

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**	EASA comment disposition	EASA response
NR	Author	Section, table, figure	Page						
1	Jonas Büttner	-	-	Changes of requirmentens comparing serial hybrid with parallel hybrid propulsion?		Yes		Noted	Requirements provided in the SC E-19 are deemed to be technology agnostic. Specific Means of Compliance may however be proposed for a kind a hybrid propulsion architecture.
2	FAA DK	Add EHPS.390	20		EHPS.390 Electrical Wiring and Interconnect System (EWIS) – The EWIS must be designed and installed such that : 1. It is suitable for the electrical loads, mechanical loads and the environmental conditions expected in the application (temperature, humidity, icing, EMI/HIRF/Lightning, sand/dust, exposure to fluids) 2. It provides physical separation and electrical isolation in the wiring consistent with the system redundancy/safety objectives and accessibility for maintenance 3. It minimizes mechanical strain, potential for abrasion/chafing or other mechanical damage. and allows for reasonable deformation and stretching without failure 4. EWIS components are labeled or otherwise identified to facilitate identification of the EWIS components and their design limitations, if any. 5. EWIS design minimizes potential for fire and smoke in the installed environment with potential exposure to flammable fluids/vapors and hot ambients Electrical bonding provides an electrical return path capable of carrying both normal and fault currents without creating a shock hazard or damage to the EWIS components, other airplane system components, or structure.	Yes		Partially accepted	The proposed wording is covered by EHPS.370 (a).
3	Pipistrel	All	All	It is inappropriate to demand DO-178 for the power controller, but for no other elements of the powertrain. E.g. what good is DO-178 software, if a cockpit indicator erroneously displays data received from the "perfect" controller? Further - DO-178 for powered gliders (CS-22) has never been demanded before and is not in line with CS-22 Subpart H, where engines can be approved with less rigor than CS-E (Far-33).	Two-step proposal: a) Introduce proportionality for Gliders and LSA, introduce design assurance (DO-178) for CS-23 and up. b) resolve the disconnect of having design assurance on certain elements of the powertrain (e.g. power controller) but not others (e.g. indication means).		Yes	Accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
4	The Boeing Company	All		What is the link between EHPS-SC and VTOL-SC?  It would be recommended to have some type of explanation of the link between this two SCs.		No	yes	Noted	The two SC are independant. The SC E-19 is a transversal SC addressing any kind of electric/hybrid propulsion system for any A/C. For example, if an applicant wishes to certify a VTOL A/C with the electric propulsion system included in the A/C Type Design, the certification basis of the A/C would consist of at least the SC VTOL and the SC E-19 EHPS.
5	Rolls-Royce	AMC EHPS.330(d)	25	Associated AMC should at least cover CS-E 80 (equipment) and its AMC and the use of DO-160	DO-160 EMC effects is just covering electrical systems up to 270V dc, max 320V, surge voltage 425V. EHPS systems of significantly higher voltage require a new test definition concerning EMC.	Yes	No	Accepted	Dedicated working groups in several standardisation bodies are currently working on the topic. The results of these WG is intended to be used as a MoC.
6	Rolls-Royce	AMC EHPS.80	25	...Associated AMC should at least cover CS-E 850...	The EHPS might contain much more Critical components than the classic CS-E 850. There are other rotating components such as generator, e-Motor, and elements critical in respect of propeller loss (reduction gearbox front housing), or loss of integrity (single load path brackets), or electric shock etc.	Yes	No	Accepted	That is why it is stated "at least". Guidance will be be provided accordingly.

7	Rolls-Royce	AMC paragraph 13	25	Repeated words "Fuel Contamination"	Remove repeated words	Yes	No	Accepted	Corrected.
8	Rolls-Royce	AMC paragraph 19	25	<p>(include EHPS.350(e)).</p> <p>If the "Essentially Single Fault Tolerant" criteria (of CS-E 50(c)(2)) are included for piston or turbine engines, and the EHPS forms part of the functional mainline thrust shaft between one or more energy sources and one or more propulsion devices, then the criteria should apply also to the EHPS control system.</p> <p>This has a substantial effect on the architecture of the EHPS control system. Could the airframe afford to lose a significant proportion of thrust from a single failure of its EHPS control system, many of which (failures) could cause loss of one engine's worth of thrust? If not, the criteria should be compulsory in the same way as CS-E 50(c)(2) is for one engine, leading to redundancy in the system such that, in full-up dispatch, No Single Failure of the EHPS control system shall cause Loss of Thrust Control equivalent to 10% of the total (centralised propulsion device) or 10% on one side (decentralised propulsion devices, depending on turning moment). If one EHPS controlled more than the equivalent of one engine's worth of thrust, this would put more eggs in one EHPS basket than there were with the equivalent discrete engines, raising the EHPS failure risk level beyond that of the equivalent engine control system. All the more reason to mandate equivalence in Essential Single Fault Tolerance. This is more important for passenger-carrying aircraft because Loss of Thrust Control could have an immediate effect on passengers, assuming that any airframe may be able to regain control prior to landing, following a significant LOTC from the EHPS control system failure.</p>	<p>Add section EHPS.350(e)(4):</p> <p>"If the EHPS controls an amount of thrust on a passenger-carrying airframe equivalent to either:</p> <p>(i) At least 50% of total airframe thrust in a centralised position, such that "insufficient total thrust" should be considered; or</p> <p>(ii) At least 50% of the equivalent engine thrust in a decentralised position, such that "asymmetric thrust" should be considered;</p> <p>then the "Essentially Single Fault Tolerant" criteria of CS-E 50(c)(2) shall be met and demonstrated for the EHPS control system.</p> <p>If the amount of thrust controlled by the EHPS is less than 50% of total airframe thrust in a centralised position and less than 50% of the equivalent engine thrust in a decentralised position, such that the risks of both "insufficient total thrust" and "asymmetric thrust" can both be shown to be insignificant from all single EHPS control system failures, then the criteria remain as an AMC to EHPS.80."</p>	Yes	Yes	Partially accepted	<p>CS-E 50(c)(2) states "essentially single fault tolerant". The term essentially in itself removes the compulsory aspect of the single fault tolerant.</p> <p>The SC E-19 is an objective based SC. As such, it is not the intent to impose a design solution.</p> <p>However, the mentioned examples are fully relevant and should be looked at during the certification process.</p> <p>The top/down approach of the safety assessment as proposed in EHPS.80, starting from an A/C FHA should lead to a safety requirement at EHPS level that is adapted to the intended A/C application.</p> <p>Safety and reliability requirements should be distinguished.</p> <p>Reliability requirements may not be related to the certification of an aircraft but more related to operational requirements (For example an A/C availability of 99.5%).</p>
9	Rolls-Royce	Associated Interpretative Material / Means of Compliance	25	"The Means of Compliance will be based on existing material: CS-E, CS-22 Subpart H..." is ambiguous. If a gas turbine based generator is used, does it mean that the gas turbine engine (that drives the generator) is expected to comply with CS-E?	No suggestion, as the intention/objective is not well understood.	Yes	No	Noted	The intention of this paragraph is to explain that the existing material may be used to show compliance to the SC E-19.
10	Rolls-Royce	Associated Interpretative Material / Means of Compliance	25	"EHPS.80 (c): Associated AMC should at least cover CS-E 850 (Compressor, Fan and Turbine Shafts), AMC CS-E 850 and the associated CM". Would this also apply to all electric platforms, with no gas turbine engine as a source of power?	No suggestion, as the intention/objective is not well understood.	Yes	No	Noted	Yes, if a shaft is part of the propulsion system.
11	AIRBUS	Associated Interpretative Material / Means Of Compliance	25	The list of existing material quoted in paragraph 2 should include CS 23, CS 25, CS 27 and CS 29	Airbus propose to updated § 2. of the Associated Interpretative Material / Means Of Compliance section as follows (new proposed text shown in <i>underlined italic</i> font):	No	Yes	Accepted	Other CS could be used.
12	Rolls-Royce	Associated Interpretive Material / Means of Compliance	25	Language unclear. Interpretive Material and AMCs are EASA documents. Actual "Means of Compliance" is owned by applicant. The first two points seem reasonably clear on this. However, multiple "EHPS.xxx: Associated AMC should at least cover CS-E yyy" are confusing. Are they supposed to mean that the applicant's proposed MoC for EHPS.xxx should consider the AMC for CS-E yyy ?	Clarfy intent. For example, should some refences to "AMC" be to "Proposed MoC" or similar.	Yes	No	Accepted	"Associated AMC" replaced by "The Means of Compliance".
13	Lange Aviation GmbH	Associated...	25	Grammar	"Contaminated fuel" double in note 13.	Yes		Accepted	Corrected.

14	Airbus DS	Contents	2	Missing Dedicated paragraph for Electrical Bonding (CS-E 135)	Consider add missing paragraph	Yes	No	Partially accepted	The term "installed" covers EHPS.370 (a) associated to EHPS.80 (Hazardous EHPS effect addresses the risk of human injury). Specific guidance will be provided in Means Of Compliance.
15	FAA DM	EHPS.10	3	(except CS-25 aircrafts) Should be qualified that it's unmanned aircraft carrying people. Otherwise, would all hazards below and related requirements apply? I.e concentration of toxic products, electrocution of crew, etc.	Clarification	Yes		Accepted	EHPS.15 ""hazardous EHPS effect" has been modified accordingly
16	FAA PH	EHPS.10	3	(except CS-25 aircrafts) "s" in aircraft should be eliminated	Delete the "s"	Yes		Accepted	Corrected.
17	FAA DJ	EHPS.10	3	Paragraph 5. "...interface aspects between rotors and/or propellers..." There seems to be a need to differentiate between "rotors and props" that are external to the EHPS and "rotors" that are an integral part of the EHPS. This statement seems to be referring to an external rotor as on a helicopter.		Yes		Noted	This paragraph has been deleted as judged not necessary.
18	Volocopter	EHPS.10	4	EHPS.10 is stating, that SC-EHPS is applicable for EHPS and the interface to rotors and/or propellers. However, in EHPS.240 it is directly addressing rotor design. On the other hand, applicability to propellers is explicitly excluded and reference to CS-P is given. Volocopter wants to better understand the scope of SC-EHPS and the potential boundary to rotors and/or propellers as well as differentiation to be considered between rotors and propellers.		Yes		Accepted	This paragraph has been deleted as judged not necessary. Rotors identified in EHPS.240 are to be understood as any rotating element in an EHPS (rotor in an electric machine, of a compressor, a turbine, a fan...) that may release high energy debris in case of burst. Propeller are indeed excluded from the EHPS as being covered by CS-P.
19	Lange Aviation GmbH	EHPS.10	3	The SC is applicable to all aircraft, regardless of the type certification basis. Many sections refer to the safety objectives of this basis or the intended aircraft application. But these objectives are not defined for all CS, e.g. CS-22. Therefore those sections are void from the beginning.	Safety objectives (and other references to CS) should be defined explicitly, if not or insufficiently defined in the CS.	Yes		Accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
20	Lange Aviation GmbH	EHPS.10	3	The SC states that CS-25 is excluded only due to lack of emission requirements. It is reasonable to apply the same SC to e.g. CS-22 and CS-23, due to the similar scope and extent of the basic CS. But in comparison CS-25 goes into much more detail due to higher risk and complexity involved typically. It is therefore questionable if a common SC should be established. This might either be too cursory to provide effective guidance, too detailed for other applications, or feature many exemptions and distinctions according to the CS involved.	The scope of the SC should be limited to certain CS, which are similar in scope and level of detail. A more thorough and detailed SC could be derived for CS-25.		Yes	Accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
21	Rolls-Royce	EHPS.10	3	Exclusion of CS-25 aircrafts based only on emissions omits the opportunity for the other principles to apply for the purpose of determining safe propulsion system architectures for future platforms. Suggest rewording to say: "The emissions requirements of CS-25 aircrafts are excluded at this stage because they are not yet defined for EHPS.", then refer to specific parts or regulations of CS-25 and CS-E for those exclusions as required.	Consider the scope and whether the principles could be applied to potential EHPS of CS-25 aircraft whilst excluding the emissions item.	Yes	No	Accepted	The scope has been modified accordingly.
22	SAFRAN	EHPS.10	3	Additional certification requirements beyond this Special Condition need to be satisfied at the aircraft level in order to safely integrate an EHPS into a manned or unmanned aircraft and these are outside of the scope of this Special Condition.	Fully supportive of the need to integrate the propulsion system into the aircraft. This requirements shall be equivalent to section CS-E 20 Propose to reintegrate initial wording : "This Special Condition addresses the interface aspects between rotors and/or propellers and the need to consider the integration of the Electrical Propulsion Unit into the manned or unmanned aircraft."	Yes	No	Not accepted	This paragraph has been deleted as judged not necessary.

23	J. Jézégou ISAE-SUPAERO	EHPS.10	3	The wording “power for flight” (“... which is used to provide or produce lift/thrust/power for flight”, “...that are not used to produce lift/thrust/power in flight”) and the EHPS definition in EHPS.15 give the impression that overlaps between EHPS and powerplant system (in aircraft CS) or electrical power generation (in aircraft CS) or APU are possible, eventually leading to not clearly-defined interfaces between various systems and applicants (e.g. EHPS vs. CS23.2430-Powerplant installation, energy storage and distribution systems)		Observation	No	Accepted	This is the intent of the various paragraphs where reference is made to the Type-Certification basis of the intended aircraft application. (example of EHPS.370 (a))
24	Airbus Helicopters	EHPS.10	3	“(except CS-25 aircrafts)” “Propellers are also outside the scope of this Special Conditions as the certification specifications for propellers are provided in CS-P. “ Propeller excluded is in contradiction with Lift/thrust unit definition given during discussion related to SC-VTOL: 6. Lift/thrust unit A lift/thrust is considered to be any engine or motor that directly contributes to providing lift or thrust and includes its controller, the connected effector (e.g. rotor, propeller, fan) and any related actuators (e.g. pitch change, tilting, vectoring). 7. Lift/thrust system The Lift/thrust system is composed of; the lift/thrust units, their related energy supply and energy management system.	Clarify the definition	Yes	No	Noted	No contradiction has been observed as the SC E-19 is not limited to VTOL aircrafts. Propellers are "products" as defined by the Basic Regulation. CS-P defines the certification requirements for those products. For the rotors, the certification requirements are provided in the CS of the intended aircraft application. For example, in a VTOL, the SC VTOL provides the certification requirements for the rotors. Fans are covered by the SC E-19 (as part of an engine).
25	The Boeing Company	EHPS.10	3	“EHPS.10 Scope ... This Special Condition addresses the interface aspects between rotors and/or propellers and the conditions for installation of the Electrical Propulsion Unit into a manned or unmanned aircraft.” We ask EASA to consider whether an error was made using the term “Electrical Propulsion Unit” here and to clearly define terms used in this document to avoid confusion and misinterpretation. Additionally, we suggest using the term “electric” in lieu of “electrical” in this application for consistency with other uses. Section EHPS.15 Terminology, defines Electric / Hybrid Propulsion System (EHPS), however 'Electrical Propulsion Unit' is not defined.	We ask EASA to either replace “Electrical Propulsion Unit” with “Electric / Hybrid Propulsion System” here or provide clear definitions in order to better understand the scope and prevent misinterpretation. For example: where is 'Electrical Propulsion Unit' defined in this document? Is ‘Electrical Propulsion Unit’ clearly understood or is there a standard definition in a different document? We recommend adding this definition to section EHPS.15.	no	yes	Accepted	This paragraph has been deleted as judged not necessary.
26	The Boeing Company	EHPS.10	3	EHPS.10 SCOPE:  This should consistent with other SC which uses applicability.	EHPS.10 Applicability:	no	yes	Accepted	Corrected.
27	The Boeing Company	EHPS.10	3	EHPS.10 Scope ... This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce lift/thrust/power for flight in any manned and unmanned aircraft (except CS-25 aircrafts), both during normal and emergency operations.  Electric or hybrid-electric propulsion aircraft to varying degrees will use electric machinery and gas powerplants driving rotors and/or propellers to provide both flight control and propulsion. This will be most common in highly distributed propulsion architectures using electric machinery directly driving rotors and/or propellers. We accept using the label “Propulsion” in EHPS, but it is important to recognize and clearly define that this system does not necessarily have the same functions as a traditional gas powerplant driven aircraft where the gas powerplant substantially just provides thrust/power/lift. The simplest example is an eVTOL aircraft where in many cases the lift rotors are the primary flight control effector.	This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce lift/thrust/power, or potentially flight control, for flight in any manned and unmanned aircraft (except CS-25 aircrafts), both during normal and emergency operations.	no	yes	Partially accepted	Flight control computers are outside the scope of this SC. The terminology "Propulsion System" is a reference to the Basic Regulation (EU) 2018/1139 definition. It is intended that the new functions in which an EHPS is involved will be addressed via the top/down safety assessment approach. For example, on a VTOL A/C, the EHPS control system is intended to control the engine speeds according to a speed law that will be defined by the Flight control computer(s).

				An alternative would be to use the term “Elecrtic / Hybrid Power System” instead and then define it as providing thrust/power/lift and potentially other functions such as flight control.					
28	TCCA	EHPS.10	3	"Each EHPS Installation Manual will document the limitations required for integration into each particular aircraft application."	Suggest to add text, if needed			Partially accepted	This is already covered by EHPS.30. The scope of the SC E-19 i snow limited to case where the intended aircraft application is known.
29	TCCA	EHPS.10	3	Second paragraph states: “This Special Condition is applicable to any Electric / Hybrid Propulsion System without any power range limitations.”	Can an explanation be added as to what is meant by the applicability being limited to “System without any power range limitations			Noted	Sentence has been deleted.
30	TCCA	EHPS.10	3	Given the varying degrees of electrification, it is possible that a new gas turbine engine design (for which the existing Part 33 rules would be adequate) could be certified using the EHPS rules because of the addition of electric propulsion components. For example: a traditional turboprop engine is outfitted with an additional generator supplying partial power to other electrically driven props. The entire system could be certified under SC-EHPS. The concern is that a subsystem of an EHPS that is essentially a CS-E product may result in a higher level for safety if CS-E is applied. It is understood that the issue is design specific, but the Authorities should be prepared for EHPS designs which incorporate new models of existing CS-E engines.	As deemed appropriate by the Agency, SC-EHPS may be applied to systems which interface with CS-E or CS-P products, or in conjunction with CS-E standards. The EHPS TCDS and I&OM would require the installation of the specified certificated product, in accordance with EHPS.30.			Noted	The SC EHPS can be used to certify a turbogenerator based on a CS-E engine. The resulting safety level will be adapted to the intended aircraft application. It is not the intent of EASA to apply systematically the SC EHPS to any electric/hybrid propulsion system. If an applicant is willing to make use of CS-E complemented with an additional Special Condition, this can be possible and compatible with Part 21 requirements. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
31	Vertical Aerospace	EHPS.10 (Scope)	3	Is this an 'open door' for DOAs to specify their system 'scope' for an EHPS? Different DOAs may include or exclude equipment within this EHPS system which could lead to a divergence in achieved safety (e.g. Batteries).	A stronger definition of the scope may aid both EASA and DOAs.	Yes		Noted	The intent of the SC E-19 is to provide technical requirements for an EHPS. It is not the intention of the SC E-19 to fix the scope of the DOA of a company. For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
32	<i>Flying Whales</i>	EHPS.10 EHPS.11	3	It is not clear whether the SC is intended for an Aircraft-TC applicant or EHPS–TC applicant? Can we use this SC to obtain a TC for EHPS or only to be considered as a subpart to the Aircraft CS?	Applicability of SC could be stated more clearly and explicitly. The possibility of certifying an EHPS component with an ETSO could be clarified.	Yes	No	Noted	The intent of the SC E-19 is to provide technical requirements for an EHPS. It is not the intention of the SC E-19 to fix the scope of the DOA of a company. For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.



33	FARADAY aerospace	EHPS.10 Scope	3	Propellers are outside the scope of this Special Conditions. What about pitch control systems ?		Yes	No	Noted	Pitch Control System could be part of the applicability. To be discussed on a case by case as for today during an engine certification.
34	FARADAY aerospace	EHPS.10 Scope	3	Propellers are outside the scope of this Special Conditions. What about belt reducers or gearboxes ?		Yes	No	Noted	The same applicability as for piston and turbine engines applies.
35	Rolls-Royce	EHPS.10 Scope	3	The text "This Special Condition is applicable to any Electric / Hybrid Propulsion System without any power range limitations" is confusing and requires clarification. The range of an all electric aircraft will differ from current operating range standards. The scope should clarify that operating range considerations are not part of this special condition.	Suggested text:  This Special Condition is applicable to any Electric / Hybrid Propulsion System. Limitations with respect to operating range are not in scope of this special condition.	Yes	No	Partially accepted	The sentence has been removed
36	Rolls-Royce	EHPS.10 Scope	3	The scope of the special conditions does not explicitly mention that the certification requirements provided are for the issuance of the type certificate	Please clarify if the SC E-19 scope is also for issuance of EHPS type certificate (as mentioned in EHPS.30) or the EHPS need to be certified under A/C TC.	Yes	No	Accepted	Both cases are identified in the SC E-19. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
37	Rolls-Royce	EHPS.10 Scope	3	It seems to be implicitly assumed that shaft power would be converted to thrust using a propeller, for which CS-P provides the airworthiness requirements. It is not clear how fans or ducted fans need to be treated, and when a rotating propulsive assembly is a ducted fan or a shrouded propeller. It should be recognised that shrouded propellers/fans may be part of the EHPS.	A definition of an Integrated Propeller/Fan should be added to EHPS.15 Terminology: Any rotating device that has blades, shrouded or unshrouded, which is part of the EHPS and which is used to convert shaft power into thrust or lift for the aircraft. The requirements of CS-P shall apply, even though an Integrated Propeller/Fan would not be type certificated to CS-P, but as part of the EHPS. An applicant may apply for relief when agreeing the acceptable means of compliance to EHPS if the integrated propeller/fan design has features that inherently exclude characteristics which are subject to CS-P requirements. Definition of the thrust need to be added.	Yes	No	Partially accepted	The propeller (shrouded or unshrouded) is out of the scope of the SC E-19 as covered by CS-P. Fans are part of the propulsion system: this is the same logic as for turbine engines. Open rotor are not considered at this stage for EHPS.
38	VOLTAERO	EHPS.10 Scope	3	For consistency, we recommend a different wording. EHPS cannot produce lift or thrust alone; it needs to be connected to a propeller, fan or rotorcraft blades.	Amend first paragraph :This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce <b>power</b> lift/thrust/power for flight	YES	NO	Not accepted	Fans are considered as being part of the scope. Therefore lift or thrust is applicable to EHPS.
39	VOLTAERO	EHPS.10 Scope	3	Applicability should be extended to wheels electrical motors. We do not understand why they are excluded.	Delete paragraph “Electric / Hybrid Propulsion Systems that are not used to produce lift/thrust/power in flight are outside of the scope of this Special Condition. As an example, electric motors that drive wheels for taxiing or electric motors for air conditioning systems are outside of the scope of this Special Condition.”	YES	NO	Not accepted	Wheels electric motors do not ensure the same function as an EHPS. They should be considered as part of the landing gear system.
40	OSTIV Michael Greiner	EHPS.10 Scope	3	This Special Condition follows the “one-size-fits-all” approach, which has put unnecessary burden upon design- and production- organisations of GA-aircraft for years. In the course of the EASA initiative GA-Roadmap this approach was realized to be contra-productive. This document conflicts with at least four out of six strategic principles that were set up by EASA in the GA-Roadmap: <b>One size does not fit all</b> Instead, this SC covers all manned and unmanned aircraft (at this stage except CS-25) <b>Adopt a risk-based approach.</b> Although the safety assessment is supposed to lead to proportionality, it is questionable to me, if the effect is really felt by the designers. This document covers all objectives that potentially could lead to a CS-25 certification (not at this stage, but for a	Exempt CS-22 products: “This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce lift/thrust/power for flight in any manned and unmanned aircraft (except CS22 and CS-25 aircrafts), both during normal and emergency operations. CS-25 aircrafts are excluded at this stage because emissions requirements are not yet defined for EHPS. CS-22 aircraft are excluded because one size does not fit all. Concerning Electric Propulsion there is already an existing Special Condition SC E-01 for CS-22/LSA products. Concerning Hybrid Propulsion a proportional Special Condition has still to be defined.”			Accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.

				<p>different reason). Now the first task to the designer is to discuss away everything that is not applicable to a powered sailplane. As SC E-19 could also be applied to pure electric propulsion systems, one can simply compare it with SC E-01 to see the amount of difference. <b>Protect ‘what shows to work well’ unless there are demonstrable and statistically significant safety reasons against doing so</b></p> <p>This would require to recognise and develop the SC E-01. But instead Special Condition E-19 contains the maximum objectives due to its wide scope. Even when it is only an alternative to SC E-01, it might become an arduous job for the designer to distance his project from the objectives given in SC E-19. There is no connection to the concepts, operational requirements, and levels of safety that are already inherently weaved into CS22 and SC E-01.</p> <p>In short, it would be appreciated, if it would clearly be said, that the level of requirements/objectives for CS 22 is defined by SC E-01. Safety assessments like in EHPS.80 are not the typical approach in CS-22 certification. I agree that in such technology, which handles much energy in small, confined spaces, brainwork must be required to identify potential hazards. But design organizations in CS-22 world have not yet grown to such size, that they can handle such formal approaches.</p> <p>On the other hand, if designers have to discuss away many topics like bird-strike for sailplanes, they will rather seek that their national government opts-out for 600kg in Annex I of the BR. This would be contra-productive since the appropriate level of safety of CS-22 and SC E-01 would then be replaced by microlight standards. Nothing gained, but much lost.</p> <p><b>Make the best use of available resources and expertise</b></p> <p>The introduction of CS E-19 will set a new standard with objectives that go beyond existing SC E-01. For such an overthrowing project it would be appropriate to investigate into available experience among the CS-22 stakeholders. The Certification Directory/General Aviation/Small Aeroplanes has a history of maintaining CS22 with the support of OSTIV (ostiv.org). The Sailplane Development Panel of OSTIV has founded a Working-group Electric Propulsion (WEP) to gather experience and research activities on electric propulsion for CS22 aircraft. The stakeholders are aware, that on the basis of existing operational experience it will be necessary to continue the development of objective-tailored SC-22.2014-01 and SC E-01. The CS-22 community is willing to contribute. However, including CS-22 into the scope of SC E-19 could make such further efforts felt as fruitless and frustrating.</p>					
41	AIRBUS	EHPS.10 Scope	3	<p>The scope excludes CS-25 aircraft apparently only because of the absence of emissions requirements. Airbus consider this exclusion is not justified. If the intent is ultimately that the requirements in the proposed SC E-19 also apply for EHPS to be installed on CS-25 aircraft, the general exclusion should be removed. It is not clear to Airbus why the appropriate emissions requirements could not be enforced on EHPS via the aircraft certification basis. A note could be added about the emissions requirement question rather than a full exclusion of CS-25 applications.</p> <p>In addition, this paragraph should be updated to clarify the fact that the Special Condition can be used as an element of the aircraft certification basis in complement to the necessary installation/integration requirements pertinent to each intended aircraft application.</p> <p>Finally the term Electrical Propulsion Unit is used only once in the SC in this Scope paragraph. The intent of using this specific term shall be clarified.</p>	<p>Airbus propose to update the wording of EHPS.10 Scope as follows (new proposed text shown in <u>underlined italic</u> font):</p> <p>This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce lift/thrust/power for flight in any manned and unmanned aircraft (<del>except CS-25 aircrafts</del>), both during normal and emergency operations. Note that for CS-25 aircrafts <del>are excluded at this stage because this Special Condition shall be completed with appropriate</del> emissions requirements <del>that</del> are <del>not</del> yet <del>to be</del> defined for EHPS.</p> <p>This Special Condition is applicable to any Electric / Hybrid Propulsion System without any power range limitations. Electric / Hybrid Propulsion Systems that are not used to produce lift/thrust/power in flight are outside of the scope of this Special Condition. As an example, electric motors that drive wheels for taxiing or electric motors for air conditioning systems are outside of the scope of this Special Condition. Propellers are also outside the scope of this Special Conditions as the certification specifications for propellers are provided in</p>	NO	YES	Partially accepted	<p>Scope modified accordingly to include EHPS for CS-25 aircraft. The possibility to certify the EHPS as part of the intended A/C application is not relevant in the SC E-19 as it is allowed by the Basic Regulation (EU) 2018/1139. It is therefore considered accepted in the EASA framework.</p>

					CS-P. This Special Condition addresses the interface aspects between rotors and/or propellers and the <u>minimum</u> conditions for installation of the Electrical Propulsion Unit into a manned or unmanned aircraft. <u>It can be directly used as an element of the concerned aircraft certification basis. However</u> , additional certification requirements beyond this Special Condition <u>and pertinent to each intended aircraft application</u> need to be satisfied <u>at the aircraft level</u> in order to safely integrate an EHPS into a manned or unmanned aircraft and these are outside of the scope of this Special Condition.				
42	Werner Scholz, European Sailplane Manufacturers	EHPS.10 Scope	3	Whereas it is understood that this SC could be applicable to any manned / unmanned aircraft, it should be mentioned that simpler version of this SC could exist for simpler aircraft and/or aircraft where failure of the propulsion system does result into less hazardous conditions (e.g. as with a powered sailplane).	Introduce: “Simplified versions of this SC and/or simplified criteria to show compliance are possible if possible, failure conditions do not result into critical / hazardous failure modes for the aircraft.”	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
43	Werner Scholz, European Sailplane Manufacturers	EHPS.10 Scope	3	I am no expert in English language, but I believe the plural of aircraft is aircraft (not aircrafts), same probably true for propeller...	Replace “aircrafts” with “aircraft” throughout the document. (And do the same with Propeller(s)).	observation		Accepted	Corrected
44	SAFRAN	EHPS.10, EHPS.15	All the document	Mention of lift is outside of the scope of a propulsion system. Lift is related to aircraft manoeuver.	PAGE 3 (for example) : This Special Condition is applicable to any Electric / Hybrid Propulsion System, so called hereafter EHPS, which is used to provide or produce power for <del>the</del> thrust/power for flight	No	Yes	Partially accepted	The notion of lift has to be kept as in some particular intended applications as VTOL, the EHPS could participate to the lift of the aircraft. However, it has been added that the control of the lift to ensure the aircraft sustentation, controllability and maneuverability is an aircraft function.
45	FAA GH	EHPS.100	11	This missed the arc-fault concerns		Yes		Partially accepted	Electrical arcing is indeed a potential source of fire. The paragraph does not provide the types of fire but only addresses the risk of fire in general, whatever the source of fire. The source of fire will be addressed in MOC. Associated to this, EHPS.370 points to intended aircraft application requirement which will address also high voltages risks.
46	FAA PH	EHPS.100	11	Paragraphs (a) and (b) in this section correspond to CS-e 130. If we’re allowing hybrid systems that have liquid fuel burning engines, don’t we need to have the appropriate versions of CS-e 130(b), (c), (d), (e), (f), and (g) as well?		Yes		Partially accepted	The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC
47	Lange Aviation GmbH	EHPS.100	11	“Minimise probablity” is an abstract and undetermined expression.	An acceptable probability, i.e. extremely remote, should be defined, depending on the effect of the fire on structure, crew,...	Yes		Partially accepted	Requirement is similar to existing requirement. Associated guidance will explain how to 'minimize'
48	Lange Aviation GmbH	EHPS.100	11	Batteries are not discussed here in detail, although they feature high energy content and are not intrinsically safe in most cases.	The inherent dangers of and the protection against a battery fire should be mentioned explicitly.	Yes		Not accepted	The paragraph does not provide the types of fire but only addresses the risk of fire in general, whatever the source of fire. The type of fire will be addressed in MOC. EHPS.380 will also provide requirements relative to the intended aircraft application. Indeed, fire protection will not be the same for a CS 23 level 1 aircraft and a VTOL enhanced category.
49	General Aviation Manufacturers Association	EHPS.100	11	EHPS 100- (b) Why is Catastrophic not included here?	(b) In addition, the design and construction of the EHPS must minimize the probability of the occurrence of an internal fire that could result in structural Failure or Hazardous <b>or Catastrophic</b> EHPS Failure.	Major/conceptual		Not accepted	The point is here to minimize internal fire that could result in the non-containment of high energy debris. The CAT failures are dealt in EHPS.100 (a)
50	Flying Whales	EHPS.100	11	Considering Smoke to be equally critical, whether smoke requirements should be considered within the scope of EHPS or aircraft?	Clarification	Yes	No	Noted	Specific guidance will be provided for a) in order to address the toxicity linked to the materials used in the EHPS. At aircraft level, the proper installation and ventilation will be addressed.



51	Airbus DS	EHPS.100	11	As a difference from CS-E, no design requirements (fire-grade, shielding, ventilation, drainage) are included. Lacking that, the A/C integrator will need to have detailed information about how the particular engine has been certified in order to ensure that fire requirements at A/C level are also fulfilled. Information regarding materials used, fire hardening of the engine in general and all its components (in particular for the engine mounting system or for any flammable fluid line or tank included as part of the design), quantity and type of flammable fluids, electrical installation stds used (...) need to be requested to assess the fire risk at A/C level.	Proposal is be included as part of the requirements or in AMC	Yes	No	Accepted	Associated guidance will explain how to 'minimize'
52	TCCA	EHPS.100	11	If a combustion engine is part of the Integrated Hybrid Propulsion System, all of the essential electrical systems for the continuation of flight should be protected from effects of fire and also be fire resistant or fireproof as determined by the certification authority.	Suggest defining fire zone and fire resistant / fire proof requirements in this section			Not accepted	The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC. For example, on VTOL aircraft, EASA has proposed other zones qualification in order to cope with electrification. Regarding the protection of A/C systems necessary for the continuation of the flight, this will be dealt as part of the aircraft certification.
53	TCCA	EHPS.100	11	a) Removed from CS-E "In addition, the design and construction of Engines must minimise the probability of the occurrence of an internal fire that could result in structural Failure or Hazardous Engine Effects." CS-E 130(c) to (g) were not retained in this SC. Removing the requirements related to fire protection of external, fuel/oil tank, firewall, EEC, draining/venting, mounting structure and fire zone requirements for EHPS may not provide the same level of safety as existing regulations. EHPS could contain many of the same, or similar, fuel or oil systems and components as CS-E engines. Additionally, the threat of battery fire should be specifically considered for mount, controllers, and other components.	Achieve equivalent level of safety by including a performance based version of these requirements			Partially accepted	The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC
54	TCCA	EHPS.100	11	Fire protection section should specifically consider fire protection of EHPS mounting structure (fireproof, unless...?)	Consider adding specific requirement for EHPS mounting structure fire protection capability.			Partially accepted	The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC
55	TCCA	EHPS.100	11	Another similar SC has an item (c) recommend adding text in the suggested resolution.	Recommend adding: "(c) EHPS high voltage electrical wiring interconnect systems should be protected against arc-faults. Any non-protected electrical wiring interconnects should be analysed to show that arc faults do not cause a hazardous EHPS effect."			Partially accepted	The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC. On top of that it is also covered by the EHPS.370 and its related AMC.
56	Bell	EHPS.100 (a)	11	"...must minimize the probablily of occurrence...": what does "minimize" mean here? It would benefit from some more clarification.	Suggest revising text to "... must minimize the probability of the occurrence to the extent needed to satisfy the SSA" to clarify.	Yes	No	Partially accepted	Requirement is similar to existing requirement. Associated guidance will explain how to 'minimize'
57	Rolls-Royce	EHPS.100 Fire protection	10	The requirement only requires provision to minimise the probability of the occurrence and spread of fire and subsequent effects. While this is similar to CS-E130 the requirement does not include the relevant CS-E 130 subsections regarding firewalls.	Fire protection requirements should be made to be equivalently rigorous as CS-E 130	No	Yes	Partially accepted	Paragraph a) address the minimization of the fire spread. The SC E-19 follows an objective based approach. The "how", as developed in CS-E 130 will be addressed in MOC. The firewall requirement may be required for an internal combustion engine but not for an electric engine. Also to be noted that electrical fires linked to the chemistry of the batteries may require different means to avoid the spread of the fire.

58	AIRBUS	EHPS.100 Fire Protection	11	Airbus note that the proposed paragraph is very much Objective Based oriented and much leaner than CS-E 130. The proposed sub-paragraph (b) seems only applicable to turbine engines, hence may be kept but only as a supplemental specific requirements. With the new electrical propulsion systems, Airbus consider that the electrical arcing risk also becomes a potential fire risk that deserves particular attention and should therefore be added	Airbus propose to update the wording of EHPS.100 Fire Protection - as follows (new proposed text shown in <u>underlined italic</u> font): (a) The design and construction of the EHPS and the materials used must minimise the probability of the occurrence and spread of fire during normal operation and EHPS failure conditions, and must minimise the effect of such a fire. (b) <u>In addition, particular attention must be given to risks of internal turbine fires and of high voltage electrical arcing.</u>	N	Y	Partially accepted	Electrical arcing is indeed a potential source of fire. The paragraph does not provide the types of fire but only addresses the risk of fire in general, whatever the source of fire. The source of fire will be addressed in MOC. Associated to this, EHPS.370 points to intended aircraft application requirement which will adress also high voltages risks.
59	Rolls-Royce	EHPS.100 Fire Protection	11	It would be useful to have better guidance on fire zoning given the introduction of new potential ignition sources and the fact that arcing will occur and can't be avoided. <See also comment 82>	AMC to cover fire zoning in relation to the risk of arcing as an ignition source.	Yes	No	Accepted	Associated guidance will explain how to 'minimize'
60	FARADAY aerospace	EHPS.100 Fire Protection (a)	11	To what level should the design and construction of the EHPS and the materials minimise the probability of ....		Yes	No	Noted	Associated guidance will explain how to 'minimize'
61	FARADAY aerospace	EHPS.100 Fire Protection (b)	11	Same question about the word "minimize"		Yes	No	Noted	Associated guidance will explain how to 'minimize'
62	FAA DK	EHPS.100(a)	11	In reference to « failue conditions » : Including battery thermal runaway		Yes		Noted	Batteries are indeed a potential source of fire. The paragraph does not provide the types of fire but only addresses the risk of fire in general, whatever the source of fire. The source of fire will be addressed in MOC. EHPS.380 will also provide requirements relative to the intended aircraft application.
63	FAA JF	EHPS.100(a)	11	In reference to « minimise » : Inconsistent spelling. See next paragraph.		Yes		Accepted	Corrected accordingly
64	SAFRAN	EHPS.11	3	Remove the notion of MoC specifically accepted & at project level	<del>when specifically accepted by the Agency at project level.</del>	Yes	Yes	Accepted	Corrected accordingly
65	Embraer S.A.	EHPS.11	3	The information security applied to aviation is a new topic for some applicants and its means of compliance may not be well known. The items (a) and (b) does not list any document like ED-202A.	We suggest to include a new item: "(c) To comply with EHPS.350, the applicant can follow the guidance provided by ED-202A Airworthiness Security Process Specification or propose an equivalent AMOC".	yes	no	Accepted	Specific guidance will be provided in the Means of Compliance.
66	TCCA	EHPS.11	3	General comment: On the use of the word “shall” and “must”. Q1. Should the text throughout only use either “must” or “shall”? Q2. Is there an EASA policy which states that it is acceptable to use either term?	Suggest to clarify and revise text, if needed.			Noted	Consistency has been ensured. The "english style guide" from the European Comission recommends to make use of "shall" when it is a bingin requirement (like Part 21). However, for CS or Special Conditions, as the requirements are non-enacting terms, the term 'must' should be used. Indeed, an aplicant can devaite from a requirement if he demonstrates an equivalent level of safety.
67	Werner Scholz, European Sailplane Manufacturers	EHPS.11 Acceptable means of compliance	3	EASA may accept also other alternative means of compliance than consensus standards (e.g. requirements developed within Ostiv as part of the Ostivas [Ostiv airworthiness standards]).	Add “which may include consensus standards <b>or other alternative means</b> , when...”	suggestion		Accepted	This is the intent of the paragraph EHPS.11 (b)
68	Volocopter	EHPS.15	5	EHPS: What is meant by Electrical Wiring Interconnection System? Only EWIS related to production of lift/thrust/power (means High Voltage lines), or as well the EWIS Low Voltage components, used for example to generate control signals and low voltage power supply?		Yes		Noted	This concerns all types of electric wiring and connectors necessary for the good functioning of the EHPS. Nevertheless , the EWIS terminology has been removed as not applicable to all intended aircraft applications.
69	Volocopter	EHPS.15	5	EHPS Control System: Why are battery or energy storage device management systems specifically excluded from the EHPS Control System definition?		Yes		Noted	Exclusion has been removed

70	Lange Aviation GmbH	EHPS.15	4	The EHPS Control System excludes all battery management systems, these systems are highly critical to the safety of the aircraft and should be discussed in this SC. Many types of batteries are not intrinsically safe and feature a high energy content. This will cause catastrophic failures, if the battery management system and recharging systems are not properly designed.	Include the battery or energy storage management system as subsystem of the EHPS control system or define discrete specifications.	Yes		Noted	Exclusion has been removed
71	Lange Aviation GmbH	EHPS.15	4	The SC refers to “electric engines”, when “engine” is usually used to describe an engine powered by fuel, i.e. turbine/piston engine. “Electric motor” is more appropriate.	“Electric engine” in this SC should be replaced by “electric motor” to discriminate more clearly between turbine/piston engine and electric motor.	Yes		Not accepted	Engine refers to the definition provided in the CS-Definition and the Basic Regulation (EU) 2018/1139.
72	Lange Aviation GmbH	EHPS.15	4	For electric motors a rating in terms of torque instead of power might be more appropriate in certain cases. This comment applies to all mentions of “power and/or thrust” in this SC.	Introduce torque as rating in addition to power and thrust	Yes		Not accepted	Torque is considered as a limitation, not a rating. A rating is used to delcared later on performances at aircraft level. It is not a maximum value but the minimum power that any produced engine shall deliver during the entire flight and over its entire life.
73	Lange Aviation GmbH	EHPS.15	5	“Failure to shut down” could relate to more serious (e.g. turning rotor) or less serious (e.g. control system) issues. In some cases a shutdown of a subsystem might even not be possible or advisable, e.g. battery management and monitoring.	The point should be clarified to address the hazardous effect caused, instead of the intended or accidental inability to shut down.	Yes		Accepted	Corrected and replaced by "(vi) Complete inability to stop any rotating parts (vii) Complete inability to isolate any component that could cause a hazard to the aircraft "
74	SAFRAN	EHPS.15	5	For new applications, not to refer to EHPS, and prefer sub system EHPS	Complete inability to shut down the <b>sub system of the</b> EHPS	Yes	Yes	Accepted	Corrected and replaced by "(vii) Complete inability to stop any rotating parts (viii) Complete inability to isolate any component that could cause a hazard to the A/C "
75	SAFRAN	EHPS.15	4	Document refer to electric motor or electric engine	Use only one wording : electric engine is preferred	Yes	Yes	Accepted	Corrected accordingly
76	SAFRAN	EHPS.15	4	EHPS Control System definition	Why the Battery or Energy Storage Management System are excluded for the EHPS Control System? There is no reason to exclude it, and they may be highly linked to the whole EHPS Control/Management System.	No	Yes	Noted	Exclusion has been removed
77	SAFRAN	EHPS.15	5	HAZARDOUS EHPS effect	(viii) This effects deals with electrocution of person causing fatal injury. Additionally, excessive magnetic field should be added, potentially causing fatal injury people sensible to this effect.	No	Yes	Accepted	Corrected accordingly. Specific guidance will have to be provided.
78	Airbus Helicopters	EHPS.15	5	“Hazardous EHPS effect [...] (viii) Electrocution of crew, passengers, operators or maintainers, sufficient to cause serious or fatal injury.” Novelty is to include effect on maintenance people on Civil.	Operators & maintainers should be considered with different approach compared to crew & passengers either by having a dedicated safety classification or dedicated methodology to show compliance (e.g. industrial rules, ...).	Yes	No	Accepted	Corrected accordingly
79	Flying Whales	EHPS.15	4	Whether Electrical Distribution System is in the scope? Only EWIS is specified in the definition.	Electric Distribution System could also be included in to the definition to make sure that equipment such as contactors, circuit breakers etc. are included within EHPS	Yes	No	Accepted	
80	Flying Whales	EHPS.15	4	(Emergency Rating) Does this include OEI conditions?	Clarification	Yes	No	Noted	Yes, OEI rating as defined for a turbine engine can be considered as an Emergency Rating
81	The Boeing Company	EHPS.15	4	“EHPS.15 Terminology ... EHPS Control System: A system or device that controls, limits, monitors or protects the operation of the EHPS or a sub-system of the EHPS excluding any battery or energy storage device management system.” We ask EASA to clarify this definition. This definition seems to	We ask EASA to explain and clarify why “battery or energy storage device management system” are excluded from this definition. Where are these elements covered?	no	yes	Noted	Exclusion has been removed

				contradict the definition presented in the document for “Electric / Hybrid Propulsion System (EHPS)”. The definition states: An Electric / Hybrid Propulsion System may include, but is not limited to, electric motors, inverters, turbine engines, piston engines, generators, electrical wiring interconnection systems, electrical power generation, <b>energy storage systems</b> , integrated fans, cooling systems and power management system. An EHPS is intended to produce lift, thrust or power for flight.					
82	The Boeing Company	EHPS.15	4	<p>“EHPS.15 Terminology</p> <p>...</p> <p>Emergency rating: Means an engine and/or generator rating intended to be used in the event of a failure leading to a power and/or thrust loss of a sub-system of the EHPS and requiring the remaining sub-systems of the EHPS to compensate fully or partially the associated power and/or thrust loss.”</p> <p>We ask EASA to clarify. We think this should also consider the energy storage system. Consider this example: if a battery string is lost, the other string(s) must be able to support safe landing and hence will have to tolerate higher discharge rate and might be allowed to go to higher temperature limits (e.g. emergency energy storage temperature rating).</p>	We ask EASA to clarify. We think emergency rating should not just affect the engine and/or generator, but the entire EHPS including the energy storage system. We recommend changing “an engine and/or generator”	no	yes	Partially accepted	Rating definition has been reworded. However, ratings are used to define the intended aircraft performances. For the energy storage device, special attention will have to be made to ensure the proper supply of electric power in all expected flight conditions.
83	The Boeing Company	EHPS.15	5	<p>Means the effect of Hazardous EHPS failure condition. As a minimum, the following effects must be regarded as Hazardous EHPS Effects:</p> <ul style="list-style-type: none"> <li>i. Non-containment of high-energy debris,</li> <li>ii. Concentration of toxic products in the air of the cabin that is sufficient to incapacitate crew or passengers</li> <li>iii. Significant thrust in the opposite direction to that commanded by the pilot,</li> <li>iv. Uncontrolled fire,</li> <li>v. Failure of the EHPS mounting system leading to inadvertent EHPS separation,</li> <li>vi. Release of the propeller by the EHPS, if applicable,</li> <li>vii. Complete inability to shut down the EHPS.</li> <li>viii. Electrocution of crew, passengers, operators or maintainers, sufficient to cause serious or fatal injury.</li> </ul> <p>Many current VTOL configurations use propellers and rotors which augment safety that could be used to improve the impact of effects considered Hazardous per CS-E510 g2 . CS-E510g(2) states the following effects must be regarded as Hazardous Engine Effects:</p> <ul style="list-style-type: none"> <li>(i) Non-containment of high-energy debris;</li> <li>(ii) Concentration of toxic products in the Engine bleed air for the cabin sufficient to incapacitate crew or passengers;</li> <li>(iii) Significant thrust in the opposite direction to that commanded by the pilot;</li> <li>(iv) Uncontrolled fire;</li> <li>(v) Failure of the Engine mount system leading to inadvertent Engine separation;</li> <li>(vi) Release of the Propeller by the Engine, if applicable;</li> <li>(vii) Complete inability to shut the Engine down.</li> </ul> <p>Losing one rotor may be considered major, rather than Hazardous, since the effects may not produce a large reduction of vehicle capabilities or safety margin.</p>	<p>Means the effect of Hazardous EHPS failure condition. As a minimum, the following effects must be regarded as Hazardous EHPS Effects:</p> <ul style="list-style-type: none"> <li>i. Non-containment of high-energy debris,</li> <li>ii. Concentration of toxic products in the air of the cabin that is sufficient to incapacitate crew or passengers</li> <li>iii. Significant thrust in the opposite direction to that commanded by the pilot,</li> <li>iv. Uncontrolled fire,</li> <li>v. Failure of the EHPS mounting system leading to inadvertent EHPS separation,</li> <li><del>vi. Release of the propeller by the EHPS, if applicable,</del></li> <li>vii. Complete inability to shut down the EHPS.</li> <li>viii. Electrocution of crew, passengers, operators or maintainers, sufficient to cause serious or fatal injury.</li> </ul>	no	yes	Not accepted	<p>The SC E-19 addresses propulsion system that are not only dedicated to VTOL.</p> <p>The point addressed here is not the loss of thrust but the risk of release of high energy debris following propeller release.</p>
84	The Boeing Company	EHPS.15	5	<p>Means a part that relies upon meeting prescribed integrity specifications of EHPS.90 to avoid its Primary Failure, which is likely to result in a Hazardous EHPS Effect.</p> <p>The SC does not provide information on the safety objectives being thought by the authority for EHPS</p>	Means a part which failure is likely to result in Hazardous EHPS Effects, reliance must be placed on meeting the prescribed integrity specifications of EHPS.90 (EHPS critical parts) in order to support the objective of an Extremely Remote probability of Failure 10 <sup>-7</sup> (or provide equivalent information than SC-VTOL per AMC VTOL.2510)	no	yes	Not accepted	<p>The SC E-19 addresses propulsion system that are not only dedicated to VTOL.</p> <p>The safety objectives are driven by the intended aircraft application and may therefore not be the same for all EHPS.</p>



85	Airbus DS	EHPS.15	4	In the case of hydrogen based electrical systems, is the hydrogen energy storage used for propulsion considered as part of the EHPS? If yes => EHPS.380 requires meeting Aircraft TC basis which may not include appropriated requirements for hydrogen	Consider modifying EHPS.380 to cope with hydrogen energy storage system	No	No	Noted	Hydrodgen Storage System or hydrogen use is outside the scope of the special condition. EHPS.380 renamed to reflect the focus on propulsion battery.
86	Airbus DS	EHPS.15	5	“Hazardous EHPS effect [...] (iii) Significant thrust in the opposite direction to that commanded by the pilot,” Electrical machines can rotate in the reverse direction in case of control malfunction. This reverse rotation, especially in a non-pitch controlled fan/propeller system can lead to strong aerodynamic effects and potential fan/propeller flutter	Proposal is to also add aerodynamic and aeroelastic effects caused by the faulty operation of the EHPS.	Yes	No	Not accepted	The mentioned aerodynamic effects can indeed lead to important issues and they should therefore be considered. However, the mentioned aerodynamic effects are consequences of the reverse rotation that is already addressed. Aerodynamic stability, absence of flutter is also addressed via EHPS.230 Virabtion Survey. EHPS.230 (c) also covers fault conditions. In any case, the mentioned list is non-exhaustive. It is a minimum. If an applicant determines another failure effect, he can add it to the list for its project during the certification process.
87	Airbus DS	EHPS.15	5	“Hazardous EHPS failure condition” Another risk to consider is the structural damage due to electrical effects (e.g. short-circuit arcs) Electro Magnetic Hazard could also be added here as a EHPS malfunction could alter the frequencies and magnitudes of the EMH couplings and affect critical systems if not well mastered.	Proposal is to include additional risks related to structural damage due to electrical effects and to EMH.	Yes	No	Partially accepted	Short circuit arcs are indeed of high importance with regards to EHPS but they may not necessarily be considered as Hazardous EHPS failure condition. Arc faults and their consequences (arc flash or arc blast) have been added to (viii) Structural damage are already covered by the release of high energy debris, the release of a propeller/rotor or the failure of the EHPS mounting system. EMH effects should be assessed at A/C level and could therefore be part of the town/down analysis requested by EHPS.80. In any case, the mentioned list is non-exhaustive. It is a minimum. If an applicant determines another failure effect, he can add it to the list for its project during the certification process.
88	Zeroavia James Lawson	EHPS.15		high energy debris needs to be defined				Accepted	Definition added. However, this question is often raised by the Industry and it might be of interest to create a working group on it.
89	Zeroavia James Lawson	EHPS.15		what toxic products are envisaged for an electric/ hybrid-electric propulsion system. Why can they not be prohibited completely, particularly if there is no compelling reason to use them?				Noted	Toxic products are not envisaged in all EHPS configurations. However, if the EHPS contains products that could be toxic for the crew or the passengers, this event should be looked as an Hazardous EHPS effect.
90	TCCA	EHPS.15	5	In ‘Hazardous EHPS effect’ terminology, item viii uses the word ‘electrocution...’. The definition of electrocution is “to be killed or severely injured by electric shock”, but the terminology uses ‘sufficient to’.	Suggest to replace with: (viii) Electric shock of crew, passengers, operators or maintainers, sufficient to cause serious or fatal injury. Which then, by definition, equates to ‘electrocution’			Partially accepted	The paragraph has been reworded.
91	TCCA	EHPS.15	5	Catastrophic Aircraft Effect and Hazardous Aircraft Effect are defined in this EHPS.	Since these terms are reserved for aircraft, it is suggested direct reference be made to aircraft requirements or aircraft advisory material.			Accepted	Corrected accordingly.
92	TCCA	EHPS.15	5	Hazardous EHPS failure condition: EHPS failure conditions leading to one of the following effects: (i) Hazardous Aircraft Effect (ii) Catastrophic Aircraft Effect	"leading to" is ambiguous. Either use "resulting in" or "contributing to", depending on intent. Consider Revising for clarity.			Accepted	Corrected accordingly.
93	SAFRAN	EHPS.15 & all the document	4	Consistency of the definition & wording to avoid confusion	Systematic use of EHPS rather than engine and/or generator For example: Means a sub system EHPS engine and/or generator rating intended to be...	Yes	Yes	Accepted	The definition of rating has been reworded. Consistency has been checked in the rest of the document.
94	Vertical Aerospace	EHPS.15 (Term.)	4	The scope of the EHPS will be aircraft dependant, however the SC E-19 does not cover many applicable requirements for the certification of a battery.	Suggest to define the battery (for electric only aircraft, main power source) as out of scope of the EHPS.	Yes		Not accepted	Refert o EHPS.380 for associated requirements.



95	Rolls-Royce	EHPS.15 Terminology	5	Hazardous EHPS effect includes eletrocution of crew, passengers, operators or maintainers, sufficient to cause serious or fatal injury. Eletrocution is only one potential cause of harm due to an electrical system. Others exist, for example, arc flash	(viii) Product related injury to crew, passengers, operators or maintainers sufficient to cause serious or fatal injury such as may be caused by electrocution or arc flash events	No	Yes	Accepted	Arc faults leading to arc flash or arc blast have been added.
96	Rolls-Royce	EHPS.15 Terminology	5	Major Aircraft effect and Major Aircraft failure conditions are defined in the Terminology but not Major effect and failure conditions for the EHPS. This terminology is also used in EHPS.80 <linked to comments 7 and 47>	Implement in EHPS.15 a definition for major effect and major failure conditions for EHPS	Yes	No	Not accepted	Failure effect have to be assessed at aircraft level. However, EASA decided to keep the Hazardous EHPS effect in order to allow the use of critical parts as it is made today for turbine engines.
97	Rolls-Royce	EHPS.15 Terminology	4	Control System definition inconsistent because all component control/protection system seems to be incuded exept for the battery management system (BMS). The rationale is not clear. With regards to component control and protection at component level, there is no difference between a protection system for the battery and component protection for an e-motor	Clarify the rationale	Yes	No	Accepted	Exclusion of the BMS has been removed
98	Rolls-Royce	EHPS.15 Terminology	4	Failure Conditions and Effects are defined, acceptable rates (eg Extremely Remote) are not, despite being used in the body of the document. Is this an intentional omission ? If so, would there not be a pointer to an external definition required ? [See also comment 51 from JvdM]	Add appropriate Terminology refences, or a reference to external definition (in Associated Interpretive Material / Means of Compliance section ?).	Yes	No	Accepted	The extremely remote rate as mentioned in EHPS.80 (d)(1)(i) as been explained as being the one defined in the associated Type-Certification basis of the intended aircraft application(s)
99	Rolls-Royce	EHPS.15 Terminology	5	Definition of "Hazardous EHPS failure condition" should include failure conditions leading to Hazardous EHPS Effect <see also comment 7 which questions reference to Aircraft Effects>	Failure conditions leading to one of the following effects: (i) Hazardous Aircraft Effect (ii) Catastrophic Aircraft Effect (iii) Hazardous EHPS Effect	Yes	No	Accepted	Added
100	Rolls-Royce	EHPS.15 Terminology	5	Hazardous EHPS effect: (vi) refers only to propeller. Does not include other types of propulsive devices that convert shaft power to thrust.	"...propeller/fan, regradless whether or not it is integrated in the EHPS,"	Yes	No	Partially accepted	Same logic as for today CS-E engines. Fans are addressed via FBO and the risk of release of high energy debris. Aircraft rotor has been added.
101	Rolls-Royce	EHPS.15 Terminology	4	Probabilty Terms such as "Extremely Remote" are not defined. This is a sensible approach because the definition of "Extremely Remote" is aircraft platform dependent, i.e. 1E-07 for CS-25 aircraft and 1E-06 for some CS-23 aircraft.	Not applicable. Comment is a positive observation only.	Yes	No	Noted	
102	Rolls-Royce	EHPS.15 Terminology	4	Why does the EHPS control system definition exclude the battery or energy storage device management system. If these are part of the EHPS scope then they are part of the EHPS control system <see also comment 49>	A system or device that controls, limits, monitors or protects the operation of the EHPS or a sub-system of the EHPS including any battery or energy storage device management system where these are within the scope of the EHPS.	No	Yes	Accepted	Exclusion has been removed

103	Rolls-Royce	EHPS.15 Terminology	4	Emergency rating. This should allow the option for time based emergency ratings such as those for turbine engines for multi-engined rotorcraft in CS-E. EHPS.40 should also specifically refer to this under Emergency ratings.	include the option of time based emergency ratings	Yes	No	Accepted	There is no exclusion to time based emergency ratings. In fact, the maximum permitted duration for any rating is requested as per EHPS.40(d). This includes emergency ratings.
104	VOLTAERO	EHPS.15 Terminology	4	Improve EHPS definition. EHPS cannot produce lift or thrust alone; it needs to be connected to a propeller, fan or rotorcraft blades.	We recommend to modify the last sentence as such : “An EHPS <del>produces power</del> , is intended to produce lift, thrust or power for flight.”	YES	NO	Not accepted	Lift/thrust/power are mentioned. This does not mean that they have to produce all of them. Propellers are indeed excluded but fans are not. If a fan is part of the EHPS, then the EHPS will produce lift or thrust
105	VOLTAERO	EHPS.15 Terminology	5 and 6	Improve coherence with well known definition	We recommend to delete the definition of - Hazardous EHPS effect - Hazardous EHPS failure condition - Catastrophic Aircraft Effect - Hazardous Aircraft Effect - Hazardous Aircraft Failure Condition - Major Aircraft Effect - Major Aircraft Failure Condition	YES	NO	Not accepted	Consistency has been ensured.
106	VOLTAERO	EHPS.15 Terminology	6	Avoid misunderstanding as we already have documents defined. The proposed “ Engineering Plan” is already covered by the Certification programme and the Maintenance Manual. The proposed “ Manufacturing Plan” is already covered by the Master drawing list and the drawings. The proposed “ Service Management Plan” is already covered by the Maintenance Manual. The repair Manual has never been requested.	We recommend to delete the definition of - Engineering Plan - Manufacturing Plan - Service Management Plan	YES	NO	Not accepted	These three plans define a closed-loop system which link the assumptions made in the Engineering Plan to how the part is manufactured and maintained in service; the latter two aspects are controlled by the Manufacturing and Service Management Plans respectively. The objective for an applicant is to develop a closed loop system where the combination and interconnectivity of these elements enhances product integrity. Specific guidance will be provided to identify the skill sets that should be present in establishing the three plans, with aim of ensuring cross discipline inclusion to achieve a closed loop system.
107	AIRBUS	EHPS.15 Terminology	5	The need for defining in this Special Condition a specific category – Hazardous EHPS effect – is not obvious. On the contrary, Airbus consider that it creates undue complexity and confusion in the way to perform the safety demonstration for an EHPS. Identifying a specific Hazardous EHPS effect may only remain meaningful for the turbomachine part of hybrid system. Therefore, Airbus propose to delete all the definitions of EHPS/Aircraft effects and Failure conditions from the Terminology paragraph and to refer only to aircraft effects and failure conditions in the rest of the Special Condition, except when specifically discussing non-containment of turbomachine high-energy debris and propeller release.	Airbus propose to update the wording of EHPS.15 Terminology as follows: Delete the following lines in the table: Hazardous EHPS effect Hazardous EHPS failure condition Catastrophic Aircraft Effect Catastrophic Aircraft Failure Condition Hazardous Aircraft Effect Hazardous Aircraft Failure Condition Major Aircraft effect Major Aircraft Failure Condition	NO	YES	Not accepted	The EHPS hazardous effect allows to make use of critical parts in the EHPS in the same logic as for CS-E
108	Rolls-Royce	EHPS.15 Terminology - "Emergency rating"	4	"Means an engine and/or generator rating intended to be used in the event of a failure....." It is suggested that the term 'motor' should be added in addition to engine and/or generator	Add the term 'Motor'	Yes	No	Not accepted	The term engine (even for electric motor) has to be kept for consistency purposes with the Basic regulation and the CS-Definitions
109	Rolls-Royce	EHPS.15 Terminology - "Normal rating"	4	"Means an engine and/or generator rating intended to be used....." It is suggested that the term 'motor' should be added in addition to engine and/or generator	Add the term 'Motor'	Yes	No	Not accepted	The term engine (even for electric motor) has to be kept for consistency purposes with the Basic regulation and the CS-Definitions
110	Rolls-Royce	EHPS.15 Terminology "Inadvertant transient EHPS exceedance"	5	It would be helpful to include examples of potential categories of exceedances, such as: voltage, current, torque, speed, temperature etc.	Add examples as listed	Yes	No	Accepted	Examples added
111	FAA GH	EHPS.15 Catastrophic Aircraft Effect	5	This and each of these Aircraft Effects may be an over reach for an engine manufacturer. Determining if a failure at the engine level is Catastrophic at the aircraft level is the installer’s responsibility and the installer is best skilled to do this.	Clarify why these definitions are included herein.		yes	Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failure modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these

									data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
112	FAA JP	EHPS.15 Catastrophic Aircraft Effect	5	Not sure how these can be required at the engine approval level as they are dependent upon the installation. The engine approval holder does not have control over these effects and conditions, the installer is responsible for this evaluation. This seems to assume the engine approval is part of the aircraft.		yes		Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
113	FAA DJ	EHPS.15 Catastrophic Aircraft Effect	5	Not sure how these aircraft effects and conditions are known by the EHPS OEM. These electric propulsion aircraft are not “typical configurations” we are used to seeing. UAS are also addressed in this special condition and the failure conditions/effects will vary greatly with configuration and operation.		yes		Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
114	FAA DJ	EHPS.15 Emergency ratings	4	The term “emergency” implies to me a potentially catastrophic event is possible. Should this term be used especially since many applications using an EHPS will have distributed propulsion which one of the benefits is the accommodation of propulsion failures? For helicopters we use the phrase OEI. Shouldn’t we consider something more along those lines?		yes		Noted	The term emergency has been chosen with regards to the diversity of the new products architecture. Some EHPS will be able to cope with the loss of 1 engine, 2 engines, 3 engines...Therefore the term OEI (One Engine Inoperative) become not usable for all EHPS. On top of that the EHPS could suffer from power loss in case of failure of battery pack and not only due to the failure of one of the engines.
115	FAA DJ	EHPS.15 Hazardous EHPS effect	5	Since Energy Storage is being considered in this special condition should “thermal runaway” be mentioned? It may be contained and not cause an uncontrolled fire but will certainly affect the energy supply for propulsion.		yes		Noted	Thermal runaway will falls most probably into the category Catastrophic Aircraft effects
116	FAA DM	EHPS.15 Hazardous EHPS effect	5	Relative to Hazardous Refer to comment above. For unmanned aircraft carrying load only (no people), some of these hazards don’t apply	Clarification	yes		Accepted	If applicable has been added
117	FAA DM	EHPS.15 Hazardous EHPS failure condition	5	I find all the definitions below quite confusing. Seems to me it’s intended to link the effects to the failure conditions noted in the TC basis. If so, I don’t see the link between the TC basis and Hazardous EHPS effects. Meaning you’ll always have to account for those Hazardous EHPS effects regardless what’s in the TC basis. I may be missing something, but if this is true, then why all the other definitions of catastrophic, aircraft level, etc?		yes		Noted	The EHPS hazardous effect allows to make use of critical parts in the EHPS in the same logic as for CS-E.
118	FAA JF	EHPS.15 Hazardous EHPS failure condition	5	It is not clear that this definition is needed or that it is a true definition. Do all Haz EHPS failure conditions lead to (i) or (ii)?		yes		Accepted	(iii) Hazardous EHPS effect has been added
119	FAA DM	EHPS.15 Inadvertent transient EHPS exceedance	5	Again, used of “abnormal” is not a clear qualifier. Why not model from EASA’s CS-Definitions of inadvertent transients (speed, torque, and temperature). These definitions don’t use “abnormal”		yes		Accepted	Corrected accordingly

120	FAA DM	EHPS.15 Normal rating	4	Not clear the intended use of “normal” which is a vague qualifier. You clearly define “emergency rating” as linked to some propulsion failure. But you define “normal rating” to relate to the type of flight operations. Usually, flight operations are normal, abnormal, and emergency. For example, an aborted takeoff is an abnormal flight condition. I think would be confusing.	Suggest not using “normal rating” and “normal transient”, just “rating” and “transient”.	yes		Accepted	Normal rating removed Normal transient exceedances is kept. The definition is deemed clear enough to avoid confusion with operations.
121	Embraer S.A.	EHPS.15, Electric / Hybrid Propulsion System.	4	Generators, electrical power generation, energy storage systems are typically part of the aircraft electrical system and certified under aircraft regulations. Recommended to keep these items out of the scope of this SC.	We suggest to change the text from: An Electric / Hybrid Propulsion System may include, but is not limited to, electric motors, inverters, turbine engines, piston engines, generators, electrical wiring interconnection systems, electrical power generation, energy storage systems, integrated fans, cooling systems and power management system. An EHPS is intended to produce lift, thrust or power for flight. To: An Electric / Hybrid Propulsion System may include, but is not limited to, electric motors, inverters, turbine engines, piston engines, integrated fans, cooling systems and power management system. An EHPS is intended to produce lift, thrust or power for flight.	yes	no	Not accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
122	Embraer S.A.	EHPS.15, Sub-system of EHPS	4	Generators, electrical power distribution system, and energy storage system are typically part of the aircraft electrical system and certified under aircraft regulations. Recommended to keep these items out of the scope of this SC.	We suggest to change the text from: A sub-system of the EHPS may include examples such as a turbine engine, a piston engine, an electric engine, a generator, an electrical power distribution system, a EHPS control system or, an energy storage system. To: <i>A sub-system of the EHPS may include examples such as a turbine engine, a piston engine, an electric engine or, an EHPS control system.</i>	yes	no	Not accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
123	Rolls-Royce	EHPS.20	6	The SC needs to recognise the effect on the propulsion system of extracting secondary offtakes for aircraft use. Typically this is discussed in the certification requirements for configuration and interfaces, Endurance test etc	Consider adding that consideration should be given to the the effect of secondary offtakes (electrical, hydraulic, pneumatic etc.) on the EHPS	Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance when the secondary offtakes may have an effect on the EHPS.
124	Airbus DS	EHPS.20	6	“The list of all the parts and equipment, including references to the relevant drawings, ...” Software (SW) is missing	Consider add “ <i>including SW builds</i> ”	Yes	No	Accepted	Added
125	AIRBUS	EHPS.20 EHPS Configuration	6	This paragraph requires to establish the list of all parts and equipment which defines the type design. The wording type design is not appropriate if there is no Type Certificate for the EHPS.	Airbus propose to update the wording of EHPS.20 EHPS Configuration as (new proposed text shown in <u>underlined italic</u> font)follows The list of all the parts and equipment, including references to the relevant drawings, which define the proposed type design of the EHPS, must be established. <u><i>When the EHPS is certified as part of the Aircraft Type Certificate, this corresponds to the list of all the parts and equipment, including references to the relevant drawings which define the EHPS configuration for the aircraft type design.</i></u>	NO	YES	Accepted	Paragraph (b) has been added accordingly.
126	SAFRAN	EHPS.200	11	Loads are assumptions.	The loads induced by any part of the EHPS must be identified in the installation instructions (according to EHPS.30(b)). The loads induced by the intended aircraft application must be established by the aircraft design holder (according to the aircraft specifications) Note: We are recommending to add a new paragraph EHPS.35, corresponding to the CS-E 30 “Assumptions”, that allows to take into consideration the intended aircraft characteristics. ‘Loads induced by any part of the EHPS’ is quite generic and a clear AMC should be established to list the different cases to take into consideration (type of loads, case to be considered, etc...).	Yes	Yes	Partially accepted	Distinction is made now between the loads induced by the EHPS and the loads induced by the intended aircraft application. EHPS.30 covers already the needs of CS-E 35 and it will allow to have these assumptions clear in the installation manual. Guidance will be provided accordingly.

127	Airbus DS	EHPS.200	11	To be in line with the EHPS.220, load assumptions coming from aircraft (i.e. gyroscopic, interface...) need to be declared in the installation manual	Proposal is to add the underlined text “(a) The loads induced by any part of the EHPS or induced by the intended aircraft application must be established. <u>Load assumptions coming from aircraft need to be declared in the installation manual.</u>	Yes	No	Accepted	This is covered by EHPS.30 (b)(7). Specific guidance will be provided.
128	Werner Scholz, European Sailplane Manufacturers	EHPS.200 Static and fatigue Loads	11	The headline “fatigue loads” implies that perhaps a full blown-up fatigue analysis might be required. Again, for CS-22H the engine is required to run safe for 50 hours and that’s it basically...	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
129	AIRBUS	EHPS.200 Static and Fatigue Loads, EHPS.210 Strength, EHPS.220 Mounting Attachment end Structure	11 & 12	The intent of these three paragraphs might be simplified and merge into a single paragraph in line with the existing CS-E 100	Airbus propose to update the wording of EHPS.200 as follows (new proposed text shown in <u>underlined italic</u> font): <b><u>EHPS.200 Strength</u></b> <b><u>(a) The static and fatigue loads induced by any part of the EHPS or induced by the intended aircraft application must be established.</u></b> <b><u>(b) A stress analysis must show that there is suitable design margin at the declared operating limits for each of the EHPS sub-system such that the EHPS will function properly under the loading conditions established in EHPS.200(a).</u></b> <b><u>(c) (1) The EHPS mounting attachments and related structure, must be able to withstand the specified loads without failure, malfunction or permanent deformation</u></b> <b><u>(2) When the EHPS is not certified as part of the Aircraft Type Certification, the maximum allowable loads for the mounting attachments and related structure must be specified in the Installation Manual</u></b> <b><u>(d) Maximum stresses in the EHPS must be determined by tests, validated analysis, or a combination thereof, and must be shown not to exceed minimum material properties defined in EHPS.50</u></b>	N	Y	Partially accepted	EHPS.200 deals with the loads and the proper function of all systems under these loads EHPS.210 is especially focused on the stress analysis.  EHPS.220 is removed as covered by EHPS.30, EHPS.200 and EHPS210
130	TCCA	EHPS.200 EHPS.210 EHPS.220	11	Approved documents referred to, first letters should be capitalized, and consider referring to EHPS.30 and EHPS.40 as appropriate to be consistent with the rest of the SC.	Make edits.			Accepted	Cross reference to EHPS.30 is now made in the paragraph EHPS.200. Paragraph 220 has been suppressed and is now covered by EHPS.200 and 210.
131	VOLTAERO	EHPS.200 Static and fatigue loads	11	The paragraph is unclear. The aircraft designer will deal with loads and fatigue by compliance with the aircraft certification requirements to obtain the TC or STC.	We recommend to delete paragraph EHPS.200.	YES	NO	Not accepted	EHPS.200 should be maintained, especially if the EHPS is certified as stand-alone product.
132	Volocopter	EHPS.200(b)	12	AMC on EHPS.200 should be corrected in a way to clearly state: “...should at least cover CS-E 190, where applicable”. Otherwise, all EHPS would need to be designed to fulfill requirements for aerobatic use which is unreasonable.			Yes	Accepted	It is not mandatory to fulfill requirements for aerobatic use. AMC will be reworked. However, the requirement is correct.
133	SAFRAN	EHPS.210	11	(a) Lack electrical stress	(a) “A mechanical, thermal <b>and electrical stress...</b> ”	Yes	Yes	Accepted	Added accordingly. Specific guidance will be provided in the Means of Compliance.
134	SAFRAN	EHPS.210	11	(b) validated analysis	(b) a test or a validated analysis may not be possible for all EHPS parts (i.e. some does not undergo any significant stress) and the means to demonstrate the maximum stress should be transfer MoC. Proposal: “Maximum stresses in the EHPS must be determined by satisfactory practice for the material involved, due account being taken of the particular form of construction and the most severe operating conditions...”	Yes	Yes	Partially accepted	This will be part of a specific guidance



135	TCCA	EHPS.210	11	Design margins need to take into consideration the defined flight and environmental envelope.	Suggest defining the design margins across the flight and environmental envelope.			Accepted	Sepcific guidance will be provided in the Means of Compliance.
136	FAA GH	EHPS.210 (a)	12	Here the electrical stress was lost	Mechanical, thermal, and electrical stress analyses must show...		yes	Accepted	Added accordingly. Sepcific guidance will be provided in the Means of Compliance.
137	Werner Scholz, European Sailplane Manufacturers	EHPS.210 Strength	11/12	It is accepted and of course needed that the operation of the EHPS does not result into exceeding stresses and thermal loads which cause failures. Nevertheless, if the margins for all parts and properties need to be shown, this could become a rather arduous task – especially for simpler aircraft. It would be much more useful for the applicant to suggest a typical operation cycle and then show by testing x-times this cycle that the system works properly and does not fail (same philosophy as in CS-22H.	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
138	SAFRAN	EHPS.22	7	Typo : to remove the word “or”	Alternatively the Instructions for Continued Airworthiness <del>or...</del>	Yes	No	Accepted	Corrected
139	The Boeing Company	EHPS.22	7	“EHPS.22 Identification ... (b) Major EHPS modules that can be changed independently in service must be suitably identified so as to ensure traceability of parts and to enable proper control over the interchangeability of such modules with different EHPS variants.” Clarification Needed: "Major EHPS Modules" is not defined anywhere in the document. We ask EASA to define it in order to avoid confusion and interpretations. The term “module” is also not used anywhere else and can be confused with specifically applying to “battery modules”.	We ask EASA to clarify and define what Major EHPS modules are. Suggest changing “modules” to “components or subsystems”	no	yes	Accepted	Reworded. Modules has been replaced by "engine modules" and EHPS components and sub-systems has been added.
140	TCCA	EHPS.22	7	Does "variants" also mean to include "derivatives"? If yes, then we suggest to make sure that it is interpreted as such for future use.	Suggest to clarify intent, if applicable			Accepted	Your understanding is correct. 'Derivatives' is no more a used term in EASA during the certification process. Specific guidance will be provided in the Means of Compliance.
141	Rolls-Royce	EHPS.22 (b)	7	"Major EHPS modules that can be changed independently in service must be suitably identified so as to ensure traceability of parts and to enable proper control over the interchangeability of such modules with different EHPS variants." - This requirement precludes designs which may be able to satisfy all requirements without needing to be traceable	Add conditional statement: "Where parts are required to be traceable, or identifiable to manage interchangeability,.....",	Yes	No	Accepted	Coorected accordingly.
142	AIRBUS	EHPS.22 EHPS identification	6	Sub-paragraph (a) would only be applicable if there were an EHPS Type Certificate equivalent to the existing Engine Type Certificate. It is therefore too restrictive and should be updated to remain applicable to a situation where the EHPS does not have a Type Certificate	Airbus propose to update the wording of EHPS.22 EHPS identification as follows (new proposed text shown in <u>underlined italic</u> font): <u>(a) For the elements of the EHPS that are covered by their own Type Certificate / ETSO</u> , identification must comply with 21A.801 (a) and (b), and 21A.805 as necessary	NO	YES	Partially accepted	EHPS.22 (a) removed to avoid redundancy with Part 21.
143	Werner Scholz, European Sailplane Manufacturers	EHPS.22 Identification	6/7	Is it really needed to include a requirement (markings of parts) which is valid for all parts of the aircraft anyway?	Delete requirement if found to be a duplication.	suggestion		Accepted	EHPS.22 (a) removed to avoid redundancy with Part 21.

144	Airbus Helicopters	EHPS.220	12	This assumes that the EHPS is a single element mounted, similar to an existing turbomachine. Given the modular nature of EHPS systems, it would be better to state that "Each EHPS element mounting attachment..."	Reword "(b) Each EHPS element mounting attachment..."	Yes	No	Partially accepted	EHPS.220 has been removed as covered by EHPS.30, EHPS.200 and 210.
145	Rolls-Royce	EHPS.220 Mounting Attachment and Structure	12	No specific fire requirements on features of the EHPS which form part of the mounting structure or EHPS attachment points.	Is this covered under Hazardous EHPS Effects (v) EHPS Sepatation?	Yes	No	Noted	This is addressed in the definition of Hazardous EHPS effect. The EHPS mountings will be addressed in the specific guidance of EHPS.100. For example, the means of compliance may be different for an internal combusiton engine installed in a designated fire zone and for an air-cooled electric engine.
146	SAFRAN	EHPS.230	12	Introduce power or thrust	(a) Thrust is added and as for the EHPS.210, all EHPS parts will not undergo significant vibration stresses. Proposed text : “The EHPS must be designed and constructed to function throughout its normal operating range of rotor speeds and EHPS output power <b>or thrust</b> , including defined exceedances, without inducing excessive stress in <del>any</del> <b>all affected parts of the EHPS parts</b> because of vibration and without imparting excessive vibration forces to the aircraft structure”			Accepted	Corrected accordingly
147	General Aviation Manufacturers Association	EHPS.230	12	EHPS 230- (c) - Why is catastrophic not included?	(c) The effects on vibration characteristics of excitation forces caused by Fault conditions must be evaluated and shown not to result in a Hazardous <b>or catastrophic</b> EHPS Effect.	Major/conceptual		Not accepted	The complete aircraft design is required to perform an assessment at aircraft level. This part of the aircraft certification process when assessing the EHPS installation.
148	Zeroavia James Lawson	EHPS.230		why only vibration survey, why not FEA?				Noted	The vibration survey may be based on a FEA if the model used has been validated. Specific guidance will be provided in the Means of Compliance
149	TCCA	EHPS.230	12	Compared to EHPS.230 (b), CS-E 340 (Vibration Test) specifies the margins that should considered at each power setting	A Performance Based Rule version of this could be added, similar to: "[...] throughout the declared flight envelope and EHPS operating range for the intended installation configuration. Adequate design margin must be demonstrated at critical conditions			Partially accepted	EHPS.230 is based on CS-E 650 for which all MoC related words have been removed. Specific guidance will be provided in the Means of Compliance.
150	Vertical Aerospace	EHPS.230 (b)	12	States 'electric field excitation' please clarify in the AMC what this means (EMI or current fluctuations causing vibrations, or electrically induced magnetic excitation?)	AMC to clarify scope of the ‘electric field excitation’ including sources.	Yes		Accepted	Specific guidance will be provided in the Means of Compliance
151	Vertical Aerospace	EHPS.230 (c)	12	Please clarify the boundary of 'fault conditions'	Further definition in an AMC to define what does EASA consider to be the fault conditions level > system level or Aircraft level fault conditions?	Yes		Accepted	Specific guidance will be provided in the Means of Compliance
152	Rolls-Royce	EHPS.230 vibration	12	I don’t think this adequately captures the types of loads that electrical systems would generate and pass-on to the surrounding systems to and in particular high frequency vibration, whether torsional or radial resulting from high frequency pulse width modulation, and the fact that it propagates through the system, due to probably low damping. Brackets and sensors would be more likely to have high frequency resonance modes due to their light weight and stiffness, ironically causing control and protection devices to be more sensitive to vibration than on a traditional gas turbine. It refers to “rotor speeds” and “electrical field excitation” which could be misleading.	Add some consideration for additional sources of vibration.	Yes	No	Accepted	"electrical" has been replaced by "electromagnetic". Specific guidance will be provided in the Means of Compliance.

153	Rolls-Royce	EHPS.230 Vibration Survey	12	(c ) imposes a more stringent requirement than EHPS.80. For EHPS.80, it is acceptable to have Hazardous EHPS Effects occurring at a rate that is Extremely Remote, when parts are subjected to nominal fatigue loads. To require that parts whose failure may result in Hazardous EHPS effects do not fail when subjected to fatigue loads resulting from failure (Fault) conditions is regarded to be overly stringent. The mitigation to prevent the onset of Hazardous EHPS effects may involve shutting down the affected component (to limit accumulation of fatigue cycles and prevent structural failure), where the shut-down function also has an inherent failure rate. Such combinations of failures can be modelled by Fault Tree Analysis, but would never be able to demonstrate a null rate of occurrence.	"(c) The effects on vibration characteristics of excitation forces caused by Fault conditions must be evaluated and shown not to result in a Hazardous EHPS Effect with a probability that is unacceptable under EHPS.80."  This is similar to the approach of CS-E 525.	Yes	No	Not accepted	Consistency with CS-E 650 (g) is maintained.
154	AIRBUS	EHPS.230 Vibration Survey	12	In subparagraph (c), it is not clear what 'Fault conditions' need to be considered and why only Hazardous EHPS Effect shall be prevented. Further clarification should be candidate for a future MOC.	Airbus propose to update the wording of EHPS.230 Vibration Survey - as follows: (c) The effects on vibration characteristics of excitation forces caused by <u>EHPS</u> fault conditions must be evaluated and shown not to result <u>in a hazard (High Energy Debris, Propeller release, hazardous or catastrophic aircraft effects)</u>	N	N	Partially accepted	EHPS has been added. Hazardous and Catastrophic aircraft effects are not considered as the complete aircraft design is required to perform an assessment at aircraft level. This part of the aircraft certification process when assessing the EHPS installation.
155	Werner Scholz, European Sailplane Manufacturers	EHPS.230 Vibration Survey	12	The wording could be interpreted in a way that a survey could include something like a ground vibration test and / or simulation of a wide range of frequencies, etc.. At least for simple aircraft it should be sufficient to demonstrate safe operation over the full operation range without undue vibration. If this would be sufficient to fulfil this requirement, then at least add guidance material to explain this without the danger of misunderstanding.	Add regarding guidance and/or simplify the wording of the paragraph.	suggestion		Accepted	Specific guidance will be provided in the Means of Compliance. Note that the following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
156	Rolls-Royce	EHPS.230 Vibration Survey	12	The more likely distributed nature of an EHPS makes a vibration survey problematic. It will be very installation dependent and the aircraft interfaces will be very difficult to specify.	Add wording to emphasise the importance of interface management and set a suitable working group looking at AMC	Yes	No	Accepted	This is covered by EHPS.30. Specific guidance will have to be defined.
157	VOLTAERO	EHPS.230 Vibration Survey	12	The EHPS designer does not know the aircraft design.	We recommend to delete in paragraph a) : "to the aircraft structure".	YES	NO	Partially accepted	In the event where the intended aircraft application is not known, specific guidance will be provided in the Means of Compliance.
158	Rolls-Royce	EHPS.230(b)	12	Scope needs to include all magnetic flux in motors or generators.	Replace "electrical" with "electromagnetic".	Yes	No	Accepted	Corrected accordingly
159	Vertical Aerospace	EHPS.240	13	Consider rewording 'Rotors'. Depending on the type of aircraft (CTOL / VTOL) there may be a mix of Rotors (left devices) and propellers (forward thrust devices)	'Rotors' - consider rewording to "rotating parts" within the EHPS. CS-P is defined to be outside of this SC scope, stating "rotors" may confuse the reader.	Yes		Partially accepted	For the use of an EHPS for a VTOL, the use of the term 'rotor' may indeed lead to confusion. However, the SC E-19 is not only intended for VTOL applications. A 'rotor' definition in the context of the SC E-19 has been included in EHPS.15.
160	SAFRAN	EHPS.240	13	Associated AMC	AMC is linked to CS-E 840 but should also cover CS-E 850 for shaft failure/loss of load cases. 'Sufficient strength' shall be defined in the associated MoC.	Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance
161	General Aviation Manufacturers Association	EHPS.240	13	EHPS- 240-(b) - Why catastrophic is not included?	(b) Rotors must be shown to provide adequate strength margin with respect to burst, growth and damages, that could result in a hazardous <b>or catastrophic</b> EHPS effect, above the certified operating conditions and speeds assumed in EHPS.240 (a).	Major/conceptual		Not accepted	Consistency with CS-E is maintained. Hazardous and Catastrophic aircraft effects are not considered as the complete aircraft design is required to perform an assessment at aircraft level. This part of the aircraft certification process when assessing the EHPS installation.

162	General Aviation Manufacturers Association	EHPS.240	13	EHPS 240 - Why catastrophic is not included?	If the EHPS contains a compressor or a turbine, it must be demonstrated that after Failure any single compressor or turbine blade will be radially contained and that no Hazardous or catastrophic EHPS Effect can arise as a result of other damage to the EHPS that is likely to occur before the EHPS is shutdown following a blade Failure.	Major/conceptual		Not accepted	Consistency with CS-E is maintained. Hazardous and Catastrophic aircraft effects are not considered as the complete aircraft design is required to perform an assessment at aircraft level. This part of the aircraft certification process when assessing the EHPS installation.
163	Zeroavia James Lawson	EHPS.240		this is not sufficiently defined to be verifiable? Is this a normal or abnormal overspeed i.e. an overspeed that is the result of a failure? Combinations of failures?				Noted	Specific guidance will be provided in the Means of Compliance
164	Airbus Helicopters	EHPS.240	13	Acceptable overspeed margins will be included in the corresponding AMC?	Include in AMC acceptable overspeed margins	Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance
165	Flying Whales	EHPS.240	13	Flying Whales would like to understand what are the categories of rotor considered on this requirement?	Clarification	Yes	No	Accepted	A 'rotor' definition in the context of the SC E-19 has been included in EHPS.15.
166	The Boeing Company	EHPS.240	13	“EHPS.240 Overspeed and Rotor Integrity ... (b) Rotors must be shown to provide adequate strength margin with respect to burst, growth and damages, that could result in a hazardous EHPS effect, above the certified operating conditions and speeds assumed in EHPS.240 (a).” The definition of “adequate margin” is not provided and introduces significant ambiguity as written.	We ask EASA to define what “adequate margin” is.	no	yes	Accepted	Specific guidance will be provided in the Means of Compliance
167	TCCA	EHPS.240	13	Note comment for the Subpart A.	Define rotors: as per comment to Subpart A, it is suggested to certify the gas turbine or piston engine portion of the Hybrid propulsion systems through the existing rules (CS-E or CS-APU) and this Special Condition to insure minimum safety requirements at the integration level.			Accepted	A 'rotor' definition in the context of the SC E-19 has been included in EHPS.15.
168	TCCA	EHPS.240	13	No margin between the speeds considered and the operating conditions are required.	Add "Adequate design margin must be demonstrated" to include conditions beyond certified operating conditions.			Accepted	Added. Specific guidance will be provided in the Means of Compliance.
169	TCCA	EHPS.240	13	Please clarify the intent of (c) "EHPS operating limitations that affect rotor structural integrity must not be exceeded in service.". Intent is unclear as the operating limits are stated to not be exceeded in service by their definition.	Please review and provide clarification.			Accepted	This has been suppressed.
170	FAA GH	EHPS.240 (a)	13	The last sentence in (a) could be captured in the AMC		yes		Partially accepted	Specific guidance will be provided in the Means of Compliance
171	Bell	EHPS.240 (b)	13	The term "adequate margin" is used here, but that's vague. Does adequate margin mean it's tested up to 125% RPM, or similar?	Add guidance towards what is considered "adequate" margin	Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance

172	Airbus Helicopters	EHPS.240 Overspeed and Rotor Integrity	13	This paragraph is understood as being applicable to any rotor within the EHPS. This might be specified since several type of rotors will be used in future Electric/Hybrid propulsion systems.	Airbus propose to update the wording of EHPS.15 Terminology as follows (new proposed text shown in <u>underlined italic font</u> ): <u>This paragraph applies to any type of rotor that may be used in an EHPS (i.e. turbine rotor, cooling fan rotor, electric motor rotor...)</u> (a) A rotor overspeed must not result in either rotor burst, rotor growth or other damage that could result in a hazardous EHPS effect. This must be shown by test, validated analysis, or a combination of both. Applicable assumed speeds must be declared and justified. Those shall account for failure conditions, including loss of load. (b) Rotors must be shown to provide adequate strength margin with respect to burst, growth and damages, that could result in a hazardous EHPS effect, above the certified operating conditions and speeds assumed in EHPS.240 (a). (c) EHPS operating limitations that affect rotor structural integrity must not be exceeded in service.	Yes	No	Accepted	A 'rotor' definition in the context of the SC E-19 has been included in EHPS.15.
173	AIRBUS	EHPS.240 Overspeed and Rotor Integrity	13	This paragraph is understood as being applicable to any rotor within the EHPS. This might be specified since several type of rotors will be used in future Electric/Hybrid propulsion systems.	Airbus propose to update the wording of EHPS.240 Overspeed and Rotor Integrity - as follows (new proposed text shown in <u>underlined italic font</u> ): <u>This paragraph applies to any type of rotor that may be used in an EHPS (i.e. turbine rotor, cooling fan rotor, electric motor rotor...)</u> (a) A rotor overspeed must not result in either rotor burst, rotor growth or other damage that could result in a <u>hazard ((High Energy Debris, Propeller release, hazardous or catastrophic aircraft effects))</u> . This must be shown by test, validated analysis, or a combination of both. Applicable assumed speeds must be declared and justified. Those shall account for failure conditions, including loss of load. (b) Rotors must be shown to provide adequate strength margin with respect to burst, growth and damages, that could result in a <u>hazard (High Energy Debris, Propeller release, hazardous or catastrophic aircraft effects)</u> , above the certified operating conditions and speeds assumed in EHPS.240 (a). (c) EHPS operating limitations that affect rotor structural integrity must not be exceeded in service.	N	Y	Accepted	A 'rotor' definition in the context of the SC E-19 has been included in EHPS.15.
174	Rolls-Royce	EHPS.240 Overspeed and Rotor Integrity	13	CS-E 840 % levels are not read-across here, what should be used then?	Clarify the acceptable levels of margin.	Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance
175	Werner Scholz, European Sailplane Manufacturers	EHPS.240 Overspeed and Rotor Integrity	13	(b) what are adequate strength margins? (c) of course, operating limitations must not be exceeded in service...	(b) clarify (c) delete as this is obvious	suggestion		Accepted	(b) Specific guidance for 'adequate strength margin' will be provided in the Means of Compliance. (c) suppressed
176	Rolls-Royce	EHPS.240(a)	13	Capitalization for consistency	"Hazardous EHPS Effect"	Yes	No	Accepted	Corrected accordingly
177	Cranfield Aerospace Solutions Ltd	EHPS.25	7	States “if” the EHPS is certified as part of the aircraft certification. Is there an alternative? e.g. an EHPS certificate?	Clarification of wording or intent on certification of EHPS.	Yes	No	Noted	For the time being, EASA is willing to offer flexibility in order to enable innovation. EHPS can be certified as part of the aircraft or a stand-alone engine product. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.



178	Rolls-Royce	EHPS.25	7	(b) The Instructions for Continued Airworthiness must be provided in dedicated manuals. Alternatively the Instructions for Continued Airworthiness <del>or</del> can be provided in the aircraft relevant manuals if the EHPS is certified as part of the aircraft certification.	Correct typographical error	Yes	No	Accepted	Corrected
179	TCCA	EHPS.25	7	In (b) delete the word "or"	Suggest to delete text, if needed			Accepted	Corrected
180	TCCA	EHPS.25	7	ICA section is too general.	Suggest this section define what ICA would consist of at the integrated package ( i.e. internal combustion engine + electric motors/generators + power distribution ).			Not accepted	A similar wording, performance-based, as CS-23 amendment 5 has been used. Specific guidance will be provided in the Means of Compliance.
181	Lange Aviation GmbH	EHPS.25 (b)	7	Grammar	Delete “or” in “...Airworthiness or can...”	Yes		Accepted	Corrected
182	VOLTAERO	EHPS.25 Instructions for Continued Airworthiness	7	Improve coherence with the practise. Paragraph b) is not useful. It seems much better not to define the format.	We recommend to delete paragraph b): (b) The Instructions for Continued Airworthiness must be provided in dedicated manuals. Alternatively the Instructions for Continued Airworthiness or can be provided in the aircraft relevant manuals if the EHPS is certified as part of the aircraft certification.	YES	NO	Not accepted	EASA has to define in which form and manner the manuals have to be provided.
183	Rolls-Royce	EHPS.25 Instructions for Continued Airworthiness (ICA)	7	(c ) Does not consider mandatory scheduled operational checks/tests. It may not be practicable to implement built-in-tests for all functions, especially functions that are mechanical in nature, so it is possible that scheduled operational checks are required.	"...each mandatory replacement time, operation check, structural inspection..."	Yes	No	Accepted	Reworded to take into account all kind of actions.
184	Rolls-Royce	EHPS.25 Instructions for Continued Airworthiness (ICA)	7	Why is the full scope of CS-E 25 not included. For example the provisions for critical parts. There is a requirement within EHPS.90 regarding ICA but the scope of ICA should be fully defined here.	Include the full scope of CS-E 25	No	Yes	Partially accepted	Provisions for critical parts mentioned in CS-E 25 (b) is covered by EHPS.25 and EHPS.90. The SC E-19 is objective based. Specific guidance will be provided in the Means of Compliance.
185	AIRBUS	EHPS.25 Instructions for Continued Airworthiness (ICA)	7	Typo to be corrected	Airbus propose to update the wording of EHPS.25 Instructions for Continued Airworthiness (ICA) - as follows: b) The Instructions for Continued Airworthiness must be provided in dedicated manuals. Alternatively the Instructions for Continued Airworthiness <del>or</del> can be provided in the aircraft relevant manuals if the EHPS is certified as part of the aircraft certification.	YES	NO	Accepted	Corrected
186	Werner Scholz, European Sailplane Manufacturers	EHPS.25 Instructions for Continued Airworthiness (ICA)	7	Within aircraft falling under Part-ML (e.g. all sailplanes) there is a clear separation between airworthiness limitations and TBO intervals. Hard ALI (typically the maximum flight time hours for the structure) cannot be changed without certification action in accordance with Part-21, whereas TBO intervals might be changed in the aircraft maintenance plan. This proposed EHPS.25 puts both types of definitions under the ALI which is too onerous for later operators.	Introduce a clear definition what ALI and what TBO should include.	suggestion		Noted	Airwothiness limitations and TBO are indeed 2 separate data. TBO does not necessarily fall into the Airworthiness limitations.
187	Volocopter	EHPS.25(b)	8	Remove “or”		Yes		Accepted	Corrected
188	Volocopter	EHPS.250	14	Failure	failure	Yes		Not accepted	This is not a typo. Word with big letters are refering to defintions providede by EASA. Refer to CS-Definitions amdt 2
189	Rolls-Royce	EHPS.250	13	.... After failure any single compressor or turbine blade will be radially contained...	EHPS is typically being powered by small shaft turbines which <del>are likely having</del> <b>may have a</b> radial compressor component (impeller --> tri-hub burst) and a free turbine. Hence containment requirements should <del>be more in agreement with the</del> <b>also consider the</b> requirements of CS-APU.	Yes	No	Partially accepted	Specific guidance will be provided in the Means of Compliance. Specific guidance will be provided on the wording "likely to occur".

190	SAFRAN	EHPS.250	13	This paragraph does not cover electrical motor/generator	Should reflect also the blade failure in the electrical motors/generator. Proposed text : 'If the EHPS contains a compressor or a turbine or equivalent bladed disc, it must be demonstrated that after Failure any single compressor or turbine blade will be contained and...'	No	Yes	Accepted	EHPS.250 addresses now containment for all kind of rotating parts.
191	General Aviation Manufacturers Association	EHPS.250	13	EHPS.250 - Suggest adding that the energy levels and trajectories from any axial debris exiting the EHPS should be defined in the installation manual.		Major/conceptual		Accepted	The word 'radially' has been removed. Specific guidance will be provided as part of the means of compliance.
192	Airbus Helicopters	EHPS.250	13	Is this applicable to open rotor /prop fans? It should be explicitly stated	Explicitly states if applicable to open rotor/prop fans	Yes	No	Noted	Open rotor or propeller are not considered as part of the SC E-19.
193	Embraer S.A.	EHPS.250	13	The containment requirement should be applicable to any high energy rotor, not limited to compressors and turbines.	We suggest to change the text from: EHPS.250 Compressor or turbine blade failure containment If the EHPS contains a compressor or a turbine, it must be demonstrated that after Failure any single compressor or turbine blade will be radially contained and that no Hazardous EHPS Effect can arise as a result of other damage to the EHPS that is likely to occur before the EHPS is shutdown following a blade Failure. To: EHPS.250 High-energy rotors containment <i>If the EHPS contains a high-energy rotor, it must be demonstrated that after Failure any rotor will be radially contained and that no Hazardous EHPS Effect can arise as a result of other damage to the EHPS that is likely to occur before the EHPS is shutdown following a rotor Failure.</i>	yes	no	Partially accepted	EHPS.250 addresses now containment for all kind of rotating parts. However, EASA does not request to provide containment of rotor failure for the entire compressor or turbine disks. Same logic as CS-E is applied.
194	Airbus DS	EHPS.250	13	Is this applicable to open rotor /prop fans? It should be explicitly stated	Explicitly state if applicable to open rotor/prop fans	Yes	No	Noted	Open rotor or propeller are not considered as part of the SC E-19.
195	TCCA	EHPS.250	13	Note comment for the Subpart A.	Suggest to redefine the concept.			Not accepted	Refer to answer provided for comment for Subpart A
196	TCCA	EHPS.250	13	Designs may include one or more fans, should be rewritten to include.	Include consideration for fan failures.			Accepted	Paragraph has been reworded.
197	Rolls-Royce	EHPS.250 Compressor or turbine blade failure containment	13	Grammar. "shutdown" is a noun, not a verb.	"...before the EHPS is shut down following..."	Yes	No	Accepted	Corrected accordingly.
198	AIRBUS	EHPS.250 Compressor or Turbine Blade Failure Containment	13	It is not clear why the containment requirement is limited to radial containment. Axial containment should also be required. In addition, the wording may be improved to specify that the blade failure and damages subsequent to the blade failure are to be considered	Airbus propose to update the wording of EHPS.250 Compressor or Turbine Blade Failure Containment - as follows (new proposed text shown in <u>underlined italic</u> font): If the EHPS contains a compressor or a turbine, it must be demonstrated that after failure any single compressor or turbine blade will be <del>radially</del> contained. <u><i>In addition, it shall be demonstrated that no hazard (High Energy Debris or Propeller Release, hazardous or catastrophic aircraft effects)</i></u> can arise as a result of <u>subsequent</u> damage to the EHPS that is likely to occur before the EHPS is shutdown following a blade Failure.	N	Y	Accepted	Corrected accordingly
199	Rolls-Royce	EHPS.250 containment	13	This should be interpreted as any rotating item, including bits of the rotor, gears, etc... not “compressor and turbine blades”. I think hybrid engines will have reduction gearboxes, that seems inevitable given the need for light weight, high power density motors (more efficient) and slow fans.	Clarify the definition.	Yes	No	Accepted	EHPS.250 addresses now containment for all kind of rotating parts.

200	Rolls-Royce	EHPS.260	13	Is it worth mentioning specific issues, such as drag and potential overspeed of an unloaded windmilling device?	Consider examples as listed	Yes	No	Accepted	Examples will be provided in a specific guidance.
201	General Aviation Manufacturers Association	EHPS.260	13	EHPS 260 - Why catastrophic is not included?	If any of the EHPS main rotating systems continue to rotate after the EHPS is shutdown while in flight, this continued rotation must not result in any Hazardous <b>or Catastrophic</b> EHPS Effects.	Major/conceptual		Accepted	Reworded to make reference to the safety assessment made under EHPS.80.
202	Rolls-Royce	EHPS.260 Continued Rotation	13	EHPS.260 Continued Rotation The requirement imposes a more stringent requirement than EHPS.80. For EHPS.80, it is acceptable to have Hazardous EHPS effects occurring at a rate that is Extremely Remote. EHPS.260 does not provide scope for a combination of continued rotation and pre-existence of latent failures that reduce the safety margins. For example, continued rotation with a failure in an oil circuit that is only used during windmilling may result in Hazardous EHPS Effect. An FTA will consider the rate of occurrence of both and would demonstrate an Extremely Remote probability of Hazardous EHPS Effects, but would not demonstrate a null rate.	"If any of the EHPS main rotating systems continue to rotate after the EHPS is shut down while in flight, this continued rotation must not result in any Hazardous EHPS Effects with a probability that is unacceptable under EHPS.80."	Yes	No	Accepted	Corrected accordingly
203	Airbus Helicopters	EHPS.260 Continued Rotation	13	The paragraph shall be updated in order to require to prevent hazards not only for the main rotating system	Airbus propose to update the wording of EHPS.15 Terminology as follows (new proposed text shown in <u>underlined italic</u> font): If any of the EHPS <del>main</del> rotating systems continue to rotate after the EHPS is shutdown while in flight, this continued rotation must not result in any hazards (High Energy Debris or Propeller release, hazardous or catastrophic aircraft effects)	Yes	No	Partially accepted	Consistency with CS-E wording is maintained. Specific guidance will be provided as part of the Means of Compliance.
204	AIRBUS	EHPS.260 Continued Rotation	13	The paragraph shall be updated in order to require to prevent hazards beyond the perimeter of the EHPS. In addition, a MOC shall be added to precise the meaning of the main rotating systems.	Airbus propose to update the wording of EHPS.260 Continued Rotation - as follows (new proposed text shown in <u>underlined italic</u> font) If any of the EHPS main rotating systems continue to rotate after the EHPS is shutdown while in flight, this continued rotation must not result in <u>any hazards (High Energy Debris or Propeller release, hazardous or catastrophic aircraft effects)</u>	N	Y	Accepted	Reworded to make reference to the safety assessment made under EHPS.80.
205	SAFRAN	EHPS.270	14	Rain conditions	The term 'sudden' is unclear, proposed text : "The EHPS must be designed and/or installed such that it is capable of satisfactory operation throughout its specified operating envelope when subject to <b>maximum</b> rain conditions in flight envelope..."	No	Yes	Not accepted	Consistency with CS-E wording is maintained
206	TCCA	EHPS.270	14	What is " the certification standard concentration of rain"?	Add direct reference to current certification rain environments.			Accepted	Specific guidance based on CS-E will be provided as part of the Means of Compliance.
207	Lange Aviation GmbH	EHPS.270 - 290	13-14	EHPS.270 to 290 have no equivalent requirement with regards to piston engines in CS-E. This might lead to a competitive disadvantage of EHPS compared to piston engines. It is not clear why EHPS should fulfill additional requirements compared to other propulsion systems. Why is this required for gas turbines and not for piston engines?	The requirements should be in line with the requirements for piston engines, or it should be differentiated according to the potential hazards or particularities of the EHPS in question.	Yes		Accepted	Water ingestion is requested for piston engines in CS-E 430. CS-E 230 dedicated to piston engines deals with design precautions for the risk of icing and blockage of the air induction system, covering so the risk of icing and snow. EHPS.290 (a) allows to take credit from the engine installation to cover the bird or hail strike (cowlings protections, propeller...)
208	Vertical Aerospace	EHPS.270 and 280	14	EHPS.270 allows 'operating envelope' but EHPS.280 does not.	There could be improved clarity of what the 'operating envelope' allows the TC DOA to select or avoid when showing compliance. Consider whether 'operating envelope' should be in both EHPS.270 and 280.	Yes		Accepted	The operation under rain conditions are considered as normal operations, whereas flight under icing or snow conditions can be forbidden as part of the aircraft flight manual. Specific guidance will be provided in the Means of Compliance.

209	Werner Scholz, European Sailplane Manufacturers	EHPS.270 Rain conditions	13 / 14	For sailplanes, no certification standard concentration of rain is defined; it should be possible either to not allow operation in rain or to use word like “light / heavy rain” without such a definition.	Add “...subject to sudden encounters with the certification standard concentration of <b>rain as applicable to the category of aircraft.</b> ”	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
210	AIRBUS	EHPS.270 Rain Conditions	14	EHPS.280 cross-refers to the applicable aircraft certification code for the icing/snow conditions. Rain conditions for this paragraph EHPS.270 are missing.	Certification standards for rain shall be described in details.	N	N	Accepted	The operation under rain conditions are considered as normal operations, whereas flight under icing or snow conditions can be forbidden as part of the aircraft flight manual. Specific guidance will be provided in the Means of Compliance.
211	TCCA	EHPS.270 EHPS.290	14	Should this requirement include hailstorm? Hail strike is included in the EHPS.90 from a FOD perspective.	Add direct reference to current certification hail and hailstorm environments.			Accepted	The intent is to have a similar approach to CS-E. Specific guidance will be provided in the Means of Compliance.
212	VOLTAERO	EHPS.270 Rain conditions	13	The installation of the EHPS but also the flight envelope of the aircraft have a lot of influence on rain effect. Flight in those conditions may also be prohibited. It is under the responsibility of the aircraft designer. The EHPS requirements cannot be more severe than the aircraft requirements.	We recommend to delete in paragraph EHPS.270.	YES	NO	Not accepted	The operation under rain conditions are considered as normal operations. Proper function of the EHPS under these conditions shall be demonstrated. Specific guidance will be provided in the Means of Compliance to take into account the installation effects.
213	FAA GH	EHPS.280	14	Seems to deviating from PBR		yes		Noted	
214	FAA AS	EHPS.280	14	A counter opinion to 32 was expressed : I don’t know what you mean by ‘deviating from PBR.’ To me this is a performance based rule. It says there must not be a problem within the specified envelope/conditions. If you don’t specify the conditions it would not be enforceable (i.e., how much ice or snow). Same as the rain requirement, above. Could even go further, to add detail similar to that under bird strike, etc., below. Also, the operational regulators need to know the capability of the engine/aircraft to make enforceable operational regulations, such as when you can launch into certain weather conditions.		yes		Noted	
215	Cranfield Aerospace Solutions Ltd	EHPS.280	14	References EHPS.30(e). This doesn’t exist.		Yes	No	Accepted	Corrected accordingly.
216	SAFRAN	EHPS.280	14	Icing è assumptions	General comment to add a § assumptions to cover data from Aircraft applicant	Yes	No	Accepted	It is covered by EHPS.30.
217	General Aviation Manufacturers Association	EHPS.280	14	EHPS.280 - The ice protection specifications should be described if it listed as a reference. Freezing fog on ground condition is not specified and EHPS.30(e) does not exist, but is recorded in the regulation to describe the ice protection specifications.	Remove "as specified in EHPS.30(e)" and add in what was supposed to be written in the regulation describing the instruction manual.	Major/concep tual		Accepted	Corrected accordingly.
218	Flying Whales	EHPS.280	14	Is it applicable to aircraft which is not certified to operate in icing condition?	Suggestion is to add the condition: “if aircraft requests certification for flight in icing conditions”	Yes	No	Not accepted	Even if the aircraft is not allowed to flight in icing conditions, the propulsion system has always been requested to demonstrate capability to do so. The intent is to follow the same approach as CS-E. That is why the wording is very similar. Specific guidance will be provided in the Means of Compliance.

219	The Boeing Company	EHPS.280	14	“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 <b>EHPS.30 (e).</b> ” Please reference the correct requirement.	This could be a typographical error. EHPS.30 (e) does not exist.	Yes	No	Accepted	Corrected accordingly.
220	TCCA	EHPS.280	14	Should consider operating envelope within existing certification environments for atmospheric icing, supercooled large droplets and ice crystals. As the environments are defined regardless of the aircraft operating in it, they should be prescribed (direct reference) and only the applicable operating enveloped under consideration demonstrated. Additionally, Authorities have generally certified engines to more severe conditions than those required at the aircraft level. Accordingly, adequate margin should be demonstrated. Industry working groups and regulators have put significant effort into defining various icing environments, these should be explicitly retained when certifying EHPS.	Add direct reference to current icing environments			Accepted	Even if the aircraft is not allowed to flight in icing conditions, the propulsion system has always been requested to demonstrate capability to do so. The intent is to follow the same approach as CS-E. That is why the wording is very similar. Specific guidance will be provided in the Means of Compliance.
221	<i>Airbus Helicopters</i>	EHPS.280 Icing and Snow Conditions	14	Typo, the requirement to identify the applicable A/C Type Certification Basis is specified in EHPS.30(b)(4), not EHPS.30(e)	Airbus propose to update the wording of EHPS.15 Terminology as follows (new proposed text shown in <u><i>underlined italic</i></u> font): 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( <u><i>b)(4)(e)</i></u> ).	Yes	No	Accepted	Corrected accordingly.
222	<i>AIRBUS</i>	EHPS.280 Icing and Snow Conditions	14	Typo, the requirement to identify the applicable A/C Type Certification Basis is specified in EHPS.30(b)(4), not EHPS.30(e)	Airbus propose to update the wording of EHPS.280 Icing and Snow Conditions - as follows (new proposed text shown in <u><i>underlined italic</i></u> font): 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( <u><i>b)(4)(e)</i></u> ).	Yes	N	Accepted	Corrected accordingly.
223	<i>Werner Scholz, European Sailplane Manufacturers</i>	EHPS.280 Icing and snow conditions	14	similar as for Rain conditions... (point 13); no snow / icing requirements typically required for sailplane	similar as for Rain conditions... (point 13)	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
224	Rolls-Royce	EHPS.280 Icing and snow conditions	13	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). EHPS.30 e does not exist in the document	- was this intended to be EHPS:30(b)(4) or other reference?	Yes	No	Accepted	Corrected accordingly.
225	Rolls-Royce	EHPS.280 Icing and snow conditions	12	Minor grammatical correction - Should read: 'The EHPS and any of its sub-systems <u>s...</u> '.	Correct wording	Yes	No	Accepted	Corrected accordingly.



226	VOLTAERO	EHPS.280 Icing and snow conditions	14	The installation of the EHPS but also the flight envelope of the aircraft have a lot of influence on ice and snow effect. Flight in those conditions may also be prohibited. It is under the responsibility of the aircraft designer. The EHPS requirements cannot be more severe than the aircraft requirements.	We recommend to delete in paragraph EHPS.280.	YES	NO	Not accepted	Even if the aircraft is not allowed to flight in icing conditions, the propulsion system has always been requested to demonstrate capability to do so. The intent is to follow the same approach as CS-E. That is why the wording is very similar. Specific guidance will be provided in the Means of Compliance.
227	Vertical Aerospace	EHPS.290	14	'AMC suggests use of Fairings/cowlings to be the means to protect the EHPS from Bird/hail/FOD. Due to nature of distributed EHPS on VTOL Aircraft the demonstration of compliance will likely be at Aircraft (SC-VTOL) level, and deferred from this SC.	A comment in the AMC may aid the TC DOA in understanding that the compliance to EHPS.290 may be at Aircraft level.	Yes		Accepted	The term "installed" addresses indeed this possibility. Specific guidance will be provided in the Means of Compliance.
228	Volocopter	EHPS.290	15	Will there be a dedicated AMC for SC-EHPS or could existing draft AMC for bird strike in accordance with SC-VTOL.2250(f) be used in the case, where the EHPS is to be used on a VTOL aircraft?		Yes		Noted	Dedicated AMC will be provided. Refer to the presentation made at the Rotorcraft symposium in 2019.
229	SAFRAN	EHPS.290	14	Bird ingestion – mention of catastrophic effect not consistent	It is proposed not to mention Aircraft Catastrophic Effect.	Yes	No	Not accepted	The mentioned inconsistency is not understood. The text is kept as is.
230	SAFRAN	EHPS.290	14	HIRF / Lightning specific requirement	Is HIRF/Lightning aggression included in the §EHPS.290, EHPS.330 or EHPS.490? A specific § may be needed as for other CS at aircraft level (including the protection at EHPS sub-system or equipment level).	Yes	No	Noted	HIRF/Lightning aggression is covered by EHPS.30, EHPS.330, EHPS.370, EHPS.380 and EHPS.490. Specific guidance will be provided.
231	Zeroavia James Lawson	EHPS.290		Suggest adding bird and hail size.				Accepted	Specific guidance will be provided in the Means of Compliance
232	The Boeing Company	EHPS.290	14	<p>“EHPS.290 Bird, hail strike and impact of foreign matter (a) The EHPS must be designed and/or installed so that any impact by bird or hail, or other impact of foreign matter, that is likely to occur in any one flight will not cause any Hazardous EHPS Effect or Catastrophic Aircraft Effect as defined in EHPS.15.”</p> <p>1) The statement, “impact by bird or hail, or other impact of foreign matter, that is likely to occur in any one flight will not cause” requires further explanation. “likely to occur in one flight” needs to be made clear so that this approach can be followed 2) EHPS-80 does not provide clear safety objectives as defined for EASA SC-VTOL which identifies at aircraft level a failure rate of 10-9. We would need to understand the target For example, CS-E510 defines in a (3) It must be shown that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote (probability less than 10-7 per Engine flight hour). The estimated probability for individual Failures may be insufficiently precise to enable the total rate for Hazardous Engine Effects to be assessed. For Engine certification, it is acceptable to consider that the intent of this paragraph is achieved if the probability of a Hazardous Engine Effect arising from an individual Failure can be predicted to be not greater than 10-8 per Engine flight hour (see also CS-E 510 (c)). In case that the safety target has not been defined it should be deleted as recommended. 3) It is possible that multiple-rotor and/or push propeller or alternative based vehicles may be able to sustain CSF&amp;L without resulting in a hazardous Classification of Failure Conditions. Please refer to comments 14 and 15</p>	<p>“EHPS.290 Bird, hail strike and impact of foreign matter (a) The EHPS must be designed and/or installed so that any impact by bird or hail, or other impact of foreign matter, that is likely to occur in any one flight will not cause any <del>Hazardous EHPS Effect</del> or Catastrophic Aircraft Effect as defined in EHPS.15.”</p>	no	yes	Partially accepted	<p>Consistency with CS-E approach has to be kept for turbine engines. Regarding 1): specific guidance will be provided for the bird and hail strike. For the other FOD, each applicant will have to propose its approach. Regarding 2): safety objectives are derived from the intended aircraft application. That is the intent of EHPS.80(a)(3). Regarding 3): Noted</p>

233	TCCA	EHPS.290	14	Should consider include threat from ice-sheet ingestion from inlet or other aircraft courses. Change to : "[...] bird, hail, ice slabs, or other impact of foreign matter". Again, "Hazardous EHPS Effect or Catastrophic Aircraft Effect as defined in EHPS.15" may be redundant as HAZ EHPS Effects are defined as those leading the CAT or HAZ A/C Effects.	Modify to include ice-sheet strike.			Partially accepted	Ice slab is related to icing conditions. It is therefore covered under EHPS.280. Specific guidance will be provided in the Means of Compliance.
234	AIRBUS	EHPS.290 Bird, Hail Strike and impact of foreign matter	14	The proposed paragraph implies that ingestion of foreign matter might not be an issue. Airbus consider that the ingestion threat may remain a problem for certain design and therefore propose to extend the scope of the paragraph. It is not clear also what added value subparagraph (b) is bringing. A single paragraph requiring no hazards as a result of impact/ingestion is likely to be sufficient. Subparagraph (c) is too broad. It is not clear if it is meant to addresses several hail encounters within one flight for instance or one single multiple bird impacts event. In addition, a reference to applicable hail/bird encounters conditions should be included in the requirement.	Airbus propose to update the wording of EHPS.290 Bird, Hail Strike and impact of foreign matter - as follows (new proposed text shown in <u>underlined italic</u> font): <b><u>EHPS.290 Bird, Hail and Other Foreign Matter Strike and Ingestion</u></b> (a) The EHPS must be designed and/or installed so that any impact <u>by or ingestion of</u> bird or hail, or other <del>impact of</del> foreign matter, that is likely to occur in any one flight will not cause <u>any hazard (High Energy Debris or propeller release, hazardous or catastrophic aircraft effects)</u> <del>Hazardous EHPS Effect or Catastrophic Aircraft Effect as defined in EHPS.15.</del> <del>(b) It must also be shown that the impacts defined on EHPS.290 (a) will not preclude the continued safe flight and landing (as defined in the Type-Certification Basis of the intended application(s)) of the aircraft as a consequence of an unacceptable:</del> <del>(1) loss of performance;</del> <del>(2) deterioration of EHPS/Aircraft handling characteristics;</del> <del>(3) exceedance of any EHPS operating limitation.</del> <del>(c) Multiple impacts must be included in the demonstration unless it can be shown that they are unlikely</del> <u>(b) Hail encounters are specified in CS-E appendix A.</u> <u>(c) For bird, the EHPS design shall be able to sustain the relevant ingestion conditions of CS-E 800 and strike conditions of the intended aircraft type certification basis</u>	N	Y	Partially accepted	Paragraph a) has been corrected. However, considering only high energy debris for the Hazardous EHPS effect is not in line with today practices on CS-E. This has not been taken into account. Paragraph b) is there to cover cases where the intended aircraft application must demonstrate its capability to ensure a CSFL, including following bird or hail strike. This is not the case for basic Category of as specified in SC VTOL. "as defined in the Type-Certification Basis of the intended application" has been replaced by "if defined in the Type-Certification Basis of the intended application" to emphasis this point. Specific guidance will be provided to clarify this.
235	Rolls-Royce	EHPS.290 Bird, hail strike and impact of foreign matter	14	(b)(1) is probably not achievable for an aircraft that is equivalent to a single engine platform. A total loss of power or thrust on a single engine platform would in most cases preclude continued safe flight and landing.	(1) loss of performance, unless addressed by the aircraft safety assessment;	Yes	No	Partially accepted	A CSFL is indeed not requested on single engine A/C after the loss of the engine. Paragraph b) is there to cover cases where the intended aircraft application must demonstrate its capability to ensure a CSFL, including following bird or hail strike. "as defined in the Type-Certification Basis of the intended application" has been replaced by "if defined in the Type-Certification Basis of the intended application" to emphasis this point. Specific guidance will be provided to clarify this.
236	Werner Scholz, European Sailplane Manufacturers	EHPS.290 Bird, hail strike and impact of foreign matter	14	similar as for Rain conditions... (point 13) no bird strike / hail conditions typically required for sailplane	similar as for Rain conditions... (point 13)	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.

237	VOLTAERO	EHPS.290 Bird, hail strike and impact of foreign matter	14	The CS-23 amdt 4 does not consider bird impact apart on the canopy. The EHPS requirements cannot be more severe than the aircraft requirements.	We recommend to delete in paragraph EHPS.290.	YES	NO	Not accepted	SC EHPS is not dedicated to CS-23 application. Turbine engines certified according to C-E that are installed on CS-23 have demonstrated capability to sustain bird and hail strike. Piston engine are considered protected by the installation which is what is proposed in (a) where an applicant can take credit from the installation.
238	FAA JP	EHPS.290(a)	14	Relative to « ...or Catastrophic Aircraft Effect as defined... » Don't think the EPHS applicant can identify all CAT aircraft effects, that is done by the installer.		yes	Yes	Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). Proper coordination with the aircraft manufacturer will be requested.
239	Embraer S.A.	EHPS.290(a)	14	The EHPS manufacturer should not be responsible to define what are the Major, Hazardous or Catastrophic Aircraft Effects. This categorization will be very dependent of the aircraft propulsion architecture and this analysis should be made by the aircraft manufacturer. Recommended to delete any reference to aircraft level effects.	We suggest to change the text from: (a) The EHPS must be designed and/or installed so that any impact by bird or hail, or other impact of foreign matter, that is likely to occur in any one flight will not cause any Hazardous EHPS Effect or Catastrophic Aircraft Effect as defined in EHPS.15. To: (a) <i>The EHPS must be designed and/or installed so that any impact by bird or hail, or other impact of foreign matter, that is likely to occur in any one flight will not cause any Hazardous EHPS Effect as defined in EHPS.15.</i>	yes	no	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). Proper coordination with the aircraft manufacturer will be requested.
240	FAA JF	EHPS.290(c)	14	In reference to « unlikely », Is this going to be qualified or quantified in the MoC		Yes		Noted	Specific guidance will be provided.
241	Rolls-Royce	EHPS.290(c)	13	Define "unlikely". This word should be avoided in safety analyses.	Refer instead to the definition of "Extremely Remote" in CS-Definitions	Yes	No	Not accepted	Specific guidance will be provided.
242	FAA DJ	EHPS.30	7	Since many of the users of electric propulsion will be eVTOL should something similar to helicopter power assurance be mentioned? We don't know how electric motors may deteriorate over time in aircraft applications so it seems important this would be addressed at least initially until experience is gained.		yes		Noted	Power assurance check is an aircraft request (like in CS-29) for performance purposes and not a propulsion request.
243	Cranfield Aerospace Solutions Ltd	EHPS.30	7	Refers to “type certificate”. Is this an EHPS certificate or the aircraft type certificate?	Clarification of wording or intent on certification of EHPS.	Yes	No	Accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. EHPS can be certified as part of the aircraft or a stand-alone engine product. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
244	SAFRAN	EHPS.30	8	Requirement shall be mentioned in assumption report (3)	Proposal to create an assumption paragraph (similar to CS-E30) for the EHPS	Yes	Yes	Accepted	EHPS.30 (b)(7) has been added to indicate the assumptions.
245	Jonas Büttner	EHPS.30	8	Safety instructions for installation is missing in EHPS.30 (b)		Yes		Noted	Refer to EHPS.30 (b)(1): it provides the technical inputs for the aircraft designer to properly design the powerplant. Concerning the physical installation by a maintenance operator, the maintenance manual will provide the instruction for a safe installation on the aircraft.

246	Airbus DS	EHPS.30	7	“(b) The instructions must include at least the following: (1) Installation instructions for each system which constitutes the EHPS” Reference to engine servicing instructions including types of fluids to be used, engine maintenance manual, instructions for storage are missing. Missing mention that assumptions used to comply with this regulation need to be part of the installation instructions (in line with CS-E 30). Probably implicit, but should also include the instructions for safe handling of the electrical components during installation, maintenance and operation.	Consider add missing instructions.	Yes	No	Partially accepted	The instructions manual for installing and operating the EHPS is intended for the aircraft designer and not the maintenance operators. Therefore, the maintenance manual, instructions for storage and the safe handling of electric component are not part of it but are part of the engine maintenance manual which is part of the ICA. Assumptions have been added (refer to EHPS.30 (b)(7). Type of fluids to be used has been added (refer to EHPS.30 (b)(8)
247	TCCA	EHPS.30	8	In (b)(3) add a comma “,” at the end In (b)(5) revise text to read "EHPS configuration, and " In (b)(6) revise text to read “...to demonstrate compliance to the requirements identified in the Type-Certification Basis...”	Suggest to revise text, if needed			Accepted	Corrected accordingly. The paragraph has been reworded.
248	SAFRAN	EHPS.30	8	(6) The necessary data to allow the installer to demonstrate the compliance to the requirements identified in the Type-Certification basis of the intended aircraft application. This paragraph is not consistent with page 3 “additional certification requirements...”	EHPS can be certified apart from intended aircraft certification. Proposal as follow: (6) The necessary data to allow the installer to demonstrate the compliance to the requirements identified in the Type-Certification basis of the intended aircraft application.	Yes	Yes	Not accepted	Requirements of the intended aircraft application are defined according to its associated Type Certification basis.
249	FAA DJ	EHPS.30 (b)(3)	8	Detail could be provided in the MOC for this information.		yes		Accepted	Specific guidance will be provided in the Means of Compliance.
250	FAA JF	EHPS.30 (b)(3)	8	This seems to be an incomplete thought. (3) is supposed to complete the statement “The instruction must include ...”. In (3) it is not clear what must be included.		yes		Noted	As stated, the instructions must include...“the interface conditions, reliability specifications and safety analyses for those components upon which the EHPS certification is based”
251	FAA JP	EHPS.30 (b)(4)	8	Using ‘Type-Certification Basis’ seems excessive and could be interpreted as requiring identification of an installation part and amendment level for EHPS approval.	Suggest replacing ‘Type-Certification Basis’ with ‘aircraft type and category.’	yes		Not accepted	Requirements of the intended aircraft application are defined according to its associated Type Certification basis.
252	Rolls-Royce	EHPS.30 Instructions manual for installing and operating the EHPS	8	“(b) The instructions must include at least the following: ..... (3) Where an EHPS relies on components which are not part of the EHPS, the interface conditions, reliability specifications and safety <u>analyses</u> for those components upon which the EHPS certification is based” - It is not foreseeable that it would be practical to include safety analyses of components outside the EHPS. Those components may be sourced by the airframer, independent from the influence of the EHPS supplier. It would be sufficient for the EHPS supplier to clearly state the reliability specifications (failure rates, acceptable latencies of failures, qualitative requirements to address common modes etc.) with the rationale for the specification.	“...conditions, reliability specifications and safety rationale for those components...”	Yes	No	Accepted	Modified accordingly
253	Rolls-Royce	EHPS.30 Instructions manual for installing and operating the EHPS	7	No assumptions mentioned (b)(1) Installation instructions for each system which constitutes the EHPS,	(b)(1) Installation instructions for each system which constitutes the EHPS <b>including necessary assumptions associated with a typical EHPS installation,</b>	Yes	No	Accepted	EHPS.30 (b)(7) has been added to indicate the assumptions.

254	AIRBUS	EHPS.30 Instructions manual for installing and operating the EHPS	7	Sub-paragraph (a) implies there is a separate Type Certificate for the EHPS. Again Airbus consider this is not necessarily required and note that the previous paragraph (EHPS.25 ICA) also consider this possibility ( <i>if the EHPS is certified as part of the aircraft certification</i> written in EHPS.25(b)). If the EHPS is certified as part of the aircraft type certification, it is not clear why separate installation/operating instructions would be required. The paragraph should therefore be updated to address the situation where there is no separate EHPS TC.	Airbus propose to update the wording of EHPS.30 Instructions manual for installing and operating the EHPS - as follows (new proposed text shown in <u>underlined italic</u> font):  (a) Each applicant must prepare and make available to the Agency prior to the issuance of the type certificate, and to the installer at the time of delivery of the EHPS, approved instructions for installing and operating the EHPS. <u>Alternatively, if the EHPS is certified as part of the aircraft certification, EHPS installation/operating instructions pertinent to the operator of the aircraft will be provided in the aircraft relevant manuals</u>  (b) <u>When the EHPS is certified independently of the aircraft, the installation/operating instructions required by this Special Condition</u> must include at least the following:....	NO	YES	Accepted	Modified accordingly
255	VOLTAERO	EHPS.30 Instructions manual for installing and operating the EHPS	8	The aircraft designer, Type Certificate Holder of future Type certificate Holder, has the responsibility of certifying the EHPS on its aircraft. The responsibility of the EHPS designer is to provide the installation instructions, the operating instructions and the limitations. It is the responsibility of the aircraft designer to comply with those instructions and limitations. He will also have to demonstrate the compliance to the applicable requirements in order to obtain the relevant EASA approval for its aircraft.	We recommend to delete the 4), 5) and 6).  <del>(4) The Type Certification Basis which is (are) assumed as being applicable to the intended aircraft application must be identified in the installation instructions,</del> <del>(5) The aircraft parts and equipment that may be mounted on, or driven by, the EHPS, which are not part of the declared EHPS configuration.</del> <del>(6) The necessary data to allow the installer to demonstrate the compliance to the requirements identified in the Type Certification basis of the intended aircraft application.</del>	YES	NO	Partially accepted	EHPS.30 has been modified to take into account the two different certification possibilities. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
256	Volocopter	EHPS.30(b)(3)	9	Sentence has no ending		Yes		Not accepted	The sentence is correct
257	Rolls-Royce	EHPS.30, EHPS.350	7, 18	Given the role of ARP4754A in defining a systems-engineering approach to aircraft development, and its adoption for large aircraft programmes, I expected to see something similar to EHPS.350 (b) to seek that the system definition and integration (at least of avionics) is done to an accepted standard. Particularly relevant for more distributed controls - including details in the Installation Manual does not really reflect how modern aircraft are designed and developed.	Consider adding this within the proposed SC.	Yes	No	Partially accepted	EHPS.80 (a)(3) and EHPS.350 (b) have been reworded to address development assurance. Specific guidance will be provided in the Means of Compliance.
258	TCCA	EHPS.300	15	If the EHPS contains reciprocating engines or turbine engines, then any fuel system of the EHPS must be designed and constructed so that it will function properly in all flight attitudes and atmospheric conditions . . Does the word properly means also safely? This sentence does not highlight the risk related to fuel ignition	" Fuel systems must be designed to avoid any risk of fuel ignition in electromagnetic environment			Partially accepted	The adjective "safely" has been added. Fire risk is covered under EHPS.100. Specific guidance will be provided in the Means of Compliance, such as electrical bonding to ensure electrostatic discharge to ground or to air.
259	Lange Aviation GmbH	EHPS.300	15	Other types, i.e. fuel cells, will also need a fuel system.	The limiting sub-clause should be deleted: "Any fuel system...". The same applies to b).	Yes		Not accepted	Any technology related to the use of hydrogen, whether used to feed fuel cells or combustion engines is outside the scope of this special condition. These technologies request further work and research before defining the associated certification requirements.



260	UK CAA	EHPS.300	15	This requirement only applies if there is a reciprocating or turbine engine as part of the hybrid installation. This means the requirements would not apply to an EHPS where a hydrogen fuel cell is used to generate electricity to then feed to a motor/battery buffer/storage arrangement. This does not seem to be logical as H2 fuel cells have both fuel and O2 supply challenges which should be considered.	Increase the scope of the requirement e.g. to include consideration of hydrogen fuel cells.	Yes		Not accepted	Any technology related to the use of hydrogen, whether used to feed fuel cells or combustion engines is outside the scope of this special condition. These technologies request further work and research before defining the associated certification requirements.
261	SAFRAN	EHPS.300	15	Negative G	It is proposed to add negative g to the text for functioning condition : (a) "...so that it will function properly in all flight attitudes including <b>negative g</b> ...."	Yes	Yes	Accepted	Corrected accordingly
262	SAFRAN	EHPS.300	15	Associated AMC	AMC of EHPS.300 list CS-E 560 but should also cover full CS-E 670.	Yes	Yes	Accepted	This will be part of the specific guidance work to be performed.
263	Embraer S.A.	EHPS.300	15	Reciprocating or turbine engines should comply with original CS-E requirements. Recommended to delete this section or to refer to applicable CS-E requirement.	We suggest to delete this paragraph.	yes	no	Not accepted	The intent is to provide a self-supporting Special Condition in order to facilitate the use. However, the use of a modified "type certified" engine as part of an EHPS will ease the certification process of the EHPS as the applicant, if holder of the TC for the certified engine will be able to take credit from the past certification and reuse certification data.
264	Airbus DS	EHPS.300	15	"(b) If the EHPS contains reciprocating engines or turbine engines, then evidence must be provided that the complete Engine fuel system is capable of functioning satisfactorily with fuel containing the maximum quantity of liquid/solid contamination, likely to be encountered in service, for a period sufficient to ensure that the Engine will not malfunction as a result." Explicit mention of prevention of Ice build-up in fuel system (water ice accumulation) is missing.	Proposal is to add mention of prevention of ice build-up in fuel system (water ice accumulation)	Yes	No	Accepted	Modified accordingly. Note however that this was already identified as being part of the specific guidance to be created.
265	TCCA	EHPS.300	15	If the EHPS contains reciprocating engines or turbine engines, then surely the relevant parts of CS-E would apply?	The requirement should point to CS-E (E250 / E560)			Accepted	This will be made via the Means of Compliance. Specific guidance will be provided in the Means of Compliance.
266	TCCA	EHPS.300	15	Note comment for the Subpart A.	Suggest to redefine the concept.			Not accepted	Refer to answer provided for comment for Subpart A
267	Rolls-Royce	EHPS.300 Fuel system	15	This rule is scoped to include only reciprocating or turbine engines. It is suggested that fuel cells and other possible power sources - even as yet unknown options - should be included. A fuel cell, for example, could run on Hydrogen and maybe even one day on kerosene.	Include all power plants, not just reciprocating and turbines in rule scope	Yes	No	Not accepted	Any technology related to the use of hydrogen, whether used to feed fuel cells or combustion engines is outside the scope of this special condition. These technologies request further work and research before defining the associated certification requirements.
268	Rolls-Royce	EHPS.300 Fuel system	15	No reference to declaration of approved fuel specification including any additive and the associated limitations in flow, temperature and pressure that ensure proper Engine functioning under all intended operating conditions.	Consider to add reference to declaration of approved fuel specification	Yes	No	Accepted	Declaration and approval of types of fuels and additives has been added.

269	Airbus Helicopters	EHPS.300 Fuel System	15	Airbus consider that the requirement to substantiate and declare approved fuel specifications should be maintained in this Special Condition. In addition Airbus suggest more generic wording for the section.	Airbus propose to update the wording of EHPS.15 Terminology as follows (new proposed text shown in <u>underlined italic</u> font): (a) If the EHPS uses fuel, <u>contains reciprocating engines or turbine engines</u> , then any fuel system of the EHPS must be designed and constructed so that it will function properly in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate. (b) If the EHPS uses fuel; <u>contains reciprocating engines or turbine engines</u> , then evidence must be provided that the complete Engine fuel system is capable of functioning satisfactorily with fuel containing the maximum quantity of liquid/solid contamination, likely to be encountered in service, for a period sufficient to ensure that the Engine will not malfunction as a result.	Yes	No	Partially accepted	Declaration and approval of types of fuels and additives has been added. However, the use of fuel is for the moment only considered for reciprocating and turbine engine. The use of hydrogen is not considered as part of the SC E-19.
270	Werner Scholz, European Sailplane Manufacturers	EHPS.300 Fuel system	15	Showing of compliance by using typical fuel types / typical containment must be sufficient, otherwise this becomes rather arduous	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
271	AIRBUS	EHPS.300 Fuel System	15	Airbus consider that the requirement to substantiate and declare approved fuel specifications should be maintained in this Special Condition. In addition Airbus suggest more generic wording for the section.	Airbus propose to update the wording of EHPS.300 Fuel System - as follows (new proposed text shown in <u>underlined italic</u> font): (a) If the EHPS <u>uses fuel</u> , <u>contains reciprocating engines or turbine engines</u> , then any fuel <u>distribution</u> system of the EHPS must be designed and constructed so that it will function properly in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate. (b) If the EHPS uses fuel; <u>contains reciprocating engines or turbine engines</u> , then evidence must be provided that the complete <u>EHPS distribution</u> fuel system is capable of functioning satisfactorily with fuel containing the maximum quantity of liquid/solid contamination, likely to be encountered in service, for a period sufficient to ensure that the <u>EHPS</u> will not malfunction as a result.  <u>(c) Each fuel specification to be approved, including any additive, and the associated limitations in flow, temperature and pressure that ensure proper Engine functioning under all intended operating conditions must be declared and substantiated</u> <u>(d) Any reliance placed upon the assumed installed conditions or installation requirements must be declared in the instructions for installation as defined in EHPS.30.</u>	N	Y	Partially accepted	Declaration and approval of types of fuels and additives has been added. However, the use of fuel is for the moment only considered for reciprocating and turbine engine. The use of hydrogen is not considered as part of the SC E-19.
272	VOLTAERO	EHPS.300 Fuel system	15	The fuel system is generally part of the aircraft design.	We recommend to modify the paragraph adding a sentence : <u>"If the EHPS installation instructions defines a fuel system, this paragraph applies."</u>	YES	NO	Not accepted	Each engine is equipped with a fuel system generally composed of pumps, filters, lines, fuel metering device... TThe SC E-19 does not adress the aircraft fuel system for which the certification requirements are provided in the relevant CS.
273	Rolls-Royce	EHPS.310	15	Is it worth having a paragraph parallel to EHPS.300(b)? Malfunction of a lubrication system, owing to contamination by liquid or solid, could lead to fire, friction, overheat and potential debris release, some of which may be Hazardous EHPS Effects; hence the EHPS lubrication system should function satisfactorily "for a period sufficient to ensure that the Engine will not malfunction as a result".	Consider analogue of EHPS.300(b) for lubrication system (and note similarity to CS-E 570, particulaly paragraph (b))	Yes	No	Accepted	New EHPS.310(b) has been added.

274	Embraer S.A.	EHPS.310	15	CS-E 270 requirements should be applicable. Recommended to refer to CS-E 270 requirements.	Refer to CS-E 270 requirements.	yes	no	Partially accepted	Paragraph EHPS.310 (b) has been added. The other paragraphs are covered by other SC EHPS paragraphs (like CS-E.270(d) addressed by EHPS.320) or will be part of the specific guidance to be provided.
275	TCCA	EHPS.310	15	There are other aspects of CS-E for oil / lube systems that are relevant here.	Review CS-E270 and E570 for relevant aspects.			Accepted	This will be made via the Means of Compliance. Specific guidance will be provided in the Means of Compliance.
276	TCCA	EHPS.310	15	Note comment for the Subpart A.	Suggest to redefine the concept.			Not accepted	Refer to answer provided for comment for Subpart A
277	SAFRAN	EHPS.310 & EHPS.320	15	Negative G	It is proposed to add negative g to the text for functioning condition : (a) "...so that it will function properly in all flight attitudes including <b>negative g</b> ...."	Yes	Yes	Accepted	Corrected accordingly.
278	SAFRAN	EHPS.310 & EHPS.320	15	Consistency between §EHPS 310(a) and §EHPS.320(a)	It is proposed to have a equivalent requirement between EHPS.310(a) and EHPS.320(a) as the cooling system may use liquid system à for EHPS.320(a), it is proposed the following text : "The design and construction of the EHPS cooling system must ensure adequate cooling in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate".	Yes	Yes	Accepted	Corrected accordingly.
279	SAFRAN	EHPS.310 & EHPS.320	15	Fire Protection	A link to the fire protection requirement is proposed for liquid cooling system : "If it is a liquid cooling system , the cooling fluid must meet the Flammable Fluid Fire Protection requirement as defined in §EHPS.100"	Yes	Yes	Not accepted	Fire protection level is function of the nature of the coolant. If the coolant is not considered as a flammable fluid, there is no need to meet the Flammable Fluid Fire Protection. Note however that this demonstration should take into account also failure cases and the installation. For example, let's consider a water/glycol coolant. If a leakage appears and the environment conditions are such that the water evaporates first, only the glycol remains which is a flammable fluid. In this configuration, the coolant will be considered as a flammable fluid. This will be part of the specific guidance provided as part of the EHPS.100 and EHPS.30 as there is a need to take into account the installation.
280	SAFRAN	EHPS.310 & EHPS.320	15	Associated AMC to §EHPS.320	Nota: AMC to §EHPS.320 should also cover the liquid systems	Yes	No	Accepted	Indeed, any type of cooling system should be considered in the MoC.
281	Rolls-Royce	EHPS.310 Lubrication system	15	No reference to: - appropriate type of oil declaration - oil contamination limits and protection - impact on EHPS when the oil flows between the EHPS lubrication system and the Propeller control system.	Consider to add reference to the identified items	Yes	No	Accepted	Appropriate type of oil requirement has been added. Oil contamination limits and protection is now covered by new EHPS.310(b), EHPS25 and EHPS.30(b)(8). Impact on EHPS when the oil flows between the EHPS lubrication system and the Propeller control system is covered by EHPS.310(a) and the specific guidance that will be provided as part of the MoC (based on CS-E 270).
282	AIRBUS	EHPS.310 Lubrication System	15	Airbus consider that the requirement to substantiate and declare approved oil specifications should be maintained in this Special Condition	Airbus propose to update the wording of EHPS.310 Lubrication System - as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.310 Lubrication system</b> (a) Any lubrication system of the EHPS must be designed and constructed so as to ensure the proper functioning of the EHPS in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate. <u>(b) Each brand and type of oil to be approved, and the associated limitations, must be declared and substantiated.</u> <u>(c)</u> Any reliance placed upon the assumed installed conditions or installation requirements must be declared in the instructions for installation as defined in EHPS.30.	N	Y	Accepted	This covered by EHPS.30(b)(8)

283	TCCA	EHPS.310 EHPS.320 EHPS.340	15	Some requirement use the generic statements (x) Any ____ system of the EHPS must be designed and constructed so as to ensure the proper functioning of the EHPS in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate. (xx) Any reliance placed upon the assumed installed conditions or installation requirements must be declared in the instructions for installation as defined in EHPS.30. Understanding that these rules are written using the Performance Based Rulemaking philosophy, several requirements using the generic wording invoke the question of whether multiple rules can be folded into each other. Additionally to appearing redundant, the high-level nature of the rules might make it difficult for applicant's to propose MoC that meet the expectations of the Authorities.	For very high-level generic rules, expand each requirement to describe the intent of the rules as it pertains to the system in question.			Partially accepted	Each high level requirement is indeed applicable to these systems. However, how to show compliance may differ pending the technology that is used. For example, an oil lubricated system is deemed different than a greased one. Specific guidance will be provided in the Means of Compliance.
284	FAA AS	EHPS.310(a)	15	Why doesn't this include the same sub-paragraph (b) as the fuel system? Example: water in the oil causes corrosion. The sub-paragraph (b) above may imply filtration systems to limit oil contamination, or contamination detection systems.		Yes		Accepted	New EHPS.310(b) has been added.
285	Rolls-Royce	EHPS.320	16	Is it worth having a paragraph parallel to EHPS.300(b)? Loss of cooling could lead to Hazardous EHPS Effects. There is potential to specify that, if Hazardous EHPS Effects are possible from loss of cooling, then the cooling system strategy should employ redundancy, diversity or other measures to ensure that cooling capability is not lost completely by any single failure.	Consider analogue of EHPS.300(b) for cooling system	Yes	No	Partially accepted	This is part of the safety assessment that should be made as requested by EHPS.80. EHPS.300(b) is more dedicated to the presence of contaminants.
286	Rolls-Royce	EHPS.320	15	Cooling does not include a provision for contamination, but experience with other fluid means shows that it is good practice to include such provisions	include a provision for contamination <See also comment 18>	Yes	No	Not accepted	This would create an inconsistency with CS-E and would not ease the use of certified engines as part of the EHPS. Specific guidance could be provided to propose the best practices.
287	Airbus DS	EHPS.320	15	Cooling of electrical systems is sometimes used as part of the electrical isolation strategy of the electrical component.	Proposal is to mention that if coolant is acting also as electrical isolator, loss of cooling shall take that into account as an additional risk.	Yes	No	Partially accepted	This is part of the safety assessment that should be made as requested by EHPS.80. Specific guidance will be provided in the MoC.
288	Airbus Group (ADS)	EHPS.320	15	“(a) The design and construction of the EHPS cooling system must ensure adequate cooling in all normal operating conditions within the declared flight envelope.” Missing CS-E 260 requirement that appropriate means or provision for liquid-cooled Engines means shall be provided to detect loss of coolant	Consider add missing requirement	Yes	No	Partially accepted	This is part of the safety assessment that should be made as requested by EHPS.80. Specific guidance will be provided in the MoC.
289	TCCA	EHPS.320	15	Consideration of foreign matter ingestion, if the source of cooling is external air?	Consider adding requirement regarding capability to withstand or preclusion of such foreign matter.			Accepted	This is already covered by EHPS.290. If the cooling system is damaged or impaired by a FOD, this will lead to an increase of temperature above the temperature limits and that is covered by EHPS.290 (b)(3). Specific guidance will be provided in the Means of Compliance
290	TCCA	EHPS.320	15	The internal combustion engine and electrical motors/generators might have completely different cooling systems based on different types cooling media.	Include the liquid cooling boiling concerns over the flight envelope.			Partially accepted	This is intended to be covered by EHPS.320(a). Specific guidance will be provided in the Means of Compliance.

291	AIRBUS	EHPS.320 Cooling System	15	Airbus propose to amend the wording to be consistent with the previous fuel and lubrication system paragraphs	Airbus propose to update the wording of EHPS.320 Cooling System - as follows (new proposed text shown in <u>underlined italic</u> font): <u>(a) Any cooling system of the EHPS must be designed and constructed so as to ensure the proper functioning of the EHPS in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate. The design and construction of the EHPS cooling system must ensure adequate cooling in all normal operating conditions within the declared flight envelope.</u> <u>(b) Each brand and type of cooling fluid to be approved, and the associated limitations, must be declared and substantiated</u> <u>(c) Any reliance placed upon the assumed installed conditions or installation requirements must be declared in the instructions for installation as defined in EHPS.30.</u>	N	Y	Accepted	Corrected accordingly.
292	FAA DJ	EHPS.320(a)	15	Relative to « ... and is substantiated by a verification methodology acceptable to the Agency. » What does normal mean? Normal operating conditions could, especially for a UAS, mean just about anything.		Yes		Noted	EHPS.320 has been reworded.
293	General Aviation Manufacturers Association	EHPS.330	16	EHPS 330- (b) - Why catastrophic is not included?	(b) The failure of equipment installed on or driven by the EHPS must not result in further damage likely to produce a Hazardous <b>or Catastrophic</b> EHPS Effect.	Major/conceptual		Partially accepted	Catastrophic Effect is now considered but at aircraft level.
294	SAFRAN	EHPS.330	16	Equipment applicability / EHPS sub-system / MoC	This requirement are derived from CS-E 80 but should applicable only to EHPS sub-system and not to the whole EHPS (as for the turbine engine). The considered equipment are those which are mounted on the sub-system. Proposed text for EHPS.330(a) : “Mountings and drives for all equipment to be installed on the EHPS <b>sub-system</b> must be designed to permit safe operation of the EHPS with the equipment fitted” Same philosophy should apply to (b), (c), (d) requirements Does the considered equipment are only those defined in the EHPS type design or also those part of the aircraft type design (and mounted on the EHPS sub-system, as the same as for CS-E 80(c)) ?	Yes	Yes	Accepted	Corrected accordingly
295	TCCA	EHPS.330	16	In (d) missing dot; should read "EHPS.20"	Suggest to revise text, if needed			Accepted	Corrected accordingly
296	TCCA	EHPS.330	16	Some systems might be essential for the safe continuation of flight.	Define the concept of essential systems for flight continuation that needs to sustain a defined level of electrical power.			Not accepted	The list of essential systems for flight continuation has to be provided by the aircraft manufacturer depending on the aircraft architecture and characteristics. This exchange of information is ensured via to the top/down approach requested in EHPS.80. EHPS.330 addresses only the equipment mounted on the sub-systems of the EHPS (like a starter for a turbine engine)
297	TCCA	EHPS.330	16	Note comment for the Subpart A/page 17	Suggest to redefine the concept.			Not accepted	Refer to answer provided for comment for Subpart A
298	Volocopter	EHPS.330 (a)	17	Could EASA please elaborate on the definition of “drives” mentioned in EHPS.330(a)?		Yes		Accepted	Specific guidance will be provided as AMC E 80.



## EASA–SC E-19 Electric / Hybrid Propulsion System - Comment Response Document

299	AIRBUS	EHPS.330 Equipment	16	The equivalent requirement in CS-E (CS-E 80) is really limited to the design of mounting and drives of the equipment. Airbus consider that the same spirit should be maintained in this Special Condition and that the proposed sub-paragraph (b) should be reworded accordingly.	Airbus propose to update the wording of EHPS.330 Equipment - as follows (new proposed text shown in <u>underlined italic</u> font): (a) Mountings and drives for all equipment to be installed on the EHPS must be designed: (i) to permit safe operation of the EHPS with the equipment fitted. (ii) <u>to prevent the failure of equipment to result in further damage likely to produce a hazard (High Energy Debris or propeller Release, Hazardous or Catastrophic aircraft effect)</u> (c) Each item of installed equipment must be installed according to the limitations specified for that equipment.	N	Y	Partially accepted	Hazardous EHPS effect is not limited to the release of High Energy Debris. Haz and Cat Aircraft Effect are now considered.
300	VOLTAERO	EHPS.330 Equipment	16	The modern code such as the amendment 5 of the CS-23 defines the reliability at the level of the aircraft and not at the level of the equipment. Its seems unconsistant to use a terminology as “Hazardous EHPS effect”.	We recommend to modify the paragraph : - Deleting (b) and (d) - Renumbering ( c ) in (b).	YES	NO	Not accepted	SC E-19 is not dedicated to CS-23 or a type of aircraft.
301	SAFRAN	EHPS.340	16	Ignition / start-restart capability	§(b) should be linked to § EHPS.460 dealing with starting/restarting capability. Proposal : “...in which the EHPS is expected to operate in accordance with EHPS.460(b)(2).”	No	Yes	Accepted	This will be part of the specific guidance provided in the MoC.
302	Embraer S.A.	EHPS.340	16	CS-E 240 requirements should be applicable. Recommended to refer to CS-E 240 requirements.	Refer to CS-E 240 requirements.	yes	no	Partially accepted	EHPS is not limited to the use of piston engines. The requirements are objective base requirements allowing to provide specific guidance depending on the nature of the EHPS sub-systems. As such, CS-E 240 will be used to create the specific guidance asit was stated in the paragraph "Means of Compliance"
303	FAA WM	EHPS.340(a)	16	Unclear requirement. Ignition system simply needs to provide uninterrupted service when/if required. This leaves room for dual ignition systems or higher reliability single ignition systems.		Yes		Noted	This requirement is an objective base requirement allowing to provide specific guidance depending on the nature of the EHPS sub-systems.
304	FAA WM	EHPS.340(a)	16	In reference to « in all flight attitudes and « : Why attitudes? How do attitude impact Ignition ? Did you mean altitudes?		Yes		Noted	Altitude is part of the atmospheric conditions. The ignition system is not limited to spark plugs or equivalent means. It must be considered in conjunction with the fuel system which can be affected by the aircraft attitude.
305	Lange Aviation GmbH	EHPS.350	18	“Reasonable assurance” is an abstract and undetermined expression.	Should be defined in terms of probabilities depending on severity of potential effect.	Yes		Accepted	Consistency with CS-E should be maintained. Specific guidance will be provided in similar way as AMC E 50(e).
306	UK CAA	EHPS.350	17	CS-E 50 Engine Control System has para (h) that addresses Aircraft-Supplied Electrical Power. There does not appear to be an equivalent in the EHPS Special Condition. Why is this not addressed as it will still need to be considered for the Engine Control System?	Include consideration of aircraft-supplied electrical power for the Engine Control System.	Yes		Partially accepted	CS-E.50 is intended for single engine. However, on full electric distributed propulsion, the EHPS control system is fully relying on the aircraft power supply. A complete loss of the aircraft electric power supply will lead to the total loss of power which is a considered as a Catastrophic Aircraft Effect. Therefore, the aircraft power supply should be part of the safety assessment to be performed according EHPS.80. Specific guidance will be provided.
307	SAFRAN	EHPS.350	17/18	General	As a remark, the EHPS Control System could be made of an EHPS general control system plus EHPS Sub-System control (as for Engine Control System). In the definition of the EHPS Control System, energy storage is excluded while it is included in the EHPS Sub-System definition à It is propose to include the Energy Storage Control System in the EHPS Control System as an Energy Storage System may be dedicated to propulsive function.			Accepted	Exclusion has been removed.
308	SAFRAN	EHPS.350	17/18	AMC	(a) may be interpretative, AMC needed			Accepted	Specific guidance will be provided in the Means of Compliance.
309	SAFRAN	EHPS.350	17/18	Flight Envelope definition	(b) The difference between ‘flight envelope’ and ‘operational envelope’ may have to be explained.			Accepted	Replaced by "in all flight attitudes and atmospheric conditions in which the EHPS is expected to operate."

310	SAFRAN	EHPS.350	17/18	A/C Certification basis	(e)(2) There is an inconsistency with this paragraph. Only the Aircraft TC Holder can demonstrate compliance with the aircraft safety objectives. For the Aircraft it is the Aircraft TCH. This Special Condition requirement applies to an EHPS applicant (with its own Certification Basis). Proposed text: (2) Not have any single failures that result in Hazardous EHPS Effect(s) or <del>Catastrophic Aircraft Effect</del> ; and..			Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
311	SAFRAN	EHPS.350	17/18	Electrical effect for local event	(e)(3) : in addition to effects listed for local event, electrical event could be also added. Proposed text : “.. or : Electrical Arcing ,Mechanical Jamming or Failure ....”			Accepted	Electrical arcing added
312	SAFRAN	EHPS.350	17/18	Protection system	(f) this paragraph seems partially redundant with the §(a) for which exceedance of operating limitations has to be avoided. Concerning Protection system, does the objective of the § aim at be focused on the availability of the function during maintenance intervals?			Accepted	Paragraph dedicated to Protection Systems has been rewored.
313	SAFRAN	EHPS.350	17/18	Power command signal and electrical power excluded	(g) Aircraft-supplied data ==> same remark as for (e)(2) for Catastrophic Aircraft Effect +why exclude power command signals ? Why the Aircraft supplied electrical power are excluded from this requirement? Why not include also aircraft-supplied electrical power ?			Partially accepted	CS-E.50 is intended for single engine. However, on full electric distributed propulsion, the EHPS control system is fully relying on the aircraft power supply. A complete loss of the aircraft electric power supply will lead to the total loss of power which is a considered as a Catastrophic Aircraft Effect. Therefore, the aircraft power supply should be part of the safety assessment to be performed according EHPS.80. Specific guidance will be provided.
314	SAFRAN	EHPS.350	17/18	EHPS perimeter	(h) ‘That may result in adverse effect on the safety of the aircraft’ à It is proposed to remain at EHPS level: "that may result in adverse effects on the specification flown down by the aircraft applicant to allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application safety of the aircraft". This may be defined in a separate requirement if it sought to be applied not only to EHPS Control System.			Accepted	Requirement targeted to EHPS.
315	General Aviation Manufacturers Association	EHPS.350	17	EHPS 350- (2) The environmental limits must be established and documented in the Installation Manual required by EHPS.30	Add A/RFMS specifically since installation manual may not include A/RFMS..	Major/conceptual		Accepted	Replaced by "Instructions for installation and operation of the EHPS ". As stated by EHPS.30, this can be part of the relevant aircraft manuals.
316	The Boeing Company	EHPS.350	18	“(f) Protection systems The design and functioning of EHPS control devices and systems, together with EHPS instruments and operating and maintenance instructions, must provide reasonable assurance that the EHPS operating limitations will not be exceeded in service.” Needs Clarification: an exceedance of continuous engine operating limits up to the approved transient limits may happen in emergency conditions. It is important to detect the transient and be sure that the maximum transient does not have detrimental effects.	“(f) Protection systems The design and functioning of EHPS control devices and systems, together with EHPS instruments and operating and maintenance instructions, must provide reasonable assurance that the EHPS operating limitations will not be exceeded in <b>normal operating</b> service.”	no	yes	Noted	Paragraph dedicated to Protection Systems has been rewored.

317	SAFRAN	EHPS.350	18	EHPS stop requirement	A requirement to have a means to stop the EHPS (as CS-E 50 (k)) could be still required as the 'inability to shut down the engine' is considered as a HAZ EHPS effect. MoC à discussion should held around the applicability of the AMC 20-3 MoC for the EHPS (applicability of the LOPC rate, general philosophy of primary system and backup system, etc....).			Accepted	Paragraph added to deal with EHPS stop and isolation.
318	TCCA	EHPS.350	18	In (f) Revise to read "(1) The design..." In (f) Add "...limitations, that affect the structural integrity of the <u>rotating parts or the electrical integrity of the EPU electrical system</u> , will..." In (f) Add “ (2) When electronic overspeed protection systems are provided, the design must include a means for testing, at least once per EPU start/stop cycle, to establish the availability of the protection function. The means must be such that a complete test of the system can be achieved in the minimum number of cycles. If the test is not fully automatic, the requirement for a manual test must be contained in the EPU instructions for operation.” In (f) Add "(3) When overspeed protection is provided through hydromechanical or mechanical means, it must be demonstrated by test or other acceptable means that the overspeed function remains available between inspection and maintenance periods." Add: "(i) <u>EHPS control system electrical power</u> (1) The EHPS control system must be designed such that the loss, malfunction, or interruption of the EHPS control system electrical power source will not result in a hazardous EHPS effect, unacceptable transmission of erroneous data, or continued EHPS operation in the absence of the control function. (2) If any electrical power is supplied from the aircraft to the EHPS control system for powering on and operating the EHPS, the need for and the characteristics of this electrical power, including transient and steady state voltage limits, must be identified and declared in the EHPS installation <u>manual</u> . <u>(j) EHPS shut down means</u> Means must be provided for shutting down the EHPS rapidly."	Suggest to revise and add text, if needed			Partially accepted	Paragraph EHPS.350(f) has been reworded and addresses the comment.  EJPS control system electrical power supply: CS-E.50 is intended for single engine. However, on full electric distributed propulsion, the EHPS control system is fully relying on the aircraft power supply. A complete loss of the aircraft electric power supply will lead to the total loss of power which is a considered as a Catastrophic Aircraft Effect. Therefore, the aircraft power supply should be part of the safety assessment to be performed according EHPS.80. Specific guidance will be provided.  EHPS shut down means: covered by EHPS.350(d).
319	TCCA	EHPS.350	17	Paragraph (b) The use of the terminology “Complex Electronic Hardware” could cause confusion with respect to the scope of what should be addressed by this paragraph. The suggestion is to use the same terminology as the recent EASA’s AMCs and CMs .Use “Airborne Electronic Hardware”.	Replace “Complex Electronic Hardware” by “Airborne Electronic Hardware”			Accepted	Corrected accordingly.
320	TCCA	EHPS.350	17	The SC removed evaluation and documentation of resulting operability characteristics from: CS-E 50(g) Aircraft-Supplied Data (2) be detected and accommodated. The accommodation strategy must not result in an unacceptable change in thrust or power or an unacceptable change in Engine operating and starting characteristics. The effects of these Failures on Engine power or thrust, Engine operability and starting characteristics throughout the flight envelope must be evaluated and documented.	Expand to include the intent of the CS-E version of the rule, in a manner consistent with PBR style.			Accepted	Added accordingly.

321	TCCA	EHPS.350	17	In reference to: “CS-E 50 (j) Engines having a 30-Second OEI Power rating must incorporate means or provision for means for automatic availability and automatic control of the 30-Second OEI Power within its operating limitations (see AMC E 50(j)).“ Instead of x-time OEI, there may be high thrust availability designed to compensate for loss of thrust of some propulsors (loss of 3 thrusters out of 5), and a rating associated to the mode.	Adapt and include CS-50(j) to account for controls related to augmented thrust time-limited modes of operation. Review other paragraphs from CS-E 50 for applicability.			Accepted	Added accordingly.
322	TCCA	EHPS.350	17	Removed: CS-E 50 (k) Means for shutting down the Engine rapidly must be provided.	This requirement may still be applicable, both for the turbine or piston portions of a hybrid design, but also for cutting electrical loads in various situations.			Accepted	It is covered by EHPS.350 (d)
323	FAA DJ	EHPS.350 (b)	17	It would be good to keep this high level to potentially use the System Verification Policy. Harmonization talks are planned in this area for early summer with EASA.		Yes		Noted	EHPS.350(b) has been renamed to reflect the development assurance aspects. Development assurance has also been added to EHPS.80(a)(3).
324	FAA GH	EHPS.350 (i)	18	Requirements for electrical power to the control has been lost.	Add it back in.		Yes	Partially accepted	CS-E.50 is intended for single engine. However, on full electric distributed propulsion, the EHPS control system is fully relying on the aircraft power supply. A complete loss of the aircraft electric power supply will lead to the total loss of power which is a considered as a Catastrophic Aircraft Effect. Therefore, the aircraft power supply should be part of the safety assessment to be performed according EHPS.80. Specific guidance will be provided.
325	Rolls-Royce	EHPS.350 Control System	17	Paragraph (f) Protection system This paragraph (f) does not refer to protection. <see also comment 36>	The protection system must be designed and constructed so that foreseeable Failures or malfunctions leading to local events in the intended aircraft application, such as fire, overheat must not result in loss of the protection function	Yes	No	Accepted	Paragraph dedicated to Protection Systems has been reworted.
326	Rolls-Royce	EHPS.350 Control System	18	There is no equivalent to CS-E50 (c )(2) 'in the Full-up Configuration, the system is essentially single Fault tolerant for electrical and electronic Failures with respect to LOTC/LOPC events'. that rule can be a substantial control system architecture driver, so if it applies, it should be included in the rules, not just the AMCs. (see also comment 22)	Consider including an equivalent to CS-E50 (c )(2) in EHPS.350	Yes	No	Partially accepted	The term "essentially" is always subject to discussions during engine certification and does not consitute a clear requirement. CS-E is dedicated to single engine design (while considering generic installations to define generic safety objectives like the CS-E 50(c)(2)). SC E-19 derives directly the safety objectives from the intended aircrfat application.
327	Rolls-Royce	EHPS.350 Control System	18	Not convinced that (e )(3) adds anything to (e )(2).	leave out (e )(3)	Yes	No	Not accepted	A local event may not be the result of a single failure.
328	Rolls-Royce	EHPS.350 Control System	18	(f) covers CS-E50 (e ) but at higher level; given the high level of (f) I am not convinced it adds anything to (a).	leave out (f)	Yes	No	Partially accepted	Paragraph dedicated to Protection Systems has been reworted.
329	Rolls-Royce	EHPS.350 EHPS Control System	18	"The design and functioning of EHPS control devices and systems, together with EHPS instruments and operating and maintenance instructions, must provide reasonable assurance that the EHPS operating limitations will not be exceeded in service." What is "reasonable assurance"? Is this related to the safety assessment? In which case should the level of assurance not be commensurate with the hazard being protected?	Define "reasonable assurance".	Yes	No	Noted	Paragraph dedicated to Protection Systems has been reworted.
330	Rolls-Royce	EHPS.350 EHPS Control System	18	EHPS.350 (g) excludes the power command signal from this regulation (as does CS-E 50) but I would have thought that more should be done to ensure that loss or corruption of the power command signal should be detected and accommodated.	Consider including the power command signal in the scope of the regulation.	Yes	No	Accepted	Corrected accordingly



331	Werner Scholz, European Sailplane Manufacturers	EHPS.350 EHPS Control System	17	The requirement (b) for the design assurance could become a difficult task especially when applied onto the software development. Here the limited possibilities for developers for the small aircraft sector could be exceeded very fast.	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
332	AIRBUS	EHPS.350 EHPS Control System	17	Sub-paragraph (a) should be completed to include a requirement to provide adequate power response to control inputs. This is identified today in CS-E and also in CS 25 and should be maintained. The intent of sub-paragraph (d) is not obvious. It is not clear what added value it brings compared to § EHPS.490 and EHPS.30. Sub-paragraph (f) seems to be redundant with sub-paragraph (a). Sub-paragraph (g) may be combined with sub-paragraph (e) Sub-paragraph (d) could be combined with subparagraph (a) The time limited dispatch requirement could be added to this EHPS Control system paragraph	Airbus propose to update the wording of EHPS.350 EHPS Control System - as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.350 EHPS Control System</b> (a) The EHPS control system <u>design must be such that:</u> (1) the EHPS does not experience any unacceptable operating characteristics <u>(including unacceptable power oscillations)</u> or exceed any of its operating limitations (2) <u>it performs its intended function throughout the declared A/C operational envelope in a manner which:</u> (i) <u>enables immediate modulation of EHPS power following flight crew command with adequate sensitivity</u> (ii) <u>enables selected values of relevant control parameters over changing atmospheric conditions</u> (iii) <u>complies with the operability specifications under EHPS.460</u>	N	Y	Accepted	Paragraph (a) has been corrected accordingly. Paragraph (d) has been removed as covered by EHPS.30 and EHPS.330a dn replaced by EHPS isolation. Paragraph dedicated to Protection Systems has been reworded. Time limited dispatch is kept separated as not required for the certification. It is considered easier to keep it separated from EHPS.350.
333	AIRBUS	EHPS.350 EHPS Control System	17	Sub-paragraph (a) should be completed to include a requirement to provide adequate power response to control inputs. This is identified today in CS-E and also in CS 25 and should be maintained. The intent of sub-paragraph (d) is not obvious. It is not clear what added value it brings compared to § EHPS.490 and EHPS.30. Sub-paragraph (f) seems to be redundant with sub-paragraph (a). Sub-paragraph (g) may be combined with sub-paragraph (e) Sub-paragraph (d) could be combined with subparagraph (a) The time limited dispatch requirement could be added to this EHPS Control system paragraph	(b) Design Assurance Any software and complex electronic hardware, including programmable logic devices, shall be designed and developed using a structured and methodical approach that provides a level of assurance <u>for the logic</u> , that is commensurate with the severity of the hazard associated with the failure or malfunction of the system <u>using this software or hardware</u> , and is substantiated by a verification methodology acceptable to the Agency.	N	Y	Accepted	Corrected accordingly.
334	AIRBUS	EHPS.350 EHPS Control System	17	Sub-paragraph (a) should be completed to include a requirement to provide adequate power response to control inputs. This is identified today in CS-E and also in CS 25 and should be maintained. The intent of sub-paragraph (d) is not obvious. It is not clear what added value it brings compared to § EHPS.490 and EHPS.30. Sub-paragraph (f) seems to be redundant with sub-paragraph (a). Sub-paragraph (g) may be combined with sub-paragraph (e) Sub-paragraph (d) could be combined with subparagraph (a) The time limited dispatch requirement could be added to this EHPS Control system paragraph	(c) EHPS control system failures. The EHPS control system must: (1) Meet the safety objectives of the intended aircraft application; (2) Not have any single failures <u>(including loss of or corruption of aircraft-supplied data)</u> that result in <u>High Energy Debris or Propeller Release</u> or Catastrophic Aircraft Effect; and (3) Be designed and constructed so that foreseeable Failures or malfunctions leading to local events in the intended aircraft application, such as fire, overheat or Failure leading to damage to EHPS Control System components, must not result in <u>a High Energy Debris or Propeller Release</u> or Catastrophic Aircraft Effect due to EHPS Control System Failures or malfunctions.	N	Y	Not accepted	Hazardous EHPS effect is not limited to the release of High Energy Debris.
335	AIRBUS	EHPS.350 EHPS Control System	17	Sub-paragraph (a) should be completed to include a requirement to provide adequate power response to control inputs. This is identified today in CS-E and also in CS 25 and should be maintained. The intent of sub-paragraph (d) is not obvious. It is not clear what added value it brings compared to § EHPS.490 and EHPS.30. Sub-paragraph (f) seems to be redundant with sub-paragraph (a). Sub-paragraph (g) may be combined with sub-paragraph (e) Sub-paragraph (d) could be combined with subparagraph (a) The time limited dispatch requirement could be added to this EHPS Control system paragraph	(d) Information system security protection. EHPS control systems, including networks, software and data, must be designed and installed so that they are protected from intentional unauthorized electronic interactions that may result in adverse effects on the safety of the aircraft. The security risks and vulnerabilities must be identified, assessed and mitigated as necessary. The applicant must make procedures and instructions for continued airworthiness (ICA) available that ensure that the security protections of the EHPS controls are maintained.	N	Y	Noted	



336	AIRBUS	EHPS.350 EHPS Control System	17	Sub-paragraph (a) should be completed to include a requirement to provide adequate power response to control inputs. This is identified today in CS-E and also in CS 25 and should be maintained. The intent of sub-paragraph (d) is not obvious. It is not clear what added value it brings compared to § EHPS.490 and EHPS.30. Sub-paragraph (f) seems to be redundant with sub-paragraph (a). Sub-paragraph (g) may be combined with sub-paragraph (e) Sub-paragraph (d) could be combined with subparagraph (a) The time limited dispatch requirement could be added to this EHPS Control system paragraph	(e) If approval is sought for dispatch with Faults present in an EHPS control system, a time limited dispatch (TLD) analysis of the EHPS control system must be carried out to determine the dispatch and maintenance intervals. <u>The time-weighted-average of the Full-up Configuration and all allowable dispatch configurations with Faults must meet the safety objectives of the intended aircraft application</u> and For each <u>proposed</u> dispatchable configuration, it must be shown by test or analysis that: (1) The EHPS remains capable of meeting all EHPS specifications for the operability aspects covered by EHPS.460 (2) The ability to control the EHPS within limits is maintained; (3) Protection is maintained against <u>High Energy Debris or Propeller Release</u> and Catastrophic Aircraft Effect, if provided solely by the EHPS control system and shown to be necessary by the safety analyses required under EHPS.80 and EHPS.350; (4) A means is maintained to provide necessary signals to identify EHPS control system Faults; (5) A further single Failure in the EHPS control system will not produce <u>a High Energy Debris or Propeller Release or a</u> Catastrophic Aircraft Effect; (6) The Engine continues to meet its certification specifications for external threats; (7) The proposed dispatch interval is justified.	N	Y	Not accepted	Hazardous EHPS effect is not limited to the release of High Energy Debris.
337	FARADAY aerospace	EHPS.350 EHPS Control System (a)	17	Can the Agency details what are "unacceptable operating characteristics"		Yes	No	Accepted	Specific guidance will be provided in the Means of Compliance.
338	VOLTAERO	EHPS.350 EHPS Control System	17	The EHPS designer does not know the safety level of the aircraft.	We recommend to modify the paragraph (b): “(b) Design Assurance Any software and complex electronic hardware, including programmable logic devices, shall be designed and developed using a structured and methodical approach <del>that provides a level of assurance for the logic, that is commensurate with the severity of the hazard associated with the failure or malfunction of the systems in which the devices are located, and is substantiated by a verification methodology acceptable to the Agency.</del> “	YES	NO	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
339	VOLTAERO	EHPS.350 EHPS Control System	17	The EHPS failures are already dealt with in EHPS.80 Safety assessment.	We recommend to modify the paragraph : - Delting (e) - Renumbering (f) in (e).	YES	NO	Partially accepted	Paragraph dedicated to Protection Systems has been reworted. Specific requirement applies on top of the safety objectives derived from the EHPS.80.
340	VOLTAERO	EHPS.350 EHPS Control System	18	The EHPS designer does not know the safety level of the aircraft. The EHPS failures are already dealt with in EHPS.80 Safety assessment.	We recommend to modify the paragraph : - Delting (g) - Renumbering (h) in (f).	YES	NO	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
341	FAA DK	EHPS.350(e)	17	Add item	(4) Not have any single electrical or electronic failures that result in Hazardous EHPS Effect(s). This applies to hard faults (short circuits, open circuits, out-of-range) and soft faults (in-range shifts, drifts, erratic fluctuations)	Yes		Accepted	Covered by 350(e)(2). Specific guidance will be provided in the MoC to define the nature of the failure including hard (short circuits, open circuits, out-of-range) and soft faults (in-range shifts, drifts, erratic fluctuations).

342	Embraer S.A.	EHPS.350(e)	17	The EHPS manufacturer should not be responsible to define what are the Major, Hazardous or Catastrophic Aircraft Effects. This categorization will be very dependent of the aircraft propulsion architecture and this analysis should be made by the aircraft manufacturer. Recommended to delete any reference to aircraft level effects.	We suggest to change the text from: (e) EHPS control system failures. The EHPS control system must: (1) Meet the safety objectives of the intended aircraft application; (2) Not have any single failures that result in Hazardous EHPS Effect(s) or Catastrophic Aircraft Effect; and (3) Be designed and constructed so that foreseeable Failures or malfunctions leading to local events in the intended aircraft application, such as fire, overheat or Failure leading to damage to EHPS Control System components, must not result in a Hazardous EHPS Effect or Catastrophic Aircraft Effect due to EHPS Control System Failures or malfunctions. To: (e) EHPS control system failures. The EHPS control system must: (1) Meet the applicable safety objectives; (2) Not have any single failures that result in Hazardous EHPS Effect(s); and (3) Be designed and constructed so that foreseeable Failures or malfunctions leading to local events in the intended aircraft application, such as fire, overheat or Failure leading to damage to EHPS Control System components, must not result in a Hazardous EHPS Effect due to EHPS Control System Failures or malfunctions.	yes	no	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
343	FAA GH	EHPS.350(e)(2) and (3) Also in (g)(1)	17	Once again, I believe that inclusion of Aircraft Effects is an overreach. The engine manufacturer is less that qualified to make that level of judgement. That is the role of the installer. While I agree that the engine manufacturer needs to be aware of these threats he is not the best individual to certify these facts.		Yes	Yes	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
344	Vertical Aerospace	EHPS.350(f)	18	What does EASA mean by 'reasonable assurance'?	Provide clarity on what 'reasonable assurance' means to the agency	Yes		Noted	Paragraph dedicated to Protection Systems has been rewored.
345	FAA DJ	EHPS.350(g)	18	A total loss of thrust for most eVTOLs would be catastrophic.		Yes		Noted	This has to be assessed as requested per EHPS.80.
346	Vertical Aerospace	EHPS.350(g)	18	More clarify is required on the following: "Single failures leading to a loss, interruption or corruption of aircraft-supplied data (other than power command signals from the aircraft)"	AMC to define the types of 'power command signals', this could include speed control (i.e. RPM command), or it may include torque control but not necessarily speed.	Yes		Noted	Following received comments, the exclusion has been removed.
347	Embraer S.A.	EHPS.350(g)	18	Aircraft level system safety assessment should evaluate effects on the aircraft and it is not required to evaluated by this SC.	We suggest to change the text from: (g) Aircraft-supplied data. Single failures leading to a loss, interruption or corruption of aircraft-supplied data (other than power command signals from the aircraft), or aircraft-supplied data shared between independent EHPS or independent engines of a EHPS must: (1) Not result in a Hazardous EHPS Effect or Catastrophic Aircraft Effect for any EHPS installed on the aircraft; and (2) Be detected and accommodated. To: (g) Aircraft-supplied data. Single failures leading to a loss, interruption or corruption of aircraft-supplied data (other than power command signals from the aircraft), or aircraft-supplied data shared between independent EHPS or independent engines of a EHPS must:	yes	no	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.

					(1) Not result in a Hazardous EHPS Effect; and (2) Be detected and accommodated.				
348	FAA AS	EHPS.350(g)(1) and (2)	18	This implies to me that total loss of thrust, landing off-site, etc. are acceptable. Given that this is a design choice (single input from the airplane that could affect all engines), maybe the requirements from EHPS 290(b) would be more appropriate.		Yes		Noted	EHPS.350 (g)(1) and (g)(2) do not imply this. The criticality of such events should be made at aircraft level by the aircraft manufacturer.
349	FAA DJ	EHPS.355	18	Shouldn't one high level rule be written and have (a) thru (e) be addressed in the MOC? The MOC requirements seem like they could vary considerably between fixed wing, rotorcraft/eVTOL, and UAS.		Yes		Not accepted	Same methodology and requirements as for CS-E. (a) is important as it defines the non obligation to show compliance to this requirement. (b) provides additional safety and operational requirements for each dispatchable configuration. Detailed guidance is provided as per ARP5107B. Similar guidance should be made for EHPS control system.
350	Lange Aviation GmbH	EHPS.355	18	"EHPS" instead of "Engine" in several instances	Search document for "engine" and replace with "EHPS" where appropriate	Yes		Accepted	Corrected accordingly.
351	Rolls-Royce	EHPS.355	18	(b)(6) Typo: Substitute "EHPS" instead of "Engine"	Substitute wording	Yes	No	Accepted	Corrected accordingly.
352	SAFRAN	EHPS.355	18	AMC	An AMC is needed to define the perimeter that could be covered in this requirement (named here EHPS Control System). The philosophy for the EHPS dispatch is understood as the same as for Engine Dispatch, please explain.			Accepted	Specific guidance will be provided as part of the Means of Compliance.
353	SAFRAN	EHPS.355	18	EHPS perimeter	'Catastrophic Aircraft Effect' à There is an inconsistency with this paragraph. Only the TC Holder can demonstrate compliance with the aircraft safety objectives. For the Aircraft it is the Aircraft TCH. This Special Condition requirement applies to a EHPS applicant (with its own Certification Basis). Engine word left, proposed text : (5) A further single Failure in the EHPS control system will not produce a Hazardous EHPS Engine Effect (6) The EHPS-Engine continues to meet its certification specifications for external threats; (7) The requirement includes all aircraft safety objectives à please explain ?			Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
354	General Aviation Manufacturers Association	EHPS.355	18	EHPS 355-(b) For each dispatchable configuration it must be shown by test or analysis that:- 'or' may be an issue here.	(b) For each dispatchable configuration it must be shown by test <b>and</b> analysis that:	Minor		Not accepted	Same methodology and requirements as for CS-E. (a) is important as it defines the non obligation to show compliance to this requirement. (b) provides additional safety and operational requirements for each dispatchable configuration. Detailed guidance is
355	FAA PH	EHPS.355 (b)(5)	18	It may not be appropriate to include aircraft level effects here. Again overreach			Yes	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
356	FAA AS	EHPS.355 (d)	19	Is there an ALS? Otherwise requiring operators to follow the TLD may not be legally enforceable		Yes		Noted	The ALS is part of the ICA requested in EHPS.25.

357	AIRBUS	EHPS.355 Time-Limited Dispatch	18	This paragraph could be combined with EHPS.350 as it pertains to the Control System	See proposal above	N	Y	Not accepted	Time limited dispatch is kept separated as not required for the certification. It is considered easier to keep it separated from EHPS.350. Specific guidance may have to be developed to support new intended aircraft architectures.
358	VOLTAERO	EHPS.355 Time-Limited Dispatch	18	The EHPS designer does not know the safety level of the aircraft.	We recommend to modify the paragraph (b) (5): (5) A further single Failure in the EHPS control system will not produce a Hazardous Engine Effect <del>or a Catastrophic Aircraft Effect;</del> “	YES	NO	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.
359	Embraer S.A.	EHPS.355(b)	18	Analysis for each dispatchable configuration that is related to an aircraft effect should be evaluated under CS-MMEL requirements.	We suggest to change the text from: (b) For each dispatchable configuration it must be shown by test or analysis that: (1) The EHPS remains capable of meeting all EHPS specifications for the operability aspects covered by EHPS.460 (2) The ability to control the EHPS within limits is maintained; (3) Protection is maintained against Hazardous EHPS Effects and Catastrophic Aircraft Effect, if provided solely by the EHPS control system and shown to be necessary by the safety analyses required under EHPS.80 and EHPS.350; (4) A means is maintained to provide necessary signals to identify EHPS control system Faults; (5) A further single Failure in the EHPS control system will not produce a Hazardous Engine Effect or a Catastrophic Aircraft Effect; (6) The Engine continues to meet its certification specifications for external threats; (7) The proposed dispatch interval is justified. To: (b) For each dispatchable configuration it must be shown by test or analysis that: (1) The EHPS remains capable of meeting all EHPS specifications for the operability aspects covered by EHPS.460 (2) The ability to control the EHPS within limits is maintained; (3) Protection is maintained against Hazardous EHPS Effects, if provided solely by the EHPS control system and shown to be necessary by the safety analyses required under EHPS.80 and EHPS.350; (4) A means is maintained to provide necessary signals to identify EHPS control system Faults; (5) A further single Failure in the EHPS control system will not produce a Hazardous Engine Effect; (6) The Engine continues to meet its certification specifications for external threats; (7) The proposed dispatch interval is justified.	yes	no	Not accepted	Same methodology and requirements as for CS-E
360	SAFRAN	EHPS.360	18	Title and requirement not sufficiently explicit	The title of the requirement deals with ‘connection’, however, it is understood that the requirement concerns the installation but also the necessary information (EHPS state, battery SOC, etc..) to be provided to the aircraft (for display purpose for the crew). As an example, CS-E 60(a) could be used.			Accepted	Paragraph has been reworded to explain the complete link from EHPS.80 to design to EHPS.30.



361	TCCA	EHPS.360	19	Add "(a)" Add "(b) The instrument or sensor connections must be designed or labeled to ensure a correct connection. (c) Any instrumentation on which the Safety Assessment (see EHPS.80) depends must be specified and declared mandatory in the EHPS installation manual."	Suggest to revise and add text, if needed			Accepted	EHPS.360 has been reworded.
362	TCCA	EHPS.360	19	Removed: CS-E 60(b) "A list of the instruments necessary for control of the Engine must be provided in the instructions for installation. The overall limits of accuracy and transient response required of such instruments for control of the operation of the EHPS must also be stated so that the suitability of the instruments as installed may be assessed."	This requirement may still be applicable, both for the turbine or piston portions of a hybrid design, but also for cutting electrical loads in various situations. Review other paragraphs from CS-E 60 for applicability.			Accepted	EHPS.360 has been reworded.
363	AIRBUS	EHPS.360 Instrument and Sensor Connection	19	The intent of this paragraph is covered under EHPS.80	Airbus propose to delete the paragraph.	N	Y	Partially accepted	Paragraph has been reworded to explain the complete link from EHPS.80 to design to EHPS.30.
364	Rolls-Royce	EHPS.360 Instrument and Sensors	19	This rule is a bit weak given the variety of new sensors and other protective devices (e.g. fuses) that turn up as a result of electrification.	Clarify the definition.	Yes	No	Accepted	Electrical protections are not part of this paragraph. This paragraph is dedicated to the instrumentation.
365	Lange Aviation GmbH	EHPS.370	19	The interdependence of systems connected to the distribution network, especially in case of failures is not discussed.	The requirement should also cover protection of connected systems, e.g. from overloads and fluctuations, short circuits in one system.	Yes		Accepted	This is covered by EHPS.370 which refers to the intended aircraft application requirements. Specific guidance will be provided.
366	Rolls-Royce	EHPS.370	19	What happens if the system is unloaded? There is a lot of energy that has to be managed in order to avoid going somewhere it is not wanted. Potential for a generator to be disconnected from a storage device, leaving no energy-sink. Add paragraph (d): "Disconnection of loads shall have no detrimental effects on the Electrical power generation and distribution.	Consider paragraph (d) to cover disconnection of loads.	Yes	No	Accepted	Added accordingly.
367	Rolls-Royce	EHPS.370	19	The means of compliance to EHPS.370 makes reference to CS-E 135, Electrical Bonding. Why isn't the scope of CS-E 135 included in full within this SC?	Include the full scope of CS-E 135	Yes	No	Accepted	This is already covered by EHPS.370 which refers to the intended aircraft application requirements where electrical bonding is addressed. Specific guidance will be provided.
368	SAFRAN	EHPS.370	18	EHPS perimeter	The Title could be 'EHPS Electrical power generation and distribution'. There is an inconsistency with this paragraph. Only the TC Holder can demonstrate compliance with its Certification Basis. For the Aircraft it is the Aircraft TCH. This Special Condition requirement applies to a EHPS applicant (with its own Certification Basis). Proposed text: (a) The electrical power generation and distribution of the EHPS must be designed and constructed so as to meet the Type Certification basis of the specification of the intended aircraft application (c) Does the 'connected loads' are those only to the EHPS or could be also all connected loads (as for aircraft electrical loads connected to the EHPS) ?			Not accepted	It is important to keep proportionality in the certification requirements. An EHPS dedicated to CS-23 level 2 aircraft will not have the same requirements as those for a CS-25 product. Specific guidance will be provided to define the requirements applicable depending on the intended aircraft application.
369	SAFRAN	EHPS.370		Failure conditions assessment	This § does address failure cases for which Hazardous EHPS effects must be prevented. It is proposed to address during the MoC the conditions for which the protective devices has to be substantiated.			Accepted	Specific guidance will be provided as part of the Means of Compliance.



370	General Aviation Manufacturers Association	EHPS.370	19	EHPS.370 - A detrimental effect is not described in part (c). Hazardous and catastrophic effects are described in the terminology section.	Describe a detrimental effect either in the EHPS.370 regulation or in the terminology section.	Major/conceptual		Accepted	The term "detrimental" is often used in the different Certification Specifications. Specific guidance will be provided as part of the Means of Compliance.
371	Embraer S.A.	EHPS.370	19	Electrical power generation and distribution should be certified under aircraft certification requirements. Recommended to delete this requirement.	We suggest to delete this paragraph.	yes	no	Not accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
372	TCCA	EHPS.370	19	Some systems might be essential for the safe continuation of flight.	Include some requirements that the electrical systems (generators, motors, transmission cables, controllers and protective devices) shall be able to furnish the required power at the proper voltage and frequency. Define the concept of essential systems for flight continuation that needs to sustain a defined level of electrical power. Define load shed capability.			Not accepted	The list of essential systems for flight continuation has to be provided by the aircraft manufacturer depending on the aircraft architecture and characteristics. This exchange of information is ensured via to the top/down approach requested in EHPS.80. EHPS.370 refers to the intended aircraft application requirements.
373	TCCA	EHPS.370	19	Note comment for the Subpart A.	To redefine the concept.			Not accepted	Refer to answer provided for comment for Subpart A
374	FAA JP	EHPS.370 (a)	19	Relative to 'Type Certification Basis of the', Just identifying the intended aircraft application should be sufficient.	Suggest removing 'Type Certification Basis of the',	Yes		Not accepted	The sentence would not be correct as one cannot show compliance to an intended aircraft application.
375	Rolls-Royce	EHPS.370 c) Electrical power generation and distribution	19	Presumably this is aiming rather for no detrimental effect on the platform. One example: pyrofuses can't be reversed back to letting current flow the way a fuel shut-off valve can, this means a "safe" outcome for the EHPS where the HV cables are protected and don't burn, but this could be very bad for the platform: no more power!	Clarify the definition.	Yes	No	Accepted	The term "detrimental" is often used in the different Certification Specifications. Specific guidance will be provided as part of the Means of Compliance.
376	Rolls-Royce	EHPS.370 Electrical power generation and distribution	19	Some architectures include motors which may regenerate electrical energy under specific conditions.	Evaluate if the risks correlated with such operation need to be covered in EHPS.370	Yes	No	Accepted	The term "detrimental" is often used in the different Certification Specifications. Specific guidance will be provided as part of the Means of Compliance. Note that electrical energy recuperation mode is also addressed in EHPS.460(e) where specific guidance will also be provided.
377	TCCA	EHPS.370 EHPS.380	19	Lacking a requirement to ensure the EHPS electrical power and distribution systems / electrical storage systems does not have failures that could result in hazardous EHPS effects	Suggest a similar requirement to EHPS.350(e) be included in EHPS.370 & 380.			Partially accepted	BMS is now part of the EHPS control system and thus subject to EHPS.350 requirements. EHPS is subject to the safety assessment process as requested in EHPS.80.
378	FAA GH	EHPS.380	19	We may have a gap as we do not believe that the Battery systems should be a part of engine requirements.	Remove or change the purpose to make this a link to ESS		Yes	Not accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
379	FAA JP	EHPS.380	19	This seems difficult to impose as a requirement on the EHPS applicant. If the EHPS is installed in an airplane without VTOL capability, then later an aircraft with VTOL capability, it could drive different requirements for the ESS, specifically the ESS emergency landing condition evaluation. Installation in the VTOL aircraft would not invalidate the initial EHPS approval, it just would not be approved in the new VTOL aircraft. My intent here is to clarify that the aircraft level requirements should not be imposed on the EHPS as an engine level requirement, only as a limitation established during EHPS approval used to determine installation eligibility.		Yes	Yes	Not accepted	Indeed, requirements may not be identical depending on the intended aircraft application. However, it is important to keep proportionality in the certification requirements. The scope of the Special Condition is now limited to the case where the intended aircraft application is known.

380	Lange Aviation GmbH	EHPS.380	20	It has to be differentiated between power and energy. Especially concerning the failure of the power generating engine, the energy storage device has to deliver a high enough power, while the stored energy also has to be sufficient for a time long enough for continued flight and landing.	Both, power and energy, have to be assessed for safe continued flight and landing, taking into account operational considerations, i.e. time to safe landing, and reliability of power generation system.	Yes		Accepted	Energy replaced by "power supply".
381	Lange Aviation GmbH	EHPS.380	20	In a hybrid configuration only the emergency rating depends solely on the energy storage device. Otherwise the power generating engine will deliver a part or all required power.	It should be differentiated between emergency and normal ratings, taking into account different hybridisation concepts.	Yes		Accepted	The mentioned case is a specific configuration and can not be used to define applicable requirements for all kind of architectures. Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
382	Cranfield Aerospace Solutions Ltd	EHPS.380	20	Wording seems to preclude hybrid configurations. What if the ESS provides only part of the required energy in certain phases of flight? With the rest provided by other sources.	If not intended, perhaps change “...at all time during the flight....” For “...at all times for which it is required during the flight....” Or something equivalent.	Yes	No	Accepted	Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
383	Rolls-Royce	EHPS.380	20	"(b) If the EHPS contains an electric energy storage device providing electric energy to an electric engine(s), it must be designed and constructed so as to provide the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers defined in EHPS.40." - This requirement does not necessarily take into account many of the likely architectures for EHPS where it may be perfectly acceptable not to meet the requirement due to redundancy or alternate sources of energy. Suggest a review of the common architectures (full electric, parallel hybrid, series hybrid) and either remove or reword this requirement	Consider rewording or removing this requirement	Yes	No	Accepted	Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
384	Rolls-Royce	EHPS.380	20	What happens if, by design, the energy storage device does not have sufficient energy, on its own, to provide the energy for full thrust, but is used to supplement another source? In this case, Paragraph (b) has an ambiguous "it"; propose we replace with "EHPS" to avoid referring to only the energy storage device of the EHPS	Replace "it" with "EHPS"	Yes	No	Accepted	"It" replaced by "Propulsion battery". Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
385	Rolls-Royce	EHPS.380	19	(a) If the EHPS contains an energy storage device, the energy storage device and its management system must be designed and constructed so as to meet the Type-Certification basis of the intended aircraft application.	Where can appropriate requirements on energy storage management system be found?	Yes	No	Noted	Specific guidance will be provided in the Means of Compliance.
386	SAFRAN	EHPS.380	19/20	EHPS perimeter	Same comment as for EHPS 370 : (a) ... must be designed and constructed so as to meet the Type-Certification basis of the specification of the intended aircraft application			Not accepted	It is important to keep proportionality in the certification requirements. An EHPS dedicated to CS-23 level 2 aircraft will not have the same requirements as those for a CS-25 product. Specific guidance will be provided to define the requirements applicable depending on the intended aircraft application.
387	SAFRAN	EHPS.380	19/20	Power supply instead of energy	(b) it's not up to EHPS applicant to manage the energy (the responsibility should remain to the aircraft manufacturer who knows the mission). EHPS applicant shall guarantee the power at the EHPS level. The aircraft manufacturer shall specify the amount of energy to be stored, the criticality of the unavailability or erroneous information. EHPS applicant will have therefore to demonstrate that how the storage system meets the specification and indicate the amount of energy stored with the right level of reliability with respect to criticality. Proposed text : “If the EHPS contains an electric energy storage			Accepted	Corrected accordingly.

					device providing electric power to electric engine(s), it must be designed and constructed so as to provide at all time during the flight the required power for the electric engine(s) of the EHPS to provide the rated powers defined in EHPS.40”				
388	SAFRAN	EHPS.380	19/20	Failure conditions assessment	As for EHPS.370, this § does address failure cases for which Hazardous EHPS effects must be prevented. It is proposed to address during the MoC the conditions (physical separation of the BMS control system, ...).			Accepted	Specific guidance will be provided as part of the Means of Compliance.
389	General Aviation Manufacturers Association	EHPS.380	20	EHPS 380- (b) What about the safety assessment of the Energy Storage System? "If the EHPS contains an electric energy storage device providing electric energy to an electric engine(s), it must be designed and constructed so as to provide the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers defined in EHPS.40."	Include ESD Safety Assessment.	Question		Noted	The propulsion battery, if part of the EHPS, must be part of the safety assessment requested in EHPS.80. The safety objectives begin derived from the intended aircraft application, there is no inconsistency.
390	<i>Flying Whales</i>	EHPS.380	19	With the increasing utilization of <b>electric</b> energy storage devices in the EHPS architecture, we feel the need to add have more specific requirements under this category	With the available battery inservice experience, suggestion is consider more specific requirements.	Yes	No	Noted	The requirements will be provided in the relevant Type-Certification basis of the intended aircraft application. Specific guidance will be provided as part of the Means of Compliance.
391	<i>Embraer S.A.</i>	EHPS.380	19	Energy storage system should be certified under aircraft certification requirements. Recommended to delete this requirement.	We suggest to delete this paragraph.	yes	no	Not accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
392	<i>Airbus DS</i>	EHPS.380	20	“(b) If the EHPS contains an electric energy storage device providing electric energy to an electric engine(s).” The energy storage systems can be charged in flight, be used as a buffer and also charged on ground. In Li-ion applications, the charging is typically more stringent than the discharging.	Reword “(b) If the EHPS contains an electric energy storage device providing electric energy to an electric engine(s), it must be designed and constructed so as to provide <u>and absorb</u> the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers defined in EHPS.40.”	Yes	No	Accepted	Paragraph (c) has been added.
393	FAA JP	EHPS.380 (a)	19	See above comment in 370(a)	Suggest removing ‘Type Certification Basis of the’, just identifying the intended aircraft application should be sufficient.	Yes		Not accepted	The sentence would not be correct as one cannot show compliance to an intended aircraft application.
394	FAA DJ	EHPS.380 (a)	19	This “energy storage device” could be just a battery for some hold up purpose, emergency, etc..or an energy system to power the motors full time. As Gary says Maybe. The line is not clear where this is part of the propulsion system or the aircraft installation.		Yes		Accepted	Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
395	FAA DJ	EHPS.380 (b)	20	What if the ESD is only for certain phases of flight such as takeoff? Will this be allowed with the statement “at all time during the flight...”?		Yes		Accepted	Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.

396	Rolls-Royce	EHPS.380 Energy Storage System	20	(b) The text "provide the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers" requires an ESS with unlimited duration. For an all electric aircraft, the power output of the ESS will only allow operation at the rated power for a stated duration.	(b) If the EHPS contains an electric energy storage device providing electric energy to an electric engine(s), it must be designed and constructed so as to provide the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers defined in EHPS.40 for the rated duration of the energy storage device. Note also comment 20 requests revision of this wording but does not address the 'rated duration' topic for all electric aircraft propulsion raised here - potential need to have an additional section in EHPS.380	Yes	No	Accepted	Paragraph (b) has been reworded to be architecture and usage agnostic.. Specific guidance will be provided in the Means of Compliance.
397	Rolls-Royce	EHPS.380 Energy Storage System	20	Typo: 'at all time' should be 'at all times'.	Correct wording	Yes	No	Noted	Paragraph (b) has been reworded to be architecture and usage agnostic..
398	Rolls-Royce	EHPS.380 Energy Storage System	20	From a certification perspective an energy storage system (EHPS.380) could be viewed as analogous to a fuel tank and therefore out of EHPS scope. Or it could be viewed as an energy storage element for power management within the EHPS (in which it might be in a similar state of charge upon landing as it was on take-off.) Our strong preference is for the latter, since any propulsion system which manages energy storage during a mission is likely to be critically dependent upon storage system performance.	Suggest this wording: If the EHPS makes use of stored energy, this must be certified as an element of the EHPS. (a) If an energy storage device is included, the energy storage device and its management system must be designed and constructed so as to meet the Type-Certification basis of the intended aircraft application. (b) If an electric energy storage device is included providing electric energy to an electric engine(s), it must be designed and constructed so as to provide the required energy for the electric engine(s) of the EHPS at all time during the flight in order for them to provide the rated powers defined in EHPS.40.(But also note additional comment 20 above, relating to this last sentence)	Yes	No	Partially accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.
399	Rolls-Royce	EHPS.380 Energy Storage System	19/20	This SC should provide far more detail regarding requirements for energy storage systems, as this is one of the main areas of regulatory uncertainty facing projects particularly those that include Lithium batteries. This standard should include specific details equivalent to the scope covered by DO-311 and approved means of compliance for these systems.	Include means of compliance for Lithium battery based energy storage systems	No	Yes	Accepted	The requirements will be provided in the relevant Type-Certification basis of the intended aircraft application. Specific guidance will be provided as part of the Means of Compliance.
400	Rolls-Royce	EHPS.380 ESS	19	No reference to DO 311A	Clarify the status of DO-311A. <See also comment 83>	Yes	No	Accepted	The requirements will be provided in the relevant Type-Certification basis of the intended aircraft application. Specific guidance will be provided as part of the Means of Compliance.
401	VOLTAERO	EHPS.380 Energy Storage System	19	The EHPS designer does not know the safety level of the aircraft.	We recommend to modify the paragraph (a): (a) If the EHPS contains an energy storage device, the energy storage device and its management system must be designed and constructed so as to meet <a href="#">the installation instructions, operating instructions and limitations-Type Certification basis of the intended aircraft application</a> . “	YES	NO	Not accepted	Instructions for installation and operation are not certification requirements. They are outputs of the EHPS design and certification process. It is important to keep proportionality in the certification requirements. An EHPS dedicated to CS-23 level 2 aircraft will not have the same requirements as those for a CS-25 product. Specific guidance will be provided to define the requirements applicable depending on the intended aircraft application.
402	Volocopter	EHPS.380(a)	20	Design and construction of the management system of the energy storage device is addressed here, although SC-EHPS excluded this by definition according EHPS.15. Could EASA please provide a rationale, why it should be considered in EHPS.380?		Yes		Noted	Exclusion of the BMS has been removed.

403	Volocopter	EHPS.40	9	There are 2 (d) sub-parts. In sub-part (f), “is” should be replaced by “are”		Yes		Accepted	Corrected accordingly.
404	Cranfield Aerospace Solutions Ltd	EHPS.40	8	Are the referenced “ratings” applicable to the system as a whole or for each of the applicable sub-systems? e.g. gas turbine/piston engine and motors? Are ratings of an engine connected to a generator instead of a propeller/fan required?	Clarification of applicability of ratings.	Yes	No	Noted	Refer to the ratings deinfition provided in EHPS.15.
405	SAFRAN	EHPS.40	8 & 25	Electrical system (Battery) : State Of Charge, State Of Health : to add consideration of State Of Power	Equivalent § to CS-E 745 should be clearly declined in SC-EHPS. Battery could limit the current and impact EHPS performance in case of high power request during a given period.	Yes	Yes	Accepted	Power response is addressed in EHPS.460 (c) Specific guidance will be provided and will be cover CS-E 745
406	Zeroavia James Lawson	EHPS.40		what is meant by "to enable the aircraft safety analysis to be carried out." Instead, suggest "and must be consistent with safety analysis assumptions."				Partially accepted	"To enable the aircraft safety analysis to be carried out" has been removed
407	The Boeing Company	EHPS.40	8	“EHPS.40 Ratings and operating limitations ... (b) EHPS operating limitations includes any limitation required to be monitored to ensure the safe operation of the EHPS and its associated sub-systems.” We ask EASA to refer to existing standards that are used for similar evaluations because the current language is unclear.	“EHPS.40 Ratings and operating limitations ... (b) EHPS operating limitations includes any limitation <del>required to be monitored</del> to ensure the safe operation of the EHPS and its associated sub-systems.”	no	yes	Accepted	Modified accordingly
408	The Boeing Company	EHPS.40	8	“EHPS.40 Ratings and operating limitations ... (f) Each selected rating must be for the lowest power that all EHPSs of the same type is capable of producing under the conditions used to determine that rating at all times during the flight and at all times between overhaul periods or other maintenance.” An explanation of the lowest power is not provided.	We ask EASA to clarify the intent of this requirement, specifically what “the lowest power” means in this context.	no	yes	Accepted	Wording is issued from CS-E. Specific guidance will be provided in the Means of Compliance
409	Zeroavia James Lawson	EHPS.40		"as well as for Emergency Ratings if needed" is ambiguous. What does if needed mean? Instead, suggest "if required by the safety analysis."				Accepted	Clarification added.
410	TCCA	EHPS.40	8	In (a), revise text to read Add "...established <u>by the Agency and included in the type certificate data sheet</u> ,..." Add new "(g) <u>Any other information necessary for safe operation of the EHPS.</u> "	Suggest to revise and add text, if needed			Partially accepted	What has to be included in the TCDS is not part of the requirements for which compliance has to be shown by applicants. Any other information necessary for the safe operation of the EHPS is not part of EHPS.40, except for the limitations that is covered by EHPS.40(b). Any other information necessary for the safe operation of the EHPS are covered by EHPS.30 and EHPS.80.



411	FAA GH/WM	EHPS.40 (c)	8	In reference to Take-off Power and Max Continuous Power.... I am still not sure that these two rating definitions are appropriate for EP. Going back to the ASTM Standard, my goal was to get people thinking about ratings based on the intended Duty Cycles. Problem I am concerned about is the very different utilization and capabilities of an electric engine. Both of these are very different from Turbine and Recip engines. A counter argument was posted : 1) It may only be applicable to hybrids using internal combustion (IC) engines. 2) Power and thrust for IC engines is inferred by a number of operating parameters required in 33.7. EHPS applicants (many are new to aviation) need detailed ratings requirements for their ICs.		yes		Noted	MCP and MTOP ratings have been kept as they are of common usage in the aviation. However, EHPS.40 (e) opens the door for new ratings that the applicant have to defined. It follows the notion of duty cycle.
412	Rolls-Royce	EHPS.40 Ratings and operating limitations	8	There are two items (d)	Correct numbering	Yes	No	Accepted	Corrected accordingly
413	Volocopter	EHPS.40(d)	9	A duration is requested here. Could there be another way defined to limit the use in this phase (e.g. based on system specific parameters)?		Yes		Noted	The duration must be established by the applicant and may differ from one application to the other. The limitation of use is also design dependant.
414	Volocopter	EHPS.410	22	(1) and (2): Can EASA please provide an example, of what would be understood to be “excessive” for further guidance?		Yes		Accepted	Excessive could be understood as greater than what is necessary to comply with the declared or intended to be declared ICA. However, this may link the results of the test to ICA and may further complicate the certification process if updates of the ICA are made in the future. Specific guidance will be provided as part of the Means of Compliance.
415	SAFRAN	EHPS.410	21	Pass / fail criteria	(c) ==> it should be interesting to specify that the EHPS must meet the 3 conditions after each of the subpart D tests in order not to leave any ambiguity (we will not do all the tests with only one EHPS and demonstrate at the end that it is still in the criteria) (c) è Upon completion of the tests in Subpart D, the EHPS and its components must [...] <u>be capable of operating at its declared ratings while remaining within limits</u> . From Safran understanding, this criterion should not apply to all EHPS tests but mostly to test simulating EHPS actual in service usage (such as durability or ingestion tests). The endurance test (EHPS.420) to be performed under all operational limits simultaneously is more severe than actual EHPS usage in service.	No	Yes	Accepted	EHPS.410(c) has been changed to cover the case of several EHPS or EHPS sub-systems use to cover all the tests required under Supbart D. Specific guidance will be provided as part of the Means of Compliance.  Pass/fail criteria for teardown inspection is now limited to EHPS.450 and consistent with CS-E approach.
416	General Aviation Manufacturers Association	EHPS.410	21	EHPS 410- (a) Maintenance of the EHPS is permitted during the tests in accordance with the service and maintenance instructions submitted in the Instructions for Continued Airworthiness defined in paragraph EHPS.25- Is there any video required for any of the tests?	Add video requirement for some safety tests.	Minor		Partially accepted	Specific guidance will be provided as part of the Means of Compliance.
417	General Aviation Manufacturers Association	EHPS.410	21	EHPS.410 - Suggest clarifying that the ICA may be in draft form when the tests are being run.		Minor		Partially accepted	Specific guidance will be provided as part of the Means of Compliance.

418	The Boeing Company	EHPS.410	21	<p>“EHPS.410 General Conduct of Tests ... (b) The EHPS or its parts must be subjected to any additional tests and maintenance that the Agency finds necessary, if during the tests: (1) the frequency of maintenance during the testing is excessive;  Need to have clarification of terms to avoid confusion and interpretations.</p>	We ask EASA to clarify what is excessive? How do we quantify it?	no	yes	Accepted	Excessive could be understood as greater than what is necessary to comply with the declared or intended to be declared ICA. However, this may link the results of the test to ICA and may further complicate the certification process if updates of the ICA are made in the future. Specific guidance will be provided as part of the Means of Compliance.
419	FAA DJ	EHPS.410 (b)	21	Can’t all items (1) to (4) be MoC?		Yes		Noted	No because they provide the criteria for which the requirement applies. Specific guidance will be provided as part of the Means Of Compliance.
420	Cranfield Aerospace Solutions Ltd	EHPS.420	21	If a gas turbine/piston engine is part of the EHPS, does that require its own endurance testing in accordance with CS-E/ CS-APU? Or is a test of the whole system considered adequate to cover the individual sub-systems?	If the former, it needs rewording to require endurance testing of sub-systems.	Yes	No	Accepted	This is a good question and the answer is not known up to day. EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance. Note that one intent is to facilitate the use of certified engine as part of an EHPS when an applicant is willing to do so.
421	The Boeing Company	EHPS.420	21	<p>“EHPS.420 Endurance Demonstrations ... (b) When approval is sought for a Normal Transient EHPS Exceedance, it must be substantiated that the EHPS is capable of operation at the maximum EHPS transient condition of the affected EHPS parameter(s) without maintenance action. (c) When approval is sought for an Inadvertent Transient EHPS Exceedance, it must be substantiated that the EHPS is capable of operation at the maximum EHPS transient condition of the affected EHPS parameter(s) without maintenance action other than to correct any failure that led to the exceedance.  1) In EHPS.350 EHPS Control System, there is no exceedance allowed. It needs to be clear in which conditions, exceedance would be allowed. 2) Unscheduled maintenance following maximum transient uses should be considered, and it should be part of the ICA. Any electrical system degradation is a process that is a function of several variables; aging is only one of these.</p>	<p>“EHPS.420 Endurance Demonstrations ... (b) When approval is sought for a Normal Transient <b>and / or inadvertent</b> EHPS Exceedance, it must be substantiated that the EHPS is capable of operation at the maximum EHPS transient condition of the affected EHPS parameter(s) <b>followed by ICAs provisions without maintenance action-</b> <del>(c) When approval is sought for an Inadvertent Transient EHPS Exceedance, it must be substantiated that the EHPS is capable of operation at the maximum EHPS transient condition of the affected EHPS parameter(s) without maintenance action other than to correct any failure that led to the exceedance.</del></p>	no	yes	Not accepted	it is important to differentiate both cases. Normal transients EHPS exceedances are considered part of the EHPS design and are required to ensure the safety of the aircraft. In this case, no maintenance action should be required. For example, if on power request there is a need to exceed transitory a torque limitation on a turboshaft engine in order to achieve a fast engine response and adequate aircraft controllability, then this should be considered as "Normal transient EHPS exceedances and declared in the Instructions for installation and operation of the EHPS. Whereas Inadvertent transients EHPS exceedances are not the results of the EHPS design and may require a maintenance action.
422	FAA AS / PH	EHPS.420 (a)	21	I recommend this be better defined. Also, I read “limit capabilities” as speeds and temperatures; is it supposed to also cover time between overhauls?	Add a sentence to the end of this paragraph (“The EHPS manufacturer should justify the specific time duration. . .” to attempt to better define this test.	Yes		Partially accepted	Time between overhaul is covered by EHPS.430. Specific guidance will be provided as part of the Means of Compliance.
423	Vertical Aerospace	EHPS.420 (Endurance)	21	More clarity on endurance demonstration would be beneficial for electric motors (e.g. 150-hour test). The link to CS-E and its AMC is more applicable to Hybrid systems. Will EASA create a new AMC specifically for electric Motors?	AMC to be created dedicated to electric motors, which defines the minimum level of endurance testing to be completed for an electric motor.	Yes		Accepted	This is a good question and the answer is not known up to day. EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance. Note that one intent is to facilitate the use of certified engine as part of an EHPS when an applicant is willing to do so.
424	Airbus Helicopters	EHPS.420 Endurance Demonstration	21	There is a need to more precisely identify that the Endurance test is expected to test the robustness of the EHPS when it is operated at its defined limits. This will help clarify the difference with the durability demonstration requirement.	Airbus propose to update the wording of EHPS.420(a) as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.420 Endurance Demonstration</b> <u>(a) Each EHPS must be subjected to an endurance demonstration of safe operation under all defined operational limits of the EHPS. The demonstration shall be of sufficient duration with respect to cycles and power settings.</u>	Yes	No	Accepted	Corrected accordingly

425	AIRBUS	EHPS.420 Endurance Demonstration	21	There is a need to more precisely identify that the Endurance test is expected to test the robustness of the EHPS when it is operated at its defined limits. This will help clarify the difference with the durability demonstration requirement.	Airbus propose to update the wording of EHPS.420(a) as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.420 Endurance Demonstration</b> <i>(a) Each EHPS must be subjected to an endurance demonstration of safe operation under all defined operational limits of the EHPS. The demonstration shall be of sufficient duration with respect to cycles and power settings.</i>	N	Y	Accepted	Corrected accordingly
426	Volocopter	EHPS.420(a)	22	For the rest of SC-EHPS, there is always considered “the EHPS”, while in EHPS.420(a) “each EHPS” is chosen. Does this wording imply a differentiated consideration?		Yes		Noted	No differentiated consideration. "Each" has been replaced by "The" in all affected paragraphs.
427	SAFRAN	EHPS.420/430	21	Endurance demonstration of the EHPS / EHPS sub-system	The endurance demonstration for the EHPS could be made on a case by case basis using different EHPS sub-system endurance strategy (test, analysis ...) and should be part of the discussion for the MoC. This comment is also applicable to EHPS.430. Endurance demonstration should be standardized to have a common approach and philosophy for this demonstration.	Yes	No	Accepted	EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance. Note that one intent is to facilitate the use of certified engine as part of an EHPS when an applicant is willing to do so.
428	FAA AS	EHPS.430	22	This sounds like an IMI test to me, but it could be good to separate TBO from off-schedule testing (EHPS 420 above)		Yes		Noted	
429	FARADAY aerospace	EHPS.430 Durability Demonstration	22	Can EASA specify what is the "durability expectation"		Yes	No	Noted	EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance.
430	FARADAY aerospace	EHPS.430 Durability Demonstration	22	Can EASA confirm that simulation can be the only mean of compliance for durability demonstration		Yes	No	Noted	EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance. At this stage, EASA does not foresee the simulation has being a sufficient mean of compliance.
431	SAFRAN	EHPS.440	22	Calibration Assurance for the EHPS / EHPS sub-system	Same comment for the EHPS.420, the calibration demonstration for the EHPS could be made on a case by case basis using different EHPS sub-system calibration strategy (test, analysis ...) and should be part of the discussion for the MoC.	Yes	No	Accepted	EASA believes the industry has the knowledge to be able to propose a meaningful and safe mean of compliance. That is why EASA is collaborating actively with SAE E-40 and EUROCAE WG113 which aim at providing a Mean of Compliance. Note that one intent is to facilitate the use of certified engine as part of an EHPS when an applicant is willing to do so.
432	Lange Aviation GmbH	EHPS.450	22	A disassembly is useful for mechanically stressed components, e.g. engine, but not applicable to electric systems, e.g. a battery. These should instead be subjected to electrical testing, if applicable. Many electrical components also do not exhibit degradation, for those testing by just testing the function of the system would be effectual.	Differentiate according to degradation behaviour of components.	Yes		Accepted	This paragraph has been reworded. Specific guidance will be provided as part of the Means of Compliance.

433	SAFRAN	EHPS.450	22	Pass/fail criteria	As proposed in EHPS.410 (c), teardown inspection proposed in EHPS.450 shall be applicable for the endurance test. It is more stringent than the CS-E philosophy where the pass/fail criteria does not impose to have the engine part in a serviceable limits for as defined in the ICA. This may imply to have ICA available at the end of the endurance test where limit of the EHPS will be tested, additionally, the endurance does not reflect real condition of the EHPS but correspond to an EHPS limit capacity demonstration where part may be more degraded than in service. However, EHPS applicant may defined how the degradation is detected and mitigated during the EHPS in-service life. Proposed text : “After the endurance and durability test have been completed, the EHPS must be completely disassembled. Each EHPS component must be within service limits and eligible for continued operation in accordance with information submitted with the instructions for continued airworthiness provided in EHPS.25. <b>When for endurance test, parts are beyond serviceable limits as defined in the ICA, it has to be demonstrated that the failure or degradation will be detected and accommodated during the in-service life of the EHPS”</b>	No	Yes	Accepted	This paragraph has been reworded. Consistency with CS-E is made. Specific guidance will be provided as part of the Means of Compliance.
434	FAA DJ	EHPS.450 (a)	22	Relative to « ... EHPS must be completely disassembled. » This should be restated? This could be defined in the MOC. Completely disassembled for an electric motor may not be clear.		Yes		Accepted	This paragraph has been reworded. Consistency with CS-E is made. Specific guidance will be provided as part of the Means of Compliance.
435	Airbus Helicopters	EHPS.450 Teardown Inspection	22	The first sentence of EHPS.450(a) might be understood as implying that the same EHPS is used for both the endurance and durability tests. Airbus consider this is not the intent and therefore propose anupdate of the wording	Airbus propose to update the wording of EHPS.450(a) as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.450 Teardown Inspection</b> (a) <u>For both</u> the endurance and durability <u>demonstrations test have been completed</u> , the EHPS must be completely disassembled after <u>each test has</u> been completed. Each EHPS component must be within service limits and eligible for continued operation in accordance with information submitted with the instructions for continued airworthiness provided in EHPS.25.	Yes	No	Accepted	EHPS.410(c) has been changed to cover the case of several EHPS or EHPS sub-systems use to cover all the tests required under Supbart D. Specific guidance will be provided as part of the Means of Compliance. EHPS.450(a) has been reworded and is consistent with CS-E approach.
436	AIRBUS	EHPS.450 Teardown Inspection	22	The first sentence of EHPS.450(a) might be understood as implying that the same EHPS is used for both the endurance and durability tests. Airbus consider this is not the intent and therefore propose an update of the wording	Airbus propose to update the wording of EHPS.450(a) as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.450 Teardown Inspection</b> (a) <u>For both</u> the endurance and durability <u>demonstrations test have been completed</u> , the EHPS must be completely disassembled after <u>each test has</u> been completed. Each EHPS component must be within service limits and eligible for continued operation in accordance with information submitted with the instructions for continued airworthiness provided in EHPS.25.			Accepted	EHPS.410(c) has been changed to cover the case of several EHPS or EHPS sub-systems use to cover all the tests required under Supbart D. Specific guidance will be provided as part of the Means of Compliance. EHPS.450(a) has been reworded and is consistent with CS-E approach.
437	SAFRAN	EHPS.460	26	AMC	EHPS.460 should also cover specific functioning modes / architecture of the EHPS, especially for electrical systems. This could be addressed within corresponding AMC.	yes	no	Accepted	Specific guidance will be provided as part of the Means of Compliance. Note that EHPS Specific Operation is now placed in EHPS.480.
438	SAFRAN	EHPS.460	26	Starting and restarting strategy	The proposal to have a possibility not to demonstrate the starting/restarting capability of the EHPS is not understood “...unless it is shown that there is no safety benefits...”. Question may be if the function is required by the aircraft manufacturer (necessary procedure for aircraft operation). Proposal could be “...unless not required by the aircraft manufacturer for aircraft operation as declared in the IOM...”	yes	no	Accepted	Corrected accordingly. Specific guidance will be provided in the Means of Compliance.



439	SAFRAN	EHPS.460	26	(e) (2) MOC	Proposed MOC for EHPS.460 (e)(2) states that AMC should at least cover specific functions. CS-E 920 is quoted in the proposed MOC whereas, from Safran understanding, CS-E 920 does not allow to validate a specific function or a particular usage but rather a “design” margin regarding OEI 30s power rating. A dedicated EHPS chapter could be created to address this requirement?	yes	no	Accepted	EHPS.480(c) has been added accordingly.
440	FAA DJ	EHPS.460 (e)	24	Relative to reference to propeller (two times)	Add “or rotor”	Yes		Accepted	Added accordingly.
441	Rolls-Royce	EHPS.460 Operational Demonstration	24	... “(e) EHPS specific operation (1) If the EHPS is designed to operate with a propeller, all applicable EHPS demonstrations required by this special condition must be performed with a representative propeller.” - Add ‘and representative propeller governor’.	If the EHPS is designed to operate with a propeller, all applicable EHPS demonstrations required by this special condition must be performed with a representative propeller and governor (if applicable).	Yes	No	Partially accepted	Consistency with CS-E wording is maintained. Specific guidance will be provided as part of the Means of Compliance. Note that EHPS Specific Operation is now placed in EHPS.480.
442	Werner Scholz, European Sailplane Manufacturers	EHPS.460 Operational Demonstration	23 / 24	What is the meaning of (d) Rotor Locking Demonstration – is this valid for rotors (like for helicopter) or any turning parts?	Clarify	suggestion		Noted	Same approach as CS-E. Refer to AMC E 710. Specific guidance will be provided as part of the Means of Compliance. Note that EHPS Specific Operation is now placed in EHPS.480.
443	AIRBUS	EHPS.460 Operational Demonstration	23	The scope of the expected operational demonstration should be clearly defined. It does not appear appropriate to use the bracket with the wording etc.in sub-paragraph (a). Also, the list of operations provided in sub-paragraph (a) and the overall paragraph should be consistent meaning that additional conditions to be demonstrated have to be added to the paragraph or the list in the bracket has to be reduced.	Airbus propose to update the wording of EHPS 460(a) Operational Demonstration -as follows (new proposed text shown in <u>underlined italic</u> font): <b>EHPS.460 Operational Demonstration</b>  (a) The operational demonstration must include tests, validated analysis, or a combination thereof to demonstrate the performance of the EHPS (starting, power <del>response-cycling, acceleration, overspeeding,</del> rotor locking <i>and any specific operations etc.</i> ) throughout its declared flight envelope and operating range. The declared EHPS operational characteristics must account for installation loads and effects.	N	Y	Accepted	Brackets have been removed and will be part of the specific guidance to be provided as part of the Means of Compliance.
444	AIRBUS	EHPS.460 Operational Demonstration	23	For the starting/restarting requirement, Airbus propose some clarification of the wording for ground start as it is considered that the term ‘safely’ is not appropriate. Requiring a ‘reliable’ start performance appears more appropriate. For the restart/relight requirement, Airbus do not understand the purpose of the ‘no safety benefit provision’. It is not clear how a restart capability cannot increase safety margin and therefore be beneficial.	Airbus propose to update the wording of EHPS 460(b) as follows (new proposed text shown in <u>underlined italic</u> font): (b) Starting and restarting/relighting (1) The applicant must demonstrate the capability of the EHPS to <del>safely</del> reliably start under all declared <u>ground</u> atmospheric temperature conditions. (2) The EHPS design must allow the shutdown and restart or the relight of the EHPS, <del>or the affected sub-system of the EHPS,</del> in flight within an established envelope, <u>unless it is shown that there is no safety benefit of providing this functionality.</u>	N	Y	Partially accepted	(1) has been reworded accordingly. (2) has been reworded and replaced by "unless not required for aircraft operation". Specific guidance will be provided in the Means of Compliance.
445	Embraer S.A.	EHPS.460(d)	23	Rotor lock demonstration is not required if there is no safety benefit of an EHPS (or affected sub-system) restart.	We suggest to change the text from: (d) Rotor Locking Demonstration If shaft rotation is prevented by a means to lock the rotor(s), the EHPS must be subjected to tests, validated analysis, or a combination thereof that includes repeated locking and unlocking operations to sufficiently establish reliable rotor locking performance. To: (d) Rotor Locking Demonstration If shaft rotation is prevented by a means to lock the rotor(s), the EHPS must be subjected to tests, validated analysis, or a combination thereof that includes repeated locking and unlocking operations to sufficiently establish reliable rotor	yes	no	Partially accepted	This is implied by the beginning "if shat rotation is prevented by a means to lock the rotor(s)". As for AMC E 710, specific guidance will be provided to explain when this rotor locking function can be provided. Note that Rotor Locking Demonstration is now placed in EHPS.470.



					<i>locking performance, unless it is shown that there is no safety benefit of providing this functionality.</i>				
446	FAA JP	EHPS.490	24	I don't see a SC that captures the requirements for propeller controls within the EHPS or inclusion of a thrust producing fan in the EHPS (ref F3338 paragraphs 5.24 and 5.25).		Yes		Noted	Propellers are outside the scope of the SC E-19. Fans are covered by the SC E-19 as stated in the EHPS definition provided in EHPS.15.
447	SAFRAN	EHPS.490		AMC	"AMC of § EHPS.490 should also cover the CS-E 170 (and corresponding AMC) plus the specific effects related to EHPS architecture, especially for electrical systems (such as, but not limited to magnetic interference, lightening) that could affect the whole EHPS (not limited to equipment)."	yes	no	Accepted	Secific guidance will be provided as part of the Means of Compliance.
448	Embraer S.A.	EHPS.490	24	The information security applied to aviation is a new topic for some applicants and dedicated security tests may be required. NPA-2019-01 text can be used to provide this information. If EHPS.350 is applicable, dedicated security tests will reduce the possibility of vulnerabilities due to implementation errors.	We suggest to include a new item: "When required by EHPS.350 and information security risks that are identified during the information security risk assessment need to be mitigated, security verification should be used to evaluate the efficiency of the mitigation means: (i) <i>This verification may be performed by a combination of analysis, security-oriented robustness testing, inspections, and reviews; and</i> (ii) <i>When necessary, by security testing that addresses information security from the perspective of a potential adversary.</i> "	yes	no	Partially accepted	Specific guidance will be provided as part of the Means of Compliance to EHPS.350 (h) and EHPS.490.
449	TCCA	EHPS.490	24	Add "a" Add " (b) Temperature limits must be established for each component that requires temperature-controlling provisions in the aircraft installation to assure satisfactory functioning, reliability, and durability. (c) Voltage and current limits must be established for each component that requires voltage or current controlling provisions, or both, in the aircraft installation to assure satisfactory functioning, reliability, and durability."	Suggest to revise and add text, if needed			Partially accepted	This is already covered by EHPS.30. Specific guidance will be provided.
450	TCCA	EHPS.490	24	To compensate environmental limits of EHPS equipment that cannot be demonstrated in accordance with endurance tests EHPS 490 recommend system and components additional test..	" Among these additional tests, the environmental tests: which must demonstrate that the EHPS can operate in HIRF or in atmospheric electricity (Lightning, ESD) environment , without endangering aircraft flight..			Partially accepted	Same approach as in CS-E. Specific guidance to be provided in the Means of Compliance.
451	Werner Scholz, European Sailplane Manufacturers	EHPS.490 System, equipment and component tests	24	Requiring tests under all declared environmental and operating conditions could become rather arduous – it should be possible to propose test conditions at then do in addition some single test points in the more extreme conditions and/or to substantiate also by service experience with similar devices.	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
452	VOLTAERO	EHPS.490 System, equipment and component tests	24	The intent of this paragraph is unclear. It seems not applicable. Any system, equipment or component would be substantiated by test or analysis.	We recommend to delete the paragraph EHPS.490.	YES	NO	Not accepted	For example, controllers might be qualified according to DO 160 in order to fulfill this requirement.
453	AIRBUS	EHPS.490 System, equipment and component tests	24	Airbus understand the purpose of this paragraph is to identify that other tests (in particular qualification tests) may have to be performed in addition to the complete EHPS tests defined in the subpart D. Airbus suggest that this is indicated in the introduction to the subpart but not as a specific requirement	Airbus propose to delete section EHPS.490 and to update the wording of the introduction to Subpart D as follows (new proposed text shown in <i>underlined italic</i> font): Compliance with the requirements for Endurance ( <i>including periods of EHPS Limits exceedance</i> ), Durability, <i>Vibration, Over Torque, Temperature limit demonstration</i> , Operation (including Power Response, Rotor Locking, Operation with a variable pitch thruster, and Operation with a fixed pitch thruster) must be substantiated via test performed on <i>a complete EHPS representative of the intended Type Design, validated analysis,</i>	N	Y	Partially accepted	The Airbus understanding is correct. Consistency with CS-E wording is maintained. Specific guidance will be provided as part of the Means of Compliance.

					<i>or a combination thereof.</i> The <del>following</del> provisions in this section provide the objective for these tests. <u>Additional partial system tests, component qualification tests may have also to be performed in order to address requirements in other subparts of the SC as well as demonstrating that systems and components are able to perform their intended function in all environmental and operating conditions of the intended aircraft installation</u>				
454	Lange Aviation GmbH	EHPS.50	9	Especially for the battery system the use of a large number of semi-finished products/COTS, i.e. battery cells, can be expected. How are these considered in terms of specification and variation in properties? Also, the manufacturer might not be willing to provide detailed insight into manufacturing methods and processes. How can the use of such products be facilitated?	Provide guidance material on semi-finished products/COTS and applicable regulations	Yes		Accepted	Specific guidance will be provided in the Means of Compliance
455	Rolls-Royce	EHPS.50	9	Part (a) "The design values of properties of materials must be suitably related to the minimum properties stated in the material specification and meet or exceed the properties assumed in the design data, over the life time of the EHPS."..... is not worded clearly such that the intent of the requirement is unclear.	Re-write to clarify meaning	No	Yes	Accepted	Reworded
456	Zeroavia James Lawson	EHPS.50		"minimum properties stated in the material specification and meet or exceed the properties assumed in the design data" is clumsy wording. Instead of "properties" suggest "performance" because some properties such as color do not have a minimum.				Partially accepted	Replaced by "relevant properties".
457	TCCA	EHPS.50	9	Add "...service conditions <u>declared in the installation manual.</u> "	Suggest to revise and add text, if needed			Not accepted	Consistency with CS-E is maintained. The service conditions are not provided in the installation manuals.
458	TCCA	EHPS.50	9	The specification of corrosion may limit the considerations of an applicant.	Propose more general statement such as: "[...] assumed service conditions over the life of the product."			Accepted	Corrected accordingly.
459	Rolls-Royce	EHPS.50 Materials	9	For hybrid systems there are better examples of deterioration over time than corrosion e.g. insulation break-down	Consider including better examples for hybrid systems.	Yes	No	Accepted	Insulation breakdown has been added but the examples that are provided does not constitute an exhaustive list. Specific guidance will be provided in the Means of Compliance.
460	Volocopter	EHPS.80	10	Given the definition in EHPS.15, is the management system of the energy storage device to be excluded from the safety analysis of the EHPS?		Yes		Noted	Exclusion has been removed
461	Lange Aviation GmbH	EHPS.80	9	It should be made clear that functional safety of a product has to be assessed and that standards and procedures according to the current state of the art at this moment have to be applied. Any ambiguity between this SC and other law (i.e. COUNCIL DIRECTIVE 85/374/EEC & ISO 26262) must be avoided. For the manufacturer any such ambiguities, loopholes, or contradictions between EASA regulations and other legislation puts him in a precarious legal position and will compromise safety. Furthermore, the complexity of even “simple” EHPS or subsystems absolutely necessitates a structured safety assessment and development approach (ED-79, DO-178,...). For example, a professional battery management system can feature tens of thousand of lines of software code. The safety of such a system can only be materialised by employing such development procedures.	The AMC should point out other applicable legislation, provide guidance on the current state of the art regarding safety assessments and acceptable regulations, and be regularly updated. Any ambiguities, loopholes, or differences with respect to other legislation must be avoided.	Yes		Accepted	Specific guidance will be provided in the Means of Compliance

462	Rolls-Royce	EHPS.80	9	(iii) Multiple Failures that result in the Hazardous EHPS Effects, <b>Hazardous Aircraft Effects or Catastrophic Aircraft Effects</b> defined in EHPS 15. - why are the last two categories included as they relate to the aircraft	Clarify why aircraft level safety is referred to which would be covered by aircraft certification	Yes	No	Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
463	Rolls-Royce	EHPS.80	9	Paragraph (b) is missing	Renumber further paragraphs or state "not used"	Yes	No	Accepted	Corrected
464	SAFRAN	EHPS.80	9	(2) Aircraft safety analysis, not EHPS responsibility	EHPS provides EHPS Failures Conditions identified as potential contributor to a hazardous aircraft effect according to the EHPS-030. Propose to maintain only major EHPS effects & hazardous EHPS effects or add "...for Hazardous Aircraft Effects or Catastrophic Aircraft Effects in accordance with safety objectives defined in the EHPS.30..."	Yes	Yes	Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
465	SAFRAN	EHPS.80	9	(3) Safety objective related to type certification basis of the intended aircraft	EHPS applicant could not conform directly to aircraft type certification basis. Proposed text: (3) proposal : "It must be shown by the EHPS applicant that EHPS design and construction is compliant to the aircraft specification flown down by the aircraft applicant to allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application."	Yes	Yes	Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
466	SAFRAN	EHPS.80	9	Aircraft applicant needs to define to EHPS applicant all necessary assumptions (e.g. : quantitative & qualitative safety objectives)	CS-E 30 should be adapted in SC-EHPS	Yes	Yes	Accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
467	SAFRAN	EHPS.80	9	No (b)	Reallocate paragraph	Yes	No	Accepted	Corrected

468	SAFRAN	EHPS.80	10	(D).(1).(ii) : Aircraft safety analysis, not EHPS responsibility	To propose to remove §	Yes	Yes	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this. Paragraph has been modified to clarify the roles and responsibilities of the aircraft manufacturer and the EHPS manufacturer. Specific guidance will be provided in the Means Of Compliance.
469	SAFRAN	EHPS.80	10	(5) Filght crew action	To move in EHPS.30	Yes	Yes	Partially accepted	Crew action replaced by Operating instructions.
470	SAFRAN	EHPS.80	10	(d)(2) - AMC Maintenance errors / human factors	AMC of § EHPS.80 should include a reference to AMC 510 (h) and also address maintenance errors especially related to electrical systems and wiring	Yes	No	Accepted	Guidance will be provided accordingly
471	General Aviation Manufacturers Association	EHPS.80	9	EHPS80-(c)- If the Primary Failure of certain single elements that are likely to result in Hazardous EHPS Effects cannot be sensibly estimated in numerical terms, reliance must be placed on meeting the...	If the Primary Failure of certain single elements that are likely to result in Hazardous or catastrophic EHPS Effects cannot be sensibly estimated in numerical terms, reliance must be placed on meeting the...	Major/conceptual		Not accepted	This § is related to the definition of critical part defined in EHPS.15.
472	General Aviation Manufacturers Association	EHPS.80	10	EHPS 80- (ii) - Why is DAL extremely improbable is not stated?	(ii) the occurrence of Hazardous and Catastrophic Aircraft Effects at rates in excess of the rates defined in the associated Type-Certification basis of the intended aircraft application(s) must be extremely improbable	Question		Noted	DAL association is a process. It does not define the safety objectives. The extremely improbable is only related to Catastrophic Aircraft effect. For Hazardous Aircraft effect, an extremely remote failure rate is more appropriate. Otherwise, the safety requirements would be too demanding.
473	General Aviation Manufacturers Association	EHPS.80	10	EHPS 80- (2) Is appropriate manuals unclude A/RFMS?	Add A/RFMS to the relevant manuals.	Minor		Accepted	Added
474	General Aviation Manufacturers Association	EHPS.80	10	EHPS 80-(5) Flight crew actions. These actions must be identified in the operating instructions manual and appropriately substantiated at aircraft level if the intended aircraft application is known	Should A/RFMS be called out as well?	Question		Accepted	Added
475	Zeroavia James Lawson	EHPS.80		"extremely remote" is associated with a probability not a rate. Instead of "rate in excess of" and "rates in excess of" suggest "probability in excess of" and "probabilities in excess of."				Accepted	Corrected
476	Zeroavia James Lawson	EHPS.80		Instead of "service management plan" should it be "in-service management plan."				Not accepted	It is understood that the comment is relative to EHPS.90 and not EHPS.80. Wording is not change so as to keep consistency with existing rules.
477	The Boeing Company	EHPS.80	9	Please correct or add missing paragraph	Missing bullet (b)	Yes	No	Accepted	Corrected
478	The Boeing Company	EHPS.80	10	(d) If the acceptability of the safety analysis is dependent on one or more of the following items, they must be identified in the analysis and appropriately substantiated: (1) Maintenance actions being carried out at stated intervals. The	(i) necessary for preventing the occurrence of Hazardous EHPS Effects at a rate in excess of Extremely Remote (probability less than 10-? per flight hour); (ii) the occurrence of Hazardous and Catastrophic Aircraft	no	yes	Accepted	Extremely remote probability is now linked with its definition for the intended aircraft application.

				<p>maintenance intervals must be published in the Airworthiness Limitations section of the Instructions for Continued Airworthiness (refer to EHPS.25) when:</p> <p>(i) necessary for preventing the occurrence of Hazardous EHPS Effects at a rate in excess of Extremely Remote; or</p> <p>(ii) the occurrence of Hazardous and Catastrophic Aircraft Effects at rates in excess of the rates defined in the associated Type-Certification basis of the intended aircraft application(s)</p> <p>1) The safety targets need to be clear to define an approach. 2) Refer to CS-E510 which defines (3): It must be shown that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote (probability less than 10<sup>-7</sup> per Engine flight hour). The estimated probability for individual Failures may be insufficiently precise to enable the total rate for Hazardous Engine Effects to be assessed. For Engine certification, it is acceptable to consider that the intent of this paragraph is achieved if the probability of a Hazardous Engine Effect arising from an individual Failure can be predicted to be not greater than 10<sup>-8</sup> per Engine flight hour (see also CS-E 510 (c)). In case that the safety target has not been defined it should be deleted as recommended.</p>	<p>Effects at rates in excess of the rates defined in the associated Type-Certification basis of the intended aircraft application(s)</p>				
479	Jonas Büttner	EHPS.80	9	(b) is missing so far.		Yes		Accepted	Corrected
480	Airbus DS	EHPS.80	9	<p>“(iii) Multiple Failures that result in the Hazardous EHPS Effects, Hazardous Aircraft Effects or Catastrophic Aircraft Effects defined in EHPS 15.”</p> <p>Novelty with respect to CS-E. Here catastrophic A/C effects are also considered. This will imply having at least a preliminary A/C FHA. EHPS certification potentially linked to an A/C design.</p>		Yes	No	Noted	<p>EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis.</p> <p>EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.</p>
481	TCCA	EHPS.80	9	<p>In (a)(1)(i) delete period to read “ ...analysis, ”</p> <p>In (a)(1)(iii) missing a dot; should read "EHPS.15"</p>	<p>Suggest to revise text, if needed</p>			Accepted	Corrected accordingly.



482	TCCA	EHPS.80	9	The Safety Assessment seems to be requested at the aircraft level rather than at the propulsion unit itself.	Suggest this section define applicability of the safety assessment only at the Integrated Hybrid Propulsion System level.			Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
483	TCCA	EHPS.80	9	Load shedding and definition+analysis of loads essential for the continuation of flight should be a capability of the an Integrated Hybrid Propulsion System.	In appropriate sections of EHPS it is suggested to define essential systems for flight continuation that needs to sustain a defined level of electrical power. In case of an OEI, remaining Internal combustion engine(s) on the aircraft or Aircraft Energy Storage System should be able to sustain the above defined power.			Not accepted	The list of the systems essential for the continuation of the flight has to be established at aircraft level. This is part of the safety assessment that has to be made under EHPS.80. The OEI case mentioned is a specific case related to a specific architecture. This could be part of Means Of Compliance.
484	TCCA	EHPS.80	9	Editorial: Reason for "Failure Conditions" with capitalisations? only capitalize terms found in EHPS.15 or other titles. Editorial: "[...] in the analysis. , and detailed [...]" to "[...] in the analysis and detailed [...]" Editorial: "EHPS 15" is EHPS.15	Minor edits.			Accepted	Corrected accordingly
485	TCCA	EHPS.80	9	EHPS.80(a)(iii) removes the need to consider safety-system failures that are relied upon in the analysis, as stated in CS-E 510 (a) (iii) and the reference to CS-E 510 (d), which was removed in this document (copied below). These considerations would likely still apply to EHPS, therefore should be retained. SC removed: CS-E 510 (d) "If reliance is placed on a safety system to prevent a Failure progressing to cause Hazardous Engine Effects, the possibility of a safety system Failure in combination with a basic Engine Failure must be included in the analysis. Such a safety system may include safety devices, instrumentation, early warning devices, maintenance checks, and other similar equipment or procedures. If items of a safety system are outside the control of the applicant, the assumptions of the safety analysis with respect to the reliability of these parts must be clearly stated in the analysis and identified in accordance with CS-E 30	Review paragraphs for applicability and include performance based wording to EHPS.80.			Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
486	TCCA	EHPS.80	9	The addition of : "(d)(2) If errors in maintenance of the EHPS, including the EHPS Control System, could lead to Hazardous EHPS Effects, Hazardous or Catastrophic Aircraft Effects, appropriate procedures must be included in the relevant EHPS manuals." Considering that HAZ EHPS Effects are defined in EHPS.15 as the effects of EHPS failure conditions that lead to either HAZ or CAT Aircraft Effects, the text may redundant, otherwise it indicates that EHPS maintenance errors that do not result in HAZ EHPS effects, yet still lead to HAZ or CAT Aircraft level effects need to be considered. Please clarify intent	Please review and provide clarification.			Noted	The text does not refer to Hazardous Failure Conditions. No contradiction has been identified.

487	Embraer S.A.	EHPS.80 (a)	9	The EHPS manufacturer should not be responsible to define what are the Major, Hazardous or Catastrophic Aircraft Effects. This categorization will be very dependent of the aircraft propulsion architecture and this analysis should be made by the aircraft manufacturer. Recommended to delete any reference to aircraft level effects.	<p>We suggest to change the text from::</p> <p>(a) (1) An analysis of the EHPS, including the control system, must be carried out in order to assess all Failure Conditions that can reasonably be expected to occur. This analysis must take account of:</p> <p>(i) Aircraft-level devices and procedures assumed to be associated with a typical installation or the intended aircraft application. Such assumptions must be stated in the analysis. , and detailed in the Installation Instructions of EHPS.30.</p> <p>(ii) Consequential secondary Failures and dormant Failures.</p> <p>(iii) Multiple Failures that result in the Hazardous EHPS Effects, Hazardous Aircraft Effects or Catastrophic Aircraft Effects defined in EHPS 15.</p> <p>(2) A summary must be made of those Failures Conditions that could result in Major Aircraft Effects, Hazardous EHPS Effects, Hazardous Aircraft Effects or Catastrophic Aircraft Effects together with an estimate of the probability of occurrence of those effects. Any EHPS critical part must be clearly identified in this summary.</p> <p>(3) It must be shown that the design and construction of the EHPS allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application.</p> <p>To:</p> <p><i>(a) (1) An analysis of the EHPS, including the control system, must be carried out in order to assess all Failure Conditions that can reasonably be expected to occur. This analysis must take account of:</i></p> <p><i>(i) Aircraft-level devices and procedures assumed to be associated with a typical installation or the intended aircraft application. Such assumptions must be stated in the analysis, and detailed in the Installation Instructions of EHPS.30.</i></p> <p><i>(ii) Consequential secondary Failures and dormant Failures.</i></p> <p><i>(iii) Multiple Failures that result in the Hazardous EHPS Effects defined in EHPS.15.</i></p> <p><i>(2) A summary must be made of those Failures Conditions that could result in Hazardous EHPS Effects together with an estimate of the probability of occurrence of those effects. Any EHPS critical part must be clearly identified in this summary.</i></p> <p><i>(3) It must be shown that the design and construction of the EHPS meets the qualitative and quantitative safety objectives for the Hazardous EHPS Effects.</i></p>	yes	no	Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
488	FAA DJ	EHPS.80 (a)(1)(i) to (iii)	9	This section including (i) thru (iii) seems very prescriptive		yes		Noted	This is not considered as guidance as these paragraphs ensures that the safety analysis is performed up tot the aircraft level, thus ensuring consistency between EHPS and aircraft safety objectives. Guidance will be provided to describe what are the data to be provided in details.
489	FAA GH	EHPS.80 (a)(1)(i) to (iii)	9	In the world of PBRs this sounds a bit like MoC	Consider moving this to the AMC	yes		Not accepted	This is not considered as guidance as these paragraphs ensures that the safety analysis is performed up tot the aircraft level, thus ensuring consistency between EHPS and aircraft safety objectives. Guidance will be provided to describe what are the data to be provided in details.
490	FAA DK	EHPS.80 (a)(1)(ii)	9	Define consequential secondary failures	Add to Terminology	yes		Accepted	Added: means a Failure of a part which is the result of the prior Failure of another part or system.

491	FAA JG	EHPS.80 (a)(1)(iii)	9	Is the distinction between Hazardous EHPS Effect and Hazardous Aircraft Effect necessary?		Yes		Noted	Hazardours EHPS effects are defined in order to introduce EHPS critical parts while ensuring consistency with CS-E
492	FAA DK	EHPS.80 (a)(1)(iii)	9	Add Major to Hazardous or Catastrophic aircraft effects.		Yes		Accepted	Modified accordingly
493	FAA DM	EHPS.80 (a)(2)	9	If there is an expectation to meet various levels of airplane level probabilities, what are the standards to support them? In part 33, the existing standards are the foundation for compliance with required probabilities, see rule below. This draft is emulating part 33. As such, it only supports the hazardous EHPS effects. §33.75(c): “The primary failure of certain single elements cannot be sensibly estimated in numerical terms. If the failure of such elements is likely to result in hazardous engine effects, then compliance may be shown by reliance on the prescribed integrity requirements of §§ 33.15, 33.27, and 33.70 as applicable. These instances must be stated in the safety analysis.”		Yes		Noted	Yes, the intent is to define the acceptable probabilities of the EHPS failures according to the intended aircraft application.
494	FAA GH / WM	EHPS.80 (a)(2)	9	The references to Aircraft Level effects over reaches the traditional boundaries. Again, this doesn’t make sense. An EHPS manufacturer can’t predict every future aircraft and installation using their product.		Yes	yes	Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
495	FAA JG	EHPS.80 (a)(2)	9	Similar comment as above (see 26)		yes	yes	Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
496	FAA JG	EHPS.80 (a)(3)	9	Isn’t this really just the general objective of obtaining a TC? I don’t see a requirement here that an applicant could reasonably show compliance with.		Yes		Noted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.

497	FAA JG	EHPS.80 (c)	9	Shouldn't EHPS.50 Materials and EHPS.240 Overspeed and Rotor Integrity also be included?		Yes		Accepted	These paragraphs are included.
498	Volocopter	EHPS.80 (c)	10	If an EHPS is to be certified together with an aircraft in accordance to SC-VTOL, there is no use of critical parts foreseen. Therefore, EHPS.80(c) would become "n/a". Does EASA agree with this understanding?		Yes		Noted	Yes for a full electric propulsion system for which it has been demonstrated that no single failure can lead to a Hazardous EHPS effect (Full containment of high energy debris has been demonstrated...). However, for a VTOL aircraft, there could be cases where EHPS critical parts would be still required in order to provide a certain level of safety and quality on the final product. Let's consider for example an hybrid propulsion with a turbine engine. High energy debris release may not be avoided in turbine. So critical parts may be required. However, the turbine may be located so as to ensure that no single failure will lead to a CAT event. This approach, combined with the SC VTOL allows defining an hybrid propulsion system that is compatible with the safety objectives of SC VTOL while ensuring a low probability of release of high energy debris.
499	FAA GH	EHPS.80 (d)	10	This not very Performance Based	Could this be moved to AMC?	Yes		Noted	This is not considered as guidance as these paragraphs ensures that the safety analysis is performed up tot the aircraft level, thus ensuring consistency between EHPS and aircraft safety objectives. Guidance will be provided to describe what are the data to be provided in details.
500	Embraer S.A.	EHPS.80 (d)	10	The EHPS manufacturer should not be responsible to define what are the Major, Hazardous or Catastrophic Aircraft Effects. This categorization will be very dependent of the aircraft propulsion architecture and this analysis should be made by the aircraft manufacturer. Recommended to delete any reference to aircraft level effects.	We suggest to change the text from:: (d) If the acceptability of the safety analysis is dependent on one or more of the following items, they must be identified in the analysis and appropriately substantiated: (1) Maintenance actions being carried out at stated intervals. The maintenance intervals must be published in the Airworthiness Limitations section of the Instructions for Continued Airworthiness (refer to EHPS.25) when: (i) necessary for preventing the occurrence of Hazardous EHPS Effects at a rate in excess of Extremely Remote; or (ii) the occurrence of Hazardous and Catastrophic Aircraft Effects at rates in excess of the rates defined in the associated Type-Certification basis of the intended aircraft application(s) (2) If errors in maintenance of the EHPS, including the EHPS Control System, could lead to Hazardous EHPS Effects, Hazardous or Catastrophic Aircraft Effects, appropriate procedures must be included in the relevant EHPS manuals. (3) Verification of the satisfactory functioning of safety or other devices at pre-flight or other stated periods. The details of this verification must be published in the appropriate manual. (4) The provision of specific instrumentation not otherwise required. (5) Flight crew actions. These actions must be identified in the operating instructions manual and appropriately substantiated at aircraft level if the intended aircraft application is known. To: (d) If the acceptability of the safety analysis is dependent on one or more of the following items, they must be identified in the analysis and appropriately substantiated: (1) Maintenance actions being carried out at stated intervals. The maintenance intervals must be published in the Airworthiness Limitations section of the Instructions for Continued Airworthiness (refer to EHPS.25) when: (i) necessary for preventing the occurrence of Hazardous EHPS Effects at a rate in excess of Extremely Remote; or (ii) (deleted) (2) If errors in maintenance of the EHPS, including the EHPS	yes	no	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.

					Control System, could lead to Hazardous EHPS Effects, appropriate procedures must be included in the relevant EHPS manuals. (3) Verification of the satisfactory functioning of safety or other devices at pre-flight or other stated periods. The details of this verification must be published in the appropriate manual. (4) The provision of specific instrumentation not otherwise required. (5) Flight crew actions. These actions must be identified in the operating instructions manual and appropriately substantiated at aircraft level if the intended aircraft application is known.				
501	FAA Jf	EHPS.80 (d)(1) (i)	10	Where is “Extremely Remote” Defined		Yes		Noted	Extremely remote probability is now linked with its definition for the intended aircraft application.
502	FAA JG	EHPS.80 (d)(1) (i) and (ii)	10	Why only apply these rate guidelines to maintenance actions? Either move them up earlier in the regulation to apply to all conditions that could produce hazardous EHPS effects or remove them.  These rates also need to be on a sliding scale consistent with the safety continuum for how these products are intended to be operated. Applying a extremely remote probability of occurrence doesn’t seem consistent with this.		Yes		Partially accepted	These two paragraphs detail when including data in the Airworthiness Limitations section of the ICA. Safety continuum is ensured whith reference to the extremely remot definition provided in the Type Certification Basis of the intended aircraft application.
503	FAA DK	EHPS.80 (d)(5)	10	Flight Crew Alerts and Actions – The alerting means and recommended crew actions must be identified		Yes		Accepted	Alerting is part of the instrumentation mentioned in (4). Crew actions has been replaced by Operating instructions
504	FAA DK	EHPS.80 (d)(5)	10	Add items	(6) Maintenance Crew Messaging and Actions – These must be identified in the operating instructions manual and appropriately substantiated at aircraft level if the intended aircraft application is known.  (7) Monitoring Systems – Prognostic and health management functions pertinent to determination of EHPS and aircraft airworthiness	Yes		Accepted	EHPS.350 (g) addresses the data that are provided by the aircraft in order for the EHPS to function properly. EHPS.360 has been reworded and is now called “A/C instruments”. It addresses the determination of the parameters to be displayed in the aircraft in order to ensure a safe monitoring of the EHPS.
505	Rolls-Royce	EHPS.80 Safety Assessment	9	The EHPS.80(a)(1)(i) states: Aircraft-level devices and procedures assumed to be associated with a typical installation or the intended aircraft application.  It is not clear how to meet several EHPS requirements assuming typical installation since the A/C failure conditions classification and quantitative safety objectives are required to be met. Can be all this part of the assumptions?	Assumption: EHPS TC is in scope of this SC.  Clarify if the EHPS TC can be achieved with a consistent list of assumptions to assume a typical A/C installation.	Yes	No	Noted	The SC E-19 scope is limited to cases where the intended aircraft application is identified.



506	Rolls-Royce	EHPS.80 Safety Assessment	10	(d)(5) Flight crew actions. These actions must be identified in the operating instructions manual and <u>appropriately substantiated at aircraft level</u> if the intended aircraft application is known.  The A/C level requirements and compliance evidence should not be with the EHPS applicant responsibility.	(d)(5) Flight crew actions. These actions must be identified in the operating instructions manual and <del>appropriately substantiated at aircraft level if the intended aircraft application is known.</del>	Yes	No	Partially accepted	If the intended application is known, EASA expects the EHPS provider and the aircraft manufacturer, if these are different entities, to work in coordination on the interfaces between the EHPS and the aircraft. Operation instructions are one of the interfaces. Reworking has been made as a substantiation may not be feasible.
507	Rolls-Royce	EHPS.80 Safety Assessment	9	there is no safety objective defined for EHPS on its own. This implies that the restriction of not necessarily fulfilling the safety objectives of an intended a/c application must be stated in the assumptions or installation document <Also related to comment 51>	(3) It must be shown that the design and construction of the EHPS allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application. <a href="#">The demonstrated safety objectives must be published in the installation manual.</a>	Yes	No	Accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
508	AIRBUS	EHPS.80 Safety assessment	9 and 10	This paragraph is mixing EHPS effects and aircraft effects and is not providing clear objectives for EHPS effects. With the aim of adding clarity whilst maintaining flexibility in the possible certification approaches (with or w/o a specific EHPS Type Certificate) Airbus is respectfully proposing a complete rewording of the proposed paragraph. The new proposal also takes into account the comment NR 3 made about the Terminology paragraph. Proposal is also made to include some considerations as part of a future AMC.	Airbus propose to update the wording of EHPS.80 Safety assessment - as follows (new proposed text shown in <u>underlined italic</u> font): <i>(a) When the EHPS is certified as part of the Aircraft Type Certificate, a safety analysis of the EHPS, including the control system, must be carried out, as per the safety analysis requirements of the certification specification applicable to the concerned aircraft, in order to assess all Failure Conditions that can reasonably be expected to occur.</i> <i>(1) In addition to each aircraft type certification safety analysis requirements, it must be demonstrated that the probability of an individual Failure leading to non-containment of High Energy debris or Propeller release as applicable can be predicted to be not greater than 10–8 per HEPS flight hour</i> <i>(2) If the Primary Failure of certain single elements that are likely to result in High Energy Debris or Propeller release cannot be sensibly estimated in numerical terms, reliance must be placed on meeting the prescribed integrity specifications of EHPS.90. Any such critical part shall be identified in the safety analysis</i> <i>(3) Any dependence of the safety demonstration on maintenance / instrumentation must be clearly identified in the safety analysis and published in the A/C ICA/manuals as required in particular (AMC EHPS.80(a))</i>  <i>(b) (1)When the EHPS is not certified as part of the Aircraft Type Certificate, an analysis of the EHPS, including the control system, must be carried out in order to assess all Failure Conditions that can reasonably be expected to occur.</i> <i>(2)(i) The analysis must show that the design and construction of the EHPS allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application.</i> <i>(ii) In addition, it must be demonstrated that the probability of an individual Failure leading to non-containment of High Energy debris or Propeller release can be predicted to be not greater than 10–8 per HEPS flight hour</i> <i>(iii) If the Primary Failure of certain single elements that are likely to result in High Energy Debris or Propeller release cannot be sensibly estimated in numerical terms, reliance must be placed on meeting the prescribed integrity specifications of</i>	N	Y	Partially accepted	The scope of the Special Condition is now limited to the case where the intended aircraft application is known. For the time being, EASA is willing to give flexibility in order to enable innovation. EHPS can be certified as part of the aircraft or a stand-alone product. Specific guidance will be provided in a Certification Memorandum to part 21 regarding the ways to certify an EHPS.

					<u>EHPS.90. Any such critical part shall be identified in the safety summary</u> <u>(3) Any dependence of the safety demonstration on maintenance / instrumentation must be clearly identified in the safety analysis and published in the EHPS ICA/manuals as required in particular</u> <u>(AMC EHPS.80(b))</u>				
509	AIRBUS	EHPS.80 Safety assessment	9 and 10	This paragraph is mixing EHPS effects and aircraft effects and is not providing clear objectives for EHPS effects. With the aim of adding clarity whilst maintaining flexibility in the possible certification approaches (with or w/o a specific EHPS Type Certificate) Airbus is respectfully proposing a complete rewording of the proposed paragraph. The new proposal also takes into account the comment NR 3 made about the Terminology paragraph. Proposal is also made to include some considerations as part of a future AMC.	<u>To be added as AMC EHPS.80(a)</u> <u>(1) If maintenance actions being carried out at stated intervals are necessary for preventing the occurrence of High-Energy Debris or Propeller release at a rate in excess of 10-8 per HEPS flight hour, or for complying with the numerical probabilistic objectives of the aircraft certification basis the maintenance intervals shall be published in the Airworthiness Limitations section of the Instructions for Continued Airworthiness of the concerned aircraft application</u> <u>(4) If errors in maintenance of the EHPS, including the EHPS Control System, could lead to High Energy Debris or Propeller release, Hazardous or Catastrophic Aircraft Effects, appropriate procedures shall be included in the relevant aircraft manuals.</u> <u>(5) If verification of the satisfactory functioning of safety or other devices at pre-flight or other stated periods is required as part of the safety analysis, the details of this verification shall be published in the appropriate manual.</u> <u>(6) If the provision of specific instrumentation not otherwise required is necessary for the safety analysis, it shall be clearly identified as part of the safety analysis.</u>	N	Y	Partially accepted	Some proposed paragraphs as "future AMC" are to be kept at requirement level. Guidance will be provided accordingly to support EHPS.80.
510	AIRBUS	EHPS.80 Safety assessment	9 and 10	This paragraph is mixing EHPS effects and aircraft effects and is not providing clear objectives for EHPS effects. With the aim of adding clarity whilst maintaining flexibility in the possible certification approaches (with or w/o a specific EHPS Type Certificate) Airbus is respectfully proposing a complete rewording of the proposed paragraph. The new proposal also takes into account the comment NR 3 made about the Terminology paragraph. Proposal is also made to include some considerations as part of a future AMC.	<u>To be added as AMC EHPS.80(b)</u> <u>(1) The analysis required by EHPS.80(b) shall take account of:</u> <u>(i) Aircraft-level devices and procedures assumed to be associated with a typical installation or the intended aircraft application. Such assumptions must be stated in the analysis., and detailed in the Installation Instructions of EHPS.30.</u> <u>(ii) Consequential secondary Failures and dormant Failures.</u> <u>(iii) Reliance placed on a safety (protection) system</u> <u>(2) A summary shall be made of those Failures Conditions together with an estimate of the probability of occurrence of those Failure Conditions that could result in</u> <u>(i) High Energy Debris or Propeller release</u> <u>(ii) Major Aircraft Effects, Hazardous Aircraft Effects or Catastrophic Aircraft Effects</u> <u>(3) If maintenance actions being carried out at stated intervals are necessary for preventing the occurrence of High-Energy Debris or Propeller release at a rate in excess of 10-8 per HEPS flight hour, or for complying with the numerical probabilistic objectives of the intended aircraft certification basis the maintenance intervals shall be published in the Airworthiness Limitations section of the HEPS Instructions for Continued Airworthiness (refer to EHPS.25) or of the concerned aircraft application</u> <u>(4) If errors in maintenance of the EHPS, including the EHPS Control System, could lead to High Energy Debris or Propeller release, Hazardous or Catastrophic Aircraft Effects, appropriate procedures shall be included in the relevant EHPS manuals.</u> <u>(5) If verification of the satisfactory functioning of safety or other devices at pre-flight or other stated periods is required as part of the safety analysis, the details of this verification shall be published in the appropriate manual.</u>	N	Y	Partially accepted	Some proposed paragraphs as "future AMC" are to be kept at requirement level. Guidance will be provided accordingly to support EHPS.80.

					<p><u>(6) If the provision of specific instrumentation not otherwise required is necessary for the safety analysis, it shall be clearly identified as part of the safety summary.</u></p> <p><u>(8) If flight crew actions are required as part of the safety analysis, these actions shall be identified in the operating instructions manual and appropriately substantiated at aircraft level if the intended aircraft application is known.</u></p>				
511	Werner Scholz, European Sailplane Manufacturers	EHPS.80 Safety Assessment	9/10	The wording of this requirement does only allow simplified showing of compliance (e.g. for simpler aircraft or sailplanes) if the PCM would allow – if not this could become a rather arduous task – even more so when probabilities for different failure types are requested. At least some guidance should be included how simplified showing of compliance could be possible here.	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
512	Rolls-Royce	EHPS.80 Safety Assessment	10	(d) (1) (ii) is not comprehensible. Is there some wording missing?	Review and correct wording [Bruce Cook input: Would make sense if "necessary for preventing" were moved from (i) to the end of (1) main text.]	Yes	No	Accepted	Reworded
513	Rolls-Royce	EHPS.80 Safety Assessment	9	"(a)(3) It must be shown that the design and construction of the EHPS allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application." This is a sensible approach to align the EHPS safety objectives with that of the intended aircraft application. It prevents over-design for some CS-23 applications, where the safety objective for Hazardous effects is 1E-06 and not 1E-07 as for CS-25 applications.	Not applicable. Comment is a positive observation only. <Repeats support for this approach also seen in comment 51>	Yes	No	Noted	
514	Rolls-Royce	EHPS.80 Safety Assessment	9-10	(c ) It is a sensible approach to limit Critical Parts to Hazardous EHPS Effects, i.e. to not extend the criteria to Hazardous EHPS Failure Conditions, since this would extend the scope of Critical Parts to many parts in a single engine application (e.g. CS-23), where it is not practicable to apply Critical Part controls to all components that can result in a total loss of power.	Not applicable. Comment is a positive observation only. <But note comment 7 on inclusion of Aircraft level safety effects>	Yes	No	Noted	
515	VOLTAERO	EHPS.80 Safety assessment	9	This paragraph is inconsistent with the safety level of some light aircraft.	We recommend to replace paragraph (1): (1) An analysis of the EHPS, including the control system, must be carried out in order to assess all Failure Conditions that can reasonably be expected to occur. This analysis must take account of the <a href="#">installation Instructions, operating instructions and limitations of the EHPS</a> .	YES	NO	Accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
516	VOLTAERO	EHPS.80 Safety assessment	9	This paragraph is inconsistent with the safety level of some light aircraft. “Secondary failures and dormant failures” are never considered in General Aviation. As the applicability does not include CS-25, the text has to be consistent.	We recommend to delete paragraph (a) (1) (ii)	YES	NO	Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
517	VOLTAERO	EHPS.80 Safety assessment	9	This paragraph is inconsistent with the safety level of some light aircraft. “Multiple failures” are never considered in General Aviation. As the applicability does not include CS-25, the text has to be consistent.	We recommend to delete paragraph (a) (1) (iii).	YES	NO	Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
518	VOLTAERO	EHPS.80 Safety assessment	9	It is not the responsibility of the EHPS designer to certify the aircraft.	We recommend to delete paragraph a) (2).	YES	NO	Not accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take

									into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
519	VOLTAERO	EHPS.80 Safety assessment	9	It is not the responsibility of the EHPS designer to certify the aircraft.	We recommend to delete paragraph a) (3).	YES	NO	Not accepted	It is not requested to show compliance with the intended aircraft application, but to allow the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application. In other words, the demonstration of compliance to type-certification basis of the intended aircraft application remains at aircraft level. No change is made to the text but guidance will be provided.
520	VOLTAERO	EHPS.80 Safety assessment	9	Typing error ( c ) should be (b)		YES	NO	Accepted	Corrected
521	VOLTAERO	EHPS.80 Safety assessment	9	This paragraph is inconsistent with the safety level of some light aircraft. Quantitative failure analysis are never considered in General Aviation. As the applicability does not include CS-25, the text has to be consistent.	We recommend to modify paragraph (c) as such : (b) <a href="#">The safety assessment shall identify the critical parts.</a>	YES	NO	Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
522	VOLTAERO	EHPS.80 Safety assessment	10	Typing error ( d ) should be (c)		YES	NO	Accepted	Corrected
523	VOLTAERO	EHPS.80 Safety assessment	10	This paragraph is inconsistent with the safety level of some light aircraft, not clear and adds nothing. The designer shall be left free to define its installation instructions, operating instructions and limitations.	We recommend to delete paragraph (d).	YES	NO	Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
524	Vertical Aerospace	EHPS.80(a)	9	(a) probability vs impact, no quantitative figures for achieved safety are defined	Define quantitative figures relevant for the EHPS aircraft category, or provide reference to established safety targets (e.g., AMC 25.1309).	Yes		Accepted	Extremely remote probability is now linked with its definition for the intended aircraft application. Guidance will be provided to support EHPS.80.
525	J. Jézégou ISAE-SUPAERO	EHPS.80(a)	9	The requirement asks for EHPS safety assessment that includes Aircraft effects. The possible highly-integrated nature of some aircraft architectures that incorporates EHPS renders this overall assessment necessary. However, in case of EHPS standalone certification with an applicant that is not the aircraft manufacturer, the responsibility required from the applicant for such an assessment may not be relevant. (CS-APU -> only APU effects / CS-E -> only E effects)	To rely on the overall safety assessment, including EHPS, at aircraft level in aircraft CS, and to focus as EHPS effects in the SC.	Suggestion	No	Partially accepted	EHPS are different from a single motor as they most of the time include several motors. As such, failures modes cannot be only assessed anymore at motor level but at aircraft level (e.g. when the propulsion system takes part in the flight control function). This is why safety objectives have to be derived from the intended aircraft application. The aircraft manufacturer will provide these data as it is already done today between aircraft manufacturers and engine manufacturers. EHPS manufacturers do need to take into account safety objectives that are provided by the aircraft manufacturers in order for them to be able to perform the complete aircraft safety analysis. EHPS.80(a)(1)(i) has been reworded accordingly to clarify this.
526	Volocopter	EHPS.80(a)(1)(i)	10	Typo: “ . , ”		Yes		Accepted	Corrected

527	Vertical Aerospace	EHPS.80(b)	9	(b) is missing	State “(b) reserved”	Yes		Accepted	Corrected
528	Vertical Aerospace	EHPS.90	10	The word 'engine' is used repeatedly here	Replace ‘engine’ with ' EHPS' or 'Engine / Motor'	Yes		Accepted	Corrected
529	Lange Aviation GmbH	EHPS.90	10	There is a risk of nullifying the whole purpose of the safety assessment when applying superficial methods here.	The AMC should provide guidance which procedures are acceptable, e.g. as in AMC CS-E 515.	Yes		Accepted	Guidance will be provided accordingly
530	Lange Aviation GmbH	EHPS.90	10	“EHPS critical part” instead of “Engine critical part” in several instances	Search document for “engine” and replace with “EHPS” where appropriate	Yes		Accepted	Corrected
531	Cranfield Aerospace Solutions Ltd	EHPS.90	10	Should “Engine Critical Part” be ‘EHPS Critical Part’?	Reword if not intended.	Yes	No	Accepted	Corrected
532	Rolls-Royce	EHPS.90	9 & 10	Scope of paragraphs is too small, referring to "engine" erroneously when "EHPS" is intended in this context. 4 instances.	Replace "Engine Critical Part" with "EHPS Critical Part". 4 instances.	Yes	No	Accepted	Corrected
533	SAFRAN	EHPS.90	10	(a) Engine mentioned	To replace by EHPS sub system	Yes	No	Partially accepted	Replaced by "EHPS"
534	General Aviation Manufacturers Association	EHPS.90	10	EHPS.90 - The regulation could be reworded to avoid confusion	Reword part (a) to "An Engineering Plan which outlines how to establish and maintain the respective combinations of loads, material properties, environmental influences, operating conditions, and the effects of parts influencing these parameters. To allow each engine critical part to be withdrawn from service at an approved life, before hazardous engine effects can occur, validated analysis, test or service experience must be evaluated."	Editorial		Partially accepted	Consistency with CS-E is maintained. Guidance will be provided accordingly
535	TCCA	EHPS.90	10	Editorial: Change "Engine Critical Parts" to "EHPS Critical Parts" (x3) Editorial: "Hazardous Engine Effects" to "Hazardous EHPS Effects"	Minor edits.			Accepted	Corrected accordingly
536	Werner Scholz, European Sailplane Manufacturers	EHPS.90 EHPS Critical Parts	10/11	Similar to EHPS.80: Guidance for simpler aircraft is missing, which could lead to onerous way of showing compliance. Within CS-22H the engine is required to run safe for 50 hours and that's it basically...	Add regarding guidance and/or introduce some tiering (i.e. simplified requirements for simpler aircraft).	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
537	AIRBUS	EHPS.90 EHPS Critical Parts	10 & 11	The wording of this paragraph needs to be adapted in line with proposed new EHPS.80	Airbus propose to update the wording of EHPS.90 Critical Parts - as follows (new proposed text shown in <u>underlined italic</u> font):  The integrity of the EHPS Critical Parts identified under EHPS.80 must be established by: (a) An Engineering Plan, the execution of which establishes and maintains that the combinations of loads, material properties, environmental influences and operating conditions, including the effects of parts influencing these parameters, are sufficiently well known or predictable, by validated analysis, test or service experience, to allow each <del>Engine</del> <u>EHPS</u> Critical Part to be withdrawn from service at an <u>Approved Life</u> before <u>High Energy Debris or Propeller release</u> can occur. Appropriate Damage Tolerance assessments must be performed to address the potential for Failure from material, manufacturing and	NO	YES	Partially accepted	Consistency with CS-E is maintained. "Engine" has been replaced "EHPS"



					service-induced anomalies within the Approved Life of the part. The Approved Life must be published as required in EHPS.25.				
538	VOLTAERO	EHPS.90 EHPS Critical Parts	11	The paragraphs b) and c) are already covered by Part 21, subpart F and G for b), 21.A.6 and 21.A.120A for c).	We recommend to delete paragraphs (b) and (c).	YES	NO	Not accepted	Part 21 provides rules as per coordination with Design and manufacturing. The three plans identified in EHPS.90 define a closed-loop system which link the assumptions made in the Engineering Plan to how the part is manufactured and maintained in service; the latter two aspects are controlled by the Manufacturing and Service Management Plans respectively. The objective for an applicant is to develop a closed loop system where the combination and interconnectivity of these elements enhances product integrity. Specific guidance will be provided to identify the skill sets that should be present in establishing the three plans, with aim of ensuring cross discipline inclusion to achieve a closed loop system.
539	TCCA	EHPS.90 EHPS.240	13	The critical rotating parts and rotor integrity requirements for gas turbines are not applicable to electric or reciprocating (including Wankel) engines. Unlike a driven turbine stage, if a piston or electrical engines suffers a sudden loss of load its rotor will not accelerate indefinitely until burst.	Suggest these sections be revised as deemed appropriate by EASA.			Not accepted	Loss of load is one failure condition leading to overspeed for engine. But a rotor burst could be the result of an engine overspeed due to control system malfunction or a production defect.
540	SAFRAN	General	N/A	Comments Introduction	SAFRAN thanks EASA for the development of this special condition which is an important step. SAFRAN does support any discussion around this special condition and the coming Means of Compliance (MoC).	No	No	Noted	
541	SAFRAN	General	N/A	From industrial standpoint, need a clear & complete certification specification basis covering the propulsion system. We use to have CS-E + SC ?	Certification basis should be define starting from CS-E + SC-E19, or SC-E19 should be standalone. We recommend adding in the scope EHPS.10 the following sentence: “This Special Conditions can be used as applicable for the certification of an EHPS”. As an example, fuel system requirements are defined in this Special Condition for fuel engines, whereas a full set of requirements is already defined in the CS-E. Having different requirements may provide confusion.	No	Yes	Accepted	The SC E-19 is a self supporting document. For the time being, EASA is willing to offer flexibility in order to enable innovation. EHPS can be certified as part of the aircraft or a stand-alone engine product. Specific guidance will be provided in a Certification Memorandum to part 21. To be noted that the intent is to ease the use of certified engines as part of an EHPS in order to make use of certification data already available. The SC EHPS is not aimed to be the only means to certify an EHPS. Pending the architecture of the EHPS under certification, one applicant could request to make use of CS-E with an additional Special Condition.
542	SAFRAN	General	N/A	Engine definition	It should be interesting to work on the “Engine” definition (in the CS-Definition) to be compatible with this new propulsion system or to use another generic word to introduce the propulsion system and the dynamic lifting system, this definition has to be compatible with Thermal Engine, Electrical Engine, EHPS, ...	Yes	No	Noted	This is not the purpose of the SC E-19. However, this may be considered for a future update of the CS-Definition
543	EBAA (Corina Stiubei)	General		Thank you for the opportunity to comment. As an organisation we do not have any specific comments.		No	No	Noted	
544	VOLTAERO	General		General support of the proposal	VOLTAERO supports the proposal as some requirements for electrical and hybrid propulsion systems were necessary.	NO	NO	Noted	

545	TCCA	General		Q1. Has EASA considered the use of SAE ARP4754 when drafting this Special Condition? If yes, where can be the guidance be found? SAE ARP4754 may be applicable to all other types of aircraft not just CS-25.	Suggest to clarify intent, if applicable			Noted	ARP4754 could be used pending the intended aircraft application. Specific guidance will be provided in the Means of Compliance.
546	TCCA	General		There is another SC being drafted by another Authority on a similar topic, hence this SC should be harmonized with the other Authority. This will make future regulations on this new technology be more acceptable worldwide and will aid in a level playing field for all concerned.	Harmonized SC between the certifying authorities.			Noted	It is the intention of EASA to promote harmonization. However, EASA is not aware of another SC begin drafted by an authority that addresses hybrid systems or even complete propulsion systems. The only other Special Condition known to EASA that is currently drafted addresses a single electric engine.
547	Rolls-Royce	General comment	N/A	If the intention of this SC is to allow Certification of an installation-neutral powerplant, then certain requirements which would seem to require an airframe/installation to be fully defined beforehand should be clarified.	Please clarify the SC intent	Yes	No	Noted	The SC E-19 scope is limited to cases where the intended aircraft application is identified.
548	Rolls-Royce	General comment	n/a	This SC allows a reciprocating or gas turbine engine as a sub-system of an EHPS. However there is no specific reference to CS-E or CS-APU. EHPS should be qualified to an equivalent safety standard as an engine so therefore any such engine used as a subsystem should be type certified.	Each turbine or piston engine within the scope of the EHPS must be type certified in accordance with CS-E, or meet accepted specifications.	No	Yes	Partially accepted	SC E-19 is based on CS-E requirements.It intends to provide the same level of safety. To be noted that the intent is to ease the use of certified engines as part of an EHPS in order to make use of certification data already available. The SC EHPS is not aimed to be the only means to certify an EHPS. Pending the architecture of the EHPS under certification, one applicant could request to make use of CS-E with an additional Special Condition. A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.
549	<i>Airbus Helicopters</i>	Identification of Issue	1	It should be clarified that this SC can be used for: - Propulsion system Type Certification, or - Propulsion system certification requirements in the frame of aircraft Type Certification.	Add clarification	Yes	No	Partially accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.
550	<i>Airbus Helicopters</i>	Identification of Issue	1	Comment n° 1 is also valid specifically for the case of an hybrid system for which one could envisage that CS-E remains applicable to the turbomachine element.	Add clarification	Yes	No	Partially accepted	For the time being, EASA is willing to offer flexibility in order to enable innovation. A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.
551	<i>Werner Scholz, European Sailplane Manufacturers</i>	Identification of Issue	1	Within the mail of Mr. Rossotto dated 16.6.2020 to the WEP group of Ostiv SDP it was detailed that powered sailplanes are eligible for simpler requirements – just as CS-22 J / H requirements are less extensive than those of CS-E or for larger propeller. Therefore, it should be included in the identification of the issue, that the requirements of SC E-19 could be replaced by less extensive requirements for sailplanes (or VLA).	Clarify that Electric and / or Hybrid Propulsion Systems for powered sailplanes (and VLA) could be less extensive and/or specified in a simplified SC.	suggestion		Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.
552	<i>OSTIV Michael Greiner</i>	Identification of Issue	1	It is correct that CS22 subpart H Engines does not consider Electric and/or Hybrid Propulsion Systems, but there does exist an appropriate Special Condition CS E-01 for this case A strategic principle of the EASA GA-Roadmap is: “Protect ‘what shows to work well’ unless there are demonstrable and statistically significant safety reasons against doing so”	Delete reference to CS-22: “The certification specifications that are usually applicable to aircraft engines (except powered sailplanes) are contained in CS-E amendment 5. However this certification specification does not consider Electric and / or Hybrid Propulsion Systems.” This could be added if necessary: “As far as Electric Propulsion Systems for CS-22/LSA aircraft are concerned, SC E-01 is applicable.” “A SC E-19 engine can be installed in the same manner as a CS-E engine in a CS-22/LSA-aircraft.”	suggestion	objection	Partially accepted	The following intended aircraft applications have been removed from the scope: CS-22, CS-LSA, CS-23 level 1 day VFR and Light UAS.

553	AIRBUS	Identification of Issue	1	<p>The wording used in the Identification of Issue seems to imply that the proposed Special Condition is a one to one replacement of CS-E. Contrarily to what CS-E states (ref to CS-E 10 Applicability), it is however nowhere explicitly stated that the proposed SC now contains airworthiness specifications for the issue of type certificates, and changes to those certificates, for Electric and / or Hybrid Propulsion Systems. Airbus suggest to modify the wording in order to clarify this is a possibility that is offered with the proposed SC to have the EHPS included in the vehicle TC.</p>	<p>Airbus propose to update wording of the ‘identification of issue’ as follows (new proposed text shown in <u>underlined italic</u> font):</p> <p>This Special Condition has been developed to support Applications received by the Agency for the certification of Electric and / or Hybrid Propulsion Systems.</p> <p><u>The certification specifications applicable to aircraft turbine and reciprocating engines are contained in CS-E. CS-22 subpart H also contains specifications for spark and compression-ignition engines used to power sailplanes. CS-22, CS-23, CS-25, CS-27 and CS-29 all contain certification specifications applicable to the integration of those traditional fuel-burn engines into various airframes.</u></p> <p><u>None of these certification specifications however consider Electric and / or Hybrid propulsion systems.</u></p> <p><u>The purpose of this Special Condition is to provide a minimum set of requirements that an Electric and / or Hybrid Propulsion System shall satisfy to be eligible for installation on CS-22/CS-23/CS-25/CS-27/CS-29 aircraft/rotorcraft/sailplane. It can be used in its entirety or in part directly as an element of the aircraft/rotorcraft/sailplane certification basis w/o the need for the issuance of a specific Engine Type Certificate.</u></p> <p>This Special Condition is articulated so as to provide objective based certification requirements which are independent of the propulsion system design or architecture. The type of technology used in the propulsion system will be addressed in the Acceptable Means of Compliance. Acceptable Means of Compliance will depend on the type of EHPS that is considered and on the type of aircraft on which the EHPS is intended to be integrated.</p>	No	Yes	Partially accepted	<p>For the time being, EASA is willing to offer flexibility in order to enable innovation.</p> <p>A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.</p>
554	Volocopter	SC-EHPS General	All	<p>In case of certification of an aircraft according SC-VTOL, SC-EHPS is understood to be used for either standalone TC of the EHPS to show compliance to VTOL.2400 (b) “...must be type certified,...” or can be used as a specification in case of certifying the EHPS together with the aircraft, which will show compliance to VTOL.2400 (b) “...or meet accepted specifications”. Can EASA provide feedback if they agree with this understanding?</p>		Yes		Noted	<p>For the time being, EASA is willing to offer flexibility in order to enable innovation.</p> <p>A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.</p>
555	Volocopter	SC-EHPS General	All	<p>In case of certifying an EHPS together with an aircraft according SC-VTOL, many of the requirements provided by SC-EHPS are as well existing in SC-VTOL. Can EASA please advise, if duplicated requirements for the EHPS should be demonstrated by showing compliance to SC-EHPS or can also be demonstrated directly via SC-VTOL (e.g. Safety assessment, strength requirements, etc.)? Would it need special mentioning, where such approach is used?</p>		Yes		Noted	<p>EHPS shall comply with the requirements provided in the SC E-19. If similar requirements are provided in the intended application, there is no need to duplicate the work.</p>

556	TCCA	Subpart A		An integrated Hybrid Propulsion System could include a gas turbine or piston engine + electric motor. The scope of this special condition is considered too broad to address all the safety concerns related to all the details of an Integrated Hybrid Propulsion System	Suggest this Special Condition to insure minimum safety conditions for only the electrical equipment, power distribution and overall integration of the Hybrid Propulsion Systems. It is suggested to keep the Energy Storage System outside this Special Condition. Energy Storage could involve very complex safety concerns and could be a special condition by itself. The gas turbine or piston engine portion of the Hybrid propulsion systems could be certified through the existing rules (CS-E or CS-APU).			Not accepted	The Energy Storage System is now only limited to battery system. Battery systems are considered active components for the electric engines. A strong interconnection exists between how the electric engine is controlled and the way the battery discharges and vice-versa. It can be so considered as an equipment necessary for the functioning and the control of the engine. For the time being, EASA is willing to offer flexibility in order to enable innovation. Battery system can be considered as part of the EHPS or as part of the aircraft. Requirements concerning the battery system refers to the aircraft ones in order to ensure consistency. The SC EHPS is not aimed to be the only means to certify an EHPS. Pending the architecture of the EHPS under certification, one applicant could request to make use of CS-E with an additional Special Condition. A dedicated Certification Memorandum to Part 21 will provide guidance regarding the ways to certify an EHPS.
557	Rolls-Royce	SUBPART C – SYSTEMS and EQUIPEMENTS	15	Typo: 'Equipements' should read 'Equipment'.	Correct wording	Yes	No	Accepted	Corrected accordingly
558	Airbus DS	SUBPART D – SUBSTANTIATION	21	What about electrical failures such as Overvoltages, Overcurrents, Sudden Step Load management, etc..? The listed requirements seem particular to combustion engines.	Consider add missing substantiation requirements to cover overvoltages, overcurrents, sudden step load management, etc..	Yes	No	Partially accepted	EHPS.490 covers the need. Specific guidance will be provided in the means of compliance.
559	AIRBUS	Subpart D Substantiation	21	Airbus understand that the intent of this subpart is to prescribe requirements for complete EHPS tests (by opposition to partial tests) that would have to be performed on top of the requirements prescribed in the other subparts of the SC. If this is confirmed this should be stated more clearly. In addition, the introductory text makes reference to Vibration, Over Torque and Temperature Limit demonstration whereas the section does not contain any requirements for such tests.	Airbus propose to update the wording of the introduction to Subpart D as follows (new proposed text shown in <u>underlined italic</u> font): Compliance with the requirements for Endurance ( <u>including periods of EHPS Limits exceedance</u> ), Durability, <del>Vibration, Over Torque, Temperature limit demonstration</del> , Operation (including Power Response, Rotor Locking, Operation with a variable pitch thruster, and Operation with a fixed pitch thruster) must be substantiated via test performed on <u>a complete EHPS representative of the intended Type Design</u> , validated analysis, or a combination thereof. The following provisions provide the objective for these <u>demonstrations</u> .	N	Y	Partially accepted	The Airbus understanding is correct. Consistency with CS-E wording is maintained. Specific guidance will be provided as part of the Means of Compliance.

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