For practical reasons, it has been decided to sequence in two stages the final release of the Second Publication of MOCs with the Special Condition VTOL. The CRD has been similarly sequenced to accompany the MOC Publication.

The document at hand constitutes the second and final issue of the CRD. It accompanies the second and final stage of the Second Publication of MOCs with the Special Condition VTOL.

This second issue of the CRD includes the responses to the comments received on the Means of Compliance MOC VTOL.2105, MOC VTOL.2115, MOC VTOL.2120 and MOC VTOL.2130, marked as " [Reserved]" in the first issue of the CRD.

MOC VTOL.2105 is intended to be extensively revised and will be subject to a new public consultation.

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1. STATEMENT OF ISSUE

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
1-1	*Rolls-Royce Deutschland*	Statement of Issue	1	Original Statement: *The Means Of Compliance (MOC) contained within this document address the applicant´s requests for clarification of EASA's interpretation of these objectives and of possibilities how to demonstrate compliance with them.* ***Some of these MOCs contain material which should be considered to be guidance material to assist the applicant with an understanding of the objective rather than providing a definitive means of compliance.***	Could you please clarify the sentence in Bold. If some of the MOCs should be considered as guidance material, does that mean that others are "mandatory" MoCs? How is it possible to identify which is what?	Recommended	Noted	None of these Means of Compliance constitutes a mandatory requirement: an applicant can always develop its own means of compliance and present them for acceptance by EASA. The sentence intends to highlight that while some of the material effectively proposes ways how to show compliance, some elements simply provide explanation and clarification about EASA's interpretation of the objectives in the SC-VTOL. The word "definitive" has been replaced by "defined". See also response to comment 1-4.
1-2	*TCCA* *AARDD/A*	*General*		Although there are several guidelines provided for engines, flight controls, loads, etc., there is no clear information about avionics equipment required. Considering all the new concepts that are being incorporated, VTOLs are somewhere between CS 23/25 and CS 27/29. Therefore there is a need to provide guidelines about what standard should be followed.	Include avionics systems recommendations as an additional section in the document.	Recommended	Noted	As explained in the Statement of Issue: *"EASA has decided to prioritise the publication of MOC with the Special Condition VTOL and to issue them in a sequential manner. This approach will allow EASA to focus its resources where the greatest safety impact will be achieved and where the need for clarity is more urgently required. It will furthermore allow the industry to gain an early insight into EASA's interpretation and expectations from the design objectives of the Special Condition which could have an important effect in the design decisions, instead of waiting until exhaustive guidance for the Special Condition is developed."* The comment is noted for future updates of the MOC document.
1-3	*TCCA* *AARDD/S*			A number of FAA AC's were replaced by corresponding EASA AMC's. However some FAA AC's, such as AC 21-26 have NOT been replaced by an equivalent EASA version (e.g. FAA AC 20-107 is replaced by EASA AMC 20-29)	A statement should be made that applicability of FAA documentation (e.g. ACs, Memorandums, DOT/FAA/AR etc.) must be discussed with EASA unless otherwise explicitily stated.	Recommended	Not Accepted	It is indeed a general principle that third partie's regulatory material is not applicable in the EU unless otherwise explicitly determined by the competent EU institutional bodies. It is not deemed necessary to insist on this general principle in this publication.

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1-4	*TCCA* *AARDD/S*		1	On p. 1 it is stated that "Some of these MOCs contain material which should be considered to be guidance material to assist the applicant with an understanding of the objective rather than providing a definitive means of compliance." Is a "definitive" MOC binding? If not, then what is a difference between a non-binding but "definitive" MOC and guidance material?	Introduce in the text an explanation/description and the intended usage of a) definitive MOC, b) an MOC that is not definitive, and c) guidance material. Or, if the intent is for this to be similar with the FAA's often-used "an acceptable means, but not the only means of showing compliance…", then perhaps a word like "compulsory" or "obligatory" rather than "definitive" might help. Or, if the intent is to differentiate between MOCs that provide a "detailed interpretation" of SC VTOL and others that present a "technical approach to demonstrating compliance", then perhaps: "Some of these MOCs are intended to provide a more detailed interpretation of the intent of SC VTOL and do not provide information on the technical approach to demonstrating compliance."	Recommended	Accepted	The word "definitive" has been changed by "definite", with the meaning: clearly stated, precise, exact, specific, explicit and distinct. The intent of the text was indeed to highlight that some of the MOCs may contain "interpretative material" about the objectives set in the Special Condition VTOL and not only specific technical approaches to demonstrating compliance, while both elements should be normally always present. See also response to comment 1-1.
1-5	*Volocopter GmbH*	Statement of Issue – last paragraph	2	The recognition that experience gained during certification will allow an increase in knowledge is very welcome. It is unlikely that the first 'live' version of SC VTOL MOC will meet the needs of the community in every respect just at the point that OEMs will be making rapid progress in certification.	It would be helpful if an alternate means of compliance mechanism is streamlined for rapid deployment in this case, recognising that the peak learning period for means of compliance will be at the latter stages of certification. It would also be helpful to all OEMs to fomalise periods of review and the schedule for MOC changes after initial issue. As a principle, any learning that establishes relief or an easing of the MOC should be implemented as soon as possible. The introduction of new MOC which tighten or create more challenging MOC post initial issue may need careful consideration to ensure individual OEMs do not get penalised at critical points. Any more restrictive or more challenging MOC at this stage should be considered against existing certification designs to establish a risk based approach to 'grace periods' for affected OEMs.	Recommended	Noted	Applicants can always develop and propose means of compliance for acceptance by the Agency. This is a known and well-established practice in the airworthiness certification of type design. Although regular updates of the regulatory material can be expected in future, it is not possible at this point in time to anticipate any schedule. EASA's gathering of experience can only go hand-in-hand with progress made by industry in the development and certification of products and in the proposal of different means of compliance. As explained in the last sentence, EASA will modify the issued MOCs "considering first and foremost the safety of the European citizens but also mindful of the effects on all stakeholders".

2. MOC VTOL.2105 PERFORMANCE DATA

Note : This MOC is intended to be extensively revised compared with the consulted version. It will be subject to a new public consultation.
The comments recived against the version proposed in MOC-2 SC-VTOL Issue 1, are reported in this section of the CRD and are being considered in the revision of this MOC.
The below EASA responses advance some of the changes that are intended to be introduced in the new version of the MOC.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
2-1	*Lilium eAircraft*	MOC VTOL.2105 Title	5	MOC VTOL.2105 is titled Performance Data, but its contents are equivalent to CS-23, CS-25, CS-27 and CS-29 Performance, General.	Rename MOC VTOL.2105 to Performance, General.	Recommended	Not Accepted	The title in the SC VTOL is “performance data” and CS 23.2105 is also titled “Performance data”.
2-2	*Rolls-Royce Deutschland*	MOC VTOL.2105 Performance data General		Is the assumption true that if a EVTOL is taking off and landing as any fixed wing A/C the performance characteristics defined in CS-23 for the different categories of A/Cs become applicable ?		Recommended	Noted	The assumption is that aircraft falling under SC-VTOL have a vertical take-off and landing capability, so the MOC would mainly address it. If, in addition, the aircraft has a fixed wing conventional take-off and landing profile, then the applicant will be able to use as MOC CS-23 requirements and applicable AMCs, adapted where necessary to the safety objectives of SC-VTOL.
2-3	*FAA, AIR-710 Flight Test - DW*	VTOL.2105 (general)	5	Altitude and Temperature details should be considered for performance in addition to parameters listed here		Requested	Accepted	Altitude and temperature effects will be included in the MOC. Other changes will be made to better clarify the MOC.
2-4	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2105(1)(a)(1)	5	Performance including Hover Performance should be conducted in still winds. Hover controllability either IGE or OGE should be conducted in all azimuth winds of 17 knots. Either condition may impose a TO or Landing maximum weight. The wording here has some level of ambuigity and stating the differences relative to performance and HQ and their impact would be beneficial.	Separate still wind performance determination. Add that wind for credit may be considered however, all azimuth controllability for 17 knots may be limiting factor for a MTOW.	Recommended	Noted	The MoC will be extensively revisited, to include first of all the difference between minimum performance, regulatory performance, and non-regulatory performance. Then, the different conditions that affect the minimum and regulatory performance will be described, including wind.
2-5	*Leonardo Helicopters*	2105 1. (a	5	it may not be possible to take-off with no tail wind (in urban environment)	require 17 knots in all azimuths	Recommended	Noted	The MOC will be extensively revisited including the wind conditions.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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2-6	*Rolls-Royce Deutschland*	MOC VTOL.2105 Bullet Point 1.	5	The wind conditions stated herein for from take-off until reaching VTOSS and from below VREF are understood as horizontal wind velocity. However, a VTOL operating from urban elevated vertiport is also subject to significant gusting vertical wind conditions which should be addressed the same way as horizontal conditions or needs to be combined with the latter.		Requested	Noted	EASA acknowledges this comment, however this MOC intends to deal only with the horizontal component of wind velocity. In the urban environment, the possibility of landing and taking-off of from a given vertiport, together with the weather limitations, will need to be evaluated at an operational level according to the aircraft performance.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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2-7	*Lilium eAircraft*	MOC VTOL.2105 (1)(a)	5	The wording of 1 (a)(1) and (2) in a performance data chapter for the identification of the most critical wind considering performance and controllability from take-off until reaching VTOSS and from below VREF to landing can lead to the interpretation that flight tests in natural wind conditions are required. This imposes a practical challenge for the execution of several take-offs and landings with varying natural wind intensities and directions. In the case of 1 (a)(2), the inclusion of gusts complicates the task even further. The above interpretation is considerably more demanding for the applicant than conventional Cat A CS-29 helicopter, to which CS29.45 and equivalent accepted AMC FAA AC 29-2C 29.45 states that performance demonstration must be executed in still air. The “winds for testing” paragraph explains which are the maximum winds that can be accepted to collect correct data for performance evaluation, as higher winds would corrupt it. The effect of wind is of course a concern and specifically covered in CS 29.143, in which winds are tested in “any manoeuvre appropriate to the type (such as crosswind take-offs, sideward flight, and rearward flight)”, and FAA AC 29-2C points to pace car testing in calm air execution for consistent and quality data development. In this approach, as discussed in AC 29-2C 29.143, the effect of wind on power demand is also assessed, to support CS 29.51, 59 and 75. In summary, section 1 (a) should take advantage of existing Cat A CS-29 helicopter specifications and point to MOC VTOL.2135 for controllability and wind demonstration, similarly to CS 29.143.	Taking guidance from CS29.45 and CS29.143, it is proposed to reword 1 (a) as follows: (a)(1) Performance must be demonstrated for still air and guidance from FAA AC 29-2C 29.45A can be adopted. (a)(2) Wind conditions in which the aircraft can be operated without loss of control are identified considering the wind envelope and manoeuvres appropriate to the category in MOC VTOL.2135. (a)(3) Limitations (which are operationally feasible) in terms of wind intensity and azimuth can be proposed (e.g. no tailwinds on take-off) when showing compliance to the requirements of Subpart B.	Requested	Noted	The MoC will be extensively revisited including the wind conditions

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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2-8	*FAA, AIR-710 Flight Test - DW*	VTOL.2105 1(a)(1)	5	Accepted limitations should effectively limit the critical wind condition for a given aircraft design. The following seems to be unnecessary verbiage for MOC Limitations (which are operationally feasible) in terms of wind intensity and azimuth can however be proposed (e.g. no tailwinds on take-off) when showing compliance to the requirements of Subpart B.	Remove. Limitations can always be proposed, but should be treated above the MoC level so they are visible to all disciplines involved in the certification process.	Recommended	Noted	The MOC will be modified to better clarify the wind conditions to be considered in the determination of the minimum and regulatory performance data of both categories enhanced and basic.
2-9	*Leonardo Helicopters*	2105 1. (a)(2)	5	"the effect of the relative wind (and gusts) should be considered on handling qualities, using the MHQRM " A reference should be included to the MHQRM document.	Include a reference to the MHQRM MOC	Recommended	Not Accepted	The text will be modified, no reference to the MHQRM will be made.
2-10	*Leonardo Helicopters*	2105 1. (b)	5	Understanding is that the performance data should include at least data for phases identified in (1) (2) and (3), both in normal and CMP condition. Possibly other phases could be required depending on aircraft caracteristics. Is that understanding correct?	Please better clarify what are the minimum set of performance data	Recommended	Accepted	The MOC will be modified to better clarify which data should be part of the minimum performance data, which of the regulatory performance data and which of the non-regulatory performance data.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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2-11	*Lilium eAircraft*	MOC VTOL.2105 (1)(b)	5	The term “nominal conditions” lacks definition. It is unclear whether this is associated to nominal performance as in MOC VTOL.2000 or to nominal environmental conditions. If it relates to environmental conditions, nominal conditions could lead to an interpretation that performance data shall be declared for a condition like Sea Level ISA+0 and no other correction to other altitudes or temperature required. The association to wind effects is also unclear in “performance data should be determined with the most critical wind condition identified in (a), in nominal conditions”. If nominal conditions are not related to wind, this text implies that performance can only be declared with the most critical wind effects. Even in dispatches with no wind, the declared performance to be considered is the one with the most critical wind. This is penalising, and in conventional Cat A RW aviation, AC 29.45 b (1) defines that performance is demonstrated in still air, provided the controllability in CS 29.143, and AC 29.59A 29.75A state that credit for headwind may be utilized for performance data. The current wording seems closer to CS 29.25 (a)(4) Cat B helicopter definitions, but even there take-off weight may include other demonstrated wind velocities and azimuths.	Clarify what “nominal conditions” means in this context. Replace the start of the paragraph with “The performance data should be determined considering the controllability identified in 1(a)(2)“	Requested	Noted	By “nominal condition” it is meant “normal”, or in other words without failure conditions.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
2-12	*Lilium eAircraft*	MOC VTOL.2105 (1)	5	Wrt: "Note: For reference, the CMP corresponds to a critical engine failure (OEI) scenario of a Category A helicopter." It is not clear what correspondence exists between CMP and CAT A helicopter´s OEI. Is it a similar probability of occurrence? Is it a same level of performance degradation from AEO case? Is it similar safety level (which results in similar requirements for probability of occurrence)?	Please elaborate on the background information and rationale that support the correspondence of CFP from MOC VTOL.2000 and CAT A helicopter OEI.	Requested	Accepted	This note will not be included in the modified MOC.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
2-13	*TCCA* *ARDD/M &* *Flight Tests*	MOC VTOL.2105 VTOL.2115 VTOL.2130 VTOL.2000	p.5/94 p.16/94	MOC VTOL.2000, published in May 2021, defines Certified Minimum Performance (CMP) and Critical Failure for Performance (CFP) as related to "failures and combinations of failures that are not extremely improbable" having a critical impact on performance degradation in a given phase of flight. This is – correctly so – a broad and inclusive definition. The proposed MOC VTOL.2105 (note under Para. 1), while referring to MOC VTOL.2000 for definitions of CMP and CFP, also indicates a correspondence to the critical engine failure (OEI) scenario of a Category A helicopter, which may misleadingly suggest a narrower interpretation. The type and nature of failures to be considered under CMP / CFP for a VTOL vehicle would be much broader than on a conventional helicopter design. Neither in MOC VTOL.2000, and in proposed MOC VTOL.2115 and VTOL.2130 are there explicit reference to failures affecting vehicle reconfiguration (manual or automatic), which could also affect performance and should be considered as potential relevant CFP. While not excluded under the broad definitions of CMP/CFP, the discussion and examples provided under MOC VTOL.2000 do not cover such re-configuration failures, instead focusing on thrust / lift and associated power source failures.	a) Recommend rewording note under proposed MOC VTOL.2105 Para. 1 to delete the explicit correlation between CMP/CFP and critical engine failure (OEI) scenario of a Category A helicopter. If such parallel is deemed useful, it should instead be included under MOC VTOL.2000, with clarification that the scope and nature of failures to be considered under CMP/CFP for VTOL aircraft is broader in nature – with examples provided. b) Recommend adding to MOC VTOL.2000 explicit reference to failures affecting vehicle reconfiguration (manual or automatic), as potential relevant CFP to be considered.	Requested	Noted	See response to comment 2-12

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
2-14	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2105(2)	5	Cooling / Heating losses. Too narrow of a definition. What expressed is correct regarding losses within that definition, it does not detail the effect of other possible performance losses that may be impacted such as electrical power availability from batteries, hybrid power solutions where power available are impacted by other areas.	Revise to be more inclusive of all possible lossess on power available not only from the active powerplant, heating and cooling. All losses that may directly or indirectly affect power available to the thrust/effectors should be included and my include environmental protection systems.	Requested	Accepted	The modified MOC will address Lift Thrust Units (LTU) installation and cooling/heating losses.
2-15	*Lilium eAircraft*	MOC VTOL.2105 (3)(b)	5	The specification of “minimum conditions for the definition of a safe take-off and landing path” requires further clarification, as minimum conditions and safe take-off and landing are undefined terms.	Confirm that by meeting MOC VTOL.2105 and the main characteristics in MOC VTOL.2115, 2120 and 2130, the minimum conditions for safe take-off and landing path are already met.	Requested	Accepted	The suggested understanding is correct. See response to comment 2-16
2-16	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2105 3.(b)	5	The intent of “minimum conditions” is not clear	Rephrase to clarify. Recommend “shall meet or exceed the min required..."	Recommended	Noted	The MOC will be modified to better differentiate the minimum performance data, the regulatory performance data and the non-regulatory performance data.
2-17	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2105 3.(b)	5	The intent of “minimum conditions” is not clear	Rephrase to clarify. Recommend “shall meet or exceed the min required..."	Recommended	Noted	See response to comment 2-16

3. MOC VTOL.2115 TAKE-OFF PERFORMANCE

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
3-1	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2115(1)(b)(c)	5/6	The takeoff and landing profiles do not account for any variation that me be utilized such as a semi thrust borne or wing borne takeoff. Those would be variation traditional aircraft takeoff and landing flight paths on traditional hard surfaces.	Address the possibily of other takeoff or landing flight paths that may be more representative of semi thrust borne or convential wing borne takeoffs.	Recommended	Noted	The take-off and landing paths representative for a semi thrust borne or conventional wing borne aircraft are included in the Conventional Take-Off (ConvTO) profile. This profile considers a take-off from a runway, and is different from the others as it does not allow a “drop down”, and neither requires a vertical segment up to an elevated FATO. This conventional profile is already used for rotorcraft performing CAT A “rolling” takeoffs and, as explained, should be applicable also to the case you are mentioning. The right hand drawing of the ConvTO in Figure 1 has been slightly modified to represent that.
3-2	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2115 1(b)(3)	6	What are examples of acceptable synthetic cues? Can synthetic cues replace visual cues?		Recommended	Noted	Example of synthetic cues include, but are not limited to, cameras, or other trajectory guidance systems that may be developed in the future. As long as these synthetic cues intended function is clear, and the reliability is proven to be meeting the safety objectives, there is no problem in replacing visual cues with them. Synthetic cues have not been used in the past for external field of view, however, the use of cameras to control the correctness of the vertical trajectory has been used for some CAT A procedures. As the VTOL Innovative Air Mobility operations will require the use of vertical trajectories to fly in and out of vertiports in the urban enviorement, the challenge of keeping the take-off or landing site in sight is acknowledged, and the possibility of using synthetic cues is explicitly considered. At the same time, this MOC does not yet intend to provide details on the intended function and types of cues. For the moment, the suitability of these synthetic cues will be addressed case by case.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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3-3	*FAA, AIR-710 Flight Test - DW*	VTOL.2115 1(b)(2)	6	"Virtual Elevated Vertiport" appears to be defined by a vehicle performance based parameter; top of the vertical climb… however, it is confusing since this new "Virtual Elevated Vertiport" is probably better served by referring to the FATO which typically provides the terminus for a given obstacle clearance slope/or approach departure surface.	Collaborate with NASA AAM NC and other industry/CAA partners to define terminal infrastructure requirements for heliports/vertiports that can be applied to aircraft certification instead of creating new terms. A Virtual FATO may be appropriate for a given Landing Zone and could be written into current vertiport standards efforts	Requested	Partially Accepted	EASA is developing together with EUROCAE vertiport standards in Sub Group 5 (ground) of EUROCAE Working Group 112 (VTOL). Collaboration with NASA-AAM-NC is of course always welcome. The term "virtual elevated vertiport" is removed to prevent confusion. The current definition of FATO, referring to the area from which the take-off manoeuvre is commenced, is kept.
3-4	*FAA, AIR-710 Flight Test - DW*	VTOL.2115 (general)	6	Obstacle Clearance needs to be defined from a defined surface for a given takeoff or landing zone- "virtual" or real		Recommended	Noted	The obstacle clearance is indeed defined from the FATO.
3-5	*FAA, AIR-710 Flight Test - DW*	VTOL.2115 1(b)	6	Vertical Take-Off (VTO) is confusing – Call it Vertical "climb" "approach/departure" or even "extended vertical takeoff" something more descriptive to separate it from the other "conventional" CAT A departure/approaches	See 3 above	Requested	Not Accepted	It is a vertical take-off, and not a vertical climb, which can be done also in "forward flight". It is different compared to the conventional CAT A procedure, as in the VTO a protection volume starts from the FATO and is complemented by Obstacle Limitation Surfaces starting from height h_2. This allows the creation of vertiports in cities in places where today it would not be possible using current heliport protection volumes.
3-6	*FAA, AIR-710 Flight Test - DW*	VTOL.2115 1(c)	6	I applaud EASA's work on these MoCs. It seems that if a "common minimum take-off path definition after VTOSS is possible" then we can collaborate with landing zone (infrastructure design) to define FATO for Vertiports, which can, in turn, be used to define minimum standards for the UAM category/class of vehicle	See 3 above	Requested	Accepted	Thank you for the positive feedback. That is indeed the intent.
3-7	*Leonardo Helicopters*	VTOL.2115 Section 1 point b-3	6	Is it possible to have several TDP during Take-Off Manouver?	Include the possibility to have several TDP on the take-Off path, as example the first TDP in OGE and a second one in IGE.	Requested	Not Accepted	According to the definition of TDP, there should be only one "decision" point along the trajectory. The intent of this comment is unclear.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
3-8	*Leonardo Helicopters*	2115 1.(b)(5)	6	"The TDP in the vertical segment can be placed at any point. " Can the TDP be placed in the trajectory after the vertical segment, which could be followed by a back-up segment and that rotation and acceleration?	Please clarify if the TDP has to be in the vertical segment or other points in the trajectory are allowable.	Recommended	Accepted	The TDP can be placed on any point along the trajectory, to include also the trajectory after the vertical segment, and theoretically also on the ground, as long as it is shown that after that a continued take-off can always be performed following a CFP. The text has been changed to better clarify this.
3-9	*Vertical Aerospace*	MOC VTOL.2115 15	7-10	The section related the approach, landing, take-off and departure dimensions to the size of the aircraft (D dimension). Whilst this allows larger aircraft to be 16ircraft16ted the areas these 16ircraft will operate in will be confined and governed by heliport and vertiport dimension requirements to ensure public safety. These should form the basis of SC VTOL requirements	The dimensions of the approach, landing, take-off and departure lanes should be defined by the requirements for regulating vertiports or heliports to ensure the safety of all personnel, passengers, operators and 3rd parties.	Requested	Noted	It has been chosen to leave maximum flexibility to the aircraft and infrastructure designers, to cater for different aircraft performance and infrastructure needs, e.g. obstacle rich or obstacle free environments. Safety is enabled by having certified procedures published for each aircraft that can in turn be used by the infrastructure designer. A given vertiport will have a design D-value limit, dictating the maximum size of aircraft that can operate there, as is the case for heliports today.
3-10	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2115 1(c) Fig 2	7	Power settings for electric motors is not clearly defined.		Recommended	Noted	That is correct. The following has been added: *"The engine power settings considered are not those already used for conventional turbine engines. For VTOL aircraft with electric propulsion, there are at the moment no specific ratings such as the 10 minutes take-off AEO rating, the 30 sec or 2 min rating, the 2,5 min OEI rating, etc.* *The power ratings will be defined at project level, as they will be depending on the overall configuration (rotor-borne or wing-borne), number of engines, and also failure cases (number of acceptable engine losses)."* Refer also to SC-EHPS.

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3-11	*TCCA Flight Test (William O'Gorman – Flight Test Engineer)*	MOC VTOL.2115 – Take-off performance	Page 7/94, Figure 2	The graphic for the take-off and landing profiles describes available power settings in traditional rotorcraft terminology. Are the settings described appropriate to electric engines and battery supply systems or an artifact of turbine engine design? Electric engines may have an entirely different usage and performance characteristics with maximum limitations more tied to battery output and heating of power cables as opposed to the turbine speed and temperature limitations defining traditional 30 sec and 2.5 minute power ratings.	Please clarify if the characteristics of the electric power and propulstion systems were taken into consideration during the development of the MOC.	Recommended	Noted	See response to comment 3-10
3-12	*Airbus Helicopters*	Figure 2	P7	Clarify that take-off and maximum continuous power setting corresponds to CFP scenario	Add a legend to the power ratings signification in the MOC	Requested	Accepted	Sentence added: *Figure 2 depicts the trajectories and the engine power settings while considering the most critical condition: a Critical Failure for Performance (CFP) during the take-off phase at TDP.*
3-13	*Leonardo Helicopters*	2115.2 (a)	8	1000 ft above TO elevation as end of take-off path is unlikely to be used in UAM operations	Suggested 500 ft instead of 1000 ft	Recommended	Noted	That is correct, and already acknowledged. Please note what is already included in the MOC: *"Note A: The altitudes of 61m (200 ft) and 305m (1 000 ft) are proposed in the development of the take-off flight path as currently used for Category A helicopters. Different take-off heights can be considered if compatible with the departure and en-route profile,"*

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3-14	*Lilium eAircraft*	MOC VTOL.2115 (2)(c)	8	Targeting VTOSS during all the 1st climb segment may not be the best option, when factors other than climb rate are considered. For example: in designs with lift-generating wings, accelerating past VTOSS while climbing will allow for faster transition to wing-sustained flight. This may reduce stress in system components because it will result in lower temperatures of components such as the engines and batteries, after the thermal build-up that will naturally occur during the low speed (and high power) segments of the take-off phase.	Rewrite to: "The aircraft should reach VTOSS and should continue at speeds not less than VTOSS, until it is 61 m (200 ft) above the take-off elevation, with a minimum gradient of climb at each point. The minimum gradients, derived from CS-27 and CS-29, are 4.5 % for the first segment and 2.5 % for the second segment."	Requested	Accepted	Text modified as suggested
3-15	*Airbus Helicopters*	Paragraph (2)(c)	P8	clarify the link between 100ft/min of the 1st segment and 150ft/min for the second segment and the percentages listed in the MOC.	Indicate the basis for the 4.5% and 2.5% gradient of climb	Requested	Noted	In CAT A rotorcraft, the V_{TOSS}, which should be maintained in the first segment, ranges between 25 and 50 kts. The "speed selected by the applicant" (which is usually V_Y), that should be maintained in the second segment, ranges from 60 to 90 kts. Assuming no wind, 100 ft/min would result in 4 % at 25 kts and 2 % at 50 kts. 150 ft/min would result in 2,5 % at 60 kts and 1,6 % at 90 kts. The assumptions could be simplified by using the most conservative values, keeping then in mind that V_{TOSS} speed could be as low as 20 Kts (some VTOL may have a V_{ne} around 50 kts) that would result in a gradient of 4,5 % for the first segment and 2,5 % for the second segment.
3-16	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2115(2)(c)	8	The assumption is that this represents nominal aircraft performance with all engines or thrust effectors operating normally. In addition, the sourcing requirements for the flight path gradients are not listed in either the CS or FAR. 14 CFR 29 does not define the climb gradients for each segment outside the all engine climb performance in 27.65 or 29.65.	Provide clarity that the underlying assumption for the climb gradients is for all engines/thrust effectors operating nominally. Provide the derivation of how the flight path gradients are constructed along with how the requiredments since there is no all engine climb information required to be determined unlike VTOL.2120 for engine out.	Recommended	Noted	The assumption for the climb gradients, since they are minimum gradients that need to be guaranteed, is a worst case scenario. This means that a Critical Failure for Performance (CFP) occurred at the first point along the trajectory in which a continued take-off is possible, hence TDP. The minimum climb gradients are derived from CAT A minimum feet per minute climb, "normalized". Please refer to response to comment 3-15 for additional details.

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3-17	*Rolls-Royce plc*	MOC VTOL.2115 Bullet Point 2.(g)	8	This should be kept: “Configuration changes requiring action by the crew are allowed only after the aircraft reaches VToss”	Keep	Choose an item.	Noted	This is already stated in sections 2(g) and 4(b) of this MOC VTOL.2115.
3-18	*Lilium eAircraft*	MOC VTOL.2115 (2)(h)(2)	8	The intent of Sect 2 (h)(2) is understood as a guarantee of path command including turns for performance dispatch. Therefore, the relation to controllability through the MHQRM is therefore not an “or” option, but rather a pure controllability requirement if necessary.	This definition should be moved to MOC VTOL.2135 since it specifically addresses handling qualities.	Requested	Not Accepted	This definition will be maintained also in MOC VTOL.2115 as the use of the MHQRM is not a given. Applicants may use other means of compliance to show that they meet the controllability requirements, which is why the term “if” is used.
3-19	*Lilium eAircraft*	MOC VTOL.2115 (2)(h)(4)	8	The term maximum causes confusion with the intent of the information. The term measured is very specific and can be argued if that is the real intent of the requirement for performance demonstration.	Rewrite to: (4) "The turn radius defined at VFTO and at the turn rate of 3 deg/s should be determined and published".	Requested	Not Accepted	Given the turn rate, the turn radius is a function of airspeed. This is why “maximum” is stated. It is not known if the bank angle can always be considered as a parameter for VTOLs, as they might use “flat turns” to change trajectory with “vectored thrust”. The term “maximum” anyway does not change the spirit of the guidance, hence it is retained.
3-20	*Volocopter GmbH*	MOC.VTOL. 2105., 2.(h) (5)	8	VTOL aircraft may allow for curved approach and take-off climb surfaces that have a smaller radius as is stated in the ICAO Vol 14 / II for helicopters	The applicant can choose to demonstrate that the aircraft can follow curved approach and take-off climb surfaces as per ICAO Annex 14, volume 2, chapter 4 **or better**. The effect on the minimum climb gradients should then be demonstrated and published		Accepted	Text modified as suggested.

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3-21	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 3.(a)	8	Defining the TDP this way is over-constraining: As with conventional multi-engine airplanes, there could be an airspeed range where both reject and engine-out continued takeoff are possible. This speed range was traditionally bracketed between 'V1Min' and 'V1Max' [a.k.a. 'decision speed' and 'refusal speed' in the USAF]. It is not clear if the intention is to provide the pilot with a TDP value at the low, high, or some intermediate value within any existing range.	Clarify the TDP definition. Consider "The TDP is the value provided to the pilot that identifies the final opportunity to safety abort the takeoff." Clarify any intended method for selecting the TDP value. Consider "If aircraft performance allows a range of TDP values, the pilot should be provided the [lowest/highest/average] value."	Recommended	Noted	The take-off decision point (TDP) is a rotorcraft term that has proven to be adequate for vertical as well as for clear area type of profiles, in this MOC called Conventional Take-Off . V1 speeds are used to help the flight crew decide whether to continue or to reject the take-off mainly in fixed wing, where the ground roll is usually much longer compared to rotorcraft. It is a point in the take-off trajectory, that can be defined with a combination of height and speed, up to which a rejected take-off or a continued take-off is possible. After the TDP a rejected take-off is not assured, hence the pilot is "committed" to take-off. In rotorcraft, some TDPs are defined only in height, as they are placed at the top of a pure vertical climb segment from the surface, so with no airspeed at all. By definition there cannot be a "range" of TDPs, as the flight crew cannot decide, if they suffer a CFP, to either reject or continue. Please refer also to answer 3-8.
3-22	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 3.(a)	8	Defining the TDP this way is over-constraining: As with conventional multi-engine airplanes, there could be an airspeed range where both reject and engine-out continued takeoff are possible. This speed range was traditionally bracketed between 'V1Min' and 'V1Max' [a.k.a. 'decision speed' and 'refusal speed' in the USAF]. It is not clear if the intention is to provide the pilot with a TDP value at the low, high, or some intermediate value within any existing range.	Clarify the TDP definition. Consider "The TDP is the value provided to the pilot that identifies the final opportunity to safety abort the takeoff." Clarify any intended method for selecting the TDP value. Consider "If aircraft performance allows a range of TDP values, the pilot should be provided the [lowest/highest/average] value."	Recommended	Noted	See answer 3-21
3-23	*TCCA AARDD/P*	MOC VTOL.2115. 3	8	Section 3. on page 8 in part reads "…Recognition Time…"	A definition of "Recognition Time" would be helpful.	Recommended	Accepted	A Note has been added providing the definition of Pilot's Reaction time, Pilot's Recognition time and Pilot's Intervention time.
3-24	*Leonardo Helicopters*	2115 3.	8	Recognition Time	Please provide a definition of Recognition Time or include a reference.	Recommended	Accepted	See answer 3-23.

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3-25	*Leonardo Helicopters*	2115.3 (b)	8	How is the FCS reaction upon the failure considered in this paragraph? Is the pilot reaction time requirement independent from the FCS capability to recover from a failure?	One of the two: 1) Specify that the pilot reaction time requirement is independent from FCS action upon a failure Or 2) Propose a pilot reaction time requirement which takes into account FCS action upon a failure	Recommended	Noted	In this case, for TDP purposes, it is considered that the crew is flying attentive, therefore no credit is given to the FCS recovery, the pilot will take over as soon as the failure is detected.
3-26	*Rolls-Royce plc*	MOC VTOL.2115 Bullet Point 3.(b)	8	Pilot's Reaction is noted as 1 second, with not less than 0.5 seconds for Recognition time, for a total reaction time of "not less than 1.5 second". Current statement is "The pilot input, and the decision to CTO or RTO, is expected to happen after the Recognition Time is elapsed"	Modify for clarity to total reaction time: "The pilot input, and the decision to CTO or RTO, is expected to happen after the Total Reaction Time is elapsed"	Choose an item.	Partially Accepted	Text modified to carify the concept of pilot's reaction time.
3-27	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 3.(b)	9	RECURRING COMMENT: The note uses the word "must" that is inconsistent with the more common use of the word "should" in the document	Review document to ensure "must" and "should" are as intended.	Recommended	Accepted	"Must" replaced by "should".
3-28	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 3.(b)	9	RECURRING COMMENT: The note uses the word "must" that is inconsistent with the more common use of the word "should" in the document	Review document to ensure "must" and "should" are as intended.	Recommended	Accepted	See response to comment 3-27
3-29	*Airbus Helicopters*	Paragraph (3)(b)	P8	Is this reaction time also applicable to reaction time after failure?		Not requested	Accepted	Yes, the text has been modified to include this precision
3-30	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 4.(a)	9	The draft text states, "Only primary controls should be used while attaining…" It is unclear what is meant by primary controls: inceptors vs. controls surfaces, vs lift/thrust units.	Clarify intended primary control. Recommend rephrasing as "Only primary control inceptors should be used while attaining…"	Recommended	Accepted	Primary flight controls are the flight control inceptors, and any switch or buttons located on them. The spirit of the guidance is that the crew to is not expected to be required to let go of the controls, and reach out for a landing gear or flap lever, until reaching V_{TOSS}.

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3-31	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 4.(a)	9	The draft text states, “Only primary controls should be used while attaining…” It is unclear what is meant by primary controls: inceptors vs. controls surfaces, vs lift/thrust units.	Clarify intended primary control. Recommend rephrasing as “Only primary control inceptors should be used while attaining…”	Recommended	Accepted	See answer 3-30
3-32	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2115(2)(h)(3) 2115(5).	9	The statement of flying at Vfto at 2.5% gradient and being able to maintain level flight while maintaining a turn at 3 deg /sec. The standard rate turn trade off of energy to maintaining level flight likey does not provide adequate margins on the thrust/effectors for turbulent conditions. Also this should also be looked at for the 200 ft case identified in 2115(b) for the 200 ft case. I am also assuming this is the all engine case. A similar position should be made fo rmanuevering margin at the CMP/CFP configuarion.	While I agree with the premise, the standard rate turn is likely not sufficient if the intent is to only maintain level flight. To maintain adequate control margins on the thrust/effectors this should be set higher that this. 4.5 or 6 deg /sec. Something similar should be evaluated for the conditions to be identified under 2120 for climb requirements for CFP for enhanced vehicles even if that is only at 3 deg/sec and level flight.	Recommended	Noted	The 3 deg/sec value corresponds to a CFP condition. This is deemed appropriate since the climb gradient and the turn capability would still be needed in this case. Regarding VTOL.2120, it is assumed that if this turn rate is possible in climb, it should also be possible in level flight.
3-33	*FAA, AIR-710 Flight Test – WW*	VTOL 2115 (4)(5)	8, 9	The requirement that prohibits the configuration changes should be modified to address 1) Configuration changes that may be actuated on the primary controls as allowed under Part 27/29. 2) Configuration changes that are automatic without pilot action and are sufficient design robubustness such that the are not part of the CFP/CMP definition.	See Comment	Recommended	Noted	See answer 3-30
3-34	*Rolls-Royce Deutschland*	MOC VTOL.2115 Bullet Point 4.(c)	9	VToss shall include sufficient margin for the limiting (negative) vertical wind velocity and turbulences		Requested	Accepted	Text added as suggested.

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3-35	*Lilium eAircraft*	MOC VTOL.2115 (4)(c)	9	The intent should be to determine VTOSS at different conditions.	Rewrite to: (c) VTOSS should be determined for each weight, most critical centre of gravity position, altitude, and temperature for which take-off data are to be published. It is also suggested to reorder items (c) and (d). ….	Requested	Not Accepted	In principle V_{TOSS} could be determined for each weight, cg and ambient condition, but usually to reduce crew workload, V_{TOSS} is fixed. No reason could be recognised to reorder c) and d)
3-36	*Lilium eAircraft*	MOC VTOL.2115 (5)(c)	9	It is not clear what needs to be demonstrated at VFTO.	Rewrite to: (c) Climb gradient at VFTO should be determined for each weight, most critical centre of gravity position, altitude, and temperature for which take-off data are to be published.	Requested	Partially Accepted	"Demonstrated" is replaced by "determined"
3-37	*GAMA*	2115.5.c	9		Should also include the configuration (angle) of the thrust tilt. "Configuration" is explained in MOC VTOL.2435.a on page 65 and may need to be included/referenced in other places throughout the document.	Recommended	Accepted	This point will be addressed in MOC VTOL.2105 *Performance Data*:
3-38	*Lilium eAircraft*	MOC VTOL.2115 (5)	9	Propose the possibility of defining different final take-off speeds: in normal condition (no failure) and in CMP condition, similarly to fixed wing aircraft, where take-off can be scheduled for V2 in OEI conditions, but acceleration to V2+XX is acceptable with AEO.	Include item €: € At applicant´s discretion, distinct values of final take-off speed may be provided for the nominal condition (no failure) and CMP.	Requested	Not Accepted	The V_{TOSS} should be considered in a CFP condition. As this speed is quite low usually, the climbout is performed at a higher speed, that in rotorcraft corresponds to Vy, which is also the speed used to show compliance to the minimum climb capability in the second segment.
3-39	*Rolls-Royce Deutschland*	MOC VTOL.2115 Bullet Point 6.	9-10	D should not describe the geometrical center of the A/C because the "maneuvering" center is defining the critical A/C dimention. D during take-off and landing might be bejond the smallest geometric circle a function of manoueverability. Similar the intend of Bullet Point 18 (hover and ground diameter)		Recommended	Noted	That is correct. However, the vertiport size, and the possibility for a given VTOL to operate out of it will be based on this static geometrical D value. At the same time, and because we acknowledge the relevance of the scatter during manoeuvring around the static D value, we are introducing scaling elements based on D to determine the minimum acceptable HQs. The HQs will be determined also based on the desired and adequate precision that will be expressed on multiples/fractions of D.

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3-40	*TCCA AARDD/P*	MOC VTOL.2115. 6	9	Avoid starting a sentence with a symbols or abbreviation. Suggest following format be used: 1) The diameter 'D' is .... 2) Report 'D' .... 3) The heights h1 and h2...	Revise as deemed appropriate.	Requested	Accepted	The definition of 'D' was using similar wording as in the existing Certification Specification for heliports (CS HPT-DSN.A.020 Definitions). The suggestion is accepted.
3-41	*TCCA AARDD/P*	MOC VTOL.2115. 7	9	Section 7. in part reads "…the conventional IGE and OGE terms have been considered to be no longer applicable …". This sentence is awkward and a bit run-on. Move this phrase to the start of the sentence with the connector "because"	Revise as deemed appropriate.	Requested	Accepted	Text modified as suggested
3-42	*Volocopter GmbH*	MOC VTOL.2115, 7	9	The MOC has for good reason recognised the ambiguity of the IGE definition in eVTOL designs and made provision for new definition and nomenclature. Similarly the application of TDP, V_{TOSS} in eVTOL is equally ambiguous. There will be multi rotor designs, where the TDP is effectively pre-take off and V_{TOSS} is zero where the RTO decision to return to the take of position could end up as handling and airmanship decision rather than performance related.	It needs to be recognised that due to the high variety of VTOL designs, there should be room for establishing different TDP and VTOSS values for different VTOL designs, performances, speeds, etc. The employment of VTOSS for VTOLs will not be the same across all VTOL designs.	Recommended	Noted	That is correct. V_{TOSS} and TDP could be in principle set to 0 (in the case of TDP the point is set when the crew starts the take-off from the ground). Once there is more data and experience on these values, a change in the guidance material could be considered.

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3-43	*Lilium eAircraft*	MOC VTOL.2115 (7)(a)	9	The wording relating the section to IGE and OGE can be more objectively defined for designs with and without ground effect behaviour.	Reword section 7 to: (a) For designs subject to ground effect, h1 is the equivalent of IGE hover ceiling, and heights above h1 up to h2 are the equivalent to OGE hover ceiling. Guidance for ground effect definitions can be taken from Cat A CS-29 helicopters. (b) Applicants may decide to establish h1 and h2 values based on other considerations, such as handling qualities or ground clearance following failure conditions. Consider Section 13 in this MOC for h1 and h2 applicability and criteria within the Vertical take-off and landing paths.	Requested	Not Accepted	We do not see the reason to make this difference. If there is a ground effect, then the applicant will choose h_1 and h_2 based on the best benefit that can be obtained.
3-44	*Volocopter GmbH*	MOC VTOL.2115, 7, 13	9	In section 7 it states “applicants may decide to establish h_1 and h_2 values based on other considerations, such as handling qualities or ground clearance following failure conditions.” In table at 13(b), h_1 and h_2 are defined as 10 and 100ft respectively. As already identified, IGE will vary from applicant to applicant for reasons of configuration related performance, HQs even sensor performance in the environment. Rather than specifying and inviting a change would it be better to merely ask applicants to nominate?	It is recommended that h_1 and h_2 are defined by the applicant	Recommended	Noted	That is correct, h_1 and h_2 should be determined by the applicant. The table you are referencing is showing “Reference volume Type 1” dimensions, which are common dimensions that infrastructure designers and aircraft designers can use for vertiport locations in an obstacle-rich environment. The VTOL designer can demonstrate during certification, if so desired, that their aircraft can operate in this particular volume.

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3-45	*FAA, AIR-710 Flight Test - DW*	VTOL.2115 9	10	FATO in FAA Heliport design advisory circular and some versions of draft Vertiport design criteria does not necessarily denote an area that is load bearing or provides all protections for safe takeoff and landing (unlike TLOF which does guarantee these capabilities) – however the FATO can be very useful for MOC development because it may define the origin of an approach/departure surface and/or obstacle clearance surface	See 3 above	Requested	Noted	See response to comment 3-3. More details can be found in the EASA Prototype Technical Design Specifications for Vertiports.
3-46	*FAA, AIR-710 Flight Test – DW*	VTOL.2115 9 & 13	10 & 11	It seems like FATO should be at same height as TLOF for ConvTO, but should be defined at a "virtual" FATO height that is relatively lower than TLOF for EconvTO, and relatively higher than TLOF altitude for so-called "VTO"…this is to provide a standardized approach/departure surface (and obstacle clearance surface) that can be used for PinS approach design and urban planning. Published Performance should only be referenced to the available "flat surface length and width" available… this is not necessarily the "FATO". I may not fully understand the EASA thought process, but it seems problematic to not standardize required performance parameters for a nascent industry that will assumedly demand mixed fleet operations at publically funded, standardized, terminals. Look forward to detailed discussions on this subject	See 3 above	Requested	Noted	The FATO, TLOF and associated surfaces will be detailed in other documents relating to aerodromes. They will follow the existing approach for heliports for the Conventional Take-Off and Elevated Conventional Take-Off. For the Vertical Take-Off, the FATO and TLOF are not necessarily collocated, however the take-off manoeuvre is commenced at the bottom of the vertical segment, thus it is where the FATO is located. EASA made the choice to leave maximum flexibility to the aircraft and infrastructure designers to accommodate different aircraft architectures, e.g. winged versus rotors-only, as well as infrastructure types, e.g. street level versus rooftop. Standardisation is offered through the Reference volume Type 1 and additional reference volumes can be proposed if the need arises.

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3-47	*Rolls-Royce Deutschland*	MOC VTOL.2115 Bullet Point 10.(a)(2)	10	Original Statement: For EConvTO: after the dropdown, the point where the aircraft reaches 35 ft above the take-off surface with the minimum climb gradient of 4.5 %; or For EConvTO should it be considered 35 ft above the ground surface instead of the take-off surface?	For EConvTO: after the dropdown, the point where the aircraft reaches 35 ft above the “ground” or equivalent surfaces in the take off vicinity surface with the minimum climb gradient of 4.5 %; or	Recommended	Not Accepted	In the case of EConvTO the aircraft is allowed to drop down. The take-off distance is calculated when reaching 35 ft above the take-off surface, and not the ground surface, as in CAT A procedure. It should be noted that the aircraft designer would not be able to determine the take-off distance if it was referred to the ground surface, as the the height of the vertiport from the ground would need to be considered, which is unknown at that time.
3-48	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 10.(a)(3)	10	As drafted, the MOC may be mis-interpreted as requiring zero horizontal takeoff distance for a VTO.	Clarify the requirement is to transition to forward flight at the Vtoss climb gradient at h2+35 ft [point of meeting gradient leading to 200' AGL]	Recommended	Not Accepted	In principle the VTO might have a zero horizontal take-off distance.
3-49	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 10.(a)(3)	10	As drafted, the MOC may be mis-interpreted as requiring zero horizontal takeoff distance for a VTO.	Clarify the requirement is to transition to forward flight at the Vtoss climb gradient at h2+35 ft [point of meeting gradient leading to 200’ AGL]	Recommended	Not Accepted	See response to comment 3-48.
3-50	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 11.(a)	11	Draft text states, “Rejected take-off distance’ (RTOD) means the length of the FATO declared available and suitable for…” The word “declared” is non-standard and can be interpreted as provided only by the FATO.	Separate the definition of RTOD from the entity that provides it. Recommend; “Rejected take-off distance’ (RTOD) means the length of the FATO ~~declared available and suitable~~ for …” Add, “The aircraft AFM provides this value for comparison to the RTOD published by each FATO.”	Recommended	Partially Accepted	Wording modified
3-51	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 11.(a)	11	Draft text states, “Rejected take-off distance’ (RTOD) means the length of the FATO declared available and suitable for…” The word “declared” is non-standard and can be interpreted as provided only by the FATO.	Separate the definition of RTOD from the entity that provides it. Recommend; “Rejected take-off distance’ (RTOD) means the length of the FATO ~~declared available and suitable~~ for …” Add, “The aircraft AFM provides this value for comparison to the RTOD published by each FATO.”	Recommended	Partially Accepted	See response to comment 3-50

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3-52	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 11.(b)	11	RECURRING COMMENT: The word “reported” is non-standard when the intention is to publish or otherwise provide information.	Recommend replacing “reported” with “publish” or “provide” throughout this document.	Recommended	Accepted	Replacement performed as suggested
3-53	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 11.(b)	11	RECURRING COMMENT: The word “reported” is non-standard when the intention is to publish or otherwise provide information.	Recommend replacing “reported” with “publish” or “provide” throughout this document.	Recommended	Accepted	See response to comment 3-52
3-54	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2115 12(c)(1)	11	TLOF size should be based upon the ability to land the aircraft within the constraints, both day and night, with winds up to the maximum from the critical azimuth.		Recommended	Noted	Correct The ability of the VTOL to fly in and out of a TLOF with the constraints reported in the comment will be achieved by showing compliance with HQs and performance requirements from SC-VTOL.

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3-55	*Lilium eAircraft*	MOC VTOL.2115 (12)(c)(2)	11	Section prescribes part of Landing determination (from VTOL.2130) in the Take-off requirement. Moreover, as written, the requirement imposes a solution that is different from the one adopted in CS-27 and CS-29, since for conventional rotorcraft take-off and landing requirements are captured in the corresponding sections of its CS chapters. In addition, the TLOF size requirements from current VTOL.2115 overlap and may conflict with the definitions of MOC VTOL.2130 (1) and (4). For cohesion of requirements and straight-forward compliance, an approach similar to CS-27 and CS-29 is recommended for EVTOL aircraft.	Move “TLOF size required” from MOC VTOL.2115 to MOC VTOL.2105 (retitled as “Performance, General”), and rewrite it as follows: XX. TLOF size required: (a) ‘Touchdown and lift-off area’ (TLOF) means an area on which a VTOL aircraft may touch down or lift off. (b) The TLOF size (length and width) required for approved procedures should be reported in meters, rounded up to the next tenth. (c)The minimum dimensions should be the larger of: • the minimum size of the surface to contain the undercarriage; • the surface required to provide the minimum suitable visual cues for RTO and Landing, following a CFP. Note: MOC VTOL.2130 shall be rewritten to reflect the changes, while ensuring consistency of landing performance. See comment 19 for further detail.	Requested	Partially Accepted	A reference has been added in MOC VTOL.2130 to MOC VTOL.2115 Section (12). We prefer not to change the title of MOC VTOL.2105 to keep consistency with the title of this SC VTOL requirement.
3-56	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 12.(c)(2)	11	Addressing aircraft performance data scatter is important; however, leaving this completely open to interpretation may lead to recurring discussions, applicant-specific solutions, and potential inconsistencies.	Recommend including one or more pre-approved methods of dealing with aircraft performance scatter.	Recommended	Noted	Valid comment. EASA is encouraging an industry-led standard to develop guidelines for performance data gathering, data processing, data extrapolation and interpolation.
3-57	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 12.(c)(2)	11	Addressing aircraft performance data scatter is important; however, leaving this completely open to interpretation may lead to recurring discussions, applicant-specific solutions, and potential inconsistencies.	Recommend including one or more pre-approved methods of dealing with aircraft performance scatter.	Recommended	Noted	See response to comment 3-56

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3-58	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 12.(c)(3)	11	The text correctly refers to the TLOF area accommodating the minimum suitable visual cues for landing. It is not clear if this requirement must be fulfilled without any sort of hover board or similar cueing arrangement. It is unclear if there is allowance for operators to use such devices to safely use a TLOF. It is unclear if there are considerations for making such cues standardly available.	The issues posed here may not require clarification within this document, but should be resolved as part of FATO design standards.	Not requested	Noted	This text provides a Means of Compliance with a airworthiness requirement for the type design certification and is not intended to regulate operational aspects.
3-59	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 12.(c)(3)	11	The text correctly refers to the TLOF area accommodating the minimum suitable visual cues for landing. It is not clear if this requirement must be fulfilled without any sort of hover board or similar cueing arrangement. It is unclear if there is allowance for operators to use such devices to safely use a TLOF. It is unclear if there are considerations for making such cues standardly available.	The issues posed here may not require clarification within this document, but should be resolved as part of FATO design standards.	Not requested	Noted	See response to comment 3-58
3-60	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	RECURRING COMMENT: Using D as a reference for setting min and max performance is reasonable. It is unclear where the scaling numbers come from (e.g. 5, 1.5, .75).	Provide links or reference to research work that produced the numbers in this table.	Not requested	Noted	The dimensions are based on existing heliport standards, helicopter procedures and proprietary industry research.
3-61	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	RECURRING COMMENT: Using D as a reference for setting min and max performance is reasonable. It is unclear where the scaling numbers come from (e.g. 5, 1.5, .75).	Provide links or reference to research work that produced the numbers in this table.	Not requested	Noted	See response to comment 3-60

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3-62	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	The Greek alpha symbol for slope conflicts with aviation's standard uses of this symbol.	Request replacing the Greek alpha symbol with theta or another acceptable symbol [using the same subscripts].	Requested	Accepted	"α" replaced by "θ"
3-63	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	The Greek alpha symbol for slope conflicts with aviation's standard uses of this symbol.	Request replacing the Greek alpha symbol with theta or another acceptable symbol [using the same subscripts].	Requested	Accepted	See response to comment 3-62
3-64	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	It is clear that D is a measure of each aircraft's size but it is not clear if the intention is for each FATO to publish its own D so operators can determine if their aircraft can fit.	Clarify and distinguish different definitions of D such as D_A for aircraft size and D_F for published FATO values.	Recommended	Noted	It is intended indeed that each FATO publishes and displays their design D. The definitions and terms follow the existing approach for heliports.
3-65	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(b)	11	It is clear that D is a measure of each aircraft's size but it is not clear if the intention is for each FATO to publish its own D so operators can determine if their aircraft can fit.	Clarify and distinguish different definitions of D such as D_A for aircraft size and D_F for published FATO values.	Recommended	Noted	See response to comment 3-64
3-66	*Leonardo Helicopters*	2115.13 (b)	11	Is the aircraft dimension "D" the only parameter that sets the take-off and landing volume? Are larger aircraft allowed to operate in a wider space than smaller ones in the same urban environment?	Suggested to link the take-off and landing volume not only to dimension "D" but also to performance and HQ (precision and accuracy).	Recommended	Noted	The list of parameters defining a generic take-off and landing volume is provided in Section 13.(b). Specifically, the Reference volume Type 1 is defined only in terms of D to facilitate integration of different aircraft. Please note that HQ are also defined in terms of D.
3-67	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(c)	11	The text refers to demonstrating trajectories consistently by flight crew of average skill. The average skill of an SVO3 pilot will be different than that of SVO1 pilot or a Harrier pilot. Average skill is difficult to measure. More common practice is to avoid exceptional pilot skill.	Request setting the skill level as 'not exceptional.' Also consider if it is appropriate to stipulate "not require exceptional pilot skill for the aircraft's automation level" (Harrier type vs SVO1, SVO2…etc).	Requested	Partially Accepted	For the time being we are not considering different levels of HQs requirements and/or different expected precision or performances, based on crew capabilities with Simplified Vehicle Operations (SVO). The "automation" for trajectory control should be at least as precise as a "not exceptional" flight crew.

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3-68	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(c)	11	The text refers to demonstrating trajectories consistently by flight crew of average skill. The average skill of an SVO3 pilot will be different than that of SVO1 pilot or a Harrier pilot. Average skill is difficult to measure. More common practice is to avoid exceptional pilot skill.	Request setting the skill level as 'not exceptional.' Also consider if it is appropriate to stipulate "not require exceptional pilot skill for the aircraft's automation level" (Harrier type vs SVO1, SVO2…etc).	Requested	Not Accepted	See response to comment 3-67
3-69	*Lilium eAircraft*	MOC VTOL.2115 (13)(c)	11	Section requires trajectories demonstrated to be executable consistently by flight crew of average skill. Consistent trajectories, however, are a consequence of procedures consistently executed. Hence requirements and MOC of CS-23, CS-25, CS-27 and CS-29 require procedures to be consistently executable by flight crews of average skill. MOC VTOL should be harmonised with these.	Rewrite (c) as follows: The procedures must be demonstrated to be executable consistently by flight crew of average skill in atmospheric conditions expected to be encountered in service, as required by VTOL.2105(c). Note: the complete section 13 is proposed to be rewritten in the next comment.	Requested	Accepted	The text has been modified to consider consistent execution of procedures that allow to obtain the trajectories corresponding to the published values.
3-70	*Leonardo Helicopters*	2115 13.	11	Understanding is that Minimum/Maximum value in (b) are the minimum for certification of the Vertical take-off procedure. The reference volume Type 1 are more stringent values which can be used for vertiports design.	Vertiport volume design should not be included in this MOC. This document as it is gives the perception that the volume in which a vertical take-off can be executed is smaller than the volume required for certification of the aircraft. Suggestion is to remove the Reference Volume, since this may depend from the vertiports surrounding obstacle.	Recommended	Not Accepted	Vertiport design will be detailed in other documents relating to aerodromes. The vertiport designer needs however aircraft data and this MOC specifies the data required. The aircraft designer can certify the aircraft for different procedures, ConvTO, EConvTO and VTO. For this last type, the aircraft designer can choose the dimensions of the volume in which the procedure is flown. This leaves thus maximum flexibility to accommodate different aircraft architectures and obstacle environments. The Reference Volume Type 1 is a specific volume offered as a possibility to the airframe and structure designers, to facilitate standardisation for an obstacle rich environment (See response to comment 3-46). The Table footnote has been moved to a new paragraph and a perspective view of the generic volume has been added to facilitate the understanding.

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3-71	*Lilium eAircraft*	MOC VTOL.2115 (13)	11	CS-27 and CS-29 do not define a "volume" for take-off and landing performance. These define Flight Path references for vertical operations instead. Guidance material provided in AC 29-2C, and CAT.POL.H.205 builds on top of CS-27 and CS-29 for Cat A helicopter flight path requirements. EASA should justify why a different approach is proposed for VTOL aircraft over existing rotorcraft.	Replace section 13 with the text below: 13. Vertical take-off procedure: (a) The applicant may provide a procedure for a vertical take-off, with a vertical segment from the ground facilitating clearance of obstacles. (b) The procedures must be demonstrated to be executable consistently by flight crew of average skill in atmospheric conditions expected to be encountered in service, as required by VTOL.2105(c). All other text should be removed from Section 13 and moved to the flight path definition guidance material being drafted in Part-IAM.	Requested	Not Accepted	The current approach for helicopters is kept through the ConvTO and EConvTO. EASA is providing the possibility to also certify, on a voluntary basis, the aircraft for a VTO, with volumes designed specifically to accommodate an obstacle rich environment, as may be encountered in the urban air mobility context. This MOC specifies the data established during certification that can in turn be used by the vertiport designers.

3-72	*Lilium eAircraft*	MOC VTOL.2115 (13)	11	The inclusion of Reference Volume Type 1 is considered to be unnecessary. Note 2 states the following: “Reference volumes Type 1” are standardised values that can be used as a reference for vertiport design in an obstacle rich environment (Figure 5). Demonstrating during certification that the aircraft can reliably conduct take-off and landings in this volume is intended to facilitate the integration in corresponding vertiports. The specific questions are as follows: 1. What is Reference Volume Type 1 ´standardised´ against? 2. Can you provide a list of the specific ´corresponding vertiports´ that has dictated the values of Reference Volume Type 1? 3. Why is a reference for vertiport design required in a means of compliance for take-off performance? 4. With reference to Section 7, h1 and h2 are aircraft specific and vary according to OEM chosen criteria. So what criteria have been used in determining the values for Reference Volume Type 1? The parameters and prescribed minimums and maximums presented in the table in section 13(b) are sufficient for each OEM to determine and demonstrate the performance of the aircraft. They may differ for every single aircraft, hence, the number of variations possible across different aircraft may be significant. It is likely to be of far greater number than the variations associated with obstacle clearance of different vertiports. Is it not more likely that vertiports (and the construction of vertiports) will be standardised? Therefore, it would be more practical to present ´reference volumes´ in such documentation. The specific combination of dimensions associated with Ref Vol Type 1 may subsequently prove to be applicable to a very small number of vertiports. This is equivalent to putting a reference runway length into the AMCs for CS-23 Amdt 5, CS23.2115. AMC1 is ASTM F3179/F3179M-18 Standard Specification for Performance of Aircraft. AMC2 is CS-23 Amdt 4. Neither contain a reference length for runways, or specified values ´to be used as a reference for airport design´, based on obstacle clearance on the approach and departure paths. An OEM is responsible for ensuring desired take-off and landing performance of their aircraft in the design process, in order to meet operational requirements for the role of their aircraft. If they want a short-field capable aircraft, then they must design it as such. For example the C-Series/A220. It was designed so that operations in and out of shorter runway airports in New York and London City Airport were possible. There were no performance requirements that dictated this capability though, or rather no reference ´example´ (type) of a runway length that an OEM may wish their aircraft to be capable of achieving.	Remove reference volume type 1 from section 13. Proposal of general reference volumes is also contradictory to established certification and operational specifications and for conventional aviation. Currently available type certification basis (ref,: AC 29.59A b. Procedures (12) Vertical Takeoffs; AC 29.75A b.(2) Procedures (viii) Vertical Landings) and CAT.POL.H already provide specifications for vertical takeoff/landing performance, which could be adopted. In these specifications, a flight path is required, not a volume. Additionally, AC 150/5390-2C and CS-HPT-DSN provide guidance for VFR approach and departure paths and HPZ (Helicopter Protection Zones) in heliport design, and obstacle clearance in the actual operation scenario will be accounted for in the dispatch performance calculations. Thus, adding yet another geometrical constraint to the aircraft performance is unnecessary and can be conflicting or misleading.	Requested	Not Accepted	As a response to the specific questions: 1. The Reference Volume Type 1 is standardised in that h_1 and h_2 have given values and all other dimensions are specified in terms of D. 2. “corresponding vertiports” refers to vertiports designed using the Reference Volume Type 1. 3. This MOC specifies the data to be established during certification that can in turn be used for vertiport design. The corresponding vertiport design guidelines will be detailed in other documents relating to aerodromes. 4. In the context of Urban Air Mobility, the volume available for take-off and landing of aircraft can be quite restricted and thus benefit from standardization. The current approach for heliports, which in general requires more space to be obstacle-free, can also still be followed. The aircraft designer is still free to specify the approved take-off and landing procedures according to the performance of its aircraft. The corresponding vertiport design guidelines and this MOC are consistent with one another.

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3-73	*Volocopter GmbH*	MOC VTOL.2115, 13	11-13	The Reference Volume Type 1 VTO and VL drives performance, handling qualities and cockpit design (where the field of view/regard that enables the pilot to judge obstacle clearance) into a niche vertiport scenario and a stressing worst case confined area.	The decision to operate in confined areas has many variables and is very specific to the location in terms of obstacles and visual references. This MOC drives the requirement to demonstrate sufficiently good HQs that allow the air vehicle to be controlled within the Type 1 Volume. But the ability to remain within the Type 1 volume, particularly at height is also based on the visual refences available to the pilot. The MOC should recognise that the visual references are specific to individual vertiports and that demonstrating the ability to remain within the Type 1 volume will be subject to this environment. The MOC should acknowledge that proving HQs during climb and descent and at the upper reaches of the Type 1 volume without the specific Vertiport references (especially if this designed to be performed over a flat / airfield surface with no references with vertical extent) is not role relatable and these should be read across from other MHQRM tasks.	Requested	Noted	The scope of MOC VTOL.2115 is performance, assuming that the controllability and external and internal cues are present. The scope of the proposal of the Reference Volume Type 1 has been better clarified in the text.
3-74	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2115 (13)	11, 12, 13	It is likely with the type 1 volumes that TDP and LDP will be more airspace restricted rather than performance or rejected TO restricted. There could be other FATO's were the approach may be larger. Tilt rotors are a case in point. 100 ft established as the h2 effectively establishes the TDP/LDP for this type of volume approach, as it would likely be the path used even though other options could be allowed under 2115(b)(5). Vehilces that are not CMP/CFP limited may not be able to safety land at the top of the service volume as visibility to the landing zone may impaired.	While not adverse to this type of profile, there may be other vertical takeoff paths that are not so restricted to the High Hover requirements listed in the RFM.	Recommended	Noted	Visibility to the landing zone is indeed a challenge for vertical landings, hence the additional consideration of synthetic cues. Other vertical take-off paths can be proposed under the generic take-off volumes.

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3-75	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(e) Figure 4	12	Figure 4 does not clearly show how the slopes of the "TO_{width}" and "$FATO_{width}$"are determined.	Clarify how to interpret the slope of these lines. It is unclear if they are perpendicular to the sloped blue line.	Recommended	Accepted	This was intended to denote a transverse dimension (perpendicular to the viewing plane). A perspective view has been added to clarify this.
3-76	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(e) Figure 4	12	Figure 4 does not clearly show how the slopes of the "TO_{width}" and "$FATO_{width}$"are determined.	Clarify how to interpret the slope of these lines. It is unclear if they are perpendicular to the sloped blue line.	Recommended	Accepted	See response to comment 3-75
3-77	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(e) Figure 4	12	Figure 4 vertical line (dividing TO_{back} from TO_{front}) passes through generic aircraft image. It is not clear if the image placement has any meaning relative to the vertical line.	Clarify any relation between the aircraft and the vertical line.	Recommended	Accepted	$FATO_{front}$ and $FATO_{back}$ are referenced to the aircraft centre of the smallest enclosing circle. As the line is vertical, TO_{front} and TO_{back} are referenced to the same point, elevated to h_2. A sentence has been added for clarification.
3-78	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2115 13.(e) Figure 4	12	Figure 4 vertical line (dividing TO_{back} from TO_{front}) passes through generic aircraft image. It is not clear if the image placement has any meaning relative to the vertical line.	Clarify any relation between the aircraft and the vertical line.	Recommended	Accepted	See response to comment 3-77
3-79	*Volocopter GmbH*	MOC.VTOL.2105., figures 4 and 5	12	An additional illustration with a side view and / or top view could improve understanding	Add a side and/or top view of the drawings. You may consider to add also an illustration with a circular FATO and circular reference volume as 'D' is actually defined as a diameter (rather than an edge length)		Partially Accepted	A perspective view of the generic volume has been added. 'D' is depicted as the diameter on Figure 3. The Reference volume Type 1 is rectangular to minimise its space requirements and this most demanding procedure is the one that can be tested in certification. A circular volume can be derived and will be detailed in the vertiport design guidelines.

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3-80	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2115 13(e) Fig 5	12	The reference volume suggests a nearly vertical descent for the last 30m altitude. This appears to not be compatible with Fig 1 on page 17.		Requested	Noted	The Reference volume Type 1 is compatible with this figure but will indeed have an influence on where the LDP can be placed.
3-81	*Rolls-Royce Deutschland*	MOC VTOL.2115 Bullet Point 13. Vertical take-off and landing procedure	12	FATO front and back of 0,75 D should be sufficient for an A/C taking off straight from the ground. For A/Cs rotating into the wind close to ground this number sounds a bit tight especially if D is defined as smallest enclosure circle and not as aerodynamic / manouvre lateral point. Similar comment in respect of TOback and front.		Recommended	Noted	The footprint of 1.5 D x 1.5 D is similar to what is used for helicopters. If an aircraft has a centre of the smallest enclosing circle significantly different from the manoeuvring centre, e.g. a long tail, and the aircraft needs to manoeuvre close to the ground, then larger dimensions may indeed be needed and the aircraft designer can specify a different volume for the procedure.
3-82	*GAMA*	Figure 6	13	The vertical nature of the flight envelope design may be acceptable for single rotor system helicopter designs, but may not be wise for multiple lift/thrust unit designs considering the potential for VRS/Settling with power or Power Settling and also the implications of degraded handling qualities associated with malfunctions/failures of single or multiple lift/thrust units.		Choose an item.	Noted	VRS should be considered for all designs, and will be taken into account when developing and validating the take-off and landing procedures.
3-83	*Rolls-Royce plc*	MOC VTOL.2115 Bullet Point 16.(a)	14	Add clarity for cases where there are >3 landing gear elements as per illustration. Current phrasing: "'Undercarriage width' (UCW) means the width of the undercarriage/landing gear"	"'Undercarriage width' (UCW) means the maximum width of the undercarriage/landing gear projection on a horizontal plane" – added as per 15.(a) language	Choose an item.	Accepted	Text modified as suggested
3-84	*FAA – JJ*	MOC VTOL 2115 19	15	AFM requirements are missing hover and climb performance data, as well as the definition of the engine power ratings.		Requested	Noted	The list provided will be probably updated in future, but please consider that the AFM should also incorporate content from other MOCs. The hover and climb performance are not really related to the 2115. Engine power ratings are still under definition.

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3-85	*Lilium eAircraft*	MOC VTOL.2115 (18) and (19)(q)	15	Equivalent to the approach on the subject for fixed wing and rotary wing aircraft, ground taxi turn radius should not be part of the AFM. Rather, it should be part of operational manuals, such as the APM (airport planning manual) or the AOM (aircraft operation manual).	For Sec.18: separate hover turn from ground taxi turn. For Sec. 19(q): remove ground taxi turn.	Requested	Not Accepted	APM and AOM are not requested and typically not available for rotorcraft and smaller airplanes. These parameters have however been identified as essential for vertiport design.
3-86	*Overair*	MOC VTOL.2115 1 (b) 1	4	What is meant by "protection"?		Requested	Noted	Protection surfaces are those surfaces that need to be free of obstacles incursion.
3-87	*Overair*	MOC VTOL.2115 2 (c)	8	How were these derived from CS-27 and CS-29? Based upon expected V_{TOSS} values (50 to 100 kts GS), these equate to RoC's of 225 to 675 fpm... but no doubt my math is wrong! These values are roughly twice those required for fixed wing multi-engine aircraft. Is there a reason for this? I fully understand that urban operations my require more stringent (higher) first segment climb values to ensure adequate obstacle clearance etc.		Requested	Noted	See response to comment #3-15
3-88	*Overair*	MOC VTOL.2115 2 (h)	8	Is this analogous to providing a minimum 1.3g maneuvering capability?		Requested	Noted	The use of g factor is considering a coordinated turn. With tiltable and vectored thrust, we decided to measure the turn capability in terms of trajectory change in degrees per second.
3-89	*Overair*	MOC VTOL.2115 12 (a)	11	Does TLOF = $FATO_{width}$?		Requested	Noted	No, the TFLOF has a specific lengh and width.
3-90	*Overair*	MOC VTOL.2115 13 (table)	11	What is 'TO'? Is this intended to include the takeoff distance required (TODRV)?		Requested	Noted	TO_{front} is the front distance at h_2 while TO_{back} is the back distance at h_2. They are not directly related to the TODRV.
3-91	*Overair*	MOC VTOL.2115 13 (table)	11	TO_{width} = TO_{front} + TO_{back}?		Requested	Noted	Not necessarily. The aircraft designer can specify all 3 values independently. For the Reference volume Type 1, TO_{front} + TO_{back} = 3 D while TO_{width} = 2 D.

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3-92	*Overair*	MOC VTOL.2115 13 (table)	11	$FATO_{width}$ = $FATO_{front}$ + $FATO_{back}$?		Requested	Noted	Not necessarily. The aircraft designer can specify all 3 values independently. For the Reference volume Type 1 they are indeed equal (square footprint).
3-93	*Overair*	MOC VTOL.2115 13 (c)	11	How is "average skill" going to be correlated to HQs and whatever rating system is adopted within ED-295? For example, what range of Cooper Harper Ratings (CHR) would constitute the minimum acceptable for a pilot of average skill? I much prefer usage of not "requiring exceptional piloting skill, alertness, or strength". I think this lends itself to better correlation with the CHR.		Requested	Accepted	Text modified as suggested.
3-94	*Overair*	MOC VTOL.2115 13	11	Recommend using 'gamma' as oppose to 'alpha'. The latter can get mistaken for AoA.		Requested	Noted	See response to comment 3-62
3-95	*Overair*	MOC VTOL.2115 13	12	This is a pretty steep departure gradient. Is this to endure adequate obstacle clearance? Will this need to met under CFP conditions? If h_2 or the "virtual elevated vertiport" is of sufficient height so as to ensure obstacle clearance, shallow departure gradients, including that of 4.5% for CFP, may be acceptable?		Requested	Noted	The gradient 12.5% has indeed been foreseen to facilitate clearing obstacles in the urban environment. This surface should not be penetrated, including after CFP. This gradient already exists in ICAO Annex 14, for the Category C slope design. In certain obstacle environments, designs of vertiports can indeed instead make use of a higher h_2 and shallower protection surfaces and the aircraft manufacturer can demonstrate a corresponding procedure. The current reference volume has been named “Type 1” to leave the possibility to add other types of reference volumes if the need arises.
3-96	*Overair*	MOC VTOL.2115 13	12	This is a pretty steep approach gradient. Isn't it better for h2 or the "virtual elevated vertiport" altitude to so as to provide sufficient obstacle clearance for both approach and departure?		Requested	Noted	See response to comment 3-95

4. MOC VTOL.2120 CLIMB REQUIREMENTS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
4-1	*FAA, AIR-710 Flight Test - MS*	MOC VTOL 2120	16	While I agree with category enhanced concept for the 1000 ft point in performance, I do think there should be a floor. The 150 fpm that is used in 29.67 would be useful in setting a minimum floor. In addition, established a climb gradient for CFP at 200 ft would be more representive of the different types of designs/configuraitons expected to be seen. Iff performance is established at 200 ft, then the 1000 ft requirements could be tailored to something more representative of CS29 Cat A or CS23 at 1500 ft. In addition, the segement performance at 200 ft should be established. The last absence for an enhance vehicle is not cat A but more like a Cat B, 29.1(e) or PC2 type of performance. It should include the 200 ft, segment engine out performance of 150 fpm. Essentially the Type 1 volume will establish a TDP/LDP of 100 ft for that category of takeoff and landing as its unlikely that any other point and transition will not violated the defined airspace. Further, Performance under CFP should be determined for all Basic aircraft and provided in the RFM. No dedicated requirements just provided.	Revise Category Enhanced to include Following a critical failure for performance (CFP) and the remaining lift/thrust engines at maximum continuous power, or if requested and approved, at some higher power up to and including takeoff power used for certification - The climb gradient without ground effect at (305m) 1000 ft above the takeoff surface be at least X.X% or a rate of climb of 150 fpm (whichever has a greater rate of climb), with the landing gear retracted and aircraft in cruise configuration, and at a speed selected by the application for each weight, altitude and temperature for which takeoff data are to be determined and The climb gradient without ground effect at (61m) 200 ft above the takeoff surface be at least 2.5% or a rate of climb of 100 fpm (whichever has a greater rate of climb), with the landing gear retracted and aircraft in a climb configuration, and at the minimum safe speed or Vtoss as applicable for each weight, altitude and temperature for which takeoff data are to be determined And For Category Basic: Following a critical failure for performance (CFP) and the remaining lift/thrust engines at maximum continuous power, or if requested and approved, at some higher power up to and including takeoff power used for certification - The climb gradient without ground effect should be determined at (305m) 1000 ft above the takeoff surface with the landing gear retracted and aircraft in cruise configuration, and at a speed selected by the application for each weight, altitude and temperature for which takeoff data are to be determined.	Recommended	Partially Accepted	The MOC VTOL.2120 is revised as follows : *"For Category Enhanced, the climb gradient without ground effect, at 305 m (1 000 ft) above the take-off surface, should be at least 2.5 %, for each combination of weight and CG, altitude, and temperature for which take-off data are to be determined, and for the duration of the flight:* *(a) following a critical failure for performance (CFP) and with the remaining lift/thrust engines at maximum continuous power, if approved, or at take-off power for aircraft for which certification for use of take-off power is requested; and* *(b) with the landing gear retracted (if applicable) and the aircraft in cruise configuration; and* *(c) at the speed selected by the applicant.* *Note: The altitude of 305m (1 000 ft) is proposed as currently used for Category A helicopters. Different cruise altitudes can be considered if compatible with the departure and en-route profile..* *See MOC VTOL.2115 and 2130 for specific climb requirements for take-off and balked landing.* *For Category Basic the climb gradient without ground effect, at 305 m (1 000 ft) above the take-off surface, should be at least 2.5 %, for each combination of weight and CG, in nominal conditions (no failure conditions), at ISA SL and for the duration of the flight."* We don't believe there is a reason to add fpm as a "floor", it is implicit in the gradient.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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4-2	*FAA, AIR-710 Flight Test - MS*	NA	NA	Lack of Hover Performance determination from CS 29.49 should be determined both in and out of group effect. Its not addressed except tangentially in the h1, h2 discussion from 2115(7) and (19) and the AFM. Similar request for 27.143 requriements which is not addressed either.	At more descriptive requirement to provide that information should be provided similar to 29.49 for Basic and Enhanced vehicles	Recommended	Not Accepted	h1 and h2 are equivalent to IGE and OGE hover, The MOC does not go into detail of the information to be provided. An EUROCAE standard is being prepared to provide guidelines in this domain.
4-3	*Lilium eAircraft*	MOC VTOL.2120 (b)	16	Not all configurations will have a landing gear retraction system.	Rewrite section (b) to: (b) with the landing gear retracted (if applicable) and the aircraft in cruise configuration; and	Requested	Accepted	Modified as suggested
4-4	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2120 (b)	16	Draft text calls for determining climb "with the landing gear retracted and the aircraft in cruise configuration…" It is sufficient to simply stipulate cruise configuration and avoid discussion about gear retractability.	Recommend rephrasing to "with the ~~landing gear retracted and the~~ aircraft in cruise configuration…"	Recommended	Not Accepted	Usually the "cruise" configuration is specifying the configuration of the aerodynamic surfaces (flaps i.e.). The landing gear, if retractable, is usually specified. Following also comment 4-3, we have added "(if applicable)" after "landing gear retracted".
4-5	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2120 (b)	16	Draft text calls for determining climb "with the landing gear retracted and the aircraft in cruise configuration…" It is sufficient to simply stipulate cruise configuration and avoid discussion about gear retractability.	Recommend rephrasing to "with the ~~landing gear retracted and the~~ aircraft in cruise configuration…"	Recommended	Not Accepted	See response to comment 4-4

5. MOC VTOL.2130 LANDING

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
5-1	*Volocopter GmbH*	MOC VTOL.2130	16/17	As per 2115 page 9 comments above. The definitions of LDRV and LDP and the associated diagram may not necessarily the best way of capturing performance in all multicopter designs especially in the enhanced category. The definitions and diagram are less relevant for configurations where LDP is in the hover and LDRV & V_{REF} are zero.	It needs to be recognised that due to the high variety of VTOL designs, there should be room for establishing different DLP and LDRV values for different VTOL designs, performances, speeds, etc.	Requested	Noted	That is correct. LDP and LDRV could be in principle set to 0. Once there is more data and experience on these values, we could consider changing the guidance material.
5-2	*Leonardo Helicopters*	2130	17	during landing on elevated vertiporty, a vertical profile may become difficult to acquire, and LDP could be hardly identified during the manouver.	Evaluate the introduction of limitation of the vertical profile for landings on elevated vertiports.	Recommended	Noted	In the MOC, there is no need to set a predifined limitation on vertical profiles or heights for a LDP, as these limitations will vary based on the design, and the performance of the VTOL. Limitations on the height of the LDP on a vertical profile, or limitations on the vertical profile in general, can always be proposed by the applicant.
5-3	*Volocopter GmbH*	MOC.VTOL. 2130., 1.(a)	16	Not clear what 'complete stop' means. Clarification recommended to exclude taxi-in (which is assumed to be not part of landing)	Rephase e.g. like this : 'A ConvL path starts at a Landing Decision Point (LDP, see below) **and ends at** ~~until~~ the point in which the aircraft reaches a ~~complete~~ **stop at the FATO and touches down or continues with taxiing**.'	Recommended	Partially Accepted	Sentence changed as follows: *"A ConvL path starts at a Landing Decision Point (LDP, see below) and ends at the point where the aircraft reaches a stop at the FATO on the ground (after which it may taxi)"*

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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5-4	*Lilium eAircraft*	MOC VTOL.2130 (1)	16	Section 1(b) intends to ensure that the vertical landing procedure, if executed by pilots of average skill, will result in consistent performance. Consistent performance, however, is a consequence of consistent procedures and this concern is already captured in VTOL.2105(c), applicable not only to vertical, but to conventional landing as well. Hence, a reference to VTOL.2105(c) can be included, and requirements applicable only to vertical landings are not necessary. This approach would be similar to the corresponding landing distance determination requirements and Guidance Material for CS-23, CS-25, CS-27 and CS-29 aircraft.	Rewrite section as follows: The landing can be of two main types a Conventional Landing (ConvL) and a Vertical Landing (VL): (a) A ConvL path starts at a Landing Decision Point (LDP, see below) until the point in which the aircraft reaches a complete stop. The trajectory may have the most appropriate glide path foreseen by the applicant. (b) A VL might be required to comply with obstacle separation when landing in a Vertiport in an Urban Air Mobility (UAM) environment. The applicant may choose to have, from a point along the approach after the LDP, a pure vertical trajectory. (c) The procedures must be demonstrated to be executable consistently by flight crew of average skill, as required by VTOL.2105(c). Further details on how to show compliance with the proposed MOC VTOL.2130(c), including the discussion of landing distance scatter and deviation from a nominal trajectory shall be included in the EuroCAE DP006 task within SG-4.	Requested	Partially Accepted	Text modified to request that: “The landing procedures should be demonstrated to be consistently executable by flight crew of average skill, as required by VTOL.2105(c).”
5-5	*TCCA* *ARDD/M &* *Flight Tests*	MOC VTOL.2130 Para 2(b)	p.16/94	“2.(b) If the aircraft is required to show continued safe flight and landing, then a landing should be possible following a CFP before or after the LDP.” a) Instead of referring to continued safe flight and landing as the condition for applicability, it should instead refer to the VTOL category (enhanced) to which it would apply, in alignment with approach used throughout the rest of SC VTOL and the rest of the proposed MOC VTOL. A similar explicit statement should be added under MOC VTOL.2115 for takeoff.	Recommend updating the wording of MOC VTOL.2130 para 2(b) as follows: “2.(b) If the aircraft is required to show continued safe flight and landing, then For category Enhanced, a landing should be possible following a CFP before or after the LDP.” Recommend adding the following wording under MOC VTOL.2115: “ For category Enhanced, a landing should be possible following a CFP before or after the TDP.”	Requested	Not Accepted	VTOL aircraft in the category enhanced must indeed be capable of continued safe flight and landing (CSFL) as per VTOL.2005(b)(1). In this text it is preferred to mention directly the CSFL capability, since an indirect reference through the enhanced category could make the link with the landing requirement less obvious.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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5-6	*Lilium eAircraft*	MOC VTOL.2130 (2)(d)	16	The MOC allows for the LDP to be reached at a speed lower than VREF and this defeats the purpose of defining a VREF, the minimum speed at which the balked landing capability is guaranteed.	Rewrite sec. 2(d) as follows: (d) LDP shall be reached at VREF.	Requested	Not Accepted	The V_{REF} is not defined as the minimum speed at whichc the balked landing capability is guaranteed. In Section 3 V_{REF} is defined as the initial speed that should be used to determine the area required to land and come to a stop. The Speed at LDP can be different.
5-7	*Lilium eAircraft*	MOC VTOL.2130 (3)	16	Proposed requirement is too prescriptive, defining VREF only for the steepest glide path angle. In fixed wing aircraft certified under CS-23 and CS-25 requirements, having different VREF(s) for normal approach and steep approach is commonplace.	EASA to elaborate on why can't different VREFs be determined for different GPAs, or otherwise allow for different VREFs for each selected GPA. For clarity, the term "maximum" should be replaced by "steepest".	Requested	Accepted	"maximum" removed as suggested. In principle different V_{REF} could exist depending on the GPA.
5-8	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2130 Landing, 3.(a)	16	The proposed text states "allows for speed variations during a landing in expected turbulence and all reasonably expected environmental conditions." This is not adequately defined and can result in inconsistent interpretation among applicants.	Provide standard definitions and values for "expected turbulence" and "reasonably expected environmental conditions." Alternately, ensure the aircraft operating envelope is restricted to vetted levels of turbulence and environmental conditions.	Requested	Not Accepted	Expected turbulence and reasonable environmental conditions are the ones demonstrated in the aircraft certification exercise, they may lead to limitations.
5-9	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2130 Landing, 3.(a)	16	The proposed text states "allows for speed variations during a landing in expected turbulence and all reasonably expected environmental conditions." This is not adequately defined and can result in inconsistent interpretation among applicants.	Provide standard definitions and values for "expected turbulence" and "reasonably expected environmental conditions." Alternately, ensure the aircraft operating envelope is restricted to vetted levels of turbulence and environmental conditions.	Requested	Noted	See response to comment 5-8
5-10	*Volocopter GmbH*	MOC.VTOL. 2130., 3.(c) and 4.(a)	17	Not clear what 'come to a stop' or 'full stop' means. Clarification recommended to exclude taxi-in (which is assumed to be not part of landing)	Rephase e.g. like this: '(c) is the initial speed that should be used to determine the area required to land and come to a stop **at the FATO and touches down or continues with taxiing**.' Similar with 4.(a)	Recommended	Partially Accepted	Text in Section 4 (a) is modified by removing the word "full".

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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5-11	*GAMA*	MOC-SUBPART B-Flight, MOC VTOL.2130 4.(a)	17	The landing distance is measured from 15m (50 ft) above the surface. While this is consistent with traditional Part 23 screen height measurement, it appears to be inconsistent with the takeoff case.	Provide [separate] explanation for rationale for selecting takeoff and landing distances.	Not requested	Noted	The 35 ft and 50 ft values are grandfathered from CS-27 and CS-29.
5-12	Boeing	MOC-SUBPART B-Flight, MOC VTOL.2130 4.(a)	17	The landing distance is measured from 15m (50 ft) above the surface. While this is consistent with traditional Part 23 screen height measurement, it appears to be inconsistent with the takeoff case.	Provide [separate] explanation for rationale for selecting takeoff and landing distances.	Not requested	Noted	See response to comment 5-11
5-13	*TCCA ARDD/M & Flight Tests*	MOC VTOL.2130 Para 5(a)	p.17/94	"5. (a) The aircraft should be capable of a balked landing following a CFP event without requiring configuration changes commanded by the crew until reaching VREF." The reference should be to Vtoss instead of Vref.	Reference under MOC VTOL.2130 para 5(a) should be corrected from Vref to Vtoss: "5. (a) The aircraft should be capable of a balked landing following a CFP event without requiring configuration changes commanded by the crew until reaching VTOSS."	Requested	Partially Accepted	Text changed to: "The aircraft should be capable of a balked landing following a CFP event without requiring configuration changes commanded by the flight crew until regaining V_{TOSS} ."
5-14	*Rolls-Royce Deutschland*	MOC VTOL.2130 Bullet Point 5.	17	Original Statement: (a) The aircraft should be capable of a balked landing following a CFP event without requiring configuration changes commanded by the crew until reaching VREF. I assume it is meant to be VTOSS	Typo	Requested	Accepted	Text changed

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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5-15	*Lilium eAircraft*	MOC VTOL.2130 (5)(a) & (b)	17	The wording in section 5(a) should be consistent with the definition of LDP from Section 2 (the last point from which a balked landing can be performed). Moreover, in 5(b) the wording "VTOSS is regained" implies accelerating from a speed lower than VTOSS, which may not be always the case. It is not clear why it is prohibited to change the configuration after a balked landing is initiated. In CS-23 and CS-25 configuration changes such as flap deflection change and gear retraction are allowed. Confusion is caused because configuration changes are discussed in both (a) and (b). Additionally, mention to VREF in (a) seems to be a mistype.	Rewrite Sec. 5(a) as follows: (a) The aircraft should be capable of a balked landing following a CFP event at or before the LDP is reached. (b) Configuration changes are not permitted with speeds below VTOSS. At speeds above VTOSS, the minimum climb gradients for the 1st and 2nd segment of the take-off path should be guaranteed (see MOC VTOL.2115). Figure 1 should be updated to reflect the proposed rewording (allowing speeds greater than VTOSS along the balked landing procedure).	Requested	Partially Accepted	There is a typo in VTOL.2130 5 (a) which has now been corrected, refer to the responses to comments 5-13 and 5-14. It is EASA's intention to not accept configuration changes from the moment the CFP event occurs, until reganing (accelerating or decelerating) V_{TOSS}, in the same spirit of the take-off. After V_{TOSS} is re-established, configuration changes will be accepted.
5-16	*Lilium eAircraft*	MOC VTOL.2130 (5) Figure 1	17	It is not clear if the 35 ft height in figure 1 is a requirement or not.	If it is a requirement, it should be explicitly written in words, not only in the figure. If it's not, then it should be removed from figure 1.	Requested	Accepted	35 ft is already in the text of MOC VTOL.2115 sections 2.(d) and 10. It has been added to section 2.(f) of MOC VTOL.2115 and section 5.(a) of MOC.VTOL.2130. The principle is that the take-off distances are always calculated when reaching 35 ft either above the take-off elevation or above h2. In a balked landing situation, if a minimum height of 35 ft above vertiport elevation is kept, and according with MOC VTOL.2130 section 5. (d) once V_{TOSS} is regained and the minimum gradients (or the calculated gradients) in MOC VTOL.2115 are met, the aircraft will be clear of obstacles.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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5-17	*Lilium eAircraft*	MOC VTOL.2130 5(c)	17	Item 5(c) refers to provision of the time required from LDP to LDP, after a balked landing is performed, for energy reserves calculation purposes. Rules for energy reserves calculation are out of scope for landing and should be considered as part of operational requirements, similarly to the approach for conventional fixed and rotary wing aircraft.	To adopt the same approach as for helicopters and fixed wing aircraft, by removing item 5(c). Recommend the inclusion of rules for energy reserves calculation under the operational requirements applicable to EVTOL vehicles.	Requested	Not Accepted	A performance based approach is being developed for the determination of the minimum energy reserve to be used for operational approval. It mainly consists in removing the prescriprive requirements of determining reserves that are using fixed flight times, maintaining runway heading and downwind, and an approach. Instead, the information of the amount of energy required for a missed approach, or go around from LDP back to LDP, should be provided. The associated calculations are expected to come from the type design holders.
5-18	*Leonardo Helicopters*	2130 5. (c)	17	"A representative time to perform a go-around from LDP back to LDP should be provided for determination of the energy reserve. "	As the time to perform the circuit from the LDP to the LDP can vary depending of the Vertiport, and It may not the best vary for estimating the energy consumption, it is suggested to change the paragraph as follows: "An evaluation of the energy required to perform the circuit from the LDP back to the LDP should be performed, for determining the energy reserve"	Recommended	Not Accepted	As we are proposing a performance based approach for the determination of the minimum energy reserve for operational approval, which mainly consists in removing the prescriprive requirements of determining reserves that we are currently using (fixed flight times maintaining runway heading and downwind and a approach), the information of the amount of energy required for a missed approach, or go around from LDP back to LDP, should be provided instead, and these calculations can't be done at an operational level, but by the type design holders.

6. MOC VTOL.2205 INTERACTION OF SYSTEMS AND STRUCTURES

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
6-1	*GAMA*	MOC VTOL.2205 Interaction of systems and structures	18	The contents of MOC VTOL.2205 are consistent with F3254-19. The FAA has accepted F3254-19 as MOC with some clarification.	Suggest harmonizing with F4254-19 as an accepted MOC.	Requested	Not Accepted	The technical details of MOC VTOL.2205 are not fully consistent with F3254-19. Some criteria specific to VTOL are introduced in MOC VTOL.2205 that are not included in F3254-19.
6-2	Boeing	MOC VTOL.2205 Interaction of systems and structures	18	The contents of MOC VTOL.2205 are consistent with F3254-19. The FAA has accepted F3254-19 as MOC with some clarification.	Suggest harmonizing with F4254-19 as an accepted MOC.	Requested	Not Accepted	See EASA response to 6-1.
6-3	*GAMA*	MOC-SUBPART C-Structures, MOC VTOL.2205 2.(a)(2)	19	It is unclear how much – if any- of this requirement must be shown via flight test.	Clarify intentions for showing compliance via simulation vs. flight test.	Recommended	Not Accepted	It is unclear which paragraph is being referred to. The MOC does not detail the means of compliance (test versus simulation) required. The Applicant should propose a suitable method. Analysis supported by test is the typical approach for static strength and durability. For aeroelasticity, compliance by analyses, tests or a combination is requested. This is the standard approach already used for certification and therefore there is no need to update the MOC.
6-4	Boeing	MOC-SUBPART C-Structures, MOC VTOL.2205 2.(a)(2)	19	It is unclear how much – if any- of this requirement must be shown via flight test.	Clarify intentions for showing compliance via simulation vs. flight test.	Recommended	Not Accepted	See EASA response to 6-3.
6-5	*Leonardo Helicopters*	2205 2. (b)(2)	19	"However, conditions beyond limit conditions need not be considered when it can be shown that the aircraft has design features that will not allow it to exceed those limit conditions." No consideration are made on the reliability of the design feature.	Please clarify what are the reliability requirement sfor those design features	Recommended	Not Accepted	The wording is consistent with CS-25 Appendix K. No specific reliability is specified. Failures of those design feature(s) would also need to be considered, and any combinations of failures, following the criteria outlined in this MOC.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
6-6	FAA AIR-621 / DR	Subpart C	18	Reference. MOC VTOL.2205 1. The value of Extremely Improbable (10^{-X}) listed in Figures 1, 2, and 3 were defined using the reference to MOC VTOL.2510 (Issue 2, dated 12 May 2021) 2. References to vertical and transition structural design speeds are not listed	For VTOL vehicles, we recommends 1. To define Extremely Improbable in Subpart C is established to no greater than 10^{-8} for manned VTOL vehicles. Remotly piloted manned VTOL vehicles should be set to no greater then 10^{-9} . 2. Add a reference to the vertical and transition structural design speeds	Requested	Partially Accepted	1. **Extremely improbable**: The MOC VTOL.2510 currently covers piloted VTOL only and will be updated in the future to include remotely piloted. The safety objectives for VTOL have been defined dependent on the Category and number of passengers, and for consistency are applicable to all Subparts. 2. **Structural Design Speeds:** MOC VTOL.2200 requests that design values and limitations, including speeds, should be established for each aircraft configuration or flight mode, as appropriate. Additional clarification is added that compliance should be demonstrated for each aircraft configuration or flight mode, as appropriate.
6-7	*Rolls-Royce Deutschland*	MOC VTOL.2205 Bullet Point 2.(c) and fig. 1	19-20	Since the section (c) is applicable to any system failure condition NOT shown to be extremely improbable I expected that in Fig. 1 the factor of safety for 10-X (equal to the probability associated to Extremely Improbable) was set to 1 and not to 1.25.	Please clarify	Requested	Not Accepted	Figure 1 is consistent with CS-25 Appendix K, and describes how to determine the factor of safety dependent on the probability of occurrence of the failure. System failures demonstrated to be extremely improbable need not be assessed and therefore the analysis described in 2.(c), including Figure 1, is not applicable.
6-8	*GAMA*	MOC-SUBPART C-STRUCTURES MOC VTOL.2205 (2)(C)	19	Civil aircraft development applies a target-based safety assessment such that once a failure condition is classified, the allowable qualitative probability becomes a target. Using the term “classified as catastrophic” describes the causal classification as opposed to the consequential safety objective allowable qualitative probability.	Recommend alternate wording from ‘For any system failure condition not shown to be extremely improbable’ to ‘For any system failure condition not classified as catastrophic”	Requested	Not Accepted	Wording is consistent with CS-25 Appendix K.
6-9	Boeing	MOC-SUBPART C-STRUCTURES MOC VTOL.2205 (2)(C)	19	Civil aircraft development applies a target-based safety assessment such that once a failure condition is classified, the allowable qualitative probability becomes a target. Using the term “classified as catastrophic” describes the causal classification as opposed to the consequential safety objective allowable qualitative probability.	Recommend alternate wording from ‘For any system failure condition not shown to be extremely improbable’ to ‘For any system failure condition not classified as catastrophic”	Requested	Not Accepted	See EASA response 6-8.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
6-10	*TCCA* *ARDD/M &* *Flight Tests*	MOC VTOL.2205 Para 2(c)(1)	p.19/94	"Note: Flight conditions may be excluded from the evaluation, if the probability of occurrence of the failure mode combined with the probability of being in the flight condition is shown to be extremely improbable." Guidance should be provided regarding the probability of being in a given flight condition. Without guidance on methodology or an accepted common reference, this is likely to result in very significant differences in interpretation.	Recommend updating MOC VTOL.2205 Para 2(c)(1) to either provide additional information on approach to determine probability of being in a given flight condition, for use in showing compliance with VTOL.2205, or reference to common / standard probabilities to be used by applicants unless otherwise justified with supporting data.	Requested	Not Accepted	The consideration of all flight conditions from the usage spectrum has been introduced for VTOL, in addition to the 1-g level flight condition. However, some alleviation has been provided to exclude some failure / flight condition combinations if extremely improbable. The Applicant has the responsbility to justify the exclusion of any failure / flight condition combination. Additional guidance is not considered necessary at this moment.
6-11	*Leonardo Helicopters*	MOC VTOL.2205 2 (c)(1) Note	19	The note report "Flight conditions may be excluded from the evaluation…" but if the event that the failure mode combined with the probability of beeing in the flight condition is shown to be extremely improbable all the failure scenario should be excluded.	Update the statement in the Note: "Failure scenario may be excluded from the evaluation, if the probability of occurrence of the failure mode combined with the probability of being in the flight condition is shown to be extremely improbable	Requested	Accepted	MOC reworded.
6-12	*Leonardo Helicopters*	2205 2. (c)(1)	19	"Most critical flight condition"	Please clarify which parameters have to be considered to select the most crtical flight condition for the system in the failure condition	Recommended	Noted	The most critical flight condition(s) is the flight condition(s) selected from the spectrum that would result in the most critical loading, minimum aeroelasticity margin and most severe forced structural vibrations, if applicable, when combined with the system failure. Additional guidance is not considered necessary.
6-13	*GAMA*	MOC VTOL.2205 Interaction of systems and structures	21	"fatigue" can mean different things.	Suggest changing from "(iv) *If the loads induced by the failure condition have a significant effect on fatigue or damage tolerance then their effects should be taken into account*" to "(iv) *If the loads induced by the failure condition have a significant effect on **durability** or damage tolerance then their effects should be taken into account*"	Recommended	Partially Accepted	Reworded and linked to SC VTOL.2240(a) and (b).

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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6-14	Boeing	MOC VTOL.2205 Interaction of systems and structures	21	"fatigue" can mean different things.	Suggest changing from "(iv) *If the loads induced by the failure condition have a significant effect on fatigue or damage tolerance then their effects should be taken into account*" to "(iv) *If the loads induced by the failure condition have a significant effect on **durability** or damage tolerance then their effects should be taken into account*"	Recommended	Partially Accepted	See EASA response 6-13.
6-15	*Leonardo Helicopters*	2205 2. (c)(3)	22	Means of this paragraph is not clear	Please clarify which other criteria can be used and explain better when they have to be applied	Recommended	Not Accepted	The intention is to clarify that some failure conditions, regardless of their probability, may need to be considered to show compliance to other paragraphs of the SC VTOL. The wording is consistent with CS-25 Appendix K. If the probability of failure is less than extremely improbable, the criteria selected should be appropriate to the failure scenario. (For example *SC VTOL 2250(c)* for Category Enhanced)
6-16	*Leonardo Helicopters*	MOC VTOL.2205 2 (c)(3)	22	Please re-word the statement to better clarify the scope. It seems suggesting additional criteria to meet the requirements, but it is not clear what are the additional criteria.	Clarify the additional criteria.	Requested	Not Accepted	See EASA response to 6-15.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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6-17	*Volocopter GmbH*	MOC VTOL.2205. 2(c)(3)	22	"(c) System in the failure condition. For any system failure condition not shown to be extremely improbable, the following apply: (3) Consideration of certain failure conditions may be required by other sections of SC-VTOL regardless of calculated system reliability. Where the failure analysis shows the probability of these failure to be less than the probability associated to Extremely Improbable for the aircraft Category and number of passengers in accordance with MOC VTOL.2510, criteria other than those specified in this MOC may be used for structural substantiation" 1/ the sentence "consideration of certain failure condition (…) regardless of calculated system reliability" is a bit confusing since it is followed by a criteria based on probability of failure. 2/ "in this MOC" It is not clear if it relates to the VTOL.2510 or VTOL.2205 criteria.	Clarify the intent of section (c) system in the failure condition, and what means the term "calculated system reliability". Suggest to change "in this MOC" by MOC VTOL.2510	Recommended	Partially Accepted	See response to 6-15. Calculated system reliability is the failure rate per flight hour of the system. "in this MOC" changed to MOC VTOL.2510.
6-18	*GAMA*	MOC VTOL.2205 Interaction of systems and structures	22	If the probability of the failure condition is less than extremely improbable, it should be the terminating point. A more detailed explanation would be helpful.	Suggest removing the following statement: *(3) Consideration of certain failure conditions may be required by other sections of SC-VTOL regardless of calculated system reliability. Where the failure analysis shows the probability of these failure to be less than the probability associated to Extremely Improbable for the aircraft Category and number of passengers in accordance with MOC VTOL.2510, criteria other than those specified in this MOC may be used for structural substantiation to show continued safe flight and landing (for Category Enhanced) or controlled emergency landing (for Category Basic)*	Requested	Not Accepted	See response to 6-15.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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6-19	Boeing	MOC VTOL.2205 Interaction of systems and structures	22	If the probability of the failure condition is less than extremely improbable, it should be the terminating point. A more detailed explanation would be helpful.	Suggest removing the following statement: *(3) Consideration of certain failure conditions may be required by other sections of SC-VTOL regardless of calculated system reliability. Where the failure analysis shows the probability of these failure to be less than the probability associated to Extremely Improbable for the aircraft Category and number of passengers in accordance with MOC VTOL.2510, criteria other than those specified in this MOC may be used for structural substantiation to show continued safe flight and landing (for Category Enhanced) or controlled emergency landing (for Category Basic)*	Requested	Not Accepted	See EASA response 6-15
6-20	*Leonardo Helicopters*	MOC VTOL.2205 2 (c)(3)	22	'less than' should be replaced by 'highter than'.	Change 'less than' in 'more than'.	Recommended	Not Accepted	The paragraph is referring to failure conditions that are required to be assessed to show compliance to other SC-VTOL paragraphs, where the probability of failure is lower than Extremely Improbable.
6-21	*Leonardo Helicopters*	MOC VTOL.2205 2 (d) (1)	22	The statement "The system should be checked for failure conditions…"should be updated in "The system should be checked for dormant failure conditions…"	Update in The system should be checked for dormant failure conditions…"	Requested	Not Accepted	Wording is consistent with CS-25 Appendix K. The system should be checked for all failure conditions, not just dormant conditions.
6-22	*Leonardo Helicopters*	MOC VTOL.2205 2 (d) (1)	22	The statement "or significantly reduce the reliability of the remaining system" seems already covered in the 2510 and should be removed since the requirement is about interaction of system and structures.	Remove "or significantly reduce the reliability of the remaining system" This paragraph is about interaction between system and structure, interaction between systems themselves should not be considered here.	Requested	Not Accepted	Wording is consistent with CS-25 Appendix K. The cascading effect of the failed system on the reliability of the remaining system should be assessed.
6-23	*Leonardo Helicopters*	2205 2. (d)(1)	22	"As far as reasonably practicable, the flight crew should be made aware of these failures before flight." Why the request to have an indication before flight and not during flight when failure happens ?	Please clarify and/or improve the sentence	Recommended	Not Accepted	Wording is consistent with CS-25 Appendix K. Indication during flight is addressed in paragraph MOC VTOL.2205 2.(d)(2).
6-24	*Leonardo Helicopters*	2205 2. (d)(1)	23	« certification maintenance requirements «	Please clarify if 'certification maintenance requirements' in this context are defined as per CS27/CS29	Recommended	Noted	Please refer to MOC VTOL.2510 for guidance regarding Certification Maintenance Requirements.

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6-25	*Leonardo Helicopters*	MOC VTOL.2205 2 (e)	23	This aspects are related to the MMEL. As per civil aircraft all these MOC should be collected in a similar CS-MMEL regulation.	What is EASA intention to manage MMEL requirement for VTOL?	Requested	Noted	The applicability of CS-MMEL and CS-GEN-MMEL to VTOL aircraft is currently under assessment. In case that amendments of CS-MMEL or CS-GEN-MMEL, or equivalent specifications, are considered necessary for VTOL aircraft, they could become rulemaking deliverables under the ongoing RMT.0230, notwithstanding any interim solution that the Agency may adopt in the meantime.
6-26	*Leonardo Helicopters*	2205 2. (e)	23	This paragraph should be linked to the MMEL process to be followed	Please clarify if CS-MMEL is applicable to SC.VTOL certified aircraft and how this paragraph is linked to that process	Recommended	Noted	The applicability of CS-MMEL and CS-GEN-MMEL to VTOL aircraft is currently under assessment.
6-27	*Volocopter GmbH*	MOC VTOL.2205. 2(e)	23	"Qj as the combined probability of being in the dispatched failure condition and the subsequent failure condition for the safety margins in Figures (…) No reduction in these safety margins is allowed if the subsequent system failure rate is greater than 10-3 per hour" Does the term "system failure rate" refers to the probability of being in the subsequent failure condition? If not, clarify what it represents.	Suggest to use consistent terms throughout the paragraph. "system failure rate" could be replaced by "probability of the susbsequent system failure condition".	Recommended	Not Accepted	Wording is consistent with CS-25 Appendix K. The "subsequent system failure rate" is the "failure rate of the subsequent system failure in FH" and is not the combined probability.

7. MOC VTOL.2210 STRUCTURAL DESIGN LOADS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
7-1	FAA AIR-621 / DR	Subpart C	23	MOC VTOL.2210 Structural Design Loads 1. We are wondering why CS 27.301 is acceptable and CS 23.301 is not. CS 27.301 uses the term Rotorcraft while CS 23.301 uses the term airplane. 2. We were interested in understanding why the MOC for Design Fuel Loads was expanded for VTOL. 3. We are interested in understanding why the follow are not listed under CS 23.2220 and are listed under CS 23.2210, since they are Ground Loads; 23.471 Ground Loads - General 23.473 Ground load conditions and assumptions 23.507 Jacking loads 23.509 Towing loads MOC # 7 - Towbarless Towing 23.511 Ground load: unsymmetrical loads on multiple-wheel units 23.521 Water load conditions 23.523 Design weights and center of gravity positions 23.525 Application of loads 23.527 Hull and main float load factors (*With Appendix I*) 23.537 Seawing loads 23.753 Main float Design	We recommend; 1. Using CS 23.301(a), (b), (c) for VTOL MOC Design Loads, for forward, vertical, and transition flight configurations. 2. The addition of Design Fuel Loads MOC is unnecessary and should be removed. Futhermore, it does not alighn with EASA's CS 23 (Amd't 5) AMCs. 3. Moving the Ground MOCs listed for CS 2210 and MOC VTOL.2210 to CS 2220 and MOC VTOL.2220.	Requested	Partially Accepted	1. CS 23.301(b) includes reference to the validation of methods used to determine load intensities on canard and tandem wing configurations. This specific reference to canard and tandem is not considered applicable to all VTOLaircraft designs. A more general statement has been added (see EASA response to 7-2). Otherwise, there are no technical differences between CS-23 and CS-27, and therefore CS-27 is selected. 2. The Design Fuel Loads paragraph is included should any VTOL aircraft configuration include disposable fuel. CS23.343 is included in CS-23 Amdt. 5 AMC2 23.2210. The requirement is updated as appropriate to eVTOL. 3. For consistency with CS-23 Amdt. 5 AMC2 23.2210, these Ground MOCs are included in MOC VTOL.2210.
7-2	*Vertical Aerospace*	MOC VTOL.2210	23	as some of the configurations are likely to be rather novel, SC-VTOL should cover the canard & tandem wing elements from CS-23	2210 part 1. Loads (general) Should be modified to CS-23.301(b) Amdt. 4, CS27.301(b) and CS 27.301(c) Amdt. 6 are accepted as a means of compliance.	Recommended	Partially Accepted	A general statement is added that "Methods used to determine load intensities and distributions should be validated by flight load measurement unless the methods used for determining those loading conditions are shown to be reliable or conservative."

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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7-3	*Lilium eAircraft*	MOC VTOL 2210 (1)	23	CS27.301 (b) discuss equilibrium of inertias, in the case of a rational approach this is not needed	Suggestion to change to: "Unless a fully rational approach is pursued, CS 27.301(b) and (c) Amdt. 6 is accepted as a means of compliance"	Recommended	Not Accepted	The requirement that, unless otherwise provided, the specified loads must be placed in equilibrium with inertia forces considering each item of mass, is common to all aircraft Certification Specifications, including CS-22, CS-23, CS-25, CS-27, CS-29. This universal standard approach is considered equally applicable to eVTOL.
7-4	*TCCA* *AARDD/S*	MOC VTOL.2210. 2	23	Paragraph 2 of this MOC is on flight loads. For flight loads, there is a MOC VTOL.2215. Making a connection between the two could improve clarity, as the CS 27.321(a) Amdt 6 currently referenced in MOC VTOL.2210 is more of a generic definition/clarification than MOC.	Consider adding a note, such as: "Note: more detailed MOC on flight loads to be accounted for are available in MOC VTOL.2215."	Recommended	Accepted	Note added.
7-5	*Lilium eAircraft*	MOC VTOL 2210 (7) (a)	24	It would beneficial to clarify which SAE ARPs are applicable and to be considered.	Specify ARP4853 and ARP5911, ARP5283.	Recommended	Not Accepted	The text is consistent with CS-25. Specific SAE ARPs are not listed to avoid the need to update the MOC should the list of SAE ARPs require updating.
7-6	*Volocopter GmbH*	MOC.VTOL. 2210., 7.	24	Does EASA foresee any MoC for Towbarless movement of VTOL aircraft with skids? It would be helpful if there was an indication of acceptable / applicable standards for Ground movement equipment that moves skid based VTOL aircraft with persons on board	Please clarify	Requested	Noted	This will be considered in a future MOC.
7-7	*GAMA*	MOC VTOL.2210 Structural Design Loads 7. Towbarless towing	25	The requirement is far beyond the current CS-23 requirements and does not account for the current practice of specifying approved list of towing vehicle in AMM.	Suggest revising the following statement: From, *"The impact of the towbarless towing on the certified life limits of the landing gear and supporting structure should be determined"*, to *"The impact of the towbarless towing on the certified life limits of the landing gear and supporting structure should be determined* ***unless OEM list approved towbarless vehicles in the AMM****"*	Recommended	Not Accepted	The criteria defined in Section 7. of MOC VTOL.2210 should be met for each approved towbarless vehicle that is included in the OEM list, see sub-paragraph (d)(1). Equivalency of different vehicles can be used to support the demonstration.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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7-8	Boeing	MOC VTOL.2210 Structural Design Loads 7. Towbarless towing	25	The requirement is far beyond the current CS-23 requirements and does not account for the current practice of specifying approved list of towing vehicle in AMM.	Suggest revising the following statement: From, *"The impact of the towbarless towing on the certified life limits of the landing gear and supporting structure should be determined"*, to *"The impact of the towbarless towing on the certified life limits of the landing gear and supporting structure should be determined* ***unless OEM list approved towbarless vehicles in the AMM****"*	Recommended	Not Accepted	See EASA response to Comment 7-7.

8. MOC VTOL.2225 COMPONENT LOADING CONDITIONS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
8-1	FAA AIR-621 / DR	Subpart C	25	MOC VTOL.2225 Component Loading Conditions 1. Engine Torque We are wondering if EASA could provide additional information concering the mention of torque oscillations and using both CS 23.361 and CS 27.361 for an MOC. 2. Unsymmetrical loads for horizontal aerodynamic surfaces: We agree with most aspects of MOC (2)(b), but would like to suggest some additional text. 3. Outboard fins or winglets: We are interested in more information pertaining to the MOC (3)(c)(1)(i) & (ii).	1. Engine Torque We would like to request some additional information concerning combining CS 23.361 and CS 27.361 and including the new proposed power torque oscillation factor. It would be helpful to the source that supports the new power torque oscillation factor 2. Unsymmetrical loads for horizontal aerodynamic surfaces: We recommend adding the following text; Horizontal surfaces of the airplane should consider combinations of unsymmetrical loads, within the design envelope, resulting from asymmetric wing slip-stream affects, tail Engine Propulsion Unit (EPU) asymmetric thrust (if installed) and prop wake effects, and tail unsymmetric control surface forces. 3. Outboard fins or winglets: Our specific interest in our request for information pertains to the additional requirement of 80% of the loading placed above and below the horizontal surface separately.	Requested	Partially Accepted	1. Engine Torque. Only CS 27.361(a) for turbine engines and CS 27.361(b) for reciprocating engines are referenced in the MOC. Reference to CS 23.361(c) Amdt. 4 has not been found necessary for VTOL projects. For electrical engines, the limit torque is as defined in SC-LSA-15-01 “Electric Propulsion Powerplant for CS LSA airplanes”. 2. Unsymmetrical loads for horizontal aerodynamic surfaces: The following is added: “Combinations of unsymmetrical loads, within the design envelope, should be considered including those resulting from asymmetric wing slip-stream effects, lift/thrust unit asymmetric thrust, propeller or lift/thrust unit wake effects and unsymmetrical control surface forces, as applicable.” 3. Outboard fins or winglets: The criteria is consistent with CS23.445(b) Amdt. 4 and is applicable to configurations where there is no possible influence of the lift/thrust unit wake on the outboard fin or winglet.
8-2	*Volocopter GmbH*	MOC VTOL.2225	25	What is the definition of limit torque? Should the limit torque be design for this requirement or the electrical engine structure, to be able to handle without breaking?	Please clarify.	Recommended	Noted	Each engine mount, lift/thrust unit and supporting structure should be designed to withstand the limit engine torque. Further clarification will be added in a future MOC.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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8-3	*Vertical Aerospace*	MOC VTOL.2225.(2).a	26	as some of the configurations are likely to be rather novel, SC-VTOL should cover the V-tail elements from CS-23	2225 part 2(a). Should be modified to CS 23.427(c) Amdt, 4 and CS 27.427 Amdt. 6 are accepted as a means of compliance for horizontal aerodynamic surfaces that do not have installed lift/thrust units.	Recommended	Noted	Further clarification for V-tail (and non conventional aerodynamic configurations) will be added in a future MOC. The CS 23.427(c) Amdt. 4 is not considered fully applicable to VTOL as currently written.

9. MOC VTOL.2240 (A) AND (B) STRUCTURAL DURABILITY

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
9-1	*TCCA* *AARDD/S*	MOC VTOL 2240 (a) (b)	27	To help clarify the distinction between the MOC for each category, we recommend adding a parenthetical example to the description of category Basic similar to what was done at the end of the description of category Enhanced.	For the category Basic, this comprises any relevant inspections or other procedures to prevent structural failure (e.g. Fatigue Tolerance (Safe Life) evaluation with structure replacement time). For the category Enhanced, this includes any relevant inspections or other procedures to detect structural damages before failure (Damage Tolerance evaluation).	Recommended	Accepted	Text modified ***as follows***: For the **Category Basic**, this comprises any relevant inspections or other procedures to prevent structural failure ***(e.g. replacement time for safe life evaluation)***. For the **Category Enhanced**, this includes any relevant inspections or other procedures to detect structural damages before failure (Damage Tolerance evaluation).
9-2	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Table 1	27	AC20-107B is also an essential reference that provides regulator-accepted MoC	Suggest adding AC20-107B to the composite row of the Table 1 to read: Sections 5 and 6 in this MOC, which include the adaptation of CS 27.573 (Amdt. 6) *"Fatigue evaluation of composite rotorcraft structures" and of AC27.573,* ***AC20-107*** *and AMC 20-29.*	Requested	Not Accepted	Efforts have been made by EASA and FAA to harmonise these two documents. The AC 20-107 B is now equivalent to AMC 20-29. However, the EASA MOC SC VTOL does not include reference to FAA AC material unless there is no EASA equivalent.
9-3	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Table 1	27	AC20-107B is also an essential reference that provides regulator-accepted MoC	Suggest adding AC20-107B to the composite row of the Table 1 to read: Sections 5 and 6 in this MOC, which include the adaptation of CS 27.573 (Amdt. 6) *"Fatigue evaluation of composite rotorcraft structures" and of AC27.573,* ***AC20-107*** *and AMC 20-29.*	Requested	Not Accepted	See response to comment 9-2

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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9-4	*Airbus Helicopters*	Paragraph 4.1	P27	VTOL.2240 (a) and (b) requests the applicant to perform all necessary evaluations and actions (inspection, procedures) "to prevent structural failures due to strength degradation, which could result in serious or fatal injuries, or extended periods of operation with reduced safety margins." It is proposed that the MOC provides additional clarification on the "reduced safety margins" criteria. This would support a standardized approach for application of the requirements for the stakeholders	To work in the MOC a guidance to define the cases corresponding to "extended periods of operation with reduced safety margins."	Recommended	Not Accepted	The "*extended periods of operation with reduced safety margins*" is part of the global performance-based requirement. The assessment performed following the criteria given in the MOC VTOL 2240 (a) and (b) is intended to meet this requirement.
9-5	*TCCA* *AARDD/S*	MOC VTOL 2240 (a) (b) Section 2	27	The term SSE is used instead of PSE. There is a high degree of similarity between the two and this SC appears to be the first time SSE is presented as a concept. The purpose of distinguishing SSEs from PSEs is unclear. While the definitions differ in the impact of the failure of the structural element, the practical result appears to be the same, since §3 then imposes that catastrophic failure be avoided.	Recommend adding additional sentences addressing the differences between SSE and PSE, or just using PSE if there is no real difference (in practice) with what is done in CS-23, CS-25, CS-27 and CS-29. Perhaps highlighting a structural element that would be a SSE but not a PSE and explaining why it needs to be assessed for SC-VTOL would be an option.	Recommended	Not Accepted	The definition of the traditional PSE includes structure that could cause a catastrophic failure. VTOL.2250(c) "Design and construction principles" has introduced the concept of no single failure catastrophic: "*For Category Enhanced, a single failure must not have a catastrophic effect upon the aircraft.*" Based on this, the traditional PSE classification cannot be maintained for VTOL aircraft. At the same time, VTOL.2240(a) requests "*to prevent structural failures due to foreseeable causes of strength degradation, which could result in serious or fatal injuries, or extended periods of operation with reduced safety margins."* The associated classification of the structure is however not defined under SC VTOL.2240. This has led to introduce in this MOC the broader definition of Selected Structural Elements (SSE) as parts which carry flight or ground loads, or parts loaded in fatigue the failure of which would reduce the structural integrity of the aircraft.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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9-6	*Airbus Helicopters*	MOC SC-VTOL2240(a) & (b) §2	P 27	In §2, SSEs are defined as "*parts which carry flight or ground loads, or parts loaded in fatigue the failure of which would reduce the structural integrity of the aircraft*". It is well known that any component is more or less subjected to dynamic loads, vibrations, accelerations,… Among the parts whose failure is CAT, some of them are "significantly" loaded in fatigue (so called PSEs in this case, meaning that the fatigue mode is much more critical than the static mode), other ones are not significantly loaded in fatigue (CAT but not PSEs). As a conclusion, AH understands that it is the duty of the applicant to quantify from which level of fatigue stress (or other mean), a component should be considered as "loaded in fatigue" (so SSE), or not. Otherwise, it may be understood that all parts of an should be SSE, which is not realistic.	EASA to confirm that the interpretation is correct.	Not requested	Noted	All parts which carry flight or ground loads, or parts loaded in fatigue the failure of which would reduce the structural integrity of the aircraft should be considered as SSE. Based on this definition, all primary load parts are SSE. For the other parts, it is indeed the responsibility of the applicant to define relevant criteria to classify each part as loaded in fatigue or not.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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9-7	*Leonardo Helicopters*	MOC VTOL.2240 (a) and (b)	27	"Selected Structural Elements (SSE) are parts which carry flight or ground loads, or parts loaded in fatigue the failure of which would reduce the structural integrity of the aircraft." This definition for SSE is a non-exhaustive definition, which could lead to enlarge excessively the original list of structural elements to an unfeasible number of components generally non affected by fatigue and damage tolerance verifications as the ones detailed in the subsequent sections of this MoC: Section 3 and 4, Section 5 and 6, Section 7 and 8. Moreover, the criteria necessary to include or exclude a generic structural element from this list of SSE shoud be also detailed for discriminating this definition respect to the definition of "Principal Structural Element" or "PSE" which is actually the reference element considered by the verification requirements detailed in the AC 27.571, AC 27.573 and the AC 29.571 A and B reported in this MOC as additional guidance for structural durability of both metallic and composite structures for avoiding catastrophic failure.	The Selected Structural Elements (SSE) should be identified through criteria as much possible similar to the ones traditionally adopted to define the list of "Principal Structural Element" or "PSE", in agreement with the verification requirements detailed in the AC 27.571, AC 27.573 and the AC 29.571 A and B that make sense only for a limited list of components in order to have an actually manageable "Airworthiness Limitations Section" or "ALS".	Requested	Noted	See responses to comments 9-5 and 9-6. For Category Basic metallic, paragraph 7(b) allows compliance without establishing retirement time, inspection intervals or other procedures. For Category Enhanced metallic, the reference to AC 29.571B also allows no specific limitations in the ALS provided that criteria are met. For composite elements, ALS limitation may not be necessary for all SSE. The above considerations should reduce the number of limitations in the ALS.
9-8	*TCCA* *AARDD/S*	MOC VTOL.2240 (a) and (b) Section 3(a) and (b)	28	Identifying a SSE should probably come before analysing it.	Reverse the order of 3(a) and 3(b).	Recommended	Accepted	The paragraphs 3(a) and 3(b) are reversed.

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9-9	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3	28	LG are not verified with damage tolerance analysis but in accordance with the "safe life" approach. The verification includes a dedicated fatigue test. Usually a CRI is defined to request deviation from damage tolerance requirement. For skid LG type, the damage tolerance approach is considered notapplicable because the spring elements works in the plastic field. Not sure if the point "(c) fatigue evaluation" at page 32 and point 7 (d) at page 36 can be used to waive the damage tolerance requirement.	Better clarify how this paragraph (fatigue tolerance) applies to landing gears. Fatigue tolerance with the damage identified in (c)(4) may not be applicable to skid landing gears,	Recommended	Noted	Reference to CS 29.571 is already made for compliance with VTOL.2240 (a) & (b) for the category Enhanced. The approach accepted for CS 29.571 will be thus also accepted for VTOL. The practicability addressed in CS 29.571 (i) is generally applicable to most metallic landing gears: *CS 29.571 (i) If inspections for any of the damage types identified in sub-paragraph (e)(4) cannot be established within the limitations of geometry, inspectability, or good design practice, then supplemental procedures, in conjunction with the PSE retirement time, must be established to minimize the risk of occurrence of these types of damage that could result in a catastrophic failure during the operational life of the rotorcraft.* The technical content of this paragraph is included in section 3.(g) of this MOC VTOL.2240 (a) and (b)
9-10	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3	28	As the proposed SSE definition includes nearly the entire aircraft structure, a huge amount of work will be required to perform a threat assessment evaluation of all the elements falling within the SSE definition.	a criteria to exclude structural elements should be proposed in order to concentrate the effort on those element whose actual failure can jeopardize safety of the flight. A different definition of SSE could solve this issue.	Requested	Not Accepted	The definition of SSE does not allow to exclude Primary load paths. However, criteria can be established to classify the additional parts loaded in fatigue. It is expected that applicants will develop their own criteria or methodology to optimise the fatigue evaluation to be performed.
9-11	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3	28	Are fatigue, damage tolerance and residual strength analyses mandatory means of compliance to determine if a structural element is classified as an SSE ?	Please clarify if the analises have to be performed in order to select the elements to be classified as SSE	Recommended	Noted	The SSE are first selected based on the definition provided in section 2. of this MOC VTOL.2240 (a) and (b). Criteria can be proposed by the applicant and agreed by EASA to classify the additional parts loaded in fatigue as SSE. For each SSEs a fatigue damage tolerance evaluation should be performed as described in sections 3, 5, 7 of this MOC VTOL.2240 (a) and (b)

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9-12	*Leonardo Helicopters*	MOC VTOL.2240 (a) and (b) 3 (a)	28	The stement "…to avoid Catastrophic Failure during the operational life of the VTOL." Is is not in line with the requirement 2250(c), which does not allow CAT event after a single failure. In addition in table 2 about "Catastrophic failure" is reported: "Concept not applicable to the VTOL durability objective. To be replaced by "failure".	Remove the statement "…to avoid Catastrophic Failure during the operational life of the VTOL.	Requested	Partially Accepted	Text modified removing the word "catastrophic": ***3. Means of Compliance for structural durability of metallic structures in the category Enhanced:*** *(a) A fatigue tolerance evaluation of each Selected Structural Element (SSE) should be performed, and appropriate inspections and retirement time or approved equivalent means should be established to avoid ~~Catastrophic~~ Failure during the operational life of the VTOL.*
9-13	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3(a)	28	As failure of structural elements cannot have catastrophic effects at aircraft level, no critical caracteristics can be identified. However, a parameter can be identified which represent the lowest design margin	If this margin is large, the structural element should not be considered an SSE.	Recommended	Not Accepted	A significant margin in fatigue damage tolerance will not change the SSE classification. However, significant margin can reduce the impact on the ALS.
9-14	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3(a)	28	A retirement life should not be required because no catastrophic consequences are allowed for failure of structural elements.	Inspection can satisfy the requirement instead of retirement life.	Recommended	Noted	A retirement life may need to be determined depending on the methodology selected for Category Basic and Category Enhanced: this retirement life may be derived from fatigue initiation methods or crack growth propagation up to critical size, for example, associated to limit load residual strength capability.
9-15	*Airbus Helicopters*	MOC SC-VTOL2240(a) & (b) §3	P 27, 28	In §3(a), the statement "*A fatigue tolerance evaluation of each Selected Structural Element (SSE) should be performed, and appropriate inspections and retirement time or approved equivalent means should be established to avoid Catastrophic Failure during the operational life of the VTOL*". It is understood that the fatigue tolerance evaluation and appropriate inspections or retirement times should be established to avoid CAT failures, so that no fatigue tolerance evaluation is required for other failure consequiences ?	Please confirm.	Not requested	Accepted	See response to comment 9-12

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9-16	*Leonardo Helicopters*	VTOL.2240(a)&(b) Point 3(a)	28	The required test evaluation on the SSE elements is expensive and time consuming.	An analysis should be considered sufficient for those elements with large design margins, or when common practice or consolidated experience are available	Recommended	Not Accepted	The principle of “proof of structure” applies for fatigue. As written in section 3.(c)(6) of this MOC VTOL.2240 (a) and (b): analyses supported by test evidence are acceptable. Proof of structure applies for fatigue and will be introduced in a future MOC VTOL .
9-17	*Leonardo Helicopters*	2240(a)&(b) 3.(a)	28	As no structural single point of failure is allowable in the design of the structure, failure of structural element may have minor or no consequences at aircraft level thanks to redundant load path. Stuctural degradation of those elements may be identified by means of visual inspection, whose intent and periodicity can be selected through accepted preventive maintenance development methods (e.g. MSG-3). Perform a fatigue analysis of those stuructural element is therefore considered an excessive burden which only partially increase the safety level	Fatigue tolerance evaluation should be required to those SSE whose failure reduces the margin of safety below a predefined level, considering also redundancies in the design and preventive maintenance tasks aimed at identifying failure in the redundancies.	Recommended	Not Accepted	For Category Enhanced, fatigue tolerance evaluation should be performed for each SSE regardless the classification of the failure. However, simplified criteria can reduce the extent of the demonstration for damage tolerance evaluation. The approach or methodology should be submitted to EASA for acceptance.
9-18	*TCCA* *AARDD/S*	MOC VTOL.2240 (a) and (b) Section 3(b)	28	“Structure sensitive to fatigue” is already defined as being part of the definition of SSE, per section 2.	Remove the second sentence, as those structures are already included in the first sentence: “Each SSE should be identified, as defined in Section 2 of this MOC. Additionally, any other structure sensitive to fatigue should be evaluated. “	Recommended	Accepted	Second sentence removed as suggested. *“Each SSE should be identified, as defined in Section 2 of this MOC. ~~Additionally, any other structure sensitive to fatigue should be evaluated “~~*

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9-19	*Lilium eAircraft*	MOC VTOL 2240 (a) (b) (3)(c)(1)	28	Paragraph 3 (c) (1) requires "in flight measurements to determine the fatigue loads or stresses for the SSEs....." This seems an excessive requirement both on the aircraft structure and propulsion system. Such requirements are not applicable for CS23 and CS25 where in-flight measurements are used to validate the loads models and any points that the designer feels is necessary to validate a hot spot. CS27.571(a) does require: (3) In-flight measurement must be included in determining the following: (i) Loads or stresses in all critical conditions throughout the range of limitations in CS 27.309, except that manoeuvring load factors need not exceed the maximum values expected in operation But this is not as severe as requiring all SSEs to have in-flight measurements.	Suggest that the wording of MOC 2240 is changed to: Paragraph 3 (c)(1) Fatigue loads and stresses used for the durability analysis of SSIs are to be validated by in flight measurements sufficient to cover both the range of design limitations required in MOC VTOL 2200 (including altitude effects) and the variations of SSEs. Scope of measurements are to be agreed with EASA.	Requested	Not Accepted	In flight measurements have been the approach to support the determination of the loads and stress at rotorcraft and component levels. A similar comprehensive understanding of the loads and stress distribution is expected for VTOL. The wording proposed in the MOC is consistent with CS 29.571 (e) (1)
9-20	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 3 (c)(1)	28	The term "fatigue tolerance evaluation" is not typically used in industry. Suggest using "durability evaluation" that aligns better with the section title. The fatigue loads or stresses used for the durability evaluation can be achieved also by using the loads or stresses obtained from previously validated methods.	Suggest the following revision: *(c) Each* ***durability*** ~~*fatigue tolerance*~~ *evaluation* ***should include: fatigue loads or stresses for the SSE determined either from In-flight measurements or from previously validated method as*** ~~*to determine the fatigue loads or stresses for the SSEs*~~ *identified in (b) in all critical conditions throughout the range of design limitations required in MOC VTOL 2200 (including altitude effects), except that manoeuvring load factors need not exceed the maximum values expected in operations.*	Requested	Not Accepted	The wording is kept consistent with CS 29.571 (e)(1) . In flight measurements have been the approach to support the determination of the loads and stress at rotorcraft and component levels. A similar comprehensive understanding of the loads and stress distribution is expected for VTOL.

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9-21	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 3 (c)(1)	28	The term “fatigue tolerance evaluation” is not typically used in industry. Suggest using “durability evaluation” that aligns better with the section title. The fatigue loads or stresses used for the durability evaluation can be achieved also by using the loads or stresses obtained from previously validated methods.	Suggest the following revision: *(c) Each* ***durability*** ~~*fatigue tolerance*~~ *evaluation* ***should include: fatigue loads or stresses for the SSE determined either from In-flight measurements or from previously validated method as*** ~~*to determine the fatigue loads or stresses for the SSEs*~~ *identified in (b) in all critical conditions throughout the range of design limitations required in MOC VTOL 2200 (including altitude effects), except that manoeuvring load factors need not exceed the maximum values expected in operations.*	Requested	Not Accepted	See response to comment 9-20
9-22	*Lilium eAircraft*	MOC VTOL 2240 (a) (b) 3(c)(5)	29	Threat assessment required for all SSEs in MOC 2240 3(c)(5). Not usual for metallic materials The use of threat assessments is normal for composite materials but not for metallics. Is the aim to cover the normal environmental considerations including wear by a threat assessment? If the intent is to include coverage to metallic materials, please explain the rationale/justification.	Add “For composite structures” at the beginning of (3)(c)(5).	Requested	Not Accepted	Threat assessment is not specifically associated to composite structure. The threat assessment should include accidental damage, corrosion, fatigue… It should be demonstrated that the fatigue tolerance evaluation method developed by the applicant addresses these degradations. A threat assessment is also required by CS 29.571 Amdt 3 and later
9-23	*TCCA* *AARDD/S*	MOC VTOL.2240 (a) and (b) Section 3(d)	29	For CS-25, residual strength is checked for a subset of limit load cases. For instance, some ground gust cases might be critical for certain structures but are not typically included in the residual strength check.	Provide more detailed guidance on load cases to be considered.	Recommended	Not Accepted	Selection of the limit loads for residual strength evaluation is a conservative approach and should be considered as a baseline. However the applicant can propose a subset of limit load cases if relevant and justified.
9-24	*Leonardo Helicopters*	2240(a)&(b) 3.(f)	29	Inspection should be included in the ALS section of the ICA only when classification of the effect of the failure is Hazardous	Include the possibility that task generated by the fatigue evaluation are included in the Chapter 5.	Recommended	Not Accepted	The inspection and retirement times or approved equivalent means established under this Section should be included in the Airworthiness Limitation Section of the Instructions for Continued Airworthiness required by VTOL.2625. See also response to comment 9-7

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9-25	*Leonardo Helicopters*	2240(a)&(b) 3.(g)	29	Since no single structural point of failure are allowed, no catastrophic result can be a consequence of a damage identified in (c)(4)	Remove the reference to catastrophic consequences or include a reference to multiple failures	Recommended	Accepted	Word “catastrophic” is deleted in section 3.(g) of this MOC VTOL.2240 (a) and (b): *If inspections for any of the damage types identified in (c)(4) cannot be established within the limitations of geometry, inspectability, or good design practice, then supplemental procedures, in conjunction with the SSE retirement time, should be established to minimize the risk of occurrence of these types of damage that could result in a ~~catastrophic~~ failure during the operational life of the VTOL aircraft.*
9-26	*Leonardo Helicopters*	2240(a)&(b) 3.(h)	29	This point is redundant to the one referenced	Remove this point	Recommended	Not Accepted	The referenced discrete source damages should be addressed in this MOC VTOL.2240 (a) and (b).
9-27	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 4	29	As Part 23 is also applicable to the VTOL operational conditions, Part 23 references should also be listed.	Recommended to include Part 23 references in addition to Part 27/29.	Requested	Not Accepted	The durability under CS 23 (Amdt 4) is addressed under 23.571, 572 and 574 for metallic structure. Reference to CS 27 and 29 is more accessible and applicable to SC VTOL 2240 (a) & (b) durability .
9-28	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 4	29	As Part 23 is also applicable to the VTOL operational conditions, Part 23 references should also be listed.	Recommended to include Part 23 references in addition to Part 27/29.	Requested	Not Accepted	See response to comment 9-27
9-29	*GAMA*	MOC VTOL.2240 (a) and (b), Section 4, Table 2	30	Should the FMEA be required for fatigue of metallic structures for category enhanced? “(f).(2).(i) The first sentence is deleted, since the Failure Mode and Effects Analysis is not required for VTOL durability.”	Do not delete FMEA for VTOL durability compliance	Suggestion	Not Accepted	The criteria selected for SSE is as defined in section 2. Of MOC VTOL.2240 (a) & (b). The FMEA does not help to determine the SSEs.

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9-30	*Volocopter GmbH*	MOC VTOL.2240(a)&(b) Table 2 and Table 3	29 30	The applicability of the concepts "failure" vs. "catastrophic failure" is unclear. It is mentioned in the tables “Catastrophic failure: Concept not applicable to the VTOL durability objective.To be replaced by “failure”. However, MOC VTOL.2240(a)&(b) uses the concept "Catastrophic failure" in several places (e.g. Section 3.(a), 3.(g)). If the both concepts are used, it should be clarified which means of compliance applies to which kind of failure (catastrophic or not), especially as there are some overlaps in the provided guidances between MOC VTOL.2240(a)&(b) and the referenced AC 29.571 and AC 27.573, which therefore apply to either “Catastrophic failures” (through MOC VTOL.2240) or “(any) failure” (through AC 29.571/573).	Either remove “catastrophic” in the whole text of this MOC or clarify the two concepts "failure" vs. "catastrophic failure" and which means of compliance and guidances apply to each.	Requested	Accepted	The word “catastrophic is removed. See also response to comments 9-12 & 9-25
9-31	*GAMA*	2240.5.b	31		Should something be included about the effects of corrosion? Should the adverse effects of corrosion be included/considered for other places in the document (maybe Table 4 on page 37).	Recommended	Noted	Corrosion is addressed under AC 29.571 referred in table 2. For metallic SSE Category Enhanced : *(vi) Damage Tolerance is the attribute of the structure that permits it to retain its required residual strength without detrimental structural deformation for a period of un-repaired use after the structure has sustained a given level of fatigue, corrosion, accidental, or discrete source damage.* For Category Basic, the effect of corrosion need not be considered for durability of metallic SSE. Protection from corrosion is addressed in VTOL.2255. Corrosion is also addressed for composite SSE under AC 27.573 referred to in table 3.

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9-32	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 5 (b)(4)	32	The section covers both composite and metallic structure and the limit load is only applicable to metallic structure in general.	The required residual strength for the assumed damage established after considering the damage type, inspection interval, detectability of damage, and the techniques adopted for damage detection. ~~The minimum required residual strength is the limit load.~~	Requested	Not Accepted	Section 5. (b)(4) is relevant for composite. Interval inspection is associated to limit load capability as a minimum. This wording is consistent with CS 27.573.
9-33	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 5 (b)(4)	32	The section covers both composite and metallic structure and the limit load is only applicable to metallic structure in general.	The required residual strength for the assumed damage established after considering the damage type, inspection interval, detectability of damage, and the techniques adopted for damage detection. ~~The minimum required residual strength is the limit load.~~	Requested	Not Accepted	See response to comment 9-32
9-34	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 5 (c)	32	The section (c) Fatigue Evaluation is typically not applicable for composites. It is uncertain how the acceptable level of manufacturing defect will be addressed by this section.	Suggest removing this section (c) Fatigue Evaluation, or add a high level statement that this approach is typically not used for composites.	Requested	Not Accepted	The section 5.(c) of the MOC VTOL (a) & (b) is applicable to composite and is consistent with the existing CS 27.573 (d). This approach is comparable to the alternative proposed under CS 29.571 (When demonstrated impractical, fatigue evaluation can be performed).
9-35	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 5 (c)	32	The section (c) Fatigue Evaluation is typically not applicable for composites. It is uncertain how the acceptable level of manufacturing defect will be addressed by this section.	Suggest removing this section (c) Fatigue Evaluation, or add a high level statement that this approach is typically not used for composites.	Requested	Not Accepted	See response to comment 9-34
9-36	*TCCA* *AARDD/S*	MOC VTOL.2240 (a) and (b) Section 5(d)	33	Further guidance would be useful, e.g. regarding the allowance for reduced "get-home" loads after a discrete damage event.	To provide further guidance on the load cases that the structure is expected to withstand with damage present (e.g. X% of limit load for maneuvering cases and Y% of limit load for gust cases).	Recommended	Noted	Residual strength should not go below limit loads capability. For get home loads, the loads associated to Continued Safe Flight and Landing (for Category Enhanced) or Controlled Emergency Landing (for Category Basic) are highly dependent of the VTOL configuration and the instruction given to the pilot. However, they should include the most critical operational loads consistent with the configuration and instruction.

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9-37	*TCCA* *AARDD/S*	MOC VTOL.2240 (a) and (b) Table 3	33	There are specific FAA procedures that have NOT been considered in terms of EASA equivalent, e.g. (f).(1).(iv) (A) to (C) where FAA, MIDO etc are discussed.	Replace FAA terms with corresponding EASA terms	Requested	Not Accepted	There is no direct equivalent process for EASA certification.
9-38	*Leonardo Helicopters*	MOC VTOL.2240 (a) and (b) 7 (c)	36	It should be shown that the probability of catastrophic fatigue failure is extremely remote within a replacement time furnished under MOC VTOL.2625. Please clarify the statement 'Catastrophic' that is not applicable to the VTOL and the word 'extremely remote' that is applicable for hazardous failure condition	Please review the statement	Recommended	Accepted	The word "catastrophic" is removed. (c) *Replacement time evaluation*. It should be shown that the probability of ~~catastrophic~~ fatigue failure is extremely remote within a replacement time furnished under MOC VTOL.2625.
9-39	*Leonardo Helicopters*	MOC VTOL.2240 (a) and (b) 7 (d)(3)	36	Please clarify with an example the requirement. Assuming a redundant configuration, seems that the evaluation should be performed as follows: (probability of failure item 1) x (inspection interval) x (probability of failure item 2) =< extremely remote (i.e.10E-7) Is it correct?	Please clarify and introduce an example to the requirement	Requested	Noted	The 7(d) (3) condition request to offer enough opportunity for detection. Factors should be applied on the interval between detectable and limit (critical). This wording is constent with CS 27.571 with the exception of "catastrophic".
9-40	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 7 (d)(3)	36	The current industry practice for the Instructions for Continued Airworthiness does not include probability calculation to show extremely improbable. Section 7(e) is also applying systems engineering approach to the structural substantiation. This approach should be provided as a possible approach in addition to the current industry practice of ICA.	Suggest removing the following sentence: ~~It should be shown that the interval determined under (d)(2) is long enough, in relation to the inspection intervals and related procedures furnished under MOC VTOL.2625, to provide a probability of detection great enough to ensure that the probability of failure is extremely remote.~~	Requested	Not Accepted	The condition in 7(d) (3) requests to offer enough opportunity for detection. Factors should be applied on the interval between detectable and limit (critical). This wording is constent with CS 27.571(d)(3) with the exception of the word "catastrophic" which is omitted here.
9-41	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 7 (d)(3)	36	The current industry practice for the Instructions for Continued Airworthiness does not include probability calculation to show extremely improbable. Section 7(e) is also applying systems engineering approach to the structural substantiation. This approach should be provided as a possible approach in addition to the current industry practice of ICA.	Suggest removing the following sentence: ~~It should be shown that the interval determined under (d)(2) is long enough, in relation to the inspection intervals and related procedures furnished under MOC VTOL.2625, to provide a probability of detection great enough to ensure that the probability of failure is extremely remote.~~	Requested	Not Accepted	See response to comment 9-40

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9-42	*Leonardo Helicopters*	MOC VTOL.2240 (a) and (b) 7 (e)	36	"combination of replacement time, inspection intervals, and related procedures furnished under MOC VTOL.2625". Furnished procedures under 2625 are replacement time or inspection intervals. Is not clear which are other related procedures and What is the difference witn (d)(3)	Please review and clarify	Requested	Noted	The guidance proposed is consistent with CS 27.571: 7.(c) addresses replacement time 7.(d) addresses interval inspection and 7.(e) addresses combination or other procedures.
9-43	*GAMA*	MOC VTOL.2240 (a) and (b) Structural durability Section 7 (f)	36	This portion seems to be out of scope promoting an "endurance limit" approach.	Suggest removing the following subsection: ~~(f) Fatigue strength: The structure should be designed, as far as practicable, to avoid points of stress concentration where variable stresses above the fatigue limit are likely to occur in normal service.~~	Requested	Not Accepted	7.(f) is consistent with CS 23.627 *Fatigue evaluation* and addresses design practice to minimise the risk of fatigue
9-44	Boeing	MOC VTOL.2240 (a) and (b) Structural durability Section 7 (f)	36	This portion seems to be out of scope promoting an "endurance limit" approach.	Suggest removing the following subsection: ~~(f) Fatigue strength: The structure should be designed, as far as practicable, to avoid points of stress concentration where variable stresses above the fatigue limit are likely to occur in normal service.~~	Requested	Not Accepted	See response to comment 9-43

10.MOC VTOL.2240(D) HIGH ENERGY FRAGMENTS – PARTICULAR RISK ANALYSIS

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10-1	*Lilium eAircraft*	MOC VTOL 2240(d) (3)(b)	38	All three aspects …, however not necessarily equally." Statement in bold seems ambiguous and open to different interpretations from applicants.	EASA is kindly requested to clarify how para 3(b) is related with existing engineering, manufacturing and service management processes for life-limited parts of the lift/thrust unit	Recommended	Noted	The Structural Failure Rate is a framework to determine a probability of failure by a qualitative approach, when a quantitative approach is not possible. The considerations are in addition to standard processes for life-limited parts, required by 2240 (a) and (b) Structural Durability. For compliance with VTOL.2250(c), each of the 3 aspects to consider must be equally addressed. This is not necessary for determining the Structural Failure Rate for 2240(d), i.e. the aspects may have different weights. No change to the MOC is considered necessary.
10-2	*Vertical Aerospace*	MOC VTOL.2240(d) (b)	38	VA aknowledges the reasons for setting the limit at 10-7 for the probability of failure the industry can claim. Setting this figure effectivley provides a proabaility of impact at 1/100 to achieve the cascading risk target for Enhance category. VA consideres the 10-7 as the overall proability of structrural failure, taking into account higher and lower loads exeprianced by High energy sources through the flight envelope.	EASA to make clear if the 10-7 maximum claimed structural failure rate is for the entire flight envelope (averaged) or should be achieved for each flight phase (e.g. Take off, Transistion, Landing, Cruise).	Requested	Noted	The Design Robustness aspect may be affected by the flight phase, configuration and power levels. Whereas, Quality of the Part and In-Service Continued Structural Robustness are considered independent. The Structural Failure Rate may not necessarily be constant. However, 10-7 is the maximum limit to not be exceeded and not an average value. No change to the MOC is considered necessary.

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10-3	*Airbus Helicopters*	MOC SC-VTOL2240(d) 3 Structural Failure rate (b)		It is unclear if a probability lower than 10-7 per flight hour can be used or not. If not, the objective of 10-9 for cascading events seems to be unachievable. The factor 100 will be difficult (impossible?) to establish based on angular factors and flight phases.		Recommended	Noted	A probability lower than 10-7 per flight hour cannot be used for the Structural Failure Rate for compliance with VTOL.2240(d). Catastrophic consequences are not permitted for the first impact, independent of the structural failure rate. It is considered that meeting the 10-9 objective for cascading events, i.e. second release, second impact and subsequent events, although challenging, is achievable. This criteria is necessary to achieve the targeted global aircraft safety level. Given the comments received in this consultation and through the stakeholder working group EUROCAE WG112 SG2, it was decided to modify the analysis for category Enhanced to allow the effect of a second impact or subsequent impacts to be Catastrophic if extremely improbable. This complexifies the analysis but gives an additional opportunity to use a probabilistic approach to show compliance. In turn, considerations for the residual risk have been added to verify that the combined risks do not exceed an acceptable level. The analysis for category Basic was also modified to retain proportionality by focusing on Basic 3 (7 to 9 passengers) and on Catastrophic events, and allowing minimisation of this risk by design to the maximum practicable extent, subject to EASA acceptance.
10-4	*GAMA*	MOC VTOL.2240(d) High Energy Fragments – Particular Risk Analysis Section 3	38	A clarification is requested if the 2250(c) approach can be used to justify up to 1E-7	N/A	Requested	Noted	The MOC VTOL.2250(c) approach can be used to qualitatively estimate a Structural Failure Rate between 1 and 1E-7, for compliance with VTOL.2240(d). See also response to comment 10-3.

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10-5	Boeing	MOC VTOL.2240(d) High Energy Fragments – Particular Risk Analysis Section 3	38	A clarification is requested if the 2250(c) approach can be used to justify up to 1E-7	N/A	Requested	Noted	See response to comment 10-4
10-6	*Airbus Helicopters*	MOC SC-VTOL2240(d)	**Fig 1, Fig 2**	The notion of first failure, second failure, third failureis misleading because there is only one failure (root cause) and several effects. By the way a single cascade can affect at the same time (without subsequent cascade) several items creating several "failures"	Replace "first failure" by "initial failure" and "second failure" by "first cascading effect", etc	requested	Partially Accepted	EASA agree that the cascading events could be considered the consequences of a single initial failure and that a single cascade can affect at the same time (without subsequent cascade) several items creating several "failures". However, the MOC VTOL.2240(d) describes a PRA for rotorburst. Terminology has been updated to clearly define first release, first impact, second release, etc.
10-7	*Airbus Helicopters*	MOC SC-VTOL2240(d) (2d safety analysis)		"The first failure shall not have an immediate catastrophic effect.": the notion of "immediate" can be understood as can have catastrophic effect later. This is for example the case if a battery is affected, reducing the availaible flight time at a catatrophic level, but not immediately. The notion of first failure needs also to be harmonized with comment #	The initial failure, without consideration of possible cascading effects shall not have a catastrophic effect	requested	Partially Accepted	MOC VTOL.2240(d) and the terminology used have been updated to clearly define first release, first impact, second release, etc, and to clarify "immediate catastrophic effect".

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10-8	*Airbus Helicopters*	MOC SC-VTOL2240(d) (2d safety analysis)	**Fig 2**	WG112 SG2 draft paper makes a difference between on the one hand other LTR and on the other hand system and airframe for the quantification WG63 within future ED135 highlighted that a PRA is a global vision at A/C level of cumulated cascading effects It's disturbing to have a PRA method applicable to any kind of A/C and any kind of risk (UERF, tire burst, bird strike, etc), and a specific method for VTOL high energy fragment, whereas the standard method can be applied.	Add a sentence to avoid any mis-interpretation. ED135 provides guidance about PRA. The initial failure and all subsequent cascading effects (other LTR, airframe, systems, etc) should be considered by the PRA and considered to determine the acceptability level (Pr<10-9)	requested	Not Accepted	MOC VTOL.2240(d) is a specific PRA to address rotorburst. The content has been updated to align, as far as possible, to the standard method. Reference to another standard (ED135) is not considered necessary at this time.
10-9	*Airbus Helicopters*	MOC SC-VTOL2240(d) (2b path of fragments)		Determine path of fragments for initial propeller release seems to be something achievable. Considering cascading effects (one propeller affecting a second propeller), the trajectory of second propeller fragments can be more difficult to establish	Add a caution to explain that same model cannot be used for initial failure and cascading trajectories	Recommended	Not Accepted	This is considered more appropriate to be included in the WG112 SG2 standard and not at MOC VTOL level. Clarification was added for category Basic 3 regarding the applicability of AMC 20-128A and AMC 25.963(e).

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10-10	Safran	2240(d)2.(d)	25 of MOC 1	The way to proceed to carry out the quantitative analysis can be interpreted in different ways. An initial failure of a rotating element can cause several propagation scenarios leading to multiple effects (or several Failure Conditions), several of which may be CAT and some of which may not be mutually exclusive. The text and figure 1 are very general. It does not specify: - if we are interested in the frequencies of each catastrophic effect taken separately whether they are independent of each other or dependent, and this resulting only from the same initial failure of an element, - if we consider all the effects leading to the same Failure Condition (according to FHA) resulting only from the same initial failure of an element, - if we must consider all the elements leading to each Failure Condition (according to FHA) since there can be several cascades, and initiating event or failures, which lead to the same FC (as is generally done for systems).	Could you better characterize the expected? As specified in MOC VTOL 2250 (c) an FHA of the functions of the structure is carried out. It captures FCs and associated classifications. How should the safety demonstration of each FC be constructed by integrating the intrinsic failures of the structure as well as the extrinsic failures?	Choose an item.	Noted	MOC VTOL.2240(d) is a specific PRA to address rotorburst and has been updated to provide additional clarification. For rotorburst, the most critical fragment should be considered. Compliance with VTOL.2240(d) will be supported by a EUROCAE Standard (WG112, SG2, DP3) which will describe an acceptable process and methodology.

11.MOC VTOL.2240 (E) IN-SERVICE MONITORING

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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11-1	*Leonardo Helicopters*	2240(e) (a)	38	'parts having an important bearing on safety in operations are parts the failure of which has hazardous or catastrophic effects for the aircraft.' No parts can have failure effect classified as catastrophic.	Remove the word 'catastrophic'	Recommended	Not Accepted	There is the possibility to have a limited number of parts with Catastrophic failure consequences for Category Enhanced. These fall under the MOC VTOL.2250(c) "simply loaded static elements" on a case-by-case basis. In-service monitoring is needed to support structural failure rate determination for these elements. Therefore Catastrophic is kept.
11-2	*Leonardo Helicopters*	MOC VTOL.2240 (e),(b)	38	Does "necessary means" refer to hardware equipment for real-time acquisition and monitoring or refer to maintenance inspection on ground?	It should specified what "necessary means" are.	Recommended	Partially Accepted	Necessary means are linked to data that could be used to support In-Service Monitoring programme, as listed in (d) of this MOC. These means could include both means listed in the comment: "hardware equipment for real-time acquisition monitoring" and "maintenance inspection on ground". For clarity the following modification is provided to MOC VTOL.2240 (e): ***"(d) The following ~~data~~ means can be used to support the In-Service Monitoring programme:"***
11-3	*GAMA*	2330	54		Requirement that not only is in-service monitoring (HUMS, unscheduled maintenance, etc) a requirement, but that the data collected should be furnished to EASA via regular reports.	Recommended	Noted	MOC VTOL.2240(e) already mentions that : "Regular reports stating the findings of the In-Service Monitoring programme during service should be furnished to EASA, assessing all findings made."
11-4	*Leonardo Helicopters*	2240 (e)	38	Does the in service monitoring applyes to electrical provisions used to ground electronic equipment mounted in a Direct Effect of Lightning environment?	Please clarify	Recommended	Noted	"VTOL.2240 Structural Durability" is in Subpart C "Structures"/"Structural performance", and is therefore applicable to structural parts only. No update to the MOC is considered necessary.
11-5	*Leonardo Helicopters*	MOC VTOL.2240 (e) (c)	38	The aim of this comment is to clarify if the In-Service Monitoring programme is applicable also to the life of the type design in terms of HIRF and IEL protection (ref. to MOC VTOL.2515 and MOC VTOL.2520).	Lightning may be a forseenable cause of structural failure, this could be included in the analysis of the occurrence under Para (d)(1). Please clarify.	Recommended	Noted	The degradation or failure of parts following a lightning may result in "occurrence reports" and/or "strip reports / analysis at overhaul" for instance. The Agency considers that the list provided in sub-paragraph (d) of this MOC should list the sources for data analysis rather than all potential sources of structural damages such as lightning.

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11-6	*Leonardo Helicopters*	2240(e)	38	most of the data to support in service monitoring (listed in point d) are not available at the entry in service of the eVTOL. These data comes with previous similar eVTOL or database	Please clarify that the in-service monitoring become effective only when sufficient data from the field are available, which can take years. Initial evaluation will be based on data gathered during experimental flight tests.	Recommended	Noted	The In-Service Monitoring programme should be in place at Entry Into Service (EIS). This means that "necessary means to verify the health and operating conditions to help ensure the continued durability, integrity and functionality of the part" should be agreed with the Agency during the certification process and that the data "used to support the In-Service Monitoring programme" should be colleted and analysed from EIS.
11-7	*Leonardo Helicopters*	2240 (e)	38	The availability of a reliable analysis toolset and procedures able to allow a revision of the usage spectrum defined at design time resulting from the post-flight analysis of the dataset recorded by dedicated Health and Usage Monitoring Systems (HUMS) fitted on board, would be sufficient, for EASA, to guarantee the compliance with the requirements of the In-Service Monitoring detailed in this MoC for "parts the failure of which has hazardous or catastrophic effects for the aircraft"?	Please, can EASA specifies the role plaied by the different data reported in section (d) of this MoC to fully satisfy the requirements of an In-Service Monitoring programme for "parts the failure of which has hazardous or catastrophic effects for the aircraft".	Recommended	Noted	Health and Usage Monitoring Systems (HUMS) data may not be enough to help ensure the continued durability, integrity and functionality of the monitored part, as HUMS may, depending on the part in question and the system capabilities, not be capable to address all aspects of durability, integrity and functionality. This is why additional data other than HUMS, as listed in (d) of this MOC, may be needed. For example, the part in question may be subject to damage or degradation which may not be detectable by HUMS. Paragraphs (b) and (c) define the objectives of the In-Service Monitoring programme and it is the role of the applicant to evaluate the needs of every part and define the programme needs accordingly.
11-8	*Leonardo Helicopters*	2240(e) (d)(11)	38	It should be clarified which is the goal in identify changes in utilization	Please clarify if this could lead to changes in the assumption used during the certification process. (e.g. utilization spectra)	Recommended	Noted	The action to evaluate the changes in utilization and operating environment may be needed, as part of the In-Service Monitoring programme, to ensure that the assumptions made at the time of certification remain valid in service. A finding indicating that an assumption may not be supported could, following evaluation of the potential impact on the certification results, lead to continued airworthiness action, for example revision of fatigue lives with updated utilization.
11-9	*Leonardo Helicopters*	MOC VTOL.2240 (e)	38	Does the in-service monitoring programme include only health structural monitoring or the monitoring of any other system?	If the rule is intended to cover the health monitoring of the structure and any other subsystem should be clearly stated as this may impact the requirements definition of all the subsystems involved.	Recommended	Noted	"VTOL.2240 Structural Durability" is in Subpart C "Structures"/"Structural performance", and is therefore applicable to structural parts and structural assemblies including supporting and interconnecting elements such as bearings and fasteners. No update to the MOC is considered necessary

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11-10	*Leonardo Helicopters*	2240 (e)	38	In the framework of the "Usage monitoring data", which is reported in the list of data that can supports the In-Service Monitoring programme, is the EASA intendment to allow the applicant to revise the usage spectrum, defined at design time, on the basis of the evidences provided by the actual usage of a specific eVTOL fleet?	Please, can EASA specifies which is the meaning of performing the proposed In-Service Monitoring programme by "Usage monitoring data".	Recommended	Noted	A proposal for a change to the usage spectrum used for certification could be supported by the usage monitoring data but the primary intent of the In-Service Monitoring is to ensure Continued Airworthiness. See also response to comment 11-8.
11-11	*Rolls-Royce Deutschland*	MOC VTOL.2240(e) In-Service monitoring Bullet Point (g)	39	"…assessing all findings made". Wouldn't a level of major and higher failure consequences being sufficient rather than all ?		Recommended	Not Accepted	In-Service Monitoring applies only to parts the failure of which has hazardous or catastrophic effects for the aircraft. All findings (such as degradations, failures, unanticipated usage…) detected through the In-Service Monitoring programme should be assessed.

12.MOC VTOL.2245 AEROELASTICITY

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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12-1	*TCCA* *AARDD/S*	MOC VTOL.2245	39	VTOL.2245 Aeroelasticity does not mention an aeroelastic analysis per se as a requirement. In MOC for VTOL.2245 an analysis is mentioned in (a) General: "Compliance with this paragraph should be shown by analyses, tests, or some combination thereof". This sentence suggests that freedom from aeroelastic instability may be demonstrated without an analytical investigation. This seems to be accepting a high level of risk for certifying aircraft in the enhanced category. Tests alone cannot be sufficient to determine the influence of a large number of parameters involved in both nominal and especially failure conditions. Additionally, using tests alone does not allow establishing aeroelastic stability trends as the aircraft airspeed is increased.	Replace VTOL.2245 (a) "Compliance with this paragraph should be shown by analyses, tests, or some combination thereof." with "Compliance with this paragraph should be shown by analyses and tests."	Requested	Accepted	MOC VTOL.2245 Section (a) Removed: "*Compliance with this paragraph should be shown by analyses, tests, or some combination thereof.*" Added: "*Compliance with this paragraph should be shown by analyses and tests.*"
12-2	*TCCA* *AARDD/S*	MOC VTOL.2245	39	On page 1, it is stated that "the proposed MOCs should enable an equal treatment of all applicants, by establishing a level playing field and ensuring that a comparable level of safety in the compliance with the objectives of the Special Condition is achieved by all designs." Since there is no mention in VTOL.2245 Aeroelasticity nor in MoC VTOL.2245 Aeroelasticity of any basic features for the aeroelastic analyses as part of demonstrating compliance with VTOL.2245 Aeroelasticity, the task of ensuring a comparable level of safety will have no regulatory basis, rely on personal experiences and, thus, not enable the above goal of ensuring a comparable level of safety.	Replace VTOL.2245 (a) "Compliance with this paragraph should be shown by analyses, tests, or some combination thereof." with "Compliance with this paragraph should be shown by analyses and tests. The following basic elements should be modelled in aeroelastic stability analyses - the elastic, inertial, and aerodynamic characteristics of the system. The degree to which other characteristics need to be included in the modeling depend upon the system complexity."	Requested	Not Accepted	It is understood that the modelling should be adapted to the complexity of the VTOL configuration. However, the methodology and its conservatism, the analysis and the level of test should be discussed and agreed at project level.

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12-3	*TCCA* *AARDD/S*	MOC VTOL.2245	39	No definitive MOC, nondefinitive MOC or guidance material is offered for possible analyses required to establish compliance with VTOL.2245 Aeroelasticity. In fact as discussed in another comment, such analyses may not even be performed for compliance with VTOL.2245 Aeroelasticity. Similar to a certification process of other aircraft types that carry people, these MOCs should specify the elements to be modelled in aeroelastic stability analyses.	Replace VTOL.2245 (a) "Compliance with this paragraph should be shown by analyses, tests, or some combination thereof." with "Compliance with this paragraph should be shown by analyses and tests. The following basic elements should be modelled in aeroelastic stability analyses - the elastic, inertial, and aerodynamic characteristics of the system. The degree to which other characteristics need to be included in the modelling depends on the system complexity."	Requested	Not Accepted	Due to the wide range of VTOL configuration and design it is not feasible to specify the exact analysis to be carried out. Existing guidance for CS23, 25, 27 or 29 may be found appropriate and can be selected by the applicant as applicable See also answer to comment 12-2
12-4	*Rolls-Royce Deutschland*	MOC VTOL.2245 Aeroelasticity	39	Where is the VTOL specific requirement for a propeller being addressed ? the current CS-P is not addressing stability aspects associated with transition from vertical to horizontal flight.		Recommended	Partially Accepted	VTOL 2245 addressed the complete aircraft configuration including the installed Lift Thrust Unit which includes also propeller. Reference to transition phase is now specifically included. MOC VTOL 2245 (*b) "Aeroelastic stability envelopes. The aircraft should be designed to be free from aeroelastic instability for all configurations and design conditions, <u>including transition phases</u>, within the aeroelastic stability envelopes as follows: …"*
12-5	*Volocopter GmbH*	MOC VTOL.2245(b)(3)	39	"Failure conditions of certain systems should be treated in accordance with VTOL.2205. For these failure conditions, the speed clearances defined in MOC VTOL.2205 Figure 3 apply." It is unclear to which systems applies this remark. Are there the systems covered by MOC VTOL.2205?	Precise the scope of the systems that are concerned by the aeroelastic stability envelopes assessment of MOC VTOL.2245 in accordance with VTOL.2205.	Recommended	Not Accepted	Reference to VTOL.2205 and the wording "certain system" is consistent with CS 25.629. The intention is to consider any system, the failure or malfunction of which could affect aeroelasticity. No change is found necessary

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12-6	*Leonardo Helicopters*	MOC-VTOL.2245 (c)(2)	39	Regulations MOC-VTOL.2245(c)(2) contain requirements concerning single failures, malfunctions, or disconnections, and any combination of these. Compliance with these requirements typically involves conducting: • Numerical-probability analyses (fault tree) to show that catastrophic events are extremely improbable, and • Qualitative and quantitative assessments to show that latent failures have been minimized.	These analyses and assessments generally have not included system's structural elements. Therefore, new guidance materials in these areas are needed.	Recommended	Noted	The possibility to exclude certain failures has been introduced provided that the failure is extremely improbable. The Applicant can propose a method for this demonstration to be discussed and agreed with EASA. Otherwise, the failure should be considered.
12-7	*Volocopter GmbH*	MOC VTOL.2245(c)(7)	40	"Failures, malfunctions, and adverse conditions. The failures, malfunctions, and adverse conditions which should be considered are: (…) Any other combination of failures, malfunctions, or adverse conditions not shown to be extremely improbable." This sentence is very generic, so does not provides specific guidance.	Either delete the sentence or precise which kind of failures have to be considered here: it is expected the ones having an effect on the aeroelastic stability of the aircraft.	Recommended	Noted	The intention is to consider any failure which could affect aeroelasticity. This is dependent on the design and configuration of the VTOL aircraft. These failures will be agreed at project level. This wording is consistent with CS 25.629

13.MOC VTOL.2250(C) NO CATASTROPHIC EFFECT FROM STRUCTURAL SINGLE FAILURES IN THE CATEGORY ENHANCED

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13-1	*Leonardo Helicopters*	2250(c)	40	"It should address each of the three following aspects (1) to (3) including any relevant items from the following non-exhaustive lists for each of them:"	With the wording "any relevant items" it appears that everything should be addressed. Understanding was that only some of those items may be considered, up to the point where satisfaction of the safety objective is shown. Please clarify if only a combination of items has be considered or the entire set.	Requested	Accepted	Sentence reworded to "It should address each of the three following aspects (1) to (3), for which a non-exhaustive list of examples is provided below for each aspect:"
13-2	*GAMA*	MOC VTOL.2250(c) No catastrophic effect from structural single failures in the Category Enhanced	40	"acceptable combination of compensating provisions" is not well defined.	Suggest rewording: *For structural elements or parts and failure modes identified in (a)(5)(ii), if a quantitative assessment is not directly feasible, ~~an acceptable combination of~~ compensating provisions should be implemented that provides sufficient confidence to achieve the safety objective and is appropriate to address the failure mode that could result in catastrophic consequences.* ***Non-exhaustive examples are provided below:*** *~~It should address each of the three following~~ It should address each of the three following aspects (1) to (3) including any relevant items from the following non-exhaustive lists for each of them:~~*	Recommended	Partially Accepted	Each of the 3 aspects should be addressed. Sentence reworded to "It should address each of the three following aspects (1) to (3), for which a non-exhaustive list of examples is provided below for each aspect:"
13-3	Boeing	MOC VTOL.2250(c) No catastrophic effect from structural single failures in the Category Enhanced	40	"acceptable combination of compensating provisions" is not well defined.	Suggest rewording: *For structural elements or parts and failure modes identified in (a)(5)(ii), if a quantitative assessment is not directly feasible, ~~an acceptable combination of~~ compensating provisions should be implemented that provides sufficient confidence to achieve the safety objective and is appropriate to address the failure mode that could result in catastrophic consequences.* ***Non-exhaustive examples are provided below:*** *~~It should address each of the three following It should address each of the three following aspects (1) to (3) including any relevant items from the following non-exhaustive lists for each of them:~~*	Recommended	Partially Accepted	See EASA response to #13-2

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13-4	*Airbus Helicopters*	MOC VTOL.2250(c) Paragraph (b)	P40	Title of paragraph (b) “Structural Failure Rate “ is not corresponding to the content of the paragraph.	Suggest to delete this title in the final version	Requested	Not Accepted	The intention is to provide an estimated structural failure rate based on a qualitative assessment.
13-5	Safran	2250(c) (b) Structural Failure Rate	40	These requirements are also applicable in the frame of 2240(d)(3)	” For structural elements or parts and failure modes identified in 2250 (c) (a)(5)(ii) and 2240(d)(3) …”	Safran	Accepted	An additional note is added to the text.
13-6	Safran	2250(c) (b) Structural Failure Rate	40	Regarding quantitative approach, it is unclear whether it refers to a probabilistic approach (Stress-Strength, FORM, etc), a return of experiment based assessment, or both. Remark : in the frame of 2240(d)(3) failure rates observable through return of experiment may be acceptable, depending on % of catastrophic fragment paths.	Clarify “quantitative approach”	Safran	Noted	The Applicant may propose a suitable quantitative approach to determine the Structural Failure Rate for a part. However, this must cover all failure modes that may result in the rotorburst event for 2240(d)(3) or result in catastrophic failure for 2250(c). A probabilistic approach based one failure mode alone would not be sufficient. Additional guidance is not considered necessary.
13-7	*Safran*	2250(c) (b) (1) Structural Failure Rate	40	“ (vii) Design values based on a statistical A-basis (99% probability with 95% confidence) as a minimum “ A 99% probability of remaining alive at the end of the useful life of the part, if that is what it is about, does not give a last flight failure rate of 10-9 / hr.		Choose an item.	Noted	This item is just one example under (1) Design Robustness, and alone would not provide sufficient confidence to achieve a safety objective of 10-9/FH.
13-8	*Rolls-Royce Electrical*	MOC VTOL2250 (c) Bullet Point (b)(3)(V)	41	Original Statement: Continued Integrity Verification Programme (CIVP), refer to MOC VTOL.2240(e) Traditionally for rotorcrafts, the CIVP refers to Critical Parts as established through CM-S-007.	Please specify if this CM also applies to SC VTOL and how to understand the term “Critical Part”	Recommended	Accepted	Wording updated for consistency with 2240(e): In-Service Monitoring to verify the health and operating conditions and the effectiveness of design and maintenance provisions, as well as other procedures, throughout the life of the type design, refer to MOC VTOL.2240(e)

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13-9	*GAMA*	MOC VTOL.2250(c), Section c	41	Overheating can cause the bearing to fail	Add overheating of bearing as a safety assessment failure mode?	Suggestion	Not Accepted	"Overheating can cause the bearing to fail". This is agreed. Nevertheless this is a cause of failure but not a failure mode. In addition, the list provided is intended to give examples and not be exhaustive. Additional failure modes may need to be considered on a case by case basis, depending of the design choices made by the applicant. Note that permanent deformation has been added to the list of failure modes which may result from overheating.

14.MOC VTOL.2250(E) DOORS, CANOPIES AND EXITS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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14-1	*TCCA* *AARDD/S*	MOC VTOL.2250(e)1.(c)	41	Editorial: word order should be amended	"This paragraph does also not apply…" should be replaced by "This paragraph also does not apply…"	Requested	Accepted	Amended as proposed.
14-2	*TCCA* *AARDD/O*	MOC VTOL.2250(e) 1. (d) (e) and 4.	41	The specifications mention latches, however there is no mention of locks means for the latches.	Locking means for the latches to be added to this section.	Requested	Not Accepted	Typically for other aircraft which are unpressurised (especially conventional rotorcraft), the addition of locks to monitor latches is considered unnecessary. Same is applied to VTOL aircraft, for as long as they remain unpressurised vehicles.
14-3	*TCCA* *AARDD/O*	MOC VTOL.2250(e) 1. (a)	41	The specifications mention "…on the exterior of the vehicle." There is no reference to any such doors, hatches, etc. on the interior of the vehicle.	Reference to doors, hatches, etc. on the interior of the vehicle to be added.	Requested	Not Accepted	Not agreed. If VTOL aircraft were ever to be pressurised then the paragraph would apply to internal pressure bulkheads, but this is not the case today. Note that the paragraph is limited to retaining dors closed in flight. Aspects such as emergency egress are out of scope (2250(e)1(f)).
14-4	*TCCA* *AARDD/O*	MOC VTOL.2250(e)1. (c)	41	Needs a grammatical correction. "…does also not apply…" needs to be corrected to "…also does not apply…"	Grammatical correction	Requested	Accepted	See reply to comment 14-1.
14-5	*TCCA* *AARDD/O*	MOC VTOL.2250(e)1.(f)	41	The paragraph indicates that the Door design and Emergency Egress is out of the scope for this paragraph. Reference to the applicable paragraphs shall be added.	Reference of the aspects of Door design and Emergency Egress shall be added in this paragraph.	Recommended	Accepted	Pertinent references are added.
14-6	*Leonardo Helicopters*	2250(e)	42	The referenced paragraph of the ASTM Standard are quite short (few lines in a 17 pages doc) and mainly generic	Suggestion is to directly include the text within the document	Recommended	Not Accepted	The suggestion is understood. However, the position of EASA is not to reproduce material whose copyright belongs to third parties. This material is however referenced where appropriate.
14-7	*TCCA* *AARDD/O*	MOC VTOL.2250(e)4..	42	The specification mentions mechanical failure however it does not seem to address wear and deterioration effects or adverse environmental conditions such as water ingress or ice as a result of operations in those weather conditions.	Wear and deterioration effects or adverse environmental conditions such as water ingress or ice as a result of operations in those weather conditions shall be addressed.	Requested	Noted	EASA would consider that aspects such as water ingress and ice are one of a subset of potential contributors to the possible mechanical failure. Aspects pertaining to inhibiting emergency egress due to a frozen door are out of scope of this para (see 2250(e)1(f))

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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14-8	*Lilium eAircraft*	MOC VTOL.2250 (e) (4)	41/42	Add more detail for acceptable design features. Suggestions on the right are taken from: - FAA AC 29-2C 29.783 b. (2) (i) AC 29-2C - 29.783 b. (2) (ii)	Add details and reword, e.g., in the following manner: "For all doors within the scope of this paragraph, there should be means for latching and for preventing their opening in flight inadvertently or as a result of mechanical failure. Acceptable features to prevent inadvertent operation by occupants are, for example: - recessing door handles; and - door handles that are moved/rotated up to open and moved/rotated down to close. Means to prevent inadvertent door opening in flight due to "mechanical failure" should be provided through multiple door latches and multiple load path door locking mechanisms so that the door will remain locked after a single failure. Care should be taken in the design of multiple load path latches and mechanisms to assure independence of all failures and to consider the effort of deflections after failures (if a failure allows deflections into the airstream sufficient to increase aerodynamic loads, the increase in loads should be accounted for; if a failure allows significant movement of latching components, the deflections should be accurately accounted for to assure that disengagement of non-failed latches does not occur)."	Recommended	Partially Accepted	The wording implemented is changed slightly from that proposed in the comment. However, the intent of the comment has been embodied.
14-9	*Pipistrel Vertical Solutions*	MOC VTOL.2250(e) Doors, canopies and exits, point 5.	42	Point 5. Requires that "There should be means for direct visual inspection of the latching mechanism by crew members…". Why only direct visual inspections, and not also sensor-based, are accepted?	Please clarify why only visual inspections are accepted to check if latching mechanisms are secured. If the intent is to have VISUAL confirmation that latching has been successful, and detection itself can be sensor based, this needs to be reworded. Currently it seems as if the door needs to be transparent to permit seeing the mechanism itself😊	Recommended	Noted	The intent is that the means should be as direct as possible to show the latching status with absolutely minimum intermediate systems aspects. For example, permanently fixed (or an integral part) to the locking mechanism; and it should not give erroneous readings to the crewmembers under any foreseeable operation or failure of the latching mechanism

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14-10	*TCCA* *AARDD/O*	MOC VTOL.2250(e)6.	42	The specification mentions "…other attention getters…" however it does not clearly identify if this is intended to be an active alert system or what the scope of attentions getters actually means.	Additional definition of the scope of this indication is necessary	Requested	Accepted	The means to attract flight crew attention should be commensurate with the need and immediacy for them to take action. Cross reference to MOC VTOL.2605(b) is added.
14-11	*Volocopter GmbH*	MOC.VTOL.2255., 6.	42	As the flight crew consists of the pilot only (in case of manned aircraft) or people on the ground (unmanned aircraft) there should be the option to alternatively indicate not-closed / not fully latched doors to ground crew members in charge of the aircraft ground handling.	Rephrase e.g. like this: 'There should be visual means (combined with other attention-getters as appropriate) to signal to appropriate flight crew or ground crew members when doors within the scope of this paragraph are not closed and/or not fully latched.'	Requested	Not Accepted	In the Preamble of the Special Condition for small-category VTOL aircraft, it is explained that: "The special condition is intended to be compatible with a remote piloting capability or different levels of autonomy, however these aspects are not currently addressed by this special condition. Flight crew references will be considered "as applicable" when material for remote piloting and autonomy is added." The same applies for the Means of Compliance with this Special Condition. As an aside, Ground crew members – appropriately qualified – could be checking the indication required for sub-para 5. However, sub-para 6 is intended to be a warning to the flight crew, be they on board or remote in the future.

15.MOC VTOL.2255 PROTECTION OF STRUCTURE

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
15-1	*GAMA*	MOC VTOL.2255 Protection of structure	42	VTOL has operational window that coincides with CS-23 aspects.	Include CS-23 in the table to cover CS-23 aspects of VTOL.	Requested	Not Accepted	The wording of the referenced parts of CS 27 and the corresponding requirements of CS 23 Amdt. 4 are slightly different, however the intent is similar. CS 27 is more specifically focusing on the actual needs for ventilation and drainage, providing more precise guidance to the applicant of when it is needed. Using CS 23.609 would require ventilation and drainage for each part, without focusing on the potential consequence. In addition it needs to be highlighted that CS 23 requirements are taking into account potential pressurization. Therefore, CS 27.609 is considered as fully applicable and adequate for VTOL.
15-2	Boeing	MOC VTOL.2255 Protection of structure	42	VTOL has operational window that coincides with CS-23 aspects.	Include CS-23 in the table to cover CS-23 aspects of VTOL.	Requested	Not Accepted	See comment 15-1

16.MOC VTOL.2260 MATERIALS AND PROCESSES

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
16-1	*Leonardo Helicopters*	2260	43	The processes included in the table and taken from CS27 should not be applicable to the entire set of SSE. Control of materials and fabriocation methods are expensive method which are necessary for critical parts, but not needed for structural elements whose failure does not lead to catastrophich events as in the SC.VTOL	Applicability of these requirements should be limited to certain specific structural elements	Requested	Not Accepted	VTOL.2260(a) is addressing “parts, articles, and assemblies, the failure of which could prevent continued safe flight and landing for Category Enhanced, or a controlled emergency landing for Category Basic”. These parts require additional substantiation with regards to suitability and durability compared to other structures. However, the referenced CS 27 paragraphs are applicable to all structures, consequently including the ones stated above. CS 27.613 is addressing failure of components, not the criticality of their failure. Therefore, irrespective of the failure consequence and of the structure classification, CS 27.613 is applicable. The referenced CS 27.603 is only applicable to parts which could adversely affect safety, and is therefore applicable to the items addressed in VTOL 2260(a). MOC VTOL.2260 provides objectives which are addressed in CS-27 by the mentioned requierments. Consequently, the CS 27 requirements are considered to be applicable.

17.MOC VTOL.2265 SPECIAL FACTORS OF SAFETY

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
No comment received								

18.MOC VTOL.2270(C) EMERGENCY LANDING CONDITIONS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
18-1	*Volocopter GmbH*	MOC VTOL.2270/ 2310(b)	43/48	The over water section of the regulation requires significant emergency flotation and levels of capsize resistance. Performance Class 1 in Part CAT offers a time ar risk argument for helicopters based on 10 minutes flying time at normal cruise speed based on the safety objectives for CS27. The aircraft safety objectives in the enhanced category have been elevated which impacts the time at risk argument. The detailed and onerous requirements for operations over water feel in stark contrast to operation in an urban envrionment where there are no additional provisions for survivability following a forced landing in cities. This feels a little imbalanced.	1. Consider relief to the over water requirements migrated from CS27 to create a more balanced risk based approach based on elevated safety objectives in the enhanced category. 2. SC-VTOL is referring to Continue of safe flight and landing up to a propability of 10^-9. The MOC does not give E-VTOL of cat enhanced any credit for this capability in case of CFP. As the compliance demonstration to this MoC leads to an increase in weight and thus decrease of performance (including safety reserves during take off and landing) means that the operater shall rather choose flight path over croweded city areas other than flights over water. A clarifiaction of the safety objective is required to understand this additional burden brought to a VTOL Aircraft of Category enhanced	Recommended	Not Accepted	1. The air operations rules will specify the airworthiness category necessary for operations over water. The MOC provides the design criteria for each of these operational categories. A tiered approach is proposed. The introduction of limited overwater operations intends to provide a basic level of occupant survivability in the event of an emergency over water, without the burden of meeting the full ditching or emergency flotation system installation requirements. 2. The over water requirements intend to address unforeseen events beyond those considered for certification. The proposed limited overwater operation design criteria are not considered to be burdensome and will provide a basic level of occupant protection. For this case, significant emergency flotation and capsize resistance is not necessary.
18-2	*Leonardo Helicopters*	2270(c) 1.(a)(3)	44	'in likely pitch, roll and yaw attitudes.'	Aircraft configuration should also be considered for tilting-rotors architectures if this can have an impact on aircraft behaviour and loads	Recommended	Accepted	Reworded: "…in likely pitch, roll and yaw attitudes, for each aircraft configuration."
18-3	*Airbus Helicopters*	MOC VTOL.2270(c) Emergency Landing Conditions (c)(1)	44	EASA to confirm the loads mentioned are "ditching loads" as it is explicated in the paragraph (c)(3)	Indicate ditching loads	Requested	Accepted	Reworded: "The buoyancy components and their attachment structure should be substantiated for limit and ultimate loads, as specified in (b)".

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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18-4	*Lilium eAircraft*	MOC VTOL.2270 (c) (2)	45	References were not correctly updated from previous draft.	MOC VTOL.2270(c) 2. (a) should be reworded to: "If certification for only limited overwater operations is requested by the applicant, the aircraft should meet the design criteria defined for MOC VTOL.2310(b) Emergency Flotation, with the exception that capsize resistance of (a)(1(ii) and (a)(2)(ii) need not be demonstrated."	Requested	Accepted	Updated as suggested.
18-5	*Leonardo Helicopters*	2270(c) 2(b)	45	'The following MOC.VTOL paragraphs are also applicable:' With this sentence, it seems that those paragraphs are only applicable to Limited Overwater ops.	Rephrase to specify are applicable to Limited Overwater operation, but not only to that kind of operations.	Recommended	Partially Accepted	The additional MOC.VTOL paragraphs applicable to Emergency Flotation or Ditching are listed in MOC VTOL.2310(b) and MOC VTOL.2310(c). An additional note is added to clarify.

19.MOC VTOL.2305 LANDING GEAR SYSTEMS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
19-1	*TCCA* *ARDD/M*	MOC VTOL.2305(a)	p.46/94	LG failures and risk of fuel spillage The requirement of SC VTOL.2305(a)(2) indicates that the landing gear must be design to "account for likely system failures…" Unlike for the corresponding CS23.2305 requirement, there are currently no proposed MOC to address the risk of fuel spillage as a result of landing gear failures. It is understood the requirements of SC VTOL VTOL.2325(a)(4) and VTOL.2430(a)(6) – for which MOCs are derived from the fuel system crashworthiness requirements of CS27.952 – would address most of the concerns. However the following considerations / concerns would currently not appear to be adequately covered in the current proposed MOC: • Penetration of energy/fuel storage (tanks) following landing gear failure, similar to what would be addressed under CS23.721. This has not been explicitly addressed for rotorcraft, presumably because typical configurations inherently did not represent a hazard. VTOL configurations may be significantly different. • Asymmetrical landing gear failures may represent a risk of vehicle rollover. On rotorcraft the risk of fuel spillage via vent lines as a result of rollover is addressed under CS27.975(b). Similar considerations should apply to VTOL if fuel is used.	Recommend adding guidance under MOC VTOL.2305, MOC VTOL.2325(a)(4) and/or VTOL.2430(a)(6) to address: • Penetration of fuel/energy storage (tanks) following landing gear failure, similar to what would be addressed under CS23.721. • Risk of fuel spillage via vent lines as a result of rollover, similar to what would be addressed under CS27.975(b).	Requested	Noted	EASA will consider adding general guidance on these subjects in a later revision of the MOCs. Today, they are not considered a priority for VTOL, based on the currently known designs and available applications.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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19-2	*TCCA* *ARDD/M*	MOC VTOL.2305(a)	p.46/94	Operations tests – as required under CS27.729(d) and CS23.729(d) – would be appropriate to support compliance with VTOL.2305(a).	Recommend adding to MOC VTOL.2305 contents similar to that of CS27.729(d) and CS23.729(d) regarding operations tests.	Requested	Accepted	Operation Tests are added.
19-3	*Vertical Aerospace*	MOC VTOL.2305	46	There is no provision here for conventional landing. "running landings" appear to be only considered as an emergency case and not as a normal use case.	Suggest make refrence to relvant AMC to CS-23 as means of compliance for Conventional Landing (AMC1 23.2305).	Recommended	Partially Accepted	For this MOC, vertical landing is stated as an assumption under Section 1, and forward speed langdings are considered for “non-normal (emergency) conditions”. It should not be assumed to use CS-23 alone for running landing – bespoke material will be provided in a future update of this MOC. The stated assumption will be expanded in a Note to clarify that running landings will be included in an update of this MOC.
19-4	*Vertical Aerospace*	MOC VTOL.2305 2	46	The paragraph is not clear as to its intent. It is Vertical’s interpretation that this refers to the pilot’s interface to the ground manoeuvring system and the potential for movement of the ground manoeuvring system before/during/after retraction could result in a retraction/extension failure. However the wording could lead to confusion.	Please reword to clarify EASAs intent.	Recommended	Not Accepted	Vertical has the correct interpretation. Whether or not it is clear is subjective, but EASA does not see any other possible interpretation.
19-5	*Leonardo Helicopters*	2305 3.	46	Editorial: Replace airplane with aircraft	Editorial: Replace airplane with aircraft	Requested	Partially Accepted	“Aeroplane” replaced by “Vehicle” for consistency.
19-6	*FAA AIR-618*	MOC VTOL.2305 Para 4(a)	46	“The wheel should be approved, to ESTO C26d or equivalent”	Reference should be ETSO C26d	Recommended	Accepted	Typo corrected.
19-7	*Leonardo Helicopters*	VTOL.2305 Point 5	47	It is allowed for helicopters to install airplane tyre considering a factor of 1.5 on the rating	Can the factor of 1.5 be applied on the rating of the tyre (as for helicopters)?	Recommended	Accepted	The permission to do this is given in ETSO C62 for helicopters (which is referenced from AC-29). It is proposed the same in this case – via reference to the ETSO and not directly in the MOC. (In addition it has been made clear that this permission applies only to vehicles that are similar to helicopters, ie not fixed-wing EVTOL).

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19-8	*TCCA* *ARDD/M*	MOC VTOL.2305 Para 5	p.46/94	Tyres The proposed MOC VTOL.2305 para. 5 reads "If the landing gear is fitted with a tyre, then it should be a tyre:…" This conditional statement is not understood, as the scope defined in paragraph 1 of the proposed MOC indicates this guidance is specifically intended to apply to wheeled landing gear – which would inherently be fitted with tyres.	Recommend deleting the conditional statement in this introductory sentence to MOC paragraph 5, i.e. "5. Tyres Each tyre should be If the landing gear is fitted with a tyre, then it should be a tyre: *(a)* That is a A proper fit on the rim of the wheel; and *(b)* Of a rating that is not exceeded under…"	Requested	Not Accepted	It is highly-likely to be fitted with a tyre, but given the level of novelty applied to VTOL designs it is not inherently guaranteed. EASA prefer to maintain the conditional statement.
19-9	*TCCA* *ARDD/M*	MOC VTOL.2305 Para 5(b)	p.47/94	Tyres a) The proposed MOC VTOL.2305 para. 5(b)(2)(3) include distinctions between nose wheel and main wheels. This assumes a relatively traditional landing gear wheels arrangement which may not be that of the VTOL vehicle. b) The proposed MOC VTOL.2305 para. 5(b)(3) include the effects of braked wheels on tyre loads – which would only relevant in the event of a running landing scenario. On the other hand MOC VTOL.2305 para. 6(c) indicates running landing only needs to be considered if it arises from failure combinations determined to be Extremely Improbable. Given this, it appears somewhat contradictory to imply consideration for running landing, without exception, under MOC VTOL.2305 para. 5(b)(3).	a) Recommend either: • Deleting from MOC VTOL.2305 para. 5(b)(2)(3) references to "nose" vs "main" wheels, and referring more generically to braked vs non-braked wheels (and adapting technical contents accordingly); or • Clarifying in MOC VTOL.2305 para. 1 (Scope) that MOC VTOL.2305 as written assumes a traditional tricycle nose & main landing gear arrangement, and that adaptations would be necessary in case of a different arrangement. b) Clarify applicability of considerations for running landing to tire rating under MOC VTOL.2305 para. 5(b)(3), to avoid apparent disconnect with MOC VTOL.2305 para. 6(c).	Requested	Accepted	(a) That is true, and will be stated as an assumption. Indeed the contents would need to be adapted for any different configuration. (b) Dynamic elements of defining the nose tyre load rating could be removed for a running landing which is Extremely Improbable.

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19-10	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2305 6(b)	47	Why has the park brake requirement been reduced from 27.735 and only need to hold the aircraft to allow emergency egress? This suggests it is acceptable for the aircraft to roll away into emergency vehicles after a few minutes.		Requested	Partially Accepted	See 19-11 below.
19-11	*TCCA* *ARDD/M*	MOC VTOL.2305 Para 6(b)	p.47/94	Parking brake The requirement of SC VTOL.2305(b) indicates "aircraft must have a reliable means… of holding the aircraft in position when parked." The proposed MOC VTOL.2305 para. 6(b) has a much narrower scope as it would only require to hold a/c in position for sufficient time for emergency egress; i.e. the proposed MOCs would not meet the intent of the rule as written (which is to hold when parked). A parking brake with very limited time capability may represent a risk in the event of an emergency landing at a vertiport, where other vehicles and persons may be in close proximity.	Similar to corresponding Part 27 requirement, there should be no time limitation for the parking brake capability. Recommend rewording MOC VTOL.2305 para. 6(b) as follows: "(b) A park brake should be included which will hold the vehicle stopped, on a 10 degree slope, for sufficient time to allow emergency egress."	Requested	Partially Accepted	The proposed rewording looks identical to the existing text? Today there is neither a *minimum* time to hold in other CS codes. The intent of the time duration is more clearly defined, ie sufficient time to allow emergency egress AND secure the vehicle in place by other means.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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19-12	*Lilium eAircraft*	MOC VTOL.2305 (6)(b)	47	Environmental conditions should be specified in conjunction with the slope angle to provide greater clarity.	Re-word to:(b) A parking brake should be included which will hold the aircraft parked on a 10° slope on a dry, smooth pavement in zero-wind conditions, for sufficient time to allow emergency egress.	Recommended	Partially Accepted	Dry and smooth is agreed. An wind requirement is to be added (not less than 17kts). The park brake is to be designed to the highest of three separate cases - Emergency egress case as already in the MOC. - Countering any unbalanced torque when starting or stopping rotating lift/thrust units - Reacting any element of longitudinal thrust from lift/thrust units, albeit that the take off and landing will be vertical. The slope and wind aspects are applicable to all three cases.
19-13	*TCCA* *ARDD/M*	MOC VTOL.2305 Para 6(c)	p.47/94	Braking performance The requirement of SC VTOL.2305(b) indicates "aircraft must have a reliable means of stopping the aircraft with sufficient kinetic energy absorption". The proposed MOC VTOL.2305 para. 6(c) indicates "brakes should have adequate controllability and stopping capacity" but does not provide any specifics on acceptable MOCs for determining, and demonstrating what would be adequate stopping capacity (energy absorption) for the brakes.	Recommend adding MOC for VTOL.2305 either detailed MOCs, or reference to other acceptable approaches (e.g. CS 23.735 Amt. 4 – adapted as necessary to VTOL aircraft).	Requested	Accepted	Part 29 covers this point by reference to ETSO. EASA will follow the same approach for VTOL aircraft.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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19-14	*Lilium eAircraft*	MOC VTOL.2305 (6)(c)	47	Category Enhanced VTOL aircraft are designed such that Failure Conditions which are not Catastrophic in severity will not lead to forward running landings.	Re-word to:(6)(c) Where the ability to provide Continued Safe Flight and Landing cannot be shown to be Extremely Improbable (e.g. for Category Basic aircraft), the brakes should have adequate controllability and stopping capacity to bring the vehicle safely to a halt for any emergency running landing (including an immediate re-land).	Recommended	Not Accepted	It is correct to say that VTOL aircraft present an intrinsic capability to take-off and land vertically. However, some VTOL aircraft may additionally be able to take-off or land as conventional aeroplanes, accelerating and/or decelerating on a runway. This mode of operation as conventional aeroplanes, also named CTOL or “conventional take-off and landing”, does not necessarily have to be linked with a failure or emergency condition. It is true that this MOC addresses for the moment only the case of normal vertical take-off and landing, with forward speed landing only in case of emergency, however such an emergency is not necessarily extremely improbable. Running take-off and landing will be included in an update of this MOC in future.
19-15	*TCCA* *ARDD/M*	MOC VTOL.2305	p.46/94	Landing gear lock The requirement of SC VTOL.2305(c)(1) indicates there must be "positive means to keep the landing gear in the landing position". An associated MOC, derived from CS23 (Amt 4) and CS 27 material should be provided to clarify what "positive means" refers to – i.e. positive locking would exclude reliance on hydraulic pressure.	Recommend adding MOC for VTOL.2305(c)(1), along the following lines: "Landing gear lock. There must be a positive means (other than the use of hydraulic pressure) to keep the landing gear extended in the landing position."	Requested	Accepted	EASA agrees that hydraulic pressure would not be a downlocking means.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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19-16	*TCCA* *ARDD/M*	MOC VTOL.2305 Para 9	p.48/94	Emergency extension The requirement of SC VTOL.2305(c)(2) indicates there must be "an alternative means available to bring the landing gear in the landing position when a nondeployed system position would be a hazard." The proposed MOC VTOL.2305 para. 9 would only require an emergency means for gear extension "when other than manual power is used to operate the gear". The text of SC VTOL.2305(c)(2) has no such exception. While the proposed MOC VTOL.2305 para. 9 is in line with CS23 Amt 4 and CS27 requirements, and also in line with the approach taken for CS23 Amt 5, this effectively results in the MOC providing an alleviation to the SC rule text, which is problematic.	Recommend rewording SC VTOL.2305(c)(2) – i.e. the SC rule text – to incorporate the exception for manual release: "(c)(2) an alternative means available to bring the landing gear in the landing position if other than manual power is used to operate the gear and when a nondeployed system position would be a hazard."	Requested	Partially Accepted	The reference to “other than manual power” used to operate the landing gear is deleted in Section 9 on MOC VTOL.2305.

20.MOC VTOL.2310(B) EMERGENCY FLOTATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
20-1	*Vertical Aerospace*	MOC VTOL.2310(b)(a)	49	the note (1) on this page is unclear why the fire protection resistance should need to match the floatation duration requirements. Each requirement is protecting against very different specific risks.	suggest the note is surplus to requirement and recommend deleting	Recommended	Partially Accepted	The purpose of this Note is to highlight that the times required for the protection from different risks that could present themselves simultaneously are consistent with each other. This could be the case of the aircraft sinking and releasing the electrical energy from the storage units following a crash into water. A 15 min duration is consistently considered to ensure a minimum evacuation time for the occupants. The Note is modified to reference MOC VTOL.2430(a)(6) “Energy retention capability in an emergency landing”

21.MOC VTOL.2310(C) DITCHING

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
21-1	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL.2310(c)	49	What criteria is required for ditching a high voltage electrical battery in a conductive fluid to ensure risk of electric shock is negated?		Requested	Noted	Energy retention capability in an emergency landing over water is addressed in MOC VTOL.2430(a)(6)
21-2	*TCCA* *AARDD/O*	MOC VTOL.2310(c)	49	There is no mention of the demonstration of the various requirements for ditching features.	Clarification as to when demonstration by test is necessary or when acceptable analysis means could be used.	Requested	Noted	More information regarding acceptable MOC is contained in the referenced AMC material.
21-3	*Airbus Helicopters*	MOC VTOL.2310(c) Ditching (a)(8)	P49	The MOC paragraph request tha aircraft design to incorporate post-capsize survivability features. The SC-VTOL-01, VTOL.2310 (c)(3) refers to "intended floating attitude" to be maintained after a safe water entry. Capsize events are considered for helicopters ditching due to their tendency to move to a capsize situation because of the mass repartition in their design (rotor mast). VTOL aircraft may have a different design that is not prone to reach the capsize attitude after entry into the water. The most detrimental aircraft attitude after ditching event should be considered in the evaluation of the performance survivability features to enable all passenger cabin occupants to safely egress the aircraft (including air pocket) .	The proposed post-ditching survivability features should be evaluated against an aircraft attitude criteria that is not design oriented (such as capsize attitude for rotorcraft) It is suggested to replace post-capsize scenario by the most detrimentalaircraft attitude that can be experienced after a ditching event.	Requested	Accepted	Capsize in this MOC is intended to mean full or partial capsize, i.e. not maintaining the intended floating attitude. Clarification is added to the MOC.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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21-4	*FAA, AIR-710 Flight Test - MS*	VTOL 2310(c)(8)	50	It is unlikely that the vehicles will fly over hostile sea enviornments as envisioned under EASA Ops 3 and North Sea operations. The addition of item (c)(8) is undue burden for very unlikey operations and sea states. It would be more appropriate to consider other hazards from the ditching of the vehicle such as high voltage exposure from the aircraft power system, if damaged.	See comments regarding undue burden for c(8) and an evaluation of high voltage exposure to the escapees for the vehicle.	Requested	Noted	The air operations rules will specify the airworthiness category necessary for operations over water. The MOC provides the design criteria for each of these operational categories. A tiered approach is proposed, with the ditching requirements providing the highest level of occupant survivability. These ditching requirements are only applicable should certification for ditching be necessary for the operation. EVTOL operations in hostile sea environments may be envisaged in the future. Energy retention capability in an emergency landing over water is addressed in MOC VTOL.2430(a)(6)

22.MOC VTOL.2315(A) MEANS OF EGRESS AND EMERGENCY EXITS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
22-1	*Vertical Aerospace*	MOC VTOL.2315(a)	50-53	MOC only address overwater emergency conditions. Ground emergency egress could also easily be addressed through reference to exising CS23 amdt 4 paragraphs	Identify the following CS-23 Amendment 4 as AMC: 23.783 (a), (b), (c)(2), (c)(3), (c)(4), (c)(5), (c)(6), (d), (f), (g) Doors 23.787 Baggage and cargo compartments 23.803 Emergency evacuation 23.805 Flight crew emergency exits 23.807 (a), (b)(1), (b)(2), (b)(3), (b)(4), (b) (5), (b)(6) (d)(1), (d)(3), (d)(4), (c), (e) Emergency exits 23.811 Emergency exit marking 23.812 Emergency lighting 23.813 Emergency exit access 23.815 Width of aisle	Recommended	Noted	A new standard in preparation by EUROCAE WG-112 SG-3 will address ground emergency egress.
22-2	*TCCA AARDD/O*	MOC VTOL.2315 (a)1.	51	There is no definition of Ditching, Emergency Flotation and Limited Overwater Operations in this paragraph.	Reference or definition of Ditching, Emergency Flotation and Limited Overwater Operations shall be added to this paragraph, or on paragraphs VTOL. 2310.	Recommended	Accepted	A footnote referencing to MOC VTOL.2270(c) “Structural Provisions: Ditching, Emergency Flotation and Limited Overwater Operation”, MOC VTOL.2310(b) and MOC VTOL.2310(c) is added.
22-3	*TCCA AARDD/O*	MOC VTOL.2315(a)1.(a)(1)	51	This paragraph refers to emergency exits accessible to each passenger, however it does not mention emergency exits for flight crew.	Reference to flight crew emergency exits shall be added.	Requested	Accepted	Additional criteria added regarding the location and accessibility of the flight crew exits (based on CS-23 Amdt 4 and CS-27).
22-4	*TCCA AARDD/O*	MOC VTOL.2315 (a)	51	The specification mentions passengers and range of occupants from 5th to 95th%ile. The specification does not address other passengers outside of this size or age range.	Additional clarification is required to address passengers outside of this size or age range	Requested	Not Accepted	The 5th percentile female to 95th percentile male range is typically used in aviation regulations for all product types. The eVTOL MOC is consistent with this common and accepted approach.

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22-5	*TCCA* *AARDD/O*	MOC VTOL.2315(a)	52	Criteria for the testing is required 5th to 95th percentile and force measurement as a criteria for "operate the exit release mechanism". The recent requirements and guidance no longer refer to a maximum operating force as a means to demonstrate the acceptability of the emergency exit opening effort. A qualitative approach shall be consider in regards to operate the exit release mechanism.	Qualitative approach to be considered in lieu of force measurement as a criteria to operate the exit release mechanism.	Requested	Not Accepted	MOC.2315(a) 1(a) (emergency flotation provisions or limited overwater operations) does not require a specific force measurement, instead each exit should be accessible and operable underwater, considering the range of occupants specified. MOC.2315(a) 1(c) (ditching) requires demonstration of a defined maximum force, consistent with the current approach for CS27/CS29 underwater emergency exits, as introduced in Amendment 5 (reference NPA 2016-21).
22-6	*TCCA* *AARDD/O*	MOC VTOL.2315 (a)(1) (a)(3); (a)(4); (d)(1); (e)(3)	51,52	These paragraphs are requesting that each exit should be shown by test, demonstration, or analysis to be accessible and operable. However the testing is specifying a range of occupants from 5% female to 95% male, the proposed wording gives margin to the applicant select any person in this range.	The statement shall be reword in regards to the range of occupants to be more restrictive, the test shall be performed including 5% female occupant and 95% male occupant.	Requested	Not Accepted	The common understanding that when a range of occupants is specified, the testing must include the extremes of this range.
22-7	*Leonardo Helicopters*	2315 (a) (a) (3) (III) and 2315 (a) (a) (4) (IV)	51	Questions: Please, clarify which type of marking will be required	The usage of fluorescent exit label should be considered as an accepted means of compliance	Requested	Not Accepted	The MOC defines the design criteria to be met and does not specify a design solution, i.e. the exit should be marked so to be readily located and operated in darkness, and these markings should remain visible if the cockpit or cabin is submerged. This is consistent with the CS 27 wording. Fluorescent exit labels may be acceptable if they are shown to meet this design criteria. (See also EASA response to 22-8)
22-8	*Leonardo Helicopters*	2315 (a) (d) (4) And 2315 (a) (e) (7)	52 And 53	This MoC requirements is more clear than the requirements: 2315 (a) (a) (3) (III) and 2315 (a) (a) (4) (IV)	Please clarify which type of marking will be required	Recommended	Not Accepted	The MOC defines the design criteria to be met and does not specify a design solution, i.e. the exit should be marked so to be readily located and operated in darkness, and these markings should remain visible if the cockpit or cabin is submerged. This is consistent with the CS 27 wording. (See also EASA response to 22-7)

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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22-9	*Airbus Helicopters*	MOC VTOL.2315(a) Means of egress and emergency exits c (3)(ii)	P52	"It should be possible for each passenger to egress the aircraft via the nearest underwater emergency exit, when capsized, with any door in the open and secured position;" EASA to clarify if this scenario is realistic as if the main entry door is open before ditching, the passenger will most probably use this door to exit the aircraft.	EASA to confirm the rationale for the requirement	Recommended	Noted	This is to avoid open doors blocking the underwater emergency exits, preventing rapid escape if the cabin is submerged. This requirement is consistent with CS29.809(j)(2) (applicable also to CS-27 Category A rotorcraft certified for ditching).

23.MOC VTOL.2320(A)(1) CLEAR COMMUNICATION BETWEEN FLIGHT CREW AND PASSENGERS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
23-1	*Leonardo Helicopters*	2320 a1	53	CS23.791 Passenger information Sign For short missions, when seat belts shall be used for the whole flight there is no need to switch on/off illuminated signs	Introduce a boarding procedure to guarantee that passengers belts are fastened before take off	Recommended	Accepted	Possibility to introduce boarding procedure with suitable placarding is added to MOC.
23-2	*Leonardo Helicopters*	2320(a)(1)	53	Amdt of CS23 regulation missing	Add the relevant CS23 amdt to be considered as a MOC	Recommended	Accepted	CS 23 Amdt 4 added.

24.MOC VTOL.2320(A)(3) OCCUPANT PROTECTION FROM BREAKAGE OF WINDSHIELDS, WINDOWS, AND CANOPIES

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
24-1	*Leonardo Helicopters*	2320(a)(3) (b)	53	Is the requirement for multiple bird strike also applicable?	Please clarify	Recommended	Noted	Multiple birdstrike is not applicable to windshields.

25.MOC VTOL.2325(B)(1) AND (B)(2) FIRE PROTECTION: MINIMISATION OF FIRE PROPAGATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
25-1	*Lilium eAircraft*	MOC VTOL 2325(b)(1) and (b)(2) Overall	53	Please see comment no 39 and 40.	Please see comments 39 and 40.	Recommended	Partially Accepted	See Response to Comment 26-48 See Response to Comment 26-50
25-2	*FAA AIR-618*	MOC VTOL.2325(b)(1) and (b)(2) Para 3(b)	53	The SC language only requires "extinguishing means when practical". These MOCs do not establish the bounds of practicality.	Include guidance on how a practicality determination is made as to whether an extinguishing system is required.	Requested	Noted	SC VTOL.2325 (b)(1) is identical to CS 23.2325 (b)(1) and it was not deemed that VTOL aircraft required any specific guidance in this respect. The comment is noted for consideration during any possible future revision of this MOC.
25-3	*FAA AIR-624 / PD*	MOC VTOL.2325(b) (1)(b)(2) Para. 3	53	This paragraph 3 is titled Designated fire zones (Category Basic and Enhanced). However the 2 sub-paragraphs are (a) Detection systesm and (b) Fire extinguishing systems. It appears these two (a) and (b) sub-paragraphs should be moved to where fire detection systems and fire extinguishing systems are discussed, unless there are no other locations.	Review previous MOC document and move sub-paragraphs 3(a) and 3(b) to locations where fire detection and fire extinguishing MOCs are discussed. If there are no other locations, revise the title of paragraph 3 to "Designated fire zone detection and extinguishing systems (Category Basic and Enhanced)". This will help make it clear what paragraph 3 is about these 2 specific systems in the designated fire zone.	Requested	Partially Accepted	The title of Section 3 is modified to "Category Basic and Enhanced: Detection and extinguishing systems in designated fire zones"

26.MOC VTOL.2330 FIRE PROTECTION IN DESIGNATED FIRE ZONES

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
26-1	*Pipistrel Vertical Solutions*		54-57	The "MOC VTOL.2330 Fire Protection in designated fire zones" sections require, that the firewalls surrounding the zones containing EESS (batteries) protect the rest of the vehicle in cases of a battery thermal runaway. We would like a clarification, wheather the method of triggering a thermal runaway described in DO-311A / Appendix C also constitutes as a battery thermal runway (meaning only two cells are triggered) or must all of the cells in the battery (unit, module, or whole) be put into a thermal runaway in to constitute as a "battery thermal runaway".	Please clarify the extent of term “battery thermal runaway”	Requested	Noted	The MOC has been reworded. When reference is made to a duration linked with the Thermal Runaway Test in Section (f), it is precised that an accepted standard should be used (see point (f)(4)). EASA will publish a specific MOC to clarify which standards are accepted for the Thermal Runaway Test.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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26-2	*FAA AIR-624 / PD*	MOC VTOL.2300 Para. 1(a) (c)(d)(e)(f)	54	In paragraph (a), there are 2 zones specified but no definition for the 2 zones, fire withstanding zone and explosive fire zone. However, in paragraphs (d) and (f), there appears to be definitions for these 2 zones. Suggest moving (d) and (f) under (a). In paragraph (c), this paragraph appears to allow the applicant to figure out on their own the flame characterization and duration time of the flame exposure. In paragraph (e), this paragraph appears to allow the applicant to figure out on their own how the battery flame characterization and duration time of the flame exposure.	For paragraph (a), there should be a definition for each of the 2 zones. Move paragraphs (d) and (f) to under paragraph (a) to provide definition for the 2 zones. For paragraphs (c) and (e), there should be some high level or recommended minimum for the duration of the fire and the flame characterics if a particular design proves difficult to establish or define the fire duration time and flame characteristics. A minimum standard may be needed in order to enable a consistent finding of compliance by the various certification and validation authorities, until another set of guidelines can be developed to define a more representative duration time of flame exposure and flame characteristics, which may or may not be feasible based on the uniqueness of the upcoming VTOL electric engine or motor designs and certification proposals. For example, if it's not possible to determine or agree on the duration time of flame exposure and the flame characteristics, the traditional definitions used in other aircraft regulations today should be considered as a potential minimum standards, ie a fire resistant duration of 5 minutes and fireproof duration of 15 minutes and the flame charateristics (temperature and heat flux density) as currently specified in FAA AC20-135 or ISO 2685, or other SAE equivalent standards.	Requested	Accepted	Paragraphs reworked and reorganized.

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26-3	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 1.(a)	54	It is unclear which zones are considered Desigated Fire Zones for VTOL. I assume the title of (a) should be read as (a) Considered Desigated Fire Zones for VTOL are: Or EASA thinks that an equivalent meaning of DFZ used for existing Certification Specification is not proposed for VTOL ?	Please clarify	Requested	Accepted	Clarification introduced in 1 (b) by differentatiting the three zones Fire Withstanding Zone (FWZ), Designated Fire Zone (DFZ) and Explosive Fire Zone (EFZ), which are further defined in subsequent sections of the document.
26-4	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 1.(b)	54	The Electrical Energy Storage System generally does not include only the battery but at least its management system.	Please clarify	Recommended	Accepted	Definition completed as suggested – now 1 (a).
26-5	*FAA AIR-624 / PD*	MOC VTOL.2300 Para. 1(c) to (1) (g)	54	The term fire withstanding is used. It is not clear whether withstanding also means that the fire withstanding means that the fire is also contained within the zone, ie the fire cannot escape to other another adjacent zone where additional hazard may occur and affect continued safe flight and landing.	Request the term fire withstanding to also require containment of the fire for the minimum required time of the fire withstanding capability, such that the fire is contained within the zone and cannot escapte to an adjacent zone so that no additional hazard may occur and affect continued safe flight and landing.	Requested	Partially Accepted	Clarifications provided in 1 (e) and (h). The concepts of Open and Closed Volumes have also been defined in 1(f) and (g).
26-6	*Lilium eAircraft*	MOC VTOL.2330 (1)(d)	54	The definition of fire withstanding zone is not clear, being able to “withstand the effect of a flame and/or sparks, arcing, heat, hot parts ejection” is not a driver for the definition of the DFZ. The definition can be aligned with the threat. The threat can also be linked to the presence of flammable fluids, gases and also ignition sources, etc.	Update the definition as follows; Fire withstanding zones are zones where a single failure of a component such as a flammable fluid line break can result in the potential for fire. (Ref. JSSG 2009 Appendix G, G-8)	Recommended	Not Accepted	Zones have been clarified. The proposed definition in the comment is not in line with the intention of EASA. FWZ is not equivalent to DFZ and does not contain flammable fluids.
26-7	*AIRBUS DEFENCE & SPACE*	MOC VTOL.2330 section 1(f)	54	It is convenient to harmonise the naming of the zone “Explosive fire zone” with EUROCAE WG112 that refers to it as “Explosive Flammable Withstanding Zone”	Please check if armonisation is needed	Recommended	Noted	EASA is collaborating with Eurocae WG-112 and the final version of the standard will benefit from knowing the concepts and terms defined in the EASA MOCs. Future EASA MOCs will maintain the consistency of the terminology (e.g. the upcoming Thermal Runaway MOC uses same naming.

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26-8	*AIRBUS DEFENCE & SPACE*	MOC VTOL.2330 section 1(g)	54	For determining the minimum fire capability, current text seems to assume that fire will not be controlled from detection until landing, apparently it does not allow to take credit of the means that may be implemented in the design to reduce the fire time duration (i.e. drainage and maximum size of puddles, fire extinguishing system); if this is the case it may be over-conservative. Besides, the time required for continued safe flight and landing is undetermined (depends on distance to alternative vertiport) unless it is regulated or established by the manufacturer as a design criteria and treated in the documentation as a limitation.	Please consider the existence of fire mitigation means to establish the minimum fire capability. Consider providing guidelines to determine the time required to be sustained.	Recommended	Partially Accepted	Definition of minimum fire capability has been deleted since its added value was very limited as complementary information to already defined zones.
26-9	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(c)	54	Does “fire withstanding capability” refer to the engine materials or the materials surrounding the engine?	Please provide clarification or examples	Requested	Partially Accepted	Refers to both. Definition in 1(e) and text in 3(e)(4) improved.
26-10	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(c)	54	Does the MOC criteria assume an electric engines always present a fire hazard, or do they allow for the possibility that the engine is not a fire hazard?	Please provide clarification or examples	Requested	Accepted	Added in 1 (e). *‘It is assumed that a lift/thrust unit basically presents a fire hazard, which means that a fire withstanding zone will provide the minimum zonal fire protection.’*
26-11	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(c)	54	In a related question, does the term "fire withstanding capability" allow for the possibility of barriers that do not have to withstand fire?	Please provide clarification or examples	Requested	Partially Accepted	In relation to Fire Withstanding capability and associated test (that has been added to MOC) the barrier would not be necessarily a closed physical barrier but the limits of a volume preventing the propagation of fire.

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26-12	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(d)	54	There are many electric engine designs in progress. Is it possible that the MOC criteria could affect the designs of air-cooled engines that are currently being proposed (or discussed) with the certifying agencies? For example, could (c) and (d) in this section of the MOCs force air-cooled engine designs to operate in closed volumes which would then prompt either an unanticipated engine cooling system change or the need for aircraft-level engine cooling features?	Please provide clarification or examples	Requested	Accepted	New definition of Fire Withstanding Zone (FWZ) provided: *'Is a volume surrounding one or several electrical thrust/lift units that could be open or closed and able to withstand the effect of a flame and/or sparks, arcing, heat, and hot parts ejection'*
26-13	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(d)	54	It appears there is always a need for a barrier of some kind between the engine and aircraft (since open volumes must also withstand the effect of a flame and/or sparks, arcing, heat, hot parts ejection). Please either describe the configurations of open and closed volumes or clarify the differences.	Please provide clarification or examples	Requested	Accepted	Definition Open and Closed Volume has been added containing their relation to the Fire Withstanding Zone (FWZ).
26-14	FAA AIR-624 / MB	MOC VTOL.2330 Para. 1(f)	54	Please explain if it is possible that the MOCS allow for batteries to be installed in non-explosive fire zones. If so, an example would be helpful to prevent misapplying of the criteria.	Please provide clarification or examples	Choose an item.	Noted	It is not possible to have batteries installed in non-explosive fire zones . Refer to the definition of the EFZ.
26-15	*TCCA* *AARDD/O*	MOC VTOL.2330 3.	55	The paragraph just refers to fire/smoke, spark, or arc, it does not mention about heat containment and/or heat transfer from the compartment to adjacent areas.	Heat containment and/or heat transfer shall be included in the MOC.	Requested	Accepted	Heat has been added.
26-16	*TCCA* *AARDD/S*	MOC VTOL.2330 Section 3.	55	Definition of material to withstand the effects of fire is vague.	To include reference to temperature exposure, heat flux, loading and time, similarly to FAA AC 20.135.	Recommended	Partially Accepted	Test criteria have been added – to be found in 3 (e) following reorganisation of paragraphs of this MOC.

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26-17	*TCCA* *ARDD/M*	MOC VTOL.2330 Para 3(a)	p.55/94	"(a) Fire protection of flight controls, engine mounts, and other flight structure: Flight controls, engine mounts and other flight structure located in the Fire Withstanding Zone or Explosive Fire Zone…" References to "engine mounts" are not adapted to the VTOL terminology.	In MOC VTOL.2330 para 3(a), recommend replacing references to "engine mounts" by "thrust/lift units mounts" or similar terminology.	Requested	Accepted	Replaced as suggested.
26-18	*AIRBUS DEFENCE & SPACE*	MOC VTOL.2330 section 3(a)	55	Regarding the text "so that they can perform their essential function during a time that covers at least the detection of the fire at the most adverse operating condition and ensuing…", it is not clear if the adverse operating condition is quoted in reference to the essential function or to the detection. It seems more logical the 1st option because the continuation of flight after detection normally is done avoiding high g maneuvers therefore it is suggested to change the wording "so that they can perform their essential function at the most adverse operating condition during a time that covers at least the detection of the fire and ensuing…"	Please consider to change the wording to something like "so that they can perform their essential function at the most adverse operating condition during a time that covers at least the detection of the fire and ensuing…"	Recommended	Accepted	Text in 3.(a) modified to: *"[...] so that they can perform their essential function at the most adverse operating condition."*
26-19	*Rolls-Royce Deutschland*	MOC VTOL.2330 Fire Protection in designated fire zones Bullet Point 3.(b)	55	In areas adjacent to fire withstanding zones ….units or EESS is subject to a characterised flame… Is the threat for components, electrical lines and fittings, located in area adjacent to fire zones meant to be the heat radiation originated by a fire in the Fire Withstanding Zone or an Explosive Fire Zone?		Recommended	Partially Accepted	Wording modified to: *"Components, electrical lines and fittings (including fire detection components, if any), located in area adjacent to a Fire Withstanding Zone, a Designated Fire Zone or an Explosive Fire Zone should be constructed of such materials and located such that if a portion of the lift/thrust unit or EESS is subject to fire, heat or arc-faults, the following is ensured: […]"*

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26-20	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(b)	55	Original Statement: Components, electrical lines and fittings, located in area adjacent to [..] will not suffer sufficient damage to endanger the VTOL aircraft [..] How “endanger” need to be interpreted? Is a Hazardous classified conequence of components, electrical lines and fittings failure due to fire in a Considered Zones for VTOL acceptable if it does not preclude, during the fire event, continued safe flight and landing (Category Enhanced) or controlled emergency landing (Category Basic)?	Please clarify	Requested	Partially Accepted	Paragraph simplified without using ‘endanger’.
26-21	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(c)	55	Original Statement: There should be a complete drainage of each part of each Fire Withstanding Zone or Explosive Fire Zone if any presence of fluids can occur. Typically 90% of the fluid drained in 10 min with limited residual puddles (<1.5 oz) is acceptable. Is there any equivalent guidance for VTOL?	Please clarify	Requested	Noted	There is no equivalency proposed so far for VTOL, especially not for those without flammable fluids.
26-22	*Lilium eAircraft*	MOC VTOL.2330 (3)(c)	55	For battery fires; ventilation and drainage are less safe as they help to propagate the fire. Instead of ventilation and drainage “venting/exhausting” and “containment” options can be evaluated here.	Add to 2330. 3 (c) 1 text “or provide provisions for containment” Add to 2330.3(c) 2 text “or venting/exhausting”.	Recommended	Accepted	Added in 3 (c) (3): *In absence of efficient draining, especially in case of limited amount of fluids, these fluids can be contained within the zone, which then should be capable to resist the increased fire threat.*
26-23	*AIRBUS DEFENCE & SPACE*	MOC VTOL.2330 section 3(c)	55	For ventilation, especific mention is done to prevent accumulation of corrosive gases but nothing is said aboul flammable gases	Please consider to substitute “corrosive gases” by something more general as “potentially dangerous gases (i.e. corrosive, flammable…)”	Requested	Accepted	*Corrosive* deleted. No alternative adjective used thanks to already existing mention “(…)*will cause an additional hazard”*
26-24	*AIRBUS DEFENCE & SPACE*	MOC VTOL.2330 section 3(c)	55	A complete drainage is requested but this may not be practical. Being a MoC document, it is suggested to indicate a maximum volume of individual puddles and of undrained fluid in total (as done for example in draft AC 25.863-1)	Please consider to recommend a maximum volume of individual puddles and of undrained fluid in total	Recommended	Noted	Due to the new technology and insufficient knowledge of design and type of fluids this comment has been noted and will be considered in future.

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26-25	*Rolls-Royce Deutschland*	MOC VTOL.2330 Fire Protection in designated fire zones Bullet Point 3.(c) 4.(ii)	55/56	Add toxic gases		Requested	Partially Accepted	Adjective *'corrosive'* deleted – therefore sentence *'gases (…)will cause an additional hazard.'* covers other dangerous characteristics.
26-26	*TCCA* *ARDD/M*	MOC VTOL.2330 Para 3(c)(4)	p.55/94	"(c)(4)(ii) arranged so that no discharge of emitted corrosive gases, smoke, soot, particulate or flame will cause an additional fire hazard or impinge occupants or persons…" Preferable to keep consideration for potential additional hazards as generic as possible, similar to wording for drainage, rather than specifically refer to "fire hazards". For example concentrated discharge of hot gases, or flames, on critical flight structure could result in an additional hazard.	Recommend updating the wording of MOC VTOL.2330 para 3(c)(4) as noted in the comment, deleting specific reference to "fire" hazard and referring more generally to "hazard" instead.	Requested	Accepted	Word "fire" is deleted in 3 (c)(6)(ii): *"arranged so that no discharge of emitted corrosive gases, smoke, soot, particulate or flame will cause an additional fire hazard or impinge occupants or persons on the ground (refer to Hazard Areas, as defined in paragraph (d) of MOC VTOL.2400(c)(3))"*
26-27	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2330 3D(1)	56	Are the disconnect means cockpit controls? What human factors friteria is associtated with these controls?		Requested	Partially Accepted	Modified: *"either manually by the flight crew or automatically"* Human Factors considerations are not covered by this MOC. Please refer to refer to MOC VTOL.2600 Section 2 "Controls and displays for use by the flight crew" and MOC VTOL.2605 "Installation and Operation Instructions".
26-28	*Leonardo Helicopters*	2330 3.(d)	56	More details are necessary about the disconnection means. Should they be easily accessible? Should they be operated only by qualified personnel with maintenance procedures?	Please clarify	Recommended	Partially Accepted	It is written 'during operation', therefore it is not related to maintenance. 'Quickly' is now added to support the fact that the power disconnect is part of fire/ heat/ arcing hazard minimisation strategy.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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26-29	*Pipistrel Vertical Solutions*	MOC VTOL.2330 Fire Protection in designated fire zones, 3. (d)	56	"Quick automatic disconnection limiting the fire temperature and heat flux to an acceptable level allowing a: (i) continued safe flight and landing for Category Enhanced VTOL aircraft (ii) controlled emergency landing for Category Basic VTOL aircraft.» Sentence has no clear meaning, verb is absent.	Please rephrase the sentence.	Requested	Partially Accepted	Sentence and concept have been deleted.
26-30	*Leonardo Helicopters*	2330 3.(d)	56	The EESS and Lift/Thust units shall have independent/dedicate isolation switches.	Please, clarify what type of switch shall be used (physical or virtual?	Recommended	Partially Accepted	There is no mention of independent in the MOC. It is clarified that the disconnection means should be operated "*either manually by the flight crew or automatically*".
26-31	*Lilium eAircraft*	MOC VTOL.2330 (3)(d)(2)	56	The requirement is very binding for the non fire zones , it is not necessary to have a disconnect if there will not be any threat for the lift/thrust system.	Update the requirement as follows; For each lift/thrust unit which is installed in a fire withstanding zone there should be a means to disconnect and isolate the engine from the main electrical circuit.	Recommended	Not Accepted	Each lift/thrust unit is installed in a Fire Withstanding Zone (FWZ) – please see definition of FWZ in this MOC.
26-32	*TCCA* *AARDD/S*	MOC VTOL.2330. 3(e) and 3(f)	56	The MOC for fire-withstanding and explosive walls are written more as performance-based objectives than MOC in terms of expectations. Are tests expected? Are there any existing standards to test to?	Provide further details/references on Means of Compliance.	Recommended	Partially Accepted	Test has been added.
26-33	*FAA AIR-618*	MOC VTOL.2330 Para 3(e) & (f)	56-57	Is there really a need to establish different terminology here for fire withstanding firewall and explosive firewall? The language is nearly identical and could be handled by requiring that the firewall be able to contain the heat and pressure expected during a failure/fire event. This would cover all types of fires including ones with high pressures that would otherwise be classified as "explosive".	Combine fire protection capability requirements such that the firewall is designed to retain the worst-case fire event expected in service.	Recommended	Noted	The different zones and their capabilities have been clarified. Due to the difference of threats, it is not considered possible to put them together in same paragraph.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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26-34	*TCCA* *ARDD/M*	MOC VTOL.2330 Para 3(e)(1) and 3(f)(1)	p.56-57/94	"(e)(1)(iii) Essential to control the flight and landing at the most adverse operating condition and an ensuing: a. continued safe flight and landing, for Category Enhanced VTOL aircraft, or b. controlled emergency landing, for Category Basic VTOL aircraft." The wording "essential to control the flight and landing" in paragraph (e)(1)(iii) carries a narrower meaning and expectations than CSF&L under subparagraph (e)(1)(iii)(a) applicable to Enhanced category. The same comment applies to MOC VTOL.2330 para 3(f)(1)(ii)	Recommend rewording MOC VTOL.2330 para 3(e)(1)(iii) as follows to avoid confusion with CSF&L expectations: "(e)(1)(iii) Essential to control the flight and landing at In the most adverse operating conditions, essential to perform and an ensuing: a. continued safe flight and landing, for Category Enhanced VTOL aircraft, or b. controlled emergency landing, for Category Basic VTOL aircraft." Similar rewording should be applied to MOC VTOL.2330 para 3(f)(1)(ii).	Requested	Partially Accepted	The MOC text has been reworded.
26-35	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(e)(3)	56	I suggest to add the following bullet even if it looks like redundant Each Fire Withstanding Wall and shroud should be: - constructed of materials capable to withstand the effects of fire	Suggestion	Recommended	Partially Accepted	The following has been added: '*constructed of self-extinguishing materials in order to prevent from fire propagation*'
26-36	*FAA AIR-624 / PD*	MOC VTOL.2330 Para. 3(e)(3) and 3(f)(3)	56, 57	For the fire withstanding wall (e)(3) and explosive firewall (f) (3), add a statement that there should be no backside burning, backside ignition or significantly high temperatures behind the firewall such that it can result in additional fire hazard.	Request a statement be added to paragraph 3(e)(3) and 3(f)(3) for the fire withstanding wall and explosive firewall, respectively, to not allow backside burning, backside ignition, or significantly high temperatures behind the wall that can result in additional fire hazard. If this is not practical, shielding or protection of components behind the wall may be required to eliminate the potential fire hazard.	Requested	Partially Accepted	The suggested statement has been added for the explosive firewall. Areas adjacent to Fire Withstanding Zones (FWZ) are sufficiently covered by 3 (b)

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26-37	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(f)(1)(3)	57	1) [..] and any other parts that are: - Affected by the battery fire 3) Each Explosive Firewall and shroud should be: - constructed of materials capable to withstand the effects of of a flame and/or sparks, heat, pressure and hot parts ejection.	Suggestion	Recommended	Partially Accepted	1) If there is a wall they are no more affected – no modification is deemed necessary in the MOC 3) The suggested text has been added to the MOC
26-38	*Rolls-Royce Deutschland*	MOC VTOL.2330 Fire Protection in designated fire zones Bullet Point 3.(f)(3)(i)	57	Add toxic gases		Requested	Noted	See response to comment #26-25.
26-39	*Lilium eAircraft*	MOC VTOL.2330 (3)(f)(3)(i)	57	ESS compartment coverage can be bigger than the explosive fire zone if the mitigations are taken in module level, the compartment can be replaced with EFZ.	Update the requirement as follows; (i)constructed so that no hazardous quantity of fluid, corrosive gases, smoke, soot, particulate, liquid metal or flame can pass from any explosive fire zone to other parts of the VTOL aircraft, and …	Recommended	Accepted	Text modified as suggested.
26-40	*Rolls-Royce Deutschland*	MOC VTOL.2330 Fire Protection in designated fire zones Bullet Point 3.(f)(3)(ii)	57	The explosion firewall is a copy of the fire withstanding wall. However, shouldn't there be a requirement subjecting potential burst pressures. Must the burst wall contain all max overpressure or could a pressure release means limit the maximum pressure ?		Recommended	Noted	Section 3.(c)(4) states that: *"Each Fire Withstanding Zone or Explosive Fire Zone should be ventilated/exhausted to prevent the accumulation of hazardous gases, smoke, soot, particulate."*

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26-41	*Vertical Aerospace*	MOC VTOL.2330 3.(f)(4)	56	We agree that the aircraft needs to remain in a safe condition for the duration of a continued safe flight and landing but the explosive fire wall does not necessarily need to be shown to withstand fire for that duration - only the duration that a fire can exist. Once an EESS has burned out there is no further material to sustain a fire and no need to demonstrate further heat and pressure resistance.	re-word 4(i): "continued safe flight and landing or complete consumption by fire of the EESS whichever is less, for Category Enhanced....Note: if time to complete consumption is less than time for continued safe flight and landing, the explosive fire wall must be shown to be protected from residual heat and pressure for the time delta to safe landing"	Requested	Noted	The MOC refers now to the duration of an accepted Thermal Runaway test. EASA will publish a specific MOC to clarify which standards are accepted for the Thermal Runaway Test.
26-42	**FAA AIR-624 / PH**	**MOC VTOL.2330** **Para. 3(g)**	57	"Following CS requirements provide means that can be used to comply with VTOL.2330(a):" It looks like the VTOL reference is intended to be "VTOL.2330" without the (a) reference, as VTOL.2330 has 3 major paragraphs.	Check and delete the (a) reference in VTOL.2330(a) as currently stated in VTOL.2330 paragraph 3(g)	Requested	Partially Accepted	This section has been deleted. Refer to section 3(b) of MOC VTOL.2325(b)(1) and (b)(2) for accepted extinguishing means in Designated Fire Zones.
26-43	*Leonardo Helicopters*	2330 (h) (1)	57	If the e-VTOL are supplied by Batteries the Overvoltage condition could be detected only in case of on-board Charge	Shall the overvoltage detection system be included in the e-VTOL with Swappable Battery (no on-board charge during flight)?	Recommended	Partially Accepted	"Overvoltage" is removed from the list in (g)(1), since it is agreed that the overvoltage condition is normally not used to detect a thermal runaway (fire) in the battery.
26-44	*Pipistrel Vertical Solutions*	MOC VTOL.2330 Fire Protection in designated fire zones, 3. (h) (2)	57	"For each EESS and lift/thrust unit there should be approved, quick-acting detectors in fire zones in numbers and locations ensuring prompt detection of fire in those zones" The verb is missing, or the comma is not where it should be. Should there be APPROVED quick-acting detectors or there SHOULD BE quick-acting detectors for each EESS APPRIVED?	Please rephrase the sentence.	Requested	Accepted	MOC text modified as follows: *"For each EESS and lift/thrust unit, there should be approved, quick-acting detectors …"*

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26-45	*Pipistrel Vertical Solutions*	MOC VTOL.2330 Fire Protection in designated fire zones, 3. (h) (5)	57	"There should be means to allow crew members to check the functioning of each detector system electrical circuit." Time period of these checks are not specified. Should the means allow crew members to check the functioning of each detector prior to every flight? Or constantly during fire? At every maintenance?	Safety assessments shall address the need to check the functioning of detector systems, it should not be specified in the MOC. Depending on the architecture and reliability of the detectors systems, monitoring each of them could be not needed. This point of the MOC should be deleted.	Requested	Not Accepted	The safety assessment defines the minimum interval for checks – automatic or manual. This requirement deals with the capability to ensure on demand that the system is in functional state.
26-46	*TCCA* *AARDD/O*	MOC VTOL.2330 3.(h)	57	The specification mentions detection system however it does not mention a maximum detection time – for example – 60 seconds.	Additional information is required to be added to address time detection for each detection system design and how it must be demonstrated (test, analysis, etc.).	Requested	Not Accepted	Comparing to other specifications there is no strict limit for a detection time. Detection time, reaction time and fire capability have to be compatible.
26-47	*FAA AIR-624 / PD*	MOC VTOL.2330 Para. 3(h)	57	For the detection system, the design should also withstand the fire or flame characteristics to ensure its operation and capability to detect the fire or overheat conditions in the fire withstanding zone and/or the explosive fire zone.	Request a statement be added to paragraph 3(h) to state that the design should also withstand the fire or flame characteristics to ensure its operation and capability to detect the fire or overheat conditions, in the fire withstanding zone and/or the explosive fire zone.	Requested	Partially Accepted	The suggested statement is Part of h (6), which has been completed in the direction suggested by this comment.
26-48	*Lilium eAircraft*	MOC VTOL.2330 (3)(h)(6)	57	ESS compartment coverage can be bigger than the explosive fire zone if the mitigations are taken in module level, the compartment can be replaced with EFZ.	The wiring and other components of each detector system in an explosive fire zone should have at least Minimum Fire Capability.	Recommended	Partially Accepted	The text has been changed to: "*The wiring and other components of each detector system in an electrical energy storage system compartment should have appropriate characteristics for the associated fire zone*"
26-49	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(h)(6)	57	Original Statement: The wiring and other components of each detector system in an electrical energy storage system compartment should have at least Minimum Fire Capability. An equivalent requirement for Fire withstanding zone is missing.	Suggestion	Recommended	Noted	It is intentional not to include the Fire Withstanding Zone (FWZ) as the fire threat in a FWZ is expected to be very short.

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26-50	*Lilium eAircraft*	MOC VTOL.2330 (3)(h)(6)	57	After detecting the fire or thermal runaway condition the need of detectors functionality depends on the emergency procedures and aircraft design. If the applicant has an emergency procedure which does not need a continuous detector functionality the requirement will not be applicable. Such as after having the signal if the a/c diverts to the nearest vertiport etc. In addition, aircraft design may allow demonstration of fire containment or exhaust.	The wiring and other components of each detector system in an explosive fire zone should have at least Minimum Fire Capability if the functionality of the detector during fire is essential for performing continued safe flight and landing.	Recommended	Not Accepted	If the detection system does not work under fire conditions, its objective is not fulfilled.
26-51	*Rolls-Royce Deutschland*	MOC VTOL.2330 Bullet Point 3.(h)(7)	58	Original Statement: No detector system component for any fire zone should pass through another fire zone, unless– (ii) The zones involved are simultaneously protected by the same detector and extinguishing systems. What does “fire zone” means in this context? Explosive fire zone with Explosive fire zone and Fire withstanding zone with Fire withstanding zone or also a mix of the two?	Please clarify	Recommended	Accepted	Text modified to: *“No detector system component for any fire zone (FWZ, DFZ or EFZ) should pass through any other fire zone […]”*
26-52	*GAMA*	2240 (e)	38		Additional performance figures will need to be flushed out to determine battery fire containment requirements as well as time required to ground and duration component would be subjected to fire depending on air vehicle performance.	Recommended	Noted	As per Section 3(b) of this MOC, continued safe flight and landing for category enhanced or controlled emergency landing for category basic should be ensured following a fire. The thermal runaway could represent the critical failure for performance in some cases and thus have a direct influence in the certified minimum performance of the aircraft.

27.MOC VTOL.2400(C)(3) LIFT/THRUST SYSTEM INSTALLATION – LIKELY HAZARDS IN OPERATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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27-1	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2400(c)(3) (a)	59	Should an external audible warning be required prior to electric motor start?		Recommended	Noted	It is important that the surrounding personal is made aware of potential electric engine start. However, there is no prescriptive requirement for a specific warning (aural or visual) prior to electric engine start. It is up to the applicant to choose the best solution or combination of visual (by means of lights or signals from the crew), aural or motion cues in order to make sure the surrounding personal is made aware.
27-2	*Leonardo Helicopters*	2400 (c) (3) (a)	59	It is not clear what “prevent inadvertent motor operation” means. Prevent inadvertent activation is a basic feature of every system.	Please clarify which kind of features are considered appropriate and if safety analysis should be performed on this features.	Recommended	Noted	Inadvertent motor operation should be understood as: it should not be possible to start the engine by simply pressing one button by inadvertence. For example, a safe-guarded switch could allow showing compliance. This should be part of the HMI evaluation.
27-3	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2400(c)(3) (c)	59	Unclear why so much emphasis for downwash measurements – is it not safe to assume the downwash should be less than CS 27 cerified helicopters?		Requested	Noted	On the one hand, VTOL aircraft are proposed with a variety of architectures and disk loadings, e.g. using jets for lift, resulting in different downwash characteristics than for helicopters. On the other hand, in the context of Urban Air Mobility, vertiports are planned to be placed closer to populations, resulting in a different environment around the aircraft. The combination of the above results in the need to carefully characterize the aircraft downwash for vertiport design. This has been acknowledged in FAA Broad Agency Announcement (BAA) 692M15-20-R-00004, with the topic “Small-Scale Outwash and Downwash Testing for Vertiports for Advanced Air Mobility”.
27-4	*TCCA* *AARDD/P*	VTOL.2400(c) (3)	59	(c) Downwash effect, method to characterise item (3) reporting in the AFM “as well as the measurement standard (here “§(c) in MOC VTOL.2400(c)(3)”)” is incomprehensible.	The intent is to be explained: in addition to speed in km/h, what is required in the AFM.	Requested	Noted	The maximum measured speed is reported in km/h to the nearest multiple of 5, as well as the measurement standard, in the performance section of the aircraft flight manual. The measurement standard proposed in this MOC can be reported as “§(c) in MOC VTOL.2400(c)(3)“

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27-5	*GAMA*	MOC-SUBPART E-Lift/THRUST SYSTEM INSTALLATION, MOC VTOL.2400(c)(3), footnote 2	60	The proposed text states "The accuracy of the hover should meet the "Desired" MHQRM for a 1 m-height precision hover (ref. MOC VTOL.2135)." It is understood that "Desired" comes from Cooper-Harper, which is mapped to MHQRM and is in the MHQRM definition of "SAT". However, MHQRM only has categories of "SAT, ADQ, CON" [Reference first publication of MOC SC-VTOL Issue 2, 12 May 2021, Section MOC VTOL.2135 4. Table 1, page 13]. Therefore, the appropriate term appears to be "Satisfactory (SAT)".	Replace the word "Desired" with "Satisfactory (SAT)"	Requested	Partially Accepted	SAT ratings are dealing with handling qualities levels, which are the result of the pilot manipulation of the flight controls while holding height, heading and lateral/longitudinal values within the accuracy that are prescribed in the ED-295 operationally representative hover maneuvers. The text of the footnote has been improved.
27-6	Boeing	MOC-SUBPART E-Lift/THRUST SYSTEM INSTALLATION, MOC VTOL.2400(c)(3), footnote 2	60	The proposed text states "The accuracy of the hover should meet the "Desired" MHQRM for a 1 m-height precision hover (ref. MOC VTOL.2135)." It is understood that "Desired" comes from Cooper-Harper, which is mapped to MHQRM and is in the MHQRM definition of "SAT". However, MHQRM only has categories of "SAT, ADQ, CON" [Reference first publication of MOC SC-VTOL Issue 2, 12 May 2021, Section MOC VTOL.2135 4. Table 1, page 13]. Therefore, the appropriate term appears to be "Satisfactory (SAT)".	Replace the word "Desired" with "Satisfactory (SAT)"	Requested	Partially Accepted	See response to comment 27-5
27-7	FAA AIR-624 / PD	MOC VTOL.2400(c)(3) Para. (d)	63	The velocity profile in the hazard area of the engine exhaust or battery venting in case of fire should also be specified.	To ensure safety of passenger, flight crew, ground maintenance personel, as well as equipment or aircraft around the hazard area, the velocity of the engine exhaust or battery venting in case of fire should be evaluated and specified in the AFM to determine the safe or keep out zone / distance from the hazard area, as an additional Figure 5 update or new Figure.	Recommended	Noted	The size of the area to provide protection from a specific hazard is expected to take into account the characteristics of the hazard, e.g. maximum exhaust or venting velocity. If relevant to protect from the hazard, the velocity profile can also be reported in the AFM.

28.MOC VTOL.2425(B) SHUTDOWN AND RESTART OF A LIFT/THRUST UNIT IN FLIGHT

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
28-1	*GAMA*	MOC-SUBPART E-LIFT/THRUST SYSTEM INST MOC VTOL 2425 b. 2425 c. 2425 d.	64	Content does not provide additional information to hazards identified through the application of a systems safety assessment or human error assessment.	Recommend text change to include “standard systems safety assessment and crew error assessments contain specific methodologies to identify and mitigate hazards presented by restarting an lift/thrust system.”	Requested	Accepted	A note has been inserted at the end of the MOC. This requirement and this MOC have the intent to cover specific topics seen today in multi-engine aeroplane or helicopter applications, such as cross-inhibition of engine shutdown function between engines. This topic is today not sufficiently addressed in the AMC to CS-E nor CS-2X.
28-2	Boeing	MOC-SUBPART E-LIFT/THRUST SYSTEM INST MOC VTOL 2425 b. 2425 c. 2425 d.	64	Content does not provide additional information to hazards identified through the application of a systems safety assessment or human error assessment.	Recommend text change to include “standard systems safety assessment and crew error assessments contain specific methodologies to identify and mitigate hazards presented by restarting an lift/thrust system.”	Requested	Accepted	A note has been inserted at the end of the MOC. This requirement and this MOC have the intent to cover specific topics seen today on multi-engine A/C or H/C applications, such as cross-inhibition of engine shutdown function between engines. This topic is not today sufficiently addressed in the AMC to CS-E nor CS-2X.
28-3	*Rolls-Royce Deutschland*	MOC VTOL.2425(b) Bullet Point (a)	64	Original Statement: In any case, there should be means to shut down and/or isolate the lift/thrust system as requested per VTOL.2440. Proposal to delete “/or” the VTOL.2440 requires lift/thrust system isolation	In any case, there should be means to shut down and isolate the lift/thrust system as requested per VTOL.2440.	Recommended	Accepted	Modified accordingly.
28-4	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2425(b) (b)	64	This paragraph assumes the pilot has control of individual propulsion motors. Current design has the flight control computer controlling engagement/disengagement of each individual unit.		Recommended	Noted	The MOC does accept different means to shutdown a lift/thrust unit: by the control system or by the crew. Parapgrah b addresses the risk in the event that the pilot shuts down one or several LTU.
28-5	*Leonardo Helicopters*	2425 (b)	64	The shutdown and the restart of the motors should be managed by the AFCS.	The Pilot shouldn’t restart the Motors in case of failure, it maybe an emergency procedure only.	Recommended	Noted	The MOC does accept different means to shutdown a lift/thrust unit: by the control system or by the crew. There is no intent to impose a design solution.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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28-6	*Rolls-Royce Deutschland*	MOC VTOL.2425(b) Bullet Point (d)(1)	64	Original Statement: Is a continued safe flight and landing possible without restarting/relighting the lift/thrust unit that has been shut down? If not, there should be means to restart/relight the shutdown lift/thrust unit (automatically or by the crew). Not clear how the shut down of a lift/thrust unit could preclude the continued safe flight and landing. It seems to contradict the VTOL.2510 The VTOL should be designed to cope with the loss of one lift/thrust unit, is this meant to cover the cases were multiple lift/thrust unit are shutdown?	Please clarify	Requested	Noted	The statement provided as comment is agreed. No single failure should preclude the CSFL for Enhanced category. However, the MOC does not specify if other LTU have been shutdown previously. This should be understood as such.
28-7	*Rolls-Royce plci*	MOC VTOL.2425(b) Bullet Point (d)(2)(i)	64	Original Statement: "This may surprise the crew which could be detrimental in situations such as the final approach. In such situations, it might be worth to provide the capability to restart/relight but let the crew the final decision whether to activate the function or not." Ambiguous language (particularly the underlined statement), it could be opened to interpretation of the severity of the requirement.	Proposed Change: "This may surprise the crew which could be detrimental in situations such as the final approach. In such situations, if automatic engine restart/relight capabilities are provided to the VTOL, the system capability shall enable the crew to make a final decision whether to activate this function or not". Something along the proposed line above is clearer and leaves room to the manufacturer to decide whether providing or not automatic engine restart/relight capabilities.	Recommended	Accepted	Modified accordingly.
28-8	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2425(b) (d)(2)(ii)	64	Is vibration monitoring a requirement, or is this pilot qualitative assessment?		Recommended	Noted	This MOC does not prescribe any means to detect vibrations. Applicants can select an appropriate means that will have to be duly substantiated.

29.MOC VTOL.2430(A)(3) AND (A)(4) ACCESSIBLE ENERGY IN ELECTRICAL ENERGY STORAGE SYSTEMS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
29-1	*Lilium eAircraft*	MOC VTOL 2430 (a)(3)&(a)(4) (a) and (b)	65	distribution system may also have impact on available energy, e.g. voltage drop over heated wiring	change “energy storage system” to “energy storage and distribution system”	Requested	Not Accepted	The standard scope is the Energy Storage System and it is up to each applicant to define an appropriate Equipment Under Test (EUT). Distribution system is a term with a broader scope, and includes the complete distribution system of the aircraft that will be tested at higher levels (i.e. integration tests)
29-2	FAA AIR-624 / MW	MOC VTOL.2430 Para. (a)(3) and (a)(4) Para. (a)	65	Eurocae ED-289 does not do a good job in evaluating the battery. It is better at establishing system parameters to be used by the flight deck. In order to use ED-289 for the battery, more information about the test setup will be needed. Also, discharge rates (both static and dynamic), peak power test, capacity (current and power) test, charge acceptance, and charge retention test will need to be incorporated. The parameters that are measured are usually captured by the battery management system. The ESS system will need to be tested in a setup that will reflex the application with all specified resistance, inductance and capacitance ranges. The setup will have to take into consideration ESS cooling and environmental requirements as well. There should also be a minimum of ESS units tested since performance varies.	Recommend including the appropriate level of supplemental detail in this document.		Not Accepted	Battery performances tests will be part of another Eurocae standard, with the title: “Technical Standard on Rechargeable Lithium Batteries in eVTOL applications”. This standard is currently under development and should include: static, dynamic and peak charge capacity and energy test, lowest capacity and energy test… Regarding the setup definition, all parameters for the setup are captured in the section: “Definition of an EUT” that gives guidelines how to define them, without being prescriptive, as there will be very different solutions. Cooling will be taken into account as the EUT has to be representative of the real installation, and the environmental requirements are captured in the load and aging profile sections defining the Temperarure start, maximum, minimum and variation. Any other environmental parameter that could be applicable is captured in requirement 5 “Ageing Profile”: “If applicable, the Ageing Profile shall reflect the environmental conditions of the EUT”.

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29-3	Safran	2430(a)(3) and (a)(4)	65	The way the prediction can be performed for a VTOL of category “Basic” raises some questions tied to the flight profile. E.g. would it be necessary to “enter” such a flight profile before flying?		Choose an item.	Noted	The scope of this document is to ensure that the Energy Storage System (ESS) can provide accessible energy until the eVTOL reaches a safe landing based on the prediction of battery states with regard to the planned flight profile for every given mission. To do so, the maximum error of that state prediction is determined using the profile(s) considered the worst-case flight profile(s) in accordance with the operational requirements of the aircraft with a safety margin and considering the complete lifetime of the ESS (Aging). This worst-case flight profile and the maximum error associated determined with a safety margin shall cover all the real operational flight profiles. Therefore it is ensured that a planned profile does not violate any safety boundary until safe landing has been reached and thus allows to the operator to confirm the useable energy and range for a given mission. In summary, the flight profile in this document is a worst-case flight profile used to calculate the maximum error that will be included in the design. This flight profile of the document is not to be entered as flight profile before flying. The real flight plan shall be used, whose error will be always lower than the maximum error calculated with the worst flight profile plus the safety margin.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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29-4	FAA AIR-624 / MW	MOC VTOL.2430 Para. (a)(3) and (a)(4) Para. (b)	65	Eurocae ED-289 does a good job of looking at the various parameters that could be measured to provide information to an algorithm to provide the cockpit with available energy information. However, it will require a great deal of specific information from the applicant. ED-289 (in general) takes care of some of the general sources of error, however; specific installation and use sources of error are not accounted for. There are general statements that refer the test setup but without much detail. The test setup can influence the data skewing the results. This document seems to be more suited for establishing the energy parameters for the ESS. For example if you had an iron bird setup with a battery emulator you could get the performance data that you require for the battery.	Recommend including the appropriate level of supplemental detail in this document.		Not Accepted	It is acknowledged that applicants will have to provide specific information. The scope of the document is to provide guidelines how to define the parameters without being prescriptive, as there will be very different solutions. As stated in section 1.3 Description of equipment/ function: System failure errors are not considered in this context as contributors for an erroneous state observation or state prediction, as they are considered in ED-79A/ARP-4754. Only normal ageing of ESS components is considered. Regarding the setup definition, all parameters for the setup are captured in the section: “Definition of an EUT” that gives guidelines in how to define those parameters without being prescriptive, as there will be very different solutions. Cooling will be taken into account as the EUT has to be representative of the real installation, and the environmental requirements are captured in the load and aging profile sections defining the Temperarure start, maximum, minimum and variation.

30.MOC VTOL.2435(F) PREVENTION OF LIKELY FOREIGN OBJECT DAMAGE TO THE LIFT/THRUST UNIT

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
30-1	*Pipistrel Vertical Solutions*	MOC VTOL.2435(f) Prevention of likely foreign object damage to the lift/thrust unit	65	"b) It should be substantiated that the strike and ingestion effects of foreign objects such as plastic bags, papers, cleaning cloths, hand tools, rivets, bolts and screws are not hazardous to the aircraft. " How can this be efficiently substanstiated?	Clarify how this part of the MOC could be efficiently substiantiated.	Recommended	Accepted	Clarifications have been added.
30-2	*TCCA* *ARDD/M*	MOC VTOL.2435(f)	p.65/94	"(c) Design precautions should be taken to avoid the clogging of cooling holes by foreign object damage." Presumably this is intended to address clogging of cooling holes directly by foreign objects (e.g. plastic bag), but the reference to 'damage' could be confusing.	Recommend rewording MOC VTOL.2435(f) para (c) as follows: "(c) Design precautions should be taken to avoid the clogging of cooling holes by foreign objects damage."	Requested	Accepted	Text modified: "damage" reference is removed.
30-3	*Volocopter GmbH*	MOC VTOL.2435(f)	65	Should we consider the strike or ingestion in only one EPU or multiple EPUs a the same time?	Please clarify.	Requested	Accepted	Clarifications have been added.
30-4	*Volocopter GmbH*	MOC VTOL.2435(f)	65	Should this be prevented in ground and/or flight?	Please clarify.	Requested	Accepted	Both in flight and on the ground. Clarifications have been added.

31.MOC VTOL.2435(G) FLIGHT CREW AWARENESS OF THE LIFT/THRUST UNIT CONFIGURATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
31-1	*Leonardo Helicopters*	VTOL.2435(g)	65	It is not clear what is a thrust unit and why it has been chosen to adopt this naming	Include a definition of thrust unit and why it has been decide to using this namig for a blade-rotor-gb assembly	Requested	Noted	The definition of a Lift/thrust unit is already provided in the MOC VTOL.2000.
31-2	*Volocopter GmbH*	MOC VTOL.2435(g)	65	Still not clear the definition of "configuration". Is the configuration regarding: Which LTU are ON/OFF? Which LTU are installed? Which LTU are used as lift and which are used as push? Else?	Please clarify.	Requested	Not Accepted	Paragraph (b) provides clarification with regards to the configurations to be looked at. This assessment has to be performed by the applicant for its specific A/C configuration. Which LTU are ON/OFF? All LTUs are supposed to operate prior to take-off unless the applicant wishes to demonstrate the possibility to operate with one LTU off or failed prior to take-off. Which LTU are installed? Same answer. Which LTU are used as lift and which are used as push? As mentioned in paragraph (b), all LTUs configurations having an impact on performances or operating procedures have to be considered.
31-3	*Rolls-Royce Deutschland*	MOC VTOL.2435(g) Bullet Point (a)	65	Typo: replace titling by tilting		Requested	Accepted	Modified accordingly.
31-4	*FAA AIR -626*	MOC VTOL.2435(g) Para. 1(b)	65	"The intent of VTOL.2435(g) is therefore to provide the flight crew through the relevant VTOL aircraft systems, with the necessary information concerning any lift/thrust configuration that has an impact on: the lift/thrust performances the lift/thrust operating procedures" If there is a safety critical issue, emergency alerting should be clear and easily interpretable.	Add verbiage about being clear and easily interpretable. If determined to be safety critical, this information should be in the primary field of view.	Requested	Accepted	Modified accordingly.

32.MOC 4 VTOL.2500(B) CERTIFICATION CREDIT FOR SIMULATION AND RIG TESTS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
32-1	*GAMA*	MOC-SUBPART F-SYSTEMs AND EQUIPMENT, MOC 4 VTOL.2500 (b)	67	The proposed section title states "Certification credit for simulation and rig tests." The material in this section does not appear to be specific to MOC SC VTOL, but is much more generic that could apply to almost any aircraft type certification and hence prevent potential duplication and unnecessary variation in numerous documents if done for each aircraft type.	Move this entire section to a document that applies to numerous/various type certifications.	Requested	Noted	MOC 4 VTOL.2500(b) is indeed derived from certification material used for some time on other products, with some adaptations, especially in section 6 It would indeed be valuable to have this material transferred to a product agnostic guidance and we will consider this recommendation. As a need has been identified for VTOL products, in the short term, EASA will proceed with the publication of this section within the MOC VTOL, updated as necessary with the results of the ongoing publication.
32-2	Boeing	MOC-SUBPART F-SYSTEMs AND EQUIPMENT, MOC 4 VTOL.2500 (b)	67	The proposed section title states "Certification credit for simulation and rig tests." The material in this section does not appear to be specific to MOC SC VTOL, but is much more generic that could apply to almost any aircraft type certification and hence prevent potential duplication and unnecessary variation in numerous documents if done for each aircraft type.	Move this entire section to a document that applies to numerous/various type certifications.	Boeing	Noted	See response to comment 32-1
32-3	*Leonardo Helicopters*	MOC 4 VTOL.2500 (b)	67	Specific guidelines exist for parts 23/25/27/29 for using "rig tests" in order to show compliance to HIRF/IEL requirements; and these appear recognized by SC-VTOL AMC, which points to EASA AMC 20-158 and 20-136. Such references should be provided in the MOC for 2500(b), althought specifying that tailored approach could be proposed in following MOC VTOL.2520 and MOC VTOL.2515	At MOC 4 VTOL.2500(b) Paragraph 1 "Scope", the addition of the following is proposed (end of paragraph): "Additional and specific guidelines for using rig tests for showing compliance to VTOL-2520 and VTOL.2515 paragraphs is provided by AMC 20-158 and AMC 20-136. Althought not being specifically defined for VTOL, they are considered as a valid option to be considered for VTOL"	Recommended	Partially Accepted	HIRF/IEL specific guidelines are already referenced in dedicated MOC VTOL. The purpose of MOC 4 VTOL.2500(b) is to provide generic guidance on simulation means usage for certification credit : generic guidance does not prevail over domain specific guidance. Paragraph 1 of the MOC has been clarified in this respect.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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32-4	*GAMA*	MOC-SUBPART F-SYSTEMs AND EQUIPMENT, MOC 4 VTOL.2500 (b) 1	67	The proposed last paragraph of this section title states “Other uses of simulation benches and test rigs are excluded from this MOC…” This appears to disallow using simulation (although defined previously in 1.(a) as ‘pilot-in-the-loop’) as a part of Calculation/Analysis. It is agreed that ‘pilot-in-the-loop’ simulation should not be used for “Calculation/Analysis”, however this should not disallow non-piloted desktop simulation for “Calculation/Analysis” which is allowed for other aircraft type certifications.	Append this paragraph with: “However, non-piloted desktop simulation may be used, when agreed, for “Calculation/Analysis.””	Requested	Partially Accepted	Indeed, non-piloted desktop simulation may be used for certification, when agreed, for “Calculation/Analysis”. Note that this type of simulation is out of scope of this particular MOC and the intent of this paragraph is not to list all practices that may be used in certification and that are outside of the MOC. For this reason the proposed sentence has not been included directly but the paragraph has been reworked
32-5	Boeing	MOC-SUBPART F-SYSTEMs AND EQUIPMENT, MOC 4 VTOL.2500 (b) 1	67	The proposed last paragraph of this section title states “Other uses of simulation benches and test rigs are excluded from this MOC…” This appears to disallow using simulation (although defined previously in 1.(a) as ‘pilot-in-the-loop’) as a part of Calculation/Analysis. It is agreed that ‘pilot-in-the-loop’ simulation should not be used for “Calculation/Analysis”, however this should not disallow non-piloted desktop simulation for “Calculation/Analysis” which is allowed for other aircraft type certifications.	Append this paragraph with: “However, non-piloted desktop simulation may be used, when agreed, for “Calculation/Analysis.””	Boeing	Partially Accepted	See response to coment 32-4
32-6	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests	67	As a general observation, TCCA is supportive of the guidance provided for integration and verification testing. The comments provided are to help improve the existing content.	N/A	Not requested	Noted	Feedback from TCCA is noted.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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32-7	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 2	67	TCCA concurs that simulators and test rigs are efficient and powerful means that enable the evaluation of failure cases which sometimes could even not be tested by flight test. This section should perhaps be expanded to included some other aspects of integration testing. The methods outlined in this guidance may be useful for loss of function assessment. Additional investigation may be needed for more complex aspects (e.g. malfunction, unintended behaviour, cascading failures/faults, propagation effects, common mode errors) and this should be highlighted in the text.	Add some wording in the introduction testing like: Traditional verification methods are effective for loss of function, but additional effort is needed for more complex aspects (e.g. malfunction, unintended behaviour, cascading failures/faults, propagation effects, common mode errors).	Requested	Accepted	Introduction modified accordingly
32-8	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 2	67	TCCA concurs that parameter variability is an invaluable aspect of integration testing. Loss of function, malfunction and unintended behaviour should be assessed for a wide array of signals (e.g. signal and data interrupts, oscillating signals, transients, data within normal range but unexpected values, over/under voltage or pressure, equipment reseets, power interruptions).	Suggest adding some wording to clarify what is meant by parameter. Also suggest adding some text, perhaps in the MOC section, elaborating on what types of signals should be included or considered by applicants when developing integration test plans.	Requested	Noted	The importance of having proper integration activities and associated means is already addressed in MOC VTOL.2510 section 11 “Considerations for highly integrated systems.” (Please refer to MOC SC-VTOL at issue 2). Duplicating some of this MOC 2510 material in this MOC is not deemed necessary. With regards to the suggestion to elaborate further on the types of signal that should be included, the comment is noted for possible future evolution of the guidance (Refer to GAMA and Boeing comments 32-1 and 32-2 on the possibility to make this MOC a product agnostic guidance)

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32-9	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3	68	3)b) The text suggests that simulators and rigs intended for use during certification should have a formalized and structured development process. While this approach would be acceptable, applicants should have the opportunity to develop their own rigs or use existing rigs. Perhaps the focus should be on ensuring that the siulators or test rigs are representative. Applicants should be free to focus on eliminating development error in development, or comprehensive review and testing to ensure adequate performance. I tmay also be worth explaining which elements of development process are needed (e.g. safety plan, requirements plan, validation, verification).	Revise text to something like: …simulators and rigs intended for use during certification should have a formalized and structured development process or be subjective to a comprehensive validation process to ensure that they are representative of the system(s) and aircraft.	Recommended	Partially Accepted	A separated sub paragraph has been added in section 3b to deal with reused simulator or rig testing
32-10	*Vertical Aerospace*	MOC 4 VTOL.2500(b) 3.b.1	68	Typographical issue	Duplicate instance of subparagraph 3.b.1; 2nd instance should be renumbered to 3.b.2	Requested	Accepted	Typographical error corrected
32-11	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Configuration Management	68	(c)(1)(ii), The identification of the impact of post-test evolutions of the design on the validity of the certification tests performed on the simulation bench & test rig; This seems like a part of the design change impact assessment, not the simulation bench or test rig configuration management. Perhaps this section should emphasize any design changes within the bench or rig, and the need to assess any impact on already completed testing.	Suggestions: Provide clarification that the design changes in question are those that would also impact the configuration of the simulation bench or test rig. Or Provide clarity that design changes need to be assessed for any impact on the validity of already completed tests. The modification impact analysis should assess the need for additional testing (e.g. new tests, regression test).	Recommended	Partially Accepted	Based on this comment and similar comments, change control section has been reworked: The commented aspect is now addressed under a new sub-paragraph (4): It is further clarified that two aspects are indeed expected to be addressed: - (i) ensures representativeness of the test bench with the aircraft, especially after a design change of the benches - (ii) deals with post test evolution (if any) of the aircraft design
32-12	*TCCA* *AARDD/S*	Section 3(c)	68	The section on configuration management explains the expectations, but it could be helpful to provide instructions with regards to deviations from those expectations.	It could be explicitly stated that deviations in drawings, instructions, procedures etc. with respect to simulation benches, test rigs, and test articles must be identified and discussed with EASA	Recommended	Accepted	Deviation from the expected configuration are expected to be managed as part of the PR processes. The suggested resolution has been integrated in the guidance.

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32-13	*Vertical Aerospace*	MOC 4 VTOL.2500(b) 3.c.1.ii	68	It is potentially unclear to what design is evolving - test bench or aircraft. As (i) ensures representativeness of the test bench to the aircraft we assume (ii) deals with subsequent evolution (if any) of the aircraft design)	Recommend wording change to "The identification of the impact of post-test evolutions of the aircraft design on the ..."	Recommended	Accepted	Wording has been further clarified in line with the comment. Please see also answer to TCCA comment 32-11
32-14	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Representivity	70-71	Human Factors & Human Error In addition to the basic human factors aspects, the system development and safety assessment process typically require the consideration of human error (flight crew, maintenance crew). Assessment of failure conditions in simualtors and test rigs should include this as a consideration.	Suggest adding a text to clarify that the safety assessment process includes the requirement to assess human error (flight crew, maintenance). Part of this assessment should be completed as part of assessing failure modes and integration testing.	Recommended	Not Accepted	Indeed, Safety assessment process requires to consider the possibility of a human error either by flight crew or maintenance crew. Some considerations are already given in MOC VTOL.2510 section 13 “Flight Crew and Maintenance considerations”. At this stage no need was identified to provide further guidance on this matter in MOC 4 VTOL.2500(b)
32-15	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Representivity	68	d)1) ATA1 per ATA verification including failure cases, followed by global aircraft level verification in the nominal aircraft state and flight domain, then finally run of multi-ATA failure cases). Concur with intent, but wording is confusing. Why bother using ATA reference which may or may not be helpful. Suggest removing ATA wording and simply describing the process broadly. Integration testing should begin with item by item integration building to intra-system, inter-system and aircraft level integration, using verification at each stage. This is an important aspect of integration and verification testing and should probably be captured in the opening parts of this guidance.	Genericize wording to something like: Integration testing should begin with item by item integration building to intra-system, inter-system and aircraft level integration, using verification at each stage.	Recommended	Accepted	Reference to ATA removed in d)1), d)2) and footnote. Wording has been generalised using proposed wording

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32-16	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Representivity	69	d)1)ii) It is also not requested to be representative of any conditions or individual parameter, but to define first the intent... Eliminate the first negative part of the sentence?	Suggested wording: The intent of the bench should be defined (e.g. test(s) intended to be performed, validation of a procedure) and depending on the intent, to demonstrate the representivity for the part/scope that is required. Conditions or individual parameters should be configurable for the tests.	Recommended	Partially Accepted	Negative statement removed for the sake of clarity: TCCA suggested rewording has been used to update d)1)ii) without prescribing that" conditions or individual parameters should be congifurable for the tests"
32-17	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Representivity	69	d)6)i) As noted in the introduction regarding integration testing, the use of system model may allow for a broader range of test cases, but it should also include a broad range of parameters and configurations.	Suggest adding a bullet that the use of model requires a wide range of signals (e.g interrupts, oscillating), operating modes (e.g. cruise, descent, ground to air) and configurations (e.g. gear up and gear down) to ensure coverage and robustness.	Requested	Not Accepted	EASA shares the point of concern. However, this level of detail is expected to be found in application specfic industrial standards.
32-18	*Leonardo Helicopters*	2500(b) 3. [d] -6- (ii)	70	It is not clear if an applicant has to use MoC A,B,C, two of them or just one	Clarify how to use these MoC	Requested	Not Accepted	With regards to 3.d.6(ii), the three sub paragraphs 6(ii)(A), 6(ii)(B), 6(ii)(C) have to be considered together.This is the reason why 6(ii)(A), 6(ii)(B) ends already with ", and". This is the same approach as in other paragraphs of the MOC. No need to change this particular paragraph is identified.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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32-19	*Volocopter GmbH*	MOC 4 VTOL.2500(b)	70	"(iii) When used to support VTOL.2510 compliance demonstration, the simulation bench: (A) should be capable of monitoring structural loads during tests through a model, and (B) if no real time monitoring is available, the simulation bench test data could be post-processed when high load level are suspected, and (C) the representivity and the limitations of aircraft loads models used should be established." The link between these guidances and VTOL.2510 is not straightforward. Isn't it a typo, with the correct reference to be VTOL.2210 (Structural design loads)?	Change reference to VTOL.2510 by reference to VTOL.2210.	Requested	Not Accepted	It is confirmed that the intent in this paragraph was to refer to VTOL.2510 System safety assessment activities for the following reason: Typically, as part of FHA failure conditions classification validation, the effect on aircraft is to be assessed. When validation of the FHA is performed using a simulation bench, the loads sustained by the aircraft should be properly considered to confirm the failure condition classification. Reference to VTOL.2510 is thus kept.
32-20	*Vertical Aerospace*	MOC 4 VTOL.2500(b) d)6(iv)	70	"Ground Model" is mentioned in 'Representivity". This is open to interpretation.	Please add clarity, suggest "Aircraft on the Ground Model"	Requested	Accepted	Section reworded as suggested

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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32-21	*TCCA* *AARDD/AISA*	MOC 4 VTOL.2500(b) Cert credit for simulation and rig tests Section 3 Representivity	70	7) the sub paragraphs i) representivity and limitations, ii) supporting assessment, and iii) configuration seems like they should be generally applicable for all test cases, instead of being listed only against failures cases with performance impact.	Revise applicability of section 7) to all failure case assessments.	Recommended	Not Accepted	The intent of paragraph 7 (as well as of paragraphs 8 “HF”, 9 “HF and HQ for certification” and 6 “model”) is to focus on a particular case: In paragraph 7, guidance is provided for failures cases with performance impacts. Generic considerations on representiveness are given in previous paragraphs (4&5). It is not deemed suitable to extend the aspects requested in paragraph 7 to all cases. In particular, since as explained in paragraph 9 for HF and HQ “the representativeness of systems and simulation means is not a key driver in the early stages of the development and should not necessarily prevent simulation bench usage as long as the nature of the limitations does not compromise the validity of the data to be collected. “
32-22	*Vertical Aerospace*	MOC 4 VTOL.2500(b) 3.d.9(i)	70	Clarification is needed on the quantification of "maximise the immersion feeling" as this is ambibuous language. FAA verbiage for the visual system requirements is better clarified for Human Factors testing in the Lab, if this is the intent of current verbiage.	Recommend a rewrite to improve clarity and add specific visual system FOV, image quality (high-def), etc. vs current qualitative verbiage.	Recommended	Partially Accepted	First, in line with FAA comment 32-23, wording has been improved. Secondly, as the guidance is meant to be generic, EASA does not intend to prescribe a list of parameters/aspects that should be considered to maximize the subject pilots' immersive environment to demonstrate and validate the HF data.
32-23	*FAA AIR -626*	MOC 4 VTOL.2500(b), Para 3. (d)(9)(i)	70	“the simulation bench should be designed to maximise the immersion feeling of the subject pilots for HF data validity purpose.” Wording is ambiguous.	Suggest rewording: “the simulation bench should be designed to maximize the subject pilots' immersive environment to demonstrate and validate the HF data.”	Requested	Accepted	Text reworded as per FAA proposal
32-24	*Vertical Aerospace*	MOC 4 VTOL.2500(b) 3.d.10	71	Vertical Aerospace believe that this list for the applicant to provide is not complete	The subject list should also include Limitations of the test rig that have been deemed "Okay As Is" by either comparison to FT data, Analysis or Engineering Judgement, and have been determined to not affect the test rig data.	Recommended	Accepted	This section of the MOC has been modified to also include limitations of the test rig as suggested. Note that not all Problem reports needs to be presented to EASA HF and HQ team, problem reports that do not affect the HF and HQ evaluations in any manner do not need to be presented. The MOC paragraph has also been updated accordingly

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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32-25	*Vertical Aerospace*	MOC 4 VTOL.2500(b) 3.f	71	The term "batch" may be inappropriate for this type testing as reference could be inferred as to a material lot or manufacturing lot, when we believe the reference is to a set of scripted test items executed in a batch sequence with testing progressing automatically.	It is recommended the verbiage be improved for clarity	Recommended	Accepted	The intent was indeed to refer to a set of scripted test items executed in a batch sequence with testing progressing automatically. Verbiage has been simplified : this section now refer to “Automatic testing”. The scope of this paragraph has also been clarified

33.MOC VTOL.2510(A) AIRCRAFT PARACHUTE RESCUE SYSTEM

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
33-1	*TCCA* *AARDD/M*	MOC VTOL.2510(a) Table 3	p.72/94	It is noted some of the requirements applied to similar certified Aircraft Parachute Rescue systems, via Special Condition, are currently not included in Table 3 – Supplemental requirements	Recommend adding the following requirements to MOC VTOL.2510(a) Table 3 – Supplemental requirements, in line with prior Special Conditions raised to address similar applications: "The rescue system should be designed to safeguard against inadvertent activation. For manual activation, at least two separate and intentional actions should be required to activate the system." "The system should not adversely affect proper functioning of other equipment and systems installed, and should not otherwise adversely influence the safety of the aircraft or its occupants."	Requested	Not Accepted	The comment *"The rescue system … to activate the system."* is formally covered by the reference to VTOL.2510(a) which requires each catastrophic failure condition to be extremely improbable and not to result from a single failure, and each hazardous failure condition to be extremely remote; and each major failure condition to be remote. The comment *"The system … or its occupants."* is a classical '.1309' aspect and is covered by SC-VTOL.2510. EASA feels that both topics are sufficiently addressed in Table 3 as it is explained by the responses above.
33-2	*FAA AIR-618*	MOC VTOL.2510(a) Para 1	72	The FAA supports the position described in 2510(a) whereas APRS cannot be used for certification credit.	None	Not requested	Noted	FAA's support is appreciated.
33-3	*TCCA Flight Test* *(Brian Harvey – Flight Test Engineer)*	MOC VTOL.2510 Parachute system	72	Is a parachute system considered "required equipment" for VTOLs, or is it considered non-required, safety enhancing equipment?	The answer to this could help determine if the proposed scope of testing is appropriate.	Requested	Noted	The Aircraft Parachute Rescue System is not 'required equipment'. Its installation is voluntary and provides no credit to the safety assessment of the aircraft.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
33-4	*GAMA*	2510(a)	72	Document makes mention of utilization and performance requirements for aircraft that utilize a APRS – aircraft parachute and rescue system – as a means of compliance with SC-VTOL Survivability requirements. This is a great opportunity to encourage APRS, but overly conservative MOC will kill the innovation. We noticed that the steering requirement was removed from category enhanced. This will help promote the use of APRS systems and ultimately improve safety. Also, not sure what "They almost behave like living creatures" means or adds to the discussion.		Recommended	Noted	The MOC provides a path for installing an ARPS in compliance with the SC VTOL without taking any credit for the APRS. As explained in Section 1(c) of this MOC VTOL.2510(b), "APRS installations cannot be used for substantiation or relief of requirements defined in SC-VTOL". According to MOC VTOL.2000: "A controlled emergency landing should be performed under control; in particular it should be possible to steer the aircraft towards a touchdown area with the remaining lift/thrust units. Therefore this objective cannot be met by the use of non-steerable parachutes." This MOC addresses these non-steerable parachutes that, albeit installed in compliance with the SC-VTOL (as any other element in the aircraft), are not used to substantiate compliance with VTOL.2005(b)(2). The sentence ""They almost behave like living creatures" is deleted.
33-5	*Airbus Helicopters*	MOC VTOL.2510(a)	P72	From the MOC, it is not clear that the APRS is not a required system	It is suggested to add clarification the te APRS is an optional system	Recommended	Not Accepted	Text in 1. (c) is considered to be clear enough. It explains that this MOC addresses APRS installations which are intended as a last resort following a failure classified as catastrophic (and already meeting the corresponding probability target as per MOC VTOL.2510), without taking any credit for the APRS. Therefore, APRS installations cannot be used for substantiation or relief of requirements defined in SC-VTOL. As such, ARPS installations are clearly not required. See also response to comment 33-3.
33-6	*Volocopter GmbH*	MOC VTOL.2510(a)	72	"They [parachutes] almost behave like living creatures." This sentence is slighty subjective and does not provide added value to understand the MOC intents.	Suggest to rephrase the sentence. The basic objective of the statement is important to highlight: 'The flight path after deployment of parachute is not controllable and may lead to unexpected problems along the path to the ground'.	Not requested	Partially Accepted	The sentence ""They almost behave like living creatures" is deleted. The objective of this statement was to highlight how parachutes are indeed less predictable in their 'behaviour' than other technical systems. Air temperature, humidity, density, packing, and airstream are all varying and thus greatly influencing the inflation process.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
33-7	VELICA	MOC.VTOL 2510(a)	72	**Parachute rescue system** It seems undue to request some flight test as it has never been requested for the aeroplane for an emergency feature. We always required a justification of the attachment points, the lines and the connecting bridles. We required a deployment on the ground.	To modify the table.	Requested	Not Accepted	Ground test is indeed sufficient for those cases to which compliance with Category 'Basic' is demonstrated. For 'Enhanced' (which means commercial passenger transport or urban environment) the behaviour of APRS deployment and filling phase in the dynamic air flow is important and needs to be demonstrated. The stepped Capability Categories leave the individual applicant the choice of the effort to take.
33-8	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2510(a) Table 2 (iii)	74	Parachute deployment during stabilized hover flight will almost always result in the parachute becoming immediately entangled in the rotors.		Requested	Partially Accepted	The risk of entanglement depends on the design of the aircraft and the parachute extraction system. Aircraft with large rotors and approximately circular downwash area have indeed a higher risk. The pull-out force and trajectory of the extraction system are factors that help mitigating this risk. The scenario of a stabilised hover is indeed conservative, but it is on the safe side for a capable APRS. In reality, a loss of control in hover will immediately result in an aircraft attitude change and an acceleration of the airframe, most probably towards the ground. The acceleration will likely deviate immediately from the 'stabilised hover' which has been highlighted by the comment. In absence of a suggested resolution EASA prefers keep Table 2 (iii) as is. However, EASA will amend the wording such that, unless test (iv) is more severe than test (iii), both tests have to be performed for Capability Category *** and ****.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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33-9	*TCCA Flight Test* *(Brian Harvey – Flight Test Engineer)*	Table 2: Flight and Deployment Tests	74	TCCA notes that four separate flight test deployments are required to demonstrate compliance. This number of deployments may be excessive, especially if each deployment significantly (and potentially irreversibly) damages the airframe (as is the case with the Cirrus SF50 and SR22 were parachute straps are “built into” the fuselage during manufacture). TCCA would point out that according to the FAA special condition for the SF50 , the SF-50 was not required to demonstrate their non-required CAPS system in flight test.	See in comment summary	Requested	Not Accepted	The number of (airframe) flight tests depends on the applicant’s choice of ‘Capability Category’ to be demonstrated for the system. For **** Capability Category it is four, for the others it is less. The**** scope of tests demonstrates the full picture of the system capability. If less effort is made, the capability category will be consequently lower. The scope of tests has been discussed in depth, also in the light of their economical impact. This is why different options were defined to leave a choice to the applicant/designer. EASA will not reiterate on existing Special Conditions established for different operational scenarios. EASA requires that the capability of the system is suitably demonstrated to adequately support the expectation of a proper function in the selected flight envelope and operational domain.
33-10	*FAA AIR -626*	MOC 4 VTOL.2500(b), Para 3. Table 3	75	“4) The handle should be large enough so that the necessary operating forces can be safely applied by the whole hand, even when gloves are worn. I**nformative Note**: A handle which - is located in a central position between the control stick (or wheel) and the pilot, - has a colour coding by yellow-black rings, - is like a stiff loop handle (analogue to an ejection seat), is considered compliant with the above-mentioned requirements.” It is unclear if the Informative Note is prescriptive or just an example.	Suggest replacing the terminology “Informative Note” with “Example” to avoid confusion.	Requested	Accepted	In addition, to meet the concept of innovative cockpit designs the text will read: - is located in a central position between the inceptor(s) (such as control stick(s) or wheel) and the pilot,

34.MOC VTOL.2530 EXTERNAL AND COCKPIT LIGHTING

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
34-1	*Lilium eAircraft*	MOC VTOL.2530 (2)	76	Taxi and landing lights: Proposed MOC is CS 27.1383 which requires separate switch for each landing light. ARP693E (§3.1.4.1) identifies the rationale for this requirement as propeller flicker. Flickering caused by propeller is not expected on Lilium jet configuration	Clarify the rationale for the requirement for separate switch or remove applicability of this paragraph as a MoC or use CS 23.1383	Requested	Accepted	CS 23.1383 and CS 27.1383 will be proposed as alternative accepted means of compliance. The applicability of CS 23.1381 or CS 27.1383 as means of compliance should be agreed with EASA based on the configuration of the aircraft, in order to ensure that the objective of VTOL.2530 is fully met.
34-2	*Lilium eAircraft*	MOC VTOL.2530 (3)	77	Position lights: Proposed MOC is CS 27.1385 to 1397 which requires red/green position lights to be installed forward on rotorcraft and white light to be installed aft. Lilium jet configuration considers wingtip installation for red/green and white (acceptable for fixed wing aircrafts).	Add CS23.1385 to 1397 as alternative MOC	Requested	Accepted	CS 23.1385 to 1397 will be proposed as alternative accepted means of compliance. The applicability of CS-23 or CS-27 requirements as means of compliance should be agreed with EASA based on the configuration of the aircraft, in order to ensure that the objective of VTOL.2530 is fully met.
34-3	*Lilium eAircraft*	MOC VTOL.2530 (3)	77	Position lights: Proposed MOC includes CS27.1385(e), which requires flame resistant cover (also required in CS23). It seems this requirement is more based on older filament technology which have a risk of overheating. That risk is not there with current LED technology	Amend MoC to condition flame resistant material in case of not using LEDs.	Requested	Not Accepted	”Flame resistant” means not susceptible to combustion to the point of propagating a flame, beyond safe limits, after the ignition source is removed. This is a required characteristic of the material, whatever the source is. The LED technology is now commonly used in external lights of several CS-23, CS-25, CS-27 and CS-29 products, with no relief from this requirement. Removing it based on assuming a lower risk associated to a particular technology could seem reasonable in first approximation, but further assessments would be needed to fully exclude the risk of any potential ignition sources in the installation. Therefore, the paragraph is kept in this MOC revision, in order to maintain the same level of safety as in other airctaft types, until further investigations will be performed. It has to be noted that this is an accepted means of compliance, but applicants can propose alternative means if they are shown to ensure a comparable or higher level of safety.

35.MOC VTOL.2535 SAFETY EQUIPMENT

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
No comment received								

36.MOC VTOL.2600 FLIGHT CREW COMPARTMENT

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
36-1	*FAA AIR -626*	MOC VTOL.2600 Para 1.	78	"In the design phase of the pilot compartment, when considering the external flight crew view, **applicants may therefore choose to start by using the guidance already available in AMC and AC material relevant to 2X.773** "Pilot compartment view", while keeping in mind the differences related with VTOL aircraft and Innovative Air Mobility (IAM) Operations." This statement is ambiguous and conflicts with a statement in Paragraph 4, (pg79) which states, "**The area of the pilot compartment field of view that according with FAA AC 27.773** should be free from obstruction **should be used as starting point for the design:** years of experience show that this obstruction free area has ensured the functions listed in (a)."	Consider rewording the first paragraph to align with paragraph 4 (27.773 should be used as a starting point for the design).	Requested	Accepted	Changed 2X.773 to 27.773 in the introduction of Section 1 of the MOC.
36-2	*FAA AIR -626*	MOC VTOL.2600 Para 1(a).	78	"(a) External crew view functions" "Functions" not necessary here.	Suggest "External Field of view (delete functions).	Requested	Partially Accepted	Title of 1.(a) replaced by "Functions of the external flight crew view."
36-3	*FAA AIR-626*	MOC VTOL.2600 Para 1(a)(iii)	78	"Depending on the design, the external vision may be used for awareness and/or as a mitigation of hazards by showing that by having parts of the aircraft visual by the crew, it is possible to identify abnormal conditions to take proper actions and safely operate the aircraft." This sentence is ambiguous and somewhat difficult to follow.	Suggest the following wording: Depending on the design, the external vision is necessary for crew awareness and mitigation of hazards by ensuring that by having parts of the aircraft visible to the crew, they will be more likely to identify abnormal conditions and take proper actions to safely operate the aircraft.	Requested	Partially Accepted	Wording in 1.(a)(1)(iii) replaced by: "Depending on the design, the external vision may be used for hazard awareness and/or mitigation, by showing that, by having parts of the aircraft visible to the crew, abnormal conditions can be identified to take appropriate action and operate the aircraft safely."

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
36-4	*FAA AIR-625*	MOC VTOL.2600 Para. 1.(b)(3)	78	"The need for windshield wipers or precipitation/snow removing devices/features should be considered." Both CS27 Amdt 8 and the MOCs for CFR 23 Amdt 23-64 specify moderate rain, regardless of the operational approval (VFR/IFR day/night).	The requirement to provide adequate visibility in moderate rain should be added as a minimum standard. In addition, the FAA/EASA SC's for hydrophobic coatings should be added.	Requested	Noted	The guidance material underwent some wording/section re-organization. The text in 1.(b)(3) is now focusing on demisting only. Precipitations conditions have been moved to section 1.(d) . It is clarified what the term precipitations includes, nevertheless without providing any level of rain fall to cope with. Specific rain removal devices (whether active, or passive coating) are not always requested and should be based on a case-by-case determination. The special conditions in relation with hydrophobic coating will be considered as project specific in case applicant will propose such passive removal means.
36-5	*FAA AIR-626*	MOC VTOL.2600 Para 1(b)(3)	78	"The need for windshield wipers or precipitation/snow removing devices/features should be considered." Are defrosters included in this?	The authors may wish to explicitly state if defrosters are included.	Requested	Accepted	Windshield demisting considerations are added.
36-6	*TCCA* *AARDD/A*	VTOL.2600 Flight crew compartment, (1)(b)(5)	79 of 94	As a MOC to VTOL.2600, "synthetic cues" were shown to be an acceptable means to provide an external compartment view. If an external compartment view is unavailable, and the VTOL pilot is required to use the "synthetic cues" to continue to perform their duties within the flight envelope of the aircraft, there must be a high level of integrity for "synthetic cues". Please clarify that.	Consider add the sentence at the end of MOC VTOL.2600, (1)(b)(5): If, for design reasons, the available external field of view does not allow the crew to perform their duties, the applicant may show compliance by using synthetic cues displayed to the crew. These synthetic cues should be designed to a high-level of integrity and precision, in order to meet their intended function. They should be introduced as soon as possible in the design and be thoroughly assessed during the complete flight test campaign.	Recommended	Accepted	Text modified as proposed.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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36-7	*FAA AIR-626*	MOC VTOL.2600 Para 1(b)(5)	79	"If, for design reasons, the available external field of view does not allow the crew to perform their duties, the applicant may show compliance by using synthetic cues displayed to the crew. These synthetic cues should be introduced as soon as possible in the design and be thoroughly assessed during the complete flight test campaign." Have synthetic cues been used as a MOC in the past? If so, in what circumstances and does that set a precedent in terms of what may or may not be acceptable?	Should this be qualified or do the authors wish to leave this open to interpretation on a case-by-case basis?	Requested	Noted	Synthetic cues have not been used in the past for external field of view, however, the use of cameras to control the correctness of the vertical trajectory has been used for some CAT A procedures. As the VTOL Innovative Air Mobility operations will require the use of vertical trajectories to fly in and out of vertiports in the urban environment, the challenge of keeping the take-off or landing site in sight is acknowledged, and the possibility of using synthetic cues is explicitly considered. At the same time, this MOC does not yet intend to provide details on the intended function and types of cues. For the moment, the suitability of these synthetic cues will be addressed case by case.
36-8	*FAA AIR-626*	MOC VTOL.2600 Para 1(c)	79	See above paragraph. Windscreen materials are not addressed in this section.	If applicable, include information pertaining to windscreen materials.	Requested	Not Accepted	The intent of this section is to address the assessment of visibility through a damaged windshield (e.g. due to severe hail impact or any other FOD) to determine whether it would still be possible to proceed with flight. The extension of damages should be based on laboratory tests (e.g. hail impact). The assessment whether the damages compromise external visibility should be based on flight test. There is no intention to address specific windshield materials at this stage. The text has been revised to clarify the intent.
36-9	*Leonardo Helicopters*	2600 1.(c)	79	Please clarify if external cameras can be used to satisfy this requirement in case external visibility is lost/degraded in a single panel windshield design	Please clarify	Recommended	Noted	See response to comment 36-7

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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36-10	*FAA AIR-626*	MOC VTOL.2600 Para 1(c)	79	"According to VTOL.2600 (c), for category Enhanced, the flight crew interface design must allow for continued safe flight and landing after loss of vision through any one of the windshield panels. If the design however is a single panel windshield, the applicant can demonstrate by analysis and/or flight test that the loss of vision through the single panel is partial and that the remaining external field of view will allow for continued safe flight and landing." Are situations such as severe hail encounters where the entire forward view becomes impaired taken into account?	If applicable, include situations where severe hail encounters may impede crew visibility.	Requested	Accepted	Severe hail should be taken into account for the qualification of the windshield robustness and its capability to sustain severe hail encounter. Section 1.(d) has been reworded to clarify its intent. See also response to comment 36-8.
36-11	*Leonardo Helicopters*	2600	78	SNOW cases are considered, but other which may have an impact on the aircraft are not, such as SAND or SALINE environment	Evaluate the introduction of guidance of other environments	Recommended	Accepted	Section 1.(d) has been reworded to clarify its intent. It now includes mention to other environmental hazards.
36-12	*TCCA* *AARDD/O*	MOC VTOL.2600 1.(d)	79	As mentioned in the note, flight into known icing conditions is out of the scope of this MOC. However it does not mention anything in regards to inadvertent icing exposure. Clarification of how the inadvertent icing exposure shall be addressed.	Clarification of how the indaververtent icing exposure shall be addressed to be included in this MOC whether, or not, the VTOL is approved for flight in known icing conditions.	Requested	Noted	Specific means of compliance for flight into inadvertent icing conditions is in preparation by EUROCAE WG-112, SG-4. In general, EASA may anticipate that, based on past experience on rotorcraft and GA, there is no need of an active protection on windshield for an inadvertent icing encounter, provided that the AFM prescribes to leave icing condition immediately upon detection.
36-13	*TCCA Flight Test* *(Brian Harvey – Flight Test Engineer)*	MOC VTOL.2600 – Flight Crew Compartment:	82	While not related to pilot compartment view specifically, are go-arounds / transitions to wingborne flight allowed after hovering in blowing snow for any length of time? With little or no forward speed, ice could accrete on and/or aft of protected leading edges (due to snow falling on, but not clearing from upper wing surface due to lack of forward speed), increasing stall speeds and possibly resulting in difficulty controlling the vehicle following a hover in blowing snow conditions.	Instructions on conducting flight test assessment of vehicle reconfigurations after extended periods in blowing snow need to be included.	Requested	Accepted	The following text was added to MOC VTOL.2600 (e) (2) (i) (C) (b): *Go-arounds and transitions to and back to wingborne flight, if applicable, should be included in these flight operations.*

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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36-14	*FAA, AIR-710 Flight Test - MS*	VTOL 2600(1)(e)	80	While incorporating the concept of flight into snow conditions, the ½ concept for falling and blowing snow is not something that had been accepted under Part 27 or Part 29 operations as mentioned. I am not sure the proposal for adjusting exposure time for practical ground and hover time consideration could lead to vastly different operationg limiations across this class of vehicle. In addition, Part 29.773 prescriptively required an window that is openable that would continue to allow for the safe operation.	A more standardized approach should be considered with only at a last resort an adjusting ground operation exposure time.	Requested	Noted	The "adjustment of ground operation exposure time" is based on the fact that some designs might only hover for 5 minutes or less.
36-15	*GAMA*	MOC-SUBPART G-FLIGHT CREW INTERFACE, MOC VTOL.2600 1.(e)(2)(C)	80	The times in the table appear excessive considering operational realities for eVTOL aircraft compared to helicopters.	Request re-evaluation of appropriate times spent hovering and generally operation in snow conditions.	Requested	Not Accepted	It is clarified in the point (c) that: "*The durations reported in the table above are minimum test duration times based on experience with rotorcraft operations, to ensure that the snow accretion on the aircraft and windshield is representative of a worst-case scenario. Different durations can be agreed with EASA depending on the actual aircraft limitations or the expected operations.*" The reference times could be re-evaluated once relevant experience with the future eVTOL operations has been gained.
36-16	Boeing	MOC-SUBPART G-FLIGHT CREW INTERFACE, MOC VTOL.2600 1.(e)(2)(C)	80	The times in the table appear excessive considering operational realities for eVTOL aircraft compared to helicopters.	Request re-evaluation of appropriate times spent hovering and generally operation in snow conditions.	Requested	Not Accepted	See response to comment #36-15

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
36-17	*FAA, AIR-710 Flight Test – JJ*	MOC VTOL 2600 1(e)(3)	81	Will windscreen defog required be required?		Requested	Noted	Demisting should be considered during the development. The installation of an additional device/feature for that purpose could be necessary. Demisting is now considered in Section 1.(b)(3). See also response to Comment # 36-5.
36-18	*FAA, AIR-710 Flight Test - MY*	VTOL.2600		The differences between CS 27.1302 and equivalent 14 CFR Part 27 regulations and guidance related to 27.771, 27.773, 27.1301, 27.1309, 27.1322, 27.1523 will need to be assessed for SEI differences which are likely,	Possible FAA MOC /SEI differences will likely exist for Part 27 vehicles and AMC guidance, and are likely applicable eVtol. Detailed review will be necessary.	Requested	Noted	Differences between EASA and FAA certification requirements and means of compliance for VTOL aircraft, in particular but not only regarding Human Factors, will be assessed once FAA requirements and means of compliance for VTOL aircraft have been established.
36-19	*FAA AIR-626*	MOC VTOL.2600 Para 2	83	"Controls and displays for use by the flight crew " Detailed visual display characteristics are not discussed in this section . Additionally, although 1302 is a good reference, it is not the only guidance to be considered. 27.773 and 1381 are also important to reference.	Consider including Visual Display Characteristics, such as 1) instruments and controls should be easily readable and discernible (2X.1381). 2) address glare and reflectance as well as luminance and lighting Some of these aspects are covered in 27.773, and 1381 (in addition to 1302).	Requested	Noted	CS 27.1302 and AMC 27.1302 are accepted as means of compliance with VTOL 2600, as explained in section 2. of this MOC, for all installed systems and equipment to be used by the crew. For example, a dedicated chapter for Controls is provided in AMC 27.1302 (4.2), including design considerations and guidance. Regarding CS 27.773, EASA agrees with your statement. This requirement is listed in chapter 2 of AMC 27.1302 where all the requirements related to cockpit design and crew member interfaces are listed. In addition, it is also mentioned that "where means of compliance in other AMC are provided for specific equipment and systems, those means are assumed to take precedence if a conflict exists with the means provided under the 27.1302." 2X.1381 is already considered in the MOC VTOL.2530 External and Cockpit Lighting: CS 23.1381 Amdt. 4 is accepted as means of compliance with VTOL.2530 (a) for the instrument lights.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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36-20	*Volocopter GmbH*	MOC VTOL.2600.2(c) MOC VTOL.2605(c).(4)	84	"The following proportional approach in the application of AMC 27.1302 supersedes AMC 27.1302 paragraph 3.2.9 "Proportional approach in the compliance demonstration"" AMC 27.1302 also considers the class (significant / non-significant) for the change to TC in its proportional approach of paragraph 3.2.9. Does MOC VTOL only applies to section (a) of AMC 27.1302 or also supersedes section (b) of AMC 27.1302?	The applicability of the paragraph 3.2.9 "Proportional approach in the compliance demonstration" of AMC 27.1302 for MOC VTOL.2600 and MOC VTOL.2605 should be clarified with regards to the criteria "significant / non-significant changes".	Recommended	Noted	It is confirmed that the table proposed in the MoC SC VTOL supersedes the complete AMC 27.1302 paragraph 3.2.9, including both (a) and (b). For the changes we intend to apply the same alleviations that are allowed for the TC (regardless of the change classification significant/not significant). No change to the MOC is considered necessary.

37. MOC VTOL.2605 INSTALLATION AND OPERATION INFORMATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
37-1	*FAA, AIR-710 Flight Test - MY*	VTOL.2605		Clarify the following "The use of alphabetic or numerical symbols will be acceptable if recognition depends upon reference to a master key and any relation between symbol and function is carefully avoided" And What is a "master key"? If this will require memorization, then using a master key could create a workload consideration.	See Comment	Requested	Partially Accepted	EASA decided to remove the sentence associated to the 2605 (a) as it was specific to depiction of pipelines in the context of AMC 25.1301.
37-2	*Lilium eAircraft*	MOC VTOL.2605 (a)(1)	84	Requirement wording is ambiguous.	Please expand on the existing text, particularly wrt the 'master key' and the 'relationship between symbol and function'	Recommended	Partially Accepted	EASA decided to remove the sentence associated to the 2605 (a) as it was specific to depiction of pipelines in the context of AMC 25.1301.
37-3	*Vertical Aerospace*	MOC VTOL.2605(a)(1)	84	it is not clear if this is: "IF(X AND Y) Avoided", or if it means: "IF X is met, and IF Y is avoided").	a comma may be necessary before the "and".	Requested	Partially Accepted	EASA decided to remove the sentence associated to the 2605 (a) as it was specific to depiction of pipelines in the context of AMC 25.1301.
37-4	*Lilium eAircraft*	MOC VTOL.2605 (b)	84	Typo: CS 27.1322 amdt 21 does not exist, only up to amdt 8. Either the reference should be CS 25.1322 as in the previous draft, or the amendment should be changed to 8.	Replace "CS 27.1322 Amdt 21" with "CS 27.1322 amdt 8"	Requested	Partially Accepted	The typo has been corrected changing the reference to CS 27.1322 Amdt 6. Please note that this requirement did not change between Amdt. 6 and the latest Amdt. 9. Unless a relevant new or modified CS requirement was introduced with a later Amendment (e.g. CS 27.1302 in Amdt. 8), the Amdt. 6, in force at the time the SC-VTOL was published, is consistently used across the MOC document.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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37-5	*Volocopter GmbH*	MOC VTOL.2605(c)	84	SC-VTOL states that "(c) Information concerning an unsafe system operating condition must be provided in a timely manner to the crew member responsible for taking corrective action. The information must be clear enough to avoid likely crew member errors." MOC VTOL.2605(c) directly refers to CS 27.1302 Amdt. 8, as per the guidelines established in AMC 27.1302 as a means of compliance. However, there is an inconsistency between SC-VTOL and CS 27.1302(c) & AMC 27.1302 which considers that the demonstration of "timely manner" is applicable not only to the system behaviour, but also to the ability of the flight crew to perform the corrective action, considering overall workload, etc. Therefore, the relevancy of the full AMC 27.1302 in front of VTOL.2605(c) is not self-evident. With regards to design of alerts itself, AMC 25.1322 seems more adequate.	Suggest to re-write SC-VTOL.2605(c) in a way that will be consistent with MOC VTOL.2605(c) referring to AMC 27.1302, for example "Information concerning an unsafe system operating condition must be provided to the responsible crew member to enable them to take appropriate corrective action in a timely manner. (…)" With regards to the guidance for design of alerts adequate to the expected crew response timing, MOC VTOL.2605(c) should also refer to AMC 25.1322.	Recommended	Noted	EASA will consider this comment in future updates of the SC-VTOL

38.MOC VTOL.2610 INSTRUMENT MARKINGS, CONTROL MARKINGS AND PLACARDS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
38-1	*Lilium eAircraft*	MOC VTOL.2610 (b)	86	The changes for CS 27.1555(a),(b)(1) and (2) and (e) were introduced in amendment 5.	Replace “Amdt.6” with “Amdt.5/6”	Recommended	Not Accepted	At the time of issuance of the SC-VTOL (2 July 2019), Amdt. 6 of CS-27 was in force. For consistency, this Amdt. 6 is therefore used throughout the MOCs, unless the need is identified to refer for VTOL certification to a specific element introduced with a later amendment.

39.MOC VTOL.2620 ELECTRONIC AIRCRAFT FLIGHT MANUAL

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
39-1	*FAA, AIR-710 Flight Test - MS*	VTOL 2620	86	The expectation of a solely electronic AFM is prescriptive feature and does not allow for tradiational paper nor mixed paper or electronic depending on the customer.	The regulation should allow for both formats to coexist and as such how they can be compatible in determining compatibility on releases (for example if a version 1 is relased how does a paper versus electronic version compare and the the associated log of pages or release notes.	Recommended	Noted	Paper AFM is still possible. This MOC addresses only the electronic AFM, as it is still considered a more novel or less traditional format for which guidance is still deemed necessary. This does not mean that electronic is the only format acceptable.
39-2	*GAMA*	2620.1	86		Should something be included about cybersecurity requirements here and also in other areas of the document.	Recommended	Noted	EFB cybersecurity considerations will apply to portable devices, hence bringing the required protection.
39-3	*Airbus Helicopters*	MOC VTOL.2620 (1)(c)	P86	The eAFM software is indicated nto to be aprt of the type design but it is AH understanding that it is part of the type certificate	Suggest to clarify that the eAFM software are approved as part of the Type certificate	Requested	Accepted	Clarification is included in the introduction: (a) Similarly to a paper AFM, eAFM software application is not certified as part of the aircraft type design, however it is approved by EASA for showing compliance with VTOL.2620 and becomes part of the type certificate.
39-4	*Leonardo Helicopters*	2620 2. (a)	87	eAFM has to run on a dedicated device that has to be integrated in the AC? Or it could be even not integrated (Ex independent Tablet). In both cases which is the DAL required? Can we use also paper version to downgrade the required DAL ?	Please clarify	Recommended	Noted	The AMC addresses two use cases for an eAFM: - Software running on non installed equipment (e.g. EFB) - Software running on installed equipment (e.g. certified avionics) The software requirements are described for both cases. The use of an electronic AFM instead of paper is an option, the eAFM is not mandated. Note that a paper AFM as a backup to eAFM would mitigate loss of information but not erroneous display of misleading information.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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39-5	*Airbus Helicopters*	MOC VTOL.2620 (3)(b)	P87	As the eAFM software are not part of the type design, why should be associated with a part number?	Suggest to remove the requirement or Part Number	Requested	Partially Accepted	Modified to “version, part or build number”.
39-6	*Airbus Helicopters*	Performance computation 7(a)(i)	P89	For consistency, add the reference to DO-330 as in 5(b)(2) paragraph	Add the reference to DO-330 as in 5(b)(2) paragraph	Requested	Not Accepted	DO-330 is already referenced in AMC 20-115 and can be used.
39-7	*TCCA* *AARDD/E*	MOC VTOL.2620 5(b)(2)	88	Reference to DO-178() and DO-330() is not consistent with requirement in section 7(a)(1)(i) on page 9.	Replace sentence by : A software development assurance process should then be defined and implemented in accordance with AMC 20-115() to a level commensurate with the failure effects identified in the safety assessment.	Requested	Not Accepted	The wording in this chapter intentionaly offers more flexibility and tailoring of the MoC than in chapter 7 dedicated to performance applications which are expected to be more safety-critical and where alternatives to classical software assurance processes cannot be readily accepted.
39-8	*Lilium eAircraft*	MOC VTOL.2620 (5)(b)(3)	88	The MOC requires providing “information on how to ensure the absence of regression in case of new or updated host platforms (e.g. Operating System update) or when new software application versions are released.” The Meaning of “absence of regression”, however, is not clear.	EASA to elaborate on the meaning of “absence of regression”.	Requested	Noted	“Absence of regression” means the absence of new issues.
39-9	*TCCA* *AARDD/E*	MOC VTOL.2620 7 (a)(1)(i)	89	It is unclear if other functions that support the performance computation (e.g. interface with user to input data to the performance computation) should implement the same development assurance as the performance computation function.	Clarify that other software items (non-performance computation) should follow the safety assessment process to determine the required design assurance level.	Requested	Accepted	Added the sentence “It should apply to any software item contributing to the performance calculation function (e.g. calculation algorithms, user interface…).”.

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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39-10	*TCCA* *AARDD/E*	MOC VTOL.2620 7 (a)(1)(i)	89	It is unclear if any kind of "partitioning" would be allowed for different functions in the performance computation software. It is suggested to make it clear and adopt the same DAL for entire performance computation function considering the worst failure condition.	The statement could be updated to "... with AMC 20-115() to a level commensurate with the worst failure effects identified in the safety assessment."	Recommended	Accepted	Modified as proposed.
39-11	*Lilium eAircraft*	MOC VTOL.2620 (7)(b)	90	The MOC mandates the adoption of DO-200/ED-76 for assurance of the databases for Performance calculations. However, For CAFMs developed following the DO-178 this may not be required, as the standard already includes provisions for assurance of DBs (referred to as Parameter Data Items in the standard), such as Verification, Configuration and Change Control and so on, if the PDIs are part of the software approval process.	Rewrite section to ensure that database assurance is performed with the adequate level, but not mandating the adoption of DO-200. Rewrite the section as follows: (b) Database Assurance: Databases used for performance calculation should be produced using standard industry processes such as the provisions of DO-178()/DE-12() for Parameter Data Item verification, configuration and change controls or the processes of DO-200()/ED-76(), as applicable, to a level commensurate with the failure effects identified in the safety assessment.		Accepted	Modified as proposed.

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39-12	*FAA AIR-626*	MOC VTOL.2620 Para 7(d)	90	"Interface Aspects: The applicant should substantiate that the eAFM performance calculation function is designed to minimise mistakes or misunderstanding by a trained user during data input and interpretation of output. For this purpose, guidance on Air Operations Regulation for Human Machine Interface and Human Factors aspects of Electronic Flight Bags, such as AMC1 SPA.EFB.100(b)(2) and paragraph (f) of AMC5 SPA.EFB.100(b)(3), may be considered." Can the applicant use computation and/or simulation when substantiating the usability of the interface? Requirements in terms of depth, breadth, and complexity of use cases for this interface evaluation?	Given the questions in the previous column, perhaps this requires further clarification.	Requested	Noted	Additional clarification on acceptable methods are provided in the referenced EFB material.

40.MOC VTOL.2625 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
NR	Name of the organisation commenting	Section, table, figure	Page					
40-1	*TCCA* *AARDD/P*	VTOL.2625 2. list 6.Multiple manuals	92 & 94	Typo for TSM Trouble Shouting Manual and 2 pages later (top of page 94) "(as e.g. trouble-shooting information as part of the Aircraft Maintenance Manual (AMM) instead of a separate Trouble Shouting Manual (TSM))."	May be Trouble-shooting was intended in both places	Recommended	Accepted	Typos corrected.
40-2	*TCCA* *AARDD/P*	VTOL.2625 2. list	92	If the intent of this list specific to ICA, then a number of abbreviations are out of places	Delete AFM and MMEL because they are not related to ICA or even mentioned in this MOC VTOL.2625	Requested	Accepted	For clarification, §2 is a "List of abbreviations" and not a list of ICA. AFM and MMEL are certainly not declared as ICA. Indeed, both are not directly mentioned in the context of the MOC VTOL.2625 and have been removed from §2 in the final MOC VTOL.2625.
40-3	*Airbus Helicopters*	Paragraph 4	P93	A reference to the revised REGULATION (EU) 2021/699 on Part-21 on ICA could be added instead of the CM which content is included in the new part-21 version	Add the reference 21.A.7 of (EU) 2021/699 on Part-21	Requested	Partially Accepted	Indeed, Executive Director Decision 2021/007/R of 27 May 2021 introduces a number of AMC/GM to Part-21, REGULATION (EU) No 748/2012 amended by REGULATION (EU) 2021/699. These AMC/GM include the methodology of CM-ICA-001 i.e. AMC1 21.A.7(c) and will become applicable in May 2022. An additional sentence to this regard is added in the final MOC VTOL.2625.
40-4	*TCCA* *AARDD/P*	VTOL.2625 7. Service documentation	94	Use of the word TELEX twice may not be current knowledge	Replace the word TELEX by Bulletin to read "All operator Bulletin" and "Operators Information Bulletin"	Recommended	Partially Accepted	In fact, bulletins have been addressed initially. The listing is not necessarily exhaustive and was meant to provide examples only. The comment is noted with respect to the potential obsolete indication of "TELEX". Any listing of telexes are removed in final MOC VTOL.2625.
40-5	*Leonardo Helicopters*	2625 8.	94	Cit: "In the context of data base management, aspects like the production of data, its validation and verification, data submission, traceability of updates, data security and relevant operational requirements should be defined and explained by the applicant." For this kind of purposes can we address DO200?	Define an axplicit bridge to those elements of DO200 that are applicable in this context.	Recommended	Not Accepted	The MOC is intended to provide here generically EASA expectation in the context of data base management and related aspects. On certification project level the applicant may propose any applicable methodology/standard, whose validity would be evaluated by EASA accordingly.

41.OTHER COMMENTS NOT RELATED WITH A MOC IN THIS PUBLICATION

Comment				Comment summary	Suggested resolution	From the commenter point of view a modification of the published text is*: -Not requested; -Recommended; -Requested	EASA comment disposition	EASA response
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41-1	TCCA ARDD/M & Flight Tests	Subpart B	p.5-17/94	Throughout the proposed Subpart B MOCs, there is generally not a clear and explicit delineation of MOCs which would be applicable to 'Basic' category, 'Enhanced' category, or both. Some of the contents under the Subpart B MOCs would seem to be only applicable to Enhanced category VTOL aircraft, without it being specified. Paragraph VTOL.2120 is much clearer and explicit in that regard, *"For Category Enhanced, the climb gradient..."*	Throughout Subpart B MOCs, add explicit delineation of applicability to 'Basic' category, 'Enhanced' category, or both.	Requested	Not Accepted	All MOCs are valid for both categories Basic and Enhanced unless it is explicitly stated otherwise.
41-2	*GAMA*	Subpart B - Flight	5-15	The examples provided are for Class A procedures in helicopters and are likely not applicable to most UAM designs.	Clarify that the applicant needs to address the points discussed specific to Class A procedures in helicopters for their vehicles.	Suggestion	Not Accepted	All MOCs are valid for both categories Basic and Enhanced unless it is explicitly stated otherwise.
41-3	*TCCA* *AARDD/L*	VTOL.2335		The MOC (all issues) with the SC VTOL does not provide guidance for showing the VTOL aircraft protection against static electricity. The guidance for the protection against static electricity in AC 27.610A also applies to VTOL aircraft and should be included or referred to in this MOC SC VTOL.	It is suggested to include in the MOC SC VTOL similar guidance as in AC 27-610A for the protection against static electricity.	Recommended	Not Accepted	Section (b) of MOC VTOL.2335 "Lightining Protection", states that: "*CS 27.610 Amdt. 6 is accepted as a means of compliance*". When applying CS 27.610, the EASA AMC included in "CS-27 book 2" becomes also fully applicable. EASA AMC 27 "General" states in point 1 that: "*The AMC to CS–27 consists of FAA AC 27-1B Change 7, dated 4 February 2016, with the changes/additions given in this Book 2 of CS–27*". No additional specific references to FAA AC material are deemed necessary in this MOC publication.

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41-4	*TCCA* *AARDD/P*	general		Use of mixed units km/h in 2400 versus ft and knots in 2105/2115 except D to be reported in meters … in the AFM. In addition, in some case both units are indicated and some cases only one unit is indicated (see some examples on page 8).	Do not require a specific units if the SC and its MOC but to allow a consistent AFM version in SI and imperials units of speed and distance. Revise document to make it consistent.	Recommended	Not Accepted	MOC VTOL.2400(c)(3) specifies means to report the downwash of the aircraft. As this value can then be used by infrastructure designers, civil engineers, architects, and city planners, it is requested to report in a unit commonly used by these disciplines: km/h. Similarly, the dimension "D", and a number of other dimensions requested in MOC VTOL.2115, are used for the design of ground infrastructure and should thus be published in meters. To facilitate international implementation, publication in feet has been added. The parameters related to aircraft height or altitude are specified in meters and feet, while aircraft speed references are in knots, as is usual in current aircraft, and as authorized by ICAO Annex 5.
41-5	*FAA (SASB)*	Subpart B	17	MOC for VTOL.2165 is missing. MOC is needed for both eVTOL certified for icing and not certified for icing.	Add MOC for VTOL 2165.		Noted	EASA is currently collaborating in the preparation of a standard on “Compliance Methodologies for VTOL Certification in ‘inadvertent icing’ Operation” in the frame of Eurocae Working Group 112 Subgroup 4. EASA intends to recognise this standard as an accepted MOC with VTOL.2165 (and other requirements). Additional MOC for VTOL.2165 (e.g. for ‘flight into known icing’) will be developed in future.
41-6	*FAA AIR -626*	Global Comment	N/A	Use of “should”, “shall”, “can” and “may” needs to be consistent.	Ensure consistency between the terminology and perhaps provide definitions of each at beginning or end of document.	Requested	Partially Accepted	The document has been reviewed for consistency and some modifications have been introduced. In the MOCs, the prescriptive uses of “shall” or “may not” are avoided, unless referring directly to a requirement (e.g. in the SC-VTOL, in a CS or regulation). “Should” or “should not” are used instead. “Can” and “may” refer typically to possibilities
41-7	VELICA	All		Support of the proposal	VELICA thanks EASA for this useful Moc.	Not requested	Noted	EASA welcomes the support
41-8	DUFOUR AEROSPACE	All		Support of the proposal	DUFOUR AEROSPACE thanks EASA for this useful Moc.	Not requested	Noted	EASA welcomes the support

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41-9	Safran			This answer gathers Safran feedbac. For 2240(d)2, it reflects discussions with WG63-SG1 people as well as with Airbus ones.	Safran		Noted	No change suggestion identified in the comment
41-10	*FAA (SASB)*	Subpart E	48	MOC for VTOL.2415 is missing. EASA's draft SC E-19 for Electric/Hybrid Propulsion Systems: **"EHPS.280 Icing and snow conditions** The EHPS and any of its sub-system must function satisfactorily when operated throughout the conditions of atmospheric icing (including freezing fog on ground) and falling and blowing snow defined in the propulsive system installation ice protection specifications of the Type-Certification basis of the intended aircraft application, as specified in EHPS.30 (e)." The meaning is unclear. Does it mean that if aircraft is not certified for snow or icing conditions, snow or icing (even inadvertent encounters) don't need to be addressed? Another draft SC E-19 question: **EHPS.270 Rain conditions:** "The EHPS must be designed and/or installed such that it is capable of satisfactory operation throughout its specified operating envelope when subject to sudden encounters with the certification standard concentration of rain."	Add MOC for VTOL 2415. Clarify the snow and rain requirements, including for aircraft not certified to fly in either snow or icing. Also please specify the rain concentration for draft SC EHPS.270.		Noted	EASA is currently collaborating in the preparation of a standard on "Compliance Methodologies for VTOL Certification in 'inadvertent icing' Operation" in the frame of Eurocae Working Group 112 Subgroup 4. This standard will also partly address compliance with VTOL.2415. Additional Means of Compliance, specific to SC-EHPS (E-19) will be developed by Standardisation bodies in the frame of specific SC-EHPS related activities (e.g. EUROCA WG113, SAE E-40, ASTM F39.05).

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41-11	FAA AIR-621 / DR	Subpart C	18	Reference. MOC VTOL.2200 Observed MOC VTOL.2200(a) did not define the MOC for structural design speeds for forward, vertical, and transition flight configuration. The current proposed MOC EASA SC VTOL for forward, vertical, and transition flight contains some confusion in the wording	We recommend the following; **Structural design speeds for VTOL** Forward Flight should use CS 23 Transition Flight; 1. Design VCON and VDCON speed margin may not be less than; VCON = 17kts + $VDCON_{min}$ And VCON = 0.8 $VDCON_{min}$ 2. Design VMIN speed may not be greater than; VMIN = $VCON_{min}$ - 17kts) And VMIN = $VDCON_{min}$ /1.8 3. VTOL vertical and transition flight structural design speed definitions are where; • VMIN = Design Minimum speed • VCON = Design Cruise speed • VDCON = Design Dive speed Vertical Flight should use CS 27 Note: 1. 30fps is approximately 17kts (reference MOC VTOL.2105 “wind conditions”)	Requested	Not Accepted	The structural design speeds of MOC VTOL.2200 should be defined for each aircraft configuration or flight mode. Depending on the aircraft there may be multiple definitions of VD, VNE, VH and VNO, covering vertical flight, transition phase, forward flight and any other configuration/flight mode as appropriate. This allows flexibility to have multiple configurations or flight phases, with a consistent structural design speed definition and flight load methodology (MOC VTOL.2215). This is further explained in the following video from the EASA VTOL Symposium: https://www.youtube.com/watch?v=BOi3QbgtZiY
41-12	AIR-621 / DR	Subpart C	None	Ground Loads: We have noticed that the CS 27 rules for helicopter drop tests were not listed in the VTOL Special Condition.	We would request your review and consideration to included the CS 27 drop test requirement in this MOC. Depending on the vehicle type, gear type, and landing type (conventional, vertical, or transition flight), there could be a need to consider both helicopter type and/or conventional type drop tests.	Requested	Noted	The CS-27 landing gear drop test requirements are already referenced in MOC VTOL.2235, published on 12 May 2020, as accepted means of compliance with VTOL.2235 Structural Strength. This MOC VTOL.2235 is also referenced in MOC VTOL.2200 Section 2. “Ground load conditions and assumptions”, sub-paragraph (b).

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41-13	*Volocopter GmbH*	MOC VTOL.2215	19	*Note: this remark is related to the previous MOC-1 SC-VTOL Issue 2.* "Failure Conditions need not be considered except as specified in paragraph (g) of this MOC." There is a typo, it should refer to paragraph (h).	Update with the correct cross-reference.	Recommended	Noted	Typo is noted for future revisions of this MOC.

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	FAA - (SASB)	Subpart F	49	There is an inconsistency in the MOC for VTOL 2500(b): "VTOL.2500(b) covers ... Such systems and equipment are required to "be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the aircraft is certified". The aircraft operating and environmental conditions include: (a) .. (b) any anticipated external aircraft environmental conditions: external environmental conditions such as atmospheric turbulence, HIRF, lightning, and precipitation, which the aircraft is reasonably expected to encounter, with severities limited to those established by certification standards and precedence;" The icing operating limitations most likely will be less severe than certification standard of part 25, Appendix C and is the reason EASA removed reference to Appendix C from the eVTOL SC's (FAA concurs). In the case of pitot heat for example (one of the highest current draws on part 23 aircraft by a large margin), these two highlighted areas contradict each other. The latter highlighted area may include ambient temperatures colder than the aircraft's AFM Limitation and includes high altitude ice crystal conditions which shouldn't be applicable to altitude limited aircraft.	Clarify whether systems and equipment requirements are limited to the AFM Limitations or established certification standards.	Yes	Noted	Systems and equipment requirements may go beyond AFM limitations to provide operational margins. Certification standards and precedence, if deemed relevant, may then help determine appropriate margins.