Proposed Special Conditions

Applicable to Eurocopter EC 225 LP helicopter model

Introductory note:

Hereby presented Special Conditions have been classified as important SC and as such shall be subject to public consultation, in accordance with EASA Management Board decision 02/04 dated 30 March 2004, Article 3 (2.) of which states:

> "2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

Appendix to EC 225LP CRI B-05 – EASA Special Conditions

"Water Bombing System"

1. Introduction

These special conditions are issued for the Eurocopter EC 225LP helicopter model.

This helicopter is type certified to Category A and B based on JAR29 Change 1 with a number of deviations, Equivalent Safety Findings and Special Conditions as shown in TCDS ref. EASA.R.002 that gives product TC basis definition.

The EC 225LP has novel or unusual design features associated with installing an innovative firefighting optional equipment, so named "Water Bombing System". Water Bombing operations with this system are also deemed to be unconventional helicopter usage.

Both reasons prompt the need of Special Conditions in accordance with Part21, § 21A.16B.

2. Statement of Issue

The Water Bombing System features a big water tank installed inside the cabin.
The cabin floor and fuselage are modified to interface this tank with inner water funnel fitted in the 6th fuel tank compartment so that on-board water load can be jettisoned in flight through dedicated dropping doors under the helicopter belly.
The cabin tank can be refilled with water either on ground by relevant system refilling port or in hover flight over water areas thanks to a pumping subsystem constituted of a retractable flexible hose connecting a snorkel pump which may be deployed from the helicopter.

When the aircraft is not engaged in water bombing operations, the water tank may be easily dismantled and partly folded in the funnel with the floor opening covered by a plate, i.e. alternative “WBH Folded Tank” configuration. This offers the operational possibility to clear the cabin floor without removing the complete water bombing system from the aircraft. Provided they are approved, further cabin conversions may be therefore conceivable for other flight activities. The other major components of the system (e.g. dropping doors assembly and retractable snorkel pump) can be also removed in order to allow reinstalling approved aircraft configurations and hence resuming passengers transport.

Water bombing Operations are claimed to be carried out at a MTOW higher than the one originally certified.

Normally, JAR29 §29.25 (c) allows to address the point of weight limits for jettisonable external loads attached that are greater than the maximum weight established under JAR29 §29.25 (a).
However in the present case, the Water Bombing System jettisonable load consists of load that is internal.

On the other hand, external loads are subject to other requirements as per JAR29 §29.865 but those cannot apply by definition on a Water Bombing System featuring a load carried aboard the helicopter.

In addition, neither JAR29 nor CS29 have requirements dealing with firefighting operations in general and those operations with the subject Water Bombing installation are moreover deemed particular given design peculiarities of this system. Thus there is justification here also to notify Special Conditions with regard to what remains unconventional rotorcraft use.

Consequently, above mentioned airworthiness codes applicable to the EC 225LP do not contain adequate or appropriate safety standards for the design features and intended use of the Water Bombing System. Therefore in accordance with Part21, § 21A.16B, these special conditions are issued which contain safety standards as the Agency finds necessary to establish a level of safety equivalent to that included in the applicable EC 225LP type certification basis and they must be met to obtain certification of the Water Bombing System.

3. Water Bombing System’s Special Conditions

3.1. JAR29 Applicability requirements

For certification of Water Bombing System installations and its operation as firefighting kit, JAR29, §29.1 Applicability requirements are still relevant. Therefore depending on the installed configuration, -

(a) when the rotorcraft is configured for passengers transport, or for the carriage of cargo only or other flight operations, with Water Bombing System elements remaining embodied on-board, the rotorcraft must be shown to continue to comply with sub-paragraphs of §29.1 as duly applicable; while

(b) when the rotorcraft is converted for Water Bombing operations only without passengers, the rotorcraft must be certified at least according to §29.1 (d), i.e. as Category B rotorcraft provided the Category A requirements of Subparts C, D, E and F of JAR29 Change 1 are met.

3.2. Detailed Special Conditions requirements

Compliance with JAR29 Change 1 requirements of EC 225LP type certification basis must be demonstrated wherever affected by the Water Bombing System, except when modified or alleviated by the following:

3.2.1 JAR29, §29.25 (c) must read as follows:

§29.25 (c) *Total weight with jettisonable on-board load for Water Bombing operation.*

(1) A total weight for the rotorcraft with a jettisonable on-board water load that is greater than the maximum weight established under sub-paragraph §29.25 (a) may be established for Water Bombing operations if -

(i) Structural component approval for Water Bombing operation under these Special Conditions is obtained,

(ii) The portion of the total weight that is greater than the maximum weight established under sub-paragraph §29.25 (a) is made up only of the weight of all or part of the jettisonable on-board water load,

(iii) Structural components of the rotorcraft are shown to comply with the applicable structural requirements of JAR29 Change 1 under the increased loads and stresses caused by the weight increase over that established under sub-paragraph §29.25 (a), and

(iv) Appropriate weight operating limitations relevant to Water Bombing operations are entered in the Flight Manual.

(2) If Water Bombing operations are claimed to be conducted with a total weight for the rotorcraft with jettisonable on-board water load that remains within the maximum weight limits established under sub-paragraph §29.25 (a), it must be shown anyway compliance with requirements of previous sub-paragraphs §29.25 (c) (1) (i) and (1) (iv) of these Special Conditions.

3.2.2 Release system

The Water bombing System must include a release system to enable the pilot to release on-board water load during flight. The release system must consist of a primary release subsystem and a backup release subsystem that are isolated from one another. The release system, and the means by which it is controlled, must comply with the following:

(a) A control for the primary release subsystem must be installed either on one of the pilot's primary controls or in an equivalently accessible location and must be designed and located so that it may be operated by either the pilot or a crew member without hazardously limiting the ability to control the rotorcraft during an emergency situation.

(b) A control for the backup release subsystem, readily accessible to either the pilot or another crew member, must be provided.

(c) Both the primary and backup release subsystems must:

(1) Be reliable, durable, and function properly with water loads up to the maximum on-board limit load for which authorisation is requested.

(2) Be protected against EMC/EMI, lightning and HIRF threats to prevent inadvertent on-board water load release, unless it can be shown that inadvertent release will not cause a risk of injury to person on ground while outside pumping and intentional water release, and in that case compliance with CS29, §29.865 (b)(3)(ii)(A) must be established.

If protection against above quoted threats is sought, then for each of these, the following applies -

(i) EMC/EMI: effects from radio comm./nav. systems and other rotorcraft equipment must be checked accurately and shown to be without adverse consequences on both the primary and backup release subsystems.

(ii) Lightning: a theoretical and/or experimental analysis must be performed to assess direct and indirect effects of a lightning strike, so that it can be demonstrated that no untimely release occurs during and after helicopter exposure to lightning. In addition, it must be shown that mechanical parts functionality of both the primary and backup release subsystems remain after a lightning strike.

(iii) HIRF: the minimum level of protection required to be complied with is a radio frequency field strength of 200 volts per meter.

(3) Be protected against any failure that could be induced by a failure mode of any related electrical or mechanical rotorcraft system.

3.2.3 Other equipment

The following is required equipment to be installed as part of, or in conjunction with, the Water Bombing System:

(a) A cabin water tank designed and installed so that –

(1) Water within the tank, and in other elements interconnected with it, is contained without leakage.

(2) Water cannot be thrown out in the cabin while manoeuvring the rotorcraft as in typical Water Bombing operations.

(3) It includes baffle plates preventing detrimental motion of the water during the flight when the tank is partially filled unless those can be demonstrated to be unnecessary.

(4) Water is automatically drained to the exterior of the rotorcraft if:

(i) The tank is filled above the approved capacity limit; or

(ii) Any untimely water leakage occurs.

(5) When filled up to full capacity, the tank itself and its structural attachment interfaces are able to withstand without failure, the vibration, inertia and structural loads foreseeable in operation.

(c) Means that protect the engines and exposed ventilation air intakes against water ingestion if required.

(d) Means must be given to the pilot to determine mass and/or quantity of water taken onboard. This information must be accurate and reliable. Through this information, or other ways, the flight crew must be able to know unmistakably when the approved maximum filling capacity is reached.

(e) External mirrors enabling the pilot to monitor visually water pumping while hovering.

(f) Efficient pilot windscreen wipers and washers.

(g) If emergency flotation equipment is required by national operating rules, it must be assured that there is no incompatibility between this equipment and the Water Bombing System.

(h) Visual indication to the flight crew of the position status of the dropping doors and retractable hose connecting the snorkel pump.

3.2.4 Water load carriage

(a) When configured with the Water Bombing System, the rotorcraft is used for the carriage of cargo only, which cargo consists of a jettisonable on-board water load. Since this water load is carried inside the cabin, the cabin area must be considered to be a cargo compartment when compliance demonstration with JAR29 structural requirements is established.

(b) However, instead of complying with JAR29, §29.855, fire hazard protections of the cabin converted with the Water Bombing System must be shown in frame of these Special Conditions to continue to meet the requirements of JAR29, §29.853 established for the passenger cabin of basic aircraft.

3.2.5 Wildfires environment effects

Adverse effects of wildfires environment to which the rotorcraft will be exposed in operation must be considered and in particular, engines susceptibility to flying over or in proximity of fires must be assessed. It must be determined by analysis or tests that there is reasonable assurance that the engines will not flameout or experience unacceptable engine behaviour while operating in wildfires environment.

3.2.6 Water load jettisoning

(a) Water jettisoning must be safe during all flight regimes and throughout the operational envelope for which jettisoning is to be authorised.

(b) It must be shown if a flight emergency occurs that the rotorcraft can be relieved of its water load by jettisoning so that any controlled emergency landing on land or water can be completed safely.

(c) In showing compliance with previous sub-paragraphs (a) and (b), it must be shown that -

(1) The time required to complete all the water release is established.

(2) Repetitive in-flight normal and emergency jettison demonstrations can be performed with normal piloting skill and without exceptionally favourable conditions.

(3) Controllability of the rotorcraft remains satisfactory throughout the water jettisoning operations which is meant to be neither adverse nor uncontrollable helicopter reactions at the time of jettisoning and no unacceptable degradation of the originally approved helicopter performance characteristics after jettisoning.

(4) In flight demonstrations are conducted -

(i) over the ranges of altitude and temperature consistent with the operational envelope to be obtained;

(ii) for both the maximum and minimum airspeed limits and maximum rates or gradients of descent and climb allowing safe jettisoning; and

(iii) from all attitudes appropriate to normal and emergency operational usage.

(5) No hazard results from water splashes which impinge on any part of the rotorcraft during water jettisoning.

3.2.7 Structural demonstration for emergency landing

Compliance with the emergency landing requirements of JAR29, §29.561 (c) must be shown whatever flight conditions are when a rotorcraft emergency arises, except in low hover if an engine failure occurs after water tank refilling. In that case, the ultimate inertial load factors to demonstrate may be different than JAR29.561(c) load factors, provided that the selected values are appropriate to the likely emergency landing condition and the probability of being exceeded is shown by analysis and flight tests to be extremely remote.

3.2.8 Corrosion protection

(a) The aircraft must be shown to be suitably protected against adverse effects of corrosion that may result of being sprayed by whatever fluids (e.g. salt water or water with chemical agents) during water pick up and jettisoning operation.

(b) If chemical agents are used, the authorized ones must be all listed in the Flight Manual.

3.2.9 Miscellaneous airworthiness considerations

(a) The aircraft must not be adversely affected by the recirculating spray to be expected during low hover needed for picking up water by pumping.

(b) Emergency conditions to be considered must include critical engine failure in a low hover typical of water pick up.

(c) The in-flight motions of the deployed snorkel pump must be shown to present no hazard to the aircraft throughout the range of manoeuvres to be expected in service.

(d) Precautions must be taken into the snorkel pump design to minimize the possibility of it becoming entangled and creating additional hazard to the rotorcraft.

3.2.10 Flight Manual Supplement

A Flight Manual Supplement dedicated to the Water Bombing System must be furnished, including all operating limitations and procedures that result of complying with these Special Conditions and stating in addition that:

(a) This Supplement does not constitute an operational approval and operations must be conducted in accordance with the relevant national operating regulations to include appropriate equipment requirements.

(b) The transport of passenger is not permitted and that personnel on board must be limited to those necessary to accomplish the water bombing tasks.

(c) The minimum flight crew while performing Water Bombing operations consists of one pilot and a suitable trained crew member in co-pilot seat.

(d) Water Bombing operations can be carried out by Day VFR only.

(e) The height-velocity envelope does not need to be listed as an operating limitation while performing Water Bombing operations.

4. References

1. EASA TCDS n°EASA.R.002
2. JAR/CS 29 and AC29-2C

End