of proportionality in the demonstration between categories Basic and Enhanced, similarly to what was accepted under CS-23 between the different levels (CS 23.2105(a)(2))
264	Airbus Group	2105(a)	4	Why say still air in (a)(1) and not in (a)(2).	Move still air to (a)	X		Not accepted	CS-23 construction and wording has been retained and corresponding conditions will be detailed in the AMC
265	Airbus Group	2105(b)	4	(b) only applies to (a)(2) and should therefore be part of (a)(2)	Move (b) as part of (a)(2)	X		Not accepted	CS-23 construction and wording has been retained. (a) refers to performance requirements while (b) to performance data.
266	Airbus Group	2105(d)	4	When (b) does not apply (case (a)(1)), not necessary to take those aspects in account ?	Move (a)(2)(d) as part of (a)(2)	X		Not accepted	CS-23 construction and wording has been retained. (a) refers to performance requirements while (d) to performance data.
267	ADS	VTOL.2105	4	Operating sites may be below mean sea level.	References should be changed to “the lowest altitude at which certification is requested under this Special Condition, or mean sea level, whichever is lower.	Yes	No	Not accepted	It is currently accepted that certifying down to sea level also covers the few regions below sea level
268	ONERA	VTOL.2105(a)(2)	4	Not only for Enhanced otherwise unfair competition with CS-23 spirit for basic Cat.	At least use (i) basic cat normal FE (ii) Cat Enhanced operational FE	Yes	No	Not accepted	CS 23.2105(a)(2)(i) covers high-speed aeroplane while the SC is currently restricted to low-speed aircraft
269	ONERA	VTOL.2105(c)	4	“The procedures used for determining take-off and landing area must be executable consistently by flight crew of average skill <u>in atmospheric conditions expected to be encountered in service.</u> ” See also comment 6.	Cat Enhanced : And at every operating site suitable for emergency landing procedures in case of automated procedures.	Yes	No	Noted	Will be considered for the AMC
270	ONERA	VTOL.2105(d)	4	“downwash considerations” : unclear. Download considerations or rotorwash and recirculation. If rotorwash, then operating site risk mitigation should be enounced.		Yes	No	Noted	“Downwash” is intended to cover effects from the aircraft on itself and has been introduced in harmonisation with the FAA. It will be detailed in the AMC.
271	Sikorsky	VTOL.2105.d	4	“Cooling needs” does not full incorporate all potential losses from both passenger and system thermal management systems.	Consider changing wording to ‘thermal management’.	Yes	No	Noted	This will be considered for the AMC
272	FAA/AIR	2105 (a)	3	Title is “Performance Data”, (a) is Performance. See comment above Why is there no “Performance” section (like Part B) and why is this paragraph not included in the AFM part of the SC?		Yes	Yes	Noted	CS-23 construction and wording has been retained

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273	FAA/AIR	2105 (c)	3	Given possible confusion with title, This is unclear. This states that an average pilot must be able to use the prescribed procedures in order to determine a takeoff and landing area. Is this “data” or is this determining that an “average” pilot can consistently perform takeoffs and landings in the atmospheric conditions, etc.?	If “data” make a (3) for (b); renumber as needed	Yes	Yes	Not accepted	CS-23 construction and wording has been retained
274	FAA/AIR	2105(a)(2)	4	See comment 15 above concerning “Enhanced”				Noted	FAA/AIR comment 15 is: Was the rationale for reducing the number of passengers to 5 and the takeoff weight to 2000kg an attempt to address most of the VTOL aircraft so far? Putting it another way, if this is a generic VTOL SC, why restrict future VTOL designs to this weight and number of passengers? See Explanatory Note 9 for the rationale on weight and number of passengers
275	FAA/AIR	2105(c)	4	“...determining takeoff and land area” is awkward. The term “performance” is generic enough to use for VTOL aircraft and follows the title of chapter. It should also be generic enough to account for landing area. Also, flight crew is OK, but small aircraft tend to use the term pilot because few if any of our aircraft are two or more crew. Flight crew is a part 25/29 term.	Recommend changing the term area to performance.			Not accepted	CS-23 construction and wording has been retained with adaptation of “distances” to “area” as is usually done for rotorcraft, e.g. in the term FATO (final approach and take-off area).
276	FAA/AIR	2105(c)		Change “landing area” to “landing performance”. For a generic VTOL SC, these VTOL aircraft may also be able to perform STOVL or CTOL as well and “performance” allows coverage for all of these possibilities.	Change “landing area” to “landing performance”.	Y	Y	Not accepted	CS-23 construction and wording has been retained with adaptation of “distances” to “area” as is usually done for rotorcraft. The term area will cover also distances in case of CTOL.
277	FAA/AIR	2105(e)	4	Some of these new VTOL aircraft will have a limited hover envelope and for reason, the hovering ceiling data should be included in the performance data.	Recommend adding the following new paragraph - (e) The hovering ceiling must be determined over the ranges of weight, altitude, and temperature, if applicable.			Partially accepted	This will be covered by VTOL.2125(b) and related AMC
278	TCCA (LD Germain)	VTOL.2105		For rotorcraft-like missions, where a landing site could be at a much higher altitude than takeoff, a means must be provided to permit the pilot to determine that each engine/motor is capable of developing the power necessary to achieve the applicable performance.	TCCA recommends a rule similar to 27.45(f) be included in the SC VTOL.2105.	yes	no	Partially accepted	Will be considered for the AMC and may include other systems such as batteries

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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279	TCCA (B Harvey)	VTOL.2015		Item (a)(2) is intended for high performance (high speed level 1 and 2) and/or large capacity (7+ pax level 3 and 4) part 23 airplanes. Are enhanced category VTOLs considered high performance? The definition in VTOL.2005 only implies that they must be capable of continued safe flight and landing, and says nothing about performance capabilities.	Remove this paragraph for enhanced category.	yes	No	Not accepted	The comment is understood to refer to VTOL.2105. CS 23.2105(a)(2) provides a level of proportionality with respect to the capacity of the aeroplane. A similar approach has been introduced for Categories Basic and Enhanced.
280	TCCA (B Harvey)	VTOL.2015		<p>Item (b)(1) and (2) effectively say the same thing as (a)(2), making one or the other redundant (ie. At all atmospheric conditions within the flight envelope vs. all altitudes up to maximum, and temperatures above and below standard day).</p> <p>The 10k' altitude limit in CS-23 Amdt 5 (that CS VTOL has replaced with maximum) was intended to cover takeoff and landing at 10k', as it was not envisioned that there would be many airplanes regularly taking off or landing at altitudes above this (similar to the 7k' for rotorcraft). Forcing applicants to produce takeoff data up to maximum certified altitude does not meet the original intent of this rule, would be punitive on applicants, and is not relevant in this case.</p> <p>This comment also applies to VTOL.2130.</p>	Remove redundance and specifically state 10k ft for fixed wings (or horizontal takeoff and landing)	yes	no	Partially accepted	CS-23 construction and wording has been retained. Removing the prescriptive 3 048 m (10 000 ft) airport altitude allows certification to lower maximum altitude if desired by the applicant, for example if operation is foreseen only for coastal cities. The SC has been modified to clarify that it refers to a maximum certified take-off and landing altitude.
281	Boeing	VTOL.2105(d)	4	<p>THE PROPOSED TEXT STATES:</p> <p><i>(d) Performance data determined in accordance with SC VTOL.2105(b) must account for losses due to atmospheric conditions, cooling needs, installation, downwash considerations, and other demands on power sources.</i></p>	<p>REQUESTED CHANGE:</p> <p><i>(d) Performance data determined in accordance with SC VTOL.2105(b) must account for losses due to atmospheric conditions, cooling needs, installation, downwash considerations, and other demands on power sources and power transmission.</i></p> <p>JUSTIFICATION:</p> <p><i>Power transmission losses can be high, particularly when switching power in motor controllers or converting from electric energy to mechanical energy.</i></p>			Partially accepted	At objective level this can be considered to be part of the installation losses and more details will be considered for the AMC

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VTOL.2110 Flight Envelopes

Explanatory Note 14:

“Flight envelopes” were introduced instead of “stall speed” to be more generic and cover a maximum of possible architectures while taking into account VTOL elements, for example advanced flight controls, variable RPM or in-flight reconfigurations. It will include minimum safe speeds when appropriate for the considered aircraft. Having 3 different envelopes provides the possibility to have proportional objectives, for example for controllability. High level definitions will be provided in VTOL.2000 , similar to the definitions from AC 25-7D, with details included in the AMC.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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282	Marco Rizzato	VTOL.2210		Difference between normal and operational envelope is not clear			yes	Noted	See Explanatory Note 14
283	David Loebel, AutoFlightX	VTOL.2110	4	To align this paragraph better with VTOL.2150 (see comment above) it is better to use the terminology “minimum safe speed” which was suggested from FAA FAST Team on the ASTM Workshop on Advanced Aircraft Technology Certification. This is a better performance based suggestion.	VTOL.2110 Minimum safe speed The applicant must determine the airplane minimum safe speed for each flight configuration used in normal operations, including applicable modes and phases of flight. The minimum safe speed determination must account for the most adverse conditions for each flight configuration.			Not accepted	See Explanatory Note 14
284	Philipp Reiß, FSD	VTOL.2110	4	In the ASTM Workshop on Advanced Aircraft Technology Certification FAAs FAST Team introduced the “minimum safe speed”. To align this paragraph better with VTOL.2150 (see next comment) we suggest to use FAAs suggestion.	VTOL.2110 Minimum safe speed The applicant must determine the airplane minimum safe speed for each flight configuration used in normal operations, including applicable modes and phases of flight. The minimum safe speed determination must account for the most adverse conditions for each flight configuration.	Yes	No	Not accepted	See Explanatory Note 14
285	Christian Sturm aerocompany	VTOL.2110 - 2130		Height Velocity Diagram is critical (Dead Man’s Curve)	Define requirements for establishing Height Velocity Diagram for basic and enhanced category. Maybe it helps to define maximum allowable occupants loads in emergency landing. See also 2270.	Y	N	Partially accepted	Will be considered for the AMC
286	Rolls-Royce	VTOL.2110	4	Slow forward flight may be applicable to EVTOL craft as a specific flight condition, e.g. during transition of a tilt wing	Add slow flight as a specific condition to be covered in the listed flight conditions	Yes	No	Partially accepted	The flight envelopes are intended to cover all flight phases, including slow flight if applicable. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
287	Manfred Hajek, TUM	VTOL.2110		Term “operational flight envelope” unclear.	Clarify	Yes	No	Accepted	See Explanatory Note 14
288	Lilium Gmbh	VTOL 2110		The introduction of the normal, operational and limit flight envelope delineations appears to add unnecessary complexity.	Collapse the Normal Envelope into the operational envelope.		Yes	Not accepted	See Explanatory Note 14
289	Vertical Aerospace	VTOL.2110		Could EASA confirm if further clarification will be given on the definitions and distinctions between “Normal” and “Operational” envelopes. The distinction between the two is not currently clear.		Observation	N/A	Noted	See Explanatory Note 14
290	SAFRAN	VTOL.2120	5/26	May you give precision about the difference between “normal” and “operational” flight envelopes?	N/A	Yes		Noted	See Explanatory Note 14

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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291	<i>Diamond Aircraft Industries GmbH</i>	VTOL.2110		Normal, operational and limit flight envelopes for SC-VTOL are only defined indirectly in other requirements.	Please provide a explicit definition of envelopes in VTOL.2000 (b) or via AMC.	yes	no	Accepted	See Explanatory Note 14
292	ANAC	VTOL.2110	4	This proposal changes the requirement substantially from stall speeds to flight envelopes. It is necessary to clearly define what is the normal, operational and limit flight envelope. Moreover, how do they relate to the structural design envelope (VTOL.2200) or manoeuvre and gust envelopes (VTOL.2215). For example, is the idea the same as Figure E-3 from AC 25-7D?	To define each flight envelope cited in the Special Condition and establish a relationship between them. This definition may appear in an AMC. ANAC understands that is a lower level definition, but it is difficult to define a position without an understanding of EASA view on this topic.	Yes	Yes	Noted	See Explanatory Note 14. Structural requirements may indeed define some aspects of the flight envelopes, especially the limit flight envelope.
293	Airbus Group	2110		The SC-VTOL-01 does introduce a new concept of different flight envelopes (normal, operational, limit). This concept does not exist as such neither in CS-23 nor in CS-VLR nor in CS-27. Moreover there is no precise definition of these envelopes and no criteria to pass from one envelope to another. Normally for certification purposes there is one safe envelope defined and demonstrated by the applicant. Operational limitations and procedures provided in the flight manual do permit to remain within the safe flight envelope demonstrated during certification process. Sometimes distinction between a limit and an operational value has been introduced in certification rules but this is for limited cases and for precise parameters (exemple VNE and VMO).	Precise criteria (as far as possible based on precise and measurable data) to define normal, operational and limit flight envelope shall be defined	X		Accepted	See Explanatory Note 14
294	Airbus Group	2110		The wording "hover if applicable" is not understood. A VTOL aircraft shall basically be able to perform hover, if not it is not a vertical take-off aircraft	Remove 'if applicable'	X		Partially accepted	The flight envelopes are intended to cover all flight phases, regardless of design particularities. It could be that some architectures have more efficient climbing flight than OGE hover, leaving the possibility to have different transitions between vertical and forward flight. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
295	ADS	VTOL.2110	4	Slow forward flight may be applicable to EVTOL craft as a specific flight condition, e.g. during transition of a tilt wing	Add slow flight as a specific condition to be covered in the listed flight conditions	Yes	No	Partially accepted	The flight envelopes are intended to cover all flight phases, including slow flight if applicable. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
296	ONERA	VTOL.2110	4	“for each flight configuration used in operations, including take-off, climb, cruise, descent, approach, <u>hover, if applicable, and landing</u> ” . See VTOL.2000 (a) remark. If “if applicable” is conserved, at least think of adding low speed manoeuvres such as proposed and in coherence with subparagraph such as §VTOL.2155.	for each flight configuration used in operations, including take-off, climb, cruise, descent, approach, hover, low speeds manoeuvres including ground handling and taxi , if applicable , and landing	Yes	No	Partially accepted	The flight envelopes are intended to cover all flight phases, including slow flight if applicable. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
297	UK CAA	VTOL.2110		The title “Flight Envelopes” should be grey shaded as it replaces “Stall Speed” in CS-23 Amdt 5.		Yes		Accepted	-

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298	UK CAA	VTOL.2110		There is some potential for confusion between normal, operational and limit flight envelope.	These three terms should be defined in AMC/GM.	Yes		Accepted	See Explanatory Note 14
299	FAA/AIR	2110	4	What are the differences in the 3 flight envelopes?		Y		Noted	See Explanatory Note 14
300	FAA/AIR	2110	4	Consider including minimum safe speed in this section. Some VTOL aircraft are also STOL capable and the minimum speed would then be used in other performance tests.	Revise section to read: “The applicant must determine the normal, operational, minimum safe speed, and limit flight envelope for each flight configuration used in operations, including take-off, climb, cruise, descent, approach, hover, if applicable, and landing. The minimum safe speed and limit flight envelope determination must account for the most adverse conditions for each flight configuration.”			Partially accepted	See Explanatory Note 14
301	FAA/AIR	2110		What is the difference in normal, operational, and limit flight envelopes?	Clarification	Yes	No	Noted	See Explanatory Note 14
302	FAA/AIR	2110		This paragraph contains part 25 concepts (see item 9) that are not defined and may not be appropriate for this type of aircraft. This definition of flight envelope completely misses the concept of modes of flight and only addresses phases of flight. For instance, a VTOL aircraft can climb (phase of flight) in vertical, transition, and forward flight modes and each mode is different aerodynamically, has different power and propulsion requirements and may require different control law schemes to operate safely.	Remove the part 25 concepts and utilise the wording found in part 23 Amendment 23-64 with the FAST team edits. Adopt the concept of modes of flight.	Y	Y	Partially accepted	The flight envelopes are intended to also cover in-flight reconfigurations. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
303	FAA/AIR	General		The terms ‘normal, operational and limit flight envelope’ are directly from part 25 guidance, AC25-7C. Is this appropriate for part 23/27 aircraft? On the part 25 side, these terms and their associated concepts have been, at best, difficult to implement and the concept of Mission Task Elements (MTEs) might be a more appropriate route to take.	Remove this part 25 concept from this Special Condition to keep it more in line with part 23/27 principles and keep from using a concept that, in practice, has not worked very well.	Y	Y	Not accepted	See Explanatory Note 14. It is considered that flight envelopes offer flexibility to include different VTOL elements such as advanced flight controls. Mission Task Elements (MTEs) are being considered in that frame, to meet VTOL.2135, with different levels of controllability and manoeuvrability required for the different envelopes.
304	TCCA – Structures	VTOL.2110	4/26	The terms ‘normal flight envelope, operational flight envelope, limit flight envelope’ are defined in all versions of AC 25-7 Flight Test Guide. It is unclear how to reconcile these terms in this context and we believe they would have to be reconsidered and redefined in the context of the SC to be meaningful in any way.	The following terms need to be clearly defined: 'normal flight envelope', 'operational flight envelope' and 'limit flight envelope'.	No	Yes	Accepted	See Explanatory Note 14

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
305	TCCA (R Brulotte)	VTOL.2105		The definition of or criteria for “operational flight envelope” vs “normal flight envelope” was not included. As a Special Condition, it should include definitions.	Include a definition for “operational flight envelope”.	yes	no	Accepted	See Explanatory Note 14
306	TCCA (LD Germain)	VTOL.2110		From cold temperature experience, environmental conditions that affect the most aircraft operations include outside air temperature, humidity, cold soaked temperature just prior to takeoff (including time of cold soak), and snow.	TCCA suggest a mention in the guidance document for CS.VTOL to include the equivalent of AC 500-006.	yes	no	Noted	Will be considered for the AMC
307	Boeing	VTOL.2110	4	<p>THE PROPOSED TEXT STATES:</p> <p><i>The applicant must determine the normal, operational and limit flight envelope for each flight configuration used in operations, including take-off, climb, cruise, descent, approach, hover, if applicable, and landing. The limit flight envelope determination must account for the most adverse conditions for each flight configuration.</i></p>	<p>REQUESTED CHANGE:</p> <p><i>The applicant must determine the normal, operational and limit flight envelope for each flight configuration used in operations, including take-off, climb, cruise, descent, approach, hover, if applicable, and landing. The limit flight envelope determination must account for the most adverse conditions for each flight configuration.</i></p> <p>In addition to our suggested change, Boeing would like clarification on whether this SC also apply to vehicles that are capable of transitioning between VTOL and fixed-wing operations, or it is applicable to aircraft with exclusively VTOL operations.</p> <p>JUSTIFICATION:</p> <p>For a VTOL SC hover should always be applicable to the flight envelope.</p> <p>It is not clear if this SC also applies to vehicles that are capable of transitioning between VTOL and fixed-wing operations.</p>			Partially accepted	The flight envelopes are intended to also cover in-flight reconfigurations, including transition from vertical flight to fixed-wing horizontal operations. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.
308	CAA NZ	VTOL.2110		Are the terms “normal, operational and limit flight envelope” defined in EASA regulations? These have a significant impact in interpreting the SC requirements and unless clearly defined could lead to differing interpretations.		Yes	No	Noted	See Explanatory Note 14
309	Aidan Reilly	VTOL.2110		Definitions “normal”, “operational” and “limit” should be included.				Accepted	See Explanatory Note 14
310	Aidan Reilly	VTOL.2110		For some proposed configurations, slow flight may have more in common with hover than cruise flight. Suggest amending “hover” to “hover, or slow flight”.				Partially accepted	The flight envelopes are intended to cover all flight phases, including slow flight if applicable. The explicit flight phases coming from CS-23 will be removed, as well as the restriction to the limit flight envelope, to make the objective more generic and details will be provided in the AMC.

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VTOL.2115 Take-off performance

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
311	Lilium Gmbh	VTOL.2115 (a)(1)		This requirement appears to be in conflict with VTOL 2105 (a)(2) which only required the operational envelope to be considered for the Category Enhanced	Clarification from the Agency requested		Yes	Noted	VTOL.2105(a) focuses on atmospheric conditions
312	Lilium Gmbh	VTOL.2115 (a)(3)		The requirement does not specify the obstacle safety margins.	Amend to read: (3) Take-off climb gradient		Yes	Not accepted	Will be addressed in the AMC and will take into account take-off profiles
313	Lilium Gmbh	VTOL.2115 (c)		Critical malfunction of thrust is not defined and therefore its effect on this provision is unknown.	Amend to read: For Category Enhanced, take-off performance must be determined taking into account any likely malfunction of thrust/lift.		Yes	Partially accepted	The Category Enhanced objectives will be detailed in the AMC on “continued safe flight and landing”. See Explanatory Note 12.
314	Vertical Aerospace	VTOL.2115(c)		A lot of VTOL vehicles are likely to be of a multicopter configuration and will have some inherent performance capability following a critical malfunction and that should be determined regardless of the category.	It is suggested that if the aircraft is not capable of continuing a take-off following a critical thrust/lift failure then potential unsafe combinations of height and velocity must be determined.	Suggestion		Partially accepted	Will be considered for the AMC
315	EVA	VTOL 2115	4	Which safety factor should we consider for take-off and landing? Can we vary that based upon the aircraft type?	Vectored thrust designs with wings do not need the same ratio as helicopter style Vtol for safe take-off/landings.	YES	NO	Noted	Will be addressed in the AMC and will take into account take-off profiles
316	Airbus Group	SUBPART B Flight. Performance related paragraphs (2115, 2120, 2125, 2130		There is no reason that performance requirements are not aligned with CS- VLR for VTOLs with a maximum of two occupants and a MTOW of not more than 600Kg, and are not aligned with CS-27 for VTOLs with more than 2 occupants or a MTOW above 600 Kg. Moreover the requirements are even less demanding than what is required by CS-23 amt5. As an example in SC-VTOL-01 there is no requirements for distance to clear by 50ft obstacles with all full integrity of thrust/lift function or to clear by 35ft obstacles with critical malfunction of thrust/lift function while these requirements do exist in CS-23 amt5. In addition some requirements are not precise enough (as an example in 2120: “the design must comply with minimum climb performance”). In the absence of AMC there is no way to know what “minimum” does mean.	Align performance requirements with either CS-27 or CS-VLR (e.g. precise clearance distances with obstacles, minimum climb performance, ...) depending on number of occupants and/or MTOW.			Partially accepted	Will be addressed in the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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317	ONERA	VTOL.2115 (a)	5	Is this sufficient regarding Height/velocity limitations especially when pointing out that hover only <u>may be possible</u> . Especially if you are in Basic Cat where a critical malfunction of thrust/lift can result in a controlled emergency landing.	Otherwise in dedicated § in "Flight Envelopes" need to add : If there is any combination of height and forward speed, including hover if applicable, under which a controlled emergency landing after applicable critical malfunction of thrust/lift cannot be made, a limiting heightspeed envelope must be established, including all pertinent information. Regarding VTOL.2115(c) one can understand that this can also be addressed in (b) for Cat Basic.	Yes	No	Partially accepted	Will be considered for the AMC. For (c) CS-23 construction has been retained with some adaptation to VTOL.
318	FAA/AIR	2115	5	There can be more variables in this section than you are accounting for in the top level rule. On the other hand, the current part 23 is too prescriptive to address the variables. The original EASA draft language for this section in the part 23 rulemaking ARC provides the best compromise. This language allows for both your personal (basic) and commercial (enhanced) requirements.	Recommend using language like the original EASA draft CS-23 proposed or the FAST language as follows: "The applicant must determine takeoff performance accounting for flight envelope and obstacle safety margins. Aircraft designed for continued flight after a critical loss of thrust must determine takeoff performance and account for performance after the loss of thrust."			Partially accepted	The Category Enhanced objectives will be detailed in the AMC on "continued safe flight and landing". See Explanatory Note 12.
319	FAA/AIR	2115		Uses part 25 concepts that may not be appropriate. Suggest using slightly modified version of 23.2115 may read better.	Remove part 25 concepts from the Special Condition. Suggest using slightly modified version of 23.2115 may read better.	Y	Y	Not accepted	See Explanatory Note 14
320	FAA/AIR	2115 (b)	4	If pilots have to be able to determine the procedures needed as in 2105(c), then they should also be able to perform the TO or L without undue concentration, skill, etc.	Add: "Takeoffs and landings must be executable consistently by pilots of average skill in atmospheric conditions expected to be encountered in service."	Yes	Yes	Partially accepted	CS-23 construction and wording has been retained and corresponding conditions will be detailed in the AMC
321	Transport Canada – NAC Engineering – F&HM	VTOL.2115 VTOL.2120	4-5/26	Unlike the CS-23 equivalent, VTOL.2115 is lacking a definition of what are the takeoff performance parameters for a VTOL aircraft; only stating considerations for determining performance. Similarly VTOL.2120 is lacking a definition of climb performance objectives for a VTOL aircraft.	Revise VTOL.2115 and VTOL.2120 to include definition of relevant takeoff / climb parameters.	No	Yes	Not accepted	Will be addressed in the AMC and will take into account take-off profiles
322	Transport Canada – NAC Engineering – F&HM	VTOL.2115(c) VTOL.2120(b)(2)	5/26	Unclear what is the scope of failures to be considered in determination of takeoff performance, and climb requirements. Single failures of thrust/lift/control? Linked to lack of definition of "critical malfunction".	EASA to clarify intent of these paragraphs with respect to scope of failures to be considered. The definition of "critical malfunction" is required.	No	Yes	Noted	The Category Enhanced objectives will be detailed in the AMC on "continued safe flight and landing". See Explanatory Note 12.
323	GAMA	VTOL.2115(c)	5	The philosophy of CS-23 includes the provision for aeroplanes to consider the likely failures which might result in a critical loss of thrust.	SC-VTOL should similarly require that all VTOL consider likely failures which will result in a critical loss of thrust, stability or lift. This issue is already addressed by VTOL.2115-VTOL.2135 and can be removed from this section.	Yes	Yes	Accepted	The Category Enhanced objectives will be detailed in the AMC on "continued safe flight and landing". See Explanatory Note 12.

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324	Aidan Reilly	VTOL.2115		Clarity is needed as to the scope of take-off. For configurations that transition between VTOL and cruise modes, does take-off include the accelerating transition manoeuvre? Is there a rejected take-off requirement? It would seem sensible for the regulation to include explicit requirements for the transitions.				Noted	Will be addressed in the AMC and will take into account take-off profiles
325	Aidan Reilly	VTOL.2115		Downwash or other exhaust effects may impact upon persons and property on the ground (e.g. parked aircraft). Data as to slipstream / exhaust velocity and temperature as a function of distance from the aircraft, speed, and configuration should be provided to ensure that pilots can avoid injury to people and / or damage to property. This is especially important given the implication that Category Enhanced aircraft will be operated from relatively small “Vertiports”.				Noted	Will be considered for the AMC

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VTOL.2120 Climb requirements

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
326	Tine Tomazic	VTOL.2120	5	Minimum climb performance per CS-23 Rev5 for single or twin airplanes?		yes		Noted	Will be provided in the AMC
327	William Branch	VTOL.2120	5	You do not define the minimum climb performance then I assume it is acceptable for the manufacturer to define their minimum. CS-23 defines a climb gradient, you should define a climb rate for VTOL. I am planning on 3 m/s climb rate is that acceptable? 2125 seems to cover it all, not sure 2120 is required.	Define a minimum for all aircraft.	Yes	No	Partially accepted	Will be provided in the AMC
328	Rolls-Royce	VTOL.2120 VTOL.2125	5	The vehicle must comply with minimum climb requirements – these are not defined. Is it expected that these will be defined as part of VTOL.2115	Define minimum climb gradients for departure and approach using a similar method to rotorcraft regulations and require these to be met even in failure cases.	Yes	Yes	Partially accepted	Will be provided in the AMC
329	Lilium Gmbh	VTOL.2120		Is the context of minimum climb performance the paragraph appears diluted by the subordinate changes.	Replace with the following text: The applicant must demonstrate and publish the minimum climb performance out of ground effect: (a) with all engines operating and in the initial climb configuration(s): (b) after a likely malfunction of thrust/lift on multi-engine aircraft (c) reserved		Yes	Accepted	The VTOL SC is limited to distributed propulsion configurations. See Explanatory Note 1. Details on failures to take into account for the Category Enhanced will be provided in the AMC on “continued safe flight and landing”. See Explanatory Note 12.
330	Lilium Gmbh	VTOL.2120 (a)		Category Enhanced certification should not require demonstration of the normal flight envelope since this is understood that normal flight envelope is completely covered by the operational flight envelope	Amend 2120 (a) to say; (a) in the normal flight envelope; or		Yes	Not accepted	While it is correct that the normal flight envelope is completely covered by the operational flight envelope, this wording clarifies that additional objectives are associated with the Category Enhanced
331	Vertical Aerospace	VTOL.2120		Please could EASA confirm that the minimum acceptable performance will be defined in an AMC?	We would expect that the SC would require at least a positive rate of climb must be possible.	Suggestion	N/A	Partially accepted	Will be addressed in the AMC
332	ADS	VTOL.2120 VTOL.2125	5	The vehicle must comply with minimum climb requirements – these are not defined. Is it expected that these will be defined as part of VTOL.2115	Define minimum climb gradients for departure and approach using a similar method to rotorcraft regulations and require these to be met even in failure cases.	Yes	Yes	Partially accepted	Will be provided in the AMC
333	ONERA	VTOL.2120 (2)	5	For specific architectures like vectored thrust/lift system, all configuration changes might be addressed if critical malfunction can occur in such climb flight cond.		Yes	No	Partially accepted	Will be addressed in the AMC
334	UK CAA	VTOL. 2120		Normal flight envelope (para a) v’s operational flight envelope (para b)?	See point 4 above.	Yes		Accepted	See Explanatory Note 14

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
335	FAA/AIR	2120	5	There can be more variables in this section than you are accounting for in the top level rule. On the other hand, the current part 23 is too prescriptive to address the variables. The original EASA draft language for this section in the part 23 rulemaking ARC provides the best compromise. This language allows for both your personal (basic) and commercial (enhanced) requirements.	Recommend using language like the original EASA draft CS-23 proposed or the FAST language as follows: “The applicant must demonstrate minimum climb performance at each weight, altitude, and ambient temperature within the operating limitations using the procedures published in the flight manual. Aircraft designed for continued flight after a critical loss of thrust must determine climb performance and account for performance after the loss of thrust.”	Yes	No	Partially accepted	See Explanatory Note 12
336	FAA/AIR	2120	5	Uses part 25 concepts that may not be appropriate. Suggest using slightly modified version of 23.2120 may read better because it is not clear in its engine out requirements as written.	Remove part 25 concepts from the Special Condition. Suggest using slightly modified version of 23.2120 may read better because it is not clear in its engine out requirements as written	Y	Y	Partially accepted	See Explanatory Note 12. For Category Enhanced, all systems affecting continued safe flight and landing will be considered.
337	TCCA (B Harvey)	VTOL.2120		What is the minimum climb performance? CS 23.2120(a) at amendment 5 lists the required climb gradients for the various certification levels (ie. 8.3% for low speed level 1s (6.7% for seaplanes/amphibs), 4% for high perf level 1/2, all level 3 and single engine level 4..	TCCA recommends that climb gradient values be included in CS-VTOL as well to ensure sufficient climb capability for obstacle clearance (8.3% for Basic, 4% for enhanced?).	no	yes	Partially accepted	Will be provided in the AMC
338	TCCA (B Harvey)	VTOL.2120		CS 23.2120(b) includes climb gradient requirements following critical loss of thrust. They are applicable to enhanced category (as they are capable of continued safe flight and landing, and having some climb capability remaining would be prudent).	Include a climb gradient as per CS 23.2120(b).	no	Yes	Partially accepted	Will be provided in the AMC
339	Boeing	VTOL.2120	5	THE PROPOSED TEXT STATES: <i>The design must comply with minimum climb performance out of ground effect:</i>	REQUESTED CHANGE: We request EASA to provide clear guidance material (GM) and / or acceptable Means Of Compliance (MOC) for the highlighted text “minimum climb performance”. JUSTIFICATION: Boeing would like to understand what the minimum climb performance requirements are. Thus, we request clear guidance what the term means.			Accepted	Will be provided in the AMC

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VTOL.2125 Climb information

Explanatory Note 15:

This objective aims at determining climb and/or descent performance for integration in the aircraft flight manual. Some failure conditions will need to be considered and will be part of the “continuous safe flight and landing” and “controlled emergency landing” AMC. The VTOL ceiling may include hovering ceiling but also the ceiling for performing transitions between vertical and horizontal flight, as applicable, and will be detailed in the AMC.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
340	William Branch	VTOL.2125 (a)	5	CS-23 section 2125 states “with critical loss of thrust” this intent should still be in place for this section. This should be applicable for both categories.	Change (a) (3) to: (3) with critical loss of thrust.	Yes	Yes	Partially accepted	See Explanatory Note 15
341	Lilium Gmbh	VTOL.2125 (a)		Category Enhanced certification should not require demonstration of the normal flight envelope since this is completely covered by the operational flight envelope	Amend 2120 (a) to say; (a) in the normal flight envelope; or		Yes	Not accepted	While it is correct that the normal flight envelope is completely covered by the operational flight envelope, this wording clarifies that additional objectives are associated with the Category Enhanced
342	Lilium Gmbh	VTOL.2125 (b)		This provision should be targeted only at Category Enhanced to be consistent with other performance requirements	Amend 2125 (b) to say; (b) For Category Enhanced, the VTOL ceiling, in and out of ground effect, where applicable, must be determined within the operational flight envelope.		Yes	Not accepted	The ceiling may be linked not only to performance but also to stability thus the objective is established for both categories
343	W Field LMWL Yeovil	2125 (a) (2)	5	Climb information “for Category Enhanced, in the operational envelope” should also include “following a critical loss of thrust” either here or in a follow on line.		YES	NO	Partially accepted	See Explanatory Note 15
344	Airbus Group	SUBPART B Flight. Performance in hover		There is no requirement for performance in hover conditions. For a VTOL aircraft, it is essential in terms of safety that hovering ceiling (in ground effect and out of ground effect) being determined and published in the flight manual for the range of weight, altitude and temperature for which certification is requested.	Require hovering ceiling (in ground effect and out of ground effect) to be determined and published in the flight manual for the range of weight, altitude and temperature for which certification is requested.		X	Partially accepted	See Explanatory Note 15
345	Airbus Group	SUBPART B Flight. Performance in hover		There is no requirement for establishing a limiting height-velocity envelope. Any VTOL will have a combination of height and speed under which a safe landing cannot be performed in case of failure of the thrust/lift function. Even architecture with distributed lift/thrust will at one point face this situation (except if the associated failure conditions are shown to be extremely improbable). This will be particularly critical for high and hot conditions.	Requirement for determination of a limiting height-velocity envelope for the range of weight, altitude, temperature for which certification is requested should be implemented.		X	Partially accepted	Will be considered for the AMC
346	ONERA	VTOL.2125(a) (3)	5	For coherence with initial CS-23 philosophy and regarding coherence with VTOL.2120	(2) for Category Enhanced : in the operational envelope; and (3) after critical malfunction of thrust/lift.	Yes	No	Partially accepted	See Explanatory Note 15
347	UK CAA	VTOL.2125		See point 5 above.	See point 4 above.	Yes		Accepted	See Explanatory Note 14

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
348	FAA/AIR	2125	5	There can be more variables in this section than you are accounting for in the top level rule. On the other hand, the current part 23 is too prescriptive to address the variables. The original EASA draft language for this section in the part 23 rulemaking ARC provides the best compromise. This language allows for both your personal (basic) and commercial (enhanced) requirements.	Recommend using language like the original EASA draft CS-23 proposed or the FAST language as follows: “The applicant must determine climb performance at each weight, altitude, and ambient temperature within the operating limitations using the procedures published in the flight manual. Aircraft designed for continued flight after a critical loss of thrust must determine climb performance and account for performance after the loss of thrust.”			Partially accepted	See Explanatory Note 15
349	FAA/AIR	2125		Uses part 25 concepts that may not be appropriate. Suggest using slightly modified version of 23.2125 may read better because it is not clear in its engine out requirements as written.	Remove part 25 concepts from the Special Condition. Suggest using slightly modified version of 23.2125 may read better because it is not clear in its engine out requirements as written	Y	Y	Partially accepted	See Explanatory Note 12. All systems affecting continued safe flight and landing or a controlled emergency landing will be considered.
350	TCCA (LD Germain)	VTOL.2125(b)		The VTOL ceiling IGE and OGE are not climb information requirements. They are performance and controllability envelopes. For rotorcraft, they are hover performance (named Performance at minimum operating speed in CS 27.49), and climb is not possible at that ceiling.	Move VTOL.2125(b) to VTOL.2110(b), or create a Performance at minimum operating speed section.	no	yes	Partially accepted	CS 23.2125 addresses “climb and/or descent performance” thus hover performance is considered to fit in that objective. It will however be detailed in the AMC that controllability may also affect VTOL ceiling determination.
351	TCCA (B Harvey)	VTOL.2125		CS 23.2125 required single engine climb performance (ie. “Following a critical loss of thrust”). What is the rationale for not requiring this from VTOLs? Is it because multi-engine/motor VTOL is a possibility.		no	No	Noted	See Explanatory Note 15

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VTOL.2130 Landing

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
352	Tine Tomazic	VTOL.2130 (b)	5	Approach and Landing speeds are not enough.	Add “Approach paths (steepness)		yes	Not accepted	CS-23 construction and wording has been retained and the term “procedures” is deemed to cover approach paths
353	William Branch	VTOL.2130 (b)	5	Balked landing is a go around – this would only apply to Category Enhanced aircraft. The requirement to define the max landing area still applies to Category Basic though.	Change (b) to: the approach and landing speeds, configurations, and procedures, which allow a flight crew of average skill to land within the published landing area consistently and without causing damage or injury, and which allow for a safe transition to the balked landing conditions (Category Enhanced) or emergency landing conditions (Category Basic).	Yes	Yes	Not accepted	A balked landing should still be possible for a Category Basic aircraft with all systems functioning, for example if during the approach the landing area becomes unavailable (wildlife, ground traffic...)
354	Luftfahrt-Bundesamt	VTOL.2130		Landing: If this SC is for VTOL, it is not understood why landing distances should be determined.		Yes	Yes	Noted	SC VTOL refers to landing area
355	Christian Sturm aerocompany	VTOL.2130		Is it necessary to define emergency landing?	?	Y	N	Noted	It will be addressed in the relevant objectives AMC
356	Vertical Aerospace	VTOL.2130(b)		It is anticipated that some VTOL aircraft will have landing procedures where a final descent to the landing site is made quite rapidly (akin to the AV-8 Harrier vertical landing). This is a decision point at which the pilot has committed to the landing and baulking would still result in contact with the ground.	It is proposed to add a decision point to this section to read “... which allow for a safe transition, prior to the Landing Decision Point being reached, to the baulked-landing conditions”	Suggestion	N/A	Partially accepted	Will be considered for the AMC
357	EVA	VTOL 2130	5	As we land in a smaller area 5x2(m*2), will it be always needed a vertiport to land? Can’t we land on private gardens/parking lots in case of a non congested area?		NO	NO	Noted	See Explanatory Note 5
358	W Field LMWL Yeovil	2130	5	Landing Is the term “flight crew” used instead of “pilot” or “pilot operator” to line up with changes to the Ops rules? It does not seem to be a necessary change. This change has been made through many of the paras of this document. However, this document still uses “piloting skills”.	The term pilot and use of the term piloting skills are preferred.	YES	NO	Noted	This adaptation was made to allow compatibility with remote piloting or different levels of autonomy. See Explanatory Note 3.
359	Airbus Group	2130	5	Flight parameters and altitude is redundant unless altitude is not a flight parameter.		X		Accepted	“altitude” will be removed
360	Airbus Group	2130 Landing		There is no requirements in terms of landing performance and associated publication in the flight manual in case of a malfunction which would lead to the incapacity to perform a vertical landing (hover). In such a case minimum rate of descent speed and best angle of glide speed should be determined and published in the flight manual.	In case of malfunction leading to the incapacity to perform a vertical landing (hover), minimum rate of descent speed and best angle of glide speed should be determined and published in the flight manual.		X	Partially accepted	Will be considered for the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
361	ONERA	VTOL.2000 (a)	3	<p>“for a person-carrying VTOL aircraft in the small category, <u>with lift/thrust units used to generate powered lift and control.</u>” If considering also the “hover if applicable” and “hover flight may be possible” used in the text.</p> <p>Does then VTOL.2130 (b) is sufficient to ensure hover capability is correctly covered by this SC in case of aircraft willing to address specific operating site procedures demanding for hover capabilities, which can be the case especially in Enhanced cat.</p>		Yes	No	Noted	The term “procedures” in (b) is deemed to encompass such cases and will be detailed in the AMC
362	FAA/AIR	2130	5	<p>Same concern about the use of the term area as above. Distance, for landing, has a long history and aligns with other sections better. Furthermore, some VTOL aircraft can land conventionally and the requirements should capture that feature. We believe that your use of “flight parameters” might include modes and configurations. That makes some sense. We still believe that weight is critical to performance.</p>	<p>Recommend replacing the term “area” with distance. Also, recommend revising as follows:</p> <p>“The applicant must determine the following, at critical combinations of weight and altitude, accounting for flight modes and configurations, within the operational limits:</p> <p>(a) the distance required to land and come to a stop, assuming approach paths applicable to the aircraft; and</p> <p>(b) the approach, transition, if applicable, and landing speeds, configurations, and procedures, which allow a pilot of average skill to land within the published landing distance consistently and without causing damage or injury, and which allow for a safe transition to the balked-landing conditions, accounting for the minimum safe speed.”</p>	Y	Y	Not accepted	CS-23 construction and wording has been retained with adaptation of “distance” to “area” as is usually done for rotorcraft, e.g. in the term FATO (final approach and take-off area). It is deemed that the more generic term “area” can also cover cases of aircraft having the possibility to perform a CTOL. This will be detailed in the AMC. The generic term “flight parameters” will cover weight, altitude, flight modes and configurations.
363	FAA/AIR	2130		<p>Change ‘area’ to ‘performance’. These VTOL aircraft may also be able to perform STOVL or CTOL as well and “performance” allows coverage for all of these possibilities.</p> <p>Need to include the concept of flight modes to fully address a landing from forward flight through transition to hover mode, as applicable in a VTOL landing.</p>	<p>Change ‘area’ to ‘performance’.</p> <p>Need to include the concept of flight modes to fully address a landing from forward flight through transition to hover mode, as applicable in a VTOL landing.</p>	Y	Y	Not accepted	CS-23 construction and wording has been retained with adaptation of “distance” to “area” as is usually done for rotorcraft, e.g. in the term FATO (final approach and take-off area). It is deemed that the more generic term “area” can also cover cases of aircraft having the possibility to perform a CTOL. This will be detailed in the AMC.
364	FAA/AIR	2130 (b)	4	The approach and landing speeds, configurations, and procedures, which allow a flight crew of average skill to land within the published landing area consistently and without causing damage or injury, and which allow for a safe transition to the balked-landing conditions	Do you need to say this? If needed break out into another subparagraph if you want to talk about the safe landing part of “continued safe flight and landing” in the event of a failure	Y	N	Noted	CS-23 construction and wording has been retained with adaptation of “distance” to “area”. The details of “continued safe flight and landing” will be addressed in the AMC.
365	FAA/AIR	2130 Landing	5	Will all VTOL aircraft be limited to landing at only published landing areas? VTOL aircraft than don’t have a helicopter rotor system (e.g. semi rigid) may have an increased tendency for dynamic rollover on a sloped landing areas.		Y	N	Noted	See Explanatory Note 11 and specific AMC may need to be developed to address slope landing

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366	TCCA (B Harvey)	VTOL.2130		A VTOL be required to demonstrate safe transition to a balked landing at any point in the approach.	Include a balked landing requirement during approach	no	yes	Accepted	This is deemed to be covered by (b) and will be detailed in the AMC
367	Aidan Reilly	VTOL.2130		The landing area will be a function of configuration and failure state. Consideration should be given to amending “area” to “areas”.				Noted	CS-23 construction and wording has been retained with adaptation of “distance” to “area”. Similarly to aeroplane, different areas for different conditions could be envisaged.
368	Aidan Reilly	VTOL.2130		See previous comment: Downwash or other exhaust effects may impact upon persons and property on the ground (e.g. parked aircraft). Data as to slipstream / exhaust velocity and temperature as a function of distance from the aircraft, speed, and configuration should be provided to ensure that pilots can avoid injury to people and / or damage to property. This is especially important given the implication that Category Enhanced aircraft will be operated from relatively small “Vertiports”.				Noted	Will be considered for the AMC

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VTOL.2135 Controllability

Explanatory Note 16:

The controllability and manoeuvrability objectives will be tailored to the different flight envelopes and possible failures in the AMC.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
369	Nick Tudor	VTOL.2135	5	The following “without requiring exceptional piloting skills,” implies that some piloting skills are always required. Does this mean that there is a definition of the minimal piloting skills required upon which systems developers can rely? NB This implication is in a number of other paragpahs but this seems the most appropriate place to comment. In particular, see VTOL.2405 where flight crew (pilot(s)?) may have a means to over ride flight/lift control . This implies a level of skill beyond ‘normal’.	Need to have some definition of the minimal piloting skills required, or change the wording to remove the ‘exceptional’ aspects.	Yes	Yes	Noted	CS-23 construction and wording has been retained with adaptation for the flight envelopes
370	ACI EUROPE		5/6	VTOL.2135 Controllability This section only covers pilot skills but does not mention any requirements regarding pilotless (automated or autonomous) flying.	Consider including Controllability requirements for remote piloting and autonomous flying.	yes	no	Noted	See Explanatory Note 3
371	Embraer S.A.	VTOL.2135(a)(3)			Embraer would like to request to EASA to clarify what are the “thrust/lift system malfunctions” to be considered in the analysis to demonstrate compliance with the requirement.	NO	NO	Partially accepted	All systems will be considered and failures to consider detailed in the AMC. See Explanatory Note 12.
372	Rolls-Royce	VTOL.2135		CS-27 requires a minimum capability of 17 knots from all azimuths, why would this not be applicable to eVTOL aircraft in the enhanced category?	Define a minimum requirement for the enhanced category. CS-27 seems a good starting point.	Yes	Yes	Partially accepted	Minima will be detailed in the AMC
373	Rolls-Royce	VTOL.2135		Given the enhanced category may operate in an urban canyon environment, there is no requirement to demonstrate capability of the aircraft to manage this? Will these limits be imposed on operating sites instead? Where will this be defined? Gust loading today would be approximately equivalent.	Clarify whether requirement for tolerance of urban canyon vortices etc will be placed on vehicle, operating site, or both.	Yes	Yes	Noted	This will be considered for the minima in the AMC. Rules for the operating sites are outside the scope of this SC.
374	NEOPTERA	VTOL.2135 (a) (5)		“electronic flight control system” If aircraft have direct (mechanical) flight control system?		Observation	substantive	Noted	Material from existing CS will be provided in the AMC to cover these cases
375	NEOPTERA	VTOL.2135 (a) (6)		Operating in urban areas would conduct to complex wind conditions in force and distribution: gust, shear, vortex. The terms “Wind velocities” would suggest a uniform wind uniform wind.		Observation	objection	Accepted	The objective has been made more generic by removing “velocities” and “from all azimuths”. Details will be provided in the AMC.
376	Lilium Gmbh	VTOL.2135 (a)(5)		The level of degradation should be bounded	Amend 2135 (a)(5) to read: (a)(5) In all approved degraded electronic flight control system operating modes; and		Yes	Not accepted	The AMC will clarify the failures to consider

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377	Lilium Gmbh	VTOL.2135 (a)(6)		The sentence is not correctly integrated into the paragraph grammatically. The provision should also make it clear it is aimed at the landing manoeuvre. It should also be a demonstrated figure and not a limit.	Amend to read: (6) in wind velocities during landing from zero to a wind velocity appropriate to the aircraft type, from all azimuths. The demonstrated wind velocity must be published in the Aircraft Flight Manual.		Yes	Partially accepted	The objective has been reworded. The flight conditions and associated limitations will be detailed in the AMC.
378	SAFRAN	VTOL.2135	6/26	Controllability of the aircraft has to be analysed ‘with likely flight control or thrust/lift system malfunction’ → ‘thrust/lift system malfunction’ could mean any failure or combination of failure of the powerplant system and maybe very extensive. Does it address the complete failure of the powerplant system ? This SC addresses aircraft that are not able to perform an autorotation or a controlled glide in the event of a loss of power.	N/A		YES	Noted	All systems will be considered and failures to consider detailed in the AMC. See Explanatory Note 12.
379	W Field LMWL Yeovil	2135 (a) (3)		“with likely flight control or thrust/lift system malfunction” is not understood. Likely is a term that can be easily misunderstood as it has possible definitions including numerical probabilities from system safety activity.	“with credible flight control or thrust/lift system malfunction”. Credible can be defined in terms of combinations eg combinations limited to 2 or 3 etc within the AMC/GM materials. This comment is not limited to this single para, but is applicable to several paras in this document.	NO	YES	Noted	All systems will be considered and failures to consider detailed in the AMC. See Explanatory Note 12.
380	Airbus Group	2135(a)		The wording of this paragraph could lead to VTOL operations with an unacceptable level of risk. It cannot be acceptable on a safety point of view that within the certified flight envelope (which includes the limit flight envelope) manoeuvrability and controllability of the VTOL do request an exceptional piloting skills, alertness or strength.	The wording should be modified as follow: "The aircraft must be controllable and manoeuvrable, without requiring exceptional piloting skills, alertness, or strength in the whole flight envelope"		X	Not accepted	The limit flight envelope is outside of the operational flight envelope (similar difference as between Vd and Vne) so no operation should have an unacceptable level of risk
381	Airbus Group	2135(a)(5)		It is not necessary to assume electronic flight controls.	Omit assumption that flight controls are electronic. Suggest "In all degraded flight control system modes".	X		Accepted	-
382	Airbus Group	2135(a)(5)		A probability should be attached to the requirement for performance in "degraded" flight controls since there will always be a non-zero probability that the electronics will suffer a complete catastrophic failure.	Suggest "In all degraded flight control system operating modes that are not shown to be extremely improbable."		X	Partially accepted	The AMC will clarify the failures to consider
383	Airbus Group	2135(a)(6)	6	Is a constraint on the flight envelope and should be given in 2110.	Transfer (a)(6) to 2110	X		Not accepted	Wind velocities are considered in CS 27.143 “Controllability and manoeuvrability”. This objective is the SC VTOL equivalent.

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384	Airbus Group	2135 (a)(6) controllability with wind		<p>The wording of this paragraph is creating a situation of unfair competition with rotorcraft (either CS-VLR or CS-27). Requirement for hovering capacity with wind up to at least 17kts from all directions has always been considered as an essential safety requirement for aircraft with hovering capabilities. Relaxing the requirement in the SC-VTOL-01 will lead to decrease the level of safety because of the wording: "in wind velocities from zero to a wind limit appropriate for the aircraft type".</p> <p>Since the origins of the FAA Parts 27/29 requirements for rotorcraft certification the 17kts minimum wind requirement has been established based on consideration that below the 17kts value the wind will by essence be variable both in terms of force and direction (so difficult to anticipate for the pilot during hovering, take-off and landing). While at 17kts and above the wind is generally more stable in force and direction and in any case the wind direction is easily detectable by the pilot to allow him to perform hover, take-off and approach with front wind.</p> <p>Not requiring VTOL to be controllable and manoeuvrable in hover with wind up to at least 17kts from all directions is a major safety concern.</p>	Align VTOL.2115 (a)(6) requirements with either CS-27 or CS-VLR depending on number of occupants and/or MTOW.			Partially accepted	Minima will be considered in the AMC. It may be however that the steady 17 knots requirement will need to be adapted, for example to take into account variable RPM rotors that need to accelerate before they can provide control to counteract a gust.
385	Airbus Group	2135 (d)	6	In what flight envelope does this apply? Obviously not Limit FE, starting from the limit makes a high risk of exceeding the limit.	To be precised in which flight envelope the requirement applies.	X		Partially accepted	This will be detailed in the AMC
386	ADS	VTOL.2135	6	CS-27 requires a minimum capability of 17 knots from all azimuths, why would this not be applicable to eVTOL aircraft in the enhanced category?	Define a minimum requirement for the enhanced category. CS-27 seems a good starting point.	Yes	Yes	Partially accepted	Minima will be considered in the AMC. It may be however that the steady 17 knots requirement will need to be adapted, for example to take into account variable RPM rotors that need to accelerate before they can provide control to counteract a gust.
387	ADS	VTOL.2135	6	Given the enhanced category may operate in an urban canyon environment, there is no requirement to demonstrate capability of the aircraft to manage this? Will these limits be imposed on operating sites instead? Where will this be defined? Gust loading today would be approximately equivalent.	Clarify whether requirement for tolerance of urban canyon vortices etc will be placed on vehicle, operating site, or both.	Yes	Yes	Noted	This will be considered for the minima in the AMC. Rules for the operating sites are outside the scope of this SC.
388	ONERA	VTOL.2135(a)	5	Ambiguous, this could be interpreted as “in the limit Flight Envelope WITH requiring exceptional piloting skills, etc “ is acceptable ?		Yes	No	Noted	The limit flight envelope is outside of the operational flight envelope (similar difference as between Vd and Vne)

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389	ONERA	VTOL.2135(a)(6)	6	“ the applicant must demonstrate controllability in wind velocities from zero to a wind limit <u>appropriate for the aircraft type</u> , from all azimuths.” Dangerous, can imply less expectations for different type of aircrafts! Must focus on its ability to perform or not hover / or its operational flight envelop to be certified. May also be linked to the published operating site expectations ? Especially as no vertical gust is mentioned in the document, while operating sites for Enhanced Cat can include buildings with specific risks.		Yes	No	Noted	This will be considered for the minima in the AMC. Rules for the operating sites are outside the scope of this SC.
390	ONERA	VTOL.2135(d)	6	“It must be possible to make a smooth transition from one flight condition to another without danger of exceeding the limit flight envelope.” Is this intended for “configuration changes” then consider modifying VTOL 2135(a)(4). Otherwise “smooth transition from one flight condition to another ” is unclear. Definition of flight condition should be clearly addressed here.		Yes	No	Noted	This will be detailed in the AMC
391	UK CAA	VTOL.2135		See point 4 above.	See point 4 above.	Yes		Accepted	See Explanatory Note 14
392	Sikorsky	VTOL.2135.a.6	6	“Appropriate to aircraft type” does not provide adequate basis for certification.	Quantify maximum sustained winds and directionality vehicle must be able to demonstrate controllability for. Include gusts and quantify gust magnitude and direction, similar to CS 27.	No	Yes	Partially accepted	This will be detailed in the AMC

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393	FAA/AIR	2135	6	<p>We believe that this language is good, but might be limiting. Would offer that by merging some of the language from the part 23 FAST effort, you could have requirements that are applicable to a broader scope of aircraft than just the 2 or 3 we see today.</p> <p>Also, we are not sure what the intent of the “limit flight envelope” clause addresses. The limit flight envelope could be interpreted to be the normal flight envelope because pilots should not exceed limits. It could also be interpreted to mean a smaller flight envelope that might be needed in a the case of a failure. As written it is confusing and may not be needed because the CS-23 language allows for a smaller emergency flight envelope.</p>	<p>Recommend revising as follows:</p> <p>(a) The aircraft must be controllable and manoeuvrable, without requiring exceptional piloting skills, alertness, or strength, within the operational flight envelope:</p> <p>(1) at all loading conditions for which certification is requested;</p> <p>(2) during all phases and modes of ground or flight operations;</p> <p>(3) with likely flight control or thrust/lift system malfunction;</p> <p>(4) during configuration changes;</p> <p>(5) in all degraded electronic flight control system operating modes; and</p> <p>(6) the applicant must demonstrate controllability in wind velocities from zero to a wind limit appropriate for the aircraft, from all azimuths.</p> <p>(b) The applicant must determine if there are any critical control parameters, such as V_{MC} or limited control power margins, and if applicable, account for those parameters where appropriate.</p> <p>(c) It must be possible to make a smooth transition from one flight condition to another without danger of exceeding the limit flight envelope.</p> <p>The FAA plans on addressing the winds in all azimuths for the different classes in a powered lift safety continuum.</p>			Noted	The limit flight envelope is outside of the operational flight envelope (similar difference as between V_d and V_{ne}). The objective has been made more generic by removing “velocities” and “from all azimuths”. Details will be provided in the AMC and may consider in addition to the different azimuths downdraft and updraft.
394	FAA/AIR	2135		This paragraph contains part 25 concepts (see item 9) that are not defined and may not be appropriate for this type of aircraft. This definition of flight envelope completely misses the concept of modes of flight and only addresses phases of flight.	<p>Remove part 25 concepts from the Special Condition.</p> <p>Adopt the concept of modes of flight.</p>	Y	Y	Partially accepted	The flight envelopes are intended to also cover in-flight reconfigurations. See Explanatory Note 14.
395	FAA/AIR	2135 (d)	5	It must be possible to make a smooth transition from one flight condition to another without danger of exceeding the limit flight envelope	Add: “without exceptional pilot skill”	Y	N	Partially accepted	It will be clarified in the AMC that it is covered by (a)
396	FAA/AIR	2135(a)(3)		Shouldn’t this also say “failure”?	Clarification	Y	N	Accepted	Removed and the failures to consider will be detailed in the AMC
397	FAA/AIR	2135(a)(5)		What about degraded thrust/lift system?	Clarification	Y	N	Partially accepted	(5) was proposed by the FAA FAST to address specifically degraded control system operating modes. Other failures to consider will be detailed in the AMC
398	FAA/AIR	2135(d)		“It must be possible, without exceptional piloting skills, to make a smooth transition.....”.	Clarification	Y	N	Partially accepted	It will be clarified in the AMC that it is covered by (a)

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399	TCCA-AISA	VTOL.2135.a(3)	6/26	The term “likely” appears in many instances throughout the SC but will not have a consistent meaning/interpretation. In this section the term is used to refer to the probability of a random failure and could be interpreted as meaning that reasonably probable failures, when encountered, should not cause a departure from controlled flight in the expected operating environment. But in other instance of the document, the term is used to state a “likely” operating environment. This again is a totally different meaning and inconsistent with other requirements as well. The term “likely” is too broad, potentially confusing and open to inconsistent interpretation.	Recommend that every occurrence of the term “likely” be removed and replaced with more appropriate terms that are in line with the expectations of the section it resides in. Terminology should be consistent with VTOL.2510, e.g. worded in terms of criticality / probability / single or multiple failures, etc. as appropriate to intent. For instance, 2135.a(3) should use the term “probable” or similar depending on the context intended.	No	Yes	Partially accepted	CS-23 construction and wording has been retained. The failures to consider will be detailed in the AMC
400	Transport Canada – NAC Engineering – F&HM	VTOL.2135(a)(3) and (a)(5)	6/26	VTOL.2135(a)(5): “...in all degraded electronic flight control system operating modes” Understanding degraded modes would be the result of failures, with potentially different criticality and probability, this seems contradictory to 2135(a)(3) which only applies to “likely flight control ... malfunctions”.	Revise paragraphs 2135(a)(3) and (a)(5) with terminology consistent with VTOL.2510, e.g. worded in terms of criticality / probability / single or multiple failures, etc as appropriate to intent.	No	Yes	Partially accepted	(a)(3) removed. (a)(5) was proposed by the FAA FAST to address specifically degraded control system operating modes. Other failures to consider will be detailed in the AMC.
401	Transport Canada – NAC Engineering – F&HM	VTOL.2135(a)(5), Subpart D	6/26	Text in VTOL.2135(a)(5) is the only reference in the SC to “degraded electronic flight control system operating modes” or even to “electronic flight control system”. TCCA would have expected additional standards addressing compliance for electronic flight controls to be included in this SC. Presumably these will be addressed as Means of Compliance? It is difficult to assess completeness of proposed VTOL standards without an understanding of how various compliance aspects relevant to these aircraft will be addressed (i.e. means of compliance, and which standards they are linked to).	EASA to clarify how compliance aspects specific to electronic flight controls (FBW) – as known from certification activities on various other categories of aircraft – will be addressed under the proposed VTOL SC and associated means of compliance.	No	Yes	Noted	Some elements have already been added to facilitate the introduction of advanced flight controls, such as the flight envelopes. Other aspects will be detailed in the AMC.
402	TCCA (LD Germain)	VTOL.2135(a)		In VTOL.2135(a)(6), the applicant is required to demonstrate controllability during all phases of ground or flight operations in winds “from zero to a wind limit appropriate for the aircraft type, from all azimuth”. As seen in previous rotorcraft certification projects, without stating that the minimum demonstration wind was 17 knots, applicants could use a wind of 3 knots (or calm), which would be acceptable for compliance, but not operationally representative or realistic.	TCCA strongly recommends to specify a minimum wind speed to which an applicant has to demonstrate controllability at maximum takeoff gross weight. Historically, 17 knots has been used, as it has been shown to be the most critical for a majority of rotorcraft.	no	yes	Partially accepted	Minima will be considered in the AMC. It may be however that the steady 17 knots requirement will need to be adapted, for example to take into account variable RPM rotors that need to accelerate before they can provide control to counteract a gust. In addition to the different azimuths downdraft and updraft may need to be considered.

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403	TCCA (B Harvey)	VTOL.2135		(a)(3) suggest changing thrust/lift system to critical loss of thrust/lift to align with current CS-23 industry standard verbiage. This also applies to VTOL.2140(c)	Replace thrust/lift system for critical loss of thrust/lift	yes	No	Partially accepted	See Explanatory Note 12
404	Boeing	VTOL.2135	6	THE PROPOSED TEXT STATES: (a) The aircraft must be controllable and manoeuvrable,... (5) in all degraded electronic flight control system operating modes; and	REQUESTED CHANGE: Boeing recommends the proposed additional regulation be deleted. JUSTIFICATION: The proposed additional regulation VTOL.2135 (a)(5) is redundant to VTOL.2135 (a)(3): (3) with likely flight control or thrust/lift system malfunction which would cover any likely flight control failure condition whether they are part of the <u>electronic</u> flight control system or any other part of the flight control system. VTOL.2135 (a)(5) is also redundant to VTOL.2510 Equipment, systems, and installations which addresses all systems and equipment failure conditions. Additionally, as written VTOL.2135 (a)(5) requiring <u>all</u> degraded conditions could be interpreted as complete loss of an electronic flight control system requiring an additional backup flight control system which is not considered the intent of the proposed regulation.		yes	Partially accepted	(5) was proposed by the FAA FAST to address specifically degraded control system operating modes. Other failures to consider will be detailed in the AMC.
405	Aidan Reilly	VTOL.2135		Wind velocities limits should be supplemented by gust parameters (e.g. the first and second derivatives of wind speed with respect to time). Control limitations may be driven by gusts rather than steady state winds, because of the ability of gusts to saturate rate-limited control systems. This is likely to be especially important for configurations using fixed pitch variable speed lift rotors due to the lag and rate limiting effect of the need to change rotor speed to generate control forces. Because of the likelihood that Category Enhanced aircraft will be operated from roof-top Vertiports subject to ‘urban canyon’ effects, vertical winds and gust limits and demonstration requirements should also be imposed for Category Enhanced aircraft. Reference should be made to e.g. CS-27.143 and CS-27.341, which imposes sensible requirements; it would seem inconsistent and irrational to impose requirements less stringent than these.				Partially accepted	The objective has been made more generic by removing “velocities” and “from all azimuths”. The AMC will detail the conditions to consider.
406	Aidan Reilly	VTOL.2135		Water operations should be explicitly included in the controllability requirements if certification is sought for water operations.				Partially accepted	This is considered to be included in ground operations and will be detailed in the AMC

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407	Aidan Reilly	VTOL.2135		CS-27 includes regulation of skis as well; there is no reason to suppose that the use of ski / skid landing gear will be fundamentally less attractive for vehicles certified under this Special Condition, and therefore such landing gear should be included in the regulation, e.g. by directly copying the relevant sections of CS-27.				Partially accepted	This will be detailed in the AMC

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VTOL.2140 Control forces

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
408	Diamond Aircraft Industries GmbH	VTOL.2140		Subparagrph(c): wording may not is not imperative	Subparagrph(c) 2 nd sentence, use “must not” instead of “may not”	yes	no	Accepted	-
409	ONERA	VTOL.2140	6	In case of level of autonomy including specific conditions where the flight crew might takeover the automation, this § should include dedicated recommendation to enable a flying threw capability without excesive control forces to apply.		Yes	No	Noted	See Explanatory Note 3
410	FAA/AIR	2140	6	The new title perhaps is more appropriate to address future flight control systems and we concur. But as written, the requirements allow for a continual residual force that the pilot must hold while in cruise flight. We don’t think this is the intent. Since many of the VTOL aircraft will fly like airplanes for the majority of their flight profile, we believe that there is merit in keeping the language from CS-23 and part 23. We would be open to finding more concise language. We concur with your proposed (c).	Recommend modifying the following CS-23 (a) and (b) language to align with a VTOL safety continuum. The FAA will work on a harmonized position with EASA. (a) If applicable, the airplane must maintain lateral, directional and vertical trim without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system, under normal phases and modes of flight: (1) For levels 1, 2, and 3 airplanes in cruise. (2) For level 4 airplanes in normal operations. (b) If applicable, the airplane must maintain longitudinal trim without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system, under the following conditions: (1) Climb. (2) Level flight. (3) Descent. (4) Approach. (5) Hover. (6) Transition.			Not accepted	The revised wording has been introduced to leave more flexibility in the possible control schemes. It may be, for example, that for some low speed phases of the flight, having the aircraft return to a hover if forces on the controls are released is advantageous.
411	FAA/AIR	2140		As written, it appears that a continuous residual force is allowed but I don’t believe that is the intent of the regulation.	Reword this regulation.	Y	Y	Not accepted	The revised wording has been introduced to leave more flexibility in the possible control schemes. It may be for example that for some low speed phases of the flight, having the aircraft return to a hover if forces on the controls are released is advantageous.
412	Aidan Reilly	VTOL.2140		Residual control forces here seems to imply the use of trim control. Trim controls may not be applicable to all proposed configurations; perhaps “residual control forces” should read “normal, or residual after trimming, control forces”.				Partially accepted	Removal of (a) and (b) was performed to allow more possibilities of control schemes. “Residual” will cover forces left on the controls after any type of intermediate processing, for example trimming. This will be detailed in the AMC.

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413	Aidan Reilly	VTOL.2140		It is inconsistent to use “likely abnormal or emergency operations, including critical malfunction of thrust/lift”, because critical malfunctions are not likely if the design is compliant with the Special Condition’s safety objectives, FDALs etc. Amend “including” to “and”.				Accepted	“critical malfunction of thrust/lift” will be removed. See also Explanatory Note 12.

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VTOL.2145 Flying qualities

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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414	Tine Tomazic	VTOL.2145	6	Suitable stability is not suitable terminology.	Why not just say "positive stability"? Within its flight envelope, the aircraft must, with its electronic flight control system in most degraded mode, show positive stability and controllability.		yes	Not accepted	CS-23 construction has been retained with (a) focused on static stability and (b) on dynamic. To take advantage of new possibilities offered by advanced flight controls the objective has been made more generic.
415	William Branch	VTOL.2145 (a)	6	Axis is plural and should be Axes.	Change axis to axes.	No	Yes	Accepted	-
416	Volocopter	VTOL.2145		SUGGESTION: When considering fixed wing aircraft, CS-23.2145 (b) deals with the specific effect of long-period longitudinal stability. In the translation to VTOL.2145 this differentiation got lost and the difference in objective between (a) and (b) is no more visible. As VTOL.2145 is also applicable to hybrid VTOL-fixed wing designs, this differentiation should remain clear, and confusion for ‘multicopter’ designs between (a) and (b) must be resolved.	Recommended to adopt original language of CS23.2145(b) instead of the proposed VTOL.2145(b) with: ‘No aircraft may exhibit any divergent longitudinal stability characteristic so unstable as to increase the pilot’s workload or otherwise endanger the aeroplane and its occupants.’	Yes	No	Not accepted	CS-23 construction has been retained with (a) focused on static stability and (b) on dynamic. To take advantage of new possibilities offered by advanced flight controls the objective has been made more generic.
417	NEOPTERA	VTOL.2145 (a)		“Within its flight envelopes” Does it mean for normal, operational and limit flight envelope?		Observation	substantive	Noted	Yes but different performances could be required in the different envelopes. This will be detailed in the AMC.
418	Airbus Group	2145	6	(a) Is such broad that it includes (b)	Delete (b)	X		Not accepted	CS-23 construction has been retained with (a) focused on static stability and (b) on dynamic

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419	Airbus Group	2145		<p>The wording of this requirement is too loose. Words like “suitable stability and control feel” do not give sufficient cues of what is suitable and what is not, precise performance objectives are lacking. As a matter of fact Flying qualities (eg stability requirements and handling qualities requirements) should be organised with two options.</p> <p>1/ first option is when flight control system and architecture is highly comparable to a standard rotorcraft. In such a case requirement should be aligned with either CS-27 or CS-VLR requirements depending on number of occupants and/or MTOW. Special care should also be taken to introduce IFR requirements from CS-27 appendix B for VTOL certified for IFR operation.</p> <p>2/ second option is for novel design with advanced control media and very stabilised control laws (most degraded mode being attitude control attitude hold) or even more advance control laws such as speed command/control, altitude/height command/control, heading command/control, autonomous navigation modes,). For this type of architecture requirement should be created in order :</p> <ul style="list-style-type: none"> Controls input and modes command being intuitive and not requiring exceptional piloting skills, alertness or strength. For example if a mini stick is used to command forward speed it shall be requested that a forward movement is required to increase the speed and a rearward movement to decrease it; if a knob is used to control a parameter (speed, altitude, heading, ...) the direction of the rotation shall be adapted to the intended effect (e.g rotation to the left to increase the speed). Control commands and law shall be designed in such a way that the VTOL be able to be flown without undue pilot fatigue or strain in any normal manoeuvre for a period of time as long as that expected in normal and emergency operations. The occurrence of any failure condition which would: <ul style="list-style-type: none"> For enhanced category operating in VFR and IFR conditions or for normal category operating in IFR conditions prevent continued safe flight and landing shall be extremely improbable; For normal category operating in VFR would prevent controlled emergency landing shall be extremely improbable. The VTOL shall be free of any divergent oscillations or instability within the limit 	<p>Flying qualities requirement should be organized following two options:</p> <p>1/first option is when flight control system and architecture is highly comparable to a standard rotorcraft. In such a case requirement should be aligned with either CS-27 or CS- VLR requirements depending on number of occupants and/or MTOW. Special care should also be taken to introduce IFR requirements from CS-27 appendix B for VTOL certified for IFR operation</p> <p>2/ second option is for novel design with advanced control media and very stabilised control laws (most degraded mode being attitude control attitude hold) or even more advance control laws such as speed command/control, altitude/height command/control, heading command/control, autonomous navigation modes,). For this type of architecture requirement should be created in order :</p> <p>Controls input and modes command being intuitive and not requiring exceptional piloting skills, alertness or strength. For example if a mini stick is used to command forward speed it shall be requested that a forward movement is required to increase the speed and a rearward movement to decrease it; if a knob is used to control a parameter (speed, altitude, heading, ...) the direction of the rotation shall be adapted to the intended effect (e.g rotation to the left to increase the speed).</p> <p>Control commands and law shall be design such a way that the VTOL been able to be flown without undue pilot fatigue or strain in any normal manoeuvre for a period of time as long as that expected in normal and emergency operations.</p> <p>The occurrence of any failure condition which would:</p> <p>For enhanced category operating in VFR and IFR conditions or for normal category operating in IFR conditions prevent continued safe flight and landing shall be extremely improbable;</p> <p>For normal category operating in VFR would prevent controlled emergency landing shall be extremely improbable</p> <p>The VTOL shall be free of any divergent oscillations or instability within the limit flight envelope in normal operation (without failure of the control system).</p> <p>For any failure condition of the control system which is not shown to be extremely improbable:</p> <p>For enhanced category operating in VFR and IFR conditions or for normal category operating in IFR The VTOL must be safely controllable and capable of prolonged instrument flight without undue pilote effort and the VTOL shall be free of any divergent oscillations or instability within a practical flight envelope providing that transitions from limit flight envelope to this practical flight envelope during and after the failure is shown to be perform without</p>	X	Partially accepted	<p>This considerations will be introduced in the AMC and where applicable will rely on existing CS material. Specific attention to human factors has been introduced in VTOL.2600 Flight crew compartment. As it is not yet clear which type of IFR infrastructure some of these operations will utilize, reference to “good visual environment” and different levels of “degraded visual environment” may be considered for the AMC. A minimum level of failure condition classification is provided in VTOL.2510 and its AMC, but a safety assessment will still need to be performed for each equipment utilised in operation.</p>
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				<p>flight envelope in normal operation (without failure of the control system)</p> <ul style="list-style-type: none">For any failure condition of the control system which is not shown to be extremely improbable:<ul style="list-style-type: none">For enhanced category operating in VFR and IFR conditions or for normal category operating in IFR The VTOL must be safely controllable and capable of prolonged instrument flight and safe landing without undue pilot effort and the VTOL shall be free of any divergent oscillations or instability within a practical flight envelope providing that transitions from limit flight envelope to this practical flight envelope during and after the failure is shown to be perform without requiring exceptional piloting skills, alertness, or strength.For normal category operating in VFR conditions, the VTOL must be controllable and capable of trough a period of time allowing a control emergency landing within a practical flight envelope without requiring exceptional piloting skills, alertness, or strength providing that transitions from limit flight envelope to this practical flight envelope during and after the failure is shown to be performing without requiring exceptional piloting skills, alertness, or strength.	<p>requiring exceptional piloting skills, alertness, or strength.</p> <p>For normal category operating in VFR conditions, the VTOL must be controllable and capable of trough a period of time allowing a control emergency landing within a practical flight envelope without requiring exceptional piloting skills, alertness, or strength providing that transitions from limit flight envelope to this practical flight envelope during and after the failure is shown to be perform without requiring exceptional piloting skills, alertness, or strength</p>				
420	UK CAA	VTOL.2145		Compare with VTOL.2135(a), now the text refers to “flight envelopes”?	See point 4 above.	Yes		Accepted	See Explanatory Note 14
421	Sikorsky	VTOL.2145.a	6	“Control feel” is generic term that does not provide adequate measure for certification, especially for systems that may be partially or fully autonomous.	Quantify control forces required or state response times control system must meet from minimal to maximum pull lengths.	No	Yes	Partially accepted	Will be considered for the AMC
422	FAA/AIR	2145	6	We concur with this approach and agree that going forward, Flying Qualities may be more appropriate to address stability because of augmentation systems. The term unacceptable in (b) might create difficulty for legal review.	Recommend changing the term unacceptable to unsafe.			Partially accepted	“unacceptable” will be removed and replaced by the standard wording of requiring “exceptional piloting skills, alertness, or strength”

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423	FAA/AIR	2145		<p>This paragraph contains part 25 concepts (see item 9) that are not defined and may not be appropriate for this type of aircraft.</p> <p>In addition, it is not clear as to what “suitable stability and control feel” means or how one could show compliance.</p> <p>As written (b) lessens the requirements [from part 23] in that it now allows for divergent dynamic and static stability.</p> <p>Especially since most of these VTOL aircraft will be heavily augmented, it is not appropriate to lessen the stability requirements from what we currently have in place with part 23.</p>	<p>Remove part 25 concepts from the Special Condition.</p> <p>Remove ambiguous wording and either adopt part 23 @ Amdmt. 23-64 with FAST team edits or rewrite so that the stability requirements are not reduced from what is currently required for part 23 aircraft.</p>	Y	Y	Partially accepted	The different envelopes will be defined. See Explanatory Note 14. To take advantage of new possibilities offered by advanced flight controls the objective has been made more generic and should not result in reduced safety levels compared to part 23 aircraft.
424	FAA/AIR	2145 (a)	5	<p>Within its flight envelopes, the aircraft must show suitable stability and control feel, in all axes</p>	<p>What is “suitable”?</p> <p>The “feel” part should be in 2140</p>	Y	N	Partially accepted	“suitable” will be defined for the different flight envelopes in the AMC. “control feel” is deemed to fit within the new more generic title of VTOL.2145 Flying qualities”.
425	FAA/AIR	2145 (b)	5	<p>Within its flight envelopes, no aircraft may exhibit any divergent stability characteristic, so as to increase the flight crew’s workload to an unacceptable level or otherwise endanger the aircraft and its occupants</p> <p>We are willing to accept a FBW system that can “exhibit divergent stability characteristics” as long as the instability does not increase the pilot’s workload to an unacceptable level?</p> <p>The revision mirrors (a) but with more words.</p> <p>I submit that a FBW FCS should not allow any stability characteristics that increase pilot workload</p>	<p>The revision below mirrors (a) but with more words</p> <p>Within its flight envelopes, no aircraft may exhibit stability characteristics that increases the pilots’ workload to an unacceptable level or otherwise endanger the aircraft and its occupants</p>	Y	N	Partially accepted	This will be detailed in the AMC
426	Aidan Reilly	VTOL.2145		<p>“...so as to increase the flight crew’s workload to an unacceptable level” seems to add unnecessary difference to the rest of the regulation; elsewhere the regulation mentions “exceptional piloting skill or strength” therefore it would seem preferable to say “...so as to require exceptional piloting skill or strength” and maintain a consistent definition.</p>				Accepted	-

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VTOL.2150 Stall characteristics and stall warning

Explanatory Note 17:

Parts of the requirements regarding stall have been retained to address architectures with a wing that may stall. The AMC for the generic objectives on flight envelopes and controllability will detail additional considerations such as minimum safe speeds, warnings when approaching the operational envelope boundaries, envelope protection, lift augmentation, in-flight configurations, vortex ring state and rotor stall.

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427	Tine Tomazic/Marco Rizzato	VTOL.2150	6	Is a stall warning truly needed if the flight control system always prevents it? This is a thing of the past for winged VTOLs. Why not perscribe that the wing-stall must be prevented system-wise?	Delete stall-warning unless manually flown VTOLs are considered likely. To me, they are highly unlikely.	yes		Not accepted	See Explanatory Note 17
428	David LoebI, AutoFlightX	VTOL.2150	6	Having a stall speed warning might be very imprecise especially for transition aircraft. In the latest ASTM Workshop on Advanced Aircraft Technology Certification FAA introduced the minimum safe speed. The minimum safe speed would be a better performance based suggestion, especially since it is also dependent on the configuration (e.g. powered lift, pure aerodynamic lift, combinations). So we suggest to remove the terminology “stall speed” completely and replace it with “minimum safe speed”. On the right you find the suggested updated paragraph. To use this paragraph, also VTOL.2110 should be updated – please see the next comment.	VTOL.2150 Minimum safe speed characteristics and minimums safe speed warning If part of the lift is generated by a wing, the aircraft must have controllable minimum safe speed characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive minimum safe speed warning that provides sufficient margin to prevent inadvertent behavior. The minimum safe speed must be determined by VTOL.2110.			Partially accepted	See Explanatory Note 17
429	Philipp Reiß, FSD	VTOL.2150	6	For transition aircraft a stall waring is not very precise, because they have powered lift systems to still have enough authority over the aircraft. As already mentioned in the comment above we suggest to use FAAs terminology of the “minimum safe speed”. This would be a better performance requirement and not a design requirement and hence be less dependent on the configuration. We suggest to remove the “stall speed” completely and replace it with “minimum safe speed”. The suggested paragraph on the right also need an update of VTOL2110 (see comment above).	VTOL.2150 Minimum safe speed characteristics and minimums safe speed warning If part of the lift is generated by a wing, the aircraft must have controllable minimum safe speed characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive minimum safe speed warning that provides sufficient margin to prevent inadvertent behavior. The minimum safe speed must be determined by VTOL.2110.	Yes	No	Partially accepted	See Explanatory Note 17
430	Rolls-Royce	VTOL.2150		If a vehicle employs a tilt wing or tilt rotor mechanism, there is likely to be a part of the operating envelope in which the wing will be stalled. Mast bumping or flapping limits associated with rotorcraft may also be relevant for these vehicles.	This could be characterised using the following: ‘If the limits of the safe flight envelopes of the aircraft are imposed by undesirable handling or controllability characteristics, the flight crew must be provided with sufficient warning of approach to these limiting conditions so as to avoid inadvertent excursion from the safe envelopes’	Yes	Yes	Noted	See Explanatory Note 17

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431	Lilium Gmbh	VTOL.2150 (a)		The definition of “If part of the lift is generated by a wing” is ambiguous for lift augmented configurations	An AMC is required to define minimum safe speeds that can account for thrust-augmented, stability-augmented configurations	Yes		Noted	See Explanatory Note 17
432	ANAC	VTOL.2150	6	The Special Condition transforms the idea of stall speeds to flight envelopes (VTOL.2110). Analogously, the stall warning should be changed to some indication (or flight characteristic) to prevent the aircraft from moving out of the operational envelope.	VTOL.2150(b) The aircraft shall have suitable flight characteristics or adequate warning cues to prevent the aircraft from exceeding the operational envelope.	Yes	Yes	Partially accepted	See Explanatory Note 17
433	Airbus Group	2150(a)		Envelope protection may prevent stall characteristics and obviate need for stall warning. Stall warning is not helpful for self-piloted aircraft that prevent entry into stall condition. As written, this SC language presumes that aerodynamic stall can occur during normal operations. A safety critical fly by wire system that provides full envelope protection with 10e-9 probability of malfunction can prevent aerodynamic stalls from occurring, and should therefore preclude the requirement to perform stall demonstrations.	Use a minimum flight speed instead of a stall speed. Stall warning only applies to piloted aircraft. Suggest "the aircraft must have controllable minimum flight speed characteristics in straight flight, turning flight, and accelerated turning flight that provide sufficient margin and/or warning to prevent inadvertent stalling."	X		Partially accepted	See Explanatory Note 3 and Explanatory Note 17
434	Airbus Group	2150 (c)		The following paragraph has been removed from CS-23 amdt 5: <i>“CS 23.2150 (c): Level-1 and -2 multi-engine aeroplanes, not certified for aerobatics, must not have a tendency to hazardously depart controlled flight inadvertently from thrust asymmetry after a critical loss of thrust.”</i> Why not considering the risk of a tendency to hazardously depart controlled flight inadvertently from thrust asymmetry after loss thrust/lift?		X		Partially accepted	See Explanatory Note 17. The AMC will detail the failures to be considered for controllability.
435	ADS	VTOL.2150	6	If a vehicle employs a tilt wing or tilt rotor mechanism, there is likely to be a part of the operating envelope in which the wing will be stalled. Mast bumping or flapping limits associated with rotorcraft may also be relevant for these vehicles.	This could be characterised using the following: ‘If the limits of the safe flight envelopes of the aircraft are imposed by undesirable handling or controllability characteristics, the flight crew must be provided with sufficient warning of approach to these limiting conditions so as to avoid inadvertent excursion from the safe envelopes’	Yes	Yes	Partially accepted	See Explanatory Note 17

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
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436	ONERA	VTOL.2150	6	As this SC is trying to be as generic as possible in its architecture coerture, why not keeping (b) and point (c) of CS-23 original document with “an if applicable” or “appropriate for the aircraft type” notion. Especially as (a) does not mention any failure caution.	eg : in case of a single thrust unit like “Aurora eVTOL” one can expect a “IF APLICABLE : aircraft with dedicated single thrust componant in level flight must not have a tendency to hazardously depart from controlled flight inadvertently.” And for a Zee Aero configuration something like : “IF APLICABLE : aircraft with dedicated thrust componant must not have a tendency to hazardously depart controlled flight inadvertently from thrust asymmetry after a critical loss of thrust/lift “	Yes	No	Partially accepted	See Explanatory Note 17. The AMC can make distinctions between different types of architectures.
437	FAA/AIR	2150	6	This covers if the wing generates “part of the lift”. What about configurations where all of the lift is generated by the wing? Does this special condition apply to these type of aircraft?		Y	N	Noted	“part of the lift” is intended to cover all amounts of lift on the wing, up to the full amount, for configurations prone to inadvertent stalling. See Explanatory Note 1 for the applicability.
438	FAA/AIR	2150	6	This language forces an applicant to have a stalling aircraft if even part of the lift is generated by a wing. It might be better to use words like minimum safe speed to allow for a flight control system that provides envelope protection from stall. Another approach it to use the term “if applicable.”	Recommended revision – (a) The aircraft must have controllable minimum safe speed flight characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive minimum safe speed warning that provides sufficient margin to prevent inadvertent stalling, if applicable.			Noted	“to prevent inadvertent stalling” is deemed to exclude configurations that do not have a risk of inadvertent stalling. See also Explanatory Note 17.
439	FAA/AIR	2150	7	Recommend removing “stall” and changing it to “minimum safe operating speed” to cover limits induced by the envelope protections as well as operating in other modes of flight other than in forward flight.	Change “stall” to “minimum safe operating speed” to cover all minimum speed limitations.	Y	Y	Partially accepted	See Explanatory Note 17
440	FAA/AIR	2150 title	6	Title	Should Vortex ring state be included?	Y	N	Noted	See Explanatory Note 17
441	TCCA (LD Germain)	VTOL.2150		There is no mention of rotorcraft stalls (retreating blade and advancing blade stalls). These have been cause for many structural, handling charcteristics and vibratory problems, causing numerous deadly accidents.	TCCA strongly recommends to include a demonstration requirement specific for rotorcraft stalls (retreating blade and advancing blade), similar to CS 27.175(b), and a clear Vne limitation as per CS 27.1505(a)(2).	no	yes	Partially accepted	See Explanatory Note 17
442	TCCA (B Harvey)	VTOL.2150		In VTOL.2150(c), it is marked as reserved for VTOL, but applies to small multi-engine aircraft in CS 23.2150(c) (ie. must not have a tendency to inadvertently depart controlled flight from thrust asymmetry after a critical loss of thrust). This regulation would appear to be relevant to (multi-engine/motor) VTOLs and should be added to this paragraph.	Add VTOL.2150(c) as per CS 23.2150(c)	no	Yes	Partially accepted	See Explanatory Note 17. The AMC will detail the failures to be considered for controllability.
443	GAMA	VTOL.2150	6	Most VTOL designs will include winged flight but a flight envelope protection system that will prevent stall or loss of control.	The requirements in this section should clearly accept this kind of design path.	Yes	Yes	Noted	“to prevent inadvertent stalling” is deemed to exclude configurations that do not have a risk of inadvertent stalling. See also Explanatory Note 17.

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444	Boeing	VTOL.2150(a)	6	<p>THE PROPOSED TEXT STATES:</p> <p><i>(a) If part of the lift is generated by a wing, the aircraft must have controllable stall characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive stall warning that provides sufficient margin to prevent inadvertent stalling.</i></p>	<p>REQUESTED CHANGE:</p> <p>Boeing requests clarification on this requirement. Should these requirement also apply to rotor stall?</p> <p>JUSTIFICATION:</p> <p>VTOL aircraft can also stall without traditional fixed-wing lifting surfaces</p>			Noted	See Explanatory Note 17
445	CAA NZ	VTOL.2150	6	<p>Is it possible that the determination of stall characteristics for VTOL aircraft using wing borne flight alone may not provide adequate protection against stall for all VTOL aircraft.</p> <p>The stall speed/warning/characteristics for the wing is likely to be greatly influenced by the thrust/lift system especially during transition from hovering to translating flight.Hence to aid safety sufficient margin should be maintained between stall and flight speed during all phases of flight.</p>	<p>Insert the following text (or similar) as an additional sub paragraph under VTOL.2150</p> <p><i>“If part of the aircraft lift is generated by fixed aerofoils, the aircraft must have a clear and distinctive stall warning or envelope protection system that provides sufficient margin to prevent stall occurring during transitions between low speed flight (operation under thrust/lift system only) and high speed flight (some or all lift generated by fixed aerofoils), and between high speed to low speed flight.”</i></p>	No	Yes	Partially accepted	See Explanatory Note 17

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446	Aidan Reilly	VTOL.2150		<p>It is not obvious that VTOL aircraft will exhibit conventional stall characteristics in all configurations. The pilot of a conventional fixed wing aeroplane experiences the stall as the moment at which the nose drops despite continued back pressure on the stick. A true stall may also involve a change in stick force gradient. If an aircraft is loaded to an extreme forward centre of gravity, there may be insufficient elevator authority to drive the wing to stall; flying around under limited control with the stick on the back stop is commonly referred to as “mushing”. Functionally, both conditions involve running out of pitch authority, but the true stall is arguably more dangerous in as much as it may lead to autorotation. “Stall-proof” aircraft such as some canard designs made popular by such as Burt Rutan predicate their safety case on the canard stalling before the main wing; functionally, this means that they mush, and the safety benefit claimed is therefore due to a reduced risk of departure leading to autorotation. A tilt-rotor flying slowly in the helicopter mode is likely to have a wing which is stalled in the negative sense (i.e. the aerodynamic angle of attack of the wing is below that for the maximum magnitude of negative lift) due to rotor downwash. Stalling the wing of the aircraft is only problematic to the extent that it produces handling and control problems. It therefore seems preferable to regulate the desired handling and controllability characteristics of the aircraft within and to the edges of its safe flight envelopes, and the warning devices to prevent excursions beyond these safe flight envelopes, e.g.:</p> <p><i>If the limits of the safe flight envelopes of the aircraft are imposed by undesirable handling or controllability characteristics, the flight crew must be provided with sufficient warning of approach to these limiting conditions so as to avoid inadvertent excursion from the safe envelopes.</i></p> <p>It is worth noting that the above statement may be made more general by removal of the first clause, i.e.</p> <p><i>The flight crew must be provided with sufficient warning of approach to the limits of the safe flight envelopes to prevent inadvertent excursion beyond them.</i></p> <p>It should also be noted that analogous limiting conditions related to rotorcraft are not included in the Special Condition due to its heritage from CS-23, but that such problems as mast bump / flapping limits and retreating blade stall may equally impact upon the safety of aircraft certified under this Special Condition, and are therefore worthy of inclusion in it.</p>				Partially accepted	See Explanatory Note 17

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VTOL.2155 Ground- and water-handling characteristics

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
447	W Field LMWL Yeovil	General		Where is “ground resonance” covered? Is this intended to be covered by sections such as 2155 that discuss controllability or similar for take off and landing?	Should be explicitly mentioned in SC VTOL where applicable. This is a significant consideration for vertical take off and landing such as for Rotorcraft / tilt rotor etc. One example of where this can be included is 2305 for Landing Gear. Ground resonance is typically of most concern over landing gear and features such as lag dampers in the rotor design for rotorcraft. Landing gear considerations will be common to all configurations of VTOL. (see CS27.663)	NO	YES	Partially accepted	Will be considered for the AMC under VTOL.2160 and/or VTOL.2305
448	Airbus Group	2155	6	water handling characteristics: is it intended for normal operation or does it also cover ditching?				Noted	This is for aircraft certified for intended operations on water (VTOL.2310(a))
449	Airbus Group	2155		How would “controllable handling characteristics” be demonstrated for a self-piloted aircraft?	Suggest “The aircraft must demonstrate controlled handling during taxi, take-off, and landing for the anticipated operation.”	X		Not accepted	See Explanatory Note 3
450	ONERA	VTOL.2155	6	Especially if Taxi can imply hover taxing capability (but maybe also in other cases),	consider adding the two following points from CS-27: (b) Spray characteristics (c) Ground resonance (this can also be addressed in VTOL.2225 if specified)	Yes	No	Partially accepted	Will be considered for the AMC under VTOL.2160 and/or VTOL.2305
451	FAA/AIR	2155(a)	6	The aircraft must have controllable handling characteristics during taxi, take-off, and landing for the anticipated operation.	Move to 2135, delete 2155 unless there are specific ground and water handling characteristics needed. As written, there is nothing that is not stated or inferred in 2135. Suggest adopting 27.231-241 inclusive	Y	N	Partially accepted	VTOL.2155 will be deleted. 27.231-241 will be considered for the AMC.

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VTOL.2160 Vibration

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
452	William Branch	VTOL.2160	7	The intent for this section is high speed buffeting, which is probably not a problem for this class of aircraft, but the simplification seems to be a bit excessive and removes the intent.	Change (a) to: Each part of the aircraft must be free from excessive vibration that would interfere with the control of the aircraft or cause excessive fatigue to the flight crew throughout the flight envelope.			Not accepted	The more generic wording of CS 27.251 was chosen. Relevant elements from CS-23 will be considered for the AMC.
453	Rolls-Royce	VTOL.2160		Ground vibration should also be covered as per rotorcraft regulations	Include ground vibration in this section	Yes	Yes	Partially accepted	Will be considered for the AMC under VTOL.2160 and/or VTOL.2305
454	Vertical Aerospace	VTOL.2160		Without AMC to support this section the Vertical Aerospace interpretation is that this is applied to address potential issues on the airframe. It is our position that the effect of excessive vibration should not have an adverse effect on crew or passengers. The proposed solution specifically addresses the flight crew by which would envelope any concerns for the passengers.	It is suggested that VTOL.2160(b) be added to read “Cabin vibration must not have be unduly fatiguing or unacceptably distracting to the flight crew”	Suggestion		Partially accepted	Will be considered for the AMC
455	Airbus Group	2160		‘buffeting’ has been removed from the title, while still addressed in 2215(b); please clarify		X		Noted	The more generic wording of CS 27.251 was chosen. Buffeting aspects may be retained in the AMC where appropriate.
456	ADS	VTOL.2160	7	Ground vibration should also be covered as per rotorcraft regulations	Include ground vibration in this section	Yes	Yes	Partially accepted	Will be considered for the AMC under VTOL.2160 and/or VTOL.2305
457	Sikorsky	VTOL.2160.a	7	“Excessive vibration” not adequately quantified to provide basis for certification.	Quantify maximum vibration magnitude and direction aircraft can experience that would be deemed acceptable.	No	Yes	Noted	The more generic wording of CS 27.251 was chosen. More details on maxima will be considered for the AMC.

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458	FAA/AIR	2160	7	<p>The Part 23 FAST team originally proposed deleting all the part 23 and CS-23 paragraphs in this section. But with further review and consideration, we realized that there are high speed issues beyond just excessive vibration that need to be addressed. We understand that most of the proposed VTOL aircraft are not high speed aircraft. But that doesn't mean there won't be one. The Harrier is a high speed VTOL aircraft. And there is a company planning a 3 fan, turbine VTOL in the US.</p> <p>There are also high speed issues associated with retreating blade stall, since the the rotor/prop-rotor blades are moving at speeds considerably faster than the aircraft itself. John S could we add this to the comment summary</p>	<p>Recommend the following:</p> <p>(a) Vibration and buffeting, for operations up to V_D/M_D, must not interfere with the control of the aircraft or cause excessive fatigue to the flightcrew. Except for stall warning buffet, each part of the aircraft must be free from excessive vibration under each appropriate speed and power condition,.</p> <p>(b) For high-speed aircraft and all aircraft with a maximum operating altitude greater than 25,000 feet (7,620 meters) pressure altitude, there must be no perceptible buffeting in cruise configuration at 1g and at any speed up to V_{MO}/M_{MO}, except stall buffeting.</p> <p>(c) For high-speed aircraft, the applicant must determine the positive maneuvering load factors at which the onset of perceptible buffet occurs in the cruise configuration within the operational envelope. Likely inadvertent excursions beyond this boundary must not result in structural damage.</p> <p>(d) High-speed aircraft must have recovery characteristics that do not result in structural damage or loss of control, beginning at any likely speed up to V_{MO}/M_{MO}, following—</p> <p>(1) An inadvertent speed increase; and</p> <p>(2) A high-speed trim upset for aircraft where dynamic pressure can impair the longitudinal trim system operation.</p>			Partially accepted	The more generic wording of CS 27.251 was chosen. More details will be provided in the AMC.
459	FAA/AIR	2160		This paragraph contains part 25 concepts that are not defined and may not be appropriate for this type of aircraft.	Remove part 25 concepts from the Special Condition.	Y	Y	Partially accepted	The more generic wording of CS 27.251 was chosen. More details will be provided in the AMC.
460	Aidan Reilly	VTOL.2160		Ground vibration should also be regulated, as per CS-27.				Partially accepted	Will be considered for the AMC under VTOL.2160 and/or VTOL.2305

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VTOL.2165 Flight in icing conditions

Explanatory Note 18:

A similar approach to CS-27 and CS 23.2415 has been adopted, where inadvertent icing must be considered. A requirement mirroring CS 23.2540 has not been deemed necessary as it is considered to be included in the objectives of VTOL.2165 and can be detailed in the AMC.

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461	Marco Rizzato	VTOL.2165(b)		Flight in icing conditions: Shouldn't this be only for the enhanced category?			yes	Noted	See Explanatory Note 18. It applies to both categories.
462	William Branch	VTOL.2165	7	In a number of places the document starts a section with a colon then puts a period on the sub-bullets. The sub-bullets should have commas or semi-colons.	Correct in a number of places.	No	Yes	Accepted	-
463	Cranfield Aerospace Solutions Ltd	VTOL.2165(b)	7	The change to this paragraph implies ice detection is required regardless if the aircraft prohibited from flying in icing conditions, is this correct?	Clarification on reasoning for change.	Yes	No	Noted	See Explanatory Note 18
464	Lilium Gmbh	VTOL.2165 (a)(2)		Effectiveness of the ice protection system should not have to be demonstrated by test.	Amend VTOL.2165 (a)(2) to read: (2) demonstrate the effectiveness of the ice protection system and its components.		Yes	Partially accepted	Wording has been modified. References to analysis and test will be made in the AMC.
465	SAFRAN	VTOL.2165(2)(b)	7/26	This requirement is contradiction with applicability to systems with automation capability. It is highly complex for an autonomous system to exit or avoid icing conditions in "any conditions", especially in case of emergency situation.	N/A		Yes	Noted	See Explanatory Note 3
466	Diamond Aircraft Industries GmbH	VTOL.2540 Vs. VTOL.2165		If the system requirements (CS 23.2540) were intentionally brought over to VTOL.2165 – "Analysis" only is very limiting to demonstrate safe operation. <ul style="list-style-type: none">If VTOL.2165 shall only cover the flight related aspects, system requirements similar to CS 23.2540 are missing.	<ul style="list-style-type: none">Gernaralize means and methods of compliance demonstration in VTOL.2165 or include CS 23.2540 requirements to VTOL.2540	no	yes	Accepted	Wording has been modified. References to analysis and test will be made in the AMC.
467	EVA	VTOL 2165	7	Are the icing conditions to be taken into account only while on the ground or while in cruise as well?		NO	NO	Noted	The AMC will clarify conditions to consider on ground and in flight
468	W Field LMWL Yeovil	2165 (a) (2)	7	Flight in icing conditions "show by test the effectiveness of the ice protection system and its components" This is a single instance of defining how to meet the rule that is held in the rule.	To be more consistent with the principles of CS-23 at Amdt 5, this information should be included in the AMC/GM materials.	YES	NO	Accepted	Wording has been modified. References to analysis and test will be made in the AMC.
469	Airbus Group	2165 (b)		Intent of this § is that it is applicable only if the applicant requests certification for flight into icing conditions	Add this clarification	X		Not accepted	The intention of the paragraph (b) is to request the detection of any icing conditions for which operation is not allowed in order to avoid/exit

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470	Airbus Group	2165(b)		Airplanes that are not certified for flight into icing conditions need not detect icing; why should it be different for eVTOL?	Include condition that detection only applies to aircraft certified for flight into icing conditions.		X	Not accepted	See Explanatory Note 18. This is the current approach for CS-27.
471	FAA/AIR	2165(a)		<p>Proposed VTOL.2165(a) to demonstrate “the aircraft can be safely operated in the icing conditions for which certification is requested” is equivalent to 23.1419 at Amdt. 23-14. The FAA determined a need to define “capable of operating safely” and made this change to the rule language at Amdt. 23-43. This rule change made a significant impact on part 23 airplane safety in icing. Stall warning is critical in flight phases that depend on wing lift, which is expected to be the majority of the Lilium flight profile.</p> <p>The analysis required in proposed paragraph (a)(1) to show adequacy of ice protection systems should be in VTOL.2540, see comment on VTO.2540.</p> <p>Proposed paragraph (2) is a means of compliance and should be in guidance material.</p>	<p>Replace proposed VTOL.2165(a) with:</p> <p>(a) An applicant who requests certification for flight in atmospheric icing conditions must show the following in the icing conditions for which certification is requested:</p> <p>(1) Compliance with each requirement of this subpart, except those applicable to spins and any that must be demonstrated at speeds in excess of—</p> <p>(i) 250 knots CAS;</p> <p>(ii) V_{MO}/M_{MO} or V_{NE}; or</p> <p>(iii) A speed at which the applicant demonstrates the airframe will be free of ice accretion.</p> <p>(2) The means by which minimum safe speed warning is provided to the pilot for flight in icing conditions and non-icing conditions is the same.</p>		Y	Partially accepted	Wording has been modified. References to specific speeds, analysis and test will be made in the AMC. See also Explanatory Note 18.
472	FAA/AIR	2165(b) 2165(c)		The proposed VTOL.2165 (b) and (c) states the same requirement as the FAA proposal. However, the EASA proposal is more straight-forward and preferable.	None	Y		Noted	-
473	TCCA-AISA	VTOL.2165	7/26	There is a requirement to provide detection when in icing conditions the aircraft is not certified for but there is no requirement to indicate when icing conditions are encountered.	Add requirement for a definition of what constitutes icing conditions and provide an indication to the flight crew so the protection icing conditions systems can be activated.	No	Yes	Partially accepted	The objective is deemed to be covered by “safely operated” and details will be provided in the AMC

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474	TCCA – OS&ES	VTOL.2165	7/26	<p>Experience with many aircraft icing certifications shows that certification for flight in icing conditions is a complex and challenging compliance activity including flight in measured natural icing conditions. The definition of the icing conditions for which certification is requested and how that translates to operational limitations and procedures is a subject of much discussion at the present time. The means to detect any icing conditions and activate systems or avoid or exit those conditions has been challenging in past programs as is expected to be more challenging with the new icing envelopes particularly SLD conditions. Inadvertent exposures to icing conditions for which the aircraft is not approved for flight in icing conditions has been shown in the past to result in incidents and accidents rather than continued safe flight. Other than an outright limitation on prohibited flight in icing conditions, it will be challenging to develop operating limitations that can reliably be applied to actual operations particularly where some icing conditions may be allowed and others may not.</p> <p>If flight in icing conditions is requested, then many other aircraft systems are affected as well as performance and handling by this requirement and the selection of the requested icing conditions. For example flying qualities may need to be demonstrated in the clean configuration as well as in the icing conditions requested. This link to many other paragraphs needs to be clearly stated in interpretative material or AMC's associated with the request for flight in icing conditions.</p>	Consider flight in icing conditions to be out of scope for this category of aircraft in the current technological context, in light of the absence of interpretative material or AMC's associated to a request for flight in icing conditions.	No	Yes	Partially accepted	EASA agrees that AMC needs to be provided as means to comply with the requirement
475	TCCA (B Harvey)	VTOL.2165		VTOL.2165(a)(1): The analysis is the only "required" action to confirm adequacy of the ice protection system in the rule as written. Suggest re-writing as "The ice protection system for the various components of the aircraft must be adequate for the aircraft's operational needs" (ie. To leave the door open for design review, analysis, test etc. as AMCs).	Re-write as "The ice protection system for the various components of the aircraft must be adequate for the aircraft's operational needs"	no	Yes	Partially accepted	Wording has been modified. References to analysis and test will be made in the AMC.
476	GAMA	VTOL.2165	7	As a result of the current state of battery energy density, it is likely that many early all electric VTOL will not include equipment for flight into known icing and they might also not include equipment for IMC flight. As a result, GAMA suggests that EASA consider the need for inadvertent icing to be considered in a manner that is similar to CS-23.	It is appropriate to assure that an inadvertent encounter will allow for thrust to continue to be produced (cooling passages, ect.) and for aft propellers to safely ingest any inadvertent ice which might form and later melt from forward propellers. It should not be necessary to conduct inadvertent icing testing beyond this kind of activities. Aircraft which are not going to fly in IMC should not need to include systems to detect and exit icing. The icing issues considered in VTOL.2415 seem to adequately capture these issues and VTOL.2165 should not be applicable to aircraft which will not fly in IMC.	Yes	Yes	Partially accepted	Will be considered for the AMC

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477	Aidan Reilly	VTOL.2165		The flight manual should contain relevant limitations governing ground operation of the vehicle when it is covered in ice or snow, because e.g. the operation of lift/thrust units which have accumulated significant quantities of ice or snow may cause damage to the aircraft and / or to people and property in the vicinity, e.g. if large lumps of ice are projected at high velocity by inertial or aerodynamic effects.				Noted	It is normal practice to clear aircraft from ice before departing and to have related instructions in the aircraft Flight Manual. Will be considered for the AMC.
478	Aidan Reilly	VTOL.2165		Aircraft which substantially rely upon battery power may suffer reductions in battery capacity at low temperature, which will be exacerbated by performance penalties and increases in power consumption associated with icing and the operation of ice protection systems. The aircraft should provide the flight crew with a clear indication of any reduction in payload-range capability as it occurs, and the rate at which further penalties may accrue in order to facilitate timely decision-making.				Noted	Will be considered for the AMC

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VTOL.2170 Operating Limitations

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
479	Tine Tomazic	VTOL.2170	7	Information about mode of operation is missing	Add (3) clear information about how to differentiate in which control mode the aircraft is (i.e. normal, abnormal, degraded, emergency, etc). It must be super-clear to the pilot/operator in which health condition the aircraft is.		yes	Partially accepted	Will be considered for the AMC
480	Rolls-Royce	VTOL.2170		The information should be provided for all configurations in which the aircraft may operate (e.g. a tilt wing a vertical lift and cruise configurations)	Add requirement for all possible vehicle operating configurations	Yes	No	Partially accepted	Will be considered for the AMC
481	EAS/ N Rostedt	VTOL.2170 Operational Limitations	7	If the operational limitations in (a) differ depending on whether the aircraft is locally piloted, remotely piloted or in autonomous flight, information for each case should be given.	Add to the SC-VTOL accordingly, alternatively include in the relevant OPS.	Suggestion	Substantive	Noted	See Explanatory Note 3
482	Airbus Group	2170	6	What have flight informations to do in operating limitations ?		X		Noted	CS-23 construction and wording has been retained
483	ADS	VTOL.2170	7	The information should be provided for all configurations in which the aircraft may operate (e.g. a tilt wing a vertical lift and cruise configurations)	All requirement for all possible vehicle operating configurations	Yes	No	Partially accepted	Will be considered for the AMC
484	FAA/AIR	2170		This appears to be a new SC requirement that did not come from part23. It is unclear as to the intent of this requirement since it appears to be redundant when compared with 2620.	Can EASA clarify what the intent is of this new requirement?	Y	Y	Noted	CS-23 construction and wording has been retained. This paragraph refers to establishing limits while VTOL.2620 addresses providing the information.
485	FAA/AIR	2170 (a)(2)	7	“Performance information” Does this infer that performance charts are in the limitations section of the AFM?	Clarify. Or change title of 2170. As written the interpretation could be that perf charts will be limitations in the AFM			Noted	CS-23 construction and wording has been retained

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SUBPART C – STRUCTURES

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
486	W Field LMWL Yeovil	Sub Part C		The VTOL requirements include “water loads” from which it is inferred that operation over water is permitted. However, the SC does not specifically include topics such as normal and emergency loading for ditching (ref CS27.563).	With people on board ditching requirements should be applicable as a requirement for preservation of life.	NO	YES	Noted	This is intended to be covered by VTOL.2310(b)(2) and (c)(2). The operational rules will determine which certification level is requested for which operation.

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VTOL.2200 Structural design envelope

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
487	David LoebI, AutoFlightX	VTOL.2200 (a)	8	In CS-23, the whole paragraph CS23.2200 (a) is dedicated to airspeed where in VTOL.2200 (a) there is a mixture of design parameters and airspeed. For a VTOL, where part of the lift is generated by a wing, there is still the powered lift system that can produce sufficient lift and control authority (i.e. prevent loss of control) for the case of falling below the stall speed. In other words, the intention of the original CS23.2200 (a) paragraph was to prevent exceedance of the lower envelope bound, which however is not the case for any transition VTOL, since the lower envelope usually ends at zero speed (i.e. hover). For the case, that a VTOL has only small lift surfaces to produce some additional lift during forward flight, definition of the stalling speed is not clear – especially if the vehicle might not be able at all to fly solely on aerodynamic lift. In summary, the envelope of a VTOL is no longer driven by its stall speed and adequate speed margins from the stall speed, which makes CS23.2000 (a)(1) obsolete.	I suggest to delete VTOL.2200 (a)(1) without substitution.	Yes	No	Partially accepted	“if applicable” is added to (a)(1), as some architectures may still be susceptible to stall
488	Philipp Reiß, FSD	VTOL.2200 (a)(1)	8	This comment again aligns with the two comments above. If the SC is compared with CS-23, where the whole paragraph CS23.2200 (a) is devoted to airspeed. In the SC it is a mixture of design requirements and airspeed. However, if there is a powered lift system there would still be enough control authority at lower speeds. So we suggest to delete this paragraph.	Delete VTOL.2200 (a)(1)	Yes	No	Partially accepted	“if applicable” is added to (a)(1), as some architectures may still be susceptible to stall. “airspeeds” will be reintroduced and the AMC will clarify that other elements that may have a bearing on the manoeuvring and gust loads, for example in case of augmented lift, will need to be considered.
489	Vertical Aerospace	VTOL.2200(a)(1)		It is considered that the phrase “part of the lift” may be open to mis-interpretation.	For clarity it is suggested that the section should read “If any lift is generated by a wing”	Suggestion		Noted	“part of the lift” is intended to cover all amounts of lift on the wing, up to the full amount, for configurations prone to inadvertent stalling. This will be clarified in the AMC.
490	W Field LMWL Yeovil	General		There is no specific mention of structural design considerations such as Yaw and Unsymmetrical loads as a reflection of similar topics within CS27 and CS29.	Specific considerations for configurations other than the pure FW basis in CS23.	YES	NO	Partially accepted	Will be considered for the AMC
491	Airbus Group	2200	8	Having changed “airspeeds” into “parameters” in (a) makes that (a)(1) does not mean anything.	Recover “Airspeeds”		X	Accepted	The AMC will clarify that other elements that may have a bearing on the manoeuvring and gust loads, for example in case of augmented lift, will need to be considered
492	Airbus Group	2200(a)(2)		How is it decided if the flight envelope is “practical”?	Suggest "provide sufficient margin for the establishment of flight envelopes."	X		Not accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC
493	Airbus Group	2200(b)		Limit load definition would be expected; based on aerodynamic and mechanical limits as in CS27 or CS29	Refer to VTOL.2230 instead of “flight load conditions to be expected in service”	X		Not accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
494	UK CAA	VTOL. 2200(a)(2)		Now the text refers to “practical flight envelopes”?	See point 4 above.	Yes		Accepted	See Explanatory Note 14
495	Sikorsky	VTOL.2200.a.1	8	Poorly worded requirement that utilized fixed-wing terms “turbulent” as opposed to VTOL-specific language, including “gusts”.	Rephrase to properly capture unique aspects of vehicles designed for VTOL flight.	Yes	No	Not accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC
496	FAA/AIR	2200	8	What about aircraft that can generate all of the lift during certain times in certain configurations? Is this intended to cover aircraft that generate lift “part of the time” also instead of just “part of the lift”?		Y		Noted	“part of the lift” is intended to cover all amounts of lift on the wing, up to the full amount, for configurations prone to inadvertent stalling, including if this is “part of the time”. This will be clarified in the AMC.
497	FAA/AIR	2200	8	VTOL.2200 (a)(1) is not clear. Structural parameters must be greater than the stalling speed? It is unclear what the requirement is. The structural design must account for conditions greater than stall speed?	Expand on what is required to be sufficiently greater than the stalling speed. Note that FAA 14 CFR 23.2200 requires this of structural design airspeeds. Since this is VTOL, there are other other parameters, to include those of rotor lift, or propulsive lift, devices that may affect structural envelope.		Yes	Accepted	“parameters” changed back to “airspeeds”. The AMC will clarify that other elements that may have a bearing on the manoeuvring and gust loads, for example in case of augmented lift, will need to be considered.
498	FAA/AIR	2200	8	No requirement to account for variation in altitude.	Add requirement: “At each critical altitude up to the maximum altitude”.	Yes	Yes	Not accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC
499	FAA/AIR	2200	8	No requirement to account for maximum rearward and sideward flight speeds on aircraft equipped with propulsor driven lifting devices.	Add requirement: “For aircraft equipped with engine driven lifting devices, lifting device rotational speed and ranges, and the maximum rearward and sideward flight speeds”.	Yes	Yes	Partially accepted	This is deemed to be covered by (b) and will be detailed in the AMC
500	FAA/AIR	2200(a)	8	“Structural design parameters to be considered...”	FAST team and current Part 23 uses airspeeds. It is understood that “parameters” is meant to further generalize the requirement, however, in context with the following subparagraphs, it does not make sense as “parameters” is not necessarily an airspeed. e.g., it reads that the ‘parameters must be sufficiently greater than the stall speed’. Recommend better clarity.	Yes	No	Accepted	“parameters” changed back to “airspeeds”. The AMC will clarify that other elements that may have a bearing on the manoeuvring and gust loads, for example in case of augmented lift, will need to be considered.
501	FAA/AIR	2200(a)(1) (maybe other locations too)	8	The term stall speed is used. The text specifies “if part of the lift is generated by a wing,”. However, if only part of the lift is generated by the wing, the stall speed may not be the issue. A stalled lifting surface may not be unsafe in some instances.	Change “stall speed” to “minimum safe speed”	Yes	Yes	Partially accepted	This paragraph is applicable only if stall can lead to loss of control. This will be detailed in the AMC
502	Aidan Reilly	VTOL.2200		The use of “parameters” instead of “airspeeds” obscures the meaning and intent of the original text of CS-23 Amendment 5.				Accepted	“parameters” changed back to “airspeeds”. The AMC will clarify that other elements that may have a bearing on the manoeuvring and gust loads, for example in case of augmented lift, will need to be considered.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
503	Aidan Reilly	VTOL.2200		Failure cases should be included in the structural design envelope because e.g. out of balance loads from failure of a rotor blade may have important aeroelastic implications; it would seem sensible to amend (b) to say “flight load condition to be expected in service, including a critical malfunction of thrust/lift”.				Partially accepted	Will be considered for the AMC, for example under VTOL.2205

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VTOL.2205 Interaction of systems and structures

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
504	TCCA – Structures	VTOL.2205	8/26	Interaction of systems and structures. Note: This is the same text as CS23.2205 which is significantly different from Part23.2205, leading to a different interpretation and application of this rule by FAA and EASA.	Harmonization.	Yes	No	Noted	EASA will continue to work towards harmonisation with its international partners

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VTOL.2210 Structural design loads

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
505	Airbus Group	2210		Instead of “structural design loads” a limit/ultimate load definition would be expected	Limit load definition would be expected; based on aerodynamic and mechanical limits as in CS27 or CS29	X		Not accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC. Limit loads are also addressed in VTOL.2230.
506	Aidan Reilly	VTOL.2210		<p>There should be more stringent regulation of what constitute “likely” loads. For example, the legacy limit load specifications in previous iterations of CS-23, 14CFR§23 etc. included important terms such as the transport category 2.5 g limit, and these should be retained.</p> <p>Given the wide range of quantitative safety objectives specified in AMC VTOL.2510 (which span a factor of 10³), the factor of 1.5 (specified in VTOL.2230) has very different effects. The FAA define a “probable” failure as a 10⁻⁵ per flying hour event in AC 25.1309-1A; if we assume that “likely” maximum loads have the same probability, then the safety factor of 1.5 is only expected to reduce the probability of catastrophic structural failure by a factor 10 in the case of a Category Basic aircraft with 0-1 passengers, but by 10⁴ in the case of a Category Enhanced aircraft.</p> <p>Given the variation in the quantitative safety objectives permitted by AMC VTOL.2510, either the assumptions used to generate the structural design loads, or the factor of safety specified in VTOL.2230 should be a function of aircraft category.</p>				Partially accepted	<p>The determination of the limit loads factors is one of the challenges for VTOL. Indeed, the VTOL limit flight envelope can consider approaches similar to rotorcraft and/or CS-23 (V, n envelope). It will need to be also determined if the load factors can be derived from the flight control system law or if conservatively a minimum load factors is considered (e.g. 3.5 g in CS 27.337(a)).</p> <p>It is not planned to introduce a probabilistic approach for the determination of safety factors in general. Specifically for interaction of systems and structures requirements, in failure cases a reduced factor can be considered associated with the probability of failure. This approach will be very similar to what is developed for example in CS 23.2205 “interaction system and structure”.</p>

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VTOL.2215 Flight load conditions

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
507	Tine Tomazic	VTOL.2215(b)(1)	9	Dive speed in CS-23 or CS-25 sense? what margin? A CS-23 1.4x margin seems excessive for digital flight control systems. Also - what if there are no wings, what's "dive speed then"?			yes	Noted	The concept of dive speed exists also for rotorcraft. Details will be provided in the AMC.
508	Lilium Gmbh	VTOL.2115(a)(1)		This requirement appears to be in conflict with VTOL 2105 (a)(2) which only required the operational envelope to be considered for the Category Enhanced	Clarification required from the Agency		Yes	Noted	VTOL.2105(a) applies only to flight performance requirements
509	Airbus Group	2215	9	Is (b)(2) necessary whereas VD exceeds the limit FE ?		X		Noted	(b)(2) can include other parts of the envelope, for example RPM limits
510	Airbus Group	2215	9	Is (c) necessary whereas it is already addressed in (a)?		X		Noted	CS-23 construction and wording has been retained
511	ONERA	VTOL.2215	9	May consider somewhere the potential configuration changes. Especially if you want to ensure continued safe flight after critical failure in Enhanced Cat.		Yes	No	Partially accepted	Will be considered for the AMC
512	CAA NZ	VTOL.2215(b)(2)		This requirement text could possibly be considered superfluous as is it not inherently covered by the normally accepted definitions of Limit and Ultimate loads?		Yes	No	Noted	CS-23 construction and wording has been retained with (b)(2) introduced to consider other limits than dive speed, for example RPM limits
513	Aidan Reilly	VTOL.2215		<p>The gust strength and shape functions to be used in defining the gust envelope should be specified by the regulator.</p> <p><i>No useful purpose is served by defining the loads resulting from a likely failure of an aircraft system, component, or thrust/lift unit, if there is not a corresponding requirement for the aircraft to be sufficiently strong to withstand them.</i></p>				Partially accepted	Will be considered for the AMC

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VTOL.2220 Ground and water load conditions

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
514	Aidan Reilly	VTOL.2220		“the applicable surface” should be amended to “surfaces from which certified operation is sought”. Structural design loads should include likely FOD due to downwash effects if certification of operation from unprepared surfaces is sought.				Partially accepted	Will be considered for the AMC. See also VTOL.2400(c)(1)

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VTOL.2225 Component loading conditions

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
515	William Branch	VTOL.2225	9	Another place where you have periods after (1) and (2) where they should be semi-colons and were changed from CS-23.	Correct throughout the document	No	Yes	Accepted	-
516	William Branch	VTOL.2225 (c)	9	The term “limit input torque” is confusing and could be taken as we must limit input torque. But I think it might be clearer if input was left out...or change wording somehow.	Make it unambiguous.	Yes	No	Not accepted	(c) was proposed by the FAA FAST. As the objective addresses determination of design loads, the meaning is deemed sufficiently clear.
517	Aerossurance	2225(c)		Use of the term ‘rotor’ may limit consideration inadvertently to only certain components of certain propulsive/lift solutions	Change ‘rotor assemblies’ to ‘thrust/lift system rotating assemblies’ and ‘rotor rotational speed’ to thrust/lift system rotating assembly speeds’.	Suggestion	Substantive	Partially accepted	The AMC will clarify which systems this objective applies to
518	Lilium Gmbh	VTOL.2225		It is unclear whether rotor assemblies refer to rotary wings or also to rotors within and engine.	Clarification requested from the Agency,(or publish associated AMC)	Yes		Partially accepted	The AMC will clarify which systems this objective applies to. See also Explanatory Note 24.
519	Airbus Group	2225(c)		Are propellers considered rotors? Requirements from CS-P should be sufficient.	Suggest adding condition for propellers satisfying requirements in CS-P.			Partially accepted	See Explanatory Note 24
520	ADS	VTOL.2225	9	Use of the term ‘rotor’ may limit consideration inadvertently to only certain components of certain propulsive/lift solutions	Change ‘rotor assemblies’ to ‘thrust/lift system rotating assemblies’ and ‘rotor rotational speed’ to thrust/lift system rotating assembly speeds’.	Yes	Yes	Partially accepted	The AMC will clarify which systems this objective applies to
521	Sikorsky	VTOL.2225.c	9	Wording is sufficiently generic to provide inadequate basis for certification.	Clarify flight and ground conditions, or reference paragraph regarding operating envelope.	Yes	No	Partially accepted	Will be considered for the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
522	FAA/AIR	2225	9	No requirement to account for certain various component loads.	<p>Add the following:</p> <p>“The applicant must determine the structural design loads acting on:</p> <p>(a) Each engine mount and its supporting structure such that both are designed to withstand loads resulting from—</p> <p style="padding-left: 40px;">(1) Powerplant operation combined with flight gust and maneuver loads; and</p> <p style="padding-left: 40px;">(2) For non-reciprocating powerplants, sudden powerplant stoppage.</p> <p>(b) Each flight control and high-lift surface, their associated system and supporting structure resulting from—</p> <p style="padding-left: 40px;">(1) The inertia of each surface and mass balance attachment;</p> <p style="padding-left: 40px;">(2) Flight gusts and maneuvers;</p> <p style="padding-left: 40px;">(3) Pilot or automated system inputs; and</p> <p style="padding-left: 40px;">(4) System induced conditions, including jamming and friction;</p> <p>(c) A pressurized cabin resulting from the pressurization differential—</p> <p style="padding-left: 40px;">(1) From zero up to the maximum relief pressure combined with gust and maneuver loads;</p> <p style="padding-left: 40px;">(2) From zero up to the maximum relief pressure combined with ground and water loads if the airplane may land with the cabin pressurized; and</p> <p style="padding-left: 40px;">(3) At the maximum relief pressure multiplied by 1.33, omitting all other loads.”</p>	Yes	Yes	Partially accepted	CS-23 construction and wording has been retained with some adaptation proposed by the FAA FAST. The additional considerations raised will be considered for the AMC.
523	Boeing	VTOL.2225(c)	9	<p>THE PROPOSED TEXT STATES:</p> <p><i>(c) The applicant must determine the structural design loads acting on rotor assemblies, considering loads resulting from flight and ground conditions, as well as limit input torque at any rotor rotational speed.</i></p>	<p>REQUESTED CHANGE:</p> <p>(c) The applicant must determine the structural design loads acting on rotor assemblies rotating systems subject to aerodynamic loads, considering loads resulting from flight and ground conditions, as well as limit input torque at any rotor rotational speed.</p> <p>JUSTIFICATION:</p> <p>Component loading conditions are of particular importance when considering any dynamic (rotating) component that transmits aerodynamic loads to static structure. Singling out the “rotor assembly” may leave many rotating system components unresolved.</p>			Partially accepted	The AMC will clarify which systems this objective applies to

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
524	CAA NZ	VTOL.2225(c)		<p>This requirement text could possibly be improved by relocating all the text to be within (a) such that it reads:</p> <p><i>VTOL.2225 Component loading conditions</i> <i>(a) The applicant must determine the loads acting upon all relevant structural components, including rotor assemblies, in response to:</i> <i>(1) interaction of systems and structures.</i> <i>(2) structural design loads.</i> <i>(3) flight load conditions; and</i> <i>(4) ground and water load conditions; and</i> <i>(5) limit input torque loads from lift/thrust units at any rotational speed</i> <i>(b) Reserved.</i> <i>(c) The applicant must determine the structural design loads acting on rotor assemblies, considering loads resulting from flight and ground conditions, as well as limit input torque at any rotor rotational speed.</i></p>		Yes	No	Accepted	-
525	Aidan Reilly	VTOL.2225		<p>Because electrical machines are often capable of imposing substantial braking torques, the most adverse likely inertial load on an electrically driven rotor may be due to braking because the aerodynamic drag and motor torques are additive.</p>				Noted	Will be considered for the AMC
526	Aidan Reilly	VTOL.2225		<p>The direction of rotation of electrical machines may be altered easily by swapping wires. Unless such an inadvertent swap can be shown to be unlikely (e.g. by designing connections which cannot be inadvertently swapped) the design loads should account for inadvertent reversed operation of one thrust/lift unit during maintenance, and the aircraft flight manual should include clear post-maintenance test instructions to ensure the full and free operation of all controls in the correct sense.</p>				Noted	Will be considered for the AMC

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VTOL.2230 Limit and ultimate loads

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
527	Rolls-Royce	VTOL.2230		This paragraph appears to allow applicants to choose not to have ultimate loads as 1.5x limit loads. This seems strange, though if flexibility if desired you could change it to <i>minimum</i> 1.5x limit load	Clarify that ultimate loads can be no less than 1.5x limit load	Yes	Yes	Partially accepted	CS-23 construction and wording has been retained. Further clarification will be provided in the AMC.
528	Dr. Norbert Lohl	VTOL.2230 (a) (2)	9	Ultimate loads may be defined with means of simulation and extensive load data for validation of safety	As alternate Means of Compliance ultimate loads could also be defined with means of simulation and extensive load data if safety is verified	yes	no	Partially accepted	Will be considered for the AMC
529	ADS	VTOL.2230	9	This paragraph appears to allow applicants to choose not to have ultimate loads as 1.5x limit loads. This seems strange, though if flexibility if desired you could change it to minimum 1.5x limit load	Clarify that ultimate loads can be no less than 1.5x limit load	Yes	Yes	Partially accepted	CS-23 construction and wording has been retained. Further clarification will be provided in the AMC.
530	FAA/AIR	2230	10	VTOL.2230 (b) is not clearly written.	Remove or reword such as under ultimate loading, permanent deformation is acceptable as long as failure to react loads does not occur.		Y	Noted	CS-23 construction and wording has been retained. EASA will continue to work towards harmonisation with its international partners.
531	Aidan Reilly	VTOL.2230		See previous comment RE VTOL.2210				Partially accepted	See Explanatory Note 20

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VTOL.2235 Structural strength

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
532	Rolls-Royce		VTOL.2235	Supporting these loads under all configurations is not explicit	Add clarification that “The structure must support <i>the following in all vehicle configurations</i> ”	Yes	No	Partially accepted	Will be considered for the AMC
533	Airbus Group	2235		Non-detrimental permanent deformation is allowed? No test is required for compliance demonstration?	Should be the same wording as CS27/CS29.0305	X	X	Accepted	“or” has been added. It is not intended in this objective to specify how to substantiate (test, analysis or both...). This will be detailed in the AMC with probably the same principle (similarity classification) as already developed in the existing AMC 2X.307 Proof of structure.
534	ADS	VTOL.2235	10	Supporting these loads under all configurations is not explicit	Add clarification that “The structure must support the following in all vehicle configurations”	Yes	No	Partially accepted	Will be considered for the AMC
535	FAA/AIR	2235	10	In VTOL.2235, the limit load requirement has conditions, but ultimate load requirement does not. This is consistent with 14 CFR 23.2235, but how is the structure supposed to support ultimate loads—with or without permanent deformation?	It is noted that ultimate load capability in rotorcraft and transport airplanes is accepted as the ability to statically sustain 1.5 times the limit load for 3 seconds, or sustain dynamic loads with other requirements. It may be prudent to maintain those higher requirements here rather than leave it up to the applicant to determine what constitutes successful supporting of ultimate loads. It also may not be appropriate for certain rotor applications to not address dynamic loading.		Y	Partially accepted	Accepted Means to comply with the objective (e.g. 3 seconds with no failure) will be addressed in the AMC. It is agreed that the ultimate loads for dynamic condition need also to be addressed in the AMC.
536	Aidan Reilly	VTOL.2235		Because aircraft concepts seeking certification under this Special Condition may dramatically change their configuration during flight, it should be required that they demonstrate compliance with VTOL.2235 under all configurations for which certification is sought.				Partially accepted	It is agreed that limit and ultimate loads have to be considered for all configurations. This issue however will be addressed in the load objective. VTOL.2235 relates only to limit and ultimate loads.

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VTOL.2240 Structural Durability

Explanatory Note 19:

It is expected that some VTOL aircraft will utilise new technology and will conduct new types of operations. An objective for provisions for in-service monitoring has been added so that the type certificate holder has means to be informed if some of the certification assumptions turn out to be incorrect. An example would be bearings being removed for wear and tear long before the anticipated service life The AMC will provide more details on how this can be achieved, for example through Instructions for Continued Airworthiness or through Health and Usage Monitoring Systems. Some further background information can be found in EASA Certification Memorandum CM-S-007. This objective has been made mandatory only for Category Enhanced to provide a level of proportionality.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
537	Embraer S.A.	VTOL.2240(d)		Embraer believes the requirement VTOL.2240(d) has not a clear definition related to the structure damage analysis caused by the event of high-energy fragments from uncontained thrust/lift unit or rotating-machinery failure.	Embraer suggests to create AMC to better define the understanding of the model and the impact analysis due to the event of high-energy fragments from uncontained thrust/lift unit or rotating-machinery failure.	YES	YES	Noted	Will be considered for the AMC
538	Lilium Gmbh	VTOL.2240 (b)		It is not understood why this requirement would not apply to the basic category aircraft.	Delete For Category Enhanced	Yes		Not accepted	This paragraph provides proportionality between the categories Basic and Enhanced, similarly to CS-23 with Level-4
539	Lilium Gmbh	VTOL.2240 (e)		The stated objective has at its heart an obligation on both an Operator/CAMO/Maintenance Organisation and the State of Registry, it cannot be executed solely by the TC Applicant.	Reword VTOL.2240 (e)to read: For Category Enhanced , a system for adequate in-service monitoring of parts having an important bearing on safety in operations must be established		Yes	Partially accepted	The terms “provisions for” have been added
540	Vertical Aerospace	VTOL.2240(d)		Please can EASA confirm that the AMC will give adequate guidance on the definition of “Minimise”		Observation	N/A	Noted	Will be considered for the AMC
541	SAFRAN	VTOL.2240	10/26	Could you provide a definition of “High Energy fragment” in the context of configurations covered by SC VTOL	N/A	Yes		Noted	Will be considered for the AMC
542	SAFRAN	VTOL.2240	10/26	Question for Stakeholders : Does the structural integrity applies also to the propulsive system (i.e. mounts for example) ?	N/A	YES		Noted	Will be considered for the AMC. See also Explanatory Note 24.
543	SAFRAN	VTOL.2240(e)	10/26	Question for Stakeholders : This requirement can be understood as equivalent to PART M life-limited part monitoring requirement (process based on ICA content) or as an additional requirement which involves implementation of electronical in-service monitoring means, such as HUMS (technical). In the first case, it shall not be included in this SC.	N/A	YES	(YES)	Noted	See Explanatory Note 19

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
544	W Field LMWL Yeovil	2240 (e)	10	Structural Durability The sentence “For Category Enhanced, adequate in-service monitoring of parts having an important bearing on safety in operations must be established” is unclear. Is this relating to Critical Parts? Is this relating to continued safe operations after a failure in lift / thrust?	Would be simpler to refer to the categories such as Critical Parts and primary structure etc.	NO	YES	Noted	See Explanatory Note 19. Wording from CS-23 has been used.
545	Airbus Group	2240.d	10	“minimization” is used for CS-27. Turbines have a good feedback experience and installations are quite similar from one H/C to another H/C. The notion of minimization for such VTOL is very open and may lead to very different design/technologies with totally different risk levels, despite minimization is applied. This may favour “risky” choices if there is a weight/performance/cost benefit.	Define a smart objective (e.g.: quantification)		X	Partially accepted	Will be considered for the AMC
546	Airbus Group	2240 (e)		“important bearing on safety in operations” is not defined criteria for a CS	Define more precisely what “important bearing on safety in operations” means as SC level	X		Partially accepted	Will be considered for the AMC. Wording from CS-23 has been used.
547	Airbus Group	2240(e)		Why is there a need for eVTOL to add a specific requirement for in-service monitoring of parts when this is not required for any category of airplane?	Suggest adding provision for in-service monitoring only if such is necessary to prevent escalation of certain failures to higher hazard severities. Otherwise, suggest omitting this requirement.	X		Noted	See Explanatory Note 19
548	FAA/AIR	2240	10	In VTOL.2240 (b), What then is implied for “Basic” category? What is acceptable for “Basic”?	Add a paragraph (c) for basic category and associated acceptability		Y	Not accepted	CS-23 construction and wording has been retained except for replacing in (b) Level-4 by Category Enhanced. For Category Basic (a) still applies.
549	FAA/AIR	2240	10	VTOL.2240(a) seems to encompass (b). What is the extra requirement that (b) generates?	Rotorcraft Standards acknowledges that this wording is the same as 14 CFR 23.2240, however this rule is not as clear as 14 CFR 25 or 14 CFR 29 fatigue/inspection rules (and their corresponding EASA CS25 and CS29). Considering VTOL operations may employ much more fatigue critical devices, suggest to include in (a) requiring inspections or procedures to detect structural degradation and then requirements to prevent structural failure, then (b) require such procedures to be recorded in the ALS. Then in (c) define Enhanced requirements and Basic requirements---as the goal is prevent structural failure due to degradation, what are any extra provisions “Enhanced” must comply with that is above “Basic”.		Y	Noted	(b) for Category Enhanced is intended to require flaw-tolerance. This will be detailed in the AMC.
550	FAA/AIR	2240	10	In VTOL.2240 (e) How is in-service monitoring defined, the subject needs corresponding guidance. Does this include subjects such as real time cockpit or post-flight monitoring such as HUMS devices?	Prefer to reword as inspections, procedures (use the same terms as above), or define the term “in-service monitoring”.		Y	Noted	See Explanatory Note 19

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
551	FAA/AIR	2240	10	The VTOL special condition does not seem to be limited to non-pressurized vehicles, but this section does not address certain concerns related to pressurized cabins.	Add the requirement: “(c) For pressurized airplanes: (1) The airplane must be capable of continued safe flight and landing following a sudden release of cabin pressure, including sudden releases caused by door and window failures. (2) For airplanes with maximum operating altitude greater than 41,000 feet, the procedures developed for compliance with paragraph (a) of this section must be capable of detecting damage to the pressurized cabin structure before the damage could result in rapid decompression that would result in serious or fatal injuries.”	Y	Y	Noted	See Explanatory Note 4
552	CAA NZ	VTOL.2240(b)		The interpretation of this requirement is that the use of safe life design philosophies for Category Enhanced aircraft is not allowed. Is this EASA’s intention or is our interpretation wrong?		Yes	No	Noted	This is correct. (b) for Category Enhanced is intended to require flaw-tolerance. This will be detailed in the AMC.
553	Aidan Reilly	VTOL.2240		Given the intent to operate Category Enhanced aircraft in congested urban environments, (d) should also seek to limit hazards to people and property in proximity to the aircraft.				Noted	This is addressed through other objectives, for example VTOL.2400(c)(3)

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VTOL.2245 Aeroelasticity

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
554	Marco Rizzato	VTOL.2245(a)4		Aeroelasticity: there appears to be a typo. in CS23 Amdt 5 it says: "for any critical failure or malfunction"			yes	Accepted	-
555	Rolls-Royce	VTOL.2245		It is unclear in (d) how many critical malfunctions must be tolerated, or is the intent that is should be multiple if they occur simultaneously?	Clarify intent	Yes	No	Noted	CS-23 construction and wording has been retained and further details will be provided in the AMC
556	Airbus Group	2245(a)(4)		A probability should be attached to the requirement for performance related to flight controls since there will always be a non-zero probability that the electronics will suffer a complete catastrophic failure.	Suggest “accounting for any critical malfunction or malfunctions not shown to be extremely remote”	X		Partially accepted	CS-23 construction and wording has been retained and further details will be provided in the AMC
557	ADS	VTOL.2245	10	It is unclear in (d) how many critical malfunctions must be tolerated, or is the intent that is should be multiple if they occur simultaneously?	Clarify intent	Yes	No	Noted	CS-23 construction and wording has been retained and further details will be provided in the AMC
558	Transport Canada – NAC Engineering – F&HM	VTOL.2245	10/26	“accounting for any <u>critical malfunctions or malfunctions</u> .” Repetition appears to be a typo. Unclear what the intent was. Unless the lack of clarity stems from the lack of definition of a critical malfunction?	EASA to clarify intent and revise accordingly.	Yes	No	Noted	Typo corrected. CS-23 construction and wording has been retained and further details will be provided in the AMC
559	Boeing	VTOL.2245(a)(4)	10	THE PROPOSED TEXT STATES: (4) accounting for any critical malfunctions or malfunctions.	REQUESTED CHANGE: (4) accounting for any critical failures malfunctions or malfunctions. JUSTIFICATION: The use of “malfunctions” appears to be unintended. The change to “failures” is in line with the similar version of the rule in CS-23.			Accepted	-
560	Aidan Reilly	VTOL.2245		It is unclear how many coincident critical malfunctions must be accounted for in (4). As previously discussed, ‘critical’ is undefined.				Noted	CS-23 construction and wording has been retained and further details will be provided in the AMC

VTOL.2250 part with critical characteristics

Explanatory Note 20:

“Critical characteristics” was intended to refer to critical parts as defined in CS-27 and 29. It has however been decided that the best use of the distributed propulsion will be achieved by wording the objective as “For Category Enhanced, a single failure must not have a catastrophic effect upon the aircraft.” This will need to be supported by a Safety Assessment considering conceivable and reasonable failure scenarios. It is not intended to request to consider complete failure of major elements (e.g. wing, fuselage, airframe) unless the design construction review and analysis shows that no precaution has been taken to prevent this scenario. The Safety Assessment process will be detailed in the AMC, including the approach for the selection of failed elements and the residual condition to be considered.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
561	Sam Bousfield	VTOL.2250 (c)	9	It would be hard to guarantee that any failure of a part with critical characteristics would not have a catastrophic effect upon the aircraft. If you were struck by a missile, and your wing is destroyed, how could one comply with this wording?	The best that can be done is to design to ultimate load, and have redundancy in both structures and systems to mitigate any single point of failure. The other option is to include a vehicle parachute to allow safe descent in case of almost any potential failure.	no	yes	Partially accepted	See Explanatory Note 6 and Explanatory Note 20. The AMC will provide more details on threat assessment.
562	David LoebI, AutoFlightX	VTOL.2250 (c)	11	“Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.” --> What is a part with critical characteristics? Since this paragraph is talking about design and construction principles, this addition can be understood as “no single point of failure in the structure”. Such a part could be for example a wing for a fixed-wing aircraft or the rotor head for a helicopter – besides that this addition is a discrimination compared to conventional fixed-wing aircraft and helicopters, it is even impossible to fulfil, if “parts” can be any structural element of the VTOL.	I suggest to delete the addition concerning failure of parts with catastrophic effects or clarify the intention of this addition.	Yes	No	Noted	See Explanatory Note 20
563	Philipp Reiß, FSD	VTOL.2250 (c)	11	Adding the additional sentence to this paragraph (“Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.”) changed the interpretation of it. Or at least is leading to confusion. Would this be understood as “no single point of failure”? If compared to a wing of a CS-23 aircraft or a rotorhead of a CS-27 helicopter this would be a discrimination. In some context it would be even impossible to comply with. So we suggest to delete this additional sentence. Or reformulate this sentence if it has another meaning.	The suitability of each design detail and part having an important bearing on safety in operations must be determined. Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.	Yes	No	Noted	See Explanatory Note 20
564	Rolls-Royce	VTOL.2250		‘Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.’ This could be interpreted to suggest that failure of a rotor/propeller blade must be non-hazardous. Should this only apply to failures that are not extremely remote?	Clarify intent – currently the wording could imply something very different from existing certification standards for fixed wing and rotorcraft certification	Yes	Yes	Noted	See Explanatory Note 20. There is no consideration on the probability of failure. The catastrophic (“conceivable”) single failure condition has to be prevented (by design). The AMC will provide more details on threat assessment.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
565	<i>Volocopter</i>	VTOL.2250(c)		<p>SUGGESTION:</p> <p>The intent of the added language to VTOL.2250(c) is understood to relate to parts involving ‘special processes’ that require dedicated control and validation, as the resulting output cannot be verified by subsequent monitoring or measurement.</p> <p>Whilst this intend is on the same way applicable to any fixed wing aircraft, it has not been included to the performance based objective requirements on CS-level, as the initial language of CS-23.2250(c) provides the full anchoring point to connect this design specific detail as part of the AMC.</p> <p>In addition, on any other product the use of such components is permitted, also in critical locations (referred to as critical components or principle structural elements within legacy CSs). Typically, there are locations in aircraft where this kind of components must be used as single load path, without technical possibility to include adequate redundancies. Legacy CSs allow for use of parts with critical characteristics in such locations but requires special treatment by for example special fatigue treatment or application of special factors. The language proposed here would completely exclude the possibility to use components in such locations, which goes significantly beyond established practice in all kinds of products, even up to transport category aeroplanes.</p>	Recommended to move this added statement to AMC level, as the performance-based objective for this is already provided in the leading sentence of the same sub-paragraph.	Yes	No	Noted	See Explanatory Note 20
566	<i>NEOPTERA</i>	VTOL.2250 (c)		<p>“Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft”.</p> <p>We understand that the sentence “Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.” forbids to have a safe life or single load path approach as it can be used in CS25.</p>		Observation	objection	Noted	See Explanatory Note 20
567	<i>Manfred Hajek, TUM</i>	VTOL.2250(c)		Second phrase formulation potentially unclear	Use same Critical Parts definition as in CS-27	Yes	No	Noted	See Explanatory Note 20
568	<i>Lilium Gmbh</i>	VTOL.2250 (C)		Introduction of the requirement that failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft requires further definition or clarification to explain what is meant by critical characteristics. This requirement also does not appear to be a VTOL specific consideration	Delete		Yes	Noted	See Explanatory Note 20
569	<i>Vertical Aerospace</i>	VTOL.2250(c)		Please can EASA confirm that the AMC will provide adequate guidance on the definition of “Critical”		Observation		Noted	See Explanatory Note 20
570									

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
571	W Field LMWL Yeovil	2250 (c)	11	Design and construction principles The following sentence has been added to the text from CS-23 “Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.” However the definition of a critical part and its critical characteristics relates to the CAT effect of failure. In addition something is required that is equivalent to CSxx607 Fasteners.	This additional sentence should be removed. Information required for fasteners. Rotorcraft regulations include para 607 to look specifically at the numerous places where loss of a single fastener is CAT and places where more than 1 locking mechanism is required.	NO	YES	Noted	See Explanatory Note 20. CS 27.607 will be considered for the AMC.
572	Airbus Group	2250 (c)	11	What does “Failure of a part with critical characteristics ...) mean ? Failure of a critical part may lead to a catastrophic effect, this is why it is critical.		X		Noted	See Explanatory Note 20
573	Airbus Group	2250 (c)	11	The notion of critical characteristics is specific for H/Cs and was driven by design solutions with single load path. Should this notion be re-conducted for all kind of A/C when other solutions exist?		X	X	Accepted	See Explanatory Note 20
574	Airbus Group	2250 (c)		“Failure of part with critical characteristics must not have a catastrophic effect upon the aircraft	For clarification purpose, use definition of critical characteristics as per AC27.602		X	Noted	See Explanatory Note 20
575	Airbus Group	2250(c)		This definition would kill single load path concepts for some technical solutions, e.g. gear boxes would be impossible	Same definition should be used as in CS29.602 Use A-(SLP) and B-values (MLP) for sizing		X	Noted	See Explanatory Note 20. The AMC will detail other means of compliance than discrete multiple load paths.
576	Airbus Group	2250(c)		This paragraph prohibits critical parts as defined today to exist assuming the definition for “controlled emergency landing” is excluding catastrophic FC.	EASA to confirm the understanding is correct	X		Noted	See Explanatory Note 6 and Explanatory Note 20
577	ADS	VTOL.2250	11	‘Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.’ This could be interpreted to suggest that failure of a rotor/propeller blade must be non-hazardous. Should this only apply to failures that are not extremely remote?	Clarify intent – currently the wording could imply something very different from existing certification standards for fixed wing and rotorcraft certification	Yes	Yes	Noted	See Explanatory Note 20. The AMC will provide more details on threat assessment.
578	UK CAA	VTOL. 2250(c)		For the Category Enhanced, consideration could be given to “Critical Parts” (Ref: CS 27.602). See also VTOL.2240(e).	For the Category Enhanced, consider “Critical Parts” (Ref: CS 27.602)	Yes		Noted	See Explanatory Note 20
579	FAA/AIR	2250	11	VTOL.2250(c) states “Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft”. Critical parts by definition have the potential to have a catastrophic effect if they fail.	Critical parts is a definition that may not be universally accepted among bilateral authorities. The VTOL.2250 rule as stated requires (must) parts to have 100% reliability. This is impossible. The intent of the critical part rule in 14 CFR 27/29.602 is to ensure that parts that could have a catastrophic effect have controls in place to ensure their reliability of design, on any critical features that are important to maintain that reliability.		Y	Noted	See Explanatory Note 20

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
580	FAA/AIR	2250(c)	10	<p>“Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.”</p> <p>This requirement appears to partially incorporate the requirements for critical parts in 27/29.602. Please clarify the intent of this requirement. Is the intent to have a critical parts list?</p>		Y		Noted	See Explanatory Note 20. More details will be provided in the AMC.
581	FAA/AIR	2250(c)	11	<p>The requirement: “Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.”</p>	<p>This seems to be an overly burdensome requirement, but also somewhat ambiguous. What is meant by “critical characteristics”? Please clarify. So in some ways, nearly every aircraft structural part has some “critical” characteristic. Fatigue strength, static strength, and fracture toughness are all critical characteristics, more or less so, depending on part geometry and load paths. So under this requirement those parts could never be used in a single load path application that would result in catastrophic loss of the aircraft, regardless of the safety margins, demonstrated fatigue life, or inspection programs. Also, if this requirement is applied to systems, then probability of failure and system safety analysis goes out the window, and only probability of failure = 0 becomes the requirement. Recommend removing this requirement or else greatly clarifying the intent and limiting the scope/application of this to something realistic.</p>	Y	Y.	Noted	See Explanatory Note 20. System objectives are detailed in Subpart F.
582	TCCA-AVIONICS	VTOL.2250 (c)	11/26	<p>“Failure of a part with critical characterisitcs must not have a catastrophic effect upon the aircraft” :</p> <p>What is a part with critical characterisitcs ? How are critical characterisitcs defined ?</p>	<p>EASA to clarify intent.</p>	No	Yes	Noted	See Explanatory Note 20

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
583	Boeing	VTOL.2250(c)	11	<p>THE PROPOSED TEXT STATES:</p> <p><i>(c) The suitability of each design detail and part having an important bearing on safety in operations must be determined. Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.</i></p>	<p>REQUESTED CHANGE:</p> <p><i>(c) The suitability of each design detail and part having an important bearing on safety in operations must be determined. Failure of a part with critical characteristics must not have a catastrophic effect upon the aircraft.</i></p> <p>JUSTIFICATION:</p> <p>The proposed text is incongruous with the majority of the proposed Special Condition. The proposed text in VTOL.2250(c) and paragraphs such as, but not limited to, VTOL.2410(a) and VTOL.2430(a)(3) imply fail safety in flight critical components. The proposed test in paragraphs such as, but not limited to, VTOL.2140 and VTOL.2145 do not require control of the aircraft after a thrust/lift malfunction. Paragraph VTOL.2435(h) states that a critical malfunction in the thrust/lift installation support system must be mitigated, but does not require fail safety. By implying that components of the thrust/lift system must be fail safe, EASA is now controlling the configuration of the aircraft, boxing in multi-rotor configurations. Other methods exist and still others can be developed to create high-reliability systems without dictating the configuration of the aircraft. The Special Condition should not control the configuration of the aircraft in a few sections without properly regulating all aspects of said configuration throughout the entire aircraft's architecture.</p>		yes	Noted	See Explanatory Note 20. A high level objective is provided and more details will be provided in the AMC on possible means to comply.
584	CAA NZ	VTOL.2250(c)		The interpretation of this requirement is that all parts with critical characteristics for all aircraft categories covered by this SC are required to be designed using a fail-safe design philosophy? Is this EASA's intention or is our interpretation wrong?		Yes	No	Noted	See Explanatory Note 20. More details will be provided in the AMC, for example on fail-safe or multiple load path approaches.
585	Aidan Reilly	VTOL.2250		"Critical characteristics" is undefined here.				Noted	See Explanatory Note 20

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VTOL.2250 Design and construction principles

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
586	NEOPTERA	VTOL.2250 (e)		The aircraft should also be protected against inadvertent opening in flight of a parachute.		Observation	objection	Noted	This is deemed to be covered under VTOL.2510
587	SAFRAN	VTOL.2250(d)	10/26	Does this mean that equipment (e.g. actuator) jamming is forbidden? Usually, the Flight Control system is designed in order to be robust to equipment jamming.	N/A	YES		Noted	This objective targets behaviour of the flight control system under air loads. Other system behaviours will be addressed under Subpart F.
588	Airbus Group	2250.e	11	Passenger could be the root cause for door opening. Passenger affected by panic may create also other issues: movement in the A/C leading to CG displacement, attempt to dismantle parts of the A/C, etc. Should it be considered for enhanced category?	Add a specific paragraph to cover passenger panic when there is no pilot onboard. This is a fundamental difference compared to physically piloted A/C	X	X	Noted	See Explanatory Note 3
589	Transport Canada – NAC Engineering – F&HM	VTOL.2250(d)	11/26	<i>“The flight control system must be free from jamming, excessive friction, and excessive deflection when the aircraft is subjected to expected limit airloads.”</i> Missing consideration for limit pilot loads, which could also induce deflection, friction, etc.	Suggested rewording: <i>“The flight control system must be free from jamming, excessive friction, and excessive deflection when the aircraft is subjected to expected limit airloads, and limit pilot loads.”</i>	No	Yes	Partially accepted	CS-23 construction and wording has been retained for this paragraph. Pilot forces will however be considered for the AMC, for example under VTOL.2210.
590	Aidan Reilly	VTOL.2250		Adding “flight” to (d) makes the regulation less robust, and is unnecessary. This modification would make it acceptable for a water rudder to jam if subjected to limit air loads; such a failure could capsize the aircraft during subsequent landing or other operations on water.				Accepted	“flight” will be removed

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VTOL.2255 Protection of structure

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
591	Rolls-Royce	VTOL.2255		Adequate drainage and ventilation should be demonstrated as part of certification	Add required test for demonstration	Yes	No	Partially accepted	Will be considered for the AMC
592	ADS	VTOL.2255	11	Adequate drainage and ventilation should be demonstrated as part of certification	Add required test for demonstration	Yes	No	Partially accepted	Will be considered for the AMC
593	Aidan Reilly	VTOL.2255		How is adequacy to be defined in this context? How may it be demonstrated? (d) Should also include inspection.				Noted	More details will be provided in the AMC

EASA SC-VTOL-01 Comment Response Document

VTOL.2260 Materials and processes

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
594	William Branch	VTOL.2260 (c)	11	The applicant selects design values (assuming those are factors of safety or margins of safety on structure) with no guidance as to what is acceptable. EASA should come out with some guidance.	Suggested guidelines: For primary structure elements (those that cause a catastrophic event upon failure) it is recommended that the following values be used to meet the design levels of the table in 2510. Suggested guidelines: For primary structure elements (those that cause a catastrophic event upon failure) it is recommended that the following values be used to meet the design levels of the table in 2510. FS 1.5 to meet 1x10-6 FS 1.5 plus tested to one life to meet 1x10-7 FS 2.0 plus tested to one life to meet 1x10-8 FS 3.0 plus tested to two lives to meet 1x10-9	Yes	No	Partially accepted	Will be considered for the AMC
595	Aerossurance	2260(a)		Not clear why 'controlled emergency landing' is introduced here rather than 'safe landing' which is the ultimate desired outcome and precludes a controlled landing that otherwise has an unsafe outcome.	Replace 'controlled emergency landing' with 'safe landing'.	Suggestion	Substantive	Partially accepted	See Explanatory Note 6. The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document.
596	Dr. Norbert Lohl	VTOL.2260 (g)	11	The use of automotive-grade material design may be considered as compliant with this Special Condition taking into account that this category of VTOLs will be mainly operated in moderate environment (e.g. high altitude, low temperature)	As alternate Means of Compliance automotive-grade material design may be considered	yes	no	Noted	Will be considered for the AMC
597	NEOPTERA	VTOL.2250 (a)		In CS23, the suitability and durability must be determined for parts/articles/assemblies, the failure of which could prevent a continued safe flight and landing. Limiting to a controlled emergency landing would mean a reduction in safety compared to CS23. For an aircraft in category Enhanced, suitability and durability should then be determined only for a controlled emergency landing and not a continued safe flight and landing.		Observation	objection	Accepted	The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document
598	Lilium Gmbh	VTOL.2260(e)		This change is not considered to bare any link to VTOL operations and should be addressed via the normal regulatory amendment process.	Amend 'environment' to 'thermal' per CS23 Amendment 5	Yes		Not accepted	Other environmental considerations may have an effect on structures, for example humidity for composites
599	Lilium Gmbh	VTOL. 2260 (a)		It is unclear as to why this provision does not refer to 'continued safe flight and landing'	Clarification required from the Agency	Yes		Accepted	The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document
600	W Field LMWL Yeovil	2260 (a)	11	Materials and processes New text "a controlled emergency landing" has been added to para (a). CS23 uses "could prevent continued safe flight and landing".	Prefer the original wording from CS23	YES	NO	Partially accepted	The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document

EASA SC-VTOL-01 Comment Response Document

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
601	Airbus Group	2260(a)		What is the proposed requirement for Category Enhanced with respect to the term "controlled emergency landing"?	Suggest explicitly stating requirement for Category Enhanced.			Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
602	Airbus Group	2260 (d)		Definition from CS29 should be used	Use A- (SLP) and B-values (MLP) for sizing	X		Partially accepted	Will be considered for the AMC
603	Airbus Group	2260 (g)		Why not use the same definition as CS29 for approved standards	Approved standards are not mentioned as source for the material properties	X		Partially accepted	Will be considered for the AMC. CS-23 construction and wording has been retained.
604	ADS	VTOL.2260	11	Not clear why ‘controlled emergency landing’ is introduced here rather than ‘safe landing’ which is the ultimate desired outcome and precludes a controlled landing that otherwise has an unsafe outcome.	Replace ‘controlled emergency landing’ with ‘safe landing’	Yes	Yes	Partially accepted	See Explanatory Note 6. The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document.
605	UK CAA	VTOL.2260(a)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	Include additional requirements for the Category Enhanced.	Yes		Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
606	FAA/AIR	2260 & 2270 & 2330	11 & 13 & 16	VTOL.2260,2270,2330 etc mention “controlled emergency landing”	These rules have traditionally stated “continued safe flight and landing”. Continued safe flight means that there are no restrictions on intended destination. Continued safe flight and landing is a higher (stricter) level of safety/reliability than controlled emergency landing. Is it the intent to make the VTOL rule less strict?		X	Noted	See Explanatory Note 6. The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document.
607	Transport Canada – NAC Engineering – F&HM	VTOL.2260(a)	11/26	<p><i>“The applicant must determine the suitability and durability of materials used for parts, articles, and assemblies, the failure of which could prevent a controlled emergency landing, accounting for the effects of likely environmental conditions expected in service.”</i></p> <p>a) Limiting to controlled emergency landing would not be in line with expectations for Category Enhanced; should refer to continued safe flight and landing instead.</p> <p>b) Materials should be adequate for the environmental conditions expected in service; “likely” terminology is vague and subjective.</p>	<p>a) Revise paragraph VTOL.2260(a) such that relevant failures: for Category Enhanced are those which could prevent continued safe flight and landing; and for Category Basic are those which could prevent a controlled emergency landing.</p> <p>b) Revise paragraph VTOL.2260(a): “...accounting for the effects of environmental conditions expected in service.”</p>	No	Yes	Partially accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document. CS-23 construction and wording has been retained for the environmental conditions and will be detailed in the AMC.
608	Aidan Reilly	VTOL.2260		VTOL.2000 refers to “continued safe flight and landing” but here we have “a controlled emergency landing”. The difference between these should be explicitly defined.				Noted	See Explanatory Note 6. The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
609	Aidan Reilly	VTOL.2260		The scope of part (a) should be expanded by removing the word “environmental”.				Partially accepted	CS-23 construction and wording has been retained for the environmental conditions and other elements to take into account will be detailed in the AMC

EASA SC-VTOL-01 Comment Response Document

VTOL.2265 Special factors of safety

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
610	Aidan Reilly	VTOL.2265		The use of “likely” as the triggering probability for VTOL.2265 may not produce the desired safety outcome for Category Enhanced aircraft.				Noted	The AMC has the possibility to introduce proportionality against this objective for Category Basic and Enhanced.

EASA SC-VTOL-01 Comment Response Document

VTOL.2270 Emergency conditions

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
611	Roger Sloman	VTOL2270 (b)2	12	A more specific definition of safety requirement is possible.	“Whatever emergency situation occurs the aircraft must be capable of performing a controlled landing which prevents injuries to the occupants.”	x		Not accepted	CS-23 construction and wording has been retained
612	Christian Sturm aerocompany	VTOL.2270		The given values from a AMC material will be essential.	Publish NPA for AMC to VTOL in near future.	Y	N	Noted	AMC will be published. See also Explanatory Note 13.
613	Christian Sturm aerocompany	VTOL.2270 (e)(4)		Will probably prohibit any Li-Ion accumulators. Redundant with VTOL.2325?	That might even be a good thing to do.	Y	N	Noted	It is not the intent of the Special Condition to prohibit specific technology, as long as it can meet the high level objectives. VTOL.2270(e) focuses on baggage and cargo compartment while VTOL.2325 addresses fire initiation and propagation.
614	Aerossurance	2270(a)(3)		The original CS-23 discusses items of mass within or after of the cabin, which is reasonable for accidents most likely with a forward velocity. For a VTOL vehicle it is more plausible that items of mass may be above the cabin and of concern in a vertical crash case or around the cabin and of concern in out of control departures from a hover for technical or operational causes.	Replace ‘within or aft’ with ‘within or adjacent to’	Suggestion	Substantive	Accepted	-
615	Aerossurance	2270(e)(4)		The text considers the release of chemical energy in a fire but not release of other stored energy.	Replace ‘a fire’ with ‘a fire or other hazardous release of stored energy’	Suggestion	Substantive	Not accepted	CS-23 construction and wording has been retained. VTOL.2270(e) focuses on baggage and cargo compartment.
616	NEOPTERA	VTOL.2270 (a) (3)		“within or aft of the cabin” In case of a VTOL, item of mass fore and side of the cabin could also injure occupants during an emergency landing.		Observation	objection	Accepted	Replaced by “within or adjacent to”
617	NEOPTERA	VTOL.2270 (e) (3)		For category Enhanced, does it mean that a damage or failure can preclude a continued safe flight and landing (with a probability $\leq 10^{-9}/FH$) but not a controlled emergency landing (deterministically)?		Observation	substantive	Noted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
618	NEOPTERA	VTOL.2270 (e) (4)		For category Enhanced, does it mean that a fire can preclude a continued safe flight and landing (with a probability $\leq 10^{-9}/FH$) but not a controlled emergency landing (deterministically)?		Observation	substantive	Noted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document

EASA SC-VTOL-01 Comment Response Document

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
619	Markus Farner	VTOL.2270	12	The Emergency Conditions in VTOL.2270 addressing only the risk for the people on Board the VTOL. As this VTOL are intendet to operate mainly in urban environment, special consideration should be taken to protect the people on the ground. This is becoming more important with an increasing numbers of VTOL's operating in the urban environment. Only relying on quantitative safety objectives/Function Development Assurance Levels (FDAL) to the VTOL will not sufficiently address the safety objective of the people on ground which are in an urban environment with constant VTOL traffic at a higher risk than the passengers on board the VTOL.	A new requirement should be incorporated for Emergency Recovery Capability and Procedures with the intent to protect the people on the ground in case of an emergency of the VTOL.	No	Yes	Noted	Protection of third parties is taken into account in a number of objectives, for example through the continued safe flight and landing
620	EAS/ N Rostedt	Structural Occupant Protection - VTOL.2270 Emergency conditions OR VTOL.2315 Means of egress and emergency exits	12	In pilotless flights, passengers should have indicators or other means available for establishing when safe egress is possible, i.e. thrust/lift systems are powered off. This concerns bothe emergency landings and normal landings.	Add to the SC-VTOL accordingly, alternatively include in the relevant OPS.	Suggestion	Substantive	Noted	See Explanatory Note 3
621	Lilium Gmbh	VTOL.2270 (e) (3)		It is not understood why the requirement has been changed from controlled safe flight and landing	Clarification required from the Agency	Yes		Noted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
622	Vertical Aerospace	VTOL.2270(a)(3)		This section does not address items of mass located above the cabin. In some multicopter arrangements it may be beneficial for controllability to have a higher centre of gravity and therefore positioning of battery packs or other items of mass above the cabin is a possibility	It is suggested to change VTOL.2270(a)(3) to read “...within, aft or above the cabin...”	Suggestion		Partially accepted	Replaced by “within or adjacent to”
623	Vertical Aerospace	VTOL.2270(e)(4)		It is not clear in the Special Condition if a fire suppression system would be considered part of the baggage and cargo compartment or not	It is proposed that VTOL.2270(e)(4) be amended to read “be designed or have adequate fire suppression so that a fire does not preclude a controlled emergency landing.”	Suggestion		Partially accepted	The AMC will consider the possibility of fire suppression, as a means to demonstrate that a fire does not preclude meeting the objective
624	Diamond Aricraft Industries GmbH	VTOL.2270		Subparagraph(e)(4) – objective of new requirement not clear – fire protection measures for cargo compartments and materials used are typically covered under VTOL.2325 (b) (cf. CS 23 Amdt. 5)	Please clarify the objective, e. g. if cargo-fire is meant.	yes	no	Noted	CS-23 construction and wording has been retained. VTOL.2270(e) focuses on baggage and cargo compartment.
625	Airbus Group	2270(a)(3)		What about mass items above the cabin???	Include overhead installation of mass items	X		Partially accepted	Replaced by “within or adjacent to”
626	Airbus Group	2270(d)		No requirements for seats and harnesses are given.	Include requirements for seat crashworthiness		X	Partially accepted	CS-23 construction and wording has been retained and the objective covers seats and harnesses

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
627	Airbus Group	2270(e)(3)		What is the proposed requirement for Category Enhanced with respect to the term "controlled emergency landing"?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document
628	Airbus Group	2270(e)(4)		This requirement seems to be duplicated by VTOL.2330(a) and (b); in other words, the cargo or baggage compartment is being treated as a fire zone.	Suggest removing the requirement.	X		Not accepted	CS-23 construction and wording has been retained. VTOL.2270(e) focuses on baggage and cargo compartment while VTOL.2325 addresses fire initiation and propagation.
629	ADS	VTOL.2270	12	The original CS-23 discusses items of mass within or after of the cabin, which is reasonable for accidents most likely with a forward velocity. For a VTOL vehicle it is more plausible that items of mass may be above the cabin and of concern in a vertical crash case or around the cabin and of concern in out of control departures from a hover for technical or operational causes.	Replace 'within or aft' with 'within or adjacent to'	Yes	Yes	Accepted	-
630 631	ADS	VTOL.2270	12	The text considers the release of chemical energy in a fire but not release of other stored energy.	Replace 'a fire' with 'a fire or other hazardous release of stored energy'	Yes	Yes	Not accepted	CS-23 construction and wording has been retained. VTOL.2270(e) focuses on baggage and cargo compartment.
632	UK CAA	VTOL. 2270(e)(4)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing. See point 11 above.	See point 11 above.	Yes		Accepted	The distinction between "continued safe flight and landing" and "controlled emergency landing" will be added throughout the document
633	Sikorsky	VTOL.2270.a	12	Why does wording include "injury that would prevent egress"? Appears to limit extent of provision.	Remove words "that would prevent egress" such that statement reads "prevents injury".	No	Yes	Not accepted	CS-23 construction and wording has been retained. The AMC will clarify.
634	Sikorsky	VTOL.2270.a.2-3	12	Paragraph and associated language does not quantify crash loads occupants must be protected against, creating insufficient basis for certification.	Update paragraph and associated references to include direction and magnitude of crash loads vehicle must be designed to. Refer to CS 27.561-562 and CS 27.952 for reference values.	No	Yes	Partially accepted	Will be considered in the AMC
635	TCCA-AISA	VTOL.2270(d)	12/26	This para states: "Each occupant protection system must perform its intended function and not create a hazard that could cause a secondary injury to an occupant. The occupant protection system must not prevent occupant egress or interfere with the operation of the aircraft when not in use." It should also not interfere with the operation of the aircraft when the protection system is in use as well (e.g. seat belt/harness).	Revise section to read: Each occupant protection system must perform its intended function and not create a hazard that could cause a secondary injury to an occupant. The occupant protection system must not prevent occupant egress or interfere with the operation of the aircraft when both in use and not in use."	No	Yes	Not accepted	CS-23 construction and wording has been retained. A harness when in use could be considered to prevent egress.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
636	Transport Canada – NAC Engineering – F&HM	VTOL.2270(a)(3)	12/26	<p>“...items of mass, including thrust/lift unit or auxiliary power units (APUs), within or aft of the cabin, that could injure an occupant...”</p> <p>Given the nature of VTOL, and potential aircraft trajectory in the event of an emergency landing, should add similar consideration for items of mass located above the cabin.</p>	<p>Revise paragraph VTOL.2270(a)(3) as follows:</p> <p>“...items of mass, including thrust/lift unit or auxiliary power units (APUs), within, above or aft of the cabin, that could injure an occupant...”</p>	No	Yes	Partially accepted	Replaced by “within or adjacent to”
637	GAMA	VTOL.2270(e)(4)	13	When looking at all electric VTOL, there are limited locations where fire might exist.	This provision should apply to a fire which might occur in likely firezones to assure those locations and the equipment (such as batteries) are designed to prevent a safe emergency landing in the event of a fire in one of these areas. Further this requirements seems redundant to VTOL.2325(a)(4).	Yes	Yes	Noted	CS-23 construction and wording has been retained. VTOL.2270(e) focuses on baggage and cargo compartment.
638	Aidan Reilly	VTOL.2270		This part assumes that all emergency landings of VTOL aircraft will occur in forward flight. (a)(3) should be made more general, in the case of aircraft that can land vertically, or even backwards or sideways.				Accepted	Replaced by “within or adjacent to”
639	Aidan Reilly	VTOL.2270		The barrier imposed by (d) is perhaps higher than intended. Secondary injuries are routinely caused by safety equipment, including seatbelts and airbags. It may be preferable to require that any hazard and corresponding secondary injury must be less severe than the primary injury prevented; the risk of mild secondary injury should not preclude the prevention of serious primary injury.				Noted	CS-23 construction and wording has been retained. More details will be considered for the AMC.
640	Aidan Reilly	VTOL.2270		As mentioned in previous comments above, the distinction between “a controlled emergency landing” and “continued safe flight and landing” is of great importance.				Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document

EASA SC-VTOL-01 Comment Response Document

VTOL.2300 Flight control systems

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
641	SAFRAN	VTOL.2300	14/26	The introduction of the role of the Flight Control System would be very welcome.			YES	Noted	CS-23 construction and wording has been retained. More details will be considered for the AMC.
642	FAA/AIR	2300		Though I like this version of the flight control requirements, it is unclear if this reduced version is similar to part 23 without knowing what the MOCs are.		Y	Y	Noted	CS-23 construction and wording has been retained. More details will be considered for the AMC.
643	FAA/AIR	2300 (a)	15	For fly by wire systems the authorities including EASA have been issuing a special condition for control margin awareness.	Include the following airworthiness standard: (a)(3) provide an indication when control authority is reduced from nominal.	N	Y	Partially accepted	A paragraph (a)(3) has been added on control limits. Additional material on control authority will be considered for the AMC.
644	Aidan Reilly	VTOL.2300		This modification is preferable to the wording used in CS-23 and should be incorporated into it.				Noted	-

EASA SC-VTOL-01 Comment Response Document

VTOL.2305 Landing gear systems

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
645	William Branch	VTOL.2305 (a)	14	I am surprised there is no requirement to provide a landing gear down indication for retractable gear aircraft.	Add to (a): (3) provide information that is required for safe operation.	Yes	No	Partially accepted	CS-23 construction and wording has been retained. More details will be considered for the AMC.
646	ACI EUROPE		14	VTOL.2305 Landing gear system (b) Consider revising for easier readability	Proposed rephrasing to VTOL2305 Landing gear system (b) The aircraft landing gear system must have be designed to ensure a reliable means of stopping the aircraft with sufficient kinetic energy absorption to account for landing and take-off, in all approved conditions, and of holding the aircraft when parked.	yes	no	Not accepted	CS-23 construction and wording has been retained, adding some considerations
647	NEOPTERA	VTOL.2305 (b)		“and of holding the aircraft when parked” This imposes to implement a mean into the aircraft to hold it when parked. Does an external mean to the aircraft (GSE) would also be compliant to this requirement?		Observation	objection	Noted	It is anticipated that GSE will not be acceptable to meet this objective, as one of the intents is to allow emergency evacuation without risking that the aircraft moves. More details will be considered for the AMC.
648	Transport Canada – NAC Engineering – F&HM	VTOL.2305(a)(2)	14/26	“... account for likely system failures...” Unclear what is intended by wording “account for” when referring to failures. It would be preferable to use terminology consistent with VTOL.2510 to ensure consistent and clear interpretation.	Revise paragraphs with terminology consistent with VTOL.2510, e.g. worded in terms of criticality / probability / single or multiple failures, etc as appropriate to intent.	No	Yes	Partially accepted	CS-23 construction and wording has been retained. More details will be provided in the AMC.
649	Transport Canada – NAC Engineering – F&HM	VTOL.2305(b)	14/26	“The aircraft must have realiable means of stopping...” The term “reliable” is not defined, and not directly relating to system failure terminology of VTOL.2510.	Revise paragraphs with terminology consistent with VTOL.2510, e.g. worded in terms of criticality / probability / single or multiple failures, etc as appropriate to intent in terms of stopping performance.	No	Yes	Partially accepted	CS-23 construction and wording has been retained. More details will be provided in the AMC.
650	Aidan Reilly	VTOL.2305		The aborted take-off brake energy requirements in CS-23 are more specific. Maybe these should be retained for VTOL-capable aircraft that are being operated in STOL or CTOL modes.				Noted	CS-23 construction and wording has been retained. More details will be considered for the AMC and will likely keep similar objectives for STOL and CTOL.

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VTOL.2310 Flotation

Explanatory Note 21:

VTOL.2310 offers three possible categories under which an aircraft can be certified for operations over water, at the choice of the applicant. (a) is for intended operations on water while (b) and (c) correspond to emergency landings on water. (a) is anticipated to include in its AMC similar material to what is currently requested for seaplanes and amphibians. (b) and (c) offer different levels of certification, with (c), “ditching” approval, being the most demanding level. (b) and (c) are anticipated to include in their AMC similar material to what is currently requested for CS 27.802 and CS 27.801 respectively. It is anticipated that future operational rules may require a given level of certification for certain types of operations over water, similarly to what is done today for rotorcraft. Adaptation of some of the wording has been made as some VTOL architectures may have different stable floating attitudes rather than the two right-side up/capsized attitudes of conventional helicopters.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
651	VELICA	VTOL.2310 (a)		VELICA recommends replacing “If certification for intended operations on water is requested” by “An Applicant who requests certification for intended operations on water “ The CS-23 amdt 5 does request certification for flotation. It is the responsibility of the Applicant to design its aircraft for the intended operations. The paragraph CS-23.2510 title is “Buoyancy for seaplanes and amphibians”. Requiring this flotation is inconsistent with the defined safety level.				Noted	See Explanatory Note 21
652	Rolls-Royce	VTOL.2310		If the aircraft is to be certified for ditching then provision to ensure electrical components do not discharge in a dangerous manner should be included	Add provision in the wording of the regulation	Yes	No	Partially accepted	Will be considered for the AMC
653	Rolls-Royce	VTOL.2310		If ditching is requested then why not use the existing provisions in CS-27?	Review why eVTOL ditching is any different from a rotorcraft	Yes	No	Noted	See Explanatory Note 21
654	<i>Volocopter</i>	VTOL.2310(b), VTOL.2310(c)		OBJECTION: VTOL2310 is adding requirements to equipment related to flotation and ditching. However, this covers requirements that are already specifically addressed by OPS rules in CAT.IDE. Overlapping definitions are the perfect precursor for conflicting requirements and mis-interpretation. As OPS rules do apply to the product anyhow, such a duplication within a CS is not reasonable.	Recommended to delete (b) and (c), not for incorrectness or inadequacy, but due to supplication with OPS rules in CAT.IDE.	No	Yes	Not accepted	See Explanatory Note 21
655	<i>Lilium Gmbh</i>	VTOL.2310 (b)		This paragraph seems superfluous. The intent is presumably covered by the certification for ditching requirements of paragraph VTOL.2310 (c)	Delete or Reserve VTOL.2310 (b)		Yes	Not accepted	See Explanatory Note 21
656	<i>Lilium Gmbh</i>	VTOL.2310 (c)		The requirement for fitment of an auto deployable emergency flotation system is unduly prescriptive.	Delete		Yes	Partially accepted	Requirement will be reworded. The objective is that the emergency flotation system must not rely on manual activation. See NPA 2016-01 for more background information.
657	<i>Vertical Aerospace</i>	VTOL.2310		Please could EASA confirm that floatation equipment and systems are not required if normal operation is over Land and small masses of water (I.e. rivers and average sized lakes) where land can be reached in the event of needing to perform an emergency forced landing?		Observation		Noted	This will be determined by operational rules

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
658	Vertical Aerospace	VTOL.2310(b) & (c)		Do these sections need to give minimum buoyancy guidance or will it be included in the AMC?		Observation		Noted	Will be considered for the AMC
659	W Field LMWL Yeovil	2310 (b) and (c)	14	Flotation This section splits emergency flotation and ditching requirements. Where are waterborne operations covered?	Where are non-emergency waterborne operations covered?	YES	NO	Noted	This is covered by (a). See also Explanatory Note 21.
660	Airbus Group	2310		Difference between (b) and (c) is not clear	Better wording and intention of the concerning sub-paragraphs	X		Noted	Construction and wording similar to CS-27 has been retained
661	ADS	VTOL.2310	14	If the aircraft is to be certified for ditching then provision to ensure electrical components do not discharge in a dangerous manner should be include	Add provision in the wording of the regulation	Yes	No	Partially accepted	Will be considered for the AMC
662	ADS	VTOL.2310	14	If ditching is requested then why not use the existing provisions in CS-27?	Review why eVTOL ditching is any different from a rotorcraft	Yes	No	Noted	See Explanatory Note 21
663	AEROMOBIL	VTOL.2310 (a)		AEROMOBIL recommends replacing “If certification for intended operations on water is requested” by “An Applicant who requests certification for intended operations on water “ The CS-23 amdt 5 does request certification for flotation. It is the responsibility of the Applicant to design its aircraft for the intended operations. The paragraph CS-23.2510 title is “Buoyancy for seaplanes and amphibians”. Requiring this flotation is inconsistent with the defined safety level.				Noted	See Explanatory Note 21
664	Aidan Reilly	VTOL.2310		Inadvertent deployment of an emergency flotation system must be prevented as it may have catastrophic consequences for an aircraft in flight, and may also be hazardous to people and property in proximity to the aircraft in the ground or on the water. Fatal accidents are recorded due to spontaneous / inadvertent deployment of flotation bags from the wings of Grumman F4F3 Wildcat / Martlet aircraft during WWII.				Noted	The emergency flotation system is considered to fall under the scope of VTOL.2510. The topic will be considered for specific AMC.
665	Aidan Reilly	VTOL.2310		Failure / deflation of a flotation system should not release hazardous gasses.				Noted	The emergency flotation system is considered to fall under the scope of VTOL.2510. The topic will be considered for specific AMC.
666	Aidan Reilly	VTOL.2310		If the aircraft is naturally buoyant with sufficient robustness then (c)(1) is unnecessary.				Accepted	Requirement will be reworted

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
667	Aidan Reilly	VTOL.2310		Ditching may occur under different conditions depending upon any underlying failure responsible for the decision to ditch. The flight manual should contain instructions as to how to ditch the aircraft, and under what conditions and aircraft configuration safe ditching may be possible. E.g. it is likely that a tilt-rotor will be better able to achieve a successful ditching in helicopter mode than aeroplane mode. Inability to certifiably ditch in aeroplane mode should not necessarily preclude certification for ditching in helicopter mode.				Partially accepted	Will be considered for the AMC
668	Aidan Reilly	VTOL.2310		If the aircraft is to be certified for ditching then any electrical components should not pose an electric shock hazard to passengers and / or flight crew when exposed to the most electrically conductive water into which ditching certification is sought (this requirement is important because salt water is far more electrically conductive than fresh water, and therefore electrically safe ditching into fresh water does not guarantee electrically safe ditching into salt water).				Partially accepted	Will be considered for the AMC
669	Aidan Reilly	VTOL.2310		I assume that the references in this part to an emergency flotation system are for the aircraft. This should be clarified, and explicit provision of e.g. life rafts and other similar survival gear should also be made for over-water operations.				Partially accepted	Will be considered for the AMC

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VTOL.2315 Means of egress and emergency exits

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
670	<i>Volocopter</i>	VTOL.2315		<p>OBJECTION:</p> <p>The language added with respect to flotation and ditching is in itself considered valid, but seen on a the detailed level of an AMC to the more objective statement already included.</p>	Recommended to revert to the level of detail as used on CS-23 Amdt. 5, and to move the added text from the draft to AMC level. Presumably applicable standards provided by ASTM F44 do cover these aspects, already.	No	Yes	Not accepted	The language has been added to cover the two additional categories for operations over water not currently in CS-23. It is deemed that the level of detail provided is similar to the existing text.
671	<i>NEOPTERA</i>	VTOL.2315		<p>After an emergency landing, the thrust/lift system could not be completely off (because of impact during emergency landing and aircraft consequent damages), that would prevent the occupants to egress safely in case of propellers (not ducted) in the vicinity of the escape path.</p> <p>This should be specified as there is no mean to guarantee the thrust/lift system is completely off after experiencing an emergency landing.</p>		Observation	objection	Partially accepted	Will be considered for the AMC
672	<i>Lilium Gmbh</i>	VTOL.2315 (a)(3)		<p>An aircraft certificated for ditching should not capsize. It is therefore considered that this additional sentence is misleading.</p>	<p>Delete: 'If certification for ditching is requested, the means of egress must be shown to work after capsize'</p> <p>Add:</p> <p>(a) If certification with ditching provisions is requested, practicable design measure, compatible with the general characteristics of the aircraft, must be taken to minimize the probability that in an emergency landing on water, the behavior of the aircraft would cause immediate injury to the occupants or would make it impossible for them to escape.</p> <p>(b) The probable behavior of the aircraft in a water landing must be investigated by model tests or by comparison with aircrafts of similar configuration for which the ditching characteristics are known. Scoops, flaps, projections, and any other factor likely to affect the hydrodynamic characteristics of the aircraft, must be considered.</p> <p>(c) It must be shown that, under reasonably probable water conditions, the flotation time will allow the occupants to leave the aircraft.</p>		Yes	Not accepted	Construction and wording similar to CS-27 has been retained with a demonstration to a certain level of probability that the aircraft will maintain its intended floating attitude. The ditching objective has an additional objective that the means of egress must be usable in all stable floating attitudes to address water impacts. See NPA 2016-01 for more background information.
673	<i>Kopter Group</i>	VTOL.2315(a)	15	<p>There are no test requirements to demonstrate compliance with any of these points.</p> <p>For example, compliance with CS 23.807(c) as well as compliance with CS 27.807(c) requires tests to show the proper functioning of any emergency exit.</p>	<p>There should be test requirements for all points listed to demonstrate egress and emergency exit features as described in the SC. These tests should extend testing said features after deformation of the aircraft structure.</p> <p>(The suggestion is based on the possibility to autonomously carry passengers without an experienced flight crew to assist the evacuation of the aircraft in case of an emergency)</p>	yes	yes	Partially accepted	Will be considered for the AMC. See also Explanatory Note 3.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
674	Vertical Aerospace	VTOL.2315		It is our position that potential structural failures following emergency landing ultimate static failure loads should not create debris or deform that prevents safe egress of the vehicle. For example, the failure of rotor support structure mounted above the cabin could collapse or fold down around the sides of the cabin thus preventing the doors opening.	It is suggested that the VTOL.2315(b) - currently reserved – be amended to read: “the aircraft must be designed to ensure that structure likely to fail in emergency loading conditions does not preclude or unduly hinder the emergency egress routes.”	Suggestion		Partially accepted	Will be considered for the AMC. “Conditions likely to occur following an emergency landing” can cover such cases.
675	TCCA-AISA	VTOL.2315a(1)	15/26	It is unclear why for landing on water that being able to quickly egress is only applicable in the case emergency floats are installed. It is just as important on water, if not more important, to ensure there are rapid means to egress when no emergency floats are installed.	Revise paragraph: <i>Facilitate rapid and safe evacuation of the aircraft in conditions likely to occur following an emergency landing, including on water.</i>	No	Yes	Partially accepted	Wording has been changed to refer to “emergency flotation system” which is part of the “emergency flotation” and “ditching” certification
676	TCCA-AISA	VTOL.2315a(2)	15/26	This section states that the means of opening exits should be shown to work after capsized only if certified for ditching. Facilities have been available for pilots of General Aviation aircraft to train for water egress in a capsized aircraft for many years. There is a training centre in the Maritimes which offers this course/training for years. A Canadian study on the topic cited training as an important factor. It is not appropriate to not have available proper egress capability for inadvertent ditching during overwater operations (where ditching certification is not required), regardless of whether certification for ditching is requested or not.	Revise paragraph: <i>Have means of egress (openings, exits or emergency exits) that can be readily located and opened from the inside and outside. The means of opening must be simple and obvious.</i> <i>the means of egress must be shown to work after capsize.</i>	No	Yes	Not accepted	Some level of proportionality has been retained between “emergency flotation” and “ditching” certification, similarly to what is currently done for CS-27
677	Aidan Reilly	VTOL.2315		Areas into which it is safe for rescue crews to cut should be clearly marked. Maximum system voltages should be clearly marked on the aircraft structure, because many tools are only insulated up to certain voltage limits.				Partially accepted	Will be considered for the AMC
678	Aidan Reilly	VTOL.2315		Hybrid-electric aircraft should have clear markings in and around heat engine bays indicating that there are electrical elements in the propulsion system.				Partially accepted	Will be considered for the AMC
679	Aidan Reilly	VTOL.2315		Aircraft fitted with pyrotechnic emergency systems (such as e.g. flotation devices) should include clear warnings indicating hazard areas.				Partially accepted	Will be considered for the AMC
680	Aidan Reilly	VTOL.2315		If the aircraft is capable of undergoing significant configuration changes during operation, satisfactory emergency egress must be demonstrated in all configurations for which certification is sought.				Partially accepted	Will be considered for the AMC
681	Aidan Reilly	VTOL.2315		At least two exits must be available for emergency egress, arranged so that all exits cannot be blocked by the ground after a crash landing.				Partially accepted	Will be considered for the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
682	Aidan Reilly	VTOL.2315		Operation of the emergency exits should be possible by passengers of limited physical strength and height (e.g. lower decile height and strength) after the aircraft has been subjected to ultimate design crash loads. This is intended to ensure that people cannot be trapped inside the aircraft after a crash due to e.g. plastic				Partially accepted	Will be considered for the AMC

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VTOL.2320 Occupant physical environment

Explanatory Note 22:

Some of the VTOL architectures may present different vulnerabilities to bird strike beyond the windshield and the objective has been moved from VTOL.2320 Occupant physical environment to VTOL.2250 Design and construction principles to be more generic. Taking into account some of the comments received as well as recommendations made in the frame of the Advisory and Rulemaking Committee Rotorcraft Bird Strike, Category Basic aircraft with higher number of passengers have also been included in the objective. The AMC will consider different factors such as speed and altitude for types of birds and impacts.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
683	Embraer S.A.	VTOL.2320(a)(2)			Embraer would like to request to EASA to clarify what are the “hazards originating from high energy.”	NO	NO	Noted	Will be considered for the AMC
684	Rolls-Royce	VTOL.2320		Why would this not also be applicable to basic category aircraft? Some guidance on bird size should also be included	Clarify bird size and logic for not having this protection in basic category aircraft	Yes	No	Partially accepted	See Explanatory Note 22
685	NEOPTERA	VTOL.2320 (a) (2)		“including while embarking and disembarking” And emergency evacuation also?		Observation	objection	Noted	Will be considered for the AMC
686	EAS/ N Rostedt	Structural Occupant Protection	12	Please consider a requirement for shrouding of propellers and rotors that are mounted so that passengers or uninvolved people can accidentally touch them easily. This is especially valid for pilotless operations or if the take-off or landing site lacks safety measures such as fencing and safety personnel.	Add to the SC-VTOL accordingly, alternatively include in the relevant OPS.	Observation		Partially accepted	Will be considered for the AMC
687	Lilium Gmbh	VTOL.2320 (b)		The Category Enhanced has developed a bird strike requirement for the aircraft which does not currently exist in CS23. In addition, the requirement that the occupants must be sufficiently protected from likely bird impact is vague and disproportionate.	Amend VTOL.2320 (b) to read: (b) each windshield and its supporting structure must withstand without penetration, the impact equivalent to a two-pound bird when the velocity of the aircraft is equal to the aircraft’s maximum approach speed in the landing configuration.		Yes	Not accepted	See Explanatory Note 22
688	Vertical Aerospace	VTOL.2320(a)(2)		Please could EASA clarify if high energy relates only to rotating part kinetic energy or if it also applied to electrical energy		Observation		Noted	This includes kinetic and electric energy. Will be detailed in the AMC.
689	Vertical Aerospace	VTOL.2320(b)		Please can EASA confirm that guidance will be given on the definitions of “sufficiently protected” and a “likely bird impact” - mass of bird etc - in the AMC?		Observation		Noted	See Explanatory Note 22
690	Diamond Aricraft Industries GmbH	VTOL.2320		Why was Subparagraph (e) removed – does the SC specifically not cover oxygen systems?	Re introduce CS 23.2320 (e).	no	yes	Accepted	-
691	Karem Aircraft, Inc.	VTOL.2320 (b)	15	Will size of bird and “sufficiently protected” be addressed in AMC?	None	Yes	No	Noted	Will be considered for the AMC
692	W Field LMWL Yeovil	2320	15	Does not include pax restraints	Should include requirements for PAX restraints	NO	YES	Partially accepted	Deemed to be covered by VTOL.2270 and will be detailed in the AMC
693	Airbus Group	2320(b)		What bird is considered as “likely”?	Better definition of bird mass and velocity.	X		Noted	See Explanatory Note 22

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
694	ADS	VTOL.2320	15	Why would this not also be applicable to basic category aircraft? Some guidance on bird size should also be included	Clarify bird size and logic for not having this protection in basic category aircraft	Yes	No	Partially accepted	See Explanatory Note 22
695	FAA/AIR	2320	15	Bird strike requirement has no velocity or mass of bird	This could be acceptable given some effort or guidance published on appropriate sized impact mass/energy.	Y		Partially accepted	See Explanatory Note 22
696	FAA/AIR	2320(a)(2)	15	The revised text in VTOL.2320(a)(2) introduces an important requirement to protect people while embarking and disembarking. However, the change makes it less clear if there is a requirement that the pilot station cannot be in line of a propeller or engine rotor unless the risk to the pilot is mitigated. Please consider clarifying the intent of this in AMC.		Y		Accepted	Will be considered for the AMC
697	FAA/AIR	2320(b)	15	The requirement (below) to design for birdstrike impact, is a broad, new requirement that potentially applies to a wide variety of aircraft. “For Category Enhanced, occupants must be sufficiently protected from likely bird impact. In particular, the flight crew must be able to perform their duties and the passengers must be protected from serious injury.”	FAA continues to have conversations on bird strike and how it should be applied in the safety continuum. FAA will work with EASA to harmonize on how it is used in safety continuum. The FAA will provide the industry a comment period for a safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	Y	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
698	FAA/AIR	2320(d) and (e)	15	Consider including the requirements for pressurization systems and oxygen systems, as noted in the comment on VTOL.2000(a).	Change 2320 (d) and (e) to state: (d) If a pressurisation system is installed in the aeroplane, it must be designed to protect against: (1) decompression to an unsafe level; and (2) excessive differential pressure. (e) If an oxygen system is installed in the aeroplane, it must: (1) effectively provide oxygen to each user to prevent the effects of hypoxia; and (2) be free from hazards in itself, in its method of operation, and its effect upon other components.		Y	Partially accepted	(e) has been reintroduced. See also Explanatory Note 4.
699	Transport Canada – NAC Engineering – F&HM	VTOL.2320(b)	15/26	“...occupants must be sufficiently protected from likely bird impact.” This wording is vague and subjective. What is “sufficient protection”? How would one quantify likelihood of bird impact / size? This appears to be a lower safety standard than CS-23, which requires windshield and supporting structure to prevent bird penetration, and therefore appears inappropriate.	a) Revise paragraph VTOL.2320(b) in line with CS-23 expectations, i.e. windshield and supporting structure preventing bird penetration. b) Define minimum bird size to be accounted for, to ensure consistency of interpretation.	No	Yes	Partially accepted	See Explanatory Note 22

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
700	GAMA	VTOL.2320(b)	15	Bird impact is not generally considered for low-speed aeroplanes and rotorcraft traditionally fly at lower speeds.	EASA should work to determine an appropriate path forward for bird strike requirements which are based upon a reasonable set of criteria.	Yes	Yes	Partially accepted	See Explanatory Note 22. It is anticipated that some products will fly at speeds equivalent to CS-29 rotorcraft which have a bird strike requirement (CS 29.631). Different levels of protection will be defined for the different products addressed under the SC VTOL.

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VTOL.2325 Fire Protection

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
701	Christian Sturm aerocompany	VTOL.2325		Redundant with VTOL.2270?	Single source for requirements, or better distinguishing what is meant.	Y	N	Noted	VTOL.2270 applies specifically to baggage and cargo compartment
702	ACI EUROPE		16	VTOL.2325 Fire Protection (a)(2) This clause should also consider the specific risks of eVTOL and mention electric batteris and thermal runways	Proposed text: (a)(2) ignition of flammable fluids, gasses, (lithium-ion ??) batteries or vapours; and	yes	no	Partially accepted	Will be considered for the AMC
703	Volocopter	VTOL.2325(a)(4)		OBJECTION: It is understood that VTOL.2325 (a) (4) relates to possible initiation of fire from the energy storage on board of the aircraft. However, this requirement is already included in Subpart E, VTOL.2430(a)(6).	Recommended to delete item VTOL.2325(a)(4) due to duplication with VTOL.2430(a)(6)	No	Yes	Not accepted	CS-23 construction and wording has been retained. VTOL.2325 considers generic fire risks while VTOL.2430 focuses on lift/thrust system installation, energy storage and distribution systems.
704	Lilium Gmbh	VTOL.2325 (a) (4)		AMC Material is required to clarify what is intended by a survivable emergency landing	Provide a definition for a survivable emergency landing in VTOL.2000	Yes		Accepted	Will be considered for the AMC
705	Vertical Aerospace	VTOL.2325 (b)(1)		One method of minimising the risk of fire,i.e. with a lithium ion battery pack is to vent the flammable gasses safely overboard	It is suggested that the VTOL.2325 (b)(1) section read “providing adequate fire or smoke awareness, venting and extinguishing means when practical	Suggestion		Partially accepted	Will be considered for the AMC
706	W Field LMWL Yeovil	2325 / 2330	16	These sections refer to equipment / structure, but do not seem to include protection for the people on board further than providing fire / smoke awareness.	2325 does include “fireproof materials that are adequate to the application, location and certification level”. This could also include options for fire extinguishing systems or hand held fire extinguishers.	YES	NO	Partially accepted	Will be considered for the AMC. VTOL.2320(c) addresses breathing hazards.
707	Airbus Group	2325(a)(4)		A survivable emergency landing is not a cause of fire	Suggested to update wording by “the consequences of an emergency landing likely to be survivable”	X		Not accepted	A survivable emergency landing may introduce risk of fire initiation, for example if a fuel tank is ruptured. The AMC will provide more details.
708	FAA/AIR	2325(a)(3)	16	If the requireements for oxygen systems in 2320(e) are not included, the reference to oxygen systems in VTOL.2325(a)(3) should be deleted.		Y		Accepted	2320(e) has been reintroduced
709	CAA NZ	VTOL.2325(a)(1)		For an all-electric aircraft, does this requirement allow for an applicant to demonstrate that the anticipated heat or energy dissipation may emanate from a single battery cell thermal event or a whole-battery-pack thermal event, or somewhere in between these extremes?		Yes	No	Noted	Will be detailed in the AMC

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VTOL.2330 Fire Protection in designated fire zones

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
710	Fabrizio Gaspari	VTOL.2330(a)	16	Withstanding the effects of fire?	Does this imply Fire Resistant of Fire Proof as terminology known to CS-23 already?		yes	Noted	Will be detailed in the AMC
711	ACI EUROPE		16	VTOL.2330 Fire Protection in designated fire zones Air taxis may be required to occasionally serve off-field landings. In such cases the provisions of VTOL.2330 the provisions of VTOL.2330 (c) would not be applicable	Include exemption for off-field landing as there is low risk of damage to terminal or other infrastructure in the event of fire.	Yes	no	Noted	“Terminals” should be understood as “a device attached to the end of a wire or cable or to an electrical apparatus for convenience in making connections”. CS-23 construction and wording has been retained.
712	Aerossurance	2330(b)		Outgassing is not an obvious term and is relatively narrow	Replace ‘outgassing with ‘a release of any other stored energy’	Suggestion	Substantive	Partially accepted	Replaced by “other release of stored energy” and will be clarified in the AMC
713	NEOPTERA	VTOL.2330 (b)		For category Enhanced, does it mean that a fire or outgassing can preclude a continued safe flight and landing (with a probability ≤ 10-9/FH) but not a controlled emergency landing (deterministically)?		Observation	substantive	Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
714	Vertical Aerospace	VTOL.2330(a)		Please can EASA confirm that guidance will be given on the necessary duration to withstand the effects of a fire, fire intensity etc?		Observation		Noted	Will be detailed in the AMC
715	Airbus Group	2330(b)		What is the proposed requirement for Category Enhanced with respect to the term "controlled emergency landing"?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
716	ADS	VTOL.2330	16	Outgassing is not an obvious term and is relatively narrow	Replace ‘outgassing with ‘a release of any other stored energy’	Yes	Yes	Partially accepted	Replaced by “other release of stored energy” and will be clarified in the AMC
717	UK CAA	VTOL.2330(b)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	The distinction between “continued safe flight and landing” and “controlled emergency landing” will be added throughout the document
718	Aidan Reilly	VTOL.2330		A minimum fire exposure time should be defined for the flight critical systems in (a) to ensure that an emergency descent and landing may be executed before catastrophic failure of structure, control, or lift is produced; a reasonable starting point might be 5 minutes plus 1 minute for every 5000 feet of certified ceiling in excess of FL050.				Partially accepted	Will be considered for the AMC

VTOL.2335 Lightning Protection

Explanatory Note 23:

Current CS-23 lightning protection requirement is worded as “For operations where the exposure to lightning is likely, the aeroplane must be protected...” The SC has been reworded so that the burden is on the applicant, if they do not want to provide lightning protection, to demonstrate that exposure to lightning is unlikely with the type of operations they certify for. Elements of the demonstration could integrate short range and endurance as well as clear and easily followable limitations in the aircraft flight manual. Special considerations for triggered lightning may need to be taken.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
723	Airbus Group	2335		Better definition of the required protection	Use the wording of §610	X		Not accepted	See Explanatory Note 23
724	Sikorsky	VTOL.2235	16	“Exposure to lightning is unlikely” is difficult to prove given every changing weather patterns.	Define conditions under which an aircraft under this Special Condition not rated for lightning protection can fly (distance away from nearest storm, etc.). Require method to ensure flight cannot be undertaken into lightning conditions.	No	Yes	Partially accepted	Will be considered for the AMC
725	FAA/AIR	2335	16	Define “highly unlikely”	This is less prescriptive, less level of safety than Part 23. Would “highly unlikely” signify a need for probability analysis such as 1301, 1309?		Y	Noted	The term “highly unlikely” is not used in the SC. See Explanatory Note 23.
726	FAA/AIR	2335 Lightning Protection	17	States the following: “Unless it is shown that exposure to lightning is unlikely, the aircraft must be protected against catastrophic effects of lightning.” ?	FAA continues to have conversations on lightning and how it should be applied in the safety continuum (possibly not test for the lower class aircraft but use design best practices). FAA will work with EASA to harmonize this lightning safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	N	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
727	TCCA-AVIONICS	VTOL.2335, VTOL.2430(a)(2) And VTOL.2515	16/26	It is noted that the protection against lightning is made conditional on the probability of exposure to lightning, consistent with CS 23. However, the potential consequences of the effects of lightning on this category of aircraft may require revisiting the appropriateness of this approach, particularly for the Category Enhanced.	Confirm the appropriateness of making lightning protection conditional on the probability of exposure to lightning for all Categories of VTOL.	No	Yes	Noted	See Explanatory Note 23. Further distinction will be provided in the AMC, for example between VFR and IFR.
728	Aidan Reilly	VTOL.2335		This conflicts with VTOL.2510. This permits catastrophic failure with an “unlikely” probability. Catastrophic failure should “extremely remote” in AMC VTOL.2510.				Not accepted	“likely” and “unlikely” are terms carried over from CS-23. See also Explanatory Note 23.

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VTOL.2340 Design and construction information

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
729	EAS/ N Rostedt	VTOL.2340 Design and construction information	16	“The following design and construction information must be established:” Add: instructions to first responders and other rescue personnel about how to safely depower thrust/lift systems and deactivate high-capacity energy stores, to facilitate safe access to passengers from the outside in an emergency.	Add to the SC-VTOL accordingly, alternatively include in the relevant OPS.	Suggestion	Substantive	Partially accepted	Will be considered for the AMC, for example under VTOL.2430(a)(6)
730	Aidan Reilly	VTOL.2340		As mentioned in previous comments (e.g. for VTOL.2315 above), information for first responders including areas in which it is safe to cut into the structure, electrical hazards (including voltages), and pyrotechnic hazards (e.g. from flotation or other emergency systems).				Partially accepted	Will be considered for the AMC, for example under VTOL.2430(a)(6)

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SUBPART E –THRUST/LIFT SYSTEM INSTALLATION

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
731	SAFRAN	Subpart-E	17/26 30/26	Global remark: Basically, there is no major difference with regard to Powerplant for a rotorcraft and for a VTOL. Hence, the introduction of the term “Thrust/Lift system” is confusing with regards to the usual lecture of the CS where: - the Fligh Control controls pitch, rool and yaw (CS-23.673 amdt4), and vertical motion/lift (CS-27.673 amdt4) - the powerplant provides the power required for thrust (used and controlled by FC)	Replace in all Subpart-E “Thrust/Lift system” by “Powerplant” as usual in CS.		YES	Not accepted	The distributed propulsion characteristic of VTOL results in particularities not covered by the existing CS and addressed through the SC: the lift/thrust units can be used to generate powered lift and control, production of power can occur in different locations and various hybrid schemes can be used. These specificities are deemed to warrant introducing a term more generic than powerplant.
732	FAA/AIR	Subpart E general		Introduction of Thrust/Lift in place of Powerplant seems unnecesarily complicated. The term powerplant is used throughout all other Certification Standards (CS-23, CS-25, CS-27, CS29, CS-E) and has a consistent meaning. Additionally, this could be confusing for certification, does a designee/engineer with authorization in powerplant have the authority to approve a thrust/lift system?	Remove Thrust/Lift term and replace with Pwerplant and Powerplant installation. 2400(a) should read “For the purpose of this Subpart, the aircraft thrust lift system powerplant installation must include each component that is necessary for thrust/lift, affects thrust/lift, or provides auxiliary power to the aircraft. Replace thrust/lift throughout subpart E with powerplant or powerplant installation.	suggestion	objection	Not accepted	The distributed propulsion characteristic of VTOL results in particularities not covered by the existing CS and addressed through the SC: the lift/thrust units can be used to generate powered lift and control, production of power can occur in different locations and various hybrid schemes can be used. These specificities are deemed to warrant introducing a term more adapted than powerplant. Authorizations linked to powerplant may need to be also changed to take into account these specificities.
733	Transport Canada – NAC Engineering – F&HM	VTOL.2000, VTOL.2300, Subpart E, VTOL.2500, VTOL.2510		As noted in VTOL.2000, lift/thrust units on VTOL aircraft are used to generate powered lift and control, such that the flight control function is indissociable from thrust / lift functions. As a result the same requirements should be applicable to flight control systems and thrust / lift systems. The proposed SC has different standards applicable to flight controls versus thrust / lift functions, with resulting apparent discrepancies and conflicts in various places of the SC, particularly where related to safety and failure cases. A number of such conflicts and inconsistencies are raised in other comments, against specific requirements, but the concern is broader.	a) Add clarification in Subpart E and/or other relevant section of the SC that thrust / lift / flight control functions should be considered as integrated functions for compliance and, unless specifically indicated otherwise, are subject to the same compliance requirements. b) Requirements of subpart E applicable to thrust / lift systems should be systematically reviewed for potential conflict with the specific requirements applicable to flight controls (subpart D), and general system / safety requirements of subpart F applicable to flight controls, for potential conflicts and inconsistencies.	No	Yes	Accepted	Throughout the SC, objectives linked to the lift/thrust system have been reviewed and removed when better addressed though the generic system objectives

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VTOL.2400 Thrust/lift system installation

Explanatory Note 24:

This objective offers the possibility to certify any engine, including electric motors, hybrid configurations, propellers and auxiliary power units (APU) as part of the aircraft without a separate Type Certificate. Accepted Means of Compliance will be provided that draw from corresponding CS-E, CS-P and ETSO specifications.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
734	Fabrizio Gaspari	VTOL.2400(b)	17	If the VTOL has 50 engines, for example, must EACH meet CS-E, CS-P etc or is it foreseeable that the power-train, consisting of 50 engines is achieving TC as a whole?	Type certified as per CS-E, CS-P? Is this is the case, I think that a distributed electric propulsion would be extremely expensive being all the props and engines to be certified. I would just certify the complete system (meeting the safety requirements)	yes		Noted	See Explanatory Note 24
735	William Branch	VTOL.2400 (b)	17	If a company makes their own propellers what are the accepted specifications?	None	Yes	No	Noted	See Explanatory Note 24
736	Embraer S.A.	VTOL.2400		<p>The requirement states:</p> <p><i>“(b) Each aircraft engine, propeller and auxiliary power unit (APU) must be type certified, or meet accepted specifications.”</i></p> <p>Embraer understands that the aircraft engine, propeller and APU will be certified under the aircraft Type Certificate (TC) considering the unique design and the unusual characteristics of the vehicle.</p>	<p>Embraer suggests to rewrite the sentence as follows:</p> <p><i>“(b) Each aircraft engine or motor, propeller and auxiliary power unit (APU) should meet accepted specifications.”</i></p> <p>According to Embraer’s understanding these parts (aircraft motor or engine, propeller and APU) may be certified as components under the aircraft’s Type Certificate.</p> <p>Embraer also understands the term “motor” should be included in the requirement because the term is commonly used for the installation of an electric propulsion system.</p>	YES	YES	Partially accepted	CS-23 construction and wording has been retained. More details will be provided in the AMC.
737	Aerossurance	2400(e)		Grammar	Change ‘each thrust/lift system’ with ‘each thrust/lift system’s’	Suggestion	Substantive	Partially accepted	“each” will be removed
738	Rolls-Royce	VTOL.2400		Will the scope of CS-E be extended to cover propulsion systems for these vehicles? How will an electric motor be certified	Clarify route to issue cert regulations for these new powertrains	Yes	No	Noted	See Explanatory Note 24
739	Vertical Aerosapce	VTOL.2400 (a)		The original premise for this section is powerplant. In the context of an electric vehicle it is necessary to be clear as to what is meant by auxiliary power (or APU), as this is unlikely to be an engine.	<p>It is suggested that this section be changed to</p> <p>“For the purpose of this Subpart, the aircraft thrust/lift system installation must include each component that is necessary for thrust/lift, or affects thrust/lift safety of the aircraft.”</p>	Suggestion		Not accepted	Some architectures may have a separate generation of power, e.g. through an APU, that may be considered as part of the lift/thrust system, thus the generic wording is retained
740	W Field LMWL Yeovil	2400 (c) (1)	17	“Foreign Object Threats” I suppose include Birdstrike and small RPAS, and possibly weather such as hail?	Definition required for “Foreign Object Threats”	YES	NO	Accepted	Will be detailed in the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
741	Airbus Group	2400		No tests similar to CS27.923/927 required (is this considering that aircraft architecture may not include a rotor drive system ?)		X	X	Noted	Considerations for transmissions will be included in the AMC
742	Airbus Group	2400(b)		As thrust/lift system is not listed it is understood a separate type certification is not required	Confirm understanding is correct	X		Noted	See Explanatory Note 24
743	ADS	VTOL.2400	17	Will the scope of CS-E be extended to cover propulsion systems for these vehicles? How will an electric motor be certified	Clarify route to issue cert regulations for these new powertrains	Yes	No	Noted	See Explanatory Note 24
744	FAA/AIR	2400	19	Use of only Certified Articles - The special condition requires certified engines, propellers, and APUs to be certified or to meet accepted standards. This requirement is inconsistent with the state of the eVTOL business. eVTOL applicants typically are inventing their own motors and fans and using non-aviation engines as APUs all under a 21.17(b) approval of the entire air vehicle. Many applicants have no desire to separately certify their constituent subsystems. The special condition also leads to asking the following: o If an applicant wanted to use a mature, non-aviation recip as an APU, would the applicant first have to gain EASA certification of the recip as an APU? o If an applicant wanted to leverage say the rotary engine from the Yamaha UAS (a 21.17(b) approval for the entire air vehicle) would EASA consider the rotary engine as certified? o Does EASA intend the special condition to support 21.17(b) air vehicle certifications			Y	Noted	See Explanatory Note 24. The lift/thrust system can have its own type certificate or be certified as part of the aircraft certification.
745	Aidan Reilly	VTOL.2400		Lifting rotors in particular may require articulation ('flapping hinges') akin to helicopter rotors. It may not be appropriate to certify such rotors under propeller regulations, and appropriate sections of helicopter regulations should be used as the certification basis.				Noted	Considerations for articulated rotors will be included in the AMC
746	Aidan Reilly	VTOL.2400		Aircraft which substantially change configuration in flight may be precluded from safely operating all propulsion system elements in all configurations.				Noted	Will be considered for the AMC

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VTOL.2405 Thrust/lift control systems

Explanatory Note 25:

The “lift/thrust control systems” and “lift/thrust system installation hazard assessment” will be addressed through the system objectives of Subpart F, including the distinction between Category Basic and Enhanced. The automation and human-machine interface aspects will be addressed in the AMC.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
747	Sam Bousfield	VTOL.2405 (a)	15	Does pilot error remove the operation from “normal operation of the system”? The wording in (a) works for fully autonomous but not for piloted vehicles. You also have the potential for environmental issues to change during flight, and present an unsafe condition due to exceeding the environmental design parameters	Suggest: (a) Autonomous thrust/lift control systems must be designed so no unsafe condition will result during normal operation of the system within the environmental design envelope.	yes	no	Partially accepted	Will be considered for the AMC
748	Sam Bousfield	VTOL.2405 (c)	15	If in piloted flight but autopilot engaged, and the pilot inadvertently puts his elbow on the joystick commanding an override of the autopilot, the pilot may command an un-safe condition. It isn’t the vehicle that is causing an unsafe condition.	I would suggest (c) wording should include some differentiation between fully autonomous and pilot with override authority. Perhaps: (c) Inadvertent override of an autonomous thrust/lift control system by the flight crew must be prevented, or if not prevented, must not result in an unsafe condition during normal operation.	no	yes	Partially accepted	Will be considered for the AMC
749	Sam Bousfield	VTOL.2405 (c)	15	Also, there are two conditions that I feel should be differentiated between. The first is normal operation of a vehicle in autonomous mode, and the second is the transition between piloted and autonomous. The reason is that it seems reasonable to have the autonomous vehicle be capable of safe flight in environmental conditions within its design scope, and expect that the vehicle manufacturer should provide that. If the vehicle is capable of piloted and non-piloted flight, and a pilot is in command, the vehicle should not be required to compensate or prevent injury or accident if the pilot does not maintain safe flight, and at the last instant, shifts over to autonomous flight with no possibility of recovery even with expert piloting. This may be found during crash investigation, however the wording of (c) above would indicate that the vehicle should be capable of preventing any unsafe condition, which is not reasonable to assume. Perhaps the addition of ‘during normal operation’ might suffice, but the intimation is that the liability would be upon the equipment, and not the pilot.	Rather than try to introduce wording in sections like (C),, perhaps there would be more general wording to point out that in any vehicle with an autopilot or autonomous mode flight in addition to piloted mode, the pilot must not exceed the capabilities of the vehicle, and is not excused from being responsible for continued safe flight of the vehicle by use of the autonomous or autopilot system.	Yes	No	Noted	Defining liability is outside the scope of the Special Condition. Human-machine interface aspects will be addressed in the AMC.
750	Marco Rizzato	VTOL.2405(d)2		Thrust/lift control systems: It is not clear what's meant with automatic function. What if the aircraft is only controllable through automatic functions? How do you control manually a quadcopter?		yes		Noted	See Explanatory Note 25

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
751	Luftfahrt-Bundesamt	VTOL.2405		Thrust/lift control system: “(a) Thrust/lift control systems must be designed so no unsafe condition will result during normal operation of the system.” What is the difference between the “unsafe condition” of Part 21.A.3A and .3B and the unsafe condition which is mentioned in this requirement?		Yes		Noted	See Explanatory Note 25
752	NEOPTERA	VTOL.2405 (b)		For category Enhanced, does it mean that a single failure can preclude a continued safe flight and landing (with a probability $\leq 10^{-9}/\text{FH}$) but not a controlled emergency landing (deterministically)?		Observation	substantive	Noted	See Explanatory Note 25
753	Vertical Aerospace	VTOL.2405		A multicopter flight control system demands the thrust setting on each motor. However, this is not just in response to the power setting but to any control input when in the hover.	It is recommended that the wording in VTOL.2405 be amended to address the interface with the flight controllers likely to be implemented with these types of VTOL vehicle	Suggestion		Noted	See Explanatory Note 25
754	SAFRAN	VTOL.2405(b)	17/26	“Any single failure or likely combination of failures... ” concerning combination of failures, there is no probabilistic approach to limit the extend of the analysis. Safety objective shall be added. Additionnaly, VTOL.2410 expresss that controlled emergency landing shall not be prevented following any “...hazard resulting from the likely failure... ”, i.e. no combination is foressen.	N/A		YES	Noted	See Explanatory Note 25
755	Royal Aeronautical Society’s Airworthiness & Maintenance Specialist Group (RAeS A&MSG) Committee	VTOL.2405(d)	17	The interpretation of the term “extremely improbable” is subjective.	A definition of the term, which makes objective interpretation possible, should be included. NB: If the term has already been defined as such elsewhere, it should be cross-referenced.	Yes	Yes	Partially accepted	See Explanatory Note 25 and VTOL.2510 AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
756	W Field LMWL Yeovil	2405 (d)	17	<p>“Unless the failure of an automatic thrust/lift control system is ‘extremely improbable’, the system must:” is not acceptable.</p> <p>There will be certain information such as NR that have been primary flight data for pilots on Rotorcraft that may not be required to be displayed for highly automated air vehicles in the same way, however, the pilot will require sufficient information to maintain continued safe flight.</p>	<p>The pilot must always receive a minimum set of data to a level that may be inversely proportionate to the “level of complexity” or “level of automation”. The type of data will depend on the types / levels of automation.</p> <p>The type of information provided may also relate to the ability of the pilot to respond in a timely manner. For instance with the pilot off board, you may not display NR, but may display exceedences. This is on the basis of time delays. The first instance of this regulation should not cover control from the ground, but it should give the pilot sufficient information on all essential and non-essential systems.</p> <p>(d) could be re-written to make it clearer what level of failure of the lift / thrust control system this relates to? At the moment this refers to all failures, not specifically CAT failures.</p>	YES	NO	Noted	See Explanatory Note 25
757	Airbus Group	2405 (b)		Any single failure or likely combination of failures of a thrust/life unit control system must not prevent a continued safe flight and landing, in the particular case of enhanced category	Differentiate “basic” and “enhanced” categories		X	Accepted	See Explanatory Note 25
758	Airbus Group	2405		The phrase "Thrust/lift control systems are systems that intervene with the thrust/lift selection" is unclear. Perhaps a word other than "intervene" might be chosen.	Change wording to clarify intent of statement.	X		Noted	See Explanatory Note 25
759	Airbus Group	2405(b)		What is the proposed requirement for Category Enhanced with respect to the term "controlled emergency landing"?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	See Explanatory Note 25
760	UK CAA	VTOL.2405(b)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	See Explanatory Note 25
761	UK CAA	VTOL. 2405(d)		Why has the text of CS 23 “extremely remote” been changed to “extremely improbable”?	Restore the text to “extremely remote” or explain the reason for the change.	Yes		Noted	See Explanatory Note 25
762	UK CAA	VTOL. 2405(d)(2)		The text “if the <u>hazard</u> outweighs the safety benefits” is not clear.	Revise the text to increase clarity.	Yes		Noted	See Explanatory Note 25
763	Sikorsky	VTOL.2405.d	17	The term “extremely improbable” is not defined or quantified, providing an inadequate basis for certification.	Define and quantify term “extremely improbable”.	No	Yes	Accepted	See Explanatory Note 25 and VTOL.2510 AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
764	FAA/AIR	2405	19	What is the scope of the thrust/lift control system? Does it include the flight control computers, inverters, navigation systems, the remote pilot station?	Clarify the scope of 2405 in the MOC.	Y	N	Noted	See Explanatory Note 25
765	FAA/AIR	2405(b)	19	EASA introduces the term “controlled emergency landing” whereas previous standards use “continued safe flight and landing” to define the acceptable boundary of thrust/lift control system failures	FAA continues to have conversations on controlled emergency landing and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it used in safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	Y	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
766	FAA/AIR	2405(d)	19	For automatic thrust/lift control systems, EASA requires the failures to be extremely improbable vs extremely remote for FAST with respect to requiring a manual override capability (10-9 vs 10-7)	Requiring 10 ⁻⁹ for basic aircraft seems excessive. This probably could line up with the FAA intent if you consider the 2500 table at the end of the rules, but I don't think EASA is considering that applicable to the 2400 series rules based on the language in 2510..	Y	Y	Partially accepted	See Explanatory Note 25
767	TCCA-AVIONICS	VTOL.2405 (d)	17/26	For configuration with many (eg. 8) thrust/lift units is it reasonable to consider that the flight crew is capable to safely control the thrust/lift in manual/direct mode ?	(2) provide a means for the flight crew to override the automatic function if the hazard outweighs the safety benefits. <i>In this case, the system should still maintain sufficient control authority to allow the flight crew to control the Thrust/lift with an acceptable workload increase.</i>	No	Yes	Noted	See Explanatory Note 25
768	Transport Canada – NAC Engineering – F&HM	VTOL.2405(b)	17/26	<p>“Any single failure or likely combination of failures of a thrust/lift unit control system must not prevent a controlled emergency landing of the aircraft.”</p> <p>This paragraph is inconsistent with the requirements of VTOL.2005(b) and VTOL.2510.</p> <ul style="list-style-type: none"> The safety standard implied by this paragraph is significantly lower than that implied by VTOL.2510. Considering thrust/lift control system also provides flight control function - which is subject to VTOL.2510 – 2405(b) should be aligned with 2510. For enhanced category, the criterion is continued safe flight and landing, not controlled emergency landing. Unclear how “single failure or likely combination of failure” relates to “critical malfunction of thrust/lift”; 	<p>Revise VTOL.2405(b) to:</p> <p>a) Align safety requirements with VTOL.2510</p> <p>b) Align terminology and requirements of VTOL.2005(b), including different criterion for category enhanced (continued safe flight and landing) versus category basic (controlled emergency landing).</p>	No	Yes	Accepted	See Explanatory Note 25

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
769	Transport Canada – NAC Engineering – F&HM	VTOL.2405(c)	17/26	<i>“Inadvertent operation of a thrust/lift control system by the flight crew must be prevented...”</i> Considering flight control is indissociable from thrust/lift function, and flight control is meant to be operated in flight, overall intended interpretation of this requirement is unclear.	EASA to clarify intent of this paragraph, in particular as it would apply to flight control function as part of an integrated flight control / thrust / lift function.	No	Yes	Accepted	See Explanatory Note 25
770	Transport Canada – NAC Engineering – F&HM	VTOL.2405(d)	17/26	This paragraph addresses automatic thrust/lift control system. Considering Considering thrust/lift units also provide the flight control function, TCCA would understand this paragraph to also cover autopilot functions.	EASA to confirm that this paragraph also address autopilot functions, and clarify wording accordingly. If the intent is not to cover autopilot functions, how is delineation between thrust/lift and flight control / autopilot to be made?	No	Yes	Noted	See Explanatory Note 25
771	Aidan Reilly	VTOL.2405		Direct mechanical linkages could be captured by this, as variation in flight speed intervenes to change the level of thrust commanded by the pilot, even if the propulsion system consists of a mechanically controlled piston engine driving a fixed pitch propeller. The intent of the regulation is clearly to control systems which interpose some sort of control loop between the thrust or power lever and the engine. Therefore, I would suggest that “Thrust/Lift control systems are systems other than a direct mechanical linkage between the cockpit controls and the physical aspect(s) of the thrust/lift units which regulate their output of thrust/lift”.				Noted	See Explanatory Note 25
772	Aidan Reilly	VTOL.2405		Again, refer to previous comments above on the subject of “controlled emergency landing” vs “continued safe flight and landing”.				Accepted	See Explanatory Note 25
773	Aidan Reilly	VTOL.2405		The word “automatic” in (d) is superfluous.				Noted	See Explanatory Note 25
774	Aidan Reilly	VTOL.2405		If a system to over-ride the system is provided as per (d)(2) then it must surely be important that (d)(3) also prevent inadvertent activation of an errant thrust/lift control system.				Partially accepted	Will be considered for the AMC

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VTOL.2410 Thrust/lift installation hazard assessment

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
775	Embraer S.A.	VTOL.2410		<p><i>“VTOL.2410 Thrust/lift installation hazard assessment</i></p> <p><i>The applicant must assess each installation separately and in relation to other aircraft systems and installations to show that any hazard resulting from the likely failure of any system component or accessory will not:”</i></p>	Embraer would like to request to EASA to clarify what components of the thrust/lift installation system are considered as “likely failure”.			Noted	See Explanatory Note 25
776	Airbus Group	2410 (a)		The applicant must (...) show that any hazard resulting from the likely failure of any system component or accessory will not must not prevent a continued safe flight and landing, in the particular case of enhanced category	Differentiate “basic” and “enhanced” categories		X	Accepted	See Explanatory Note 25
777	Airbus Group	2410(a)		What is the proposed requirement for Category Enhanced with respect to the term "controlled emergency landing"?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	See Explanatory Note 25
778	UK CAA	VTOL.2410		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	See Explanatory Note 25
779	FAA/AIR	2410(a)	20	The powerplant system safety assessment for likely failures uses the term “controlled emergency landing” whereas FAST uses “continued safe flight and landing” to define the acceptable boundary of thrust/lift control system failures. EASA also remove the minimize caveat which is needed for rotorburst, engine case burn through and single engine designs.	“controlled emergency landing”better defines the intent.. Need an allowance to minimize if single failure criteria that cannot be met to cover rotorburst, engine case burn through and to permit single engine or system architectures.	Y	Y	Partially accepted	See Explanatory Note 25

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
780	Transport Canada – NAC Engineering – F&HM	VTOL.2410 and VTOL.2410(a)	18/26	<p>“... show that any hazard resulting from the likely failure of any system component or accessory will not ... prevent a controlled emergency landing.”</p> <p>For enhanced category, this paragraph is inconsistent with VTOL.2500(c) and VTOL.2510(a)(1). “Preventing controlled emergency landing” is a more severe condition than “Preventing continued safe flight and landing” – which is already considered catastrophic for enhanced category per 2500(c), and therefore subject to 2510(a)(1) which has much more stringent safety requirements than the “likely failures” referred to here.</p> <p>For basic category, VTOL.2005(b) states that controlled emergency landing be assured after “critical malfunction of lift/thrust” – presumably not be the same as the “likely failure” referred to here. Again, these terms need to be defined, and harmonized throughout the SC.</p>	EASA is requested to clarify safety intent of VTOL.2410(a), and revise as necessary to ensure alignment with safety objectives VTOL.2500(c), VTOL.2510 and VTOL.2005(b) as applicable, both for enhanced and basic category.	No	Yes	Accepted	See Explanatory Note 25
781	Boeing	VTOL.2410	18	<p>THE PROPOSED TEXT STATES:</p> <p><i>The applicant must assess each installation separately and in relation to other aircraft systems and installation to show that any hazard resulting from the likely failure of any system component or accessory will not:</i></p> <p><i>(a) prevent a controlled emergency landing;</i></p>	<p>REQUESTED CHANGE:</p> <p><i>The applicant must assess each installation separately and in relation to other aircraft systems and installation to show that any hazard resulting from the likely failure of any system component or accessory will not:</i></p> <p>(a) prevent a controlled emergency landing;</p> <p>In addition to our suggested text removal, we request EASA to provide clear guidance material (GM) and / or acceptable Means Of Compliance (MOC) for the highlighter term “likely failure”.</p> <p>JUSTIFICATION:</p> <p>Clarification of the term “likely failure” is warranted; under first interpretation it is understood to mean that thrust/lift installation hazards must be fail safe, but could also be interpreted that low reliability thrust/lift installations must be fail safe, but systems that are shown to be high reliability (unlikely failures) are not subject to this paragraph. In either case, however, the remaining specification does not include necessary information required to make the aircraft fail safe, thereby adding unnecessary cost to the thrust/lift installation and making EASA the configuration designers.</p>		yes	Noted	See Explanatory Note 25

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
782	Aidan Reilly	VTOL.2410		Again, refer to previous comments above on the subject of “controlled emergency landing” vs “continued safe flight and landing”.				Accepted	See Explanatory Note 25

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VTOL.2415 Thrust/lift installation ice protection

Explanatory Note 26:

CS 23.2415(a) addresses protection against ice shedding into the powerplant due to accumulation of ice on forward aircraft components. This does not necessarily require an active ice protection on forward aircraft components. The objective applies regardless of the icing certification sought. Similarly for rotorcraft CS 2x.1093 includes requirements for different types of engines, regardless of the icing certification sought. The objective will be rewritten to align more closely to CS-27 and the AMC will provide more details on the conditions to consider.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
783	Christian Sturm aerocompany	VTOL.2415		In practical life this will/can be very close to VTOL.2165, as lift and thrust similarity might define the VTOL.	Avoid redundant requirements.	Y	N	Noted	Having a separate objective for the lift/thrust system installation ice protection allows to take into account particularities of such systems, for example air induction.
784	Rolls-Royce	VTOL.2145		This seems inconsistent with VTOL.2165 which allows for the ice protection system to be certified for flight in only a subset of icing conditions, provided that adequate means of detecting and escaping from icing conditions for which the aircraft is not certified are provided.	It seems unreasonable to require an ice protection system if the aircraft is not certified for flight in icing conditions; (a) should be amended to only apply in conditions for which certification is requested.	Yes	Yes	Not accepted	See Explanatory Note 26
785	Airbus Group	2415		Both paragraphs concern icing/snow effects on Thrust/Lift, so potentially also on rotors and propellers whereas in CS 27/29/VLR it only concerns powerplant installation.	To be justified the difference of requirement as compared to CS 27/29/VLR.	X		Noted	The modification has been introduced to cover VTOL aircraft configurations that may have highly integrated lift/thrust systems, for example with a fan on top of an electric motor. More details will be considered for the AMC.
786	Airbus Group	2415(a)		'foreseeable accumulation or shedding of ice or snow' is unclear.	To precise the meaning of 'foreseeable'	X		Partially accepted	"foreseeable" will be removed. More details will be considered for the AMC
787									
788	Airbus Group	2415 (b)		According to (b) no protection to icing and snow is required if the VTOL aircraft is forbidden to fly in icing conditions (if the aircraft has not been certified to icing), whereas in CS-27/29/VLR, for turbine engines, protection to inadvertent icing (including 30 minutes icing for powerplant) and protection to inadvertent snow are required even if the rotorcraft is forbidden to fly in icing/snow conditions.	Apply the same concept for icing and snow protection as for CS 27/29/VLR at least if turbine engines are installed.		X	Accepted	Objective will be modified. See Explanatory Note 26.
789	ADS	VTOL.2145	6	This seems inconsistent with VTOL.2165 which allows for the ice protection system to be certified for flight in only a subset of icing conditions, provided that adequate means of detecting and escaping from icing conditions for which the aircraft is not certified are provided.	It seems unreasonable to require an ice protection system if the aircraft is not certified for flight in icing conditions; (a) should be amended to only apply in conditions for which certification is requested.	Yes	Yes	Not accepted	See Explanatory Note 26

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
790	TCCA-AISA	VTOL.2415(a)	18/26	Para 2415b mentions “icing conditions for which certification is requested” but not part (a). This would then infer that capability needs to be available for inadvertent icing encounters. (a)...	EASA should clarify the intent of 2415a, or include a lead in sentence to this section that reads “ If certification for operating in icing conditions is requested: (a)...	No	Yes	Noted	See Explanatory Note 26
791	Aidan Reilly	VTOL.2415		This is inconsistent with VTOL.2165 which allows for the ice protection system to be certified for flight in only a subset of icing conditions, provided that adequate means of detecting and escaping from icing conditions for which the aircraft is not certified are provided. It seems unreasonable to require an ice protection system if the aircraft is not certified for flight in icing conditions; (a) should be amended to only apply in conditions for which certification is requested.				Not accepted	See Explanatory Note 26

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VTOL.2420 (reserved)

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
792	Airbus Group	2420		This paragraph is highlighted as being changed but no change in fact from CS-23 (paragraph is also ‘Reserved’ in CS-23)		X		Accepted	Highlight will be removed
793	Aidan Reilly	VTOL.2420		I note that this is also reserved in CS-23 Amendment 5; what purpose does this serve?				Noted	CS-23 construction and wording has been retained

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VTOL.2425 Thrust/lift operational characteristics

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
794	Lilium Gmbh	VTOL.2425 (b)		AMC material is required to establish the principles for demonstrating where the safety benefits outweigh the hazard when considering the Inflight Shutdown of engines or distributed propulsion	AMC Material to be developed		Yes	Partially accepted	Will be considered for the AMC
795	SAFRAN	VTOL.2425(b)	18/26	Please precise the sentence : “If the safety benefits outweighs the hazard...”	N/A	YES		Noted	Will be considered for the AMC
796	Diamond Arircraft Industries GmbH	VTOL.2425		In Subparagraph (a) - Why was “... and thrust/lift system installation” omitted?	Please clarify if intentional exceedance of thrust/lift systems limitations allowed? E. g. for temporary emergency operation, ...	yes	no	Noted	“lift/thrust system installation” will be added
797	Airbus Group	2425(b)		What is the expectation for shutdown and restart of electric motors? Is this zero current (idle) or power disconnection or motor controller reset (power cycle) or something else?	Define more clearly what is meant by shutdown and restart for electric motors.	X		Partially accepted	Will be considered for the AMC
798	UK CAA	VTOL.2425(b)		The text “if the <u>safety benefits</u> outweighs the hazard” is not clear. Compare also with VTOL.2405(d)(2) – see point 16 above.	Revise the text to increase clarity.	Yes		Partially accepted	Existing CS-23 wording has been used and clarification will be considered for the AMC
799	FAA/AIR	2425(b)		The EASA rule does not require shutdown/restart capability “If the safety benefit outweighs the hazard” If is unclear why you would not give the crew or operator the ability to shutdown and restart the engines or what is meant by safety benefits outweighing the hazards	Remove the “If the safety benefit outweighs the hazard” and make it a requirement to be able to shutdown and restart the engines in flight. Its likely this function will be managed by a computer, but it should still be available.	Y	Y	Partially accepted	Existing CS-23 wording has been used and clarification will be considered for the AMC

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VTOL.2430 Thrust/lift system installation, energy storage and distribution systems

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
800	William Branch	VTOL.2430 (a) (3)	18	The term “safe functioning” means continued flying...but that should only apply to Category Enhanced aircraft. Category Basic should only have to perform emergency landing.	Change (a) (3) to read: provide energy to the thrust/lift system installation with adequate margins to ensure continued flight and landing for Category Enhanced or emergency landing for Category Basic, under all permitted and likely operating conditions, and accounting for likely component failures;	Yes	Yes	Partially accepted	CS-23 construction and wording has been retained and clarification will be considered for the AMC
801	Aerossurance	2430(b)		The terms ‘sufficient’ and ‘standard flight’ without further guidance are open to wide and varied interpretations in applicant proposals.	EASA to ensure suitable guidance and/or definitions are provided.	Observation	Substantive	Accepted	Will be detailed in the AMC
802	Rolls-Royce	VTOL.2430		Additional information on acceptable reserves would be very helpful	Clarify acceptable reserves for each cert category. Define them in terms of onward flight to account for differences in kerosene and battery energy sources	Yes	No	Partially accepted	Will be detailed in the AMC
803	Rolls-Royce	VTOL.2430		Energy seems to have been used as a proxy for both fuel and battery systems. Jettisoning energy, for example, is very different for fuel or a battery.	Provision separate paragraphs for fuel and battery storage as the behaviour in failure cases and subsequent action may be very different	Yes	Yes	Partially accepted	Existing CS-23 wording has been used and clarification will be considered for the AMC
804	Dr. Norbert Lohl	VTOL.2430 (b) (4)	19	It would be sufficient that the energy reserve accounts for a normal landing instead of a standard flight	Request that the phrase “a sufficient reserve based on standard flight” be modified to “sufficient reserve to execute a normal landing”	yes	no	Not accepted	More details will be provided in the AMC but it is anticipated that provisions will be needed for going around and diverting
805	Volocopter	VTOL.2430(a)(1)		SUGGESTION: The addition of ‘including fire’ goes to a prescriptive level emphasizing just of one of the failure modes that are already required to be considered by ‘so that a failure’. While this is a valid aspect, but in its criticality connected to just the electric propulsion and battery technology. The level of prescriptiveness therefore is limiting for technology development.	Recommended consideration of this aspect as part of electric propulsion specific AMC (which is already the case when adopting the related electric power system installation ASTM F44 requirements)	Yes	No	Partially accepted	This addition emphasizes a risk that exists in a number of VTOL architectures being proposed. This will be detailed in the AMC that may in turn refer to consensus standards.
806	NEOPTERA	VTOL.2430 (b) (4)		Who is responsible to define what is standard flight? How this reserve quantity for different VTOLs type/manufacturer/operator are harmonized and adequate with air traffic management and control?		Observation	objection	Noted	Will be detailed in the AMC
807	Lilium Gmbh	VTOL.2430 (b)(4)		The term ‘sufficient reserve based on a standard flight’ is considered an inappropriate approach to safeguard a safe flight and landing objective. This proposal is also considered to be an issue best managed as part of the operational rules/requirements.	Amend VTOL.2430 (b)(4) to read ‘(4) be designed to provide indication of the available remaining energy from which the flight crew can reliably calculate operational flight reserves; and’		Yes	Not accepted	The AMC will clarify that the aircraft must indeed be designed to provide indication of the available remaining energy from which the flight crew can reliably calculate operational flight reserves (e.g. under AMC VTOL.2445(g)), however minimum values may also be considered as is the case in CS-23 and CS-27

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808	Kopter Group	VTOL.2430(b)	19	The proposed requirements VTOL.2430(b)(3) “storage system must [...] be designed to prevent significant loss of stored energy” and (b)(4) “... provide energy for a sufficient reserve based on a standard flight” are quite critical in the case of a battery-based energy storage.	Define additional provisions to: (1) make a reliable power-assurance check available to the pilot or passengers. (2) guarantee endurance and peak power for missions and/or maneuvers planned beyond “standard flight”.	yes	yes	Partially accepted	Will be considered for the AMC
809	Vertical Aerospace	VTOL.2430(b)(4)		The standard flight will require planning around potential diversions and alternatives and the diversion option should be accounted for.	It is suggested that the definition of “standard flight” includes diversion considerations and that the diversion is performed without exceeding the operational envelope.	Suggestion		Partially accepted	Will be considered for the AMC
810	SAFRAN	VTOL.2430(a)(7)	19/26	The requirement is clear when ‘contamination’ is related to fuel propulsion system, but for other energy system, could explain what the term ‘contamination’ refers to? This formulation is misleading for Electric or Hybrid electric designs.			YES	Noted	Will be clarified in the AMC
811	SAFRAN	VTOL.2430(b)(4)	19/26	The requirement “ provide energy for a sufficient reserve based on a standard flight ” is unclear and does not provide a clear safety objective for energy reserve (safe landing, constraints in time, etc...)	N/A		YES	Noted	Will be detailed in the AMC
812	Diamond Aircraft Industries GmbH	VTOL.2430		<ul style="list-style-type: none"> Subparagraph (a)(6): it is not clear if the hazards to people on ground are to be minimized only during or also after emergency landing, e. g. first responders, ... Subparagraph (a)(6) Compared to CS 23 Amdt. 4, it is assumed that landing gear system failures are meant. <p>Landing gear system failures due to overload are only considered in CS 23 Level 4 (10 to 19 passengers) whereas SC-VTOL allows only up to 5 passengers Category Enhanced – is this requirement necessary for small category VTOL.</p>	<ul style="list-style-type: none"> Please clarify new requirement. Insert the word „gear“ <p>Remove last sentence of subparagraph (6)</p>	yes	no	Noted	Will be detailed in the AMC CS-23 construction and wording has been retained. In general CS-23 requirements for Level-3 and Level-4 have been transposed to Category Enhanced to retain a level of proportionality while providing an increased safety level for this category.
813	EVA	VTOL.2430 (a)(3) VTOL.2430 (b)(4)	18	Is there any further percentage or value of energy margin which will be defined in the final CS (like in the CS25 concerning the energy supplying instruments or like in the CS25 in term of fuel quantity margin)?		NO	NO	Noted	Will be detailed in the AMC
814	Airbus Group	2430.a.1	18	the notion of energy storage is ambiguous. For electrical storage it may be a single cell, or a cluster of cells. What is important here is to not endanger the aircraf (Particular Risks and functional risks)	Despite this paragraph is not greyed, the requirement is solution oriented Suggest to attach the notion of safe flight/safe landing: sufficient independence to ensure that safe flight safe landing is not endangered by failure propagations.	X	X	Partially accepted	Will be detailed in the AMC

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815	Airbus Group	2430(a)(2)		Is there a particular reason that the wording was changed from "where the exposure to lightning is likely" to "unless it is shown that exposure to lightning is unlikely"? What is the consequence of this change?		X		Noted	See Explanatory Note 23
816	Airbus Group	2430(a)(5)		Better definition of “means” and “energy stored”	Use of emergency cut-off switches, use of emergency (rotor) braking systems	X		Partially accepted	Will be considered for the AMC
817	Airbus Group	2430(b)(4)		... a sufficient reserve on a standard flight...	This definition is ambiguous. Shall be defined more clearly. At least an intention how to quantify the reserve shall be given	X		Partially accepted	Will be detailed in the AMC
818	Airbus Group	2430(b)(4)		Why removing the 30 minutes duration at MCP?	We propose to keep the 30 minutes duration at MCP requirement as basis and add a point stating that for system having less than 30 minutes endurance, that endurance shall be assessed with MCP/MCT (and take into account minimum power requirement in battery like not less than 30%).	X		Noted	Will be considered for the AMC
819	ADS	VTOL.2430	19	Additional information on acceptable reserves would be very helpful	Clarify acceptable reserves for each cert category. Define them in terms of onward flight to account for differences in kerosene and battery energy sources	Yes	No	Partially accepted	Will be detailed in the AMC
820	ADS	VTOL.2430	19	The terms ‘sufficient’ and ‘standard flight’ without further guidance are open to wide and varied interpretations in applicant proposals.	EASA to ensure suitable guidance and/or definitions are provided.	Yes	No	Accepted	Will be detailed in the AMC
821	ADS	VTOL.2430	19	Energy seems to have been used as a proxy for both fuel and battery systems. Jettisoning energy, for example, is very different for fuel or a battery.	Provision separate paragraphs for fuel and battery storage as the behaviour in failure cases and subsequent action may be very different	Yes	Yes	Partially accepted	Existing CS-23 wording has been used and clarification will be considered for the AMC
822	ONERA	VTOL.2430(b)(4)	19	Agreed that 1/2hour is no more the reference as it was in CS-23. But, “reserve based on a standard flight” is too evasive. At least for Enhanced cat consider reserve based on emergency operating site separations in standard flight operations.		Yes	No	Noted	Will be detailed in the AMC
823	UK CAA	VTOL.2430(a)(1)		“...including fire,.....”. Is this covered by VTOL.2325?	Consider and contrast with VTOL.2325.	Yes		Noted	VTOL.2325 focuses on fire initiation and propagation while VTOL.2430 emphasizes the risk on the independence between multiple energy storage and supply systems. Details will be provided in the AMC.
824	Sikorsky	VTOL.2430.a.1	18	Language is overly proscriptive and prevents innovative solutions to the need to protect against cascading lift/thrust unit failures as a result of fire.	Rephrase to indicate the need to continue safe flight (and quantify duration) in the event of a fire in one of the lift/thrust units.	No	Yes	Partially accepted	Existing CS-23 wording has been used and clarification will be considered for the AMC
825	Sikorsky	VTOL.2430.a.2	18	See comment related to VTOL.2235. No reliable way to prove that lightning exposure is unlikely unless flight is limited by some means in certain weather conditions.	See comment related to VTOL.2235.	No	Yes	Noted	See Explanatory Note 23

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826	FAA/AIR	2430(a)(6)	20	Would a drop test of a fuel tank be required to “minimize hazards”? We would like to see the acceptable means of compliance for this requirements. All rotorcraft type vehicles in the US will require fuel system crash resistance testing in the near future. Isn’t this protection provided by the requirement to minimize the hazard to the occupants.	The FAA and EASA should harmonize on an acceptable means of compliance.	Y	N	Noted	A drop test for the fuel tank (battery, fuel cell...) can be anticipated/ requested and would be developed in the AMC. EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
827	FAA/AIR	2430	20	States the following: (2) be designed to prevent catastrophic events due to lightning strikes taking into account direct and indirect effects for aircraft unless it is shown that exposure to lightning is unlikely. Part 27.954 requires fuel system lightning protection.	FAA continues to have conversations on lightning and how it should be applied in the safety continuum (possibly not test for the lower class aircraft but use design best practices). FAA will work with EASA to harmonize this lightning safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	N	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
828	FAA/AIR	2430(a)(1)		This rule requires the applicant consider fire as a failure when assessing any component of the energy storage or supply system. It is unclear what the intent of this requirement is. Fire is historically a specific risk item where fire is assumed. Is EASA allowing the applicant to determine the probability of fire or are they assuming fire. If it is assumed, then each component of the energy storage and distribution system must be isolate in the event of a fire. This is a significant increase in the fire threats from previous design requirements. The FAA as of yet has not been concerned with any of these components except the battery, which likely only need meet the DO-311A containment criteria vs. a fire containment criteria. The fire protection requirments should be in VTOL.2440, not VTOL 2430. Recent proposed designs bring isolated energy sources together at a single electric motor which have redundant 3 phase inputs to provide redundant capability for a distributed thrust system. This requirement would be impossible to achieve in these types of designs.	Need further explanation of the intent of the requirement. Remove “including fire” from this rule and add actual intent to VTOL.2440 fire protection requirement.	Suggestion	objection	Noted	VTOL.2430 emphasizes the risk regarding the independence between multiple energy storage and supply systems while VTOL.2440 focuses on the hazards to the aircraft in the event of a lift/thrust system fire or overheat. Details will be provided in the AMC.
829	FAA/AIR	2430(a)(6)		Introduces a requirement to protect people on the ground during a survivable emergency landing. This is a new concept never before considered. Further explanation is needed. Is the intent to protect the public from an aircraft emergency landing or the rescue crew after an emergency landing? If it’s the latter, then VTOL.2400(c)(3) already captures this.	Remove “and people on the ground” No previous standard for airplanes or rotorcraft has ever considered people on the ground, this would be an unrealistic task which is more relevant to operational approval than aircraft certification approval. If the intent is to protect the ground rescue crew, then the requirement is already captured in VTOL.2400(c)(3).	Suggestion	objection	Not accepted	European regulations consider third parties (e.g. Regulation (EU) 2018/1139, Article 4). The new type of technology and operations is deemed to warrant this explicit reference to people on the ground. The AMC will consider proportionality for the “minimise” objective.

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830	TCCA-AVIONICS	VTOL.2430 (a)(6)	18/26	<p><i>“be designed to retain the energy under all likely operating conditions and minimise hazards to the occupants and people on the ground during any survivable emergency landing.”</i></p> <p>How does “survivable emergency landing” relate to a controlled emergency landing for Category Basic or continuing safe flight and landing for Category Enhanced ?</p>	(a) be designed to retain the energy under all likely operating conditions and minimise hazards to the occupants and people on the ground during any survivable emergency landing (<i>as defined in VTOL.2005 (b)(1) and (2)</i>).	No	Yes	Noted	A survivable emergency landing typically involves a higher level of energy (e.g. 15-m fuel tank drop test in CS-27). This will be detailed in the AMC.
831	Transport Canada – NAC Engineering – F&HM	VTOL.2430(a)(4)	18/26	<p><i>“The system must ... (4) provide the information established in SC VTOL.2445(a) to the flight crew...”</i></p> <p>Reference to VTOL.2445(a) appears incorrect, as a large portion of 2445(a) refers to design information that would be included in supporting documents, manuals, but not provided to the crew <u>by the thrust/list system</u>.</p> <p>Would VTOL.2445(e) and (g) be the correct reference instead?</p>	EASA to confirm intent of VTOL2430(a)(4) is indeed for system to provide information (e.g. cockpit indications) to the crew while operating the aircraft, and update paragraph reference as needed.		Yes	Accepted	The wording will be modified to refer to “relevant information established in SC VTOL.2445”
832	GAMA	VTOL.2430	18	Issues related to fire are already addressed in VTOL2325(a)(4).	Including fire many times does not enhance safety but confuses compliance and discredits these requirements.	Yes	Yes	Noted	VTOL.2325 focuses on fire initiation and propagation while VTOL.2430 emphasizes the risk regarding the independence between multiple energy storage and supply systems. Details will be provided in the AMC.
833	CAA NZ	VTOL.2430(6)		Use of the term “landing system” is not understood – this appears to be a carry-over from CS-23.		Yes	No	Noted	Indeed CS-23 construction and wording has been retained. Clarification will be provided in the AMC.
834	Aidan Reilly	VTOL.2430		The scope of this regulation is set by the definition of each system. Given the nature of electrical propulsion architectures, this leaves open potential loopholes. At a minimum it should be required that a consistent definition of systems be used throughout the certification process, so that systems claimed as independent during the construction of multiple redundancy arguments cannot be held to be subsystems of a larger system defined to facilitate compliance with this regulation.				Noted	Will be considered for the AMC
835	Aidan Reilly	VTOL.2430		The use of “likely” and “unlikely” is still not defined clearly. It would be better to use the quantitative safety objectives set out in AMC VTOL.2510.				Noted	CS-23 construction and wording has been retained. Clarification will be considered for the AMC.
836	Aidan Reilly	VTOL.2430		In the context of VTOL flight, especially for aircraft which make substantial configuration changes, the flow of stored liquids during flight poses significant safety challenges which should be carefully considered in regulations. In addition to static loads, dynamic free surface effects (‘slosh modes’) may have a significant impact on stability and control.				Noted	Will be considered for the AMC

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837	Aidan Reilly	VTOL.2430(a)(4)		VTOL.2430(a)(4) is unclear.				Noted	The wording will be modified to refer to “relevant information established in SC VTOL.2445”
838	Aidan Reilly	VTOL.2430(a)(5)		Additional clarity should be provided as to the intent of VTOL.2430(a)(5). Isolation is very different from removal, and it is unclear whether it is required to demonstrate this capability in-flight, on the ground, or both.				Noted	Will be considered for the AMC
839	Aidan Reilly	VTOL.2430(a)(6)		VTOL.2430(a)(6) should not limit the requirement to protect people on the ground. People on the ground should be protected from more serious accidents, even those that are not survivable by the occupants of the aircraft.				Noted	A survivable emergency landing already typically involves a higher level of energy (e.g. 15-m fuel tank drop test in CS-27). This will be detailed in the AMC.
840	Aidan Reilly	VTOL.2430(b)(1)		VTOL.2430(b)(1) should surely be based upon ultimate loads rather than “likely” loads, because there seems to be no purpose in designing the primary structure of the aircraft to survive an ultimate load event if the energy storage system then suffers catastrophic failure.				Noted	CS-23 construction and wording has been retained. Clarification will be provided in the AMC.

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841	Aidan Reilly	VTOL.2430(b)(4)		<p>VTOL.2430(b)(4) is unclear, as “a standard flight” is not defined. An example could be:</p> <p>1. The greater of a minimum power descent from the maximum certified cruising altitude to circuit height, or a maximum rate climb to circuit height and configuration change to the most efficient cruise configuration, as required;</p> <p>• Circuit height is the greater of 1000 feet AGL or the minimum altitude required to permit a 30 second final approach satisfying stabilized approach criteria at the approach speed and angle specified by the applicant for normal operations;</p> <p>2. Configuration change to the certified configuration capable of the shortest landing distance on the down-wind leg of the circuit;</p> <p>3. A standard rate turn from down-wind to final approach heading (military circuit), i.e. one (1) minute of flight endurance at approach power plus increment for the drag due to lift increment associated with the prescribed turn rate;</p> <p>4. A 30 second approach (to satisfy stable approach criteria; if the final approach from 1000 feet AGL takes longer than 30 seconds, then it is assumed that the base turn will be descending);</p> <p>5. A 15 second hover in ground effect for terminal positioning / obstacle avoidance;</p> <p>6. Five (5) minutes of flight at the power setting for best specific air range in the cruise configuration to permit field selection;</p> <p>The above feels like the minimum requirement commensurate with about 10⁻⁵ per event safety given reasonably forgiving terrain for day-VMC operations or night-IMC with synthetic vision, i.e. compatible with 10⁻⁹ safety if the reserve is only called upon at a rate of 10⁻⁴ per flying hour (but see later comments on the subject of flying hours).</p>			Noted	Will be considered for the AMC	
842	Aidan Reilly	VTOL.2430(b)(5)		<p>I am extremely unhappy with the concept of jettisoning energy, as this implies an in-flight activity. Given that Category Enhanced VTOL aircraft are intended for operations over congested areas, jettisoning of fuel to dump down to MLW should not be permitted, and jettisoning of solids should be positively criminal; MLW should be equal to MTOW in order to permit immediate landing if required.</p>				Noted	Will be considered for the AMC

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843	Aidan Reilly	VTOL.2430(d)		It should be clarified as to whether this refers to a loss-of-energy event as the hazardous event per se, because of some discharge of energy, or if it refers to hazards caused because the aircraft may no longer have sufficient energy to complete its operations in safety.				Noted	Will be considered for the AMC

EASA SC-VTOL-01 Comment Response Document

VTOL.2435 Thrust/lift installation support systems

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
844	Airbus Group	2435(g)		"able to react accordingly" is not clear in this requirement.	Consider rephrasing this requirement.	X		Noted	Requirement will be removed
845	FAA/AIR	2435	21	States the following:” (a) Thrust/lift installation support systems are all systems whose direct purpose is to support any thrust/lift unit or the energy storage device in its intended function as part of the thrust/lift system installation. “ What are Thrust/lift installation support systems? Are exhaust and air induction systems Thrust/lift installation support systems? What would be the Thrust/lift installation support systems for an all electric aircraft? Would it be the cooling for the motors and inverters?	Clarify in the MOC what are Thrust/lift installation support systems?	Y	N	Accepted	Will be clarified in the AMC
846	FAA/AIR	2435	22	A majority of these requirments are already captured by other requirements. (ex. VTOL.2435(a) and (b) are captured by VTOL.2400(a), VTOL.2435(c), (d) and (f) are captured by VTOL.2400(c)(1), VTOL.2435(e) should be captured by subpart B. VTOL.2435(h) is covered by VTOL.2410. VTOL.2435(g) introduces a requirement for the flight crew to “react accordingly”. What is the intent of this requirement.	A majority of VTOL.2435 is redundant and can be removed. VTOL.2435(h) identifies a requirement for the flight crew to be able to “react accordingly”. This requirement need clarification as the intent is unclear. Is the reaction to a failure or normal thrust/lift transitions and steady state conditions such as vertical mode vs horizontal mode. Suggest simply removing the requirement to “react accordingly” and require awareness of the configuration. This was originally intended to cover piston engine induction systems and intended for the crew to know if the intake was configure for normal or alternate air.	Observation	substantive	Accepted	Requirements will be removed from VTOL.2435
847	TCCA-AISA	VTOL.2435(f)	19/26	This para reads: “ <i>Likely foreign object damage that would be hazardous to the thrust/lift unit must be prevented.</i> ” Not sure how this would be prevented unless there are the addition of additional structure such as shields, screens, etc.	EASA to clarify if the intent is to add shielding, screens or similar means to prevent damage to the thrust/lift unit from foreign objects.	No	Yes	Accepted	Will be clarified in the AMC
848	TCCA-AISA	VTOL.2435(h)	19/26	Section 2405(b) states “ <i>Any single failure or likely combination of failures of a thrust/lift unit control system must not prevent a controlled emergency landing of the aircraft.</i> ” The additional word “likely” is included in 2435(h) but the outcome could be same as that which 2405(b) is trying to protect against (i.e. controlled emergency landing). Why is the perceived outcome in this section different, leading only to a need to mitigate the failure?	For consistency in the document – including with 2405(b), 2005(b) and 2510(a) – and to address concerns raised about definitions of what a critical failure is, revise para: Any lsingle failures of thrust/lift installation support systems that result in a critical malfunction of thrust/lift must be prevented		Yes	Partially accepted	Requirements will be removed from VTOL.2435 and will be driven by VTOL.2510

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849	Aidan Reilly	VTOL.2435		<p>The word “support” should be defined. Is this intended to refer to the mechanical support of the system, or to be interpreted more widely, as in “ground support equipment”?</p> <p>If the systems are integral to the aircraft, it seems peculiar they should be separated from their parent systems.</p> <p>If these systems are vital to the operation of their parent system, they are surely subsystems and the regulations governing them should therefore be clauses within the scope of the regulations governing the parent system because separation implies independence. Clarity is important here.</p>				Noted	Onboard systems are intended under this objective. Will be clarified in the AMC.
850	Aidan Reilly	VTOL.2435(b)		<p>It is important to be clear that availability and dispatch reliability are not safety-of-flight issues: aircraft unavailable for flight are unavailable for flying accidents. Whilst applicants are well-advised to make products which achieve high dispatch reliability, this is a business decision. Safety is only a factor after dispatch authorization is issued.</p>				Noted	-
851	Aidan Reilly	VTOL.2435(c)		<p>The definition of “location” is unclear. Is this a geographical stipulation, or is it a reference to location relative to a reference point on the aircraft? In either case this requirement seems redundant given VTOL.2435(d).</p>				Noted	Requirements will be removed from VTOL.2435
852	Aidan Reilly	VTOL.2435(d)		<p>Again, “likely” seems not appropriate here. If the support system is required for the safe operation of the parent system, then the “likely” threshold may preclude the achievement of the safety targets for Category Enhanced aircraft set out in AMC VTOL.2510.</p>				Noted	Requirements will be removed from VTOL.2435 and will be driven by VTOL.2510

EASA SC-VTOL-01 Comment Response Document

VTOL.2440 Thrust/lift unit installation fire protection

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
853	Vertical Aerosapce	VTOL.2440		In an e-vehicle We would not want to isolate the battery (or thrust/lift system) system in the event of a fire, but, to isolate the fire and allow the battery and thrust/lift system to overheat to enable a landing.	It is suggested to change the wording to “There must be means to isolate and mitigate hazards to the aircraft in the event of a thrust/lift system fire or overheat in operation. Unless the isolation has a detrimental impact on safe flight and landing.”	Suggestion	Objection	Partially accepted	The term “hazard” is sufficiently high level to cover such scenario. Clarification will be considered for the AMC.
854	Aidan Reilly	VTOL.2440		The word “isolate” should be clearly defined in this context; it appears to be superfluous.				Partially accepted	CS-23 construction and wording has been retained. Clarification will be considered for the AMC.

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VTOL.2445 Thrust/lift installation information

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
855	Vertical Aerospace	VTOL.2445(e)		Configuration of the vehicle is likely to be closely linked to the flight phase and this information also needs to be considered in establishing the installation information required by this section	It is suggested to change VTOL.2445(e) to read: “information related to the thrust/lift configuration, and the associated flight phase.”	Suggestion		Partially accepted	CS-23 construction and wording has been retained. Clarification will be considered for the AMC.
856	W Field LMWL Yeovil	2445 (g)	19	Thrust/lift installation information Is sub part g intended to include requirements like “containment” for high energy elements of engines / APUs etc?	If this section is not intended to include requirements such as “containment, where are these covered?	YES	NO	Partially accepted	Containment will be considered in the AMC, for example under VTOL 2320 or VTOL.2400
857	Aidan Reilly	VTOL.2445(b)		There should also be a requirement to display these markings.				Partially accepted	Will be considered for the AMC, for example under VTOL.2435
858	Aidan Reilly	VTOL.2445(g)		“Energy management” in flight operations is generally taken to refer to control of the sum of the specific kinetic and specific potential energies of an aircraft (i.e. its energy height). The alternative definition implicit in this regulation is liable to cause confusion.				Partially accepted	CS-23 construction and wording has been retained. Clarification will be considered for the AMC.

SUBPART F –SYSTEMS AND EQUIPMENT

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
859	ACI EUROPE		21	<p>SUBPART F – Systems and Equipment</p> <p>As the VTOL in this SC covers air taxies it is likely that the aircraft will travel through both U-space and controlled airspace for landings/take offs at certified airports. In order to allow the integration into controlled airspace, the VTOL should be equipped with a transponder or similar technology permitting the entry into controlled airspace.</p>	Draft VTOL.25XX Text covering the equipping of VTOL with a transponder to permit entry into the controlled airspace.	yes	no	Noted	Airworthiness considerations for equipment used for flight in the U-space can be detailed in the AMC, however equipage requirements are typically included in operational or airspace regulations

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VTOL.2500 General requirements on systems and equipment function

Explanatory Note 27:

VTOL.2500(c) has been moved to the AMC to reflect more closely existing CS. A similar consideration for Category Basic has been added.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
860	William Branch	VTOL.2500 (d)	21	You have a definition of catastrophic for Category Enhanced and you should have an equivalent for Category Basic.	Add (d) (d) For Category Basic, failure conditions that would prevent emergency landing of the aircraft are considered catastrophic.	Yes	Yes	Accepted	See Explanatory Note 27
861	William Branch	VTOL.2500 (d)	21	You have a definition of catastrophic for Category Enhanced and you should have an equivalent for Category Basic.	Add (d) (d) For Category Basic, failure conditions that would prevent emergency landing of the aircraft are considered catastrophic.	Yes	Yes	Accepted	See Explanatory Note 27
862	Luftfahrt-Bundesamt	VTOL.2500		General requirements on systems and equipment function: “(c) For Category Enhanced, failure conditions that would prevent continued safe flight and landing of the aircraft are considered catastrophic. “	For Category Basic an analogue requirement should be added: “For Category Basic, failure conditions that would prevent a controlled and survivable emergency landing of the aircraft are considered catastrophic. “	Yes	Yes	Accepted	See Explanatory Note 27
863	Christian Sturm aerocompany	VTOL.2500 (c)		Will probably prohibit any Li-Ion accumulators.		Y	N	Noted	The requirements are set as objectives and do not exclude any particular technology a priori
864	THALES	VTOL.2500/c	21	This topic should be addressed within AMC VTOL. 2510 and missing corresponding definition of CAT for Basic, plus other severities definition	Move this topic in AMC VTOL. 2510 and address all severities for Basic and Enhanced categories	Observation	Substantive	Accepted	See Explanatory Note 27
865	Rolls-Royce	VTOL.2500		The limitation of VTOL.2500(c) to Category Enhanced seems unreasonable, and leaves open to question the treatment and meaning of “emergency landing” as used but not defined elsewhere within this Special Condition.	Clarify rationale for this working and discuss with industry.	Yes	Yes	Noted	The wording is similar to past CS 2x.1309 advisory material. See also Explanatory Note 11.
866	Markus Farner	VTOL.2500(c)	21	The catastrophic statement in this requirement would be no longer valid if an Emergency Recovery Capability and Procedures is incorporated, as the VTOL can initiate the ERCP. Occupant protection under ERCP condition is still ensured by VTOL.2270.	Rephrase to “For Category Enhanced, failure conditions that would prevent continued safe flight and landing <i>or initiating the Emergency Recovery Capability and Procedures</i> of the aircraft are considered catastrophic”	Yes	No	Noted	See Explanatory Note 3
867	Lilium Gmbh	VTOL.2500 (c)		In light of the concept of both continued safe flight and landing and controlled emergency landing, it seems inconsistent to suggest that a failure condition of systems and equipment which prevented continued safe flight and landing would in any event be catastrophic.	Delete VTOL.2500 (c)		Yes	Not accepted	The Catastrophic classification links to the extremely improbable and no single failure criteria. The wording is similar to past CS 2x.1309 advisory material.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
868	SAFRAN	VTOL.2500(c)	21/26	According to VTOL.2005 (b) (1) for the Category Enhanced an aircraft is capable of continued safe flight and landing after critical malfunction of thrust/lift. This suggests that only thrust/lift system failure is considered, and not other system failure (for exemple navigation).. This is also suggested by several instances where the aircraft is allowed to be able to perform a controlled emergency landing instead. This principle is however not clearly reflected in VTOL.2500 (c) which does not account explicitly for the possibility of such a controlled emergency landing.	It is suggested to change VTOL.2500 (c) to the following: <i>(c) For Category Enhanced:</i> <i>(1) failure conditions of the Powerplant systems system that would prevent continued safe flight and landing of the aircraft are considered catastrophic; and</i> <i>(2) failure conditions of all other systems and equipment that would prevent a continued safe flight and landing of the aircraft and prevent a controlled emergency landing are considered catastrophic.</i>		YES	Not accepted	See Explanatory Note 12 and Explanatory Note 27
869	Airbus Group	2500.a	21	It will be difficult to manage safety process, applying ARP4754A (implicitly suggested in AMC 2510) if the scope is limited. Many interactions between systems and lift/thrust will exist for such A/C	Safety approach should supersede specific safety VTOL requirements, or ways to comply with 2510.b should be clarified. The word 'supersede' should be clarified	X	X	Accepted	See Explanatory Note 12 and Explanatory Note 25. The term "supersede" will be clarified in the AMC.
870	Airbus Group	2500 (c)		In addition to enhanced category, this § should address basic category	To be added : For category basic, failure conditions that would prevent controlled emergency landing on the aircraft is catastrophic		X	Accepted	See Explanatory Note 27
871	Airbus Group	2500(c)		By this language, for Category Enhanced aircraft a controlled emergency landing resulting in no aircraft damage or injury is considered catastrophic	Allow controlled emergency landings as is allowed for airplanes and rotorcraft. Reconsider current definition and use of Category Enhanced.		X	Noted	See Explanatory Note 11. Category Enhanced has an objective similar to a Category A rotorcraft.
872	ADS	VTOL.2500	21	The limitation of VTOL.2500(c) to Category Enhanced seems unreasonable, and leaves open to question the treatment and meaning of "emergency landing" as used but not defined elsewhere within this Special Condition	Clarify rationale for this working and discuss with industry.	Yes	Yes	Noted	The wording is similar to past CS 2x.1309 advisory material. See also Explanatory Note 11.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
873	ONERA	Subpart F – Systems and Equipment VTOL.2500 and VTOL.2510	21	<p>In the SC, it is stated:</p> <p>“VTOL.2500</p> <p>(b) Equipment and systems required to comply with type certification requirements, airspace requirements or operating rules, or whose improper functioning would lead to a hazard, must be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the aircraft is certified.”</p> <p>“VTOL.2510 (b) The operation of equipment and systems not covered by SC VTOL.2500 must not cause a hazard to the aircraft or its occupants throughout the operating and environmental limits for which the aircraft is certified.”</p> <p>In both cases, risk to people on the ground and infrastructures should be highlighted, just as it is done for UAS from all categories. Indeed, these VTOL VTOL for UAM are aimed to operate in a very different operational context than most today’s CS 23 or CS 27 aircraft: over cities for instance, where ground risk is much more important, and air risk as well in case of large number of such VTOLs flying in the same area at low altitude.</p>	Provide a definition of hazard in this SC VTOL context as not only applicable to the aircraft itself and its occupants. Include air risk to other aircraft and ground risk to people and infrastructures.	Yes	no	Accepted	See Explanatory Note 11. The “continued safe flight and landing” objective takes into account risk to third parties. Some other objectives, for example VTOL.2430, also take this risk into account.
874	ONERA	Subpart F – systems and equipment VTOL.2500	21	“(c) For Category Enhanced, failure conditions that would prevent continued safe flight and landing of the aircraft are considered catastrophic.”	Define catastrophic failure condition for the basic category as well.	yes	no	Accepted	See Explanatory Note 27
875	FAA/AIR	2500	22	<p>There is nothing for “basic”?</p>	<p>For Category “Basic”, failure conditions that would prevent a controlled emergency landing of the aircraft are considered catastrophic.</p> <p>Assuming the suggestion adding “controlled emergency landing” definition accepted.</p>	Y	Y	Accepted	See Explanatory Note 27
876	FAA/AIR	2500	23	Paragraph c attempts to add additional criteria for a hazard severity of catastrophic. Adding “Aircraft designed for continued flight after a critical loss of thrust must determine takeoff performance and account for performance after the loss of thrust” to VTOL.2115 would establish a performance requirement to meet VTOL.2500(b)	Remove paragraph (c)		Y	Partially accepted	The wording is similar to past CS 2x.1309 advisory material. See also Explanatory Note 11. This paragraph has been moved to the AMC.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
877	TCCA-AVIONICS	VTOL.2500 (c)	21/26	A similar requirement is missing for Category Basic	(c)(1) For Category Enhanced, failure conditions that would prevent continued safe flight and landing of the aircraft are considered catastrophic. (2) For Category Basic, failure conditions that would prevent controlled emergency landing of the aircraft are considered catastrophic.	No	Yes	Accepted	See Explanatory Note 27
878	Transport Canada – NAC Engineering – F&HM	VTOL.2500(a)	21/26	<p>As requirements of general applicability, paragraphs 2500, 2505 and 2510 should be applicable to any equipment or system installed on the aircraft – unless specific elements are exempted from compliance to these requirements. The SC currently makes no such explicit exemption.</p> <p><i>“... should not be used to supersede any other specific SC VTOL requirement.”</i></p> <p>While this wording is similar to wording found in earlier EASA guidance (AMC 23.1309 Amt 4), the more succinct wording in CS-23 Amt 5 and in this SC VTOL does not convey the intent as clearly. TCCA is concerned this could be interpreted as allowing not to apply requirements of VTOL.2500, 2505 and 2510 where specific design requirements exist in SC VTOL – even if these are less stringent. This would be contrary to the intent. Especially given the expected high level of complexity and systems integration of VTOL aircraft, it is imperative requirements of VTOL.2500, 2505 and 2510 be clearly and consistently applied across all systems.</p> <p>Although not applicable to VTOL aircraft, TCCA notes SC-RPAS.1309, which deals with similar levels of system complexity and integration, indicate this requirement is applicable “in addition to” specific design requirements.</p>	<p>a) EASA is requested to confirm the intent is for VTOL.2500, 2505 and 2510 to be applicable to any equipment or system installed on the aircraft, effectively in addition to specific design requirements of other parts of SC VTOL.</p> <p>b) If there are specific anticipated exceptions to the above (for example systems / equipment not subject to safety requirements of VTOL.2510), they should be clearly specified. EASA is requested to clarify which these are, if any, and where/how these specific exceptions will be documented for consistent interpretation.</p>	No	Yes	Not accepted	CS-23 construction and wording has been retained. In general this objective will be widely applied (see Explanatory Note 12) but it leaves the possibility to apply higher objectives or specific considerations for particular systems, as is the case for example today with CS 27.865 which has higher objectives than CS 27.1309.
879	GAMA	VTOL.2500(c)	21	Because EASA has proposed a definition of continued safe flight and landing as not landing at an operating site, this requirement becomes illogical. Not even in commercial airline service would not landing at an operating site be considered catastrophic.	This provision is trivial and must be removed. The definition of catastrophic has plenty of heritage in aviation and it is just as applicable for VTOL without this kind of distraction to the development of a rational safety standard.	Yes	Yes	Not accepted	The wording is similar to past CS 2x.1309 advisory material. See also Explanatory Note 11.
880	Aidan Reilly	VTOL.2500		(c) should also apply to Category Basic aircraft.				Accepted	See Explanatory Note 27

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VTOL.2505 General requirements on equipment installation

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
881	UK CAA	VTOL.2505(b)		Why is CS 23.2505(b) not included?	Consider the inclusion of CS 23.2505(b).	Yes		Partially accepted	The wording from CS 23.2505(b) was deemed too specific to conventional engine-driven accessories. Similar objective will be considered for the AMC.

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VTOL.2510 Equipment, systems, and installations

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
882	Dewi Daniels	AMC VTOL.2510	26	VTOL.2510 requires that each catastrophic failure condition be extremely improbable. AMC 25.1309 defines extremely improbable failure conditions to be those having an average probability per flight hour of the order of 1×10^{-9} or less. The table in AMC VTOL.2510 allows catastrophic failure conditions to have a probability as high as 1×10^{-6} . The same comment applies to minor, major and hazardous failure conditions in the table in VTOL.2510.	Correct the table in AMC VTOL.2510 to be consistent with the text in VTOL.2510, i.e. the quantitative probabilities should match those in AMC 25.1309. If EASA intends that failure conditions should be allowed to occur more frequently in small VTOL than in other aircraft, the text in VTOL.2510 should be modified accordingly, rather than changing the definition of extremely improbable.	No	yes	Not accepted	The approach is similar to CS-23 with different numerical and DAL objectives depending on categories/levels for a same failure condition classification
883	THALES	VTOL 2510 (c)	21	What is the purpose of this monitoring (reliability follow-up, a complement to continued airworthiness, or slef test, etc.). Why not for basic?	Please clarify or remove	Suggestion	Substantive	Partially accepted	This objective mirrors for systems VTOL2240(e) applicable to structures. The intent is for the type certificate holder to be informed if some of the certification assumptions turn out to be incorrect, for example on the reliability of systems. See also Explanatory Note 19.
884	Lilium Gmbh	VTOL.2510 (c)		The stated objective has at the heart an obligation on both an Operator/CAMO/Maintenance Organisation and the State of Registry, it cannot be executed solely by the TC Applicant.	Reword VTOL.2240 (e) to read: For Category Enhanced , a system for adequate in-service monitoring of equipment and systems which failure may have hazardous or catastrophic consequences must be established.		Yes	Partially accepted	The terms “provisions for” will be added
885	SAFRAN	VTOL.2510(a)(1)	21/26	In comparison with CS-23, VTOL.2510 (a) (1) has the added constraint of ‘and does not result from a single failure’. This added constraint is deemed applicable to both the Category Basic and the Category Enhanced. Comparing these two categories with categories found in e.g. CS-23, there appears no clear objective relationship with the expressed safety objectives justifying the inclusion of this condition here for all catastrophic failure conditions and for both categories.	It is suggested to apply the condition of ‘no single failure’ only to catastrophic failures for the Category Enhanced, and (given the proposed definition of VTOL.2500 (c)) limited to failure conditions of the Powerplant system.		YES	Not accepted	The “no single failure catastrophic” is already part of CS-23 and CS-27 advisory material. It has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures.
886	SAFRAN	VTOL.2510(c)	21/26	It is required to have an ‘in-service monitoring in-service monitoring of equipment and systems which failure may have hazardous or catastrophic consequences must be established.’, does it means that it is required to have flight recording systems for systems involved in those kind of effect (i.e. HAZ to CAT event gravity).	N/A	YES		Noted	See Explanatory Note 19
887	Diamond Aircraft Industries GmbH	VTOL.2510		Requirement “and does not result from a single failure”	The term “single failure” is design prescriptive; the safety objective “extremely improbable” is sufficient. Suggestion to remove the additional requirement compared to CS 23, Amdt. 5.	no	yes	Not accepted	The “no single failure catastrophic” is already part of CS-23 and CS-27 advisory material. It has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
888	Karem Aircraft, Inc.	VTOL.2510 (a)	21	(1) “each catastrophic failure condition is extremely improbable and does not result from a single failure” is overly-restrictive and does not account for flight-critical components for which failure is designed to be extremely unlikely, such as rotor blades and hubs.	Language changed to (1) “each catastrophic failure condition is extremely improbable and does not result from a single, likely failure”	Yes	Yes	Not accepted	The “no single failure catastrophic” is already part of CS-23 and CS-27 advisory material. It has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures. This paragraph addresses systems. See VTOL.2250 for structural considerations.
889	Airbus Group	2510.a	21	Major is not defined, nor other severities	Define at least Major situation corresponding to one failure away from impossibility to conduct safe flight and landing should also be defined and may help the understanding of VTOL2005.a.1	X	X	Partially accepted	Definitions will be provided in the AMC, as is currently the case for CS-23 and CS-27
890	Airbus Group	2510.a.1	21	what about the notion of error? It should be clarified as it is a permanent debate.		X		Partially accepted	Will be considered for the AMC
891	Airbus Group	2510(a)(1)		The single failure or malfunction criteria is already understood to apply in the definition of a hazard (AC23.1309). If the meaning is single cause, this should be clarified accordingly	Suggest removing "and does not result from a single failure" or clarify the intent of the requirement	X		Noted	The “no single failure catastrophic” has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures. Common causes will be considered for the AMC.
892	Airbus Group	2510(c)		Does this language essentially require a safety-critical datalink? This would not allow for aircraft that are resilient to loss of datalink. It seems the intent of this requirement to guard against hazardous and catastrophic consequences is already captured in paragraph (a).	Omit paragraph (c).		X	Not accepted	This objective mirrors for systems VTOL2240(e) applicable to structures. The intent is for the type certificate holder to be informed if some of the certification assumptions turn out to be incorrect, for example on the reliability of systems. See also Explanatory Note 3 and Explanatory Note 19.
893	UK CAA	VTOL.2510		There is no reference to AMC VTOL.2510.	Add a reference to AMC VTOL.2510.	Yes		Not accepted	The objectives typically do not refer to the advisory material
894	Sikorsky	VTOL.2510.a.1	21	Term “extremely improbable” is not defined or quantified.	Quantify and specifically define term in Special Condition.	No	Yes	Partially accepted	Numerical objectives are provided in the AMC
895	Sikorsky	VTOL.2510.a.2	21	Term “extremely remote” is not defined or quantified.	Quantify and specifically define term in Special Condition.	No	Yes	Partially accepted	Numerical objectives are provided in the AMC
896	FAA/AIR	2510		The additional requirement to prohibit catastrophic failure conditions as a result of a single failure is more closely related to CS-25/Part 25 operations and is a significant increase in certification level that will drive unneeded complexity and cost.	Remove the single failure prohibition from paragraph (a) (1) and address in the MOC.		Y	Not accepted	The “no single failure catastrophic” is already part of CS-23 and CS-27 advisory material. It has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures.
897	FAA/AIR	2510		During rulemaking for CS-23, proposals to require ICA as part of the technical deliverables under CS-23 were rejected: “The obligations of the applicant to provide the ICA prior to delivery is not considered as a technical requirement and should be covered by the certification procedure in Part-21 or its AMC, similar to requirements regarding the certification plan.” Similarly, VTOL.2510 is not the appropriate place to establish a requirement for in-service component monitoring.	What is EASA intent with service monitoring and and how it will be used to ensure reliability of the equipment and systems in VTOL.2500? The FAA needs to understand the intent.		Y	Noted	This objective mirrors for systems VTOL2240(e) applicable to structures. The intent is for the type certificate holder to be informed if some of the certification assumptions turn out to be incorrect, for example on the reliability of systems. See also Explanatory Note 19.

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NR	Author	Paragraph	Page						
898	FAA/AIR	Subpart G 2510		This requirement has set the bar very high for the design assurance levels for these aircraft. While I do understand that these systems will be more complex than any system to date on both Part 23 & Part 27 aircraft, harmonization on this requirement is a necessity for validations.	Recommend harmonization between FAA groups and also among other international CAAs.		Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
899	TCCA-AISA	VTOL.2510 (c)	21/26	This requirement should apply to both categories Enhanced and Basic. The word adequate which is too subjective and open to wide interpretation and does not constitute an appropriate performance metric. Critical failures of critical equipment should be monitored.	(c) In-service monitoring of equipment and systems which failure may have hazardous or catastrophic consequences must be established.	No	Yes	Partially accepted	The objective is mandatory only for Category Enhanced to provide proportionality. The word “adequate” will be removed.
900	Transport Canada – NAC Engineering – F&HM	VTOL.2510(a), 2510(b)	21/26	Both paragraphs 2510(a) and 2510(b) make reference to equipment and systems covered by SC VTOL.2500. Correct reference should presumably be VTOL.2500(b) for clarity.	Revise VTOL.2510 (a) as follows: “... identified in SC VTOL.2500(b)...” Revise VTOL.2510 (b) as follows: “... not covered by SC VTOL.2500(b)...”	No	Yes	Not accepted	CS-23 construction and wording has been retained
901	Aidan Reilly	VTOL.2510		The effect and impact of this part is strongly dependent upon the definition of systems and subsystems in a manner similar to that identified in comments relating to VTOL.2430.				Noted	-
902	Aidan Reilly	VTOL.2510(a)(1)		This seems unreasonable, as it is not practical to provide redundancy for major airframe components (e.g. the main wings), and such requirements are not imposed upon transport category aeroplanes under either CS-25 or 14CFR§25.				Not accepted	The “no single failure catastrophic” is already part of CS-23 and CS-27 advisory material. It has been brought to the level of the objective as this consideration may have a large impact on distributed propulsion architectures. This paragraph addresses systems. See VTOL.2250 for structural considerations.
903	Aidan Reilly	VTOL.2510(c)		“Adequate” is rather vague.				Accepted	The word “adequate” will be removed

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VTOL.2515 Electrical and electronic system lightning protection

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
904	THALES	VTOL.2515	21	Is it normal that Enhanced is not differentiated from Basic ?		Observation	Substantive	Noted	The differentiation will be made
905	Lilium Gmbh	VTOL.2515		How does the Agency propose that an applicant is able to show that exposure to lightning is unlikely?	Clarification required from the Agency	Yes		Noted	See Explanatory Note 23
906	Airbus Group	2515		Is there a particular reason that the wording was changed from " where the exposure to lightning is likely" to "unless it is shown that exposure to lightning is unlikely"?	Clarify need for change in wording.	X		Noted	See Explanatory Note 23
907	Airbus Group	2515(a)		What is the implication of "controlled emergency landing" for Category Enhanced aircraft since that term is not proposed as applicable?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	An objective for Category Enhanced will be added
908	UK CAA	VTOL.2515(a)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	The differentiation will be made
909	FAA/AIR	2515 Electrical System Lightning Protecion	23	2515 in subparagraphs (a) and (b) uses “unless its shown that exposure to lightning is unlikely” for indirect effects of lightning. Part 27.1309 requires lightning protection rotorcraft equipment.	FAA continues to have conversations on lightning and how it should be applied in the safety continuum (possibly not test for the lower class aircraft but use design best practices) . FAA will work with EASA to harmomize this lightning safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	N	Y	Noted	See Explanatory Note 23. EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
910	FAA/AIR	2515(a) 2520		Introduced a new term “controlled emergency landing” which is not defined.	FAA continues to have conversations on controlled emergency landing and how it should be applied in the safety continuum. FAA will work with EASA to harmomize this definition and how it used in safety continuum. The FAAwill provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition		Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
911	Transport Canada – NAC Engineering – F&HM	VTOL.2515(a) VTOL.2520(a)	21-22/26	<p>“... the failure of which would prevent a controlled emergency landing of the aircraft...”</p> <p>The above failure criterion as related to Lightning and HIRF compliance appears to contradict VTOL.2500(c) for enhanced category – for which any failure that would prevent continued safe flight and landing (more stringent than controlled emergency landing) should be considered catastrophic.</p>	<p>Revise VTOL.2515(a) and 2520(a) such that criteria is:</p> <ul style="list-style-type: none">For category enhanced: “...the failure of which would prevent continued safe flight and landing of the aircraft...”For category basic: “...the failure of which would prevent a controlled emergency landing of the aircraft...”	No	Yes	Accepted	An objective for Category Enhanced will be added
912	CAA NZ	VTOL.2515		Why is a “controlled emergency landing of the aircraft” allowed here for all aircraft as opposed to also including “continued safe flight and landing” for a Category Enhanced aircraft?		Yes	No	Noted	An objective for Category Enhanced will be added

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VTOL.2520 High-intensity radiated fields (HIRF) protection

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
913	William Branch	VTOL.2520	22	The level of HIRF is not defined...so not sure as a manufacturer what level I would be required to certify to.	Define HIRF levels by referencing DO-160 or equivalent.	?	?	Noted	The HIRF levels will be included in the AMC
914	THALES	VTOL.2520	22	Is it normal that Enhanced is not differentiated from Basic ?		Observation	Substantive	Noted	The differentiation will be made
915	NEOPTERA	VTOL.2520 (a)		For category Enhanced, does it mean that a system failure due to HIRF exposure can preclude a continued safe flight and landing (with a probability $\leq 10^{-9}/\text{FH}$) but not a controlled emergency landing (deterministically)?		Observation	substantive	Noted	An objective for Category Enhanced will be added
916	SAFRAN	VTOL.2520(a)	22/26	HIRF related malfunction is only considered for "emergency landing" in this requirement and does not consider safe flight & landing. It's not in consistency with other requirements and distinction between enhanced & basic categories. Can you explain this difference?	N/A	YES		Noted	An objective for Category Enhanced will be added
917	Airbus Group	2520	22	The notion of IFR is usually applied for en-route, approaches, landing in areas covered by radio com and beacons. AC29 Appendix B explains that VHF and VOR for example can be used. It is not necessarily expected to have such ground system over "congested areas"	Define IFR for category Enhanced	X	X	Noted	The reference to IFR will be removed. VTOL.2515(b) will be aligned with VTOL.2520(b) and further consideration for the different categories will be included in the AMC. The certification can then integrate different types of ground infrastructure.
918	Airbus Group	2520(a)		What is the implication of "controlled emergency landing" for Category Enhanced aircraft since that term is not proposed as applicable?	Suggest explicitly stating requirement for Category Enhanced.	X		Accepted	An objective for Category Enhanced will be added
919	UK CAA	VTOL.2520(a)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	An objective for Category Enhanced will be added
920	Sikorsky	VTOL.2520	22	Given that Enhanced category aircraft will be flying in dense urban environments where constant HIRF to varying levels is likely, degradation and then recovery of function in and out of HIRF situations could cause significant adverse safety implications on the vehicle.	For Enhanced category aircraft, mandate that normal operation at all times without degradation of functions in HIRF environments is a requirement.	No	Yes	Accepted	The reference to IFR will be removed. VTOL.2515(b) will be aligned with VTOL.2520(b) and further consideration for the different categories will be included in the AMC.
921	CAA NZ	VTOL.2520		Same comment intent as that made against VTOL.2515 except in relation to HIRF.		Yes	No	Noted	An objective for Category Enhanced will be added
922	Aidan Reilly	VTOL.2520		HIRF exposure levels need to be defined by the regulation.				Noted	The HIRF levels will be included in the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
923	Aidan Reilly	VTOL.2520(b)		<p>The limitation of this requirement to IFR operations does not seem sensible given that the Special Condition permits autonomous vehicles which are dependent upon electronic systems for sense-and-avoid capability, especially when operating under VFR conditions in class G airspace in receipt of a basic air traffic control service (or no service at all). <i>Even if the risk to the aircraft certified under this condition is accepted, the risk to other airspace users surely cannot be acceptable.</i></p> <p>It would therefore seem pragmatic to impose additional HIRF protection regulations upon autonomous vehicles, irrespective of certification for VFR or IFR conditions (though another way to manage this would be to require that autonomous vehicles must always satisfy IFR requirements even when operating under VFR for the purposes of ATC).</p>				Noted	The reference to IFR will be removed. VTOL.2515(b) will be aligned with VTOL.2520(b) and further consideration for the different categories will be included in the AMC.

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VTOL.2525 System power generation, storage, and distribution

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
924	THALES	VTOL.2525	22	Is it normal that Enhanced is not differentiated from Basic ?		Observation	Substantive	Noted	The differentiation will be made through VTOL.2510 and AMC
925	THALES	VTOL.2525/b	22	What about combination of failures to power system?	Combination of power system failures preventing controlled emergency landing should be extremely improbable ?	Suggestion	Substantive	Accepted	This paragraph will be removed and the requirement will be driven by VTOL.2510
926	NEOPTERA	VTOL.2525 (b)		For category Enhanced, does it mean that a single failure or malfunction can preclude a continued safe flight and landing (with a probability $\leq 10^{-9}/FH$) but not a controlled emergency landing (deterministically)?		Observation	substantive	Noted	This paragraph will be removed and the requirement will be driven by VTOL.2510
927	SAFRAN	VTOL.2525(b)	22/26	There is an ‘and’ at the end of the requirements that should not be used as the § (c) is now reserved.	N/A	YES		Accepted	“and” will be removed
928	Airbus Group	2525		No crashworthiness requirements for energy storage are given.	Specify safety requirements for energy storage (fuel tank, battery), e.g. similar to §952		X	Partially accepted	Will be considered for the AMC
929	UK CAA	VTOL.2525(b)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	This paragraph will be removed and the requirement will be driven by VTOL.2510
930	UK CAA	VTOL.2525(c)		For the Category Enhanced, why is CS 23.2525(c) not included?	For the Category Enhanced, include CS 23.2525(c).	Yes		Partially accepted	The wording from CS 23.2525(c) was deemed too specific to conventional power architectures. Similar objective will be considered for the AMC.
931	FAA/AIR	2525		Title is “power generation” With the type of vehicle anticipated there may not be any power generation on the aircraft. First sentence uses the same term 2525(b) Introduced a new term “controlled emergency landing” which is not defined.	Change title to “System power, energy storage, and distribution.” Change first sentence to read “The power, energy storage, and distribution....”		Y	Partially accepted	The sentence would read “The power [...] must be designed and installed to [...]”. To fulfil the same intent “as applicable” will be added.
932	FAA/AIR	2525	P.22	Recommendation is to have a better description of the type of “storage”, which is an “energy storage”.	Recommend to use the term of “energy storage” in lieu of “storage”	Suggestgion	Substantive	Accepted	Wording will be modified
933	FAA/AIR	2525 (b)	23	ensure no single failure or malfunction will prevent the system from supplying the essential loads required for a controlled emergency landing; Single v. “or in combination with other failures” OK here?	Why “single” and not “in combination with . . .”?	Y	N	Accepted	This paragraph will be removed and the requirement will be driven by VTOL.2510

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
934	TCCA-AISA	VTOL.2525(b)	22/26	This should apply equally to the Enhanced Category aircraft and include continued safe flight and landing.	Revise para: <i>“ensure no single failure or malfunction will prevent the system from supplying the essential loads required:</i> <i><u>(1) for continued safe flight and landing, for category Enhanced; or</u></i> <i><u>(2) a controlled emergency landing, for category Basic.”</u></i>	No	Yes	Accepted	This paragraph will be removed and the requirement will be driven by VTOL.2510
935	Transport Canada – NAC Engineering – F&HM	VTOL.2525(c)	22/26	Corresponding paragraph 23.2525(c) has the following wording: <i>“(c) have enough capacity, if the primary source fails, to supply essential loads, including non-continuous essential loads for the time needed to complete the function, required for safe flight and landing.”</i> Unclear why similar requirement has not been included in the VTOL standard, as it would appear equally relevant.	EASA to clarify why requirement similar to 23.2525(c) has not been included in SC VTOL. Consider adding.	No	Yes	Noted	The wording from CS 23.2525(c) was deemed too specific to conventional power architectures. Similar objective will be considered for the AMC.
936	CAA NZ	VTOL.2525		Same comment intent as that made against VTOL.2515 except in relation to system power generation / storage and distribution.		Yes	No	Noted	This paragraph will be removed and the requirement will be driven by VTOL.2510
937	Aidan Reilly	VTOL.2525		This seems to refer implicitly to electrical power and energy, but if that is the intention it should be made explicit. The regulation seems confused between power and energy (energy can be stored, power cannot).				Accepted	Wording will be modified
938	Aidan Reilly	VTOL.2525(c)		The requirements of CS-23.2525(c) are better worded and should be retained.				Partially accepted	The wording from CS 23.2525(c) was deemed too specific to conventional power architectures. Similar objective will be considered for the AMC.

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VTOL.2530 External and cockpit lighting

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
939	FAA/AIR	2530 (b)	24	Any position and anti-collision lights, if required by operational rules, must have the intensities, flash rate, colours, fields of coverage, and other characteristics to provide sufficient time for another aircraft to avoid a collision. How will an applicant show compliance to this?	Suggest adopting current rules into the SC.			Noted	CS-23 construction and wording has been retained. Details will be provided in the AMC.
940	Aidan Reilly	VTOL.2530		Consideration should be given to mandating internal and external emergency exit lighting, and the provision of emergency illumination of door handles etc. to facilitate emergency egress.				Partially accepted	Will be considered for the AMC

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VTOL.2540 (reserved)

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
941	FAA/AIR	2540		The ice protection system requirements that were in CS 23.2540 were moved to VTOL.2165 in Subpart B. This requirement can affect systems that are unrelated to performance and flight characteristics, such as windshields (for manned flight), air data, navigation and communication antenna, RAT for electrical power, cooling inlets for systems other than propulsion. It is also the rule that addresses ice protection system coverage for considerations of ice shedding into airframe, and flutter. The icing system requirement of 23.2540 should be retained.	Insert into VTOL 2540: An applicant who requests certification for flight in icing conditions must show the following in the icing conditions for which certification is requested: (a) The ice protection system provides for safe operation.		Y	Partially accepted	Objective VTOL.2165 has been reworded and “safely operated” is deemed to incorporate all related systems. See also Explanatory Note 18. More details can be provided in the AMC.
942	FAA/AIR	2540		Paragraph (b), which required the airplane design to provide protection from slowing to less than the minimum safe speed when the autopilot is operating, was removed. The intended application of this requirement in 23.2540 was certain STCs on airplanes certified prior to Amdt. 23-43 in which the stall warning system was not designed for critical ice accretions. For new airplanes, compliance to the stall warning requirement in 23.2165 would satisfy this requirement. Since all VTOLs are new designs, as long as the requirements in VTOL.2165 were adequate, there is no need for paragraph (b).	None, as long as the suggest resolution to VTOL 2165 is adopted.	Y		Noted	-
943	TCCA (LD Germain)	VTOL.2540		It is assumed that para CS 23.2540 was omitted because of the reference to CS 25 appendix C. TCCA agrees, and based on preliminary flight test data, it was revealed that CS 25 and 29 appendix C may not be the most critical icing condition for all aircraft, expecially small propeller/rotor radii. Nevertheless, if flight into known icing is requested, the SC should allow for an applicant to determine the most critical icing conditions for the aircraft design, or use CF 25/29 appendix C.	Add VTOL.2540 that will allow an applicant to determine the most critical icing condition, and demonstrate aircraft performance.	no	Yes	Partially accepted	See Explanatory Note 18. EASA recognises that icing conditions experienced at low altitude could be sensibly different and due to specific small reference lengths of the current VTOL aircraft, the accretion rate could be quite severe compared to usual applications. The modified VTOL.2165 shall still permit to demonstrate to be capable to fly into a selected icing envelope and to detect when such conditions are exceeded to permit a timely exit. This will be detailed in the AMC.

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VTOL.2545 Pressurised systems elements

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
944	Aidan Reilly	VTOL.2545		Fatigue loading is a common mode of failure for pressure vessels and should be considered.				Noted	Will be considered for the AMC

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VTOL.2555 Installation of recorders

Explanatory Note 28:

VTOL aircraft are expected to introduce novel technologies and conduct new types of operations. It is therefore deemed to be essential for this new category of aircraft to have a requirement for the installation of recorders included in the airworthiness requirements to support occurrences/accident investigation and to maintain an appropriate level of safety by enabling continuing airworthiness action. As most foreseen configurations are anticipated to have advanced flight controls, this data should already be available and therefore the burden on initial aircraft designs is minimised. Additionally EASA has introduced the possibility to transmit and record some data remotely. Proportionality is planned to be introduced in the AMC with recorders not necessarily having to meet ETSO-level specifications. Reference to operating rules has been removed. These operating rules, still to be defined, may require higher levels for specific operations.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
945	Fabrizio Gaspari	VTOL.2555(b)	23	Intent is clear, but the language is too loose	Most reliable power source in the world or what? I would say that it has to be powered long enough for the rescuers to find it (1 week, 1 month? i don't know)		yes	Noted	CS-23 construction and wording has been retained. Details will be provided in the AMC.
946	Embraer S.A.	VTOL.2555		<p>The requirement states:</p> <p><i>“Unless operating rules mandate higher requirements, the aircraft <u>must be equipped with a recorder or recorders that:...</u>”</i></p> <p>The VTOL.2555 requires the installation of a recorder without considering the operating rules. However, the design requirement of the CS-23 does not require the installation of a recorder, unless required by the operating rules.</p>	Embraer suggests to harmonize the proposed SCVTOL requirement with CS-23 Amendment 5. The installation of a recorder should be a mandate of the operating rules, as applied in the current operation regulation.	YES	YES	Not accepted	See Explanatory Note 28
947	VELICA	VTOL.2555		<p>VELICA recommends to replace “Unless the operating rule mandate higher requirements, the aircraft must be equipped with a recorder or recorders that:” by “If recording is required by the operating rules, the system: “.</p> <p>The CS-23 amdt 5 wording is much better than the proposed one. There is no reason to mandate recorders in VTOL via the certification rule when operational rule may do so. A recorder is not a feature which increase the safety level of the aircraft but it is an item of mass and a consumption. We can expect that it is a non-necessary equipment in certain VTOL.</p>				Not accepted	See Explanatory Note 28
948	Volocopter	VTOL.2555		<p>SUGGESTION:</p> <p>The headline generates a reference to ‘e.g. voice recorders and flight data recorders’. However, the data intended for recording are not identified in any way (which makes sense for performance-based objective rules).</p>	Eliminate the content in () from the requirement headline	Yes	No	Accepted	Wording will be adapted

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
949	Volocopter	VTOL.2555		OBJECTION: Within the CS-23 rulemaking activities it was well understood, that this requirement is overly prescriptive in the otherwise objective based set of requirements. It has however been included due to some FAA specific ways of implementation on legacy rules, which did not find equivalence on EASA side.	Recommended rewording this requirement to plainly express the objective safety intent, and to leave prescriptive detailing to the AMC. By reducing to proposed item (a) this might already be achieved.	No	Yes	Not accepted	Alternative way to achieve the objective has been added with respect to the CS-23 requirement, as well as a clarification of the intent. More details will be included in the AMC.
950	Lilium Gmbh	VTOL.2555		The imposition of a CVR and FDR on all aircraft is considered disproportionate.	Delete VTOL.2555		Yes	Not accepted	See Explanatory Note 28
951	R.Ferriol	VTOL 2555	23	In the case of a twin seats eVtol, the traditional voice recorder or datas recorder certified, would increase the cost and the weight of the aircraft. Except mistakes, others conventionals aircrafts which is able to perform commercial flight are not obliged to have these kind of devices on board. So we thinks that won't be the better things to do. Others solutions could do the job more efficiently.	In order to maintin high level of safety using our services, we suggest to allow future companies that provides these type of services to use some devices and IT solutions to record all datas for each flights (evtol aircraft datas and VHF communication / internal communication) using softwares or devices that won't be abord the aircraft. We have to deals about this point and try to find the better way according to this new type of travel.	yes		Partially accepted	The possibility to transmit some data has been introduced by VTOL.2555(f). See also Explanatory Note 28.
952	Vertical Aerospace	VTOL.2555		Currently there is no requirement on an aircraft of this MTOM to have a flight recorder unless required to do so by 965/2012. Considering that the data may be transmitted and recorded remotely it the distributed data collection components and transmission components of the recorder should not have to meet the requirements of VTOL.2555(a) - only the on-board data storage sections need to.		Observation		Noted	The possibility to transmit some data has been introduced by VTOL.2555(f). See also Explanatory Note 28.
953	SAFRAN	VTOL.2555	23/26	Question to Stakeholders : Taking in account the various possible configurations for which this SC is applicable, this requirement does not appear to be clear enough. The title mentioning CVR involves that such equipment shall be installed under any configuration? Does it mean that a CVR shall shall be installed in the Aircraft even in a configuration without pilot?	It is suggested to remove "CVR" mention in requirement title or to add a AMC considering this kind of configuration.	YES		Accepted	Wording will be adapted
954	Royal Aeronautical Society's Airworthiness & Maintenance Specialist Group (RAeS A&MSG) Committee	VTOL.2555(f)	23	If allowing data to be transmitted and recorded remotely is an option, what criteria will such a transmission and remote recording system need to meet?	A set of criteria for such a transmission and remote recording system should be included. In particular, this should include criteria relating to reliability and data security.	Yes	Yes	Partially accepted	Will be considered for the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
955	W Field LMWL Yeovil	2555	23	Installation of recorders It is unclear whether the control station and the air vehicle are both required to have data recorders. If the data is transmitted, then this transmission of data should be secure.	Unless the data is transmitted for storage then it should be stored locally for both the air vehicle and ground control station if unmanned operation is permitted. At first issue of this rule, unmanned operation should not be permitted.	YES	NO	Noted	See Explanatory Note 3
956	Sikorsky	VTOL.2555.f	23	Given communication issues in densely obstructed geographies, including urban areas, opportunity arises for loss of critical data if onboard flight recording device is not mandated.	Remove VTOL.2555.f and require onboard data recording capability.	No	Yes	Partially accepted	(f) will be modified by referring to “some data”. Reliability of transmissions and possibility of loss of critical data will be considered for the AMC.
957	AEROMOBIL	VTOL.2555		AEROMOBIL recommends to replace “Unless the operating rule mandate higher requirements, the aircraft must be equipped with a recorder or recorders that:” by “If recording is required by the operating rules, the system: “. The CS-23 amdt 5 wording is much better than the proposed one. There is no reason to mandate recorders in VTOL via the certification rule when operational rule may do so. A recorder is not a feature which increase the safety level of the aircraft but it is an item of mass and a consumption. We can expect that it is a non-necessary equipment in certain VTOL.				Not accepted	See Explanatory Note 28

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
958	FAA/AIR	2555	25	This is introducing operation requirements into certification.	<p>Delete 2555</p> <p>If not rewrite –</p> <p>The aircraft must be equipped with a recorder or recorders that:</p> <ul style="list-style-type: none"> (a) is installed so as to ensure accurate and intelligible recording and safeguarding of the applicable operating rules’ required data, also in conditions encountered during crash, water immersion or fire; (b) is powered by the most reliable power source and remains powered for as long as possible without jeopardising service to essential or emergency loads and emergency operation of the aircraft; (c) includes features to facilitate the localisation of a memory medium after an accident; and (d) is installed so that it automatically records when the aircraft is capable of moving under its own power. (e) record in an accepted format. <p>Alternatively, in addition to paragraph (a), the required data may be transmitted and recorded remotely in parallel using an approved transmission system.</p>		Y	Not accepted	See Explanatory Note 28
959	FAA/AIR	2555 (c)	24	Locate a better use. Localization means something else	Change to the following: “(c) includes features to locate the memory medium after an accident; and”	Y		Not accepted	CS-23 construction and wording has been retained
960	Aidan Reilly	VTOL.2555		The opportunity should be taken to mandate long duration recorders (e.g. 25 hours), as recently recommended in NPA-2018-3.				Noted	Will be considered for the AMC
961	Aidan Reilly	VTOL.2555(c)		The term “localisation” is unclear; the intent is better conveyed by “position”.				Not accepted	CS-23 construction and wording has been retained
962	Aidan Reilly	VTOL.2555(d)		Recording of aircraft parameters should start when the master switch is turned on because this gives the best chance of capturing accident sequences due to e.g. interrupted checklists.				Not accepted	CS-23 construction and wording has been retained. Power architectures may differ from conventional aircraft, for example during ground charging.
963	Aidan Reilly	VTOL.2555(e)		The recording format should be published and open-source, otherwise recovery is dependent on continued existence of specialist program(s) to access it.				Noted	Will be considered for the AMC

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
964	Aidan Reilly	VTOL.2555(f)		If this is the case, the reliability of the transmission and storage system should be demonstrated to be at least an order of magnitude greater than the reliability of the aircraft, in order to reliably capture accident data.				Noted	Reliability of transmissions will be considered for the AMC

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SUBPART G –FLIGHT CREW INTERFACE AND OTHER INFORMATION

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
965	EAS/ N Rostedt	SUBPART G – FLIGHT CREW INTERFACE AND OTHER INFORMATION	24	A remotely piloted aircraft must have sufficient autonomy for continued safe flight and landing in case of a loss of the flight control link connection to the remote pilot. (for example, Return-to-Home or emergency landing capability)	Add to the SC-VTOL accordingly.	Suggestion	Substantive	Noted	See Explanatory Note 3

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VTOL.2600 Flight crew compartment

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
966	Sam Bousfield	VTOL.2600 (c)	15	<p>Is this intended to require an autoland feature? Since these are typically small vehicles, there is likely to be only one windshield panel. If a bird strike breaks the windshield, and the cockpit is hit with turbulent air, any pilot trying to get to a landing will have to contend with air blowing through the cockpit. A low-time or novice pilot may have a hard time with this, and an autoland feature would be of benefit.</p> <p>There are other designs with open cockpit and small windscreen that I would think be exempt from this, as they are open most of the time to the wind, and there wouldn't be a drastic change if a goose took out the windscreen.</p>	(c) For Category Enhanced, the flight crew interface design must allow for a controlled emergency landing after the loss of vision through any one of the windshield panels in a fully enclosed vehicle.	Yes	No	Partially accepted	CS-23 construction and wording has been retained. Details for different types of windshields will be considered for the AMC.
967	Fabrizio Gaspari	VTOL.2600(c)	24	Not in sync with automated or pilotless aircraft	What about the remote piloted version or the automatic one?		yes	Noted	See Explanatory Note 3
968	Rolls-Royce	VTOL.2600		This could be interpreted to imply that there must be a separate crew compartment divided from the passengers? Is this the intent?	Clarify the intent as this will be a key design driver at vehicle level	Yes	Yes	Noted	CS-23 construction and wording has been retained. This objective does not impose a separate crew compartment.
969	NEOPTERA	VTOL.2600 (c)		<p>Does it mean that the loss of vision through any one of the windshield panels can preclude a continued safe flight and landing but not a controlled emergency landing?</p> <p>If so, is it relevant to the Enhanced category operated in an urban area?</p>		Observation	objection	Accepted	Wording will be modified to “continued safe flight and landing”
970	Markus Farner	VTOL.2600(a) & (c)	24	This requirements are referring only to a VTOL with on board flight crew.	Add objective requirements for a remote crew compartment or, if this conflicts with certification, a GM/AMC which refers to considerations which should be taken into account for a remote crew compartment	Yes	No	Noted	See Explanatory Note 3
971	Vertical Aerospace	VTOL.2600(a) & (c)		Please can EASA confirm if the AMC will allow the use of video systems in meeting the requirement or does it all have to be demonstrated through traditional glazings		Observation		Noted	VTOL.6000 foresees transparency windshield. Use of video systems for aircraft with pilot on board would probably be addressed through an additional special condition.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
972	Vertical Aerospace	VTOL.2600(c)		This is carried over from CS23.2600(c) which is for Level 4 aircraft. these are large aircraft and typically have multiple glazing panels. SC-VTOL applies (at the moment) to <2000kg aircraft which typically have a single glazing or even a canopy. therefore, this requirement is inappropriate to the class of vehicle addressed by the special condition. Example would be the DA42 aircraft which would meet the Enhanced requirement but would not meet this requirement as it has a single panel glazing.	It is suggested that the requirement be removed in line with the intent of CS23.2600.	Suggestion	Objection	Partially accepted	CS-23 construction and wording has been retained. Details for different types of windshields will be considered for the AMC.
973	SAFRAN	VTOL.2600(a)	24/26	The end of CS-23 requirement which mentions "excessive concentration, skill, alertness, or fatigue." has been removed whereas it seems relevant also for VTOL. Can you explain this difference?	N/A	YES		Accepted	Wording will be added
974	SAFRAN	VTOL.2600(a)	24/26	"Operating envelop" have been replaced by "Flight envelop". As I understand, flight envelop is rather related to Aerodynamics & structural characteristics of the aircraft (cf. VTOL.2110), whereas operating envelop can be understood as including environments for example (wind, rain...). Could you explain this change?	N/A	YES		Noted	Flight envelopes include environmental considerations. See also Explanatory Note 14.
975	SAFRAN	VTOL.2600(c)	24/26	Remark to Stakeholders : This requirement is not in consistency with JARUS Conops for certified operations of RPAS, as the applicant is not always the one responsible for the whole system. As the SC is said applicable to RPAS, consistency shall be ensured.	N/A		YES	Noted	See Explanatory Note 3
976	SAFRAN	VTOL.2600(c)	24/26	This requirement is only considered for "emergency landing", It does not consider safe flight & landing, even when original CS-23 requirement does. It's not in consistency with other requirements and distinction between enhanced & basic categories. Can you explain this difference? More generally, Can you clarify this requirement? has "windshield panel" to be understood in this context as a transparency panel in front of Camera lens?	N/A		YES	Partially accepted	Wording will be modified to "continued safe flight and landing". Use of video systems for aircraft with pilot onboard would probably be addressed through an additional special condition.
977	SAFRAN	VTOL.2600/2615	24/26	VTOL 2600(b) and VTOL.2615(c) are both requiring the same monitored data display capabilities, except that "Surveillance" aspect is removed from 2615(c). Note : this inconsistency is also existing in CS-23.	N/A	YES		Noted	CS-23 construction and wording has been retained. CS-23 and SC VTOL do not include a paragraph 2615(c).
978	EVA	VTOL.2600	24	Talking about the flight crew, does this term considers an onboard computer system for autonomous flight as a flight crew?		NO	NO	Noted	See Explanatory Note 3

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
979	EVA	VTOL 2600	24	Can the flight crew compartment be the same as the passenger compartment for 2 or less passengers?		NO	NO	Noted	CS-23 construction and wording has been retained. This objective does not impose a separate crew compartment.
980	W Field LMWL Yeovil	2600 (c)	24	<p>The purpose for this sub para is unclear. Does loss of vision through any one of the windscreen panels relate to obscuration (eg failure of windscreen wipers, fogging) or Birdstrike.</p> <p>It has been understood for sometime that EASA have been considering bringing in Birdstrike requirements for the windscreens of CS27 rotorcraft (although this is not explicitly stated, this seems to be equivalent to the approach for Basic in SC VTOL, with enhanced being equivalent in approach to CAT A for CS27/29 rotorcraft)</p>	<p>The purpose of this sub para should be clarified. Or is this intended to be included in the AMC/GM material?</p> <p>If this relates to fogging, then rotorcraft / VTOL pilots are able to open a window and perform a landing, and could expect to have things like chin windows available for additional information during landings.</p> <p>IFR or automated landings are alternatives.</p>	NO	YES	Noted	Clarification will be considered for the AMC. See also Explanatory Note 22.
981	Airbus Group	2600 series		Indicate that the flight crew can be in the aircraft or in a remote location		X		Noted	See Explanatory Note 3
982	Airbus Group	2600 (c) Flight crew compartment		<p>The wording of VTOL 2600 (c) does not guarantee an adequate level of safety because requesting Enhanced category to be able to perform a controlled emergency landing after loss of vision through any one of the windshield while essence of the enhanced category is to certify capability of prolonged safe flight and landing after failure.</p> <p>Moreover if windshield is the appropriate wording for a VTOL with the pilot on board, it is not appropriate for VTOL with remote pilot. A more generic term should be found and AMC material developed to address the different cases (with pilot onboard and with remote pilot).</p>	<p>The requirement should be written as such:</p> <p>(c) For Category Enhanced operating in VFR and IFR and Category Normal operating in IFR, the flight crew interface design must allow for prolonged instrument flight and safe landing without without requiring exceptional piloting skills, alertness, or strength after the loss of vision through one of the media providing external vision.</p> <p>(d) Category Normal operating in VFR, the flight crew interface design must allow for controlled emergency landing without without requiring exceptional piloting skills, alertness, or strength after the loss of vision through one of the media providing external vision</p>	X		Partially accepted	“without excessive concentration, skill, alertness, or fatigue” will be added to (a). “continued safe flight and landing” will be added to (c). See also Explanatory Note 6 for considerations on IMC.
983	ADS	VTOL.2600	24	This could be interpreted to imply that there must be a separate crew compartment divided from the passengers? Is this the intent?	Clarify the intent as this will be a key design driver at vehicle level	Yes	Yes	Noted	CS-23 construction and wording has been retained. This objective does not impose a separate crew compartment.
984	UK CAA	VTOL.2600(c)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Accepted	Wording will be modified to “continued safe flight and landing”
985	FAA/AIR	2600		This paragraph contains part 25 concepts (see item 9) that are not defined and may not be appropriate for this type of aircraft. I believe the concept of phases and modes of flight is more appropriate that part 25 concepts for this type of aircraft. Part 23.2600 seems more appropriate wording.	<p>Remove part 25 concepts from the Special Condition.</p> <p>Adopt the concept of modes of flight.</p>	Y	Y	Not accepted	See Explanatory Note 14

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
986	FAA/AIR	2600 (a)	26	The flight crew compartment arrangement, including flight crew view, and its equipment must allow the flight crew to perform their duties within the flight envelopes of the aircraft.	Qualify this statement, otherwise is too general. Make a little less general by adopting 2x.771 language: “without undue concentration or fatigue”.			Partially accepted	“without excessive concentration, skill, alertness, or fatigue” will be added
987	FAA/AIR	2600 (b)	26	The applicant must install flight, navigation, surveillance, and thrust/lift system controls and displays so that a qualified flight crew can monitor and perform defined tasks associated with the intended functions of systems and equipment. The system and equipment design must account for flight crew errors, which could result in additional hazards Does “qualified” imply training, other than endorsement, is needed?	Consider clarification	Y		Noted	CS-23 construction and wording has been retained
988	FAA/AIR	2600(a)	24	The proposed language does not define a minimum for the flight crew to perform their duties. It is possible to operate many aircraft with enough skill, and/or concentration, but these would not be certifiable today.	Recommend modifying the paragraph as follows— “The flight crew compartment arrangement, including flight crew view, and its equipment must allow the flight crew to perform their duties, and any maneuvers, within the flight envelopes of the aircraft, without excessive concentration, skill, alertness, or fatigue.”			Noted	CS-23 construction and wording has been retained. Details on minimum flight crew will be considered for the AMC.
989	FAA/AIR	2600(c)	24	The FAST effort recommended that the paragraph (c) addressing windshield panels would be more appropriate and flexible if moved to MOC.	Recommend deleting (c).			Partially accepted	CS-23 construction and wording has been retained. Details for different types of windshields will be considered for the AMC.
990	FAA/AIR	2600(c)	26	This appears to be a requirement for bird strike, which has not been required for similar part 23 aircraft.	FAA continues to have conversations on bird strike and how it should be applied in the safety continuum. FAA will work with EASA to harmomize on how it is used in safety continuum. The FAA will provide the industry a comment period for a safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition	Y	Y	Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
991	TCCA-AVIONICS	VTOL.2600 (c)	24/26	The requirement for Category Enhanced should be to allow continuing safe flight and landing. A similar requirement is missing for Category Basic.	(c)(1) For Category Enhanced, the flight crew interface design must allow for continuing safe flight and landing after the loss of vision through any one of the windshield panels. (2) For Category Basic the flight crew interface design must allow for a controlled emergency landing after the loss of vision through any one of the windshield panels.	No	Yes	Partially accepted	Wording will be modified to “continued safe flight and landing” for Category Enhanced. Category Basic does not have an equivalent objective to retain proportionality.

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
992	TCCA (B Harvey)	VTOL.2600		In VTOL.2600(b), Recommend changing “account for” flight crew errors back to the original verbiage of “minimize”, as the goal is to minimize flight crew errors.	Replace account for, for minimize	yes	No	Not accepted	This modification has been introduced to take into account human factors in system and equipment design
993	CAA NZ	VTOL.2600(c)		For a Remotely Piloted aircraft what is the safety risk if loss of vision through any one of the windshield panels occurs? Should this section be preceded by “ <i>With the exception of aircraft that do not have a pilot on board...</i> ”		Yes	No	Noted	See Explanatory Note 3
994	CAA NZ	VTOL.2600(c)		The rationale for changing from “...continued safe flight and landing” from CS-23.2600 for Level 4 aeroplanes to “...a controlled emergency landing” for enhanced aircraft is not well understood.		Yes	No	Accepted	Wording will be modified to “continued safe flight and landing”

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VTOL.2605 Installation and operation information

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
995	FAA/AIR	2605(a)	26	Each item of installed equipment related to the flight crew interface must be labelled, if applicable, as for its identification, function, or operating limitations, or any combination of these factors What is meant by «if applicable»? Need for labels to be readable at night.	Each item of installed equipment related to the flight crew interface must be labelled and readable in all lighting conditions, as for its identification, function, or operating limitations, or any combination of these factors			Noted	CS-23 construction and wording has been retained. Details will be considered for the AMC, e.g. some aircraft may seek only day VFR certification.
996	Aidan Reilly	VTOL.2605(c)		This is a common cause of accidents. This provision of information deserves more thought and regulation.				Noted	Will be considered for the AMC

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VTOL.2610 Instrument markings, control markings and placards

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
997	Aidan Reilly	VTOL.2610(c)		Primary flight controls, including those controlling aircraft configuration should be readily identifiable by touch alone.				Noted	Will be considered for the AMC

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VTOL.2615 Flight, navigation, and thrust/lift instruments

Explanatory Note 29:

VTOL.2615(b)(2) will be reserved and detailed in the AMC, with considerations specific for Category Basic and Category Enhanced aligned with VTOL.2510. VFR/IFR will also be considered as mentioned in Explanatory Note 6.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
998	THALES	VTOL.2615/b/2	25	Combination of failures of indicating system preventing controlled emergency landing should be extremely improbable	Add: Combination of failures of indicating system preventing controlled emergency landing shall be extremely improbable	Suggestion	Substantive	Partially accepted	See Explanatory Note 29
999	Airbus Group	2615 Flight, Navigation, and thrust/lift instrumentation		The wording of the VTOL.2615 is not consistent with the safety level required for enhanced VTOL category. For Enhanced category operating in VFR and IFR and for Normal category operating in IFR, flight and navigation information essential for continued safe flight landing should be available to the crew after any probable failure condition For Normal category operating in VFR flight and navigation information essential controlled emergency landing should be available to the crew after any probable failure condition	Requirement should be written to be consistent with enhanced and normal category safety objectives.	X		Partially accepted	See Explanatory Note 29
1000	UK CAA	VTOL. 2615(b)(2)		For the Category Enhanced (operation over congested areas or CAT), consideration should be given to the prevention of continued safe flight and landing.	See point 11 above.	Yes		Partially accepted	See Explanatory Note 29
1001	FAA/AIR	2615(a)	25	In addition to phases of flight, VTOL aircraft can have different modes of flight that should be considered.	Recommend adding “...each phase and mode of flight. This...” to paragraph (a).			Partially accepted	The term “phase” is deemed generic enough to cover modes and more details will be considered for the AMC
1002	FAA/AIR	2615(a)		This requirement should in addition to specifying phases of flight should also include modes of flight to capture all of the VTOL elements.	Adopt the concept of modes of flight.	Y	Y	Partially accepted	The term “phase” is deemed generic enough to cover modes and more details will be considered for the AMC
1003	FAA/AIR	2615(b)(2)	27	in combination with other systems, be designed and installed so information essential for a controlled emergency landing will be available to the flight crew in a timely manner after any single failure or probable combination of failures. No higher requirement for «Enhanced»?	Consider adding Enhanced “. . . essential for continued safe flight and landing. . .”			Partially accepted	See Explanatory Note 29

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1004	FAA/AIR	2615(b)(2)	25	<p>Controlled emergency landing adds confusion when CS-23 and Part 23 both use the term continued flight and safe landing, that gives the authority more latitude in addressing capability after a critical failure that is appropriate for the aircraft.</p> <p>CS-23 uses the following:</p> <p>b) For the purposes of this Certification Specification, the following definition applies:</p> <p>‘Continued safe flight and landing’ means an aeroplane is capable of continued controlled flight and landing, possibly using emergency procedures, without requiring exceptional pilot skill or strength. Upon landing, some aeroplane damage may occur as a result of a failure condition.</p>	<p>FAA continues to have conversations on controlled emergency landing and how it should be applied in the safety continuum. FAA will work with EASA to harmonize this definition and how it used in safety continuum. The FAA will provide the industry a comment period for the safety continuum. Failure to harmonize will cause validation issues. EASA should come to a harmonized approach before issuing the special condition</p>			Noted	EASA supports the FAA comment on harmonisation. EASA tried to engage with the FAA at several level of the organisation 6 months prior the issuance of this SC in order to align the approaches and decided to move forward as the projects addressed by this SC could not be delayed anymore. Further harmonisation will be sought to the largest extent.
1005	Transport Canada – NAC Engineering – F&HM	VTOL.2615.(b)(2)	25/26	<p><i>“... information essential for a controlled emergency landing will be available... after any single failure or probable combination of failure.”</i></p> <p>The above failure criterion as related to indication systems compliance appears to contradict VTOL.2500(c) for enhanced category – for which any failure that would prevent continued safe flight and landing (more stringent than controlled emergency landing) should be considered catastrophic.</p>	<p>Revise VTOL.2615(b)(2) such that criteria is:</p> <ul style="list-style-type: none"> For category enhanced: <i>“... information essential for continued safe flight and landing will be available...”</i> For category basic: <i>“... information essential for a controlled emergency landing will be available...”</i> 	No	Yes	Partially accepted	See Explanatory Note 29
1006	Aidan Reilly	VTOL.2615(a)(2)		Intended operations should explicitly include emergency operations.				Noted	Will be considered for the AMC

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VTOL.2620 Aircraft Flight Manual

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1007	FAA/AIR	2620(e)	25	It is helpful to the applicant to include the specific areas were we are looking for other information.	Recommend revising as follows – Other information that is necessary for safe operation because of design, operating, or handling characteristics.			Not accepted	CS-23 construction and wording has been retained
1008	TCCA (B Harvey)	VTOL.2620		VTOL.2620 does not include 14 CFR 23.2620 that states which portions of the flight manual are approved by the regulator. Recommend re-adding this paragraph. In terms of international harmonization, every flight manual is approved by the CAA.	Add the regulator approval paragraph	no	Yes	Partially accepted	Will be considered for the AMC

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VTOL.2625 Instructions for Continued Airworthiness

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1009	W Field LMWL Yeovil	2625 (d)	25	Sub para (d) specifically includes structural failures, but the para does not seem to include specific reference to items coming from the safety analysis.	Are system failures and things such as inspections / inspection intervals coming from the safety analysis process assumed to be covered by sub para (a)?	YES	NO	Noted	Will be considered for the AMC

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AMC.VTOL.2510 Equipment, systems, and installations

Explanatory Note 30:

The types of operations that the Category Enhanced aircraft will perform correspond to the highest operational risk to third parties and/or to passenger transport for remuneration. For this reason the most stringent system safety objectives are assigned regardless of the number of occupants. These safety objectives have been established based upon two complementary EASA evaluations which converged on a numerical value of the same order of magnitude.

The first evaluation considered the underlying assumptions of the current certification specifications, in particular CS-25, CS-27/29 and CS-23. The EASA evaluation aligned with the considerations included in FAA AC 23.1309-1E, when referring to Classes of Airplanes, or “Assessment Levels” in the ASTM standards, and the associated upper limit for the average probability per flight hour for catastrophic failure conditions (i.e. $<1.10^{-6}$ for Class I): “*These classes were defined based on the way accident and safety statistics are currently collected. Generally, the classes deal with airplanes of historical equivalent levels of system complexity, type of use, system reliability, and historical divisions of airplanes according to these characteristics. However, these classes could change because of new technologies. The placement of a specific airplane in a class should be done in reference to all of the airplane’s missions and performance characteristics.*” EASA concluded that the levels of system complexity that is introduced by the distributed propulsion and corresponding advanced flight controls is deemed sufficiently unusual and novel that the current CS-23 acceptable means of compliance are no longer considered appropriate for determining the aircraft and system safety objectives.

The second evaluation was based on the Concept of Operations that were provided by applicants and further complemented by market projection analyses. Two concepts of operations were considered: high-density deployment of urban on-demand passenger commercial air transport for intermodal connections and high-density deployment of urban and inter-urban, on-demand passenger commercial air transport.

Both evaluations confirmed that the current system safety objectives for CS-25 and CS-27/29 aircraft should be maintained as a minimum for the commercial air transport operations of passengers as well as for urban air mobility using VTOL aircraft to address the risks to persons on board and on the ground. For Category Basic, some level of proportionality is provided: The safety objectives are linked to the maximum number of passenger seats for a given configuration, which is similar to the approach in CS-23. The levels have been aligned with the CS-23 aeroplane certification levels 1 to 3. The corresponding safety objectives, however, have been increased by one level compared to CS-23, due to the higher dependency on systems that are associated with distributed propulsion, VTOL and the possible invalidation of other CS-23 assumptions. This increase realigns the upper level of Category Basic with current CS-27 aircraft and potential UAS Safety Objectives, while some proportionality between the Categories Basic and Enhanced is maintained through a number of other requirements, such as continued safe flight and landing capability. Objectives are also provided in terms of Functional Development Assurance Level (FDAL) so that, for certain system architectures and levels, it is possible that elements with lower Development Assurance Levels can be combined to achieve the top level objective.

The objectives are provided for each failure condition but considerations for the aircraft level may be developed in a second step.

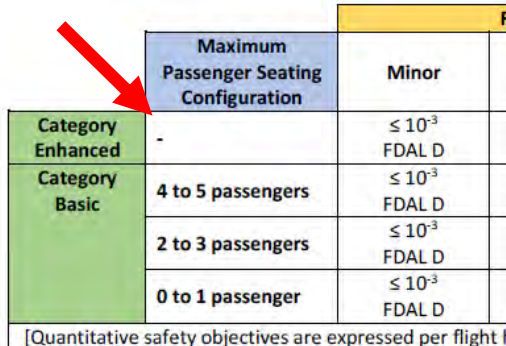
The safety objectives are for now applicable only to aircraft with flight crew on board as some other considerations may need to be added for remote piloting or autonomy.

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1010	M.Piva	AMC VTOL 2510		Lower safety targets than for other aircraft types, e.g. for CS23, CS27 will create an unfair competitive environment. This will also increase the chances for negatively influencing the publics view on flight in general if accidents happen.	Use same safety targets as other aircraft types, e.g. CS 23		yes	Partially accepted	See Explanatory Note 30
1011	Nick Tudor	AMC.VTOL.25 10	26	Seems rather strange to have 1 passenger being only at a maximum of FDAL C when even the unmanned sector is making claims from the likes of JARUS that unmanned in the Specific Category (above 25kg) FDAL C is likely to be needed; and I repeat this is unmanned. Even the unmanned sector have acknowledged that mass is a crucial indictor of required safety. When things get a little more massive, even the unmanned sectora agrees that DAL B will be required. Why then, is not DAL A required for any of the categories to mitigate against Catastrophic failures? There is no justification for the current proposals.				Partially accepted	See Explanatory Note 30
1012	Fabrizio Gaspari	VTOL.2510	26	I don't understand why in the category "0 to 1 passenger" the DAL level is D up to HAZ and C for CAT. In ASTM F3061/F3061M -17, for aicraft in Assessment Level 1 (normally SRP, 2 seater. Like alpha electro), the DAL level required is D for MINOR and C from MAJOR to CAT. So why a 2 seater VTOL can be less reliable than a conventional 2 seater aicraft?	Synchronise with CS-23 and AMC		yes	Partially accepted	See Explanatory Note 30

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1013	Dewi Daniels	General	General	The Special Condition focuses on the mechanical aspects of aircraft design, but says little about the dependency of small-category VTOL aircraft on software. No manned CS-23 aircraft has been certificated with complex fly-by-wire control systems. Small-category VTOL aircraft will depend on complex airborne electronic hardware and software to ensure continued safe flight and landing, even in the presence of equipment failures. This increased dependency on software suggests that the software will need to be developed to a higher level of integrity than for conventional aircraft, not the lower level of integrity suggested by AMC VTOL.2510.	Provide more guidance on the software aspects of small-category VTOL certification. Remove the suggestion in AMC VTOL.2510 that software for small-category UAS can be developed to a lower level of integrity than for other manned aircraft.	no	yes	Partially accepted	See Explanatory Note 30. Specific guidance for software will be considered for the AMC in a second step.
1014	Dewi Daniels	AMC VTOL.2510	26	DO-178C/ED-12C states that software that could cause or contribute to a catastrophic failure condition should be developed to Level A. The table in AMC VTOL.2510 allows a function that could cause or contribute to a catastrophic failure condition to be developed to FDAL C. Even JARUS RPAS.1309 requires a function that could cause or contribute to a catastrophic failure condition to be developed to at least DAL B, even though the premise in RPAS.1309 is that there is no-one on board the RPAS, so the only hazard is to persons or property on the ground or in other aircraft.	Correct the table in AMC VTOL.2510 to align with DO-178C/ED-12C, i.e. catastrophic = FDAL A, hazardous = FDAL B, major = FDAL C, minor = FDAL D.	No	yes	Partially accepted	DAL C is the current accepted standard for CS-23 Assessment Level I (ASTM F3061). See Explanatory Note 30.
1015	Dewi Daniels	AMC VTOL.2510	26	The table in AMC VTOL.2510 applies to aircraft with flight crew onboard. VTOL.2000 states that this Special Condition can also apply to aircraft that are remotely piloted or with various degrees of autonomy. There is no table that applies to aircraft with no flight crew onboard.	Insert a table that applies to aircraft with no flight crew onboard.	yes	no	Noted	The table provided in AMC VTOL.2510 provides objectives for an aircraft with flight crew on board. Objectives for automated or autonomous mode without flight crew on board are not part of the current scope of the SC. See Explanatory Note 3 and Explanatory Note 30.
1016	David Loebel, AutoFlightX	AMC VTOL.2510	26	We are very happy to see this AMC already right now to start discussion on safety objectives and FDALs! However, it is not clear how the classification was derived. In CS-23, aircraft with 2-6 seats are categorized as airworthiness level 2 (C23.2005 & ASTM F3061/F3061M-17, 3.2.1.1). According to ASTM F3230-17 Table 3, this relates to assessment level II, with the related safety objectives 10-3/10-5/10-6/10-7 and DAL C for catastrophic events. In AMC VTOL.2510, category basic with 4-5 seats is more stringent and therefore not consistent. The classification for category enhanced is reasonable, since it is comparable to Category A rotorcraft operations (also for small rotorcraft CS-27). Still, this is only true as long as Category Enhanced is only required for operation in hostile environment and not further linked to commercial air transport (CAT) (see comment 2).	For category basic, I would suggest a split up in just two groups, Level 1 for 0-1 passengers, level 2 for 2-6 passengers, where the safety objectives and DALs are similar to the current 0-1 and 2-3 passenger group.	Yes	Yes	Partially accepted	See Explanatory Note 30

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Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Paragraph	Page						
1017	Philipp Reiß, FSD	AMC VTOL.2510	26	<p>We would suggest to simplify this table in the basic category to stay in line with CS-23. So that this AMC is not more stringent compared to CS-23.</p> <p>In CS-23.2005 together with ASTM F3061/F3061-17 and ASTM F3230-17 there are only two classes for 0-6 passengers:</p> <ul style="list-style-type: none"> - Level 1: 0-1 passengers 10-3/10-4/10-5/10-6 and DAL C for catastrophic events - Level 2: 2-6 passengers 10-3/10-5/10-6/10-7 and DAL C for catastrophic events <p>For the category enhanced this table is reasonable, but would only be applicable if the transport is in hostile congested environment (see comment above).</p>	<p>Simplify the basic rows with:</p> <ul style="list-style-type: none"> - Level 1: 0-1 passengers 10-3/10-4/10-5/10-6 and DAL C for catastrophic events - Level 2: 2-6 passengers 10-3/10-5/10-6/10-7 and DAL C for catastrophic events <p>So that it is the same classification as in CS-23.</p>	Yes	Yes	Partially accepted	See Explanatory Note 30
1018	Christian Sturm aerocompany	AMC to VTOL.2510		<p>This is not in line with VTOL.2005, where all VTOL (basic and enhanced) under this SC are limited to 5 pax and 2000kg. As I understand it.</p>  <p>[Quantitative safety objectives are expressed per flight]</p>	Either say in the respective field “all”, or differentiate further for enhanced category.	Y	N	Noted	The dash denotes that maximum passenger seating configuration is not a consideration for the safety objectives of Category Enhanced
1019	ACI EUROPE		26	<p>AMC VTOL.2510 Equipment, systems, and installations</p> <p>This table provides the relationship between failure conditions classifications and quantitative safety objectives/Function Development Assurance Levels (FDAL) for an aircraft with flight crew onboard.</p> <p>How is this issue dealt with for an aircraft that operates without flight crew onboard?</p>	Consider adding an AMC covering the relationship between failure condition classifications and quantitative safety objectives/Function Development Assurance Levels (FDAL) for an aircraft that operates in automated or autonomous mode without flight crew on board .	Yes	no	Noted	The table provided in AMC VTOL.2510 provides the relationship between failure condition classifications and quantitative safety objectives/Function Development Assurance Levels (FDAL) for an aircraft with flight crew on board. Objectives for automated or autonomous mode without flight crew on board are not part of the current scope of the SC. See Explanatory Note 3 and Explanatory Note 30

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1020	THALES	AMC VTOL. 2510	26	In relation with NR#5. Missing definition of what is a CAT or HAZ or Major or Minor condition for Basic and Enhanced respectively (excepted 2500/c defining one CAT condition for Enhanced only). Provided that, we fully support the qualitative and quantitative objectives set here, considering the important number of flight hours in total that should arise out of these new operations	Add definitions of what is to be considered as a CAT, HAZ, MAJ and MIN condition for both Enhanced and Basic .	Suggestion	Substantive	Partially accepted	See Explanatory Note 27. These definitions are foreseen to be similar to the ones used for other products. If needed further definitions will be added in a second step.
1021	Embraer S.A.	AMC VTOL.2510		Embraer believes that the current regulations and Advisory Circulars applied to the aircraft certified under CS-23 and CS-27 provide the adequate level of safety related to the operational risk of the aircraft. The VTOL failure classification for the category basic is compared to the safety provided by similar aircraft certified under CS-23 (Level 1, 2 and 3) and CS-27. Embraer also believes that the current accepted standards, already applied to CS-23 and CS-27, should be enough for VTOL application because there won't be an excessive number of first generation VTOL operating commercially and over congested areas.		NO	NO	Partially accepted	See Explanatory Note 30
1022	VELICA	VTOL.2510		VELICA recommends deleting all the quantitative safety objective for the Basic category. The quantitative approach is the current practise for the "basic" aeroplane to be certified in CS-23 or CS-LSA. Such an approach is consistent with the safety level of the Basic category.				Not accepted	The quantitative approach is the current practice when demonstrating compliance to 2510/1309 for the systems and equipment to be certified in CS-23 or CS-LSA when their loss or malfunction can result in failure condition more severe than major. The qualitative approach could be accepted for Minor and some Major as described in the ARP4761 figure 4. See Explanatory Note 30.
1023	Rolls-Royce	AMC VTOL.2510		Why do the DAL requirements reduce with changes in number of passengers, surely the safety requirements should be 0 passengers or 1-5 passengers?	Update table to show minimum consistent safety level for any vehicles capable of carrying passengers.	Yes	Yes	Partially accepted	See Explanatory Note 30. Proposed approach is similar to CS-23.
1024	Volocopter	AMC VTOL.2510		OBJECTION: The proposed AMC is generally welcome by introducing proportionality, comparable to what CS-23 is doing successfully already since long time. Nevertheless, when considering an "Enhanced" category aircraft the requirements are raised 2 times. For the intended use of Enhanced products, the critical feature is the non-availability of immediate landing sites. Therefore VTOL.2500(c) already requires to consider this case as "catastrophic" in any case. A failure case that would be "major" on "basic" vehicles gets "catastrophic" for "enhanced" and therefore has a higher requirement. The proposed AMC is now in addition raising all levels of requirements even further – this is duplicating the consideration of one specific factor.	VTOL.2500(c) is already sufficiently considering the difference between "Basic" and Enhanced". It is recommended to maintain the levels defined for "Basic", and to clarify the intent of 2500(c) within this AMC, to ensure non-availability of continued safe flight and landing is catastrophic and must comply with the higher requirement.	No	Yes	Partially accepted	See Explanatory Note 27 and Explanatory Note 30

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1025	NEOPTERA	AMC VTOL.2510		For category Enhanced, the required level of safety is equal to CS25, but the vehicle use case is completely different (pax per vehicle, speed). Is it appropriate?		Observation	substantive	Noted	See Explanatory Note 30. This corresponds to the current levels of CS-27 small rotorcraft, CS-29, CS-25 and CS-23 AL4 (or class IV).
1026	Dr Terry Martin, Project Director, UAV Traffic Management Consortium Singapore	VTOL.2510			The wording of AMC VTOL.2510 should be amended to remove “for an aircraft with flight crew onboard”. This requirement will potentially be applicable to remotely piloted and/or autonomous aircraft, and the applicable FDALs should therefore not be dependant on whether the aircraft has flight crew or not – the consequence of failure will be the same irrespective of whether flight crew are onboard or not (except maybe for a 0 passenger and 0 onboard crew situation – depending on flight over congested area or not).	Suggestion		Noted	The current scope of the AMC.VTOL.2510 is limited to person-carrying VTOLs with flight crew on board. See Explanatory Note 3 and Explanatory Note 30.
1027	Markus Farner	AMC VTOL.2510	26	VTOL.2000(c) indicates an applicability for remotely piloted VTOL’s or VTOL’s with a pilot on board. AMC VTOL.2510 refers only to VTOL’s with flight crew on board	Add a similar table for remotely piloted VTOL’s	No	Yes	Noted	The Special Condition is published to address the need of ongoing certification projects for which the current airworthiness codes were not deemed to be appropriate. At the time of publication of the final Special condition, none of these projects are remotely piloted. See Explanatory Note 3 and Explanatory Note 30.
1028	Lilium Gmbh	VTOL (b)(1)		Category Enhance Definition. The reduction of categories from four to two does not seem to be driven by or based on any unique, novel characteristic of VTOL.	Retain the Four Levels as currently published in CS23		Yes	Not accepted	The updated AMC.VTOL.2510 includes four levels. See Explanatory Note 30.
1029	Lilium Gmbh	VTOL (b)(2)		Category Basic Definition. The reduction of categories from four to two does not seem to be driven by or based on any unique, novel characteristic of VTOL.	Retain the Four Levels as currently published in CS23		Yes	Partially accepted	The updated AMC.VTOL.2510 includes four levels. See Explanatory Note 30.
1030	Kopter Group	AMC VTOL.2510	26	Why is it possible to achieve compliance with a catastrophic failure condition by only providing an FDA level C and a quantitative safety objective of 1E-6/FH?	For catastrophic failure conditions a quantitative safety objective of “extremely improbable” should be applicable for all operating conditions.	yes	yes	Partially accepted	See Explanatory Note 30. Proposed approach is similar to CS-23.
1031	Vertical Aerospace	AMC VTOL.2510		Linked to Comment 4. The category Enhanced should be limited to operations over congested areas and not linked to air transport of passengers in general in order to not put such vehicles at a disadvantage compared to CS23 equivalents.		Suggestion	Objection	Not accepted	See Explanatory Note 10 and Explanatory Note 30
1032	SAFRAN	AMC.VTOL.2510	26/26	The quantitative safety objectives listed in the table for AMC VTOL.2510 suggest that these are at aircraft level whereas they appear to be at system level instead.	It is suggested to change the introduction text to something like: <i>The table below ... (FDAL) at system level for an aircraft ...</i>	YES		Partially accepted	Additional clarification text provided

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1033	EVA	AMC VTOL 2510	26	We should have a failure condition classification for the Category Enhanced which take into account the number of passengers configuration as well. A 2 passenger VTOL should not be subjected to the same rules as a 10 passengers VTOL.		NO	NO	Not accepted	See Explanatory Note 30
1034	Airbus Group	AMC VTOL.2510	26	<p>1E-9/Fh objective was historically used and has demonstrated positive in service feedback. Nevertheless the rationale in AC25 to establish the 1E-9/Fh is no more valid as it was based on an observed accident rate and an assumption concerning the amount of Catastrophic FC on an A/C:</p> <ul style="list-style-type: none"> - Observed accident rate on VTOL cannot be claimed and technologies will be quite different. - The amount of FC (100) is not controlled (or the accident rate) <p>In addition, the today observed accident rate for fixed wing commercial A/C is still considered acceptable despite the huge increase of air traffic. This is the case because safety has been continuously improved while the traffic was increasing. So is 1E-9 still relevant starting from scratch?</p>	<p>A rationale for justification of the quantitative safety objectives should be established.</p> <p>In the absence of a rationale, we fully agree with EASA that the quantitative safety objectives/FDALs for the Category Enhanced have to be kept as proposed and identical to the CS-27/VLR values, as minimum requirements to address air taxis flying at very low altitudes above cities.</p>	X	X	Noted	We note the stated position that the proposed safety objectives are minimum requirements to address air taxis flying at very low altitudes above cities. See Explanatory Note 30.
1035	Airbus Group	AMC VTOL.2510	26	ARP4754A should be mentioned; otherwise there is no definition for FDAL.		X		Accepted	The ED-79A and other standards such as the ED-12C will be considered for the AMC in a second step
1036	Airbus Group	AMC VTOL.2510	26	<p>Over flown population may be affected by accidents of the category enhanced. Up to now, the A/C density above cities was quite low, it may be different with such VTOL, then increasing the risk for the population</p> <p>Is such a level acceptable for the public?</p>	Rationale for safety objectives, including acceptance for over flown population, should be established	X	X	Noted	See Explanatory Note 30. Additional considerations will be introduced through operational and airspace rules.
1037	Benoît Ferran Ascendance FT bfn@ascendance-ft.com	AMC VTOL.2510	26	For the category 'enhanced' this AMC does not take into account in which environment the aircraft operates, which should impact the required level of safety.	<p>The AMC should dissociate the required level of safety depending on the operating environment, which could be based on the Royal Aeronautical Society - The Provision of Acceptable Levels of Safety for Operations with Exposure to Engine Failure in Helicopter Commercial Air Transport [2016]:</p> <p>ALoSP for 'Exposure in Offshore Operations in a Hostile Environment' might be 5 x 10⁻⁸.</p> <p>ALoSP for 'Exposure in Onshore Operations – General' might be 1 x 10⁻⁷.</p> <p>ALoSP for 'Exposure in Onshore Operations – with Extenuating Circumstances' might be 1 x 10⁻⁶.</p> <p><i>ALoSP: acceptable level of safety performance</i></p>	No	Yes	Partially accepted	The Category Enhanced applies for operations over congested areas. This provides a consideration of the environment in which the aircraft operates. See Explanatory Note 30. Additional considerations may be introduced through operational rules.

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1038	ADS	VTOL.2510	21	Why do the DAL requirements reduce with changes in number of passengers, surely the safety requirements should be 0 passengers or 1-5 passengers?	Update table to show minimum consistent safety level for any vehicles capable of carrying passengers.	Yes	Yes	Not accepted	The safety objectives described in the AMC.VTOL.2510 are for person carrying VTOLs. Even in case of a VTOL without passengers (Passenger Seating Configuration of 0), due considerations have to be taken of the pilot. See Explanatory Note 30. Proposed approach is similar to CS-23.
1039	ONERA	AMC VTOL.2510	26	Regarding the proposed AMC VTOL.2510 (page 26), the probability levels for e.g. hazardous and catastrophic failure conditions depend on the number of passengers (by a factor of ten between 0-1, 2-3 and 4-5 passengers). This may require justification, as one could expect these quantitative levels to be independent on the number of passengers, or at most proportionate to this number.	Option 1: Justify in a note to AMC VTOL.2510 the multiplication factors for the basic category in the three seating configurations for the MAJ, HAZ and CAT severity classes. severity classes. severity classes. Option 2: delete the passengers category configurations (in CS-23, the objective is independent of the number of passengers). Option 3: provide safety objectives proportionate to the number of passengers.	no	yes	Noted	See Explanatory Note 30. Proposed approach is similar to CS-23.
1040	Sikorsky	AMC.VTOL.2510	26	Document suggests tiered safety approach based on results of potential failure, but fails to take into account resultant safety of multiple, disparate failures or system level failures. Individual systems designed for 10 ⁻⁹ reliability, for instance can lead to a overall system safety of 10 ⁻⁶ or lower when fully integrated.	Suggested 10 ⁻⁹ safety level is appropriate for these vehicles in the Enhanced category at the full system level, and language should be updated to reflect a full system approach versus a individual system/failure approach.	No	Yes	Partially accepted	The quantitative safety objectives are set at the level of the system failure conditions. There is indeed an assumption made on the overall number of failure conditions. The Agency agrees with the benefit of having an approach at full system level which may be considered in a second step. An applicant may propose this alternative approach as part of the discussions on the Means of compliance. See Explanatory Note 30
1041	Sikorsky	AMC.VTOL.2510	26	Basic Category suggestion of tiered safety based on number of passengers fails to account for safety of general public on the ground. Aircraft with less passenger but with a higher gross weight (designed for cargo, etc.) could cause significantly more damage in a failure condition.	Update tiered recommendations for Basic category based on gross weight of the aircraft and not passengers.	No	Yes	Not accepted	The Special condition covers small-category VTOL aircraft and an upper limit was set to 3175 kg. This is independent of the number of passengers and applies for the Basic and Enhanced Categories. See Explanatory Note 30. Proposed approach is similar to CS-23.
1042	AEROMOBIL	VTOL.2510		AEROMOBIL recommends deleting all the quantitative safety objective for the Basic category. The quantitative approach is the current practise for the “basic” aeroplane to be certified in CS-23 or CS-LSA. Such an approach is consistent with the safety level of the Basic category.				Not accepted	The quantitative approach is the current practice when demonstrating compliance to 2510/1309 for the systems and equipment to be certified in CS-23 or CS-LSA when their loss or malfunction can result in failure condition more severe than major. The qualitative approach could be accepted for Minor and some Major as described in the ARP4761 figure 4. See Explanatory Note 30.
1043	FAA/AIR	2510 AMC	28	The FAA is working on a normal category powered-lift safety continuum that appears to cover the scope of EASA’s SC. Recommend that the FAA and EASA work on a harmonized VTOL safety continuum for aircraft with 5 or less passengers. The FDAL for the enhanced aircraft is considered too stringent for this small class of aircraft.	Develop a harmonized VTOL safety continuum for aircraft that carry 5 or less passengers with equivalent DALs and failure rates for the functional failure classifications. Discuss FDAL A versus B for the catastrophic functional failure classification for the category enhanced. Investigate whether or not it would be possible to have equivalent operational criteria (e.g. carrying passengers for hire)	N	Y	Noted	See Explanatory Note 30. The Category Enhanced introduces an operational criteria based on carrying passengers for hire.

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1044	FAA/AIR	General		Software Qualification - The special condition is way too subtle regarding qualification of software. Considering that eVTOL applicants are (1) typically inexperienced with the certification process and (2) all of the rigor that we require when qualifying software (AC 20-115D, RTCA specs, hazard risk assessment and mitigation, design assurance level, etc.), software requirements need to be added.				Partially accepted	CS-23 construction and wording has been retained. Guidance on Software Qualification is not provided at the level of the certification requirement but in the AMCs. More details on software will be included in the AMC in a second step.
1045	TCCA-AVIONICS	AMC VTOL.2510	26/26	It is questionable whether the lower safety objectives for Part 23 aircraft are appropriate to use for the VTOL category. Of particular concern are those for the Category Basic, 0-1 and 2-3 passengers.	A review or justification of the safety objectives would be appropriate in light of the nature of the VTOL category.	No	Yes	Noted	See Explanatory Note 30
1046	TCCA (LD Germain)	AMC VTOL.2510		In AMC VTOL.2510, there is no maximum passenger seating configuration in the enhanced category although this contradicts VTOL.2005(a), which states that the maximum passenger seating is 5.	TCCA recommends to state “5” in the table of AMC VTOL.2510 to not contradict VTOL.2005(a).	yes	no	Noted	The dash denotes that maximum passenger seating configuration is not a consideration for the safety objectives of Category Enhanced. See Explanatory Note 9 for the new limits.
1047	GAMA	AMC.VTOL.25 10	26	CS-23 was developed with commercial operations in mind. Because many systems in VTOL aircraft will be intended to replace traditionally pilot related functions, it become important to consider the safety enhancement that these implementations will bring. Raising the SSA expectations on systems isn’t a powerful safety tool when compared to enabling systems that can have a positive effect on pilot error, which can add redundancy and which can eliminate other kinds of human error.	EASA should take a fresh look at how to achieve the truly safe VTOL operations and in many cases, the use of lower DAL software and less reliable systems in an intelligent architecture will result in a far superior safety record than will persisting with a paperwork exercise which relegates the use of systems that fail back to pilots at inopportune times.	Yes	Yes	Not accepted	See Explanatory Note 30. The use of FDAL allows to take credit of appropriate architectures. The VTOL operational safety will be a combination of airworthiness and operational requirements. The comment on automation failing back to pilots is noted and will be considered for the AMC.
1048	Boeing	AMC VTOL.2510	26	THE PROPOSED TEXT STATES: Table of FDAL applicability for VTOL categories The table provides the relationship between failure condition classifications and quantitative safety objectives/Function Development Assurance Levels (FDAL) for an aircraft with flight crew onboard.	REQUESTED CHANGE: Boeing would like to understand the quantitative safety objectives/FDALs for remotely piloted or autonomous (no pilot in the loop) aircraft, and requests the rationale for the change from the 14 CFR Part 23/CS-23 levels. JUSTIFICATION: We would like clarifications on this table. What is the rationale for the FDAL A requirement for the Enhanced Category? How does EASA expect to evaluate this in initial low-density operations? Perhaps EASA should revisit the FDAL applicability and consider changing the level requirements. We request clarifications on the table.		yes	Noted	See Explanatory Note 3 and Explanatory Note 30. FDAL A for the Enhanced Category aligns with the current CS-27 small rotorcraft, CS-29, CS-25 and CS-23 AL4 (or class IV).
1049	CAA NZ	AMC VTOL.2510: (Safety Objectives)		FDALs and Quantitative Failure Probabilities: CAA NZ agrees with the progressive application of safety objectives based on the risk exposure of the various aircraft configurations.		Yes	No	Noted	-

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1050	Aidan Reilly	AMC VTOL.2510		<table><tr><td colspan="6">Failure Condition Classifications</td></tr><tr><td></td><td>Maximum Passenger Seating Configuration</td><td>Minor</td><td>Major</td><td>Hazardous</td><td>Catastrophic</td></tr><tr><td rowspan="2">Category Enhanced</td><td>-</td><td rowspan="4">≤ 10⁻³ FDAL D</td><td rowspan="4">≤ 10⁻⁵ FDAL C</td><td>≤ 10⁻⁷ FDAL B</td><td>≤ 10⁻⁹ FDAL A</td></tr><tr><td>4 to 5 passengers</td><td>≤ 10⁻⁷ FDAL C</td><td>≤ 10⁻⁸ FDAL B</td></tr><tr><td rowspan="2">Category Basic</td><td>2 to 3 passengers</td><td>≤ 10⁻⁶ FDAL C</td><td>≤ 10⁻⁷ FDAL C</td></tr><tr><td>0 to 1 passengers</td><td>≤ 10⁻⁴ FDAL D</td><td>≤ 10⁻⁵ FDAL D</td><td>≤ 10⁻⁶ FDAL C</td></tr><tr><td colspan="6">[Quantitative safety objectives are expressed per flight hour]</td></tr></table> <p>The table should be presented in the simplified form rendered above.</p>	Failure Condition Classifications							Maximum Passenger Seating Configuration	Minor	Major	Hazardous	Catastrophic	Category Enhanced	-	≤ 10 ⁻³ FDAL D	≤ 10 ⁻⁵ FDAL C	≤ 10 ⁻⁷ FDAL B	≤ 10 ⁻⁹ FDAL A	4 to 5 passengers	≤ 10 ⁻⁷ FDAL C	≤ 10 ⁻⁸ FDAL B	Category Basic	2 to 3 passengers	≤ 10 ⁻⁶ FDAL C	≤ 10 ⁻⁷ FDAL C	0 to 1 passengers	≤ 10 ⁻⁴ FDAL D	≤ 10 ⁻⁵ FDAL D	≤ 10 ⁻⁶ FDAL C	[Quantitative safety objectives are expressed per flight hour]								Not accepted	The table follows the format of existing advisory material
Failure Condition Classifications																																											
	Maximum Passenger Seating Configuration	Minor	Major	Hazardous	Catastrophic																																						
Category Enhanced	-	≤ 10 ⁻³ FDAL D	≤ 10 ⁻⁵ FDAL C	≤ 10 ⁻⁷ FDAL B	≤ 10 ⁻⁹ FDAL A																																						
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Category Basic	2 to 3 passengers			≤ 10 ⁻⁶ FDAL C	≤ 10 ⁻⁷ FDAL C																																						
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[Quantitative safety objectives are expressed per flight hour]																																											
1051	Aidan Reilly	AMC VTOL.2510		<p>The Quantitative safety objectives should take account of varying flight length and include a component based on the number flight cycles.</p> <p><i>This is especially important for VTOL aircraft certified under this Special Condition, because transition related risks seem likely to be dominant.</i></p>				Partially accepted	Considerations for cycles may be added to the AMC in a second step																																		

* Please complete this column using the word “yes” or “no”
** Please complete this column using the word “yes” or “no”