EASA	COMMENT RESPONSE DOCUMENT
	EASA PAD No. 13-155 **[Published on 04 October 2013 and officially closed for comments on 01 November 2013]**

Commenter 1: Noordzee Helikopters Vlaanderen (NHV) N.V. – Kevin Matton – 04.10.2013

Comment # 1

I was just reading the PAD that [has been] issued on the Goodrich hoist system. One of the limits is defined in hoist operating hours. Can I [draw] attention to the fact that Eurocopter France did not include this limit in the chapter 05 of the hoist. The hoist is only limited in cycles (lifts) and calendar [time].

Therefore our system (both flight Ops wise and CAMO tracking wise) is not foreseen to track this item. Could it be an option to change the limit in flying hours and redefine the limits?

The hoist system we are using (PN 42325-16-5) does not have an operating hour counter. Although I see that this specific PN is not listed (only 42325), would that mean we are not concerned?

EASA response: Partially agreed.

The hoist operating hours are removed from the AD. Only calendar time and cycle/lift limits are retained. See also response to comment #13.

Table 1 clarifies that, unless specified, all suffixes (dash numbers) of the hoist P/N listed are affected.

Commenter 2: Nucleo elicotteri VVF – Claudio Lo Presti – 07.10.2013

Comment # 2

Just for clarification, it would be advisable that your documents in subject should be more detailed in the application box or it need to improve your policy.

Indeed, these AD/PAD are applicable to several type of helicopter, but to discriminate which component is affected, we need to jump to the 'Required action & Compliance time' box; so, we think it would be better that you'll include in the applicability box "helicopter types ... xyz… that install Goodrich external hoist system".

In the other hand, if you issue a directive for an equipment, you need to issue a directive for Goodrich external hoist installed on helicopter type ...xyz..., don't you? (ref. FAA AD).

For information, we manage two AW139 that are equipped with Breeze-Eastern external hoist system; this system install a clutch system in the same manner of Goodrich. According to your directive (that is applicable to AW139 in our case), there are two possible installation Goodrich and Breeze-Eastern; only one is reported; what does it happen on the other one? Have you got any alert for Breeze-Eastern type trouble?

Please advise us if you consider our above interpretation is not correct.

EASA response: Agreed.

The Applicability has been modified accordingly. Please note however that this is not an equipment AD as the hoist manufacturer does not hold a European approval at equipment level (e.g. ETSO or equivalent).

EASA has, at this time, no information to indicate that Breeze-Eastern hoists are affected by the condition addressed by PAD 13-155.

Commenter 3: Bristow Helicopters – Chris Richards – 09.10.2013

Comment # 3

With regard to the Proposed Airworthiness Directive No. 13-155, our company (Bristow Helicopters) have considerable concerns over the proposed AD for the Goodrich Hoist Inspection / Replacement.

The criteria mentioned in the PAD for replacing the hoists (24 months, 22 hoist hours or 200 lifts) will have a severe detrimental effect on our SAR operations. A couple of points are:-

- Can the reason for the drastic reduction in hoist replacement time be justified? This is based on….
- If this has happened on only a very few occasions, is there an operating procedural change required rather than restricting the hoist replacement limits?

As a company we have a dedicated maintenance programme for all the hoists we operate which is based on the manufactures recommendations and our in service history (25+ years). This load test forms part of our scheduled maintenance tasks and to date, we along with many other operators have never suffered from any of the issues mentioned in the AD. With the limits proposed in PAD 13-155, this will severely restrict operators who are maintaining and operating the hoist IAW the recommended maintenance schedules and operating procedures.

Bristow currently operates globally between 20-30 of the effected part number hoists on various aircraft types, this number will increase to approx. 80 hoists in the next 18 months with the commencement of the UK SAR contract. With this number of hoists in operational use the proposed life limit (in particular the 200 lifts limit) will mean hoist replacement approx. every 3 months.

We feel that unless Goodrich can provide a technical reason as to the hoist failures with possible improvements via service bulletins that the life limits on the hoists should remain as the manufactures recommendations but maybe with a scheduled check of the overload clutch.

EASA response: Partially agreed.

Please see answer to comment #13.

Commenter 4: UNI-FLY A/S – Hans Skov Hermansen – 11.10.2013

Comment # 4

A direct and unedited implementation of the required actions set forth in EASA PAD No.: 13-155 would constitute a very serious problem for helicopter operators such

as UNI-FLY A/S.

The restrictions imposed and their consequences will have far-reaching and devastating impact and will, in essence, ruin the economical basis for our operation and business. Thus we cannot accept the required actions and the limitations in EASA PAD No.: 13-155 in their current form.

UNI-FLY conducts passenger transport flights of service personnel to offshore wind turbines utilizing the Goodrich 44301 Rescue Hoist mounted on a Eurocopter EC135.

This operation was the first of its kind – starting the now rapidly expanding industry of helicopter support to offshore wind farm maintenance operations. This is our main business and over the last 12 years we have conducted more than 23,000 hoist lifts in this type of operation. In daily operations we may conduct as many as 40-50 hoist lifts per day.

Thus a hoist overhaul interval of 200 hoist lifts would have devastating consequences. Such requirement would mean that we shall send our hoist off to overhaul once a week (!) Furthermore such limitation would cause the cost per hoist cycle to sky rocket for all operators worldwide.

The potential implementation of the restrictions set forth will play a crucial role for our company's continued existence and will result in the closure of our and other helicopter offshore wind farm support operations, which, in turn, will affect the entire offshore wind turbine industry.

When taking the number of Goodrich 44301 hoist systems currently in use worldwide, and the time span in which they have been used, into perspective, it appears as rather drastic measures to inflict stricter regulations and limitations onto an industry-wide number of operators on the basis of merely two incidents. Especially when taking into account that the probable cause have been operations outside of the approved flight envelope and/or failure to perform maintenance activities correctly (Goodrich SIL-2013-01).

The result would be that incorrect use of equipment by a few will in effect cause mayor restrictions and consequences for the vast majority of hoist operators.

It is our assessment that the proposed required actions are going too far and the restrictions should be based on, not only one incident related to a test, but also on facts from actual operations.

We would like to propose a different set of actions for consideration. These will in our perspective ensure that the technical integrity of the equipment is tested.

These are based on our long-standing experience in hoist operations. The hoist lifts are normally performed at a cable length of approximately 5 meters and with loads of up to 160 kg.

It is crucial to emphasize that we do not want to compromise safety in any way, but that our intentions merely is a scenario where the implications do not cause such catastrophic impact on our operations.

Until final AD action has been decided on, we suggest following actions:

1. To temporary reduce the maximum hoist load with 30% from 230 kg to 160 kg.

2. To prevent uncontrolled exceedance of the overload clutch capacity, restrict aircraft manoeuvers in flight with load on the cable.

3. After last flight or before first flight, perform following extra check together with the “Daily after last flight check”, in accordance with Goodrich Component Maintenance Manual: REPAIR. 4. Limit Switch Adjustment O. Check operation of the up-limit switches S9 and S10 (Figure 703) and check homing load for hoist fitted with hook assembly, part number 44301-420 and 44301-423 as follows:

(1) Operate the hoist assembly and reel out approximately four feet (1.22 m) of hoist cable.

(2) Operate the hoist assembly and reel-in the hoist cable until the cable hook assembly striker disc actuates limit switches S9 and S10.

(3) Check that the hoist ceases operation.

(4) Verify that the damper compression is between 0.065 and 0.125 inches (1.65 to 3.17 mm). See Figure 704.

(5) Measure distance from cable hook assembly carrier to the upper disk (Dimension A, Figure 704).

(6) Repeat steps (1), (2) and (3) two more times. Actuate limit switches S9 and S10 in turn and verify that each limit switch will stop hoist operation.

(7) If required, adjust the limit switches on their mounting bolts to attain required operation.

(8) Reel in the hoist cable until the roller cage actuates the up limit switches S9 and S10, stopping the hoist assembly and applying a load on the energy absorbing neoprene damper.

(9) Make sure Dimension A - Dimension B is from 0.065 to 0.125 inch (1.65 to 3.18 mm).

(10) If required, adjust limit switches S9 and S10 to obtain correct homing load.

UNI-FLY recommends the above restrictions to be implemented so that the Goodrich hoist P/N 44301-10-5 can continue in operation without other restrictions.

We do believe that we are one of the world's most experienced hoist operators with a very high number of hoist lifts conducted.

On a single hoist system, used exclusively in our wind turbine operation, a total number of 13,272 hoist lifts have been logged. All within 100,9 hoist operating hours and achieved in the period from when the hoist was factory new (2002) to the hoist was due for overhaul (due to hoist hours).

This hoist has been working without any problems, is now due for overhaul according to calendar time.

UNI-FLY A/S suggest that the mentioned hoist system is submitted to Goodrich for examination in order to gain an impression of how the overload clutch condition is after a lifetime with that many lifts and when due for overhaul.

The purpose of this examination can help EASA, Goodrich etc. to form a picture of the hoist condition and to help for establishing of more realistic operational criteria.

Conclusion

It is UNI-FLY's position is that when following the above mentioned restrictions it be ensured that the overload clutch during operation not will do an uncontrolled roll out in the light of the following:

1. To temporary reduce the maximum hoist load with 30% from 230 kg to 160 kg.

2. To restrict aircraft manoeuvers in flight with load on the cable.

3. Post flight check of the hoist to ensure that switches S9 and S10 are correctly adjusted and working correctly to ensure that the hoist cable is correctly stopped by the up switches and thus not causing unintentional wear of the overload clutch.

4. Examination of a hoist belonging to UNI-FLY A/S to verify the reliability of the overload clutch.

UNI-FLY A/S recommends that EASA in collaboration with Goodrich, relevant partners and other agencies as soon as possible examines our hoist which is due for overhaul. We hope that our proposals of preventive steps can solve the problem and prevent the EASA PAD No.: 13-155 to be implemented in its current form, which would have drastic consequences for helicopter hoist operation in general and catastrophic consequences for UNI-FLY A/S

EASA response: Partially agreed.

Please note that at this time there is no determination that the event that triggered the original AD was caused by operations outside of the approved flight envelope and/or failure to perform maintenance activities correctly. Restriction of the maximum hoist load would affect 2-person lift operations and has thus not been considered. The setting of the limit switches will be clarified in the maintenance instructions. Please see answer to comment #13 for the aircraft manoeuvres limitations and adjustments of cycle/lift limits.

Commenter 5: Swedish Police Air Support Unit – Joakim Lundmark – 18.10.2013

Comment # 5

The Swedish Police operate EC 135P2+ with Goodrich rescue hoist from our two most northern bases in Östersund and Boden. We have just had a new hoist delivered, two years after order. In total we have three hoists for our mountain rescue operation. We were forced to ordered the third hoist just to have two units operative since Goodrich have such long turnaround time for overhaul and for the reason that we operate from two bases. We save several lives every year in mountain rescue operation with our hoist equipped EC 135 and our well trained crews.

The PAD cycle limits will stop the Swedish Police from alpine rescue within a few months since our personnel need continuous training. With proposed limit we need to stop the training and that is not safe at all and even without training we will lose our capability within a few months since the turnaround time for this overhaul at Goodrich is way too long. Goodrich can't maintain all produced hoist´s in that time frame. They can´t even manage todays limit's.

Even without training we will be out of hoists shortly after the AD is affected since the hoist must be sent for overhaul already after 200 cycles. We use approximately 100 cycles each month during high season. That means we will lose our rescue capability with hoist within two months. That is not acceptable.

I suggest you must find another limit or a maintenance action that can be performed by the operators or any 145-company.

As a national resource for rescue operations that performs real live saving hoist operations in the mountains we can't accept to lose our hoist capability and request that EASA will help us to save lives by listen to the need of the operators and the rescue organizations and therefore will change the cycle numbers before overhaul.

EASA response: Partially agreed.

Please see answer to comment #13.

Commenter 6: AgustaWestland – Bernardino Paggi – 21.10.2013

Comment # 6

The following highlighted proposed limitation] [§ (8) of the PAD, see quote below] is not controllable by the pilot since there is no possibility to measure and show the pilot the actual lateral pendulum angle. Since CS29.1585 does not allow to introduce limitations that are not in control by the pilot, this proposed one should be removed.

AC 29.1585. § 29.1585 (Amendment 29-24) OPERATING PROCEDURES.

a. Explanation. The procedures sections of the manual should contain essential information peculiar to the particular type or model, the knowledge of which may be expected to enhance safety in the kinds of operations for which the type or model is approved. Information or procedures not directly related to airworthiness, or not under control of the crew, should not be included, nor should any procedure which is accepted as basic airmanship.

(8) For helicopters with a Goodrich hoist system installed having a P/N listed in Appendix 1 of this AD (all s/n), from the effective date of this AD, the following hoist operation limitations must be applied and all flight crew members and hoist operators must be informed accordingly:

- Maximum permissible bank angle with extended cable is 20°
- Maximum permissible lateral pendulum angle with respect to the vertical axis of the helicopter is 15°

The following requirement [also part of § (8) of the PAD] is impractical and does not contribute to safety nor to clarity. The inclusion of the placard in the RFM would be enough.

> Installation of a placard with these limitations, in full view of the pilot(s), or inserting a copy of this AD into the applicable Rotorcraft Flight Manual, is acceptable to comply with the requirement of paragraph (8) of this AD.

EASA response: Partially agreed.

Please see answer to comment #13. Placards are a common method to convey limitations to the flight crew. Rotorcraft Flight Manual revisions can be submitted to EASA for approval as an (alternative method of) compliance with this paragraph.

Commenter 7: RUAG Schweiz AG – Stefan Bürki – 25.10.2013

Comment # 7

Swiss Airforce and its maintenance organization (RUAG Aviation) would like to express our concerns about the planned implementation of the EASA PAD 13-155. The Swiss Airforce is operating 20 EC135/635 built by Eurocopter Germany. Even though the operation is done under military approval, the civil technical and operational guidelines are followed. Up to now, especially flight safety concerning cases, which are covered by an EASA AD are followed without an exception.

Eighteen of twenty EC635 are equipped with hoist attachments. The affected Goodrich hoists are used frequently on these helicopters for search and rescue missions. Currently, the Swiss Airforce has 12 hoists in operation with PIN 44301-10-5 (Serial numbers 717,716,195,190,189,185,184,178,162,161,141,188).

Besides the training of personal, the Swiss Airforce takes over missions from 3rd party organizations such as e.g. Search & Rescue missions from some of the Swiss EMS operators, law enforcement organizations etc. Therefore, the imposed restrictions and their consequences will have far-reaching and devastating impact on the mandate of the Swiss Airforce. Thus, we cannot accept the required actions and the limitations in EASA PAD No.: 13-155 in their current form.

Specially Search & Rescue missions, which can't be done by the local EMS operator are often urgent and decide about survival or loss of an injured person. At all-time, there is an Swiss Airforce helicopter ready to fulfill such missions within Switzerland, where a hoist with PIN 44301-10-5 is used.

Main concerns:

(1) EASA PAD No.: 13-155; Required Actions Page 2+3/6 (Item 1+7)

• Alert Service Bulletin ASB EC135-85A-058 specifies an one-time inspection of the external mounted hoist i.a.w. the Goodrich Alert Service Bulletin 44301-10-15, which has been performed on the Swiss Airforce Fleet without any findings. With EASA PAD No.: 13-155 the required actions are pushed further to a repetitive hoist test after 5 hoist operating hours or 50 hoist cycles.

Since the Swiss Airforce operates the aircrafts in remote locations and the local personal is not trained and allowed to perform the load cycle test, a huge effort will be created to continuously move unserviceable hoists to the main operating base, where the test can be done. It has to be noted, that during the last 5 years of operation with about 10'000 load cycles, no incident occurred with this hoist. Based on the so far communicated investigation results (Goodrich SIL-2013-01), a damage to the overload clutch (a critical safety feature) is possible, if the hoist I helicopter is operated outside of the approved flight envelope or if certain maintenance activities on the hoist are not performed correctly.

With respect to the known two incidents and possible harm to the winch personal, the Swiss Airforce takes the given flight envelope and maintenance requirements seriously and does not harm these limits or requirements given by the TC holder or Goodrich. RUAG Aviation holds an I-Level Goodrich repair approval for this type of winch and does therefore have very good detail knowledge of these winches.

For more than 5 years, during annual inspection a complete load check is done on the test bench under steady workshop conditions without any negative findings. When taking the number of Goodrich 44301 hoist systems currently in use worldwide, the time span in which they have been used, local maintenance, operation procedures and know-how into perspective, it appears as a rather severe measures to inflict such strict limitations. Especially when taking into account that the root cause analysis and its technical determining action has not been communicated yet in detail.

(2) EASA PAD No.: 13-155; Required Actions Page 2+3/6 (Item 4-6)

• Based on pervious experiences with our allocated Goodrich hoist vendor in the USA, the average TAT for a hoist repair is at least 10-14 weeks. We believe, that with effectiveness of this EASA PAD based on the huge demand, the TAT will further increase and therefore for a longer period in time the allocated helicopter missions will be jeopardized. We clearly request a local or field solution, which provide the possibility to bring back unserviceable hoist to a service condition.

Suggested or acceptable measures:

a. To prevent uncontrolled exceedance of the overload clutch capacity, restrict helicopter manoeuvers in flight with load on the cable acc. to the limitations found in EASA PAD No.: 13-155 (Required actions, § 8).

b, Perform following extra limit switch adjustment check together the annual check or at a lower interval such as the monthly check in accordance with Goodrich Component O-Level Maintenance Manual:

REPAIR. 4, item O. Limit Switch Adjustment (full up limits switches S9, S10 only).

c. Reduce inspection interval of the overload clutch margin validation check from 12 to 6 month, which is currently found in ASB44301-10-15. Usage of alternative means to verify the condition of the clutch such as a test bench procedure must be acceptable and available.

d. Define maintenance actions to be able to change the unserviceable to serviceable condition (Ref. EASA PAD No.: 13-155 (Required actions; (4), (5), (6) of the winch at a repair shop with I-Level approval. This will allow RUAG Aviation to react fast and to support the customer within acceptable TAT and therefore help to fulfill the planned helicopter missions.

EASA response: Partially agreed.

Please note that at this time there is no determination that the event that triggered the original AD was caused by operations outside of the approved flight envelope and/or failure to perform maintenance activities correctly. Please see answer to comment #13 for the aircraft manoeuvres limitations, TBO reduction and adjustments of cycle/lift limits. The setting of the limit switches will be clarified in the maintenance instructions.

Commenter 8: Swiss Air-Rescue (Rega) – Ernst Kohler – 25.10.2013

Comment # 8

We refer to the draft EASA PAD 13-155, which has come as a great surprise to us, and would like to submit a request that this will be amended.

First of all, a few key statistics relating to our operations in 2012. In the course of the year, Rega flew with its AWI09SP fleet (11 helicopters) 738 hoist missions with a total of 3,904 cycles, and with its EC145 fleet (6 helicopters) 134 hoist missions with a total of 1,913 cycles. This gives a total of 872 hoist missions with 5,817 cycles in all, including cycle-intensive obligatory training exercises, during the year in question.

Our comments in detail…

….. from a **technical** point of view:

With the over 5,800 hoist cycles per annum (with an upward trend) as outlined above, we would have to arrange for almost 30 major overhauls to be performed each year. Quite apart from the tremendous costs involved, the manufacturer has said himself that he would not be in the position to handle such large volumes of maintenance work within an acceptable period of time. This is not least due to the fact that other operators would also be subject to the same requirements and huge quantities of rescue hoists would all need to be overhauled within a short period of time. Currently, 17 of our 19 rescue hoists (17 are installed in our helicopters, two are reserves) have already exceeded 200 cycles. As a result, for a short time only one mountain helicopter base and one lowland helicopter base would have a serviceable rescue hoist. In our experience, the turnaround time for a major overhaul is between three and six months.

For Rega, this would mean that from the date this AD goes into force, practically none of our rescue hoists would be serviceable. In effect, this would result in our helicopters being grounded for hoist rescues for months - perhaps even years, in view of the manufacturer's capacity in this respect.

... from an **economic** point of view:

As can be seen from the above statistics, on average three hoist cycles are needed per hoist mission (only rescue missions, excluding training exercises). With a permitted maximum of 200 cycles before being required to undergo a major overhaul, that would make around 70 missions in total or, at an overhaul cost of approx. US$ 70,000 (empirical value), an additional cost of around US$ 1,000 per hoist mission - extra costs that have to be paid by the insurance holders, and in tum their insurance providers! Even **more dramatic** is the situation with training courses, whereby up to 50 hoist cycles are performed every day. The new provision would mean that the hoist would have to undergo a major overhaul after only 4-5 days of use! It goes without saying that we must not set off money against safety. However, in view of the soaring healthcare costs throughout Europe, this factor should not be ignored .

... from an **operational/aviation** point of view:

It is here that, in our opinion, these new requirements would have the most serious repercussions.

A grounding of a rescue hoist - even if only temporarily - would have **extremely serious consequences for Rega's rescue operations**. The majority of the 872 hoist missions per year would have to be abandoned or else performed by landing the helicopter in rough terrain. This would give rise to **new, substantial risks**. Instead of using the rescue hoist, the helicopter pilot would have to try to land near to the patient, at the same time coping with all the potential obstacles (trees, buildings, rocks, whiteout and brownout caused by downwash, etc.). Rescues in steep terrain would be impossible or at best only from a hovering position with the nose landing gear on ground!

Another alternative would be a fixed rope operation, provided that both the flight material and the suspension device (double cargo hook) were certified correspondingly. However, this type of operation runs the **risk of using the wrong - i.e. too short or too long – rope length**, as the correct length is often not easy to estimate, particularly in high-Alpine regions. Moreover, at night, this procedure would be totally out of the question.

As far as Rega is concerned, this new provision would result in far-reaching procedural changes, which would need to be implemented and meticulously trained - a measure that cannot be realised in the short term as it, too, is subject to approval by the appropriate authorities. In addition, it would lead to all crew members losing their hoist certification due to their subsequent lack of experience with hoist rescues.

Our analyses have shown that if new risks are to be excluded - which is without doubt also in the interests of everyone concerned - a maximum of 10-20 % of rescue missions could be carried out without a rescue hoist. In contrast, we assess the risk of working with the [Goodrich] hoist as considerably less - quite apart from the adverse impact on patients who can no longer be rescued by air.

On the other hand, we completely agree that the malfunctions that have arisen with respect to the rescue hoist must be addressed. We would therefore like to propose the following package of measures:

<u>Measures that are recommended by Rega and are in our opinion adequate</u>

- permissible bank angle of 20°: accepted

- vertical axes 15°: accepted

- Reduction of the overhaul interval from 10 to 8 years

(*Here it should be pointed out that the damaged hoist was almost due for its 10-year overhaul*)

- As before, no cycle limitation
- Hoist check every six months with 250 kg load (acc. AD 2013-0077RI)
- Hoist check with 250 kg if the entire hoist or components thereof have been replaced
- Hoist check with 250 kg after major maintenance work

Otherwise, the existing manufacturer's instructions relating to hoist maintenance should continue to apply.

We are confident that these measures will enable any hoist problems to be properly identified at an early stage. We therefore kindly request that you revise this PAD, also bearing in mind the consequences for rescue aviation not only in mountainous Switzerland, but also in other countries with similar topography.

We would particularly like to reiterate that alternative methods of rescue would give rise to new risks which would considerably surpass those caused by a hoist failure. After all, to our knowledge no one has come to any harm as a result of this type of rescue hoist to date.

EASA response: Partially agreed.

Please see answers to comment #13. Please also note that the reduction in TBO of 24 months or 1 200 hoist cycles / 1 600 hoist lifts is calculated as accumulated after the effective date of the AD, thus will not affect your operation for the next 2 years for an average usage.

Commenter 9: Polizeihubschrauberstaffel Bayern – Joachim Walzik – 29.10.2013

Comment # 9

The Police Helicopter Squadron Bavaria use the hoist for rescue missions in the State of Bavaria especially in the Alps. Trainings with the rescue hoists will be performed in the whole country. We have 8 helicopters EC'135 P2+ and 5 rescue hoists in use.

Helicopters:	D-HBPA S/N 0831, D-HBPB S/N 0864, D.HBPC S/N 0870, D-HBPD S/N 0882, D-HBPE S/N 0891, D-HBPF S/N 0900, D-HBPG S/N 0902, and D-HBPH S/N 0912
Hoists:	44301-10-10 SN 00258 - in use since 18.06.2010 4430'l-10-10 SN 00315 - in use since 02.04.2010 44301-10-10 SN 00336 - in use since 16.04.2010 44301-10-10 SN 00337 - in use since 21.05.2010 44301-10-10 SN 00381 - new one (17.09.2013) not in use in the moment.

We have bad experiences with turnaround times for hoist overhaul/repair performed by Goodrich in the USA, up to 12 months per unit, for our old hoists. Generally we use this type of rescue hoist since 1998 without any major defect or occurrences. The above listed rescue hoist type is in service since April 2010. We have accumulated 140 hoist hours and 3691 hoist cycles. The reliability of the rescue hoist is very good, with only few minor defects in the past. During scheduled maintenance (monthly and yearly) we had also no problems.

The average mission year (number of cycles, hoist operating hours) for the total fleet is 41 hours and 1070 cycles. See Table below.

We have up to 90 rescue missions per year with 6 to 10 cycles per mission. For training we need SOD cycles per year for the flight crew to stay combat ready. Due to

this PAD all rescue hoists get unserviceable according paragraph (4) and Appendix (2) and no police rescue mission in Bavaria is possible. This is not acceptable. Paragraph (1) of this PAD is not performable during a hoist mission or hoist training because there is no weight and no technical persons available.

The flight crew has the permission to install a rescue hoist on a helicopter if there is no technician available (night-time and weekends), but it is not possible that the flight crew makes the hoist test as required in paragraph (1) of this PAD. Hoist trainings cannot be performed and the flight crew lost their authorization for hoist missions.

Appendix (2) is not acceptable because all hoists which are in service and passed the test should stay in service and not get unserviceable (overhaul necessary). We expect about 80 additional hoist test per year due to hoist operating hours or hoist lifts and scheduled replacements of the rescue hoist. This are 320 man hours additional. Because of this PAD our hoists need one overhaul per year. The costs for one overhaul is expected to 60.000 US$ and the availability of our hoists is endangered due to the long overhaul times.

Conclusion:

We request no calendar check and no overhaul every 24 months for the hoists. Based on our 15 years' experience this PAD is exorbitant.

Hoist		Average/Year	Total
SN 00258	Hours	9,6	31
Since 18.06.10	Cycles	230	739
SN 00315	Hours	13,1	46
Since 02.04.10	Cycles	360	1269
SN 00336	Hours	8,3	29
Since 16.04.10	Cycles	224	782
SN 00337	Hours	10,0	34
Since 21.05.10	Cycles	266	901
SN 00381	Hours	0,0	0
Since17.09.13	Cycles	0,0	0
total fleet	Hours	41	140
	Cycles	1070	3691

EASA response: Partially agreed.

Please see answers to comment #13. Please note that the numbers presented are not sufficient to meet the safety objectives for hazardous/catastrophic failures.

Commenter 10: Polizeifliegerstaffel Hessen – Franz-B. Thiemeyer – 30.10.2013

Comment # 10

The Hesse State Police Flight Squadron (Polizeifliegerstaffel Hessen) is since more than 10 years holder of a helicopter rescue-winch (goodrich rescue hoist assy, Part No. 44301-10-7, Serial No. 00081) to supply the State of Hesse and Rhineland-Palatinate with the possibility for helicopter rescue.

There were no serious technical failures or disturbances during the time. The hoist was always maintained accordingly of the technical regulations and got this year a general overhaul by goodrich with costs of approximately 50.000,00 € and a down-time of more than 6 months. The currently available regulations are complete enough from our view.

The contents of the Proposed Airworthiness Directive (PAD) now intending the change of the servicing intervals will lead to considerable add-on costs and down-times. So we cannot recommend the PAD 13-155.

Concerning the reasons the Hesse State Police Flight Squadron joins all the arguments of the Police Helicopter Squadron Bavaria (see Comment #9 above).

EASA response: Partially agreed.

Please see answers to comment #13. Please note that the numbers presented are not sufficient to meet the safety objectives for hazardous/catastrophic failures.

Commenter 11: Air Zermatt AG Switzerland – René Lauber – 30.10.2013

Comment # 11

On behalf of Air Zermatt AG Switzerland we would like to express our concerns about the planned implementation of the EASA PAD 13-155. Air Zermatt AG is operating 1 EC135 built by Eurocopter in Germany in 2002 as well as 1 Bell 429 build by BHT in Montreal in 2012. Both choppers are equipped with a Goodrich Rescue Hoist.

The company currently works out of its own three bases at Zermatt, Raron and Gampel. It has been able to build up a first-class infrastructure, which is, quite understandably, greatly admired and envied in professional circles. The company has become a symbol, recognised for its knowledge, skills and competence, as well as the reliability of its staff and collaborators and its high technical maintenance standards for its rotorcrafts. During the past 45 years of existence, Air Zermatt - which now employs a highly specialised staff of 55 people - has become the service company that now completely indispensable in the Haut-Valais region. The figures are impressive: 150,000 flight hours and 30,000 rescue flights. Air Zermatt cannot be defined simply by its statistics. What really counts here is the human factor - the people who, by their hard work, commitment and conviction as well as their force and energy, made the company what it is today.

Our EC 135 T2 as well as our new Bell 429 are equipped with Goodrich hoists used for search and rescue missions. EC 135 T2 PIN 44301-10-10 SIN 00139 and Bell 429 PIN 42 316-12-102 SIN 00179.

The imposed restrictions and their consequences will have far-reaching and devastating impact on the mandate of Air Zermatt AG. This we cannot accept the required actions and the limitations in EASA PAD No.: 13-155 in their current form.

Main concerns:

(1) EASA PAD No.: 13-155; Required Actions Page 2+3/6 (Item 1+7)

Alert Service Bulletin ASB EC135-85A-058 as well as ASB 429-13-09 specifies an one-time inspection of the external mounted hoist i.a.w. the Goodrich Alert Service Bulletin 44301-10-15 which has been performed on the EC 135 as well as on the Bell 429 hoists. With EASA PAD No.: 13-155 the required actions are pushed further to a repetitive hoist tests after 5 hoist operating hours or 50 hoist cycles. Since Air Zermatt operates the aircrafts in remote locations and the local personal is not trained to perform the load cycle test, a huge effort will be created to continuously move unserviceable hoists to the main operating base where the test can be done. Furthermore in case of multiple rescue missions within one day these limits can easily be reached (inadvertently and absolutely unforeseeable) within one or two days. We often have to evacuate several or even several dozens of persons from dangerous and life-threatening situations. In such a case the imposed tests would directly conflict with our mission and may even impede live saving rescue action!

In addition it has to be noted that during the last 10 years of operation with about 3000 load cycles and over 100 Hoist hours, there was never an incident with this hoist noted. Based on the so far communicated investigation results (Goodrich SIL-2013-01) a damage to the overload clutch (a critical safety feature) is possible, if the hoist / aircraft is operated outside of the approved flight envelope or if certain maintenance activities on the hoist are not performed correctly. With respect to the known 1 incident and possible harm to the winch personal, Air Zermatt takes the given flight envelope and maintenance requirements seriously and does not harm these limits or requirements given by the TC Holder or Goodrich. Special training in house given by Eurocopter II BHT specialist were often organized. When taking the number of Goodrich 44301 1144316 hoist systems currently in use worldwide, the time span in which they have been used, local maintenance, operation procedures and know-how into perspective, it appears as a rather severe measures to inflict such strict limitations. Especially when taking into account that the root cause analysis and its technical determining action has not been communicated yet in detail.

Overall the repetitive inspection requirements with very short time and cycle limits are absolutely disproportional to the isolated singular occurrences, cause inappropriate costs and may impede the mission of the aircraft. Furthermore the past showed that as many incidents happened exactly because of and in the execution of the inspection as in ordinary use. The imposed inspection seems also absolutely inappropriate also in this respect. This is even more the case as it is not yet established, whether these inspections rather may be the cause of the incidents, which should be avoided by the test.

(2) EASA PAD No.: 13-155; Required Actions Page 2+3/6 (Item 4-6)

Based on previous experiences with our allocated Goodrich hoist vendor in the USA the average TAT for a hoist repair is about 10-14 weeks. We believe that with effectiveness of this EASA PAD based on the huge demand, the TAT will further increase and therefore for a longer period of time the allocated helicopter missions will be jeopardized. We clearly request a local or field solution, which provides the possibility to bring back unserviceable hoist to a service condition.

Suggested or acceptable measures:

a. To prevent uncontrolled exceedances of the overload clutch capacity, restrict aircraft manoeuvers in flight with load on the cable acc. to the limitations found in EASA PAD No.: 13-155 (Required actions; (8)).

b. Perform an extra limit switch adjustment check together with the annual check or at a lower intervals such as the monthly check in accordance with Goodrich Component O-Level Maintenance Manual: REPAIR. 4, item O. Limit Switch Adjustment (full up limits switches S9, S10 only).

c. Reduce inspection interval of the overload clutch margin validation check from 12 to 6 months, which is currently found in ASB 44301 -10-15. Usage of alternative means to verify the condition of the clutch such as a test bench procedure must be acceptable and available.

d. Define maintenance actions to be able to change the unserviceable to serviceable condition (Ref. EASA PAD No.: 13-155 (Required actions; (4), (5), (6)) of the winch at a repair shop with I-Level approval. This will allow Air Zermatt to react fast within acceptable TAT and therefore help to fulfil the planned helicopter missions.

EASA response: Partially agreed.

Please note that at this time there is no determination that the event that triggered the original AD was caused by operations outside of the approved flight envelope and/or failure to perform maintenance activities correctly. Please see answer to comment #13 for the aircraft manoeuvres limitations, TBO reduction and adjustments of cycle/lift limits. The setting of the limit switches will be clarified in the maintenance instructions.

Commenter 12: DRF Luftrettung – Robert Schick – 31.10.2013

Comment # 12

DRF Luftrettung operates in commercial air transportation and provides Helicopter Emergency Medical Services conducted to the highest industry standards with respect to safety and reliability. Together with its partners, today DRF Stiftung Luftrettung gemeinnützige AG is the leading air rescue alliance in Europe.

DRF Luftrettung operates a fleet of almost 50 helicopters including Eurocopter Model EC135 for helicopter hoist operation (HHO) by utilization of Goodrich Hoist Assy P/Ns affected by the current version of EASA PAD 13-155.

These by the PAD / AD imposed restrictions with all their consequences will have a significant impact on our obligations of air rescue and finally the survival of injured people in Europe. All concerned operators are exposed to higher direct maintenance costs, increased downtime of aircraft or non-availability of hoist equipment, increased shop maintenance workloads and costs, without any key benefit to the inherent safety and reliability of the helicopter hoist equipment.

Thus it appears that we cannot accept the proposed actions with all the limitations in regards to current EASA PAD No.: 13-155.

Main concerns from operator's point of view:

- Our shown experience on turnaround time for repair / overhaul at the vendor Goodrich USA, takes in average at least 8-12 weeks and we expect an increased TAT due to higher demands caused by PAD maintenance measures to utilize serviceable equipment.
- DRF Luftrettung fleet overall experience and reliability during the past seven year of operation, has shown no incident or accident occurred with this type of hoist system.
- This PAD causes additional effects and efforts with a high impact on outlay to maintain contractual obligations due to increased maintenance requirements and non-availability of mission equipment.

We are continuously seeking for solutions to improve aviation safety and put our customers first. Therefore we are looking forward and requesting a practical on-site and field solution, to minimize unserviceable hoist equipment and to improve the airworthiness of helicopter hoist equipment.

EASA response: Partially agreed.

Please see answers to comment #13. Please note that the numbers presented are not sufficient to meet the safety objectives for hazardous/catastrophic failures.

Commenter 13: EUROCOPTER – Martin Lawall – 31.10.2013

Comment # 13

References :

[1] EASA PAD 13-155, issued 04.10.2013

[2] Goodrich Failure Analysis Report FAR-44301-10-13, Issue A, issued 13.06.2013 Hoist P/N 44301-10-7, SN 00073

[3] Goodrich Failure Analysis Report FAR 42325-12-01, Issue B, issued 04.10.2013 Hoist P/N 42325-12-0, SN 00027

[4] Goodrich Failure Analysis Report FAR42325-12-02, Issue A, issued 26.07.2013 Hoist P/N 42325-12-1, SN 00087

[5] Goodrich Failure Analysis Report, FAR-44311-1-12-01, issued 11.01.2008 Hoist P/N 44311-10-2, SN 00017

[6] Goodrich Service Information Letter SIL-2013-01, issued 25.07.2013

[7] Component Maintenance Manual CMM 44301-1, Revision 13, dated 31.08.2013

[8] Goodrich ASB 44301-10-15, dated 03.03.2013

[9] E-mail “AW: Rescue Hoist - Common discussion on further way ahead”, dated 18.09.2013

containing two attachments:

- [10] ETYA_023_13_Rescue Hoist Flight Envelope
- [11] Hoist load accelerations in flight envelope for rescue hoist operation

Please find [below] the harmonized AgustaWestland / Eurocopter comment on EASA PAD 13-155 “Equipment / Furnishing – Hoist – Inspection / Replacement”.

The response on PAD 13-155 (reference [1]) is separated into two main chapters. The first chapter summarizes the general and common approach on this topic from AgustaWestland (AW), Eurocopter (EC) and Eurocopter Deutschland (ECD). The second chapter of this document gives statements and information on the individual PAD action paragraphs.

[first chapter]

Substantiation and ratio on proposed protective measures

In the following the three categories are explained more in detail to show the methodology and ratio on the chosen approach:

A) Inspection (Load Check) Interval

B) Assessment on need for service limit reduction

C) Rescue Hoist Flight Envelope

A) Inspection (Load Check) Interval

This assessment is based on the methodology for the inspection interval determination, provided by EASA via mail, dated 23.07.2013.

Fleet:	2873 units
Fleet experience:	220.000 hoist operating hours (OH)
Average helicopter operating hours per year:	300 Flight Hours (FH) / year (conservative approach)
Average usage of hoist per year:	11,1 hours
Average usage in cycles per year:	300 cycles / year

Occurrence level for event “uncontrolled reel-out of rescue hoist cable” (considered as “catastrophic” event):

Failure rate = Number of events / [220.000 OH * (300 FH / 11,1 OH)]

= Number of events / 5.945.946 FH

Number of events for above mentioned scenario: 1

Ratio on "Number of events":

- Number of "uncontrolled reel-out of rescue hoist cable" is 2 (reference [2] and [5]) taking into account the provided historical data from Goodrich for the complete hoist fleet with this overload clutch design principle.

- An event in year 2007 on a foreign helicopter involving hoist P/N 44311-10-2, SN 00017 was caused by excessive manoeuvring / operation outside the envelope during testing activities and therefore considered operational. This event is not counted within the total number of events.

- It is concluded that only the event in year 2013 involving hoist P/N 44301-10-7, SN 00073 is considered in the calculation (for Failure Analysis Report, see reference [2]).

- Hoist P/N 42325-12-0, SN 00027 (as feedback from ASB) is not considered as an "uncontrolled reelout". It showed a lower overload clutch value as required by the drawing/ ATP, but does not fit into the same group with a "catastrophic" criticality. For more details on the analysis of this hoist see reference [3].

- Hoist P/N 42325-12-1, SN 00087 was part of the watch list (as feedback from the ASB) and has been subject to detailed investigation. For further details see reference [4]. The FAR concludes: "The test and inspection of this hoist verified that there was no issue with the slip clutch in this hoist." Therefore this event is also not taken into account in the calculation.

Conclusion on failure rate:

Failure rate = 1 / 5.945.946 FH = $1{,}68 \times 10^{-7}$

Ratio on "effectiveness level" for inspection:

Baseline for assessment:

- The inspection (= load check) is triggered by two elements
  - o Calendar time / cycles (or lifts – depending on hoist application)
  - o event based (e.g. detection of a peel-out, entanglement of cable on ground)

Both elements will be reflected in the currently prepared Goodrich ASB revision.

- "the objective of the inspection is to catch on time degraded clutches, whatever the cause of the degradation."
- The root cause of the incident on hoist P/N 44301-10-7, SN 00073 this year is considered to be a combination of several events / contributing causes which lead over time to a degradation of the overload clutch torque holding capability.
- A partial peel-out occurs, when the applied load on the rescue hoist cable is (temporarily) larger than the torque holding capability of the overload clutch. After assembly a minimum force of 1000 or 1200 lbs depending on hoist P/N is required to activate the clutch. This is detectable:
  - o By the characteristic sound of the clutch during activation
  - o by hand (of the hoist operator) when guiding the hoist cable

Awareness on this topic was increased by means of SIL 2013-01, dated 25.07.2013 (see reference [6]).

Respecting the flight limits mandated in section (8) of PAD 13-155 will not allow to create a peelout by flight maneuvers due to the reduced envelope and in consequence reduced achievable load level.

- Investigation and tests by Goodrich (see reference [2]) have shown that small peel-outs and even mid-speed peel-outs (driven by motor) have not a significant influence on the torque holding capability.

- Longer peel-outs are easier to detect and are then always linked with high forces on the hoist cable which trigger the peel-out. In addition, the currently prepared Goodrich ASB revision will ask for a load check in case certain operational events and limits are exceeded.

Assessment on "effectiveness level" for inspection:

A minimum "effectiveness level" for the load check of 85 % is considered

Ratio on chosen "effectiveness level":

- A "two sigma" approach would indicate an effectiveness level of 95%. To be conservative the level was chosen even below this 95%
- The effectiveness level of 85 % was chosen to determine an inspection interval which acts as repetitive protective measure to cover all elements which can degrade a clutch. This inspection interval acts as supporting element to the event triggered (e.g. detection of a peel-out) inspection (see Goodrich SIL 2013-01).
- The elements of the Goodrich SIL 2013-01 will be implemented into the currently prepared revision of the Goodrich Alert Service Bulletin.
- A review of the effectiveness level will be performed upon receipt of the fleet feedback on further load checks.

Summary of input figures for assessment

- Number of events for mentioned scenario: 1
- Failure rate 1,68 x 10 -7
- Effectiveness level for inspection 85%

The reaction time in accordance with GM21.A.3B(d)(4) 3.7 was calculated with 1,486 % and leads to an initial reaction time of 3,5 months (corresponding to approx. 90 cycles). This was covered by the initial one time load check in accordance with Goodrich ASB 44301-10-15, dated 03.03.2013 (see reference [8])

The corrected reaction time from the calculation model taking into account an effectiveness level of 85% was calculated with approx. 24 months respective approx. 600 cycles.

Operating hours are not taken into account as they are not accumulated on all Goodrich hoists.

As a further conservative approach, the calculated inspection interval will be reduced in a first approach by a factor of 2 for the cycles, resulting in a **proposed interval of 300 cycles**.

To enrich the statistical basis, it is proposed to have in a first approach a **calendar interval of 6 months**, which is even more conservative in the frame of the calculation model, but ensures independent from the usage spectrum of the hoist, that further results from load checks on all serviced hoists are available for review.

These results and statistical data of future inspections and the additional one time inspection (see next chapter) will provide a statistical basis that allow the review of the reduction factor of 2 and / or correction of the effectiveness level for the load check.

This topic will be monitored by industry in order to relief the inspection periodicity in the future.

A review is planned latest after the next two (scheduled) load checks, that means around mid-year of 2014.

	Calculated Interval	Proposed Interval to be published (to gain fleet experience)
Calender Time	approx. 24 months	6 months
Cycles (CMM definition)	approx. 600 cycles	300 cycles
Lifts (Agusta Westland definition)	800 lifts	400 lifts

Table 1: Comparison of calculated versus proposed inspection interval

Compliance time for next load check

This load check will

- define a starting point, from which the
  - o repetitive load check will be implemented
  - o operational aspects (e.g. event based load check) have to be considered as mandatory action (not only as recommendation from the Service Information Letter)
- provide further service data from the fleet (e.g. is there a significant change in the fleet?)
- allow comparison with result from initial load check required by ASB (reference [8]).
- support the chosen effectiveness level
- increase confidence level on fleet status and its evolution

It is proposed to have the next load check within the following compliance time:

Cycles / Lifts:

Check number of cycles / lifts of last load check

Next load check after 300 cycles / 400 lifts since first load check

If number of cycles has already exceeded 300 cycles / 400 lifts, then perform load check

within 50 cycles / 70 lifts.

Calendar time:

Within 30 days (from issue date of revised ASB).

Whichever criterion is met first (cycles / lifts or calendar time) triggers the next load check.

Ratio on Compliance Time for next Load Check

After the initial load check an interval of 300 cycles / 400 lifts is introduced. Therefore for the next upcoming load check, a review of the cycles since initial conduction of the load check must be performed.

For helicopters above 300 cycles / 400 lifts a grace period of 50 cycles / 70 lifts is introduced. This allows operators to prepare the load check. For high cycle users of hoists, this grace period corresponds to one to two days of operation (e.g. wind park maintenance).

In addition a calendar time of 30 days is given to ensure that within a defined time frame, results of the load check are available and further fleet data are available.

Table 1 shows that the calculation model would provide a longer time in terms of calendar interval. In consequence, the approach is still considered conservative, as the time frame between initial load check with ASB (reference [8]) conducted in March / April 2013 is significantly below 12 months.

B) Assessment on need for service limit reduction

- EASA PAD 13-155 proposes a service limit reduction to 2 years / 22 hoist operating hours / 200 hoist lifts (see paragraph (5) and (6) of EASA PAD). The event of the un-commanded reel-out of the cable has been assigned to the overload clutch. In consequence an overhaul of the complete Rescue Hoist (taking into account much

more systems beside the overload clutch) is not adequate.

- Baseline: “the objective of the inspection is to catch on time degraded clutches, whatever the cause of the degradation.”

- The method to detect such a degradation of an overload clutch is the load check. The load check is a tool to determine a level of torque holding capability, which ensures in consequence safe operation. When a hoist passes successfully several load checks and is operated within the limits, it must not be sent back for overhaul due to safety reasons.

- Main objective of an overhaul is to determine the condition of components and depending on the result continue their usage. Within a return of a hoist, two main characteristics on the overload clutch could be determined:

  o Friction disc thickness

  o Overload clutch slipping point

As the friction disc thickness is not recorded for each disc individually, they just can be measured versus conformity (after disassembly of the complete clutch), which brings in consequence no further information for safety reasons.

The overload clutch slipping point can be measured and compared to the required value during production. This is a method to verify conformity of the values.

The load check in its current status ensures that a certain level of torque holding capability is given. With a successful load check, operation within the limits is possible and no further restriction is necessary.

MIBA as current supplier of friction discs for the overload clutch (initial supplier: Friction Tec) was also asked for expertise on the application and the long term behaviour. As “Options for improvement” it was mentioned: “Observe long-term behaviour based on field observations and align service requirement with reasonable exchange frequency (-> 5 years)”.

Field observation is a part of the FAR (reference [2]) in the following chapters:

  o Appendix G – ASB Load Check - pdf document from page 247 on

  o Appendix H – Legacy MRO Data - pdf document from page 250 on

  o Appendix I – Current MRO Activities - pdf document from page 255 on

As the overload clutch is considered as a static device (and only activated in specific conditions), the observed field experience shows positive and confirming results in regards of the currently valid TBO limit (10 years, 111 hoist operating hours, 3300 cycles).

- The proposed reduction of the service limit (24 months, 22 operating hours, 200 lifts) is therefore not considered as a safety supporting measure.

On the contrary, it represents a heavy burden on the hoist operators still not supported by the evidence collected during the investigation stemming from the event occurred in service. Moreover, evidence collected by average use operators and by the equipment supplier itself has been presented earlier to the Authority demonstrating that the supplier is not able to support the logistics impact associated with request. Due to the above considerations the service limit reduction will not be published in the corresponding Bulletins issued from the TC Holders involved in this document. The completion of the additional partial peel-out tests presently under discussion is considered as a key element to define if, in addition to the load check, different time limits have to be considered and in general to assess what is the final structure of the ICA adequate for this clutch assembly.

The following references give technical data based on tests to demonstrate the robustness of the overload clutch over time and number of cycles / slippages:

  - Appendix T – Low Speed Clutch Cycling Test - reference [2] – pdf document from page 347 on

  - Appendix U – Mid-speed Clutch Cycling Test – reference [2] –pdf document from page 363 on

  - Appendix D - JAMCO Friction Disc Conditioning Experiment – reference [3]

- Appendix E - Friction Tech Multiple Conditioning Experiment – reference [3]

C) Rescue Hoist Flight Envelope

Note: during initial assembly of the hoist, the overload clutch is adjusted and tested to open between 2 to 2,5 g of the corresponding maximum load (500 lbs or 600 lbs, depending on hoist type).

With reference [9], Eurocopter has provided substantiation, that

- a flight manoeuver creating a 2 g or higher acceleration on the hook (with limit load attached) has an “extremely remote” occurrence level (see reference [10])
- Taking into account the published flight limits in the Rotorcraft Flight Manual (RFM) rescue hoist supplements of the EC135 and EC145 (max. 30 degree bank angle, max. 15 degree pendulum angle, max. 60 / 70 kts airspeed), the minimum overload clutch setting value of 2 g is not reached.

Reviewing the consequences of the published rescue hoist flight limits in PAD 13-155 (max. 20 degree bank angle, max. 15 degree pendulum angle) leads to the following conclusions:

- the maximum achievable acceleration for 30 degree bank angle is approximately 1,4 g
- the maximum achievable acceleration for 20 degree bank angle is approximately 1,2 g
- due to the bank angle limitation to 20 degrees, the maximum achievable load on the rescue hoist hook is decreased significantly.
- This provides in turn a significantly enlarged margin between maximum achievable load on the hook compared to the torque holding capability of the overload clutch ensured by the load check.
- **Example**: for a hoist P/N 42325 (max. load 600 lbs / 272 kg), a weight for the load check between 950 and 1050 lbs is required.
    - o 950 lbs corresponds to 1,58 g
    - o 1050 lbs corresponds to 1,75 g
- A hoist successfully tested with a load check and respecting the flight limits of the PAD 13-155 cannot induce an overload clutch slippage by flight manoeuvres.

Summary of key elements

- Event based load check (ASB revision currently drafted / main content already discussed during common hoist conference EASA/GOODRICH/EC/AW in Donauwörth, dated 08. and 09. October 2013)
- Next load check within 300 cycles after initial load check or within next 50 cycles, if more than 300 cycles are already accomplished since last load check or within 30 days (whichever of the criterion is met first).
- Load check interval of 6 months or 300 cycles / 400 lifts (whichever comes first)
- Future review of load check results in order to increase inspection interval
- No further limitation of rescue hoist in terms of additional inspection or return to hoist service center. Premise of the load check is that a lower overload clutch slippage value will be detected during the repetitive load checks.
- The introduced rescue hoist flight limits within PAD 13-155 reduce significantly the maximum achievable load on the hook and increase therefore the torque holding margin which is ensured by the load check.

- The proposed measures would have led to 19 load checks on the incident hoist P/N 44301-10-7, SN 00073 based on a 6 months calendar interval (and still at least 9 load checks considering a 12 months interval).

In addition the cycle based interval and the implementation of an event driven load check complete the protective measures approach and provide a significant higher and appropriate safety level compared to situation prior to the event involving hoist P/N 44301-10-7, SN 00073.

[second chapter]

Comments on the individual paragraphs of section “required actions” for PAD 13-155

Paragraph (1)

The definition of operating hours should be deleted, as it is not used on all hoist applications mentioned in PAD 13-155.

It is proposed to stay with the definition of corresponding hoist applications:

Definition of “lift” for AgustaWestland application

The external hoist lift is defined as an unreeling and recovery of the cable with a load attached to the hook, independent of the length of the cable that is deployed/recovered. An unreeling/recovery of the cable with no load on the hook is not considered to be a lift. Any operation where a load is applied for half the operation (i.e. unreeling or recovery) must be considered as one lift.

Definition of “cycle” for Eurocopter / Eurocopter Deutschland application [7]

NOTE: The term "cycle" is defined as an extension and subsequent retraction of the cable during flight, or on the ground, the extension and subsequent retraction of the cable equal or beyond 16 feet (5.0 meter) whatever the load used.

NOTE: Rescue Hoist, part number 44301-10-2 usage is monitored in cycles and years. Rescue Hoist, part numbers 44301-10-4 through 44301-10-11 usage is monitored in hours, cycles and years .

It is proposed to refer only to P/N, but not to S/N as the actions mainly refer to the design principle of hoist (including an overload clutch). Therefore the reference of the P/N only is sufficient.

The proposed interval for the load check is

- every 6 months or
- every 300 cycles (for Eurocopter applications) whichever criteria is met first.
- every 400 lifts (for AgustaWestland applications) whichever criteria is met first

Paragraph (2)

No comment on this paragraph, as the work instruction in accordance with Goodrich ASB 44301-10-15 is regarded sufficiently.

Paragraph (3)

No comment on this paragraph

Paragraph (4)

It is proposed to remove this paragraph.

Ratio: Goodrich report (see reference [3]) gives substantiation that the conditioning process does not result in a different long term behaviour.

Appendix D Friction Disc Conditioning Experiment

Appendix E Friction Tech Multiple Conditioning Experiment

Paragraph (5)

It is proposed to remove this paragraph. For more details see next chapter.

Paragraph (6)

It is proposed to remove this paragraph.

Ratio: See chapter “Assessment on need for service limit reduction“ from page 8 on.

Paragraph (7)

A hoist is considered serviceable as long as it shows positive results during the required repetitive and event based load checks.

In consequence Appendix 2 is not necessary and can be removed and the content above implemented in paragraph (7).

Paragraph (8)

It is proposed not to introduce a precise pendulum angle limitation into the AD.

There is no means for the crew to measure accurately this angle and we have operator feedback saying that in case of a rescue hoist mission over sea in hover conditions, the pendulum angle can sometimes exceed the proposed limit of 15°. But this does not result in a high load condition on the rescue hoist cable.

So it is proposed to make a recommendation to the crew (winch operator, pilot) to limit the pendulum angle as much as possible. This is already reflected in some Flight Manuals. A general introduction of a pendulum angle limitation in all hoist applications is not supported.

Examples:

- IN ORDER TO AVOID CONTACT BETWEEN CABLE AND LANDING GEAR OR EQUIPMENT:
  - THE HOIST BOOM SHALL BE SWIVELLED OUT AS FAR AS PRAC–TICABLE
  - CABLE OSCILLATIONS SHALL BE KEPT TO A MINIMUM

RFM supplement – EC145 - 9.2-11 – 12

The RFM supplements for the rescue hoist of EC135 and EC145 will currently remain as it is, as it provides additional safety margin.

For drastic cable deflections (e.g. due to aggressive manoeuvring for an emergency case) or perception of the crew on high cable loads, a load check should be performed.

Note: AW139 RFM Supplement has been amended in the meantime to introduce a 20° bank angle limitation that was initially missing, while the final wording to

manage the pendulum angle will be proposed only if and when this part will be considered part of the final actions for this issue.

Regarding bank angle limitation:

The current PAD states: “Maximum permissible bank angle with extended cable is 20°”.

The introduced bank angle limitation does not refer to (steady) turns and load attached to the extended cable.

Explanation: the way the limitation is currently written in PAD 13-155, the bank angle is limited as soon as the cable is extended. With no load on the hook, there is no need to restrict the bank angle immediately, as no significant load can be introduced into the hoist.

Proposal: Maximum permissible bank angle in turn with load attached to the extended cable is 20°”.

Comments on the “Appendix” for PAD 13-155

Appendix 1

It is proposed to delete the column “s/n”. For explanation see also “Paragraph (1)”

Appendix 2

It is proposed to delete Appendix 2 and change the wording of the AD in accordance with the proposal of “Paragraph (7)”

General comments on “Reason” for PAD 13-155

PAD 13-155 states in section: “The investigation has identified another un-commanded cable reel-out with loss of load as well as hoists not passing the overload test mandated by the initial AD.”

This gives the impression that in the frame of the initial AD another un-commanded cable reel-out has taken place and that various non-successful load checks were performed.

In fact the un-commanded cable reel-out was an event in year 2007 on page 2 which is taken as a reference in terms of damage pattern for the friction discs. The load check and subsequent investigation at Goodrich revealed in total one case of low overload clutch torque holding value (= see reference [3])

For further details please see above.

General comments on “Applicability” for PAD 13-155

As not all listed aircrafts have in general a hoist installed (optional equipment not mounted on all helicopter serial-numbers), the applicability should be detailed to reflect helicopters with hoist P/N of Appendix 1 installed.

EASA response: Partially agreed

[first chapter]

Recognition of a peel-out event and repetitive load test:

The Agency does not agree with the high effectiveness level of 85% given to the recognition of a peel-out event by the operator. Acoustic detection is dependent on a large number of factors such as helmet worn or strength of the downwash while tactile detection requires the operator to be holding the cable rather than just guiding it, which is not always practical. A partial peel-out during reeling in might also translate only in a slowing down of the cable which might be difficult to recognize.

Compliance time was determined in accordance with GM 21.A.3B(d)(4). The equivalency from time to Hoist Hours/Cycles/Lifts presented in the PAD was

computed following a generic Goodrich correlation. It is recognized that this equivalency might be overly conservative for high-cycle hoist users. Based on actual fleet usage and taking into account the high-usage users, the equivalency proposed by the European Type Certificate holders will therefore be adopted. As a result interval for repetitive pull tests is 6 months or 300 cycles/400 lifts and the same calendar time /Cycles/Lifts equivalency is used for the TBO reduction. It is agreed to remove the Hoist Hours limit.

Compliance time for next load check

As the PAD has been out for consultation for 4 weeks and the AD includes a further 14 days between publication and effective date, no additional compliance time is considered necessary for the next load check.

Assessment on need for service limit reduction

The Agency does not agree that the proposed reduction of the service limit is not a safety supporting measure. At this time the root cause of the incident that prompted the original AD is not known and the hoist overhaul allows a visual inspection of the clutch and a measurement of the clutch setting, thus allowing trending and detection of degradation. The interval for the load check has been determined using GM 21.A.3 and further testing is required to demonstrate that clutch degradation can be captured timely by load check only. The interval for the clutch inspection will be reconsidered once the results of this testing are presented. Alternatively other means than an overhaul to achieve the above objectives can be presented to EASA for compliance with AD paragraph (4).

Rescue Hoist Flight Envelope

The maximum achievable accelerations presented are based on static calculations in a steady turn. Dynamic effects and turbulence will induce additional loads. Furthermore, as noted by commenter #6, the pendulum angle of 15° cannot be exactly determined and is especially difficult to evaluate in the outboard direction. Safety margins have thus to be considered. These safety margins can be reconsidered if an objective mean to measure the 15° angle is provided.

[second chapter]

Removal of PAD paragraph (4)

It is agreed to remove this paragraph based on the on-going qualification programmes of the alternate clutch friction disks and the preliminary test results received. The hoist S/N are thus no longer relevant and have been removed from the AD as well.

Wording of PAD paragraph (7)

Partially Agreed. Appendix 2 has been removed from the AD but the requirement for reduced Time Between Overhaul is maintained.

Wording of PAD paragraph (8)

Partially Agreed. See also answer to comment #6. The 15° pendulum angle is retained but has been changed from a limit to a warning. Wording has been modified accordingly in the AD.

General comments on Reason

Agreed. Paragraph has been reworded.

General comments on Applicability

Agreed. Applicability has been reworded.

Commenter 14: Spanish Maritime Safety Agency – Néstor Perales – 31.10.2013

Comment # 14

The Spanish Maritime Safety Agency has roles in Search and Rescue (SAR) and marine environmental protection. To provide those services we have eleven ready to fly 24/7 helicopter bases located along the Spanish coast. Nine of those bases are medium helicopter type where we use our owned AgustaWestland AW139 fleet. These helicopters are equipped with one of the Goodrich hoist affected by your Proposal of Airworthiness Directive PAD 13-155.

Our normal activity requires that one helicopter performs more than ten hoist cycles and, approximately, 2 hours of operation every two days. That means that a helicopter dedicated to our SAR activities will reach the proposed limits of 200 cycles or 22 hours in less than 3 weeks that results in 9 overhauls every 2-3 weeks for the whole fleet.

We consider that those limits will have a serious negative impact in the availability of hoists, which are essential for our roles, and they will very likely lead us to interrupt the service in some bases.

We suggest EASA reconsiders the PAD 13-155, replacing the proposed actions. Instead of them, we propose to reduce the maximum load (statics and dynamics produced by manoeuvers) and to add preventive maintenance actions before/after the flight.

EASA response: Partially agreed.

Please see answers to comment #13.

Commenter 15: Bell Helicopter Textron Canada – Luc Murphy – 01.11.2013

Comment # 15

Bell Helicopter Textron would like to express its concerns regarding EASA proposed airworthiness directive 13-155.

Per the PAD EASA has identified that the failure prompting the proposed action occurred on a non-Bell product. During the investigation leading to the PAD, EASA has not had any direct contact with Bell Helicopter to determine if there is any specific operational or installation differences that may mitigate the risks on Bell products. EASA is proposing to mandate corrective actions on all models based on limited data.

After discussion with Goodrich, it is suspected that the hoist incidents were associated with specific events that have overloaded the hoist and degraded the hoist clutch integrity. The types of events that could degrade the clutch are very dependent on the Flight Manual limitations and operational procedures and not related to a hoist design deficiency. By EASA's own admission, the root cause of the failure has not yet been determined.

The operating time and cycle limits proposed by EASA will not provide any mitigation to an unexpected event that causes an un-commanded reel-out of the hoist cable. Bell Helicopter believes a more appropriate approach would be to review Flight Manual limitations associated with hoisting to ensure that the normal usage of the hoist will not exceed the hoist limits that have been established by Goodrich.

The proposed compliance time of 22 hoist operating hours or 200 hoist lifts before overhaul will have a significant impact on Bell Helicopter operators. Hoist equipment is primarily used in rescue operations, and imposing the proposed limitations will significantly affect the ability for operators to respond to emergency situations. It is conceivable due to high usage rates, that some operators may need a new/overhauled hoist every month, a replacement rate Goodrich cannot meet due to low availability of replacement equipment.

In addition, Bell Helicopter has not received any reports of un-commanded cable reelout or overload test failure on Bell models. Bell Helicopter is confident that the Bell Flight Manual limitations and operating instructions are sufficient to ensure safe operation of the Goodrich hoist.

Bell Helicopter respectfully requests the opportunity to discuss the PAD with EASA and Goodrich prior to any corrective action being mandated by EASA on Bell products to ensure that action is appropriate for the Bell Helicopter platforms.

EASA response: Partially agreed.

Please see answers to comment #18.

Commenter 16: New EUROPEAN HELICOPTER ASSOCIATION (EHA) – Elisabetta Dalla Benetta – 04.11.2013

Comment # 16

EHA is very concerned about the requirements of the aforementioned PAD. We have received several comments on this issue, which I summarise below.

1. Eurocopter ASB EC135-85A-058 specifies a one-time inspection of the hoist i.a.w. Goodrich ASB 44301-10-15, yet PAD 13-155 specifies a repetitive inspection of the hoist, after 5 operating hours or 50 hoist cycles. Hoists are often fitted to aircraft operating largely in the field, so the removal of hoists, shipping back to base for maintenance actions etc, will be overly burdensome. This is reinforced that it would appear that the root cause analysis of the problem and its technical determining action has not yet been performed.

2. Based on previous experience with Goodrich hoists, the average turn-around time for a hoist repair in the USA is 10-14 weeks. We expect this TAT to only increase if this PAD were implemented.

3. Feedback from operators in Europe who use this hoist is that it is a very reliable unit – both DRF [see Comment #12 above] and Swiss Air Force (CAMO – RUAG) have had no instances of failure.

4. It appears to be clear that this PAD will mean that the availability of aircraft, with hoists, to perform their essential public safety missions will be much reduced. This has commercial repercussions on the operators, as well as the risk to public safety caused by having no hoist capability.

We would request that EASA, in conjunction with the TC holder and the operators, explores a more appropriate level of action. The [comment #7 above] from RUAG suggests such a programme of appropriate measures.

EASA response: Partially agreed.

Please see answers to comment #13. Please note that the numbers presented are not sufficient to meet the safety objectives for hazardous/catastrophic failures.

Commenter 17: Geneva University Hospitals (HUG) – Christian Decurnex – 30.10.2013

Comment # 17

HUG are operating a Eurocopter EC135 T2i for HEMS and SAR Missions. Our helicopter is equipped with a Goodrich Hoist, PN 44301-10-5, S/N 0054.

We are operating in the Geneva Canton, as well as in the whole Switzerland on behalf of the “Schweizerische Rettungsflugwacht (REGA)”, and also for 3 neighboured French Departments.

During 2012, 130 hoist missions with 270 cycles have been performed, including cycle-intensive obligatory training exercises.

Furthermore, we underline that no hoist incident has been reported during the last 10 years of operation.

Our comments on the AD consultation:

With an average of 270 hoist cycles per year (trending upwards), we would have a major overhaul on our hoist to be performed every 9 months.

Required to train new personnel, whereby up to 50 hoist cycles can be performed per day, the operational situation would not be realistically practicable. The new provision would mean that the hoist would have to undergo a major overhaul up to every 4–5 days of use.

Based on experiences with our Goodrich hoist overhaul centre in France and USA, the average turnaround time for a hoist overhaul is about 12 to 16 weeks. Combining the new EASA PAD based with our large demand, the turnaround time will excessively increase due to the manufacturer's incapacity to handle such large volumes of maintenance work within an acceptable period of time, therefore dangerously reducing the availability of the helicopter for rescue missions.

As can be seen from the above statistics, on average 2 hoist cycles are needed per hoist mission (excluding training exercises). With a permitted maximum of 200 cycles before undergoing a major overhaul, that would allow only 100 missions in a row. Given an approximate cost of 70’000 € per major overhaul, it would mean an additional cost of 700 € per hoist mission to be paid by the insurance holders, and in turn their insurance providers. We would not set off money against safety. However, in view of the healthcare costs throughout Europe, this factor should not be ignored.

A grounding of a rescue hoist – even if only temporarily – would have extremely serious consequences for HUG’s rescue operations. The majority of our hoist missions cannot be done and the rescue of loss or an injured person has to be performed by landing the helicopter in rough terrain. This would give rise to new substantial risks. Instead of using the rescue hoist, the helicopter pilot would have to try to land near to the patient, at the same time handling with all the potential obstacles (trees, buildings, rocks, whiteout and brownout caused by downwash, etc.). Rescues in steep terrain would be impossible or at best only from a hovering position with the nose landing gear on ground.

An alternative to the hoist would be a fixed rope operation. However, this kind of operation runs the risk of using the wrong (too short or too long rope length) as the correct length is often not easy to estimate, particularly in high-Alpine regions. For night operations, this procedure will not pass our risk assessment and therefore the rescue of loss or an injured person would again not be possible.

As far as HUG is concerned, this new provision would result in large procedural changes, which would need to be implemented and meticulously trained. This measure that cannot be realised in short term as it is subject to training needs for all our crew members, doctors and mountain rescuers, including approval by the appropriate authorities. In addition, all crew members, doctors and mountain rescuers will lose their hoist certification due to their subsequent lack of experience with hoist rescues.

With over 30 years experiences on hoist missions operations and 12 years with the concerned hoist we assess the risk of working with the Goodrich hoist as considerably low in comparison to the adverse impact on patients who can no longer be rescued by air and specifically lower than the substantial new risks caused by the hoist longer unavailability.

For reasons mentioned above, HUG does not support the required actions and the limitations in EASA PAD No.: 13-155 in their current form.

Regarding the malfunctions known, this unsafe condition must be clearly addressed. HUG would therefore propose the following measures:

- o Maximum permissible bank angle with extended cable is 20° (according required actions; (8) of EASA PAD No. 13-155).
- o Maximum permissible lateral pendulum angle with respect to the vertical axis of the heli-copter is 15° (according required actions; (8) of EASA PAD No. 13-155)
- o Reduction of the overhaul interval from 10 to 8 years
- o No cycle limitation

o Hoist check every six months with 230 kg load (depends of type of hoist, acc. AD 2013-0077R1)

o Hoist check with 230 kg, if the entire hoist or components of the hoist have been replaced

o Hoist check with 230 kg after major maintenance work

o Existing manufacturer's instructions for hoist maintenance continues to apply.

We are confident that those measures would enable any hoist problems to be properly identified at an early stage. Regarding the consequences for rescue aviation in mountainous Switzerland and other countries with similar topography we therefore kindly request that the new PAD to be re-vised.

We would particularly like to reiterate that alternative methods of rescue would give rise to new risks which would considerably overwhelm those caused by an improbable hoist failure.

EASA response: Partially agreed.

Please see answers to comment #13.

Commenter 18: Bell Helicopter Textron Canada – Mike Deer – 08.11.2013

Comment # 18

Additional [see also Comment #15 above] comments vs. EASA PAD 13-155:

Bell Helicopter has completed a thorough review of Goodrich Report (FAR 44301-10-13). The evidence provided in the report does not support the suspicion that either the oil or the clutch material are part of the root cause of the clutch failure. The following assessment is provided:

a. The independent Lab reports reported that the MIL-PRF-2369 oil sample taken from the failed hoist was overheated and contained clutch disc material particles. The labs are not able to ascertain when the oil was overheated, but it is possible that it happened during the cable run-out. Based on this it is apparent that the hoist had the correct oil, and had no significant contaminants other than disc material particles which, in theory, would increase the friction between the clutch discs and plates, and not reduce it to the point of leading to a runaway.

b. The clutch material, friction pads, on the failed clutch were installed in the 2003 timeframe. The qualification of the second source for the disc material was concluded in 2009. From this, the issue raised by EASA is not pertinent in establishing root cause for the hoist failure. This aside, fit/form/function of the second source discs was considered the same by Goodrich and was considered a Class 2 configuration change.

In addition to the above points, there was a second hoist from REGA that was overhauled by Goodrich just prior to the hoist failure incident. On that hoist, which was ~ 10yrs old, the clutch components were retrieved and inspected, and all the components were within the original ATP limits – no damage or signs of degradation in the components. This second hoist was of the same type hoist, from the same operator, and has a similar time history (manufacture, maintenance etc.). The differences in the hoist conditions suggest the first hoist cable run-out was driven by operational cause factors. During the REGA incident, the operator was in a climb headed for an open field for the maintenance check. With a dead weight on the end, if the rate of climb was more than a gentle climb with a turn involved, it is feasible the resulting load factors could have exceeded the hoist clutch limits.

Based on the evidence that has been reviewed and the Goodrich hoist operational history, with just over 2800 hoists in operation with over 220,000 cycles, Bell Helicopter agrees with Goodrich's conclusion that the cable reel-out events were driven by an as yet unconfirmed operational overload causal factor.

Concerning EASA's proposed bank angle of 20°, this limit is not sufficient in low speed tight manoeuvres with a 200 ft cable. According to Bell Helicopter's calculations, at 10 knots and a 40 ft turn radius, the cable angle with respect to the helicopter would exceed the established 30° limit. It is more appropriate to limit

airspeed and aircraft turn radius. Appropriate combinations of airspeed and turn radius need to be assessed to ensure that the resulting forces on the hoist cable at various cable lengths do not exceed the OEM hoist operational limits.

Bell Helicopter's recommendation is to conduct a one-time load check, and implement appropriate limitations in the FMS, educate the operational community on the limits and what drives them, and remain with the existing overhaul schedule. Bell Helicopter will publish revisions to the applicable Flight Manual Supplements to provide Bell Helicopter operators with procedures and limitations to prevent hoist limits from be exceeded in flight.

Should EASA require an inspection interval be established, it is Bell helicopters position that the intervals be no less than 6 months or 1000 cycles to prevent unavailability of critical rescue capabilities.

EASA response: Partially agreed.

Please see answers to comment #13. Regarding point a.) above it should be noted that the Agency has experience in other aviation applications of loose particles closing off the pores on clutch friction disks leading to a decrease in friction coefficient. It is agreed that limiting aircraft bank angle is not sufficient in limiting acceleration on the load hence the additional warning given on the pendulum angle. Alternatively limits on airspeed and turn radius may be acceptable and can be submitted to the Agency for approval as an alternative method to comply with paragraph (6) of the AD.