



NPA-OPS 50

(JAR-OPS 3)

**Operation of Helicopters Certified for Flight in
Limited Icing Conditions**

<p style="text-align: center;">NPA-OPS 50 NPA to JAR-OPS Part 3 (Commercial Air Transportation Helicopters)</p>

This NPA is comprised of:-

1. Explanatory Note

- 1.1. Regulatory Background
- 1.2. Regulatory Impact Assessment

2. Text Proposals

For ease of reference, the proposals are shown in much the same format as they would appear in the JAR. Thus, Section 1 material is shown in columnar format and Section 2 reads across the page. The proposed changes to the text are shown by a combination of ~~strikeout~~ and ***bold italics***. The latter indicates proposed new text (or numbering).

Paragraph/s affected:-

ACJ OPS 3.346

Flight in expected or actual icing conditions

1. Explanatory Note

1.1. Regulatory Background

Few civil helicopters have the necessary rotor ice protection systems to enable a full icing clearance to be granted. Nevertheless, an unprotected rotor (non-heated blades) may have a useful level of capability to operate safely within a limited and defined set of atmospheric conditions, provided that suitable airworthiness and operational constraints are in place and applied. This capability can be utilised in specific operational situations that allow the aircraft freedom to change flight conditions in order to vacate or avoid atmospheric conditions beyond the demonstrated icing capability. Such clearances have been used successfully and without incident for the past 30 years for offshore operations and to airfields located near the coast when combined with appropriate carefully defined operating rules.

The Limited Icing Approval may be granted following the achievement of Limited Icing Certification. Extensive flight testing in natural icing conditions is required to achieve this Certification. The UK CAA has certified Limited Icing under the aegis of BCAR Paper G610 and the Advisory Material contained in CAA Paper 96009 for the past 30 years. EASA invited the UK CAA to develop a Special Condition, based on BCAR G610 and the Advisory Material, to allow Limited Icing Certification of helicopters under JAR-29. This Special Condition states that a Helicopter Limited Icing Approval is only envisaged for a Large Rotorcraft certified in accordance with JAR-29, including Category A and IFR Approval.

The following basic principles apply to the certification of a helicopter for flight in Limited Icing conditions:

- The rotor system is not protected by a de-icing system, but relies on natural tolerance to limited ice accretion;
- Systems essential to safety of flight, such as the engines, pitot static systems and windscreens, must be fully protected against the effects of ice. These critical components must comply with JAR-29.1419 (CS-29.1419);
- The aircraft must be certified Category A and IFR;
- The engine intakes must be certified for flight in snow;
- The aircraft must continue to comply with the relevant sections of JAR-29 (CS-29) in the iced state, including:
 - ◆ Handling – including the capability to enter and recover from autorotation;
 - ◆ Stability;
 - ◆ Performance;
 - ◆ Vibration;
 - ◆ Flight loads;
 - ◆ Fatigue;
 - ◆ Flutter.
- The aircraft must have means of indicating to the crew the likely ice accretion on areas of the airframe not visible to them.
- The certification provides a practical set of atmospheric conditions and airworthiness limitations within which the rotorcraft may be safely operated in icing conditions.
- The limitations must be clearly defined in the aircraft's flight manual using parameters ready available to, and observable by, the operating crew.

It can be seen clearly that flight under a Limited Icing Approval is equally as valid as flight with a "full" icing approval as a similar and rigorous certification process is followed. The fundamental difference between the two regimes is that the Limited Icing Approval uses a known band of positive temperature air to de-ice the blades if icing conditions beyond the limits of certification are encountered, rather than de-icing the rotors and stabiliser by means of heated elements. Because of

this requirement, and the practicality of ensuring that a band of positive temperature air is available in a suitable area for descent, it is envisaged that this clearance will only be used by large helicopters conducting offshore / coastal operations. If flight in areas predominately over land were to be considered, then suitable procedures and guidance would have to be developed by the operator concerned in accordance with JAR-OPS 3.346.

JAR-OPS 3 currently provides rule and advisory material for helicopter flight in expected or actual icing conditions, detailing the procedures, training and specific equipment required. The material does not explicitly apply only to helicopters with a Full Icing Clearance, as no reference is made to Limited Icing Approvals. In view of this, no additional rule material for Limited Icing Approvals is necessary in Section 1, but additional guidance is required and, in particular, a means of complying with the ability to vacate icing conditions from any point within the declared envelope.

The EASA Special Condition states that “Compliance with the Special Condition does not constitute an operational approval”. For operations in accordance with the provisions of JAR-OPS 3, ‘operational approval’ for flight in all types of icing conditions is implicit through compliance with articles 3.345, 3.346 and 3.675.

At the OST 06-1 meeting in Paris, 24-26 January 2006, six NAAs expressed the need to progress the NPA under the implementation issue stabilisation criteria in the Agenda for Change.

The outcome of the first review at RST 06-1 Mar 06 was that the NPA should be reviewed by certification experts at EASA. The NPA was then tabled for a second review at RST 06-2 Aug 06, prior to being launched for public consultation. Comments arising from the second RST review have been addressed in the explanatory note of the NPA.

1.1.2 Amendment proposal rationale

A) Section 1, Subpart D

- JAR-OPS 3.345 Ice and other contaminants – ground procedures. It is not intended to revise this text as it does not exclude aircraft with a Limited Icing Approval and the requirements are equally applicable for flight under a Limited Icing Approval.
- JAR-OPS 3.346 Ice and other contaminants – flight procedures. It is not intended to revise this text as it does not exclude aircraft with a Limited Icing Approval from flying in forecast or actual icing conditions. The requirements in JAR-OPS 3.346(a) are equally as applicable to flight in Limited Icing Conditions and require no further embellishment.
- A Limited Icing Clearance meets the requirements of 3.346(b) as the aircraft is fully certified for flight in icing conditions with a defined operating envelope. The conditions for which flight under a Limited Icing Approval is permitted is set out and explained in the justification text below.

B) Section 1, Subpart K

- JAR-OPS 3.675 Equipment for operations in icing conditions. It is not intended to revise this text as it does not exclude aircraft with a Limited Icing Approval from flying in forecast or actual icing conditions. An Airworthiness Approval for flight in Light Icing conditions meets the requirements of 3.675(a) and no further text is required. Equipment specific to a Limited Icing Approval will be included in the amendment to ACJ OPS 3.346, as specified in item C) paragraph (vi) below.

C) Section 2, Subpart D

- The proposed revision to Subpart D is intended to improve the text by clearly describing the requirements for flight in Limited Icing Condition for those aircraft with an Approval in

accordance with JAR-29 Special Condition - Helicopter Limited Icing Approval, Issue 1 or BCAR G610 Issue 3. Due to the carefully defined operational procedures required, it is envisaged that use of this approval will only be used for offshore operations arriving and departing from an offshore heliport or airports at the coast.

- ACJ OPS 3.346 Flight in expected or actual icing conditions. It is proposed to amend this ACJ by the addition of guidance specific to Limited Icing Conditions as itemised below:
 - (i) An additional paragraph (see text proposal, para 5) introduces new guidance material for Limited Icing operations during over water operations departing and arriving from an offshore heliport, or heliports at the coast. This is currently the only type of operation where a Limited Icing Approval is used.
 - (ii) An additional paragraph (see text proposal, para 5(a)) advises crews to use the best available information to ensure that there is no unavoidable icing of a severity worse than the flight manual continuous limit along the planned route at the planned altitudes or flight levels. If icing worse than forecast is encountered inadvertently, the crew have the ability to use the transient icing limit as they prepare to vacate the icing condition for the layer of positive temperature air, which should always be present.
 - (iii) An essential element of any approval is the ability to vacate the icing conditions from any point within the declared envelope to non-icing conditions in order to de-ice naturally. An additional paragraph (see text proposal, para 5(b)) refers to the non-icing layer above the surface or MSA, to which the aircraft can descend safely, within the time limit specified in the aircraft's Flight Manual, following Flight Crew recognition of a declared icing limitation having been reached. Although a transition from icing conditions to non-icing conditions will usually cause the accreted ice to sublime, it is intended that compliant procedures specify the availability of a layer of air at a positive air temperature to ensure the shedding of ice in a timely manner.
 - (iv) An additional paragraph (see text proposal, para 5(c)) states that the minimum Cloud Ceiling in the Landing Forecast for an IMC approach should not be lower than the Decision Height/Minimum Descent Height + 400 ft when the 0°C isotherm onshore is at or below MSA. This will help ensure that a go-around back into icing conditions will not be necessary. The need for of a Landing Forecast indicating a Cloud Ceiling of DH/MDH +400 ft is derived from AMC OPS 3.295(c)(1) paragraph 2.4 (a) as experience has shown this to provide a high probability of the cloudbase remaining in excess of the instrument approach minima during the forecast period.
 - (v) An additional paragraph (see text proposal, para 5(d)) advises that any descent into a band of positive air should take place over the sea or as part of an instrument procedure. This will ensure that any descent is conducted in accordance with existing requirements and minimise risk due to CFIT.
 - (vi) An additional paragraph (see text proposal, para 5(e)) indicates that the aircraft should have an operational Airborne Radar and Radar Altimeter so that a descent below MSA can be safely made offshore - in accordance with the conditions specified in sub-paragraph (v) above.
- It can be seen that no changes are required to JAR-OPS 3.345, 3.346 and 3.675 as these are equally as valid for flight under a Limited Icing Approval as they are for an aircraft with a full De-icing Approval. This rule text, combined with the amended ACJ OPS 3.346 is sufficient in scope and detail for the Authority to grant an Operational Approval.

1.2. Regulatory Impact Assessment

Purpose and Intended Effect of the Measure

1.2.1 Issue

- Few civil helicopters have the necessary rotor ice protection systems to enable a full icing clearance to be granted. Nevertheless, an unprotected rotor (non-heated blades) may have a useful level of capability to operate safely within a limited and defined set of atmospheric conditions, provided that suitable airworthiness and operational constraints are in place and applied. This capability can be utilised in specific operational situations that allow the aircraft freedom to change flight conditions in order to vacate or avoid atmospheric conditions beyond the demonstrated icing capability. Such clearances have been used successfully and without incident for the past 30 years for offshore operations and to airfields located near the coast when combined with appropriate carefully defined operating rules.
- The Limited Icing Approval may be granted following the achievement of Limited Icing Certification. Extensive flight testing in natural icing conditions is required to achieve this Certification, with no extrapolation to the conditions encountered during test being permitted for certification. The UK CAA has certified Limited Icing under the aegis of BCAR Paper G610 and the Advisory Material contained in CAA Paper 96009 for the past 30 years. EASA has proposed a Special Condition, based on BCAR G610 and the Advisory Material, to allow Limited Icing Certification of helicopters under JAR-29. This Special Condition states that a Helicopter Limited Icing Approval is only envisaged for a Large Rotorcraft certified in accordance with JAR-29, including Category A and IFR Approval.

1.2.2 Objective

- This Regulatory Impact Assessment (RIA) explains the changes required to JAR-OPS 3, ACJ OPS 3.346 to provide clear and explicit Guidance Material for flight planning, operations and minimum equipment levels for flight in accordance with a Limited Icing Certification for a specific operational case, namely over water (sea areas) operations departing and arriving from an offshore heliport or heliports at the coast.

1.2.3 Risk Assessment

- Flights in Limited Icing Conditions have been successfully conducted for many years in the UK offshore helicopter industry. An analysis of the operations database of one major North Sea operator indicates that in the period 2003-2004, 873 flights departed when the surface temperature was at zero degrees Celsius or below out of a total morning number of 14,064 flights (6.2%). A large proportion of these flights would have occurred in the early morning and the air temperature would have exceeded zero by the time they returned some hours later; the UK Meteorological Office Statistical Database supports these figures. Approximately 2 days a year are lost through icing conditions being outside the Limited Icing Flight Envelope, although it is common for these periods to coincide with adverse weather and a lack of available alternates, so flight would not have been possible anyway.
- A search of the available safety databases has not revealed any incidents or accidents directly attributable to icing when aircraft have been operated within the Certified Icing Envelope.

- A number of measures help to minimise the risk from flight in this icing regime:
 - Probable areas of icing, temperature and liquid water content information is available to the crew.
 - The aircraft are certified for flight in Limited Icing Conditions using proven testing methodologies and standards.
 - The aircraft are equipped to an appropriate standard.
 - Crews are trained for flight in Limited Icing Conditions.
 - A band of positive air temperature is always to be available and so the aircraft can vacate the icing conditions from any point within the declared envelope to non-icing conditions and shed ice naturally.
- The slight increase in risk when flying in icing conditions must be offset by the benefits of being able to maintain IFR at a safe altitude, retaining vertical aircraft separation in busy sectors and in good radio communications with ATC. If flight under Limited Icing Conditions were not permitted, then aircraft would be operated for a greater proportion of the time at lower altitudes under VFR. This would increase the risk of CFIT and mid-air collisions as the aircraft would be under a reduced ATC service.

1.2.4 Options

- Option 1 One course of action would be to do nothing. JAR-OPS 3 does not explicitly prohibit flight under Limited Icing Conditions; consequently new helicopters entering offshore operations could seek to use similar operational approvals to current aircraft.
- Option 2 To provide explicit Guidance Material for a specific operational case so that over water operations departing and arriving from an offshore heliport, or airports at the coast may be conducted in a safe, standard and regulated manner.
- Option 3 To revise the Rulemaking Text in JAR-OPS 3 to require a de-iced or anti-iced aircraft for flight in all icing conditions. As a fully de-iced helicopter would typically only permit flying on two additional days per year in the UK North Sea compared to the current Approvals, it would not be economically justifiable to have a de-iced aircraft. If flight under Limited Icing Conditions was banned, then pilots might chose to operate VFR in order to remain clear of icing conditions, possibly reducing helicopter separation, increasing the risk of CFIT and in reduced radio coverage. Finally, a lack of a Limited Icing Approval would act as a disincentive for the operators to invest in new helicopters, as they would be put at a commercial disadvantage compared to current helicopters that have a Limited Icing Approval.
- Evaluation Adopting Option 1 would leave the Guidance Material deficient and would not provide sufficient guidance to operators new to the Limited Icing concept. If option 3 was adopted, it would mean withdrawing the previously available and proven option of operating in Limited Icing Conditions. This would result in an overall reduction in the safety of North Sea helicopter operations. In evaluating the three options, it is concluded that adopting Option 2 will ensure high operational standards due to the provision of improved Guidance Material, whilst minimising the regulatory burden on operators.

1.2.5 Benefits

- Flight in Limited Icing conditions permits helicopters operating over water to maintain safe surface separation, as well as optimising ATC and radio services.

1.2.6 Compliance Costs

- Most, if not all helicopters operating in support of oil and gas exploitation in the North Sea, are currently equipped with ice detectors and ice accretion meters in order to inform the crew when they are in icing conditions. As this equipment is already in place, the equipment compliance costs are assessed as minimal.
- The alternative solution of requiring a fully de-iced or anti-iced aircraft would result in increased equipment, maintenance and operating costs due to the weight and complexity of the equipment and therefore does not show a cost benefit. A fully de-iced/anti-iced aircraft can only demonstrate a clear safety benefit in severe over water conditions or operations over land.

1.2.7 Consultations

- The JAA HSST working paper, HSC-WP-05-02 Limited Icing Clearance has been circulated through the NAA, operators and manufacturers representatives of the JAA HSST. Additionally, the working paper has previously been sent to EASA for comment.
- Following discussion with the CJAA, some amendments to the Preamble and ACJ were made. These were principally to emphasise that the Limited Icing Approval is obtained after rigorous flight testing and provides an equivalent level of safety to a de-iced aircraft, by clearly defining an operating regime and means of exiting the conditions to a layer of positive temperature air.

1.2.8 Result of Consultations

- HSST members suggested two minor editorial changes and these have been included in the text of the amended ACJ. Apart from the comments raised by CJAA, and noted in the paragraph above (see 1.2.7 Consultations, bullet point 2.), there were no adverse comments raised by any interested parties.

1.2.9 Summary and Recommendations

- The proposed changes to JAR-OPS 3, ACJ 3.346, as defined in this NPA, introduce clear and explicit Guidance Material for operations in Limited Icing Conditions. The impact costs for the Limited Icing regime used in over water operations is minimal, whilst permitting aircraft to maintain safe surface clearance and optimise ATC and radio coverage.

2. Text Proposals

JAR-OPS 3, Section 2, Subpart D

ACJ OPS 3.346

Flight in expected or actual icing conditions

See JAR-OPS 3.346

1 The procedures to be established by an operator should take account of the design, the equipment or the configuration of the helicopter and also of the training, which is needed. For these reasons, different helicopter types operated by the same company may require the development of different procedures. In every case, the relevant limitations are those which are defined in the Helicopter Flight Manual (HFM) and other documents produced by the manufacturer.

2 For the required entries in the Operations Manual, the procedural principles which apply to flight in icing conditions are referred to under Appendix 1 to JAR-OPS 3.1045, A 8.3.8 and should be cross-referenced, where necessary, to supplementary, type-specific data under Appendix 1 to JAR-OPS 3.1045, B 4.1.

3 Technical content of the Procedures. The operator should ensure that the procedures take account of the following:

- a. JAR-OPS 3.675;
- b. The equipment and instruments which must be serviceable for flight in icing conditions;
- c. The limitations on flight in icing conditions for each phase of flight. These limitations may be imposed by the helicopter's de-icing or anti-icing equipment or the necessary performance corrections which have to be made.
- d. The criteria the Flight Crew should use to assess the effect of icing on the performance and/or controllability of the helicopter;
- e. The means by which the Flight Crew detects, by visual means or the use of the helicopter's ice detection system, that the flight is entering icing conditions; and
- f. The action to be taken by the Flight Crew in a deteriorating situation (which may develop rapidly) resulting in an adverse affect on the performance and/or controllability of the helicopter, due to either;
 - i. The failure of the helicopter's anti-icing or de-icing equipment to control a build-up of ice, and/or
 - ii. Ice build up on unprotected areas.

4 Training for dispatch and flight in expected or actual icing conditions. The content of the Operations Manual, Part D, should reflect the training, both conversion and recurrent, which Flight Crew, and all other relevant operational personnel will require in order to comply with the procedures for dispatch and flight in icing conditions.

4.1 For the Flight Crew, the training should include:

- a. Instructions on how to recognise, from weather reports or forecasts which are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and how to modify, as necessary, the departure and in-flight routes and profiles;
- b. Instructions in the operational and performance limitations or margins;
- c. The use of in-flight ice detection, anti-icing and de-icing systems both in normal and abnormal operation; and
- d. Instruction in the differing intensities and forms of ice accretion and the consequent action, which should be taken.

4.2 For Crew Members other than flight crew, the training should include:

- a. Awareness of the conditions likely to produce surface contamination; and
- b. The need to inform the Flight crew of significant ice accretion.

5 If the helicopter has been certified for flight in Limited Icing Conditions and it is intended to operate over water (sea areas) departing and arriving from an offshore heliport or heliports at the coast, then the operator should ensure that procedures in the Operations Manual take additional account of the following:

- a. The need for the Flight Crew to use the best available information, such as an Area Forecast and liquid water content and temperature profiles, to ensure that there is no unavoidable icing of a severity worse than the flight manual continuous limit along the planned route at the planned altitudes or flight levels;**
- b. The aircraft's flight path should ensure that the time to vacate icing conditions by reaching a positive temperature band of air, or landing at the arrival heliport, is not greater than the time stipulated in the Aircraft Flight Manual. The band of positive temperature air should not be less than 500 ft in depth. Offshore, the positive temperature band of air should exist at or above 500 ft AMSL and onshore between MSA and MSA +500 ft. However, an onshore approach in IFR may be conducted with the zero degree isotherm below MSA providing that sub-paragraphs 5(c) and 5(d) can be complied with;**
- c. If the approach is made in IMC and the 0°C isotherm is at or below the MSA with no band of positive air above MSA, then in order to ensure a missed approach back into icing conditions will not be necessary, the minimum Cloud Ceiling in the Landing Forecast should not be less than DH/MDH + 400 ft;**
- d. Any descent into the band of positive air should take place over the sea or as part of an instrument procedure;**
- e. The aircraft should not be dispatched without a serviceable Radio Altimeter and Airborne Radar. The MEL should reflect this requirement.**