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WORKING PAPER

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TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

CERTIFICATION OF AERIAL FIREFIGHTING AIRCRAFT

(Presented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA), International Federation of Air Line Pilots Associations (IFALPA))

EXECUTIVE SUMMARY

Wildfires are happening with increased frequency and intensity and in more diverse locations around the globe. Multiple studies have found that climate change has led to an increase in wildfire season length, intensity and burned area. The environmental benefits of preventing deforestation due to wildfires are clear. Aircraft for aerial firefighting missions, whether purpose-designed or modified, have become invaluable and key tools in the efforts to combat such wildfires. As the need for aerial firefighting aircraft grows, the regulatory regime for these specialized aircraft has become a bottleneck in terms of both certification, international validation and operational requirements. A lack of a common approach to certification, validation and operation of these aircraft has led to jurisdictionally unique and often cumbersome regulatory approval processes, often resulting in impractical limitations for the missions intended. This, in turn, has been shown to make transferability between countries extremely difficult and often financially unviable for the producers of these aircraft. These challenges point to a need for ICAO to develop international standards for the airworthiness (certification) and operations of specialized firefighting aircraft, including rotorcraft.

Action: The Assembly is invited to: request ICAO to prioritize work related to the development of international standards related to the certification and operation of specialized firefighting aircraft.

Strategic Objectives:	This working paper relates to the Safety and Environmental Protection Strategic Objectives
Financial implications:	The activities referred to in this paper will be subject to the resources available in the Regular Programme Budget and/or from extra budgetary contributions.
References:	None

[1] English, Arabic, Chinese, French, Russian and Spanish versions provided by ICCAIA.

1. INTRODUCTION

1.1 As the frequency and intensity of forest fires (often referred to as wildfires) increases due to the effects of climate change, the tools needed to combat them become increasingly important.

1.2 Aircraft, both fixed wing and rotorcraft have, either as purpose designed or through specialized modifications conferring scooping or land-based firefighting capabilities, become one of the primary tools in this battle. Design features or modifications required to fulfil a firefighting role, although not necessarily technically complex, generally involve extensive certification and validation efforts, due to the application of standards that in many cases did not envisage this role. As such, these situations commonly require the addition of customized requirements to those existing rules to cater to both the unique nature of the mission as well as the inherent risk associated with these missions.

1.3 Similarly, the operation of such modified aircraft requires unique and special consideration, as seemingly commonly applied limitations may impose restrictions that are not practical for firefighting operations.

1.4 Given there does not exist a standardized approach to adapting commonly used certification and operational rules to this unique role, solutions are typically customized by one jurisdiction, and this customization tends to warrant extensive scrutiny and often re-work when an aircraft is exported to another country or jurisdiction.

1.5 The inherent market size of these specialized aircraft often cannot support the level of certification effort of such significant re-examination or re-work typically required when these aircraft are sold abroad. As such, there is a need to lower costs for firefighting aircraft. High costs associated with certification and validation often makes these ventures not viable for many enterprises who specialize in developing purpose built firefighting aircraft and firefighting conversions to existing aircraft types.

2. DISCUSSION

2.1 The customization of an existing aircraft type for firefighting operations starts with an existing aircraft design that has been shown to comply with a basis of certification appropriate to the category of aircraft, typically “Part 23, 25, 27 or 29” for fixed wing and rotorcraft respectively.

2.2 The challenges really begin when considering additional requirements, or deviations from existing requirements, that are warranted due to the unique nature of the modification and operation applicable for firefighting operations.

2.3 These additions or deviations include issues not related to specific design features such as waterborne operations, static longitudinal and lateral stability, high angle of attack operations, loads, fatigue, take-off and climb performance, and unique requirements unique to firefighting operations such as water scooping and bombing systems, crash-landing conditions with water tanks in the fuselage, and additional considerations for pilot workload and pilot fatigue management in a more dynamic operational environment.

2.4 The customization of standards required for aircraft either purpose designed or modified for a firefighting role often render a number of requirements that would normally apply, impractical (e.g., takeoff performance) or not applicable (e.g., some crashworthiness and cabin safety requirements). As such, the use of a Restricted Category certification is employed by some authorities, enabling the lack of

compliance to specific standards that cannot be met by virtue of the nature of the modifications required to carry out what is termed as a Special Purpose Operation.

2.5 In turn, these deviations or exceptions from the normally prescribed Standards are typically compensated for by limitations which are often novel and unique. Restricted Category certification, however, is not applied equally amongst authorities, and is generally challenging to accept by importing authorities.

2.6 Additional requirements needed, above and beyond the basic standard, are typically dealt with via the addition of Special Conditions, which are often drafted and customized for each unique application. The creation of both the limitations associated with the Restricted Category certification, as well as the case (and authority) specific Special Conditions results in a very unique one-off set of requirements that are highly prone to a high level of review if not the imposition of an alternate approach by an importing authority, resulting in significant cost implications to the applicant. Given the current lack of standardization of certification standards for firefighting aircraft, these frequent "one off" solutions continue to be proliferated.

2.7 From a certification perspective, it is important to create a common approach recognizing the specifics or uniqueness of a firefighting mission as it relates to inherent risk. The application of standards with a "passenger paying large transport" mindset may introduce interpretations to standards and/or limitations that in a typical certification exercise may be reasonable, yet in a firefighting role may be impractical. Consideration of the ability to jettison a water or retardant load quickly, for example, could play into performance considerations.

2.8 Limitations with respect to the carriage of "passengers" are also important to consider, as precluding the transportation of firefighting crew as part of a typical mission makes both the airworthiness and operational approvals impractical for many firefighting operations. The use of the term "occupant" may be useful in allowing carriage of trained personnel versus the untrained general public.

2.9 Whilst the objective is always to achieve an acceptable level of safety, the inherent risks of firefighting, as well as the appropriate set of limitations applied, must always be commensurate with the firefighting environment and its risk exposure to the general public. This approach would be similar to the "safety continuum" philosophy developed by the Federal Aviation Administration (FAA) in their development of recent standards including FAR 23 Amendment 23-64.

2.10 The enhancement of ICAO Annex 8 — *Airworthiness of* Aircraft to incorporate Standards that would facilitate certification recognition and transfer of all types of firefighting vehicles (e.g., fixed wing, flying boat or amphibious, rotary wing) could draw upon existing efforts expended on this subject by various authorities. One possible approach could be the consolidation of relevant requirements into a common Appendix/Addendum to ICAO Annex 8, similar to, say, EASA's CS-25 Appendix S for Executive Interior Requirements, which could also introduce international recognition of Restricted Category for firefighting aircraft.

2.11 Similar to ICAO Annex 8 opportunities, challenges also exist on the operational approval in Annex 6. Historically, ICAO has not specifically considered the international, or transferability issues of an aerial firefighting operation. Annex 6 has so far excluded the topic of "aerial work" in its development of international standards, but has left considerations for such further development a possibility. The "Aerial Work" definition in Annex 6 — *Operation of* Aircraft, Part I — *International Commercial Air Transport — Aeroplanes*, Part II — *International General Aviation — Aeroplanes* and Part III — *International Operations — Helicopters* does not specifically mention firefighting operations

to-date. The definition appears to categorize aerial work more as a general aviation (i.e., non-commercial) operation, whereas recognition of aerial firefighting as a commercial operation would be required to give proper visibility and thus international recognition.

2.12 The key to enhancing the transferability of operational approvals internationally may lie in the use of the Air Operator Certificate (AOC). The Operations Specification required by an AOC includes the option of a "Specific Approval", which lists examples, and includes an "Other" category that firefighting operations could fit into. Alternatively, aerial firefighting could be listed as a stand-alone option.

3. CONCLUSION

3.1 Given the increased frequency and intensity of forest fires and that they are occurring in more diverse global locations, the tools required to fight them have become more critical. Aircraft, whether purpose-designed or modified for firefighting, are produced by a small number of specialised manufacturers for a relatively small market. Both the design and operational regulatory approvals of aerial firefighting aircraft are approached in a varying manner by States, as these certifications are accomplished via the deviation from and addition to requirements above and beyond existing accepted standards. The level of safety applied also varies and is not necessarily commensurate with the nature of firefighting operations. All of these factors make the transferability of these products across borders onerous and in some cases prohibitively expensive for the producers of these specialized aircraft.

3.2 This paper invites ICAO to:

a) promulgate Standards in ICAO Annex 8 that will facilitate type certification recognition and cross-border transfer of all types of firefighting vehicles; and

b) promulgate Standards in ICAO Annex 6 that will allow global recognition of operational approvals required for conducting firefighting operations.

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