European Union Aviation Safety Agency

Comment-Response Document (CRD) 2021-10

RELATED TO NPA 2021-10 — RELATED ED DECISION 2022/018/R
RMT.0709

6.9.2022

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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Comment-Response Document (CRD) in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's Rulemaking Programme for 2022, under RMT.0709. The scope and timescale of the task were defined in the related Terms of Reference (see process map on the title page).

The text of this CRD has been developed by the Agency.

The process map on the title page contains the major milestones of this rulemaking activity.

1.2. The structure of this CRD and related documents

This CRD provides a summary of comments and responses as well as the full set of individual comments (and responses thereto) received to NPA 2021-10.

1 Regulation (EC) No 216/2008 of the European Parliament and the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1), as last amended by Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure), EASA MB Decision No 01-2012 of 13 March 2012.

2. Summary of comments and responses

For NPA 2021-10, comments (163) were received from industry (73%) and national aviation authorities and partner authorities (23%). The comments that were received varied in nature but they have been summarised below:

- General support was received from the National Aviation Authorities of EASA Member States;
- Concerns were expressed that the benefits of an Overload Protection Device (OLPD) may not be achieved with a design that was compliant with the new ETSO;
- Requests were received to recognise the SAE standard AS 6342 in its entirety without any changes (as proposed by the draft ETSO);
- Concerns were expressed about a potential lack of harmonisation with other partner certification authorities;
- Some commenters felt that the ETSO requirements would lead to an overly complex hoist design;
- Requests were received to justify the dataset that was used in the safety assessment of the regulatory impact assessment as some commenters were of the opinion that the number and nature of the occurrences should not be attributed to the design of the hoist;
- Comments were received that asked for clarifications on the terminology (including requests for definitions) that was used and the intent of some of the ETSO requirements;
- Challenges were received on the some of the assumptions that were contained in the regulatory impact assessment including the process that was used;
- Requests were received to modify some ETSO requirements to improve their comprehension and logic or to align closer with the SAE standard;
- Requests were received to change the title of the ETSO to the clarify that the ETSO was applicable to ‘electrical hoists’ only;
- Clarifications were requested on the boundary of the ETSO and in particular the meaning of the term ‘hoist equipment’.

3. Individual comments and responses

In responding to comments, a standard terminology has been applied to attest the Agency's position. This terminology is as follows:

(a) **Accepted** — The Agency agrees with the comment and any proposed amendment is wholly transferred to the revised text.

(b) **Partially accepted** — The Agency either agrees partially with the comment, or agrees with it but the proposed amendment is only partially transferred to the revised text.

(c) **Noted** — The Agency acknowledges the comment but no change to the existing text is considered necessary.

(d) **Not accepted** — The comment or proposed amendment is not shared by the Agency.

(General Comments)	-

comment	*1*	comment by: *AOPA Sweden*
	AOPA Sweden The comments from AOPA Sweden in general are that we favour the NPA. Fredrik Brandel Member of the board AOPA Sweden	
response	Noted. The support of AOPA us welcomed.	

comment	*3*	comment by: *Norwegian Helikopter Employee Association*
response	Noted.	

comment	*4*	comment by: *LBA*
	LBA has no comments	
response	Noted. The response from LBA is noted.	

comment	*7* comment by: *Airbus Helicopters* Airbus Helicopters comments on this NPA have been consolidated with GAMA and ASD Rotorcraft Subcomittee members and submitted to EASA by GAMA
response	Noted. The comments from GAMA have been reviewed.

comment	*9* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* Thank you for the opportunity to comment on NPA 2021-10. Please be advised that there are no comments from the Swedish Transport Agency.
response	Noted. The response from SE STA is noted.

comment	*10* comment by: *UK CAA* **General Comment** Due to issues identified in the JAA with hoist airworthiness, EASA adopted AMC1 SPO.SPEC.HEC.105(b). We would be grateful if the Agency could clarify whether this AMC will therefore be reviewed with the introduction of this new ETSO.
response	Not accepted. All requirements in this ETSO standard are based on the current CS 27/29 requirements. Therefore, new designs are compliant with the AMC 1 SPO.SPEC.HEC.105(b) (a)(1).

comment	*11* comment by: *GAMA* The General Aviation Manufacturers Association (GAMA) greatly appreciates the opportunity to provide comments on NPA 2021-10. The comments below were developed and agreed collectively by GAMA's Rotorcraft (RTR) committee, comprising all the major civil rotorcraft OEMs from the EU, USA and Canada. GAMA's staff remain at the Agency's disposal at any time if there are any questions regarding any of the comments provided below.
response	Noted.

The comments from GAMA have been fully reviewed.

comment *12* comment by: *GAMA*

OLPDs were developed to reduce serious incidents and accidents associated with hoist entanglements around the time changes to 14CFR Part 27 and 29 were being introduced regarding HEC.
EASA has failed to recognize the safety benefits of the OLPD and with the changes proposed in the NPA will reintroduce entanglement related hazards that have been reduced since OLPD have been used.
Suggested resolution:
The industry consensus standard for the function and associated loads of the OLPD and cable attachment need to be re-evaluated by EASA to ensure that the safety benefits that were realized when OLPDs were introduced are not lost. The proposed function of the OLPD that is included in the EASA NPA/ETSO has a high probability of increasing entanglement related accidents and fatalities.
If EASA perceives that OLPDs as defined in AS6342 do not comply with the HEC loads required under 27/29.865, a rulemaking activity against CS-27/29 needs to be initiated to recognize this important safety enhancing feature.

response Not accepted.

Through the OLPD text as provided by the ETSO, the safety benefit of the OLPD is still provided while the certification requirements are also met. The wording as proposed by the SAE standard is not in-line with the current CS/FAR 27/29 requirements. However, changing the CS/FAR 27/29 requirements to meet the SAE text would lower the safety level for HEC operations. Further discussions with the SAE G-26 WG are welcomed to align the SAE text with the CS27/29 requirements.

Through the activation of the OLPD at dynamic loads even below 2.5g (but sufficiently above operational loads) the safety for the rotorcraft during entanglements is ensured.

comment *13* comment by: *GAMA*

Companies participate in committees and standards activities at considerable expense in manpower, travel, and cost. These efforts and expenses are undertaken because of the recognized benefits of developing consensus standards with industry experts with the goal of improving safety. Standards generated without consideration of the industry experts are not likely to be successful and will likely produce unintended negative effects. Through the NPA, EASA is choosing to undermine this process and has called into question whether continued industry participation in such efforts has benefit.

Suggested resolution:
EASA should recognise the work of recognized industry experts who developed AS6342 and not take their own path at the possible detriment to aviation safety.

response

Noted.

EASA recognises the work of the industry in committees and standards activities, as such many ETSO standards directly reference industry standards for their MOPS. This ETSO standard also uses a SAE standard as reference but some changes had to be introduced to cover some safety aspects required for Hoist, so as to comply with the current CS/FAR 27/29 requirements.

comment *14* comment by: *GAMA*

The proposed ETSO will generate lack of harmonization with other leading airworthiness authorities and potentially create an uneven playing field with little quantified safety benefit. The lack of harmonization will create different standards for EU applicants and non-EU applicants and operators using hoist equipment outside of the EU.

Suggested resolution:
Harmonization with other authorities is paramount to the success of the rotorcraft industry and EASA needs to recognize the work of recognized industry and authority experts and not take their own path at the possible detriment to aviation safety.

response

Noted.

EASA understands the benefit of harmonization and is working with the FAA to achieve common standards. In this particular case there is no equivalent FAA standard on the topic. Therefore, referring to dis-harmonization between authorities is considered to be not applicable to the situation of ETSO-2C208.

Moreover, EASA has provided to the SAE committee a proposal that was harmonized with the FAA in 2019. The current text of the ETSO is based on this FAA-EASA agreed version.

comment *33* comment by: *Bell*

To whom this may concern,

Bell's comments have been provided as part of the industry response from GAMA.

Best regards,

Ratana Hassard
Principal Engineer | Bell

Office: +1-817-280-4394

response

Noted.

The comments from GAMA have been fully reviewed.

comment	*34* comment by: *Sikorsky Aircraft* General comment from Sikorsky Aircraft: The proposed ETSO will eliminate harmonization with other leading airworthiness authorities. It is suggested EASA work with FAA and other leading authorities to harmonize requirements based on the SAE AS6342 document, and bring agreed upon changes to the SAE G-26 Committee Working Group for AS6342 revision.
response	Noted. See response to comment #14.

comment	*114* comment by: *Leonardo Helicopters* Comment: The proposed ETSO will generate lack of harmonization with other leading airworthiness authorities and potentially create an uneven playing field with little quantified safety benefit. The lack of harmonization will create different standards for EU applicants and non-EU applicants and operators using hoist equipment outside of the EU. Suggested resolution: Harmonization with other authorities is paramount for any TSO document. Individual local authority TSO documents undermine the whole purpose of a TSO
response	Noted. See response to comment #14.

comment	*169* comment by: *Transport Canada Civil aviation* Although TCCA F&HMS support the improvements to design compliance activities (cable selection, sizing, analysis and testing of system load carrying performance and system operation), along with improving overload protection and cable quick release systems, there appear to be many additional design complexities being introduced (monitoring, indication and recording) for which the specific needs and benefits are less apparent. The provided data indicates the vast majority of incidents result from cable entanglement, cable rupture, and cable rebound, with both cable rebound and cable rupture resulting from entanglement. Entanglements are an inherent operational risk during hoist operations, not caused by hoist design itself, and realistically only mitigated by hoist overload protection and cable quick release systems. Personal carrying Device Systems (PCDS) and hooks are the two other types of incidents cited in the document, for which the proposed hoist system design changes do not appear relevant. A well designed and appropriately quality controlled simple system is more often better than an overly complex system performing the same function.

Hoists are primarily used as rescue equipment, therefore the risk of fatalities should also consider equipment availability:
• The additional complexity being introduced will raise the cost of the equipment, which risks reducing numbers of hoist equipped aircraft in the field, which may result in fatalities due to rescue not being available when required.
• The increased complexity adds additional failure modes which, although each new failure mode may be properly designed to fail safe, the concern then becomes their effect on serviceability. If hoists become overly complex there will be more things to go wrong, a likely decrease in serviceability, potentially further reducing hoist equipped aircraft availability when required for rescue… more fatalities.

suggested resolution:
A thorough review and understanding of the data available on incidents and accidents related to hoist operations should guide the prescription of requirements/expectations to concerns that are genuinely resulting in fatalities with existing hoist designs.
As stated in the Comment Summary, TCCA's data does not allow us to conclude that the additional complexity being introduced by this NPA will be beneficial.
TCCA would appreciate a better understanding of EASA's data, to better understand the rationale for the requirements and expectations in this NPA.

response

Noted

EASA has performed a regulatory impact assessment and investigated the root causes of incidents and accidents before launching this NPA. This is summarized in the NPA introduction. TCCA may contact EASA for any further clarifications or questions.

The additional monitoring, indication and recording requirements have been reworded from the ETSO to highlight that the ones that are needed to ensure safe operations shall be included in the design.

For operational risk, see the response to comment #80.

In addition, most of the changes to the SAE AS6342 are introduced to align the standard with the CS 27/29 requirements. It is acknowledged that with increasing complexity additional failure modes might be generated. However, the risk is mitigated by a thorough system safety analysis.

1. About this NPA p. 4

comment *6* comment by: *Breeze Eastern*

Ian Azeredo
Breeze-Eastern's Chief Engineer

Response to NPA 2021-10 Prevention of catastrophic accidents due to rotorcraft hoist issues

This document serves as Breeze-Eastern's written response to EASA's published Notice of Proposed Amendment 2021-10.

By and large the NPA document serves as add-on recommendations for regulation changes beyond the industry collaborated SAE AS6342, of which EASA was an original part of. History recalls that at some point EASA disclosed to the rest of industry that beyond the FAA-TSO originally intended by the constructs of AS6342, EASA would commit to creating its own E-TSO in keeping with current EASA interpretation of the existing regulation. In fairness, the collaborative effort started as creating an industry-agreed set of minimally-required characteristics of a Part 29 / CS-29 rotorcraft's rescue hoist. Industry, beyond the FAA and EASA, included:
Collins (Goodrich) and Breeze-Eastern, the two primary manufacturers of rescue hoists, acting as chair and vice chair of the group respectfully
Lockheed Martin (Sikorsky), Airbus Helicopters, Bell Helicopter, Leonardo Helicopters
Two other companies striving for civil certification – Vincorian and Reel SAS
SAE itself, as the host of the standard and specification created.

It should be noted that Breeze-Eastern is the original manufacturer of the helicopter mounted rescue hoist, dating back to first operative use and installations from 1945. Goodrich (Collins) shares similar history (though slightly more complicated). Many of the rules, regulations, rescues, survivals, safety devices, and ultimately lessons learned are based on the longstanding pedigree of these two companies.

Breeze-Eastern is not unaware to how the current EASA interpretations and attitude towards rescue hoists came to be. It is predominantly with the onset of Goodrich's clutch issues which resulted in exhaustive and still existing Airworthiness Directives. With EASA's newfound rule interpretations, industry is responding with collective uncertainty and a foreboding caution, where design changes of the proposed magnitude as mandated by a small team of regulatory liaisons are pushing a generations-honed industry away from its current development path.

Goodrich's Airworthiness Directives started with a singular event in Europe, where Vega reported an unintended reel out of cable from a hoist during a load check. Versions of the actual events continue to be debated since the circumstances and surrounding influences did not have video or recorded data. However, on the aforementioned hoist the post-event slip range was below tolerance after the incident, which only lead to the following years of cascading design critique and "whatabout-isms".

This brought to prominence the inherent difficulty, complexity, and overall cost from all parties concerning certification of hoist installations on rotorcraft. Given that rescue hoists are peculiar and are offered in all types of configuration, often in part numbers configuration-specific to particular aircraft. The AW109S, for example, may have an entirely different hoist from the AW109E (though it shares a similar airframe), and may have several further versions of configurations depending on end-customer preference. This leads to increased certification costs, increased component cost since there are different production runs, and overall less supportability due to uniqueness of each configuration.

So, the conversation began between regulatory, OEMs, and hoist manufacturers to develop standards for TSO incorporation. In reality all parties would win, as certification costs would be lessened and an already developed industry would be able to focus on

logistic and technology improvements. The gathering committees working to generate a minimum performance standard, and working under the original goals, later devolved into exercising of debating how, in certain stakeholders opinion, that current technology did not meet the intention of currently written regulation.

How rules developed by decades of industry collaboration became viewed as unobtainable by industry practices, remains an enigma to this engineer. With all things considered, there is a possibility that there is an unstated objective to have a European-based hoist supplier instead of the current choice between two US-based manufacturers.

It must be noted, appreciated, and understood by both industry and regulatory agencies that uncountable numbers of human lives have been saved due to hoists equipped with existing overload protection devices. Likewise it must be noted that the incorporation of modern hoist safety features did not arise due to regulatory changes, but rather due to the organic technology development, specific customer demand, and market competition between the two major manufacturers.

Could rescue hoists be designed and certified with greater safety thresholds, with better usability, with more features to remove the inherent chaos of the hoist operation and mission? The answer is a unequivocal YES. However the vehicle to which this must be done must also be to the stepping tune of an aligned industry, considering the realistic aspirations of what can be accomplished with todays knowledge and todays technology and todays economic maneuverability through this niche aerospace market.

As EASA well knows, as well as the FAA ever has known, the safe features we take for granted today are marked reminders from hard lessons learned. Breeze and Goodrich both know that small changes must be concise, appropriate, and utterly validated before serious consideration for an end-product.

So, to this introduction's end, this document will go section by section through the NPA 2021-10 and provide Breeze-Eastern's (oft candid) response. The format may be considered as follows:

Section from NPA 2021-10

"Existing wording within section"

Response and analysis

Section 2.1:

"However, most hoist designs are derived from models that predate the change in the certification specifications for external loads, and their compliance is potentially questionable"

We are unaware of any major respected product that lacks design pedigree. There is no such thing as a blank slate aerospace design, or at least a major one. The comment that "most" hoist designs have questionable compliance is speculative. Does EASA have a technical source for this, or is this opinion based on the interpretation of existing verbiage in the regulations?

"A recent review of in-service incidents/accidents by EASA has highlighted that the introduction of some design improvements could potentially mitigate some of the catastrophic occurrences."

Breeze-Eastern is noting that EASA has presented a list of in-service accidents and incidents and previously provided them to industry during SAE AS6342 standard development. EASA is not noting industry's prior responses to these incidents and its relevant impact to the probability calculations. There is formalized disagreement between the statistics interpreted by EASA and the response from industry. More about these claimed incidents later…

Section 2.2:

"The primary objective of this RMT is to reduce the likelihood of catastrophic occurrences during rotorcraft hoisting operations through improved designs and eliminating design features that have been shown to contribute to these in-service occurrences on the existing hoist models."

In a perfect world, if EASA is proposing required changes to impending rescue hoist designs, EASA then also owns the burden of proof that these specific design changes will not negatively affect safety. Hoist manufacturers, for example, own the burden of proof when demonstrating that features meet the applicable level of safety. Perhaps a Fault tree analysis detailing affect of these changes (since proposed by EASA and not by industry professionals) should be presented and defined? Breeze is using the term "should" in the theoretical and moral tense, since a manufacturer cannot force a regulator to do anything (especially a US-based sub-supplier to EASA certification applicants). However EASA owns the proof (and perhaps moral responsibility) that these changes will net safety improvements absolute.

If a Technology Readiness Level were thought of, many of the propositions within the E-TSO rank low on the TRL scale, and certainly not to qualification levels high enough for consideration to be immediately adapted into a TSO.

Section 2.3:

"In order to meet the objectives of this RMT, a dedicated ETSO has been prepared that addresses the safety concerns that have been identified on the current design of rotorcraft hoists."

Understood that ETSO has been drafted, this has been announced for a few years. What specific safety concerns have been identified in the current design of rotorcraft hoists? Of a tabulated list of risks identified in the hoist mission, how many of those risks are directly, and not indirectly, attributable to the rescue hoist. Its unclear what specifically EASA is referring to.

For hypothetical sake lets consider if EASA sampled industry and found that there were 500 equal risks within an average hoist usage, but 5 were directly attributable to existing hoist designs. A recall of 5 solved risks of equal proportion to 495 other risks of other root cause should be in the publics understanding.

Section 2.4:

"The expected drawbacks are:
— the additional costs for the design and certification of rotorcraft hoists;
— the technical challenges of complying with the design objectives."

Unsurprisingly these added drawbacks are monetary in nature and directly affect the current manufacturers of rescue hoists, primarily Breeze and Goodrich as these are the two companies with developed supply chain and logistics. Breeze and Goodrich have both worked on updated designs in the recent years, but other internal advances have been

towards the improvement of logistics and training. With this mandate from EASA, other drawbacks will be shifting of resources from those improvement areas. Otherwise, costs arising from any supplier for any development must be amortized into pricing. As another drawback from this proposal, operating costs and installation costs for rescue hoists will increase significantly for EASA certified markets (regardless of supplier). Outside of these characteristics, weight and size of the rescue hoist are expected to increase with the consequence of affecting aircraft performance, weight/balance, range, or other key characteristics of the mission.

Draft ETSO-2C208 – Section 1.0

"This hoist ETSO covers articles which are intended to be operated in the complete range of possible hoist missions, including missions with high risk of entanglement."

The intention of "all possible missions" is understood by the current hoist OEMs but as we are seeing, the hoist application use continues to evolve and in that sense the applicability is recommended to be further defined for currently envisioned missions, as later missions with peculiarities of concern would be grandfathered in to the rule as written. Similar to the issue we're in today – hoists were originally meant for SAR, and are now finding commercial non-emergent usage.

Draft ETSO-2C208 – Section 4.2

"The maximum rated load shall be marked on the equipment, and the placard shall be installed in a location easily visible for the hoist operation."

Question: Some hoists may be allowed different rated loads for NHEC vs HEC, and should be published as so on the hoist, correct?

Draft ETSO-2C208 – Appendix 1 Section 2.3

"The hoist is equivalent to the hoist equipment. Hoist equipment includes the hoist itself, load attachment means (cable, hook, etc.), control and monitoring interfaces (including pendants, controllers and interconnecting wires), a structural interface to attach the hoist to the boom/rotorcraft structure and the overload protection device. The boom itself is not considered to be a part of the hoist equipment."

We understand the intention. We think there should be a separation in some way of internal components and external components. Otherwise EASA is opening up, for example, bird strike requirements as written to include the pendant and connecting harnesses, normally installed internal to the cabin and otherwise not usually susceptible to bird strike effects.

Draft ETSO-2C208 – Appendix 1 Section 3.3.2

"The hoist shall have a system to manage the reeling out and reeling in of the cable, minimizing the possibilities of jamming, fouling, kinking, or excessive wear on the cable."

Perhaps semantics, but what is the difference between jamming and fouling?

Draft ETSO-2C208 – Appendix 1 Section 3.3.4

"Cable rebound shall be characterised through testing by the hoist manufacturer, and a characterisation report shall be provided as part of the certification application. The rebound characterisation report shall include information about the influence of the different loading conditions and the influence of the different cable lengths related to the rebound behaviour."

The intention of the AS6342 inclusion of rebound reporting was due to initial comments from EASA as well as the published CM-HS some years ago. Characterization may be gathered through empirical testing, sure, but what is the intended use of this data? EASA

lists elsewhere that an objective is to reduce rebound but there is no threshold requirement, nor guidance of where this information would be published for the pilots/operator, or helpful to improving safety in any way.
Characterization testing, for the record, was performed previously by Breeze-Eastern and the characteristics of several rope types and sizes was documented. At the same time during AS6342 development, comments were received from EASA representatives to industry recalling rebound characteristics of non-metallic ropes based on rope manufacturer data. However Breeze characterization testing showed that this was not so, that rebound on a vertical scale was a phenomenon controlled by variables outside the immediate impressions of a non-metallic cable. For this reason, Breeze strongly warns against requirements or actions regarding rebound. Industry has already evolved two improvements with regards to rebound outside of regulatory requirements:
Overload protection device, limiting loads and limiting potential for catastrophic cable separation
Breeze's alternate wire rope cable, which has rebound characterizations improved from existing 19x7 cables.

Draft ETSO-2C208 – Appendix 1 Section 3.3.4

"Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured."

The goal of the verbiage as written in AS6342 was to account for rescue missions. There are particular scenarios where a miswrap could occur but the person beneath the helicopter (whether attached to the cable or not) is considered lost if not hoisted. In that case, the override option was meant as a decision by the hoist operators, to choose the lesser of two risk-laden options, to literally override an existing safety function. Continued safe operation may not be probable, but no operation leads to fatality in the aforementioned scenario anyway.

Draft ETSO-2C208 – Appendix 1 Section 3.4.1.1

"The hoist equipment shall monitor the safe operation of the hoist, through specific parameters including but not limited to the weight of the load, the fleet angle, the temperature of the temperature-sensitive components. The hoist equipment shall provide the status information (I) to the aircrew."

Has EASA received a consensus from hoist operators that having status display of weight of the load and fleet angle to be considered critical information? Breeze has explored and received no consensus, with some pilots saying the information would be only a nice-to-have, while others saying an improvement, to others remarking it would be additional workload to the aircrew and non-relevant to current operations. Fleet angle and load status information is considered secondary information, information which is already known by the aircrew based on visual sight. Temperature of sensitive contributions is not known and cannot be inferred by the aircrew and agreeably should be displayed as a status. EASA is asked to demonstrate why having weight and fleet angle status would directly improve safety in a live scenario. EASA is also asked to consider the relevant status displays to include pertinent information from the hoist, relevant to the mission, which the aircrew could not infer otherwise.

Draft ETSO-2C208 – Appendix 1 Section 3.4.1.1

• Load exceedance (I+R) (sampling rates need to be sufficient to capture shock loads)

Question: Based on previous testing from Breeze, shock loads and functional exceedances are not readily or easily defined. There are spectrums to what could be considered shock loads, and the speed to which shock travels through a tensioned steel rope is faster than

what most sampling rates would discern and would otherwise reject as outlying noise. Exceedance, in one respect, has lesser impact to the mission and the overall safety as does change in overall load. Because of Breeze's past history with products (We had our "mission view" system years ago undergoing flight testing, which produced troves of data. It showed how unhelpful most of the data was, thus contributing to scrapping of the program), we caution EASA related to the indication and recording of load exceedances IN GENERAL, and advise to focus on the recording of variables which impact safety. For example, the recording of loads beyond the limit load threshold are more important than when a load increases suddenly from 300 to 600 lbs for a 600 lb rated hoist. The latter scenario becomes a conversational abyss into the definition and uneasiness of the term "shock load".

Draft ETSO-2C208 – Appendix 1 Section 3.4.1.1 [and others in 3.4.1 sub bullets]

In general, the recording of information may be useful to maintenance crew for diagnostics and reduction of maintenance burden. It does not, however, directly lead to safety improvement and so should be considered as "should" instead of "shall". In looking at other E-TSOs, there are few relevant examples where recording of information is listed as direct requirement. At least this particular engineer had difficult finding precedence.
As an aside, in AS6342 we listed the payout distance display in 3.4.1.2.2 as non-critical. Based on other additions, it is with some surprise that EASA did not consider this a "shall" with r+I.

Draft ETSO-2C208 – Appendix 1 Section 3.4.3

"The operator control shall meet the applicable environmental requirements for outside use."

Excepting bird strike, as previously mentioned. Additionally why would a held-held pendant be held to a higher threshold for vibration? The added safety benefit from this added qualification burden is doubtful.

Draft ETSO-2C208 – Appendix 1 Section 3.4.4

"Minimum acceleration at rated load shall be 5 ft/s/s (1.5 m/s/s)."

Understood on the intentional add of "at rated load". We recommend to change it to "at all loads". It was kept as generic previously to implicitly capture that condition. Some systems may have different accelerations at variable loads if using torque/current based control loops.

Draft ETSO-2C208 – Appendix 1 Section 3.4.10

"The hoist shall have a means to measure and record the usage of the system. The usage shall be calculated in operating hours (time while the hoist drive is active) and hoist cycles."

Previous verbiage included drum revolutions, which is a method both Breeze and Goodrich employ on various product (Goodrich less so, Breeze more so). What is the safety rationale of excluding the method of calculating usage according to drum revolutions?

Draft ETSO-2C208 – Appendix 1 Section 3.6

"The static flight load factor shall not be less than 2.5 g for HEC applications. The substantiated load factor shall be stated in the hoist limitations."

What is the safety impact of restricting the static load factor to less than 2.5g? If the load factor is published anyway and stated in the limitations, why set a threshold which is higher than current allowable of overload protection devices compared to rated loads? SAE G26 committee for AS6342 had agreed to 2.2g limits on the OLPD, what is EASA's justification for mandatory increase (since static load allowable and OLPD are tied together)?

Draft ETSO-2C208 – Appendix 1 Section 3.6

"If the hoist is intended to be installed on a CS-29 rotorcraft, an impact with a 1-kg bird, at a velocity compatible with the maximum allowed speed installed on a rotorcraft, shall not lead to the detachment of parts which could prevent continued safe flight and landing. Compliance must be shown by tests."

What are the determinant pass/fail criteria? It is not explicitly worded as such, but is a hazard identified if there are any parts separated after bird strike (i.e. no ejected small fasteners allowed)?

Draft ETSO-2C208 – Appendix 1 Section 4.6

"During HEC operations, both the PQRS and BQRS are required to have a dual activation device (DAD) for external cargo release. The switch design shall be evaluated by ground test. Additional safety precautions (such as the use of a lock wire) should be considered for a remote hoist console in the cabin."

Minor comment – change to "frangible lock wire"

Draft ETSO-2C208 – Appendix 1 Section 4.7

"The purpose of the overload protection is to protect the aircraft, its occupants and the person being hoisted. It provides to the crewmembers the possibility to either stabilise the aircraft or to safely activate the PQRS and release the external load in less than 5 seconds after the declared emergency (i.e. snagging of the cable/hook), as requested in AMC 27/29.865."

Actually according to us, who developed the first overload clutches, the original purpose was to prevent unintended shock loads and destabilization of the aircraft. Shock loads in this case being change in loadings too quick for human/aircraft corrective response.

Draft ETSO-2C208 – Appendix 1 Section 4.7

"The overload protection system shall be capable of reliably withstanding the dynamic loads and the sustained overloads, as defined by the hoist manufacturer. It shall be designed to hold any static load coming from the cable up to the static limit load."

See comment from section 3.6. Given the AS6342 definition of 2.2g, what is the EASA substantiation for requiring higher threshold, if a lower limitation is declared?

Draft ETSO-2C208 – Appendix 1 Section 5.1.9.1.1

"increase of the cable tension through the hoist. The cable tension must always be below limit load."

Theoretically this is a possibility, that a hoist could apply tension and "snatch" the load back into a controlled state from where its otherwise reeling out (sort of like its "grabbing" the rope). Inertial considerations dictate that this will lead to shock loads and EASA must state that the shock loaded event on top of the existing pull-out forces should be accounted. Inertial considerations would not need to be reflected in subpart (a) as this is reflective of actual overload conditions.

Draft ETSO-2C208 – Appendix 1 Section 5.1.9.1.2

"The hoist must function normally (i.e. continues to lift at the rated load and speed) after completion of each set of 5 tests"

Based on previous notations and added thresholds, can EASA clarify that if this includes the static load factor?

Draft ETSO-2C208 – Appendix 1 Section 5.1.11

"Using a milliohm meter measure the bonding resistance between the hoist bonding location as indicated by the hoist manufacturer and the appropriate connector mounting block screw as indicated by the hoist manufacturer."
EASA requested to check EWIS standard practices for bonding path measurement on exposed screws on connector. This particular engineer was taught in the past not to do this since screws aren't directly in the bonding path.

Draft ETSO-2C208 – Appendix 1 Section 5.2.2.2
"A cable sample including damages and flaws that can be encountered during manufacturing or in service shall be prepared with two end fittings identical to the cable assembly design requirements of the hook end and subjected to fluctuating cable loads between 1 to 2 g times the rated load in accordance with DIN EN14311-8 Section 5.2.2.3. The cable shall be tested for 75 000 test cycles (150 000 reversals) with one end of the cable attached to a free swivel."
Based on previous wording in the draft ETSO, please clarify if this is for defects during usage or manufacturing which cannot be inspected (and thus earn the relevance of fatigue testing of a sample)

Section 4 - Impact Assessment
Reference Figure 1
At the onset of the SAE G26 committee a number of events were tabulated and discussed between regulatory agency and industry professionals, to which there was some disagreement. In the case of the impact assessment, EASA owns the dataset and will not disclose the dataset for industry audit. Of note, the title notates "potentially linked to hoist design". This title is itself a leading conclusion.

Reference Table 2
Adding onto previous comment, what is most striking on the list of causes and causal factors: nowhere are human factors mentioned – i.e. maintenance errors or operational errors. For a document regarding aerospace incidents, it is unusual to see that human factors as causal contributors being passed over.

Section 4.1.1.1 Entanglement
"It has been previously argued that entanglements could be prevented with increased training and experience. The assessment of the occurrences, however, shows that entanglements also occur with the most experienced operators who dedicate significant resources to training such as the US Coast Guards, the US Army, US National Guards, the Royal Air Force, the Royal Canadian Air Force, the Gendarmerie, CHC, Bond, Bristow, Eliliguria, Rega, the German Bergwacht, etc."
This point has been mentioned by EASA during the SAE G26 initial meetings when EASA first participated. The counterpoint is that for most of the aforementioned operators, future incidents of entanglements were inarguably mitigated after adoption of OLPDs. Recent lack of entanglement incidents resulting in catastrophic failures reflects the success of the current OLPDs.
An interesting dataset to see would be to see how many entanglements directly resulted in catastrophic failures, derived from Figure 7. As a second note, Figure 7 may not be showing increases in entanglements, but a trend resulting from increased hoist activity or a manifestation of Booth's Second Law where, now equipped with overload protection, hoist operators are more prone to hoist with greater entanglement risk.
On the same vein, EASA datasets up to this point display a growth of incidents, but these are not additionally reflecting the general increase of hoist missions per given year

(admittedly mentioned in a different section, but the purpose of this comment is to call attention to the leading conclusions based on presented datasets).

Section 4.2 Specific Objectives

"Reduce the likelihood of a rotorcraft accident or incident caused by a rebound of the hoist cable;"

This was previously mentioned, but the ETSO makes no mention of how to improve the current rebound characteristics but only asks to characterize. Of course, having less rebound lends itself to market attraction to that product as enhanced safety benefit, but that is beyond what the ETSO directly requires.

Section 4.3 Options not considered further

"EASA has already initiated continued airworthiness actions to address potential shortfalls in the reliability of current rotorcraft hoists. This has resulted in maintenance penalties in the reduction of European Union Aviation Safety Agency NPA 2021-10 4. Impact assessment (IA) TE.RPRO.00034-010 © European Union Aviation Safety Agency. All rights reserved. ISO 9001 certified. Proprietary document. Copies are not controlled. Confirm revision status through the EASA intranet/internet. Page 32 of 40 An agency of the European Union the time between overall and also a reduction in the permitted service life of current rotorcraft hoists. Additional restrictions that are more stringent were not considered to be necessary and would not eliminate some of the failure mechanisms that have been identified."

Question: is there evidence these airworthiness restrictions and limitations led to improved safety in the 8 years since implementation?

Section 4.5.1.1

"The 'no change' option would result in no improvement in the number of annual fatalities (3.00 fatalities per year (last 5 years) and loss of aircraft"

Correct that it would have no direct result, however the rescue hoist industry is creating improvements over time anyway and those improvements organically generated outside of EASA involvement are not captured by this statement. For example Breeze has unveiled its STC for an alternate wire rope cable outside of the ETSO, generated by internally generated engineering expenses. It should be noted that most of the requirements for AS6342 wire rope cable dynamics were based on Breeze's disclosure of test methods used to achieve certification of the new rope, to which EASA nor FAA never had guidance on previously.

With respect to AD 2015-0226R5, this is applicable to only one supplier and is not a truthful statement to apply to the rescue hoist industry. EASA should recognized that despite the ADs, new helicopters continued to be produced at large production numbers with hoists susceptible to the particular AD. At no point was the other primary hoist supplier (Breeze-Eastern) formally approached by a Type Certificate holder to develop a replacement solution for the affected installations under the Airworthiness Directive. What steps did EASA make to ensure certificate holders were able to implement hoist-safety improvements, or facilitate the approval of alternate installations?

Section 4.5.1.2

"It is expected that improvements in the design of rotorcraft hoists will significantly lower the number of annual fatalities (3.00 fatalities per year (last 5 years) and loss of aircraft. The level of safety improvement will increase over time as and when existing hoists are replaced by hoists with the design improvements"

It was previously mentioned, but there is argument that many accidents analyzed are wrongly assigning root cause to the rescue hoist in lieu of other human factors. Since EASA has presented a data set but refused to disclose to industry, Breeze would like to propose a non-biased engineering entity to review EASA's data collection assignment (such as NTSB tasking, if possible). Otherwise, the data presented is suspect.

Section 4.5.4.2

"EASA has confirmed that there would be no increase in the costs of designing a hoist to comply with the proposed improved hoist standards"

Previously discussed, though this is not a true statement. Design costs are amortized over product pricing as any business enterprise would do. Based on consensus from the two major hoist manufacturers, costs and prices are both expected to increase significantly, and the end result will be more expensive hoist installation and recurring costs. EASA should be aware that rescue hoists are different from all other previous E-TSO components in that non-recurring costs for production and engineering are significantly larger than for other components, and thus even with ETSO it will always be difficult for other manufacturers to enter the market. Unlike most other ETSO components, rescue hoists are critical and essential mission equipment to which end customers are extremely sensitive towards.

"Existing rotorcraft hoist manufacturers would have the cost of developing and certifying a new hoist design. This is considered to be in the order of €1M. This would only affect the main rotorcraft hoist manufacturer that has the majority share of the current hoist market. The current situation of the restrictions on the TBO of existing hoists would most likely drive existing manufacturers to redesign their hoists regardless"

For EASA's information, hoist material qualification testing costs alone (based on the ETSO writing), excluding labor costs, are greater than €1M for a supplier with an existing developed supply chain and existing test fixtures.

"The purchase costs of a new hoist that complies with the new standards are expected to be the same as for existing hoists. It is expected that with increased competition in the market the purchase costs of a new rotorcraft hoist may be lower in the future if new standards are introduced."

Purchase costs are mostly driven by supply chain costs. Within a single company, it is the classical numbers game, where labor costs pale in comparison with material costs. With the hoist market not expected to significantly expand, and given EASA's expectation for new suppliers to take market share, overall material costs for rescue hoists across the industry will only increase as batch runs on components decrease. They will increase especially in tune with EASA's comment that existing rescue hoist pedigrees are not desirable from a certification perspective (thus losing the advantage of part commonality). In the end, purchase costs for a rescue hoist are guaranteed to increase significantly even regardless of expected increase in market competition.

Section 4.5.4.2 Question 1

"Stakeholders are invited to provide quantified justification elements on the possible economic impacts of the options proposed, or alternatively propose another justified solution(s) to the issue."

Much like EASA's presumption of the major rescue hoist manufacturing players, the Type Certificate holders will only act based on financial incentive. To an extent that is also due to recently increased certification costs and wariness. How many TC holders have approached EASA with sizable hoist installation changes or new installations since the new

	ADs were enacted? Perhaps the TC holders are wary of the increased certification costs associated with hoists through EASA, and could have enacted improvements if not for the hesitation and perceived risk. A proposed path forward prior to incorporating E-TSO may be considered as follows: Current suppliers with developed supply chains to provide an expected non-recurring cost to meet proposed objectives, as well as known increases to recurring costs affecting end-item pricing. These estimations can be provided to EASA directly and discretely. Additional cost estimations can be provided from major OEMs for their side, for additional costs associated with airframe support of E-TSO end item as opposed to that defined through SAE AS6342. Value of the E-TSO proposed end items as opposed to SAE AS6342 to be evaluated for safety impact (benefits analysis) separately by current operators within EASA airspace who would be majorly affected by E-TSO action. An audit should be performed by a non-biased third party of NPA-tabulated data sets. Once all three are known, EASA would have a true picture of cost/benefit analysis and weigh consequences versus other rule-making means.
response	General introduction comment: Noted. EASA is respectful of industry experience and feedback, nevertheless ETSO-2C208 is the result of a rulemaking task that should be and remain independent of a particular industry stakeholder(s) and interest. Section 2.1 1st comment: Noted. The statement, that the designs are potentially questionable, is based on the assumption that the current certification specification for external loads was not existing at the time of the hoist design. Therefore, the hoists have not been designed taking them into account. 2nd Comment Noted
	Section 2.2 Noted For the hoist ETSO, EASA does not divert from the approach used for approving other equipment or the certification of helicopters itself.
	Section 2.3 Noted See response to comment #74.

	Section 2.4 Noted EASA acknowledges the fact that new requirements may lead to additional costs (see also the Regulatory Impact Assessment section 4.5.4 of the NPA). However, it is not evident that the new requirements lead to a weight increase. See response to comment #102.
	Section 1.0 Not accepted Hoists will have to be designed for the entire range of its use. If, in future, operations are envisaged that cannot be safely performed by hoists that comply with the current ETSO text, restrictions will have to be introduced to exclude this operation.
	Section 4.2 See the response to comment #27
	Section 3.1 Appendix 1 2.3. Not accepted This definition is used to describe in detail which components are addressed when using the term “hoist”. If any of the requirements are not applicable to a part, such as bird strike for parts within the cabin, these do not have to be addressed. This is standard practice in certification. For example, installations not exposed to the risk of a bird strike do not have to be evaluated.
	Section 3.1 Appendix 1 3.3.2 The term “fouling” refers to a “mis-wrap” of the cable on the drum. Jamming could be a result of fouling, however, jamming can also occur due to other reasons.
	Section 3.1 Appendix 1 3.3.4 1st comment Not accepted The rebound characterization test will give the installer data on how the cable behaves when rapidly released under load. This is essential since a rebound could have a catastrophic effect on the rotorcraft. Since this ETSO only takes into account the hoist, without considering the installation on a rotorcraft, it is the responsibility of the installer to show that catastrophic events due to the rebound of the cable are extremely improbable.

	It is acknowledged by EASA that the overload protection device plays a significant role in limiting the energy stored in the cable. If it would be shown that it is reliable, then credit can be taken from the installed overload protection (see section "Interactions of systems and structure").
	Section 3.1 Appendix 1 3.3.4 2nd comment Accepted The text has been adapted to reflect the safety benefit of the override function in certain operational scenarios.
	Section 3.1 Appendix 1 3.4.1.1. 1st comment Not accepted Since the maximum load on the hook as well as the fleet angle exceedance are limitations contributing to the load carrying capability of the hoist and the aircraft structure, this information has to be provided to the aircrew in accordance with the certification specification. This is based on the necessity that the aircrew has to be made aware of exceedance of limitations when they are critical for flight safety or when dedicated maintenance tasks are necessary to re-establish the required safety level.
	Section 3.1 Appendix 1 3.4.1.1. 2nd comment Partially accepted Load exceedance, either statically or due to a shock load, are exceedances of a limitation which needs to be made aware to the aircrew. However, EASA did not include a definition of shock load, in order not to limit new designs. Therefore, it is up to the ETSO applicant to propose a definition which enables the safe use of their specific hoist design.
	Section 3.1 Appendix 1 3.4.1.1.3rd comment Accepted See response to comment #41
	Section 3.1 Appendix 1 1.3.4.3. Partially accepted Bird strike is not an "environmental requirement". However, it is accepted that vibration qualification for outside-use is only applicable if the pendant can be stored outside of the rotorcraft. The text will be amended accordingly.

	Because the pendant will be used outside, it is expected that only applicable paragraphs of DO160 for the "outside use" need to be addressed such as salt spray, sand and dust, temperature and so on. As for all other equipment, if a risk does not exist, it does not need to be addressed but the installer needs to be made aware of such "restrictions" when the equipment is claimed to be "for outside use". The text has been amended.
	Section 3.1 Appendix 1 3.4.4. Accepted "at rated load" has been deleted. The original SAE AS6342 will be kept.
	Section 3.1 Appendix 1 3.4.10 Partially accepted The limitation for the life of the hoist is generally expressed in operating hours or hoist cycles, which can be monitored by the operator. Therefore, this is the information that is needed by the installer. The monitoring of drum revolutions can be used in addition by an applicant, however, it is not mandated by this ETSO.
	Section 3.1 Appendix 1 3.6. 1st comment Partially accepted The minimum static load factor of 2.5 is required by the current certification specifications CS 27/29.865. If a hoist design does not comply with this, then it is not possible to be installed on a rotorcraft. However, a lower load factor (but with a safety margin to normal operational loads) is acceptable for dynamic events as described in the OLPD requirements. See also the response to comment #12 The text has been amended.
	Section 3.1 Appendix 1 3.6 2nd comment Noted No parts that are sufficiently large in size or weight to preclude continued safe flight and landing should depart, since the rear structure, including the tail-rotor, could be damaged. If any part detaches in such a test, the information shall be provided to the installer in order to enable them to assess the criticality.

	Further information can be found in the EASA Certification Memorandum CM-21.A-A-001 "Parts detached from aeroplanes" and proposed CM-21.A-A-002 Issue 01 "Parts Detached from Rotorcraft".
	Section 3.1 Appendix 1 4.6 Accepted Text has been changed accordingly: "During HEC operations, both the PQRS and BQRS are required to have a dual activation device (DAD) for external cargo release. The switch design shall be evaluated by ground test. Additional safety precautions (such as the use of a frangible lock wire) should be considered for a remote hoist console in the cabin."
	Section 3.1 Appendix 1 4.7 1st comment Noted The ETSO reflects today's purpose of the overload protection system, which is summarized as "to protect the aircraft, its occupants and the person being hoisted." However, the outcome of the equipment safety assessment will determine which events the OLPD is needed in order to meet the requirements of this ETSO. In the ETSO, the shock loading as well as the destabilization of the rotorcraft is covered by the test for shock load test (AS6342 section 5.1.9.1.2) and the OLPD allowing for a limited unspooling at loads below 2.5g.
	Section 3.1 Appendix 1 4.7 2nd comment See response to comment #6 Appendix 1 1st paragraph of section 3.6
	Section 3.1 Appendix 1 5.1.9.1.1. Not accepted EASA understands the comment, but EASA does not want to be more prescriptive in order not to dictate any design solution. How the hoist reacts to this loading condition is dependent on the hoist equipment design, including the OLPD design.
	Section 3.1 Appendix 1 5.1.9.1.2. Noted

	In general, it is required that the hoist is able to hold any static load up to the static limit load.	
	Section 3.1 Appendix 1 5.1.11 Not accepted The wording is taken from the SAE AS 6342 standard, that was agreed by industry to reflect common practice.	
	Section 3.1 Appendix 1 5.2.2.2 Noted Chapter 5.2.2.2. covers “tensile fatigue testing”. Fatigue testing, damage and flaws that can be encountered during manufacturing and in service have to be taken into account, if they cannot reliably be inspected.	
	Section 4 Impact assessment Noted Only occurrences that potentially related to design were included in the dataset. For the regulatory impact assessment, EASA uses official sources (such as ECR). Figure 1 shows cases where the hoist design is a contributor to the events.	
	Section 4.1.1.1 Noted	
	Section 4.2 See response to comment on Section 3.1 Appendix 1 paragraph 3.3.4.	
	Section 4.3 Noted Through introducing the measures as defined in the EASA AD 2015-0226R5 an acceptable level of safety is restored for the affected hoists. So far, this has been proven to be an adequate measure based on the reporting since the publication of the Airworthiness Directive.	
	Section 4.5.1.1 Noted	

	The comment is not directly related to the NPA or ETSO standard. Hoist safety improvements for the hoist addressed under the EASA AD were mandated by the AD. In addition, EASA is in close contact with the European rotorcraft manufacturer in order to continuously enhance the safety of rotorcraft operations (EASA Rotorcraft Safety Roadmap). This ETSO standard is part of the actions EASA has undertaken to enhance the safety of rotorcraft operations.	
	Section 4.5.1.2 Not accepted. EASA collected data from occurrences reporting (SDM), from the EU repository ECR (which is governed by implementing EU rule 376/2014), from some Certification Authority and also from publicly available sources such as accident reports. A hoist safety review, based on anonymised data and publicly available accident reports, was prepared and provided to the industry group and discussed during a 2-day workshop. The original set of data contains proprietary and confidential information and cannot be provided as such to industry by the EASA certification team. The commenter is invited to contact the EASA legal department for a more detailed explanation on the EU protection of data and submit a request for information on this topic with them.	
	Section 4.5.4.2 Noted See response to comment #102. Submitting an article to ETSO authorization is optional. The equipment can still be approved via the TC/STC process. The comment also reflects a lack of knowledge of the ETSO context, please refer to CS-ETSO subpart A and subpart B to discover to what degree CS-ETSO contains standards addressing safety critical functions.	
	Section 4.5.4.2 Question 1 Noted Since the current hoist designs are not able to be certified for newly or recently certified rotorcraft, a new hoist design is needed in any case. Consequently, only the additional costs through the changes made to the AS6342 by EASA need to be taken into account. However, these changes are applicable at the point of the certification of an ETSO hoist on the rotorcraft. Therefore, without the ETSO, the cost for a new hoist design would be similar, since compliance to the CS 27/29 requirements has to be shown in any case, either directly through the ETSO, or as a combination of the AS6342 and the CS 27/29.	

comment	*140* comment by: *Civil Aviation Authority the Netherlands* The Netherlands does not have any comments to share on this Notice of Proposed Amendment.
response	Noted.

2.1. Why we need to amend the rules - issue/rationale p. 5

comment	*15* comment by: *GAMA* EASA states that current hoist designs are potentially non-compliant with the current certification specifications without clarification of the reasons. Recent hoist installations have been found to be compliant to the latest rules, so the comment from EASA can only be based on changes in interpretation and not in the rules themselves. Hoist OEMs have developed improvements based on accident data to improve safety. These improvements and the reasons for the improvements have not been recognized by EASA. **Suggested resolution:** A more holistic view is needed to ensure that the rules match the available technologies and change requirements for the hoist equipment to meet rules that may be too prescriptive and not provide the required level of safety.
response	Not accepted. EASA does not concur with the generic statement that all recent hoist installations comply with the CS-27 or CS-29 rules. Deviations are currently published on EASAs website. The ETSO-2C208 lays down requirements that fully match and support the further demonstration of compliance to the CS 27/29 requirements. EASA considers that ETSO-2C208 will enhance safety for hoists. ETSO-2C208 may be considered prescriptive (as are many other (E)TSO standards) but the ETSO certification path remains optional , the hoist can still be proposed together with its installation for certification via TC/STC.

comment	*16* comment by: *GAMA* EASA quotes a reliability target of 1 x 10-9 but does not acknowledge that design of the hoist will not mitigate the majority of occurrences that are presented in section 4 of the NPA. **Suggested resolution:**

	The NPA needs to also include assessment of the benefits of the safety promotion that is underway as a potentially more effective mitigation than the changes defined in the proposed ETSO.
response	Not Accepted. The benefits of the safety promotion are very helpful to ensure a safe operation of the hoist. However, the safety promotion does not mitigate safety risks that are attributed to the reliability of the design.

comment	*105* comment by: *Collins/Goodrich Hoist* However, most hoist designs are derived from models that predate the change in the certification specifications for external loads, and their compliance is potentially questionable. All hoist certified since the introduction of the latest rules meet the requirements as set down by the certification authority. They have been certified on multiple platforms by multiple agencies, both as part of TC and STC's. We see no basis for this comment that compliance is potentialy questionable. These occurrences have been happening with a probability at least an order of magnitude higher than the safety level required by the CSs. Where is the data to back up this comment? The data in the document has not been reviewed with industry and is at odds with the industry data collected as part of the G26 committee.
response	Noted EASA agrees that the sentence is ambiguous, however what was meant is that designs predate the latest change in the external load requirements and as a consequence these older designs could not take into account the latest requirements. As said, this data comes from occurrences and this data is proprietary information and cannot be disclosed to third parties.

comment *129* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	5	2.1	These occurrences have been happening with a probability at least an order of magnitude higher than the safety level required by the CSs. The current CSs and acceptable means of compliance (AMC) require that such occurrences should have a probability lower than 1 × 10–9 per flight hour (FH).	FAA can not confirm this statement from FAA accident reports. EASA provided a spreadsheet of accidents/incidents pulled mostly from web searches to build this case. Many of the records were military related. Industry through the G26 committee challenged each of these records.	No solution but a potential difference in jurisdiction between regulators. From the FAA position these numbers are potentially bloated to build a case.	Conceptual

respons e

Not accepted.

The numbers are not bloated nor manipulated

The “case” for the need to improve the designs of hoist equipment is recognised by industry and a SAE working group, including FAA, has issued a standard, on this “case”.

2.2. What we want to achieve - objectives p. 5

comment	*106* comment by: *Collins/Goodrich Hoist* These occurrences have been happening with a probability at least an order of magnitude higher than the safety level required by the CSs. Again no data or analysis has been presented to show the cause of the accidents or how the proposed changes will reduce the number of future incidents.
response	Not accepted. See response to comment #105

comment	*142* comment by: *Transport Canada Civil aviation* The entire premise of the NPA is to enact regulatory change to reduce fatal accidents related to hoist operation, but it only introduces new standards for the hoist equipment. The NPA does not mention anything about them being introduced in any aircraft level standard or rule, if only operational rule. If the usage of the ETSO'd equipment is not strictly mandated by regulation, it raises the question of the impact. Also, rules do exist in CS-27/29 that should/do by themselves prevent fatal accidents with a probability lower than 10E-9. There is no specific explanation as to why these should not be amended, and why instead it is proposed to prescribe additional requirements at the equipment level. Suggested resolution: In addition to creating the new ETSO, either mandate its usage via rule or identify it as a Means of Compliance to relevant sections of CS-27/CS-29. If additional requirements are really considered as necessary to mitigate accidents, then consider introducing them in CS 27/29.865 or other section, with justification given in the NPA.
response	Noted. EASA does not consider the need for additional requirements into CS-27 or CS-29 for the hoist, nevertheless the suggestion is well received and could be an option in case there would be some need to support the proper installation of ETSO approved hoists. The intent of this ETSO-2C208 is to ease the certification process for TC/STC applicants that would like to install a hoist. Applying for an ETSO-2C208 approval remains an optional path for the hoist equipment manufacturer.

2.4. What are the expected benefits and drawbacks of the proposal p. 6

comment	*107* comment by: *Collins/Goodrich Hoist* There is nothing in this proposed standard that relates or would affect the safety of hoist operations.
response	Noted ETSO-2C208 contains key features and requirements that will support hoist operational safety.

2.3. How we want to achieve it - overview of the proposals p. 6

comment	*142* ❖ comment by: *Transport Canada Civil aviation* The entire premise of the NPA is to enact regulatory change to reduce fatal accidents related to hoist operation, but it only introduces new standards for the hoist equipment. The NPA does not mention anything about them being introduced in any aircraft level standard or rule, if only operational rule. If the usage of the ETSO'd equipment is not strictly mandated by regulation, it raises the question of the impact. Also, rules do exist in CS-27/29 that should/do by themselves prevent fatal accidents with a probability lower than 10E-9. There is no specific explanation as to why these should not be amended, and why instead it is proposed to prescribe additional requirements at the equipment level. Suggested resolution: In addition to creating the new ETSO, either mandate its usage via rule or identify it as a Means of Compliance to relevant sections of CS-27/CS-29. If additional requirements are really considered as necessary to mitigate accidents, then consider introducing them in CS 27/29.865 or other section, with justification given in the NPA.
response	Noted. EASA does not consider the need for additional requirements into CS-27 or CS-29 for the hoist, nevertheless the suggestion is well received and could be an option in case there would be some need to support the proper installation of ETSO approved hoists. The intent of this ETSO-2C208 is to ease the certification process for TC/STC applicants that would like to install a hoist. Applying for an ETSO-2C208 approval remains an optional path for the hoist equipment manufacturer.

ETSO-2C208 p. 7

comment	*2* comment by: *MAP 21* 3.2.1 " *The failure of the function defined in paragraph 3.1.1 of this ETSO is:* *• Catastrophic for loss or malfunction of the hoist equipment (including the overload protection device), which could lead to serious injuries or a fatality (including the HEC).* *In addition, no single failure of the hoist equipment shall result in a Catastrophic Failure Condition.* " This statement is not in line with aviation System Safety Assessment principles (ref for instance table below from EASA) I can understand that EASA wishes to increase the safety by requiring a higher safety for the system, that is 10^-9 probability of something happening, but then the requirement clearly should state that this would be an exception from normal system safety principles. The single failure requirement, is also not really in line with the principles of EASA. If there is a single part, which could provide a catastrophic effect, then the part should be handled as a critical part and dealt with accordingly, nothing more, nothing less.
response	Partially accepted. EASA is not increasing the reliability of the system through the ETSO in comparison to the safety level established in CS 27/29. The required probability for an external load system is currently defined as “extremely improbable” (equal to 1 x 10^{-9}) for a potential catastrophic failure condition that results in a serious injury or a fatality as defined in the AMC to 27/29.865. However, EASA acknowledges the need for clarification for a single load path, where the text has been updated to differentiate between systems and structural parts. The text has been amended.

comment	*109* comment by: *Collins/Goodrich Hoist*
response	Noted. No comment entered.

3.1. Draft ETSO-2C208 'ELECTRICAL HOIST EQUIPMENT' p. 7

comment	*17* comment by: *GAMA* The applicability includes the need to have an OLPD which is not part of the ETSO applicability. Requirements are included under the technical requirements section. **Suggested resolution** Remove technical requirements from Section 1 as they are already included under Appendix 1 which is the more appropriate location.
response	Not accepted. The applicability of an ETSO standard has to be stated in section 1 (in conformity with EASA ETSO template) in order to define the exact scope of the ETSO.

comment	*18* comment by: *GAMA* Applicability includes definitions which are included in Appendix 1. **Suggested resolution** Remove the definitions from this section as they are included under Appendix 1 which is the more appropriate location.
response	Not accepted. The intent is to define the scope of the ETSO equipment. Unavoidably there are a few repetitions, but this section does not replace the definition section. If the definition for hoist equipment is meant, it needs to be stated in order to define the applicability of the ETSO.

comment	*19* comment by: *GAMA* This hoist ETSO covers articles which are intended to be operated in the complete range of possible hoist missions, including missions with high risk of entanglement. **Suggested resolution** Remove “including missions with high risk of entanglement”. It is unclear why “missions with a high risk of entanglement” are specifically mentioned. Does that mean that a hoist which is not intended for missions with a “high risk of entanglement” does not have to meet the requirements of this ETSO? Or does it mean that a hoist which meets the ETSO requirements is robust against entanglements? Entanglement is an operational issue and a general risk to hoist operations. Even the best hoist design cannot prevent entanglement nor can it reduce all risks associated with entanglement. We therefore believe that it is unwise to label a hoist as being specifically designed for “missions with a high risk of entanglement”.
response	Accepted.

	The text was included in order to highlight that the risk of an entanglement has to be taken into account for the design of the hoist to ensure that the design is robust against such events. However, it is agreed that the statement might lead to false interpretations and has therefore been deleted.

comment	*20* comment by: *GAMA* The statement that "no single failure of the hoist equipment shall result in a Catastrophic Failure Condition." Is not achievable with a single load path cable. **Suggested resolution** Change to state that single load paths shall be minimized.
response	Partially accepted. This comment has been addressed with a different resolution. See response to comment #2.

comment	*21* comment by: *GAMA* The statement about the OLPD failure being catastrophic is too prescriptive as there could be failure modes that are not catastrophic. **Suggested resolution** Remove the OLPD from Section 3.2.1. The safety assessment process in Section 3.2.2 will identify the failure modes and related hazards.
response	Not accepted The ETSO text highlights that only failures "which could lead to serious injuries or a fatality (including the HEC)" are considered catastrophic, which is in line with AMC No 1 to CS 29.865 (c)(2)(ii).

comment	*22* comment by: *GAMA* "Catastrophic for loss or malfunction of the hoist equipment (including the overload protection device), which could lead to serious injuries or a fatality (including the HEC)." **Suggested resolution** Agree to consider a fatality during hoisting as catastrophic, but propose to remove serious injury from the catastrophic failure definition. This definition of a catastrophic event is far more severe than the definition used for §1309, where serious injury to passengers or cabin crew falls within the hazardous category. By requiring that serious injury to HEC shall be extremely improbable (10-9), the ETSO is requiring a significantly higher level of safety for persons being carried on the hoist than for persons seated in the cabin.

● It is unreasonable to require that the risk of serious injury should be extremely improbable (10-9). The definition of serious injury (see Table 2 of the proposed ETSO), includes non-life-threatening injuries such as a fractured bone, a crushed finger, or a concussion. In an exposed operational environment, such as hoisting, it is hard to imagine that such injuries can be reduced to an extremely remote level. This is all the more problematic since the use of personal safety equipment (PCDS, gloves, or helmets) by the HEC is not regulated through the ETSO approval.

● By classifying serious injuries as catastrophic rather than hazardous, the overall level of safety for passengers is not significantly increased. A hoist operation is normally short compared to the duration of the overall flight. Since the probability of a serious injury for the non-hoisting portion of the flight is extremely remote (10-7), the short hoisting phase with an extremely improbable (10-9) risk of serious injury will barely increase the overall risk of serious injury during the flight.

response

Not accepted

The requirement is expressed for the hoist equipment, and only the hoist equipment, as defined in the applicability. This requirement is in line with CS 27/29.865.

For CS 27/29.865 the definition of catastrophic events differs from the definition of CS 27/29.1309. The AMC 27/29.865 explicitly includes serious injury and single fatality in the complete airborne system as a catastrophic event (AMC No 1 to CS 29.865 (c)(2)(ii)) and is calculated per flight.

comment

23 comment by: *GAMA*

The Equipment Safety Assessment refers to an FHA without stating which FHA is being referenced. It is also redundant based on the reference to ARP4761.
Suggested resolution
The reference to a specific FHA should be deleted as ARP4761 provides the recommended practices that should be followed.

response

Partially accepted

The ETSO text provides a reference to ARP4761. The text has been amended to clearly state which FHA is referred to.

comment

24 comment by: *GAMA*

“Note: Particular aircraft installations will drive additional, and more stringent, safety requirements for the hoist equipment. The ETSO applicant may elect to comply with these more severe aircraft installation requirements in the ETSO article FHA.“

Suggested resolution
“... more stringent…” - Does this mean it needs to be more stringent than CAT ? EASA to clarify.

response	Noted During installation of the hoist, the equipment safety analysis will be merged together with other system safety analysis such as power supply. This could mean that the hoist equipment safety analysis needs to be more stringent than the 10^-9 requirement related to a catastrophic event to meet the overall rotorcraft safety level.

comment	*25* comment by: *GAMA* The reason to include information about the "Maximum permanent deformation of the hoist after the application of the crash load factor" is unclear. The hoist will not be used after this type of event. **Suggested resolution** Remove the need to provide "Maximum permanent deformation of the hoist after the application of the crash load factor".
response	Not accepted The hoist manufacturer needs to inform the installer about the permanent deformation in order for the installer to assess the compliance to the emergency exit requirements: If the hoist is installed above an emergency exit, this exit should not be blocked by the hoist equipment.

comment	*26* comment by: *GAMA* Bird Strike is an aircraft installation related consideration. Different types of damage and debris can be tolerated at the aircraft level based on the specific installation and configuration. The aircraft OEM (for CS-29) will need to assess the impact but this should be provided in the form of a more detailed assessment as per Appendix 1. **Suggested resolution** Remove the need to provide "Impact speed for the bird strike test" as part of the installation manual.
response	Accepted See response to comment #51

comment	*27* comment by: *GAMA* Marking of the rated load can vary based on HEC or NHEC use. The limits are required to be placarded at the installation level per CS-27/29 and including them on the hoist is redundant.

Suggested resolution
Remove the need to provide the rated load on the hoist.
CS27/29.865(e) and CS27/29.1541 require the installation of a placard stating the operating limitations. This placard will contain the approved maximum load for the aircraft-hoist combination. This approved maximum load may be less than the maximum rated load of the hoist itself. Displaying contradicting information in the aircraft is likely to lead to confusion.
In addition, the readability of a placard will depend on the specific installation of the hoist. Therefore, it may be impossible to find an appropriate location for the placard that will be readable for all possible installations.
Furthermore, placarding requirements are not usual in other CS-ETSO specifications for installed equipment.

response

Accepted

The paragraph has been removed.

The requirement for documenting the rated load of the hoist equipment has been introduced into section 3.2.3 of the ETSO “installation manual”.

comment

32 comment by: *DGAC FR (Mireille Chabroux)*

3.2.1 page states that "Catastrophic for loss or malfunction of the hoist equipment (including the overload protection device), which could lead to serious injuries or a fatality (including the HEC)"

Shouldn’t the possibility for a helicopter loss also be specified in this definition (no associated scenario resulting from a malfunction/loss of the hoist equipment) ?

response

Not accepted

The wording “serious injury or fatality” comes from AMC 27/29.865 and is in addition to the definition of “catastrophic” as stated in CS 27/29.1309 covering the rotorcraft. HEC is explicitly included to clarify that not only the rotorcraft is considered.

In addition, this ETSO only affects the hoist equipment and not the installation.

comment

108 comment by: *Collins/Goodrich Hoist*

3.1 Applicability The Hoist equipment includes the hoist itself; load attachment means (cable, hook, etc.), control and monitoring interfaces, a structural interface to attach the hoist to the boom/rotorcraft structure and the overload protection device. The boom itself is not considered to be a part of the hoist equipment.
Under typical definition a TSO covers the equipment to be installed, and not the aircraft. If a hoist is marked as compliant with the ETSO, but may then be installed on an aircraft that does not meet the proposed rules, there is no way for a ETSO holder to validate an installation. The TC or STC process should cover those parts the hoist manufacturer has

little or no say over. The TSO should focus on the hoist equipment, independent of the platform installed on.

3.2.1 Failure Condition Classification
See CS-ETSO, Subpart A, paragraph 2.4.
The failure of the function defined in paragraph 3.1.1 of this ETSO is:
• Catastrophic loss or malfunction of the hoist equipment (including the overload protection device), which could lead to serious injuries or a fatality (including the HEC). In addition, no single failure of the hoist equipment shall result in a Catastrophic Failure Condition.
Supporting information is provided in AMC 27/29.865(c)(2) and CS 27/29.1309 Amendment 8.
Propose the following text:
Catastrophic single point failures may only be structural and must be minimized. Single point failures in the critical load path must be minimized and meet the requirements of part 27/29 .571 and .602.

3.3.2 Cable Assembly Management System
The hoist shall have a system to manage the reeling out and reeling in of the cable, minimizing the possibilities of jamming, fouling, kinking, or excessive wear on the cable.

Nowhere is a 'jam' defined in this or previous standards. We would propose that if the operator is commanding the hoist to reel out, and the cable is not reeling out, that the operator is immediately aware of this (as they are allowing the cable to run through their gloved hand)

3.3.2.2 Cable Assembly Storage System
The storage provision (e.g. drum) shall be able to attach the cable end, and store all the usable cable. The storage provision shall minimize wear affecting either the cable or the storage provision. Unravelling and damage of the cable on the drum shall be avoided. Potential environmental conditions such as vibration shall be taken into account. A means shall be provided to visibly check/inspect the storage of the cable. All reference to storage visibility shall be for maintenance on the ground, not necessarily for hoisting operations.

Subjective measurement – how shall potential environmental conditions such as vibration 'be taken into account'

3.3.5 Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured.

Propose wording 'Once initated the mis-wrap protection system may be capable of being overridden once the mis-wrap condition has been cleared

3.4.3 The operator control shall meet the applicable environmental requirements for outside use.
It is unclear why this is necessary, outside use includes such requirements as 'bird strike' Propose that a list be included with the exact requirements that a pendant shall meet to avoid unnecessary or inappropriate tests.

3.6 Static flight load factor

The static flight load factor shall not be less than 2.5 g for HEC applications. The substantiated load factor shall be stated in the hoist limitations.
The reason for the increase from the current standard of 2.0g or the SAE agreed 2.2g is unclear. Collins strongly believes that raising the static flight load factor to 2.5 negates the primary reason to have an OLPD in the first place. No safety reason for the increase to 2.5 has been given.

4.1 The arresting system shall be designed to sustain ultimate load without cable reel out. If not otherwise protected, engaging the arresting system shall not lead to an overload of the hoist equipment structure and shall reasonably protect human cargo on the hook.
Unclear what is meant by 'reasonably protect human cargo on the hook' means

4.3 Note: It may be necessary to substantiate greater angles than the hoist operational envelope, since the hoist might be installed at different angles on different airframes.
The requirement to support angles greater than 30deg serves no purpose in a practical sense in-light of the requirement to notify the crew if hoist is used outside of its operating range

4.6 BQRS requirement
The BQRS has been part of the aircraft installation (today a hand held device is the preferred method) and is not part of the hoist equipment per the ETSO

4.7 The purpose of the overload protection is to protect the aircraft, its occupants and the person being hoisted
It appears that the primary purpose of the OLPD, to reduce serious incidents and accidents associated with hoist entanglements. It appears that the proposed rule will lessen the primary function of the OLPD and will result in increasing entanglement accidents.

4.7 The hoist shall be equipped with overload protection capability
If a hoist equipped with overload protection, Collins believes strongly, that the initial arrestablity requirement (section 4.7) operate whether the hoist is powered up or not

4.9.21 Routing of electrical wires to the hoist interface shall include protection against chaffing or damage due to vibration introduced by the aircraft.
This is an aircraft installation requirement and should not be included in a TSO

4.9.24 Deleted
Unclear why this section was deleted?

5.1.9.1.2
The hoist equipment including the OLPD shall be able to arrest the load with a limited height loss after a shock load event.
Propose that this test be completed both with and without hoist powered up

5.2 This includes all damage and manufacturing flaws which are not inspectable or are allowed to remain in the cable

	Please explain this note further, if a flaw is uninspectable, then there is no way to confirm if they are present or not
response	Section 3.1 Accepted. It is not fully clear which issue the commenter wants to report under section 3.1. Applicability. It is agreed that the ETSO of the hoist equipment should only address requirements of the hoist equipment itself, independent from any installation. The hoist definition, as in section 3.1 does not include any rotorcraft specific parts. The interface to the rotorcraft covered by the ETSO is the structural interface of the hoist to the rotorcraft structure. The structural interface on the rotorcraft side will be provided by the installer.
	Section 3.2.1 Partially accepted See response to comment #2
	Section 3.3.2. Not accepted The term “jam” is widely used in the FAR and CS and is considered to be basic English. For instance, for flight controls: “n. Jam. A failure or event that results in either a control surface, a pilot control, or a component being fixed in one position.” The fact that the hoist operator is aware of a jam by touching the cable is an operational requirement. For the design the proposed wording is considered to be adequate.
	Section 3.3.2.2. Not accepted Vibration testing is expected to be part of the compliance demonstration to ED-14/DO-160 testing. It is expected that the cable assembly storage system is robust under the vibration levels selected by the ETSO applicant.
	Section 3.3.5. Partially accepted See response to comment #6 Section 3.1 Appendix 1 3.3.4 2nd comment
	Section 3.4.3. Accepted.

	The text has been adapted. Bird strike test is not considered as an environmental requirement. See also response to comment #6; section 3.1 Appendix 1 2.3. and section 3.1. Appendix 1 3.4.3.	
	Section 3.6 Not accepted The reason for requesting 2.5g as a minimum is to make the ETSO equipment in line with the current certification specification for rotorcraft CS-27 / CS-29, require a static load factor of not less than 2.5g-3.5 g for HEC operations (depending on the rotorcraft capability within the hoist operational envelope). See also response to comment #12	
	Section 4.1. Noted The term “Reasonably protect human cargo on the hook” is meant to address shock loading which can lead to serious injuries or fatalities when exceeding values as specified in CS-27/29.562 and chapter 5.1.9.1.2. of the SAE 6342. Exceeding these values shall be avoided by the arresting system.	
	Section 4.3. Not accepted The hoist needs to be substantiated to a minimum of 30° in each direction of the rotorcraft vertical axis. Since the actual installation, which might be not exactly in line with the vertical axis of the rotorcraft, needs to be considered, this note is intended to inform the hoist manufacturer about this issue. An adequate margin for such an installation should be provided by the ETSO holder, otherwise the hoist can only be installed such that the hoist vertical axis is in line with the rotorcraft vertical axis.	
	Section 4.6. Not accepted The BQRS is considered, in the context of this ETSO, as part of the hoist equipment. The hoist manufacturer needs to specify the BQRS in accordance with the cable that is used and the capability to cut it. This is also valid for a “handheld device”. If all existing “handheld devices” cut the cable reliably, no further restrictions for the BQRS are necessary. The method used today can be considered as being in line with the ETSO text.	
	Section 4.7. 1st comment	

	Partially accepted See response to comment #12
	Section 4.7. 2nd comment Noted The OLPD requirement is not directly linked to “powering up or not”. It is dependent on the specific design if a powering up is needed to ensure the required safety level.
	Section 4.9.21 Not accepted This requirement only addresses the electrical wires that are part of the hoist equipment as per the applicability of this ETSO.
	Section 4.9.24 Accepted Paragraph 4.9.24 will be reintroduced in the ETSO. However, it will be highlighted that the “duty cycles” are not considered to be a fatigue or endurance test in their own right. Chapter 5.1.4. references the AC 29-2C material. The AC/AMC material does not address duty cycle testing. It only addresses installation testing. Therefore, the section has been kept for the ETSO, however, the reference to AC 29-2C has been deleted.
	Section 5.1.9.1.2. Partially accepted The requirement does not specify the power state of the hoist. The possible combination needs to be defined by the hoist manufacturer for the specific design.
	Section 5.2. Accepted. The text has been amended to be more precise. Flaws that are not inspectable by normal maintenance inspection methods need to be included in the cable in order to ensure that the cable can withstand the loading requirements even with a minimum manufacturing quality. This approach is comparable to the certification of composite materials structures where small disbonds, which are not inspectable during scheduled maintenance, need to be included in static and fatigue testing.

comment	*141* comment by: *Transport Canada Civil aviation* All TSO MPS requirements are contained in SAE 6342 so the NPA does not give any insignt into actual technical requirements it introduces unless the reader has a copy of AS SAE 6342. suggested resolution: Copy or specify directly in TSO actual requirements contained in AS SAE 6342 (Copyright issue is acknowledged but this highlights this classic issue of TSO practice), if only as a summary in the NPA description, along with justification for each.
response	Not accepted For obvious copy right reasons, it is not the solution that has been chosen by EASA. Generally, an ETSO applicant would purchase the industry standard that lays down the MOPS of the ETSO standard.

comment	*143* comment by: *Transport Canada Civil aviation* “applicable standard is ...(AS) 6342...as modified by Appendix A....” There would be some benefit for the reader to see, at a glance, the list of modifications in a table in this paragraph. suggested resolution: Incorporate the list of modified paragraphs as compared to SAE AS 6342 in paragraph 3.1.1, with the appendix giving the detailed text of the modification.
response	Not accepted. Section 3.1.1 typically provides the applicable MOPS and the reference to the SAE standard. Given the number of topics that are addressed, EASA decided to include the table in the appendix as for similar cases in CS-ETSO.

comment	*144* comment by: *Transport Canada Civil aviation* Numbering of ETSO-2C208 suggests that there is an existing FAA TSO for that equipment, albeit with differences. Otherwise we expect an index 2, 500 series for ETSOs unique to EASA. At the time of NPA commenting, there is no FAA TSO for hoist equipment, and from our understanding, none planned in the near future. At TCCA, we are also numbering FAA TSO and ETSO we adopt as is, so the question may be asked if someone is looking for the equivalent FAA TSO. suggested resolution: Explain the rationale for numbering the ETSO in the NPA (why it’s not a 2C5XX ETSO).
response	Noted.

EASA does not intend to re-publish the NPA.

EASA has obviously liaised with the FAA to define the ETSO number. Information received from the FAA states that FAA has reserved the number C208 for hoist equipment. At this stage, there is no FAA draft TSO that EASA is aware of. Therefore EASA has properly numbered this ETSO as 2C208 following TSO-ETSO numbering practice .

comment *145* comment by: *Transport Canada Civil aviation*

The title and applicability of the ETSO very clearly specifies "electrical hoist equipment". While it is undertood that the vast majority of hoist systems nowadays would be electrical, and the standard and SAE AS 6342 are written for such equipment, it is not impossible (even if unlikely) that some aircraft be equipped with "mechanical" hoist equipment. The understanding is that the goal of the new ETSO is to trigger usage of equipment that follows these standards. However, it is not the same to say "This standards is applicable to electrical hoist equipment" than to say "this standard is applicable to hoist equipment" and then: "hoist equiment must be electrically controlled/activated" or "it shall meet these requirements" (that inherently imply an electrical hoist). Strictly speaking, as it is written, a non-electrical hoist would not be eligible for the proposed TSO, and there would be no standard (fully) applicable to that hoist equipment. It brings back comment # 2. If the usage of equipment meeting ETSO-2C208 is not specifically mandated by another rule, then a non-electrical hoist would be acceptable since a) ETSO-2C208 is not applicable to that equipment and b) there is no other TSO applicable to that equipment. We believe that was not the intent.

suggested resolution:
Change the title and applicability of TSO to remove "electrical". The electrical control/monitoring functional requirements would take care of mandating the functions that inherently require electrical components if that is the intent.

response Not accepted

The SAE standard as written only focuses on electrical driven hoists. Requirements that would be needed for other types of hoists are not included in the SAE standard AS 6342. Non-electrical hoists are not eligible to use this ETSO standard. For other hoists, such as hydraulic hoists, an installation can be approved via the major change or STC process directly complying with the CS 27/29 requirements.

3. Proposed amendments p. 7

comment *35* comment by: *Sikorsky Aircraft*

Section 3.2.1 (page 8):

	"In addition, no single failure of the hoist equipment shall result in a Catastrophic Failure Condition." Sikorsky Comment: Considering that the rescue hoist itself is a series of single load path elements, e.g. hook, cable, drum, OLPD, geartrain, motor, etc., it is impossible to meet this requirement. It is recommended each single load path critical element be designed for safety and reliability and quality controlled to minimize the risk of Catastrophic failure. Suggested Rephrase: "In addition, any primary load path element or component whose failure could result in a catastrophic event shall be considered 'critical parts' and be designed (such as flaw tolerance, additional margin of safety, redundancy where possible, etc.) for safety and high reliability and controlled by special quality processes to minimize the risk of failure." "Catastrophic for loss or malfunction of the hoist equipment (including the overload protection device), which could lead to serious injuries or a fatality (including the HEC)." Sikorsky Comment: Serious injury should be a lower level hazard classification. Suggested Rephrase: "Catastrophic for loss or malfunction of the hoist equipment (including the overload protection device), which could lead to a fatality (including the HEC)."
response	Partially accepted See response to comment #2 for 1st suggestion and response to comment #22 for the 2nd suggestion.

ELECTRICAL HOIST EQUIPMENT p. 7

comment *113* comment by: *REEL SAS*

Attachment #1

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	*REEL*	3.2.3	9	On the 3rd bullet, clarification is needed to understand on which parts of the hoist we need to focus on : What are the objectives to add this data in the installation manual ? Data are dependent from the installation.	Delete the topic or clarify the limit condition to perform the calculation.	Yes	No		

2	*REEL*	4.2	9	A hoist manufacturer is able to mark the rated load of its hoist. But at installation level, limitation can be implemented regardless of the hoist rated load. Therefore it could lead to have different placards with contradictory information and at this end it could bring confusions to the operator.	The rated load placard should be installed by the installer. The rated load value should be printed on the identification/marking plate of the hoist.	Yes	Yes		

response

Section 3.2.3.

Noted

See response to comment #25

Section 4.2.

Accepted

See response to comment #27

comment	*115* comment by: *Leonardo Helicopters* Comment: To qualify for the ETSO, the hoist system has to include an Overload Protection Device (OLPD). Although this is agreed by LH to be an improvement which will improve safety, it is not something that is mandated by the CS rules: if it will be mandatory, this should also be covered by a Rule Making activity for CS 29. Suggested resolution: Start a rule making activity to add the introduction of the OLPD to the CS 29.865 rules
response	Not accepted See response to comment #130 section Appendix 1 3.3.8.

comment	*116* comment by: *Leonardo Helicopters* Comment: (page 9, 4.2 - Specific) “And the placard shall be [...] visible for the hoist operation”: this is not controllable by the Hoist manufacture when complying with the ETSO. It is a requirement of the airframer, depending on installation. Suggested resolution: Remove this statement
response	Accepted See response to comment #27

Appendix 1 to ETSO-2C208 ELECTRICAL HOIST EQUIPMENT p. 10

comment	*30* comment by: *GAMA* “Hoist” is not equivalent to “Hoist Equipment”. The hoist is the winch and anything permanently attached, the hoist equipment is the hoist plus the other equipment required for basic functionality (pendant, control panels and wiring). Also the use of hoist and hoist equipment is not consistently used in Appendix 1. **Suggested resolution** Add a new separate definition for “Hoist Equipment”, if deemed necessary, for clarity and review the text in Appendix 1 for consistency.

response	Not accepted For this ETSO, the definition of “hoist” and “hoist equipment” are equivalent. In the SAE text, the term “hoist” is typically used when “hoist equipment” is meant. In order not to change each term “hoist” into “hoist equipment” in the SAE text, this approach was chosen.

comment	*31* comment by: *GAMA* The hoist equipment definition specifically mentions the OLPD feature. This is just one integral feature of the hoist and is not necessary as part of the definition as requirements for the OLPD function are specified within the Appendix. **Suggested resolution** Remove the reference to the OLPD from the definition.
response	Not accepted The OLPD was explicitly added in order to highlight that the OLPD is part of to the hoist equipment as an essential part of this ETSO.

comment *112* comment by: *REEL SAS*

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion*	Comment is substantive or is an objection**
NR	**Author**	**Section, table, figure**	**Page**				
3	*REEL*	Appendix 1 2.3	10	The “pendant” is included in the paragraph “hoist equipment” and in the paragraph “hoist system”. The interconnecting wires are generally specific to each installation platform and should belong to hoist system instead of hoist equipment	We propose the following : In the hoist equipment, we should replace “pendant” by “pendant and its coil cord” and remove “interconnecting wires”. In the hoist system, we should replace “pendant” by “additional controls” and add “interconnecting wires”.	Yes	Yes
4	*REEL*	Appendix 1 2.3	10	There is no information regarding the BQRS.	We propose to add a sentence “For the BQRS, two options are possible : inside the hoist equipment or included in the hoist system”	Yes	Yes
5	*REEL*	Appendix 1 3.4.3	12	For safety purpose , it is better to consider this requirement as an exposition duration risk of the load instead of requesting an acceleration that is more a performance of the hoist.	Then we propose to rephrase the requirement as below: “It is requested to reach the maximum speed for any load in less than 1s”	Yes	Yes
6	*REEL*	Appendix 1 3.6	13	Clarification is needed to understand the aim of introducing the static flight load factor which is related to installation platform.	Please Clarify	Yes	No

7	*REEL*	Appendix 1 3.6	13	"The maximum permanent deformation resulting from the application of the load factors shall be documented in the installation manual" This is a repetition of the requirement in 3.2.3. Moreover it is unclear if it is linked to all the three load factors defined just above or only linked to the crash load factor	Clarify or Delete the sentence in this chapter	Yes	No
8	*REEL*	Appendix 1 3.6	14	"The attachment shall be able to withstand limit load conditions" Please clarify the perimeter of the cable attachment	Add a definition of the cable attachment. For example : mechanical link of the end of the wire rope on the drum including the friction of remaining dead turns on the drum	Yes	No
9	*REEL*	Appendix 1 3.6	14	'complete unspooling of the cable' has to be understood in normal operation, until the normal stop on end of travel. It is possible and recommended for safety reason to detach the cable in case of an overload event when the cable is close to be fully reel out.	Please Clarify	Yes	Yes

10	*REEL*	Appendix 1 5.1.9.1.2	17-18	As this requirement is directly linked to the sentence in §4.7 "The person(s) being hoisted shall also be reasonably protected against serious injury (see 5.1.9.1.2)" We propose to clarify this paragraph.	In the 1st paragraph, replace the current sentence by the following : "The hoist equipment including the OLPD and the PCDS shall be able to arrest the load with a limited height loss after a shock load event". Modify the two last bullets : For each hoisted person : - A maximum arresting force <1 798 lbf (8 kN) - A transient peak is acceptable, the energy generated during this peak shall be limited to an equivalent value corresponding to 12,5 kN during 30 ms.	Yes	Yes
11	*REEL*	Appendix 1 5.2	18	"The cable being tested shall conform to the minimum manufacturing quality as specified by the cable manufacturer." It is impossible to produce a cable with minimum quality.	Please clarify the expected procedure.	No	Yes
12	*REEL*	Appendix 1 5.2.2.1 6th Paragraph	19	"Delete the paragraph"	Please precise that the Table 3 is also deleted	Yes	No
13	*REEL*	Appendix 1 5.2.2.2	19	"A cable sample including damages and flaws that can be encountered during manufacturing or in service shall be prepared" It is impossible to produce such a cable sample or damage and flaws shall be defined.	Please clarify the expected procedure.	No	Yes

response	Section Appendix 1 2.3. 1st comment Accepted The text has been changed as requested. The hoist and hoist system definition has been changed.
	Section Appendix 1 2.3. 2nd comment Partially accepted Indeed, in the definition of hoist equipment BQRS is not mentioned in particular to not over complicate the definition. Though section 4.6 clearly states the need for a BQRS within the hoist equipment function. See response to comment #108 section 4.6
	Section Appendix 1 3.4.3. Accepted EASA understands that the comment relates to section 3.4.4. See response to comment #6 Appendix 1 section 3.4.4.
	Section Appendix 1 3.6. 1st comment Accepted The text has been amended accordingly. The static flight load factor shall not be less than 2.5-3.5 g for HEC applications. The substantiated load factor shall be stated in the hoist limitations.

	Section Appendix 1 3.6. 2nd comment Partially accepted Chapter 3.2.3 only addresses the information that needs to be included in the installation manual. The maximum deformation only addresses the 3rd bullet point. The formatting has been changed.
	Section Appendix 1 3.6 3rd comment Accepted The text has been updated so that the use of dead turns could be considered as an “alternative means”. See also response to comment 130 section 3.6 2nd comment
	Section Appendix 1 3.6 4th comment Partially accepted The text has been updated to cover comment #112 section 3.6 (complete unspooling has been removed from the text)
	Section Appendix 1 5.1.9.1.2. Accepted The text has been amended. In addition, it has been clarified that the reset of the OLPD includes the dampening device.

	Section Appendix 1 section 5.2. Accepted The variation of manufacturing parameters and their influence on the static and fatigue strength characteristics shall be established for the specific manufacturing process. If a “as produced” cable is used, the possible strength reduction can be taken into account using knock-down factors i.e. derived from test with an artificial flaw, which were established by test. In order to clarify EASA’s expectations the text has been adapted.
	Section Appendix 1 5.2.2.1. 6th paragraph Accepted The text has been changed as suggested and the associated paragraph and table have been deleted.
	Section Appendix 1 5.2.2.2. Accepted The text has been changed accordingly. For damage, a damage threat assessment shall be made in order to identify the damage that can be encountered during service. For tests, this damage shall be included in the test specimen.

comment	*130*	comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	8	3.2.1 Par. 4	In addition, no single failure of the hoist equipment shall result in a Catastrophic Failure Condition.	There are many single point failures defined as PSEs. This pargraph does not address 27 & 29.571.	Add the following to the end of the paragraph: This does not cover parts identified as PSE.	Conceptual
FAA/AFS-340 Kevin Myers 817-222-113	NPA 2021-10	8	3.2.2		Maintenance/instructions for continued airworthiness requirements normally follow installation considerations.	This document should include Maintenance/instructions for continued airworthiness.	Conceptual
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	10	2.3	Add at the beginning of the LIMIT LOAD definition the following: Limit load is the maximum load that is expected to occur once in the lifetime of a hoist.	There is allready a definition of LIMIT LOAD in the regulations (27 & 29.301) which may cause confusion.	Propose no change to this section.	Editorial
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	10	2.3	Add at the beginning of the ULTIMATE LOAD definition the following: Ultimate Load is the maximum load that is expected to occur once in a hoist population (all hoists in	There is allready a definition of ULTIMATE LOAD in the regulations (27 & 29.301) which may cause confusion.	Propose no change to this section.	Editorial

				operation throughout their entire operational life).			
FAA/AIR-7F1 John Miller 817-222-5018	NPA 2021-10	11	3.3.4	Replace the paragraph with the following: The cable is a life-limited part. Cable fatigue characteristics shall be determined by the hoist manufacturer. Methods for cable life calculation shall be defined. Cable inspection and acceptance criteria shall be defined by the hoist manufacturer and shall be provided in the maintenance manual. See 3.6.2.	Fatigue is covered in Section 3.6.2. Section 3.3 outlines the major components where as 3.6 outlines structural requirements and contains a subsection related to fatigue which is where that topic should be addressed. Section 3.6.2 specifically lists the cable as a component requiring a fatigue tolerance approach.	Recommend not changing this section.	Format
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	11	3.3.4	Replace the paragraph with the following: For the structural substantiation, any damage threats and manufacturing flaws that can be encountered during manufacturing and in service, shall be taken into account.	"For the structural substantiation" is unnecessary clarification.	Remove "For structural substantiation".	Editorial
FAA/AIR-623 Matt Wilbanks	NPA 2021-10	11	3.3.4	The rebound characterisation report shall include information about the influence of the different loading conditions and the influence of the	This sentence adds confusing requirements from an applicant of an	This is a specific installation requirement as it will most likely be different for each aircraft	Conceptual

817-222-5051				different cable lengths related to the rebound behaviour.	article to be installed on an aircraft.	type in which the article (hoist) is installed. Recommend making this clearer or removing it.	
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	11	3.3.5	Replace the paragraph with the following: Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured.	I think there is a possibility that it may be unsafe to leave the hoist in an "as is" condition to complete the sortie. Allowing the pilot to overide the safety system without more awareness could lead to a catistrophic event.	Leave section unchanged.	Conceptual
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	11	3.3.8	Replace the section with the following: The hoist "shall" be equipped with overload protection capability.	Overload protection is not required by the rules.	Recommend not changing this section.	Conceptual
FAA/AIR-623 Matt Wilbanks 817-222-5051	NPA 2021-10	11	3.4.1.1	Replace the section with the following: The hoist equipment shall monitor the safe operation of the hoist, through specific parameters including but not limited to the weight of the load, the fleet angle, the temperature of the temperature-sensitive components.	By making this mandatory by changing "may" to "shall" and adding the requirement to record fleet angle exceedance results in EASA making requirements for capabilities that currently	In lue of replacing this section and moving section 3.5.4 to this location, keep the original text but add "All operating limitations and other information necessary for safe operation must be	Conceptual & Editorial

				The hoist equipment shall provide the status information (I) to the aircrew. The hoist manufacturer shall define the recorded information (R) that is to be stored until the next scheduled maintenance and made available before the next flight. This recording may be performed either by the hoist equipment itself or be provided as an output to the aircraft systems for recording. The following information shall be provided by the hoist equipment: • Hoist active (I) • End of travel (I) • Caution zone (I) • Quick-release system status (I+R) • Fleet angle exceedance (R) As a minimum, the flight crew shall be made aware of a fleet angle exceedance during post-flight check. • Activation of overload protection (I+R) • Load exceedance (I+R) (sampling rates need to be sufficient to capture shock loads) All operating limitations and other information necessary for safe operation must be provided as an output of the hoist equipment. The monitoring (I and R) shall be	do not exist for hoist manufacturers to meet.	provided as an output of the hoist equipment."	

				described in the installation manual. The display or recording of this information may be handled by additional equipment provided by the hoist manufacturer or may be handled by the STC or TC applicant for the installation. Note: The additional display or recording of the I in the cockpit are not considered as part of the ETSO function.			
FAA/AIR-623 Matt Wilbanks 817-222-5051	NPA 2021-10	12	3.4.1.2.4	Replace the section with the following: The hoist shall indicate "and record" when an over temperature condition is present. The hoist over temperature condition shall be defined by the hoist manufacturer, based on the specific design of the hoist "equipment".	Overly prescriptive requirement to require recording.	Recommend not requiring recording.	Conceptual
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	12	3.4.3	The operator control shall meet applicable environmental requirements.	Leave paragraph unchanged.	This is an unnecessary clarification.	Conceptual
FAA/AIR-623 Matt Wilbanks	NPA 2021-10	13	3.4.10	Replace the section with the following: The hoist shall have a means to measure and record the usage of the	Overly prescriptive.	Recommend no change to this paragraph.	Conceptual

817-222-5051				system. The usage shall be calculated in operating hours (time while the hoist drive is active) and hoist cycles.			
FAA/AIR-7F1 John Miller 817-222-5018	NPA 2021-10	13	3.5.1.1	Delete the section (covered by ETSO standard text Chapter 3.2.2). 3.2.2 Equipment Safety Assessment The hoist manufacturer shall conduct an Equipment Safety Assessment, including a systematic, comprehensive evaluation of the hoist equipment to show that the safety objectives from the Functional Hazard Assessment (FHA) and the derived safety requirements are met. The latest revision of SAE ARP4761 provides guidance for the safety assessment process. Any assumptions taken by the hoist manufacturer shall be documented in the safety assessment. See also CS-ETSO, Subpart A, paragraph 2.4. Note: Particular aircraft installations will drive additional, and more stringent, safety requirements for the hoist equipment. The ETSO applicant may elect to comply with these more severe aircraft installation requirements in the ETSO article FHA. If this option is	This change allows for inclusion of installation requirements during the TSO authorization process. A TSO is a minimum performance standard for specified articles. Design aspects related to installations on specific products should not be approved under TSOA. Other certification processes exist (such as the TC/STC process) that address installation approval of an article onto a product. These processes ensure that all applicable regulations related to the installation of the TSO article onto the product are considered at the appropriate amendment level and appropriate showings of compliance	Recommend removing: "Any assumptions taken by the hoist manufacturer shall be documented in the safety assessment. See also CS-ETSO, Subpart A, paragraph 2.4. Note: Particular aircraft installations will drive additional, and more stringent, safety requirements for the hoist equipment. The ETSO applicant may elect to comply with these more severe aircraft installation requirements in the ETSO article FHA. If this option is selected, this shall be identified in the ETSO Certification programme, and demonstrated within the ETSO data package. Compliance with non-ETSO requirements will	Conceptual

				selected, this shall be identified in the ETSO Certification programme, and demonstrated within the ETSO data package. Compliance with non-ETSO requirements will also be assessed during the approval (TC/STC) of the installation.	are made by the applicant.	also be assessed during the approval (TC/STC) of the installation."	
FAA/AIR-623 Matt Wilbanks 817-222-5051	NPA 2021-10	13	3.5.4	Delete the section.	Recommend not moving requirements to 3.4.1.1.	Recommend leaving this section unchanged.	Conceptual
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	13	3.5.5	Delete the section.	There is no rationale for deletion of this section	Recommend leaving this section unchanged.	Conceptual
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	13	3.5.6	Delete the section.	There is no rationale for deletion of this section	Recommend leaving this section unchanged.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	13	3.6	Complete the section with the following: Single critical load paths should be minimised. Additional structural requirements The hoist shall be able to withstand	Most of this information is in the appropiate chapter (Ch. 5) Section 5.1. This includes the dynamic load reactions	Recommend leaving this section unchanged.	Conceptual

				the most critical load factor expected in service. The load factors shall cover the entire rotorcraft operational envelope in which hoisting is allowed, including rapid direction reversal and rapid stops. • Static flight load factor The static flight load factor shall not be less than 2.5 g for HEC applications. The substantiated load factor shall be stated in the hoist limitations. • Dynamic load magnification factors Any significant dynamic load magnification factors should be taken into account. A dynamic load magnification factor is the difference between the static load factor and the load factor at the load attachment means (e.g. hook). • Crash load factors The hoist equipment shall withstand the following load factors without failure for at least 3 seconds during a static load test. The 3 seconds do not apply if the tests are performed dynamically to simulate actual loading application. (1) Upward – 1.5 g (2) Forward – 12 g (3) Sideward – 6 g	from the shock load test in 5.1.9.		

				(4) Downward – 12 g (5) Rearward – 1.5 g The hoist cable is expected to be fully stowed during load factor tests. The maximum permanent deformation resulting from the application of the load factors shall be documented in the installation manual.			
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	14	3.6	Cable attachment The cable shall be attached to the drum. The attachment shall be able to withstand limit load conditions, or if limit load carrying capability cannot be shown, alternative means shall be provided to minimise the possibility of losing the load after complete unspooling of the cable.	Proven engineering practice for cable attachment relys on the last two or three wraps to hold the cable.	Industry already does this recommend not including this statement.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	14	3.6 Continued	Bird Strike If the hoist is intended to be installed on a CS-29 rotorcraft, an impact with a 1-kg bird, at a velocity compatible with the maximum allowed speed installed on a rotorcraft, shall not lead to the detachment of parts which could prevent continued safe flight and landing. Compliance must be shown by tests. The impact speed shall be	Bird Strike should not apply at the TSO/ETSO level.	Recommend not including language on bird strike.	Conceptual

				documented in the installation manual.			
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	14	3.6 Continued	Interactions Systems and Structures For ETSO articles equipped with systems that affect structural performance, either directly or as a result of a failure or malfunction, the influence of these systems and their failure conditions shall be taken into account when showing compliance with the requirements of this ETSO standard. Appendix K to the CS-25 Amendment that is current at the time of the application, or in any later revision, should be used to evaluate the structural performance of ETSO articles equipped with these systems.	Interactions Systems and Structures is not a CS 27, CS 29 requirement.	Recommend not adding this language.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	14	3.6.4.1 End of chapter	Complete the section with the following: Strength reduction factors such as environmental effects (see 3.6.4.3) or unwinding/bending of the cable can be included in the testing. Strength reduction factors that are used shall be established by individual tests. If separate strength reduction factors are used, they should not influence each other.	Section 3.6.4.1 is meant to establish basic design allowables. Strength reduction factors should not apply and are covered in the following two sections.	Recommend leaving it as is.	Conceptual

FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	14	4.1	Replace the section with the following: The arresting system shall be designed to sustain ultimate load without cable reel out. If not otherwise protected, engaging the arresting system shall not lead to an overload of the hoist equipment structure and shall reasonably protect human cargo on the hook.	This is inherent in the design and will be demonstrated in the arrestability testing in 5.1.9.	Recommend leaving it as is.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	15	4.3	Replace the section with the following: The load shall be applied in any direction making the maximum angle with the vertical axis within the helicopter reference coordination system, but not less than 30° (60° cone). The most critical fleet angle in the most critical direction shall be taken into account for the static strength substantiation (Limit and Ultimate Load). Note: It may be necessary to substantiate greater angles than the hoist operational envelope, since the hoist might be installed at different angles on different airframes.	These are installation design issues.	Recommend leaving it as is.	Conceptual
FAA/AIR-616 Martin Crane	NPA 2021-10	15	4.7	Replace the section with the following: The purpose of the overload	There is a fundamental difference between regulators. EASA	Propose no change to this section.	Conceptual

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				the capability to absorb shock loads. • The load shall be arrested within a maximum of 10 m during a cable unspooling event. Limited unspooling of the cable for functions other than overload protection could be also accepted (e.g. for cargo vibration reduction). • The person(s) being hoisted shall also be reasonably protected against serious injury (see 5.1.9.1.2 • An overload activation tolerance band shall be defined taking into account e.g. production and maintenance tolerances, variations due to the environment (e.g. temperature and humidity), and operations (i.e. length of cable paid out). The above-mentioned load holding requirements shall be met in the entire activation tolerance band. • With regard to aging effects, all functional elements of the overload protection that are subject to aging effects leading to potential degradation of the overload protection shall be considered. The corresponding tests in 5.1.9. provide the means of compliance for sustained overload and dynamic loads including demonstration that the person(s) being hoisted is (are)		

				reasonably protected in the complete hoist envelope.			
FAA/AIR-623 Matt Wilbanks 817-222-5051	NPA 2021-10	16	4.8	Delete the section.	No apparent rationale to delete this section.	Recommend leaving this section unchanged.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	16	4.9.24	Delete the section.	We beleve the Duty Cycle requirement should be evaluated and tested.	Recommend leaving this section in.	Conceptual
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	17	5.1.3 4th Par.	Replace the paragraph with the following: Testing for endurance (the ability of parts moving relative to each other to continue to perform their intended function) should be sufficient to show: • that the assumptions used in demonstrating compliance with the required safety level are correct, and • via a test that the equipment is free from design errors, specifically when there is the introduction of a new technology to reach a compliance demonstration for full life, either by a full TT test or by X% TT test supported by analysis.	Safety Analysis is covered by ETSO Standard Text Chapter 3.2.2.	If you follow that guidance then the applicant is covered. It is not necessary to repeat.	Conceptual

				Testing for performance can be included in endurance testing which should demonstrate the rates and responses required for proper system operation.			
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	17	5.1.3 Table 2	Delete the table.	How does EASA plan to review the test data when recommending deletion of established test conditions?	Recommend leaving as is.	
FAA/AIR-621 Michael McGuire 817-222-5107	NPA 2021-10	17	5.1.4	Delete the section.	We beleve the Duty Cycle requirement should be evaluated and tested.	Recommend leaving this section in.	
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	17	5.1.9.1.2	Replace the section with the following: The hoist equipment including the OLPD shall be able to arrest the load with a limited height loss after a shock load event. The arresting capability shall be demonstrated by an instrumented drop test in accordance with the following criteria: • Rated load solid block • Free fall factor of 1 on 71 inches (180 cm) • Height loss <197 inches (500 cm)	FAA is agreeable to the original section as written. EASA additions are not FAA/EASA regulatory requirements.	Propose no change to this section.	Conceptual

				• maximum arresting force <1 798 lbf (8 kN) for each hoisted person • A transient peak of 12.5 kN or limit load, whichever one is less, for a maximum of 30 ms is acceptable. The above test shall be repeated for a 100-kg solid block. The above test must be repeated for a total of 5 times for each load level (rated load and 100 kg). The OLPD can be reset after each test. After each set of 5 tests the cable and OLPD can be replaced. The most detrimental setting within the OLPD activation tolerance band must be tested. The hoist must function normally (i.e. continues to lift at the rated load and speed) after completion of each set of 5 tests.			
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	18	5.2	Complete the section with the following: The cable shall sustain limit and ultimate load conditions. The test shall be performed at the hoist (with the OLPD locked) or a mock-up representing all influencing factors of the installation on the hoist. The load attachment end of the cable shall be able to swivel freely. The cable shall be tested at its most	This is covered in AS6342 Section 5.2. The addition does not seem to add or change the existing requirements.	Recommend not adding this change.	Conceptual

				critical length and most critical fleet angle if this influences the static strength characteristics. The cable being tested shall conform to the minimum manufacturing quality as specified by the cable manufacturer. This includes all damage and manufacturing flaws which are not inspectable or are allowed to remain in the cable. In addition, all material strength reduction factors shall be taken into account.			
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	18	5.2.2 Headline	Replace the headline of the section with the following: Cable Endurance and Fatigue Testing	Fatigue requirements are outlined in 3.6.2 which describes the CS 29.865 & 571 requirements. This section is about endurance.	Do not change the title. Recommend adding the following text after the heading: The tests describe in this section are specific to endurance test requirements, and are not a part of the fatigue tolerance evaluation required under 3.6.2. It is not the complete data set required for certification or life and inspection requirements at installation. Similar language may be	Conceptual

						appropriate in 3.6.2 & 5.1.5.	
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	18	5.2.2 1st Par.	Replace the paragraph with the following: Fatigue and endurance testing of the hoist cable shall be conducted in laboratory tests. These tests shall be conducted to determine the suitability of the rescue hoist cable compared to several worst-case fatigue scenarios.	Fatigue requirements are outlined in 3.6.2 which describes the CS 29.865 & 571. This section is about endurance.	Recommend leaving as is.	Conceptual
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	18	5.2.2 2nd Par.	Replace the paragraph with the following: The manufacturer shall determine each hoist's maximum cable usage (MCU) which is a number used to determine the maximum number of hoist cycles, or maximum number of cable extensions, a cable can undergo in field usage before requiring replacement in order to preclude cable fatigue considerations. The manufacturer shall also determine and publish all inspection criteria related to the as-designed cable in the maintenance manual, and this inspection criteria shall be used in the following fatigue testing.	Fatigue requirements are outlined in 3.6.2 which describes the CS 29.865 & 571. This section is about endurance.	Recommend leaving as is.	Conceptual

FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	19	5.2.2 3rd Par.	Replace the paragraph with the following: Cable fatigue testing shall be conducted in five separate sub-tests. Each test, considered an individual worst-case scenario, shall be performed using a new cable.	This section covers endurance testing rather than fatigue testing.	Recommend leaving as is.	Conceptual
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	19	5.2.2 End of chapter	Complete the section with the following: 5.2.2.1 and 5.2.2.2 are acceptable as a fatigue test if it can be shown that cable bending and tension fatigue are independent and do not reduce the cable life if applied simultaneously.	This section covers endurance testing rather than fatigue testing.	Recommend leaving as is.	Conceptual
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	19	5.2.2.1 2 - 4 Par.	Delete the paragraphs.	Deleting the full description of the referenced MIL-DTL-83140B is acceptable, though reference to that specification is appropriate as an acceptable method of test setup.	Replace with the following: One of the acceptable methods of testing is defined in MIL-DTL-83140B Figure 4, using the geometry and cable design required in this ETSO.	Conceptual
FAA/AIR-616 Martin Crane	NPA 2021-10	19	5.2.2.1 7th Par.	Replace the paragraph with the following: Following the fatigue testing described above, the test sample shall be inspected for damage and	The word "endurance" should not be changed to "fatigue". This section covers endurance testing	Recommend leaving as is.	Conceptual

	817-222-5056				tested for minimum breaking strength. The minimum breaking strength shall be greater than the hoist's ultimate load (5.25 times the rated load).	rather than fatigue testing.		
	FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	19	5.2.2.2 2nd Par.	Replace the paragraph with the following: Following the fatigue testing described above, the test sample shall be inspected for damage and tested for minimum breaking strength. The minimum breaking strength shall be greater than the hoist's ultimate load (5.25 times the rated load).	The word "endurance" should not be changed to "fatigue". This section covers endurance testing rather than fatigue testing.	Recommend leaving as is.	Conceptual
response	Section Appendix 1 3.2.1. Par. 4 Accepted See response to comment #2							
	Section Appendix 1 3.2.2 Accepted The comment is understood to relate to section 3.2.3. and not on 3.2.2. as stated in the comment field.							

	In AS6342 chapter 3.5.2 maintenance aspects are included. This part has not changed by the ETSO.
	Section Appendix 1 2.3. 1st comment Accepted Text has been reworded to reflect the CS 27/29 requirements.
	Section Appendix 1 2.3 2nd comment Accepted Text has been reworded to reflect the CS 27/29 requirements.
	Section Appendix 1 3.3.4. 1st comment Partially Accepted The purpose of this addition is to introduce the notion of “fatigue characteristics” as used in CS 27/29 requirements for accuracy. It is agreed that section 3.6.2 covers the fatigue evaluation.
	Section Appendix 1 3.3.4. 2nd comment Not accepted A clarifying text has been introduced to highlight that this approach is only valid for structural substantiation, to avoid misinterpretation.
	Section Appendix 1 3.3.4. 3rd comment Not accepted

	The influence of the cable length and the loading conditions is independent of the installation. The influence of the actual installation must be investigated by the installer using the rebound characterization of the cable provided by the hoist manufacturer.
	Section Appendix 1 3.3.5. Partially accepted. EASA agrees that there is the need to address the safety risk in overriding the safety system. Nevertheless, the original SAE standard text is not sufficient to control the risk, therefore, EASA has kept the modified text. The text has been changed from “to allow for continued operation” to “The risk for continued hoist operation when overriding shall be identified by the hoist manufacturer” in order to address the safety concern. If the crew is not sufficiently aware then overriding the mis-wrap protection should not be allowed.
	Section Appendix 1 3.3.8. Partially accepted While EASA agrees that overload protection is not required by CS 27/29, the modification to the SAE standard AS 6342 has been kept because the ETSO standard only addresses a hoist with an overload protection device as defined in the applicability of this ETSO. Applicants wishing to install a hoist without an overload protection device can still apply through the regular the TC/STC certification processes.
	Section Appendix 1 3.4.1.1. Accepted See response to comment #41.
	Section Appendix 1 3.4.1.2.4. Not accepted

	A short over-temperature event might not be detected by the crew. Especially in a dynamic environment such as hoist operations when the crew is concentrating on the external load and an indication alone might not be sufficient for maintenance purposes.
	Section Appendix 1 3.4.3. Not accepted From past experience it is considered to be necessary to be more precise.
	Section Appendix 1 3.4.10 Partially accepted The recording of the hoist cycle and operating hours are necessary for safe operation of the hoist with regard to the fatigue and endurance requirements. However, EASA has added “or other equivalent method” in order to allow for more flexibility.
	Section Appendix 1 3.5.1.1. Partially accepted EASA agrees that design aspects related to the installation side are not considered to be in the scope of the ETSO. Nevertheless, the text in section 3.2.2 of the ETSO standard focuses on the hoist equipment itself and refers to equipment safety assessment. EASA has modified the text to avoid any misinterpretation of the intended limited scope and applicability to the ETSO equipment itself.
	Section Appendix 1 3.5.4. Not accepted For clarity all requirements for hoist status information are now included in one section (3.4.1.1) to support the compliance demonstration.

	Section Appendix 1 3.5.5. Not accepted This section of the SAE standard AS6342 is considered outdated and not relevant for inclusion in the MOPS document. It is superseded by section 3.1.3. that contains the up-to-date requirement for software development assurance referring to published AMC 20-115D (equivalent to the harmonized FAA AC 20-115D).
	Section Appendix 1 3.5.6. Not accepted The section of the SAE standard AS6342 is considered outdated and not relevant for inclusion in the MOPS document. It is superseded by section 3.1.4. that contains the up-to-date requirement for airborne electronic hardware development assurance referring to published AMC 20-152A (technically equivalent to FAA AC draft 20-152A under publication process).
	Section Appendix 1 3.6. 1st comment Not accepted Section 5 of AS 6342 only deals with tests, whereas section 3 defines the “general design requirements”. Therefore, these requirements need to be included in section 3.
	Section Appendix 1 3.6. 2nd comment Noted EASA does not understand the rational of the FAA comment on this particular point, especially since there is no particular industry issue to fulfil this requirement.

	In general, the limit load capability is expected.
	Section Appendix 1 3.6. 3rd comment Accepted See response to comment #51
	Section Appendix 13.6 4th comment Not accepted The requirement is already partially included in the AMC to 27/29.351 and used for rotorcraft designs using “fly-by-wire”-technology. In addition, it clarifies the split of responsibilities between the ETSO applicant and the installation level for the safety assessment regarding interactions with systems and structure.
	Section Appendix 1 3.6.4.1. Partially accepted EASA agrees that unwinding or bending are not material properties and will be deleted from this section. However, the environmental effects, similar to composite material, are part of material strength properties.
	Section Appendix 1 4.1. Not accepted Section 5 only deals with tests, whereas section 4 defines the functional requirements and standard conditions. Therefore, these requirements need to be included in section 4.
	Section Appendix 1 4.3.

	Partially accepted EASA agrees to remove any reference to the helicopter coordinate system, but the amendment of the section to consider the load application in the most critical direction and the most critical fleet angle is retained.
	Section Appendix 1 4.7. Not accepted The SAE AS 6342 wording in section 4.7 is not in line with the current EASA CS 27/29 and FAA Part 27/29 requirements. EASA disagrees with the FAA interpretation of the (E)TSO process. It is the EASA position that the intent of the requirement is to ensure no loss of HEC at loads between 2.5g and 3.5g as substantiated by CS 27/29.337 through CS 27/29.341. The requirement explicitly states “static limit load”. This wording does not encompass a dynamic event. Therefore, EASA is of the opinion that the original requirement addresses static loads coming from events such as manoeuvres. This is underlined by the reference in CS 27/29.865(a) to CS 27/29.337 through CS 27/29.341 that addresses manoeuvring and gust loads. The intention was not to cover dynamic external load events. Therefore, it is the EASA opinion that the general term “limit load” in CS 27/29.865 was intentionally used.
	Section Appendix 1 4.8 Accepted This section of the SAE standard will no longer be deleted in the ETSO.
	Section Appendix 1 4.9.24 Accepted See response to comment #32 Section 4.9.24

	Section Appendix 1 5.1.3.4th par. Not accepted Section 5 is addresses testing and not safety assessment.
	Section Appendix 1 5.1.3. table 2 Not accepted It has not been substantiated by industry that this table sufficiently represents the usage which needs to be used for endurance testing for all hoist designs. A dedicated test proposal needs to be provided by the hoist manufacturer taking into account the design of the specific hoist design during the ETSO project.
	Section Appendix 1 5.1.4. Partially accepted Chapter 5.1.4. references the AC 29-2C material. The AC/AMC material does not address duty cycle testing. It only addresses installation testing. Therefore, the section will be kept for the ETSO standard, however, the reference within SAE AS6342 to AC 29-2C will be deleted.
	Section Appendix 1 5.1.9.1.2. Not accepted EASA additions are part of the CS 27/29 requirements. For reliability in the frame of 27/29.865 the FAA references 27/29.1309 with the recent update, whereas EASA still includes a single fatality and serious injuries of the total airborne system (including HEC) within CS 27/29.865. In addition, the text gives more details on the provided test requirements (reset after 5 tests, cable and OLPD change).

	Section Appendix 1 5.2. Partially accepted Some of the wording is indeed redundant, however these additions at the beginning of this section 5.2 clarifies that these essential points have to be taken into account for all testing performed. The addition avoids misinterpretation of the expectation in demonstrating compliance.
	Section Appendix 1 5.2.2 Headline Partially Accepted EASA concur with the comment. However the text of 5.1.5. and 5.2.2 have been amended slightly differently.
	Section Appendix 1 5.2.2. Partially Accepted See response to comment #130 Appendix 1 5.2.2. Headline
	Section Appendix 1 5.2.2. 2nd paragraph. Partially Accepted See response to comment #130 Appendix 1 5.2.2. Headline
	Section Appendix 1 5.2.2. 3rd paragraph. Partially Accepted The paragraph has been deleted.

	Section Appendix 1 5.2.2. end of chapter Accepted See response to comment #130 Appendix 1 5.2.2. Headline
	Section Appendix 1 5.2.2.1. 2-4 paragraph. Accepted The text has been amended after the 1st paragraph.
	Section Appendix 1 5.2.2.1 7th paragraph. Accepted See response to comment #130 Appendix 1 5.2.2. Headline
	Section Appendix 1 5.2.2.2. 2nd paragraph. Accepted See response to comment #130 Appendix 1 5.2.2. Headline

comment	*151* comment by: *Transport Canada Civil aviation* AS 6342 Many of the requirements in AS6342 are not specifically prescribed in CS 27/29.865 or other sections of CS-27/29, and there is no indication as to why these added prescriptive requirements would be necessary to achieve the desired safety objective. The NPA does not provide any correlation between these requirements/features and observed accidents, other than a general unsubstantiated remark that this standard would raise the level of safety. In particular, the NPA highlights the fact that the majority of accidents are a consequence of entanglement, but does not give any evidence as to how the proposed added standard would mitigate these occurrences. While the QRS feature (which is already mandated in 27/29.865) may be the most immediately intuitive one, there are a lot of questions to ask about its impact on the accident rate. The new standard is (only) introducing a time to release requirement for this feature (beside the already existing requirement of C27/29.865), some accident data highlighted in the NPA itself show that even that would be insignificant in some accidents (see comment 6) Consistent with earlier comment, if the goal is to mandate that all installed hoist equipment comply with those requirements at the aircraft level, then these should be added to CS-27/29, after careful evaluation of their necessity, evidence of which is not provided at all in the NPA. Without this evidence, this mandate could be overly restrictive. suggested resolution: Explain how each added requirement (compared to all prescriptive and performance based requirements of CS-27/29) add to safety and correlate with accident evidence, i.e. have the many features been identified as specific causes of accidents, and would there be no other way to achieve the same safety level ?
response	Not Accepted The accident data and requirement background has been discussed during the SAE G-26 WG meetings and during workshops.

comment	*152* comment by: *Transport Canada Civil aviation* Appendix 1, table 1 AS 6342, section 3.3.8 Overload protection capability was replaced from a possibility (may) to a requirement (shall). Consistent with other comments, there is no explanation as to why this prescriptive requirement is necessary. While it is understood that the overload protection is a safety enhancing feature, it is not clear why this is the only way to achieve the desired safety objective. If the goal of the ETSO is only to provide “a” standard that hoist equipment may comply with, then it is acceptable. But if the goal is to make every hoist equipment installed comply with this standard, then it may be overly restrictive.

suggested resolution:
Do not modify text of AS 6342 section 3.3.8 for overload protection i.e. overload protection is not a requirement but a possible feature.

response

Partially accepted

EASA agrees with the goal for the applicant to have flexibility to apply for the installation of equipment without OLPD. However, when establishing a standard ETSO, EASA aims to require this capability for safety enhancing features for new generation hoists.

A hoist without an OLPD, based on the assumption that all reliability and system safety targets of CS 27/29 are met, can be proposed for certification via the TC/STC process.

Table 1 - Modifications of requirements for the ETSO p. 10

comment *36* comment by: *Sikorsky Aircraft*

Table 1 (page 12); When reading SAE AS6342 section 3.4.1.1:

Sikorsky Comment: The Note in Section 3.4.1.1 appears to conflict with the definition of the Hoist System defined in 2.3. The note states; "Note: The additional display or recording of the status information in the cockpit are not considered as part of the ETSO function."

What is "additional display" in this context?

Does that go with the statement of "additional equipment" in the sentence above it? Or is that a secondary display of data already available on the hoist/additional equipment?

Section 2.3 states: Replace the HOIST SYSTEM definition as follows:
The system, inclusive of the hoist and ancillary components. For clarification, the hoist system includes the hoist equipment and other systems needed for integration to the rotorcraft and operation of the hoist. This includes but is not limited to, displays, controls within the cockpit, boom, pendants, wiring in the rotorcraft and the power supply.

Clarification of this section is required.

Table 1 (page 14); When reading SAE AS6342 section 3.6:

Cable attachment "The cable shall be attached to the drum. The attachment shall be able to withstand limit load conditions, or if limit load carrying capability cannot be shown, alternative means shall be provided to minimise the possibility of losing the load after complete unspooling of the cable."

Sikorsky Comment: In normal full-out conditions the cable is retained to limit load by remaining cable wraps on the drum. In a runaway condition the cable is allowed to depart from the hoist drum by set screw or frangible link. A high speed runaway hoist with drum to cable limit load retention capability could result in cable back drive fouling damage,

	extended cable and load dynamic magnification resulting in cable break, rebound and potential catastrophic impact to the helicopter. Suggested rephrase: "In normal full-out static conditions the cable shall be retained on the drum to limit load by remaining cable wraps on the drum. In a runaway condition the cable shall be allowed to depart from the hoist drum by set screw or frangible link when fully unspooled."
response	Table 1 (page 12) Accepted Text has been amended to improve clarity. The "additional display" addresses the additional equipment that may be handled by the installer. This can include, for example, cockpit displays which are part of the rotorcraft and not the hoist equipment.
	Section 2.3 Noted The hoist system is the hoist equipment and all other installations necessary for integration into the rotorcraft. This also includes the parts provided by the installer. The hoist equipment is a subset of the hoist system, excluding the parts provided by the installer, such as, but not limited to, the boom, rotorcraft wiring, cockpit installations.
	Section 3.6. Partially accepted See response to comment #130 section 3.6
comment	*37* comment by: *GAMA* Appendix 1 3.3.2.2: The changed text includes the statement "Unravelling and damage of the cable on the drum shall be avoided." Requirements should be verifiable and not be subjective. **Suggested resolution** Remove the text or revise such that the requirement is not subjective.
response	Accepted The text has been updated to reflect the concern raised in the comment.

comment	*38* comment by: *GAMA* Appendix 1 3.3.4 6th para: It is not understood why EASA has removed the statement about the manufacturer determining the cable life. **Suggested resolution** If this is believed to be an installation level consideration it should be clearly stated but the hoist manufacturer should be required to provide a recommendation based on testing conducted. Otherwise the statement about the manufacturer determining the cable life should be retained.
response	Partially accepted EASA agrees that the ETSO applicant should consider cable life but through the determination of the fatigue characteristics of the cable (e.g. hoist cycles with defined load spectrum). This data will then be used by the installer to determine the cable life, taking into account the specific usage spectrum envisaged for the specific rotorcraft.

comment	*39* comment by: *GAMA* Appendix 1 3.3.5 2nd para: "Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured." The hoist simply needs the override ability. The Crew will make the determination whether to override based on the real-time situation and whether the override is needed to save lives. The statement mixes what is required of the equipment and how it will be used in the installed environment. **Suggested resolution** It is proposed to maintain the original SAE definition and remove reference to continued safe operation. If EASA choose to keep the text, EASA should clarify the definition of continued safe operation as the objective of the sentence is not clear. The intention of the override function is to allow the hoist to be operated in abnormal situations in order to prevent further damage to the aircraft but reducing safety margins or to recover a HEC load. This assessment should be primarily made by the operator and will depend on the operational environment (e.g. run the hoist to free the aircraft from an entanglement when HEC is not carried). By requiring this function to be activated "only when continued safe operation is ensured", the decision with respect to what constitutes safe operation or not would lie within the hoist system and not with the operator. The proposed wording would place the responsibility for deciding whether overriding is safe or not within the hoist design and not with the hoist operator. Due to a failure, an untimely activation of mis-wrap protection system could prevent hoist operations whereas the hoist is not wrapped, in this case the override function could allow continued hoist operations with no impact on safety.
response	Partially accepted

	EASA has clarified the sentence regarding continued safe operation. See response to comment #6 Appendix 1 section 3.4.4

comment	*40* comment by: *GAMA* Appendix 1 3.3.5 2nd para: "Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured." **Suggested resolution** Provide clarity that activation of the override is upon the operator`s discretion. Generally the hoist will not be able to determine, if continued safe operation is ensured.
response	Accepted See response to comment #6 appendix 1 section 3.4.4

comment	*41* comment by: *GAMA* Appendix 1 3.4.1.1: The requirement includes several parameters for status and recording. The ETSO should identify the minimum requirements required to achieve the desired level of safety. There are several parameters that although they may help in the maintenance of the hoist are "nice-to-have". The need to record and store this information either on the hoist or external complicates the hoist system design and increases cost with negligible benefit. Several of these parameters can be indicated and latched rather than recorded with the same safety benefit. **Suggested resolution** The ETSO needs to distinguish between the parameters that have a real safety benefit vs those that are not critical. Recording needs to be defined as any means to know that an event has occurred.
response	Accepted The text has been changed accordingly. The means of recording are not defined in the text. This needs to be defined by the hoist manufacturer.

comment	*42* comment by: *GAMA* Appendix 1 3.4.1.1: The requirement includes several parameters for indication to the crew. The amount of information does not seem to have been assessed for Human Factors. The crew needs to concentrate on either flying the aircraft of managing the

external load. The amount of additional information that would be indicated may distract from more important critical tasks at the expense of safety.

Suggested resolution
Consideration of Human Factors needs to be taken into account and only those parameters that are critical to ensure continued safe operation are to be required.

response

Accepted

See response to comment #41

comment

43 comment by: *GAMA*

Appendix 1 3.4.1.1: "The hoist manufacturer shall define the recorded information (R) that is to be stored until the next scheduled maintenance and made available before the next flight. This recording may be performed either by the hoist equipment itself or be provided as an output to the aircraft systems for recording."
Suggested resolution
It is proposed to change the requirement for the definition of recorded information from "shall" to "should".
Although the recording of information is useful for maintenance purposes, it is unclear how it immediately contributes to the safety objectives and to the prevention of catastrophic accidents. From the impact assessment, the requirement for data recording was not derived.

response

Accepted

The text has been adapted accordingly.

comment

44 comment by: *GAMA*

Appendix 1 3.4.1.2.3: Requirement includes the need to record a cable foul/mis-wrap but the safety benefits of providing this capability are not known. The reporting of a fouling or mis-wrap could be reported by the crew following a mission of a simple latched indication could be provided.

Suggested resolution
Requirements to be revised to remove the need to "record" or recording needs to be defined as any means to know that an event has occurred including reporting by the crew.

response

Accepted

Text has been amended accordingly.

comment	*45* comment by: *GAMA* Appendix 1 3.4.3 8th para: Requirement includes that the operator control shall meet the applicable environmental requirements for outside use whereas the pendant will be stored and used inside the cabin. **Suggested resolution** Requirement should identify the specific intended environment and refer to the applicable DO-160 category.
response	Partially accepted A reference to DO-160 has been added. EASA has retained the flexibility for the ETSO applicant to select the applicable DO-160 categories according to the intended installation.

comment	*46* comment by: *GAMA* Appendix 1 3.4.3 end: Requirement includes that the operator control shall minimise inadvertent activation during stowage, but does not indicate activation of which functions. Requirement is also subjective. **Suggested resolution** Clarify activation of all functions and make requirement verifiable.
response	Accepted Text has been amended accordingly. “The operator control device shall be designed such that it minimises the inadvertent activation of critical functions during stowage.”

comment	*47* comment by: *GAMA* Appendix 1 3.4.10: Requirement to record is too prescriptive. Recording could be through manual means and not have to be “built-in”. Also other means to track the hoist usage can be employed. **Suggested resolution** Change to 3.4.10 to be deleted. Hoist usage could be determined by other parameters such as cable length or combination of load and operational hours or cable length.
response	Partially accepted EASA agrees that the parameters that need to be recorded to measure the usage of the system should not be prescribed. However, the usage of the hoist should be recorded.

The operating hours of the rotorcraft does not help to monitor the actual usage of the hoist.

Measuring the usage, as defined by the SAE standard, such as operating hours of the hoist, would be required to be recorded, as a minimum until the operator has the possibility to note the usage.

comment *48* comment by: *GAMA*

Appendix 1 3.6: "Dynamic load magnification factors – Any significant dynamic load magnification factors should be taken into account. A dynamic load magnification factor is the difference between the static load factor and the load factor at the load attachment means (e.g. hook)."
Suggested resolution
Proposal is to include examples of dynamic load conditions which may require the use of a magnification factor.
It is unclear which "significant dynamic load magnification factors" shall be considered.

response Accepted

The text has been amended accordingly.

comment *49* comment by: *GAMA*

Appendix 1 3.6: "Crash load factors The hoist equipment shall withstand the following load factors without failure for at least 3 seconds during a static load test. The 3 seconds do not apply if the tests are performed dynamically to simulate actual loading application.
(1) Upward – 1.5 g
(2) Forward – 12 g
(3) Sideward – 6 g
(4) Downward – 12 g
(5) Rearward – 1.5 g
The hoist cable is expected to be fully stowed during load factor tests. The maximum permanent deformation resulting from the application of the load factors shall be documented in the installation manual."

Suggested resolution
It is proposed is to remove the crash load factors from the NPA 2021-10.
The intent of the crash load factors is unclear. In a crash condition the hoist does not need to operate.
The crash load factors proposed are applicable according to §561(c) for "any item of mass above and/or behind the crew and passenger compartment that could injure an occupant if it came loose in an emergency landing."
The hoist systems are installed outside of the H/C on the side of the cabin, therefore such factors are not applicable for hoists.

response | Not accepted

See response to comment #25.

comment | *50* comment by: *GAMA*

Appendix 1 3.6: Definition of Critical Parts is not consistent with 27/29.602 (i.e. “critical part is a part, the failure of which could have a catastrophic effect upon the rotorcraft, and for which critical characteristics have been identified which must be controlled to ensure the required level of integrity.”)

Suggested resolution
Definition to be revised to be consistent with CS-27/29.602.

response | Not accepted

For external load installations, in accordance with CS 27/29.865, the definition of a “catastrophic effect” is a “failure which could lead to serious injuries or a fatality (including the HEC)”. Consequently, the wording for the ETSO standard has to be adapted to the scope of the ETSO article and so resulting in a difference to the rotorcraft level one.

comment | *51* comment by: *GAMA*

Appendix 1 3.6: Bird Strike is to be assessed at the aircraft level and will vary based on the specific installation and hazards identified for specific aircraft configurations. This is clearly an aircraft level installation requirement. Testing (or simulation) can be done by the ETSO applicant to characterize the effects of bird strike but should not be mandated.

Suggested resolution
Change the bird strike requirement to be optional characterization that may be conducted and provided to the installer.

response | Accepted

The text has been amended to make it optional.

comment | *52* comment by: *GAMA*

Appendix 1 3.6: “Bird Strike: If the hoist is intended to be installed on a CS-29 rotorcraft, an impact with a 1-kg bird, at a velocity compatible with the maximum allowed speed installed on a rotorcraft, shall not lead to the detachment of parts which could prevent continued safe flight and landing. Compliance must be shown by tests.”

Suggested resolution

	Proposal: “Compliance must be shown by tests and/or simulation.” Why is compliance by simulation excluded? Compliance by simulation (validated by previous experience) shall be also possible.
response	Not accepted The requirement is taken from CS-29. In order for the ETSO article to be accepted during installation, the wording should not be changed.

comment	*53* comment by: *GAMA* Appendix 1 3.6 Cable attachment loads. **Suggested resolution** The cable attachment to be the same as AS6342. See general comment concerning OLPD function and safety benefits
response	Not accepted The comment is not understood, as the cable attachment is not included in AS6342.

comment	*54* comment by: *GAMA* Appendix 1 3.6: “Cable attachment: The cable shall be attached to the drum. The attachment shall be able to withstand limit load conditions, or if limit load carrying capability cannot be shown, alternative means shall be provided to minimise the possibility of losing the load after complete unspooling of the cable.” **Suggested resolution** Proposal: “Cable attachment: The cable should be allowed to detach from the drum when the OLPD has opened and the cable has completely unspooled.” Unspooling of the cable is important to avoid excessive forces pulling on the hoist and aircraft during a cable entanglement or similar event. If the cable does not unspool, excessive forces could act on the aircraft and control of the aircraft may be lost. Loss of control may occur too fast for the pilot or hoist operator to operate the quick release system (as detailed in section 4.1.1.1 of the NPA). Erroneous unspooling of the cable will be prevented by the means detailed in the NPA to an acceptable level (i.e., extremely improbable).
response	Partially accepted See response to comment #130 section 3.6

comment	*55* comment by: *GAMA*

	Appendix 1 4.1: "The arresting system shall be designed to sustain ultimate load without cable reel out. If not otherwise protected, engaging the arresting system shall not lead to an overload of the hoist equipment structure and shall reasonably protect human cargo on the hook." **Suggested resolution** Proposal: Proposal is to specify what is required for a "reasonable protection". It is not clear what is meant by "shall reasonably protect human cargo on the hook".
response	Accepted In the test section the term "reasonably protect" has been further clarified. See response to comment #108 section 4.1

comment	*56* comment by: *GAMA* Appendix 1 4.3: Hoists are installed such that the angle of the equipment is optimized to the expected aircraft attitude. In practical application a 30° degree cone is relatively unachievable and is not able to be accurately measured. The additional requirements to substantiate greater angles serves no purpose in the practical sense. **Suggested resolution** Remove the Note about angles greater that 30 degrees
response	Not accepted According to CS/FAR 27/29 requirements, a 30° cone is the minimum that has to be substantiated during hoist installation. The note is necessary to highlight this to the hoist manufacturer.

comment	*57* comment by: *GAMA* Appendix 1 4.6: The BQRS is required to be part of the aircraft installation but does not need to be part of the hoist equipment or system provided under the ETSO. **Suggested resolution** Identify the BQRS is optional.
response	Not accepted See response to comment #108 section 4.6

comment	*58* comment by: *GAMA*

	Appendix 1 4.7: OLPDs were developed to reduce serious incidents and accidents associated with hoist entanglements around the time changes to 14CFR Part 27 and 29 were being introduced regarding HEC. EASA has failed to recognize the safety benefits of the OLPD and with the changes proposed in the NPA will reintroduce entanglement related hazards that have been reduced since OLPD have been used. **Suggested resolution** The industry consensus standard for the function and associated loads of the OLPD and cable attachment need to be re-evaluated by EASA to ensure that the safety benefits that were realized when OLPDs were introduced are not lost. The proposed function of the OLPD that is included in the EASA NPA/ETSO has a high probability of increasing entanglement related accidents and fatalities. If EASA perceives that OLPDs as defined in AS6342 do not comply with the HEC loads required under 27/29.865, a rulemaking activity against CS-27/29 needs to be initiated to recognize this important safety enhancing feature.
response	Partially accepted See response to comment #12

comment	*59* comment by: *GAMA* Appendix 1 4.7: "The overload protection system shall be capable of reliably withstanding the dynamic loads and the sustained overloads, as defined by the hoist manufacturer. It shall be designed to hold any static load coming from the cable up to the static limit load." **Suggested resolution** Proposal is to retain the SAE proposal for opening of the overload clutch between 2.2. and 3.2 of the rated load. The overload clutch is important to avoid excessive forces pulling on the hoist and aircraft during a cable entanglement or similar event. The overload clutch limits the maximum force acting through the hoist cable. By using the static load as a limit for the overload protection instead of a load between 2.2 and 3.2 of the rated load, the force on the cable before unspooling may be significantly higher (>3.5 times the rated load). In order to maintain control, any force acting through the hoist cable must be countered by the aircraft main rotor. If these forces become excessive (which could easily be the case at >3.5 times the rated load), aircraft control may be lost before the overload clutch opens. Loss of control may occur too fast for the pilot or hoist operator to operate the quick release system (as detailed in section 4.1.1.1 of the NPA).
response	Partially accepted See response to comment #12

comment	*60* comment by: *GAMA* Appendix 1 4.7: "The load shall be arrested within a maximum of 10 m during a cable unspooling event." **Suggested resolution** Please specify what is meant by "unspooling event". Presumably you mean "any temporary event leading to unspooling, other than a sustained overload event"
response	Accepted See response to comment #12

comment	*61* comment by: *GAMA* Appendix 1 4.7: The 4th bullet requires the person(s) being hoisted shall also be reasonably protected against serious injury. The requirement is subjective and not verifiable. **Suggested resolution** Remove the 4th bullet or make the requirements verifiable and non-subjective.
response	Partially accepted The text has not been amended because in the test section the term "reasonably protect" has been further clarified. See response to comment #108 section 4.1

comment	*62* comment by: *GAMA* Appendix 1 4.7: "The person(s) being hoisted shall also be reasonably protected against serious injury (see 5.1.9.1.2)." **Suggested resolution** Proposal is to provide evidence in the impact analysis that the avoidance of shock loads can significantly enhance safety. This requirement is aimed at avoiding shock loads. The impact analysis and evaluation of accidents and incidents did not illustrate the need for a complex mechanism to avoid these shock loads.
response	Not accepted The activation of the OLPD in service is a probable scenario. Since this case has to be included in the possible operational scenarios, this event shall not lead to a serious injury of the person(s) being hoisted.

comment	*63* comment by: *GAMA* Appendix 1 4.9: Requirement includes that the operator control shall meet the applicable environmental requirements for outside use whereas the pendant will be stored and used inside the cabin. **Suggested resolution** Requirement should specific the specific intended environment and refer to the applicable DO-160 category.
response	Not accepted See response to comment #132

comment	*64* comment by: *GAMA* Appendix 1 4.9.21: Chafing of wire is included with the requirement for electrostatic discharge. **Suggested resolution** Move to Section 4.9.5.
response	Accepted The text has been moved to section 4.9.5

comment	*65* comment by: *GAMA* Appendix 1 5.1.3 3rd para: The use of the word random is incorrect. **Suggested resolution** Change “random” to “any order”.
response	Accepted The text has been changed accordingly.

comment	*66* comment by: *GAMA* Appendix 1 5.1.8 1st para: Includes the option for flight test to demonstrate jettison. As this is an equipment ETSO, flight test would not be practical. **Suggested resolution**

	The need to specify how testing would be conducted is not necessary and should be removed.
response	Accepted The text has been changed accordingly.

comment	*67* comment by: *GAMA* Appendix 1 5.1.9.1.1: Overload Protection Devices **Suggested resolution** See general comment on OLPD. The NPA to align with the industry consensus standard AS6342
response	Not accepted See response to comment #12

comment	*68* comment by: *GAMA* Appendix 1 5.1.9.1.2: “The hoist equipment including the OLPD shall be able to arrest the load with a limited height loss after a shock load event.” **Suggested resolution** Proposal is to allow consideration to be given to the attachment and aircraft structure when considering shock loads. The test places specific requirements on the maximum arresting force (i.e. damping) following a shock load event. This test assumes that the hoist is installed on a rigid structure. When installing the hoist on an aircraft, however, the attachment structure (e.g. a boom) and the aircraft itself will significantly add to the damping of a shock load.
response	Noted The ETSO only addresses the hoist equipment excluding the installation. Considering this, the approach with a rigid structure is conservative and thus can be proposed for ETSO compliance.

comment	*69* comment by: *GAMA* Appendix 1 5.1.9.1.2: The 4th bullet identifies the “hoisted person” whereas other bullets refer to specific test apparatus and quantifiable measures **Suggested resolution** The “hoisted person” should be replaced with a quantifiable measure.

response

Partially accepted

The text has been updated to reflect the definition taken from AMC 27/29.865 below.

The weight as defined in the AMC 27/29.865 can be used to determine the weight of a hoisted person.

AMC 27/29.865 (c)(6)(ii)(B)(3)

"For the purpose of structural analysis or test, applicants should assume a 101.2-kg (223-pound) man as the minimum weight of each occupant carried as HEC.

NOTE: if the HEC is engaged in work tasks that employ devices of significant added weight (e.g. heavy backpacks, tools, fire extinguishers, etc.), the total weight of the 101.2-kg (223-pound) man and their equipment should be assumed in the structural analysis or test."

comment

70 comment by: *GAMA*

Appendix 1 5.2.2.1 1st para: The change proposed in the NPA adds no value from the test identified in AS6342

Suggested resolution
Delete the change.

response

Not accepted

The described text in AS6342 is too specific and does not necessarily cover the actual installation in a representative or conservative manner.

comment

71 comment by: *GAMA*

Appendix 1 5.2.4.1.1 and 5.2.4.1.2: The requirements include a steel plate "expected to be found in ship construction". This is not common and not quantifiable.

Suggested resolution
Remove the references to ship construction.

response

Not accepted

The steel plate proposed in AS6342, which is clarified further by the diagram that is used in section 5.2.4.1 of AS 6342, aims to cover the likely entanglement scenario on a ship.

Quantifiable data needs to be proposed by industry and accepted by the authority. If industry includes quantifiable data in AS6342, EASA could then accept this as a standard value if appropriate.

comment	*72* comment by: *GAMA* Appendix 1 5.2.4.1.1: "The static cable (i.e. not reeling in or out) shall suspend the rated load. The cable shall be dragged over the A36 or equivalent standard steel plate edge for a total distance reasonably expected to occur in service with a load hanging freely on the hoist (note: multiple strokes may be used). The plate surface roughness and edge diameter should represent a severe scenario expected to be found in a ship construction. The angle between the vertical axis of the hoist and the cable should be at a minimum 30°." **Suggested resolution:** The key parameters shall be defined and not left to the ETSO applicant`s discretion. Key parameters like the plate`s corner radius and the plate`s roughness are undefined as well as the speed and the number of the strokes.
response	Not accepted There is no standardised approach, therefore EASA prefers to leave the parameters to the choice of the applicant. It will then be assessed as part of the ETSO project. See also the response to comment #71

comment	*117* comment by: *Leonardo Helicopters* Comment: (Table 1, 2.3) Limit load is described as a once in a hoist life event, however clarification should be provided on this value and the interaction of the OLPD with this requirement i.e if the OLPD is set to 2.6g, the value of 3.5 will never be achieved. Suggested resolution: Wording is ambiguous and the impact of the OLPD on this requirement needs to be considered or a note added to disregard the OLPD impact on this value
response	Partially accepted See response to comment #130 Section 2.3. 1st comment The OLPD requirements, including the activation load, is defined in section 4.7 of AS6342.

comment	*118* comment by: *Leonardo Helicopters* Comment: (Table 1, 2.3) There is no mention of the Ultimate load requiring a safety factor of 3 if by analysis as per the latest advisory material for 29.865: will this still be the requirement of the ETSO?

	Suggested resolution: Confirm if different safety factors will be applied depending on certification evidence being by test or analysis
response	Accepted The minimum safety factor of 3 is still applicable when only analysis is conducted. The text has been amended accordingly.

comment	*119* comment by: *Leonardo Helicopters* Comment: (Table 1, 3.3.5 2nd par) “Once initiated, the mis-wrap protection system may be capable of being overridden only when continued safe operation is ensured.“ Provide clarity that activation of the override is upon the operator's discretion. The hoist itself will not be able to determine if continued safe operation is ensured. This will be down to the actual conditions at the time of decision.
response	Accepted See response to comment #6 Appendix 1 section 3.4.4.

comment	*120* comment by: *Leonardo Helicopters* Comment: (Table 1, 3.4.10, page 13) “The usage shall be calculated in operating hours and hoist cycles”: this is too restrictive for new innovation and it should be up to the hoist manufacturer to determine what is the best parameter to record such that usage is recorded. Suggested resolution: Delete the second sentence “The usage shall be calculated in operating hours and hoist cycles”
response	Partially accepted See response to comment #6 Appendix 1 section 3.4.10

comment	*121* comment by: *Leonardo Helicopters* Comment: (Table 1, 4.1, page 14) "The arresting system shall be designed to sustain ultimate load without cable reel out": is this assuming the OLPD has failed? otherwise why is the system being designed to hold a

load which it will never achieve in service (assuming the OLPD can be demonstrated to be repeatable and reliable).

Suggested resolution:
Provide clarification of OLPD interaction with this paragraph

response

Noted

The requirement is stated in AS6342 and was not changed by the ESTO.

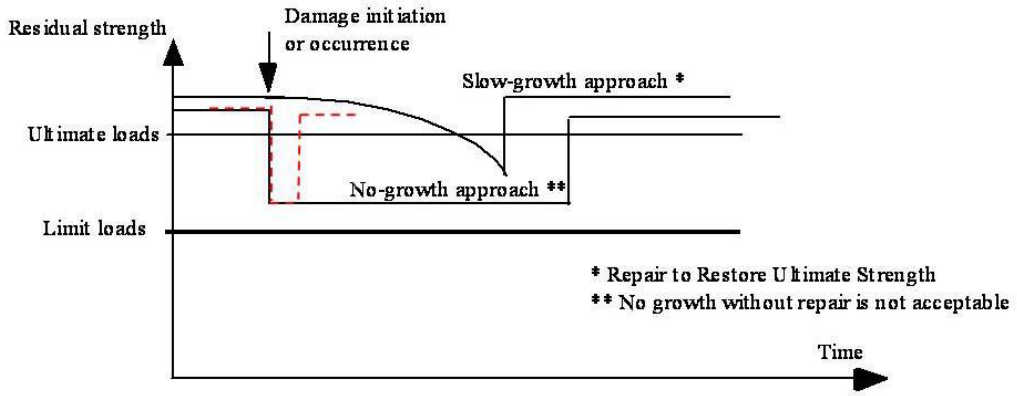
comment *122* comment by: *Leonardo Helicopters*

Comment:
(Table 1, 5.2.2.1 7th paragraph, page 19)
"5.25 times the rated load"
This allows for no degradation over operational use and is still over and above the once in a lifetime value: why?

response

Noted

During the life of a structural part the residual strength is allowed to go below ultimate load. However, this must be detectable during scheduled maintenance and ultimate load needs to be restored (See Figure 4 of AMC 20-29).



comment *123* comment by: *Leonardo Helicopters*

Comment:
(Table 1, 5.2.4.1.1, page 20)

"The plate surface roughness and edge diameter should represent a severe scenario found in a ship construction": this is too vague.

Suggested resolution:
Fully define material, geometry and distance to be dragged.

response

Not accepted

See response to comment #71

comment

146 comment by: *Transport Canada Civil aviation*

Appendix 1 table
Paragraph 4.6

Modified requirements state that the PQRS shall release the load in less than 5 seconds, and BQRS shall release in less than 30 seconds. There are several issues with this requirement (modified from AS 6342).

1) Per paragraph 4.1.1.1 (page 28) of the NPA impact assessment, the 5s/30s for QRS/BQRS release time have shown to be insufficient in dynamic situations, with one example given of 3-5 seconds between cable snagging and aircraft impact. So it is not clear why the NPA is proposing to set these time limits in the proposed standard while at the same time highlighting that they are insufficient.

2) the start time ("emergency is declared") is not clear. Is that when the pilot/hoist operator actually notices the problem, or when monitoring systems do, or when operator/pilots manually activate the QRS?

3) The time to release (TTR) seems inconsistent with the other requirement of 3.3.7 of AS 6372 – not modified in the proposed ETSO – of 0.5 seconds after actuation for the PQRS. If the release is manual, then the total TTR is driven by operator reaction time and then it is not an equipment requirement (other than a "capability"). For the PQRS TTR from activation time, there is a conflict between 3.3.7 and (modified) 4.6.

In addition, It is undersood that activation of the QRS is manual. Having an automatic QRS would add some additional concerns of erroneous release, especially when considering human cargo. Since the NPA does not give any evidence of evaluation in terms of safety in this regard, it is assumed that it was never the intent to have an automatic release system. While it is never implied in current AS 6342 that the QRS should be automatic, it might be worthwhile to specify that QRS design should be such that it can only be triggered by operator or pilot (human decision based), explicitly excluding any kind of automatic triggering.

suggested resolution:
Remove the release time requirement for PQRS and BQRS from paragraph 4.6, and keep it in paragraph 3.3.7 (add the one for BQRS in 3.3.7 as well if required). Explicitly require both QRS to be manually activated only (human decision based, no automatic release).

response

Partially accepted

1) Without an OLPD it has been shown that the time to release the load is not sufficient. This is the reason why an OLPD is mandated in this ETSO.
2) The emergency is declared when the flight crew is notified of, or recognises the emergency. The text has been amended to reflect this.
3) The release time stated in paragraph 3.3.7 of AS6342 is for the PQRS system. The time is measured between actuation of the BQRS (pushing the release switch) and the release of the load.
   Note: For the PQRS and its reaction time of 5 s, manual cable cutting by handheld cutters is not accepted.

An automatic QRS is not addressed under this ETSO.

comment

149 comment by: *Transport Canada Civil aviation*

Appendix 1, table 1

AS 6342, section 3.3

There is no modification to section 3.3 of AS 6342, yet section 3.3 is a requirement depending on aircraft level safety assessment. ETSO is at the equipment level.

suggested resolution:
Rewrite section 3.3 to specify "...on the criticality specified in section 3.2.1 of this ETSO"

response

Not accepted

Section 3.3 only addresses hoist elements.

comment

161 comment by: *Transport Canada Civil aviation*

3.3.4

The cable is a life-limited part and hoist manufacturer shall determine its fatigue characteristic and define a method for life calculation. There is no mention of using a Scatter Factor (SF).
The preferred approach is to perform an actual fatigue test as mentioned in page 18 item 5.2.2 Cable Endurance and Fatigue Testing.

suggested resolution:
To include a note indicating a reference to item 5.2.2 (actual fatigue and endurance test) unless the life calculation cited in 5.2.2 is related to a definition of Scatter Factor (SF) to be applied in the fatigue test results to meet 75,000 test cycles (page 19 – item 5.2.2.2).
A SF should be define on the 75,000 test cycles

response

Partially accepted

	See also response to comment #6 5.2.2. Headline Section 3.3.4 makes reference to 3.6.2 (fatigue tolerance evaluation). Section 3.6.2 has been revised as per comment #130 'section 5.2.2 Headline' to make the link to section 5.2.2.

comment	*162* comment by: *Transport Canada Civil aviation* 5.2.2.2 The cable (with damage) shall be tested for 75 000 test cycles (150 000 reversals) with one end of the cable attached to a free swivel. If a cable is tested to 75,000 cycles without a fatigue failure, does this imply the cable need not be inspected? What is the objection of testing only to 75,000 cycles?
response	Noted The test for 75000 cycles is proposed in SAE AS 6342 and is found to be acceptable to EASA. Based on the results of the test, the maximum cable usage will be defined by the hoist manufacturer. The method of how to determine the maximum cable usage based on the test data is defined by the hoist manufacturer.

comment	*168* comment by: *Transport Canada Civil aviation* 5.2.4.1.1 Although there is mention to static test to simulate an entanglement (Page 20 – item 5.2.4.1.1), it is seem a little vague the definition " The distance the cable slides along the steel plate shall reflect a distance which can be **reasonably expected** (?) in such an event.". suggested resolution: To provide guidance, i.e. measure or figure to clarify without doubt what it is reasonably expected for this test condition.
response	Not accepted See response to comment #71

Table 2 - Additional definitions	p. 21

comment	*73* comment by: *GAMA*

	The cable is the means to suspend the load being raised or lowered not means to raise or lower the load. **Suggested resolution:** Revise the definition.
response	Accepted The text has been revised accordingly.

comment *131*

comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	21	Table 2	Personnel-carrying device system (PCDS): Is a device that has the structural capability and features needed to safely transport occupants external to the helicopter during HEC operations. A PCDS includes but is not limited to life safety harnesses (including, if applicable, a quick-release and strop with a connector ring), rigid baskets and cages that are either attached to a hoist or cargo hook or mounted to the rotorcraft airframe.	PCDS are not covered by either the AS6342 specification or the proposed ETSO-2C208. PCDS are discussed in the Impact Assessment only. Note EASA and FAA definitions of PCDS are different.	Remove the definition from the proposed ETSO-2C208 and move the definition to where used in the Impact Assessment as necessary.	Editorial

response Accepted

The definition of PCDS has been deleted.

comment	*163* comment by: *Transport Canada Civil aviation* “instantaneous release” should be followed by a time range: suggested resolution: “instantaneous release, i.e. < ## seconds”
response	Partially accepted The time range is defined in section 4.6. of AS6342.

comment	*164* comment by: *Transport Canada Civil aviation* Emergency jettison (or complete load release) “to prevent a significant reduction in the safety margins for continued safe flight and landing of the rotorcraft” Note: reword this portion of this sentence suggested resolution: to **ensure** continued safe flight and landing of the rotorcraft”
response	Accepted The text has been changed accordingly

comment	*170* comment by: *Transport Canada Civil aviation* The Dual Actuation Device (DAD), as defined in Table 2, addresses the risk of an inadvertend activation – by the flight crew – of the load release. The means to mitigate this risk is to require two distinct successive crew actions (e.g. thumb movements) to be completed for the load release actuation. This proposed sequential control does not address the risk of a single failure of the load system itself causing an inadvertent load release. suggested resultion: To reduce the risk of single failure leading to unintended cutting of cable, the DAD should include separate arming and activation circuits. For example: Opening the guard or cover should arm the QRS, followed by the second action of activating the cable cut activation switch to release the load.
response	Accepted The text has not been amended because for the demonstration of compliance, it is expected that the system requirements for the DAD will be the output of the FHA/SSA

(per section 3.2.2. of the main ETSO section). Depending on the criticality and reliability, more than one activation circuit might be needed.

Table 3 - Additional list of acronyms p. 22

comment *165* comment by: *Transport Canada Civil aviation*

Add additional Acronyms to the table

suggested resolution:
Add:

TT: Total Time
OLPD: Overload Protection Device
MCU: Maximum Cable Usage

response Accepted

The suggested acronyms have been added to Table 2.

4.1.1. Safety risk assessment p. 23

comment *74* comment by: *GAMA*

"The dataset consists of more than 250 occurrences, spanning from 25 February 1955 to the date of issuance of this NPA and does not claim to be exhaustive."

Suggested resolution:
EASA to provide a brief summary of each of the 250 incidents/accidents with at least the identified cause of the incident/accident and – where possible – details of the accident and circumstances. This would allow the reader to better separate the technical from the operational accident causes.
It is clear that not all reported accidents are in the public domain. Nonetheless, many accident reports are in the public domain. For anyone wanting to verify the work of EASA, it would be very useful if EASA could provide a brief summary of each of the 250 incidents/accidents with at least the identified cause of the incident/accident and – where possible – details of the accident and circumstances. This would allow the reader to better separate the technical from the operational accident causes.
A chart is shown, where the rate of occurrences classified as potentially catastrophic is plotted. It is unclear what "potentially catastrophic" means in this context. This chart should be supplemented with a line showing the rate of occurrence for actual fatal accidents.

When identifying the cause of the accidents, a single accident could have more than one cause. It is unclear how these are related in the data presented. For instance, do all cable ruptures go back to an entanglement or not? A more detailed treatment of the accident's causes would be highly appreciated.

response

Not accepted

The data has been provided to the SAE working group (anonymized) and has been discussed during a 2-day workshop, including a 12 page "Helicopter Hoist Safety Review" document.

Furthermore, the purpose of the safety assessment that was conducted in the RIA was to demonstrate that there is a need to improve the safety of rotorcraft hoists based upon the incidents and accidents that have occurred. The purpose of the safety assessment was not to justify the requirements contained in the proposed ETSO. The safety assessment would have been identical if EASA had accepted the AS 6342 standard.

It should be noted that the majority of the changes to the AS 6342 standard have been introduced in order to address the gaps between the standard and the requirements of CS 27/29.865 not to address specific accident causes. Therefore, the provision of a comparison table between the occurrences and proposed ETSO text would not be worthwhile.

The safety assessment has not been used as the basis for the inclusion of a requirement for an Overload Protection Device (OLPD), therefore the distinction between occurrences that occurred with and without an OLPD would not fundamentally affect the outcome of the safety assessment.

It has been suggested that some of the incidents and accidents are not applicable due to the type of operation being conducted at the time. From a technological point of view, the type of operation does not affect the fact that the incident or accident could have been mitigated through improvements in the design of the hoist.

Nevertheless, even if a very stringent filter was applied and only 33% of the incidents and accidents were considered, then this would still result in 1 fatality per year. This would still be sufficient to justify the need for a safety improvement when balanced against the costs of implementation in a rudimental cost-benefit analysis based upon the cost of a preventable fatality of 3.5 million euros.

Therefore, the safety assessment is not sensitive to significant changes in the applicability of the incident or accident.

comment

76 comment by: *GAMA*

Table 2

Suggested resolution:
To be clarified: unintentional cable cut is a commanded but not intended cable cut initiated by the operator and uncommanded cable cut is initiated by the equipment itself without pressing a cable cut button?

response | Noted

Both proposals fall under this category. Either a cable cut was initiated by the operator unintentionally (e.g. not sufficiently guarded switches), or the equipment initiated a cable cut itself (e.g. a short circuit).

comment | *77* comment by: *GAMA*

Table 2

Suggested resolution:
Provide a risks mitigation table with the list of causes of fatal accidents as identified by EASA and the corresponding chapter of the appendix 1 to ETSO-2C208 mitigating these risks.
There is no direct link between the causes of fatal accidents of table 2 (and sorted in figure 5) and the amended/additional requirements proposed in Appendix 1 to ETSO-2C208 showing how each safety concern is mitigated.

response | Not accepted

The majority of changes to AS6243 are introduced in order to align the standard with the CS 27/29 requirements, not to address specific accident causes.

For further details see response to comment #74.

comment | *78* comment by: *GAMA*

Figure 4

Suggested resolution:
Are the incidents of cable rupture and cable rebound stand alone or initiated by entangling on ground or a mixture ?

response | Noted

In this table there is no distinction between cable rupture or rebound with and without entanglement.

comment | *79* comment by: *GAMA*

Generic to Chapter 4

Suggested resolution:
Is the benefit of the proposed protective devices already measurable. E.g. OLPD equipped hoists have a significant lower risk for cable rupture and rebound than others?

	A TBO of 36 month is mentioned, but not clear if this is only for the older types of hoist or also new developed. Please clarify.
response	Noted The majority of hoists used today have a clutch included. Therefore, it is not possible to provide statistically meaningful data from comparing hoists with and without OLPD. The TBO stated in this chapter addresses the hoists covered by the AD 2015-0226R5.

comment	*80* comment by: *GAMA* Figures 4 & 5: The figures identify entanglement and rupture as the most common occurrence categories. The changes proposed in the NPA will not change these occurrences as these are most commonly associated with operational environment and human factors. The addition of the OLPD as defined in the ETSO will likely increase these occurrences as the intended function of the OLPD as identified in AS6342 is being negated. **Suggested resolution:** See previous comments about the OLPD and unintended consequences.
response	Not accepted It is acknowledged that an entanglement is always associated with the operational environment. However, the design should mitigate operational risks to a maximum extent. This is commonly achieved in aviation through improvements such as “human-machine-interface”, cockpit resource management, damage tolerance evaluation (including maintenance errors).

comment	*81* comment by: *GAMA* 4.1.1.1: Hoisting is inherently dangerous and needs specific training and awareness of the hazards. The NPA has not correlated the new design requirements in the NPA to the causes and how specific hazards will be mitigated. Changes being proposed in the NPA could have unintended consequences and there is no evidence provided by EASA that these have been adequately assessed. **Suggested resolution:** The NPA needs to align the revised design requirements to the specific occurrence data and show that the changes proposed will be achievable and effective and unintended consequences avoided
response	Not accepted See response to comment #77

comment	*82* comment by: *GAMA* 4.1.1.1:OLPDs were developed to reduce entanglement related accidents. **Suggested resolution:** The NPA needs to recognize the original purpose of the OLPD.
response	Not accepted See response to comment #12

comment	*83* comment by: *GAMA* 4.1.1.1: The statement about the QRS being used in the event of entanglement is only partially correct. Some hoist designs also include a slip-clutch or OLPD that can also free the helicopter from an entanglement and prevent the loss of the complete aircraft. **Suggested resolution:** See previous comments about the OLPD and unintended consequences.
response	Accepted One of the benefits of the OLPD is that the flight crew will be given more time to assess the specific situation and decide on further actions. This is acknowledged by EASA.

comment	*84* comment by: *GAMA* 4.1.1.1: Entanglement **Suggested resolution:** A more detailed discussion and weighing of technical improvements versus operational improvements to avoid entanglement should have been part of the discussion. Since most entanglements go back to operational issues, a more thorough discussion of these issues would have been desirable. The effect of training is only briefly discussed in the impact analysis, but the use of modern training methods or better operational practices is not discussed or considered as a means to improve hoist safety.
response	Not accepted See response to comment #80

comment	*85* comment by: *GAMA* 4.1.1.1: Figure 7

Suggested resolution:
Due to the fact that there are already hoists with OLPD (clutch) in field and operation, is it possible to differentiate the entanglement cases for with and without OLPD, and also the following cable ruptures and rebound, to get a feeling of effectiveness of an OLPD? If the hoist is known the information could be derived.

response

Not accepted

See response to comment #79

comment *86* comment by: *GAMA*

4.1.1.2: Cable Rupture

Suggested resolution:
The report mentions 15 instances of falls from the cabin, steps, skids, moving decks and from ledges. A more detailed discussion of the consequences of the various falls would have been helpful: e.g. how many cables ruptured during a fall from the cabin, or during a fall where the cable was bent or in contact with sharp edges.

response

Not accepted

Such detailed data is generally not included in the reports.

However, taking into consideration the loads that occur during such an instance, the current cable was not designed for such load cases.

comment *87* comment by: *GAMA*

4.1.1.3: Cable Rebound

Suggested resolution:
The report fails to mention the consequences of the cable rebound occurrences. It would be interesting to know how many cable rebounds led to a loss of the rotorcraft and crew and how many resulted only in non-catastrophic damage

response

Noted

For initial airworthiness, a cable rebound shall be considered to be a potential catastrophic event. This the reason for the classification.

comment *88* comment by: *GAMA*

4.1.1.4: Hoisting is inherently dangerous and needs specific training and awareness of the hazards. The NPA has not correlated the new design requirements in the NPA to the causes and how specific hazards will be mitigated. Changes being proposed in the NPA could have

unintended consequences and there is no evidence provided by EASA that these have been adequately assessed.

Suggested resolution:
The NPA needs to align the revised design requirements to the specific occurrence data and show that the changes proposed will be achievable and effective and unintended consequences avoided

response

Not accepted

See response to comment #79

comment *89* comment by: *GAMA*

4.1.1.4: "'The failure of the external load system, including the PCDS where applicable, and its attachments to the rotorcraft should be shown to be extremely improbable (i.e. 1 x 10-9 failures per flight) for all failure modes that could cause a catastrophic failure, serious injury, or fatality anywhere in the total airborne system."

Suggested resolution:
Please correct: 1E-9 failures per Fh
It should not be "1E-9 failures per flight", but ""1E-9 failures per Fh"

response

Accepted

The text has been changed accordingly.

comment *90* comment by: *GAMA*

4.1.1.4: Summary

Suggested resolution:
It is very unlikely that the introduction of ETSO hoists will reduce the risk of accidents and incidents to the objective of 1 per billion flight hours. The vast majority of hoist accidents are operational in nature. They often happen during rescue missions, where higher operational risks are taken deliberately in order to save life. In addition, lack of training and poor operational practices may also contribute to the accident rate. The ongoing initiatives in this area are also expected to reduce the number of hoisting accidents.
These aspects should be recognized when discussing the safety objectives.

response

Not accepted

See response to comment #80

comment *110* comment by: *Collins/Goodrich Hoist*

Figure 1 - Fatalities and serious Injuries potentially linked to hoist Design
Collins does not agree with the title of this graph. This is the primary evidence being presented as the need for new regulations for hoist design. These accidents occurred during hoist operations but your later data references entanglement, cable damage after impact with airframe or even unintentional cable cut as causes. Although some of these incidents are related to hoist design issues, Collins strongly believes they are mostly operational issues. Collins requests an independent review of the accident data to provide an agreed upon basis for rule changes. It should also be noted that EASA's own safety publications for rotorcraft accidents do not list hoist design/hoisting as a contributor to accidents.

Section 4 Page 25 Table 2
Provide a risk mitigation table linking the accidents listed and the corresponding reference of this NPA to show linkage between

response

Not accepted

See response to comment #74 and #80

comment

125 comment by: *Leonardo Helicopters*

Comment:
(page 27, Figure 6)
It should be highlighted/clarified how many installations were provided with OLPD, within the 19 cases of cables ruptures.

Suggested resolution:
Update data to include this information

response

Not accepted

See response to comment #79

comment

126 comment by: *Leonardo Helicopters*

Comment:
(page 28, Figure 7)
Assumptions are made on incomplete assessment of the data.

Suggested resolution:
This chart should also show when the 19 cable ruptures occurred.

response

Not accepted

See response to comment #80

comment	*127* comment by: *Leonardo Helicopters* Comment: (Figure 8, page 29) Again, data is misleading: the data needs to be split, to show events on hoists with and without OLPD – without this, the data is not relevant. Suggested resolution: The data needs to be split to show events on hoists with and without OLPD.
response	Not accepted See response to comment #74 and #79

comment	*128* comment by: *Leonardo Helicopters* Comment: (page 29, Figure 9) Data is not conclusive: without the missing information related to the OLPD installed or not, the data is not accurate. Suggested resolution: Integrate / present data with the missing information related to the OLPD installed or not.
response	Not accepted See response to comment #74 and #79

comment *133* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	29	IA 4.1.1.4	Hoist operations are growing and the number of accidents, on average 3 fatalities per year over the past 5 years, can be expected to grow in the same magnitude. The above safety review highlights some of the key factors in hoist accidents and incidents that could be addressed by design and can guide the development of new standards such as SAE AS6342.	Early in the program EASA provided a spreadsheet of accidents/incidents they pulled mostly from web searches to build the database. Many of these data points were military related and industry, through the G26 committee, challenged every one of them.	No resolution just a statement of fact.	Conceptual
FAA/AIR-623 Matt Wilbanks	NPA 2021-10	30	IA 4.1.1.4	As the number of hoist flights is unlikely to have reached a billion, 1 in-	Can neither confirm or dispute this statement. By making this statement EASA		Conceptual

	817-222-5051				service failure signifies that the safety objective requested by the rule has not been met.	is excluding analysis as an acceptable method for predicting reliability.		

response

1st comment

Noted

2nd comment:

Not accepted

EASA does not exclude the use of analysis, however, in-service data cannot be used to justify the reliability if less than 1 billion hoist flight hours are reached.

comment	*159* comment by: *Transport Canada Civil aviation* 4.1.1.3 Some of the cable rebound is also linked to entanglements and a figure similar to figure 6 should be used to show how many events are directly linked to entanglements. suggested resolution: To add a figure similar to figure 6. Graph showing the number of entanglements that resulted in cable rebound (1980–2018)
response	Not accepted The data is not available for all of the accidents. For further details see response to comment #74.

comment	*167* comment by: *Transport Canada Civil aviation* It is not clear how the implementation of this new standard will address the most common and critical occurrence (Figures 4 & 5 – Page 26 - Entanglement) of incidents in the hoist design and operation based on what was presented in item "4.1.1.1 Entanglement", i.e. timing to activate QRS by crew suggested resolution: To provide more guidance.
response	Noted Through the implementation of an OLPD, the energy stored in the cable will be limited and enable the flight crew to assess the situation and initiate corrective actions.

4. Impact assessment (IA) p. 23

comment	*75* comment by: *GAMA* Flight Hours **Suggested resolution:** What is the reference number of Fh for all the calculations? What is the overall number of hoists installed? Is there a figure available about hoist operating hours or overall operations performed in this time?

response	Not accepted The data used by EASA contains proprietary and confidential information and therefore cannot be disclosed in full detail to third parties.

comment	*124* comment by: *Leonardo Helicopters* Comment: Data are missing for some key elements, which could alter conclusions: e.g. the presented data show an increasing failure rate per year, but this should be evaluated in relation to the total flying hours per year. The total flying hours significantly increased over the last 25 years. The information should also be split down into the two hoist categories – with or without OLPD fitted – i.e it should be shown the actual benefit of OLPD. Suggested resolution: Add/include missing data
response	Not accepted The failures are also expressed in occurrences per flight hour, which takes into account the increasing usage. For the split in categories, see response to comment #79. For further details on the safety assessment see response to comment #74.

4.1. What is the issue p. 23

comment *132* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	23	IA 4.1.1 Table 1		Early in the program EASA provided a spreadsheet of accidents/incidents they pulled mostly from web searches to build the database. Many of these data points were military related and industry, through the G26 committee, challenged every one of them.	No resolution just a statement of fact.	Conceptual
FAA/AFS-340 Kevin Myers 817-222-113	NPA 2021-10	23	4.1.1	Please note that for the US, Civil Aircraft Operations are the only operations conducted in accordance with all FAA regulations	This sentence should take for the US, Civil Aircraft Operations were "not" conducted in accordance with FAA regulations, Reference AC00-1.1A dated 2/12/14, Public Aircraft Operations.	Revise the paragraph so it is correct.	Editorial

				(Reference AC 00-1.1A dated 2/12/14, Public Aircraft Operations).			
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	24 & 25	IA 4.1.1 Figure 1 - 3		These Figures are generated from the spreadsheet of accident and incidents all of which were challenged by industry. EASA is using this data to make a case but most of these are military or public use and outside the jurisdiction of the FAA.	No resolution just a statement of fact.	Conceptual

response

1st comment:

Noted

For further details see response to comment #74.

2nd comment

Accepted

The text should have read:

“Please note that for the US, Public Aircraft Operations are the only operations not conducted in accordance with all FAA regulations (Reference AC 00-1.1A dated 2/12/14, Public Aircraft Operations)”

	However, unless there are significant and fundamental errors discovered in the RIA, the NPA itself is not republished after consultation.
	3rd comment Noted For further details see response to comment #74.

4.1.3. How could the issue/problem evolve p. 30

comment *94* comment by: *GAMA*

4.1.3: The paragraph also includes reference to cargo hooks which is not relevant.

Suggested resolution:
Reference to cargo hooks should be remov

response Accepted

The text should have read:

"If no improvements are made to the design of hoists ~~and cargo hooks~~ and their associated systems, then the current 5-year rolling average of 3.00 fatalities per year will not change and may increase with the increased usage of rotorcraft hoists as foreseen above."

However, unless there are significant and fundamental errors discovered in the RIA, the NPA itself is not republished after consultation.

comment *95* comment by: *GAMA*

"For specific operations, such as search and rescue, the aim is to reduce the number of accidents by 80% compared to 2000 taking into account increasing traffic."

Suggested resolution:
Proposal is to clarify this section.
It is assumed that 2000 is the year 2000, but in 2000 we do not see an entangling occurrence in figure 7 and 80% less of zero is still zero. Please clarify.

response Partially accepted

The sentence is a quote from "Flightpath 2050, Europe's Vision for Aviation". This document takes the year 2000 as a basis. It is acknowledged that in that particular year no entangling events were reported. However, the safety level that existed in 2000 was used as a baseline and not the incidence in that year.

4.2. What we want to achieve - objectives p. 30

comment *96* comment by: *GAMA*

	Unintended reel-out is identified under specific objectives yet has not been previously identified as a major cause of occurrences. Whereas unintended reel-out could result in a catastrophic event the data does not support the changes to the OLPD that are proposed in the NPA. **Suggested resolution:** See previous comments about the OLPD and unintended consequences.
response	Not accepted The initial event leading to further investigation was an unintended reel-out, fortunately only resulting in the loss of a dummy load. However, this event is considered as being potential catastrophic.

4.3. How it could be achieved - options p. 31

comment *134* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	31	IA 4.3 Table 3	Due to the fact that the design of hoists has not fundamentally changed in 40 years, it is not foreseen that hoist manufacturers would be compelled to voluntarily redesign their hoists.	Disagree, both U.S. manufacturers are in the process of redesign. Accidents are bad for businesses and both manufacturers are developing improvements.	Recommend removing this statement.	Conceptual
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	31	IA 4.3 Table 3	Introduction of specific rotorcraft hoist standards This option would implement improvements to the current designs of rotorcraft hoists and	For the FAA the TSO is a MPS and not meant to mandate new and novel technology that doesn't currently exist. A major and key difference between regulators.	Recommend we find a way to make this a rule making priority for review of 27 & 29.865.	Conceptual

				would reduce the likelihood of some of the most significant failure modes which are not considered in current designs. This could be achieved through the development of a European Technical Standard Order (ETSO).			

response

1st comment

Not accepted

The current redesign is acknowledged by EASA, however it does not change the fact that there was no fundamental change in design for the last 40 years.

2nd comment

Noted

comment	*160* comment by: *Transport Canada Civil aviation* The statement is contradictory, where if the primary causes of safety has been identified as technical in nature and that improvement in training could not achieve the potential improvements in safety. Yes, training will not eliminate the failure mode, but improved hoist will not eliminate entanglement, which is the most common factor (see figure 4). Reaction time and inability to activate the emergency jettison was identified in paragraph 4.1.1.1. page 28, and hoist improvement will not eliminate that situation. suggested resolution: To further investigate what could improve the reaction time to allow the crew to activate the emergency jettison in case of entanglement, rebound, cable failure PCDS and hook. In addition, they should investigate the ability to perform a quick override out of the hoist by the pilot in a situation where the hoist get entangled. Training to recognize the emergency situation, the crew management to activate the jettison in time and the ergonomics and location of the jettison switch should be considered to improve the reaction time. Add to Option 1: To include human factor to the activation of the emergency jettison or override out function. Add Option 2: Training and crew management.
response	Not accepted It is acknowledged that entanglement events will not be eliminated by a new hoist. However, the effect of an entanglement will be minimized by providing the flight crew with sufficient time to assess the situation and react accordingly. Human factors and training will be taken into account for the BQRS, which is included in the ETSO. Training and crew management is already today part of the hoist operations and will be focussed on in future.

4.5. What are the impacts p. 32

comment	*97* comment by: *GAMA* The impact assessment provided in the NPA does not consider the benefits of the changes that are identified in AS6342. The NPA assumes no change or the ETSO hoist configuration. Whereas the NPA is revising the contents of the industry consensus standard, the impact assessment needs to weigh the benefits and the additional burden of the changes proposed in the NPA/ETSO vs AS6342.

Suggested resolution:
The impact assessment needs to consider three options. No changes, AS6342 and ETSO-2C208 to determine whether the changes proposed in the NPA will increase the level of safety over those agreed by industry consensus in AS6342.

response

Not accepted

In the RIA, EASA considered two Options; Option 0: 'No change' and Option 1: 'Introduction of specific rotorcraft hoist standards'. The reason for only including these two Options was that the adoption of the AS6342 standard, as published, would not have been a viable option to consider and take forward for assessment in the RIA because it would not have resulted in a hoist design that would be compliant with the requirements of CS 27/29.865.

In hindsight, it should have been explicitly explained in the NPA that the AS6342 standard was not considered further as an Option in the RIA for the reasons stated.

4.5.1. Safety impact p. 32

comment *98* comment by: *GAMA*

4.5.1.2: The table does not include the introduction of the changes in AS6342.
The difference between the ETSO and AS6342 would be negligible, and potentially greater for the AS6342 due to the unintended consequences that could materialize due to the OLPD function defined in the NPA/ETSO.

Suggested resolution:
Add another option to the table to assess whether there is a benefit to changing AS6342.

response

Not accepted

See response to comment #77 and #97.

comment *99* comment by: *GAMA*

4.5.1.2: "The safety assessment in Section 4.1.1 clearly shows that there are accidents and occurrences which could have been prevented by improvements in the design of rotorcraft hoists."

Suggested resolution:
Section 4.1.1. fails to show the number of accidents and occurrences that could have been prevented by design improvements. In fact, it is unclear how a design improvement of the hoist will prevent entanglements or the consequences of these entanglements.
We would expect a more detailed discussion rather than a blanket statement. A benefit of +6 is therefore probably an overly optimistic estimate.

response	Not accepted. By introducing an OLPD with the ability to unreel the cable for a limited length at very low loads, the flight crew is given sufficient time to assess the situation and react accordingly. See response to comment #147

comment *135* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	32	IA 4.5.1.1	The 'no change' option would result in no improvement in the number of annual fatalities (3.00 fatalities per year (last 5 years) and loss of aircraft.	Disagree. Industry is currently improving their hoists.	Recommend rewording this encouraging industry to focus on their engagement with regulators and not make it seem like industry is unresponsive and dismissive towards improving the safety of their products.	Conceptual

response Noted

Hoist safety improvements for the hoist that was addressed under the EASA AD were mandated by the AD. In addition, EASA is in close contact with the European rotorcraft manufacturer in order to continuously enhance the safety of rotorcraft operations (EASA Rotorcraft Safety Map).

In order to facilitate the approval or alternate installations, EASA has developed this ETSO. This will enable alternate installations to be qualified as a stand-alone part, which will allow an easier entry into the market for alternate products.

comment	*147* comment by: *Transport Canada Civil aviation* 4.5.1.2 There is no rationale as to why a score of 6 was given. There is no justification given as to how the added requirements relate to a reduction in accidents, i.e. do data support the fact that the features or their performance were indeed the cause of accidents? How much of a reduction in accidents is expected? suggested solution: Explain quantitative criteria that are used to score the impact, i.e. how can you quantify the impact. Is there a methodology that is followed ? Add correlation between accident data and the added/modified requirement.
response	Not accepted Impact assessments follow the guidelines developed by the European Commission. A more detailed general explanation of multi-criteria analyses can be found in the Better Regulation Toolbox (available at https://ec.europa.eu/info/sites/default/files/br_toolbox-nov_2021_en_0.pdf, see pages 546-549). The impacts are scored on a scale of minus 10 to plus 10 to indicate negative and positive impacts. A score of zero means no or insignificant/negligible impact. Scores of 2, 4, 6, 8 and 10 correspond to very low, low, medium, high and very high impacts, respectively. A medium positive score was given to the safety impact because the proposed improvements are believed to significantly lower the number of fatalities and aircraft losses. (The improvement is assessed as a share of accidents avoided, not as the absolute number of accidents avoided.) Social impacts include working conditions such as health and safety at work. If an option is expected to prevent injuries or fatalities of employees (and indirectly also prevent operational disturbances), then these positive impacts need to be taken into account. Social impacts, however, include a wider range of areas than safe working conditions. Therefore, a score of low positive social impact was estimated for the proposed option. Please note that the final comparison of the options is not sensitive to minor changes in the assessment of the safety and social impacts: Even if you decrease these scores to +4 and +2, that is low positive and very low positive impacts (for the safety and social impacts, respectively), the preferred option is going to still be Option 1

4.5.3. Social impact p. 33

comment	*100* comment by: *GAMA* 4.5.3.2: The table does not include the introduction of the changes in AS6342.

	The difference between the ETSO and AS6342 would be negligible. **Suggested resolution:** Add another option to the table to assess whether there is a benefit to changing AS6342.
response	Not accepted See response to comment #77 and #97

comment	*148* comment by: *Transport Canada Civil aviation* 5.5.3.2 There is no rationale as to why a score of 4 was given. In addition, one could wonder why the score is 6 when it comes to safety impact while it is only 4 for social impact, as these are directly related to each other in this particular case. It is acknowledged that the population affected is minimal, hence the lower score, and social impact may take into consideration other factors than safety, which "dilutes" the benefit of increased safety. But again, there are no quantification criteria to assess this. suggested resolution: Explain quantitative criteria that are used to score the impact, i.e. how can you quantify the impact. Is there a methodology that is followed ?
response	Not accepted See response to comment #147

4.5.2. Environmental impact p. 33

comment *136* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	33	IA 4.5.1.2	This has been achieved in the draft ETSO (see Chapter 3) by mandating additional design features and better qualification of the hoist. These improvements include: the provision of an OLPD; introducing system redundancies; providing an indication and recording of established limits; better cable and hoist testing; higher system reliability; and	I believe the OLPD enhancement required in the ETSO are unclear. What does "reasonably protect human cargo on the hook" on page 14 Section 4.1 really mean? The technology for protection from a broad but rare range of senarios (ie. shock loading) does not exist. Does the hoist need to figure the mass it is hoisting for the hoisting event? Are we	Recommend we find a way to make this a rule making priority for review of 27 & 29.865.	Conceptual

				improved structural behaviour of both the cable and the hoist. The ETSO standard defines a clear perimeter of the hoist equipment and its interfaces, with technical requirements in line with expectations when installed in a CS-27/CS-29 type-certified rotorcraft.	discussing adjusting OLPD for the hoist event in preventing or reducing potential injuries spaning from HEC weighing from 80 to 600 pounds?		

response

Not accepted

With regard to the definition of catastrophic events for CS 27/29.865 EASA has included “serious injuries”. Therefore, this is also included in the ETSO.

4.5.4. Economic impact p. 34

comment	*101* comment by: *GAMA* 4.5.4.1: The reference to EASA AD 2015-0226R5 includes an EASA imposed requirement and arguably the OH interval is not supported by the data that Collins has made available, yet EASA has chosen to maintain a 36 month OH. It is also only applicable to one hoist manufacturer so does not provide an accurate representation. **Suggested resolution:** Impact assessment provided by EASA is misleading and biased based on the imposition of the EASA AD and shall be re-evaluated.
response	Not accepted See response to comment #102

comment	*102* comment by: *GAMA* 4.5.4.2:"Existing rotorcraft hoist manufacturers would have the cost of developing and certifying a new hoist design. This is considered to be in the order of €1M." The statement that there is no additional cost to develop a hoist based on the proposed standards is not accurate. Hoist manufacturers have indicated that the costs to comply with the additional requirements in the EASA NPA/ETSO would be significant. In addition the cost to aircraft OEMs due to the lack of harmonization with other leading authorities needs to be considered. **Suggested resolution:** EASA needs to ensure that accurate costs for development of new hoist equipment are used in the impact assessment and costs to aircraft OEMs are included. The cost of €1M is a significant underestimation of the true costs of a new hoist development. In addition, the additional requirements to the hoist are likely to increase the weight and size of the hoist, thereby requiring more performant helicopters for the same mission. These detriments are likely to offset any benefits from reduced maintenance.
response	Not accepted The cost estimates were based on provisional discussions for potential applicants for an ETSO approval. The estimated costs relate to the additional costs compared with the AS6342 standard (i.e. the delta between the AS6342 standard and the ETSO) and not the total cost for the approval of a hoist in compliance with the ETSO. It should be noted that a hoist manufacturer would need to expend these additional costs (due to the additional development activities to integrate the hoist design into the

helicopter design) anyway, in order to ensure that the hoist design complies with CS 27/29.865 if the design of the hoist only complied with the AS6342 standard.

The proposed ETSO provides these requirements upfront so that the hoist manufacturer can integrate their hoist without any additional development. Therefore, for transparency, these costs have been included in the RIA, however these costs would need to be expended anyway to integrate the hoist into the design of the helicopter.

However, for the sake of argument, even if these development costs were 3 times higher at 3M Euros, a rudimental cost benefit analysis would still result in a justifiable rulemaking action. Based upon the following assumptions: 1 fatality per year (using a reduced result from the safety assessment) and a value of a preventable fatality of 3.5 million euro.

Regarding the economic benefits in terms of the avoidance of overhaul costs and the reduced Overhaul period, these were included to show an associated positive economic benefit and do not fundamentally contribute to the comparison between Option 0 and Option 1. Therefore, the outcome is not sensitive to the accuracy of these minor economic benefits.

comment *103* comment by: *GAMA*

4.5.4.2: An additional option needs to be included in the assessment to assess the cost of developing a new hoist to AS6342 as defined in the industry consensus standard. Costs for this option will be less than development of an EASA unique variant as previously commented.

Suggested resolution:
The table is to be updated to include the AS6342 option. This option would likely be considered +3 whereas the NPA/ETSO option would be 0 or +1 when considering the lack of harmonization that would be created by EASA which would drive additional cost for hoist manufacturers and aircraft OEMs having to maintain different configurations.

response Not accepted

See response to comments #97 and #102.

comment *111* comment by: *Collins/Goodrich Hoist*

4.5.4.1 EASA has issued AD 2015-0226R5 to limit the TBO of existing hoists to 36months
The current EASA AD requires an overhaul of the clutch at 36months, NOT an overhaul of the hoist. It should be noted that the cost to overhaul a clutch is significantly less than the list 70k Euros, it is closer to 15k Euros.

4.5.4.2 Existing rotorcraft hoist manufacturers would have the cost of developing and certifying a new hoist design. This is considered to be in the order of 1M Euros.

	The numbers stated for the cost to design and certify a new hoist design are very significantly understated.
response	Accepted The text should read: *"EASA has issued AD 2015-0226R5 to limit the TBO of existing ~~hoists~~ clutch to 36months"* However, unless there are significant and fundamental errors discovered in the RIA, the NPA itself is not republished after consultation.

comment *137* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-616 Martin Crane 817-222-5056	NPA 2021-10	34	IA 4.5.4.2	The development and introduction of acceptable standards for rotorcraft hoists would enable the hoist to be treated as a 'part' in the context of Part 21. This would enable other manufacturers to enter the hoist market and design and then certify their improved hoist designs.	The FAA believes there are valid concerns with the wording in 14 CFR 27 & 29.865 that needs to be addressed so that a TSO for the article will not be in violation of the rule. It is unclear if EASAs ETSO will be in conflict with the formentioned rules.	Recommend we find a way to make this a rule making priority for review of 27 & 29.865.	Conceptual
FAA/AIR-623 Scott Johnson	NPA 2021-10	34	IA 4.5.4.2	EASA has confirmed that there would be no increase in the costs of designing a hoist to comply with	If this were true it would suggest no redesign is necessary. There is always cost to redesign efforts. The way this would be true is for	Recommend correcting the statement.	Conceptual

918-289-7887				the proposed improved hoist standards.	new applicants and we are aware of two potential new applicants in Europe. This thought is confirmed on bullet 3 of page 35 of the EASA NPA 2021-10. For US manufacturers to meet the ETSO there will be increased development costs. European manufacturers are start-ups in the development phase.		

response

1st comment:

Noted

2nd comment:

Not accepted

The costs for designing and certifying aeronautical products have also increased through the changes of the requirements over the last 50 years.

The cost of designing a hoist compliant to current CS/FAR 27/29 requirements do not increase significantly through introduction of the ETSO. The design requirements laid down in the ETSO are needed in order to comply during installation with the current CS 27/29 requirements.

See response to comment #102.

comment	*166* comment by: *Transport Canada Civil aviation* 4.5.4.2 For “Option 1”, it is mentioned that for existing hoist manufacturers, redesigning or modifying an existing hoist is not considered to be a viable approach. Note: There was no data presented to corroborate this statement as statistical data indicated an average of 3 fatalities per year with current hoist design which does not meet the 1E-9 per FH criteria. Why not include a plan to replace existing hoists ing the field in the public interest? suggested resolution: To propose a discussion with stakeholders to find out a possible solution to implement a plan to replace old hoist equipment in the field.
response	Noted A replacement of an old hoist with a new hoist, possibly using the same hardpoints on the rotorcraft, is a possible solution. However, this point addresses redesigning hoists, not new hoists fitted to existing hardpoints.

4.5.5. General Aviation and proportionality issues p. 36

comment *138* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Matt Wilbanks 817-222-5051	NPA 2021-10	35	2nd to last bullet	The purchase costs of a new hoist that complies with the new standards are expected to be the same as for existing hoists. It is expected that with increased competition in the market the purchase costs of a new rotorcraft hoist may be lower in the future if new standards are introduced.	This statement contradicts with page 6 section 2.4 under the 1st bullet on expected draw backs, which discusses increased costs.	Recommend correcting the impact analysis.	Conceptual

response	Not accepted Section 2.4 addresses the design and certification costs, whereas section 4.5.5. is addressing the purchase cost. See response to comment #102.

4.6.1. Comparison of the options p. 37

comment	*104* comment by: *GAMA* The summary comparison provided in the NPA does not consider the benefits of the changes that are identified in AS6342. Whereas the NPA is revising the contents of the industry consensus standard, the impact assessment needs to weigh the benefits and additional burden of the changes proposed in the NPA/ETSO vs AS6342. **Suggested resolution:** The table must include the baseline for the EASA NPA/ETSO configuration which is AS6342. If included, the AS6342 option would have comparable safety impact (+6), comparable social impact (+4) and improved economic impact (+3) where the ETSO/NPA option would have an economic impact of +1 or less. The totals would therefore be +14 for the AS6342 option vs +10 or +11 for the NPA/ETSO. If the assessment is preformed correctly there will be no justifiable benefit over the equipment defined in the industry consensus standard, AS6342.
response	Not accepted See response to comments #77 and #97

comment *139* comment by: *FAA*

Agency/Organization Name Phone #	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
FAA/AIR-623 Scott Johnson 918-289-7887	NPA 2021-10	37	4.6.1 Last Sentence	As a result, the relevant parts of the IA might need to be adjusted on a case-by-case basis	This sentence gives a lot of discretion to impose or reduce the requirements. This discriminates against a fair market.	Recommend rewording this so that it is clear favoritism is not part of the regulatory process.	Conceptual

response Not accepted

The intent of this sentence is to state that if the assumptions and estimates are significantly flawed then this may result in the need to re-evaluate the Options particularly if 2 options are close in terms of their scoring.

Appendix A - Attachments

REEL comment_response_to_EASA_NPA_2021_10.pdf
Attachment #1 to comment #113

