


<b>EASA</b>	<b>COMMENT RESPONSE DOCUMENT</b>
	<b>Proposed Special Condition for limited Icing clearances Applicable to Large Rotorcraft CS 29 or equivalent</b>

Note : Following the consultation of this Proposed Special Condition, and in accordance with some of the comments received, the initial Special Condition will be slightly amended.

Due to the minor aspects of the changes, the new issue of the Special Condition will not be subject to a new public consultation.

*Commenter: Airbus Helicopters*

**Comment # 1 (Section 1: Definition of a Limited icing clearance)**

AH would recommend removing the Ice severity criteria as a potential limitation. Indeed, based on flight experience, AH consider that this parameter is not enough accurate (20% of accuracy with Flight test devices, less with industrial devices). Moreover, Liquid Water Content is not a sufficient parameter to determine the Ice severity criteria. AH recommend basing the limited icing clearance demonstration on the whole App C of CS 29; any limitations needed should be addressed through other parameters.

**EASA response**

*In principles, an applicant can establish the envelope where flight is safe based on Liquid Water Content (LWC) measurements as well, provided that flight test has proved that the measurements were reliable for the scope of safely defining the limited icing envelope and that such parameter is available on cockpit. As a matter of fact, the LWC can help the crew to react more timely to a change in the icing severity before the effects are experienced on the aircraft handling and performance.*

*As far as the accuracy of the LWC measurement is concerned, AH concern is shared by EASA, but it is normal certification practice to include it in the compliance demonstration. The applicant will have to demonstrate that the accuracy is enough to establish a safe envelope.*

*Regarding AH second point, EASA agrees that LWC is not the only parameter to determine the ice severity and moreover the icing vacating criteria are not to be based only on LWC measurements (some other criteria should be considered, singly or in combination, such as torque increase, vibrations,... that may trigger crew intervention). Normally, based on the flight test results, each applicant develops its own "helicopter level" criteria to determine whether flight into the approved icing envelope is safe or whether a vacation manoeuvre must be commenced*

**Comment is rejected.**

**Comment # 2 (Section 2.1.2: Induction system icing) (**

**.AH would recommend modifying the wording “full icing clearance” by “icing conditions of the claimed limited icing domain” to remain consistent with the scope of this CRI that is the limited icing clearance**

**EASA response:**

*. CS 29.1093(b)(1)(i) is equally applicable even for rotorcraft not certified to flight into known icing conditions. In such case the concept of inadvertent entry to ice applies and a time-limited exposure is requested.*

*For operation in “limited icing”, as intended in the Special Conditions introductory wording, EASA would request unlimited exposure in terms of time duration and icing envelope for the engine induction system as it was consistently requested for past applications. However, EASA is going to publish, concurrent to this CRD, specific AMC text to clarify how any additional limitations resulting from engine induction system to full icing exposure could be acceptable.*

**Comment is partially accepted**

**Comment # 3 (Section 2.1.3: flight into snow conditions)**

**Demonstration of snow clearance is not requested for flight in full icing neither for flight in inadvertent icing conditions. Based on a regulatory approach and for consistency, demonstration of snow clearance should not be requested for the certification of Limited icing clearance.**

**EASA response:**

*EASA acknowledge that snow clearance is not directly related to icing environment however sometimes both environments may co-exist in the atmosphere at slightly different altitudes. In particular, past experience has shown that during the downward escape toward the warm air layer which would trigger a natural de-icing effect, snow conditions are likely to be encountered below the ice clouds and before reaching the warm layer. Therefore EASA request a “limited snow” clearance associated to level flight and descent to demonstrate safe escape capability. On the other hand, capability to operate in re-circulated snow conditions is not requested, as deemed not operationally relevant to the limited icing approval*

**Comment is rejected**

**Comment # 4 (Section 2.1.5: Instruments and other system)**

**AH would recommend modifying the wording “full icing envelope” by “claimed limited icing domain ” to remain consistent with the scope of this CRI that is the limited icing clearance.**

**EASA response:**

*The combination of contrasting physical phenomena (like ice accretion and shedding caused by centrifugal and aerodynamic forces) which prevent an “unprotected” rotating blade from being negatively affected from icing conditions, provided that icing parameters remain within a*

*certain envelope, does not apply to other rotorcraft equipment that are exposed to icing.  
If these equipment are essential for the continuation of a safe flight then it is EASA opinion that, in order to guarantee an adequate level of safety, they have to be protected against full icing conditions. As far as the protection of equipment essential for the safety of flight, see also Paragraph 2.5 of the Special Condition that is consistent with the requirements of this paragraph.  
However, as for the induction system, EASA is going to publish AMC text to clarify at which extent other possible additional limitations, resulting from essential equipment exposure to full icing envelope, could be acceptable.*

**Comment is partially accepted.**

**Comment # 5 (Section 2.2: Ice severity)**

**Same comment as the one made for § 1 with regard to the use of ice severity criteria as a limitation. AH would recommend removing “ice severity (Liquid Water Content)” from the sentence.**

**EASA response:**

*See answer to Comment #1*

**Comment is rejected**

**Comment # 6 (Section 2.4: Flight loads)**

**Flight load substantiation will rely on flight load measurements collected during the limited icing flight test campaign. No measurement program as done for GIR flight test campaign is planned to be established/applied. AH would recommend replacing “measurement program” by “substantiation” to avoid confusion**

**EASA response:**

*The intent of this paragraph is to request the Applicant to perform a dedicated load survey in order to assess the effects of the limited flight conditions on the fatigue loads acting on the rotorcraft PSE's.*

*In this respect the Applicant is expected, for compliance with 29.571 (a)(1)(ii) to agree with the Agency a dedicated in flight measurement program aimed to define :*

- 1) The impacted PSE's which will be monitored,*
- 2) The helicopters configurations which will be investigated in terms of CG and Weight, and installed kit ( e.g. rescue hoist )*
- 3) The flight conditions, in terms of manoeuvre, airspeeds, altitudes and rotor RPM, which will be flown .*

*The flight conditions under point 3 above, should be as much as possible representative of the typical helicopter flights flown under limited ice conditions, this means that it is expected that the dedicated flight load measurement program might significantly differ in terms of type of manoeuvres, flight conditions from those generally requested to be investigated for the basic certification ( see as an example Figure AC 27.MG 11-7 of AC 27-1B Change 3 ).*

*It is understood that as said above, the Applicant and the Agency should agree at the earliest stages of the certification on the type of flight conditions which are necessary to be investigated in order to fully represents the effects on fatigue loads of the flights in limited ice conditions.*

*In light of above regarding the AH recommendation of replacing “measurement program” as it might generate confusion or misunderstanding, it is noted that the use of this verbiage is rather consolidated and used extensively throughout the AC 29-2C to indicate the flight activity conducted under 27/29.571, and therefore the AH’s comment is not shared by the Agency.*

**Comment is rejected.**

**Comment # 7 (Section 2.5: System functioning)**

***AH would recommend to complete the sentence with the effects of ice and low temperatures "in the claimed limited icing domain" ...***

**EASA response:**

*See also answer to Comment #4. EASA has updated the Special Condition text by clearly specifying that essential equipment must comply with “full icing envelope”.*

**Comment is rejected.**

**Comment # 8 (Section 2.8: Vacating icing conditions)**

***Limited icing certification relies on the assumption that there is a positive layer that can be reached. As described in the note of paragraph 1 of present CRI, in such a layer, “the rotorcraft will de-ice naturally and efficiently”; indeed the natural de-icing is obvious in a positive layer. Therefore, it doesn’t need to be demonstrated. AH would recommend removing this sentence.”***

**EASA response:**

*EASA agrees on the presence of the de-icing layer is an operational assumption for limited icing operations but considers appropriate that the de-icing of the unprotected part is demonstrated to be safe and efficient while crossing the warm layer. As a matter of fact, each rotorcraft may show different characteristics during the vacating procedure, in particular as far as the shedding effects are concerned. Therefore, flight tests must be performed to demonstrate the helicopter safe behaviour during natural de-icing.*

**Comment is rejected**