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ASSEMBLY — 39TH SESSION

TECHNICAL COMMISSION

Agenda Item 37: Other issues to be considered by the Technical Commission

COMMUNICATION OF AIRWORTHINESS LIMITATIONS RELATED TO HAZARDOUS GOODS

(Presented by the United States)

EXECUTIVE SUMMARY

One of the key findings from the extensive studies carried out by various international bodies on the safe transportation of lithium batteries is that there is currently no formal mechanism to relate the capability of the aircraft safety systems to the allowances for carriage of dangerous goods. This situation leaves the operator of the aircraft with potentially conflicting information on what constitutes acceptable cargo. This paper provides an overview on means whereby the state of design could ensure that the operator is provided with safety critical information regarding the limitations of the airplane cargo safety systems.

<i>Strategic Objectives:</i>	This information paper relates to the Safety and Security and Facilitation Strategic Objectives.
<i>Financial implications:</i>	This paper has no significant financial implications.
<i>References:</i>	

1. INTRODUCTION

1.1 Amendment 99 to Annex 8, Part IIIA, of the ICAO International Standards and Recommended Practices, adopted a requirement in § 4.1.6 (g) that cargo fire suppression systems "...shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods. The phrase "or dangerous goods" was added to this section, which had been originally adopted at Amendment 97 to address security concerns.

1.2 Many National Authorities, including the United States, have not adopted the 'dangerous goods' provision. In our view, there is no way a Type Certification requirement to address 'dangerous goods' could be reliably met. Nor would a design that meets that requirement at the time of certification be guaranteed to continue to meet the requirement as the dangerous goods rules evolve.

1.3 Unlike traditional limiting conditions (such as center of gravity position or maximum permissible crosswind for take-off), the fire suppression capabilities of the airplane are not easily quantified. Thus, operators' knowledge of what is and is not within the capabilities of the airplane systems may be limited. Operators may assume the capabilities match what the dangerous good requirements say is permissible. The dangerous goods rules establish a risk management framework focusing on provisions to ensure the material stays safely within the package, and if there is a release that release does not pose an unreasonable risk. The dangerous goods rules do not broadly address fire engulfment, either at the single package level or in larger cargo quantities, although some specific materials are held to that higher standard.

1.4 Lithium batteries are an excellent example of a product that, when they were first introduced, were shipped in moderate quantities, but have since become quite prevalent in aviation cargo. In addition, as the quantities shipped have continued to increase, the batteries themselves have become more energetic; providing both a potential ignition source as well as a fuel for a fire initiated by any source.

2. DISCUSSION

2.1 Due to emerging safety concerns regarding lithium batteries as cargo, ICAO held a series of meetings involving experts in airworthiness, operations and dangerous goods requirements, to address safety issues and make recommendations for improvement. At its first meeting, which took place in Atlantic City, USA on 4 to 6 February 2014, the group formed the following recommendation:

Recommendation 4 —

"There was agreement that the multidisciplinary approach undertaken by the meeting was worthwhile and was likely to lead to greater awareness, understanding and cooperation. Including the airframe manufacturers as part of this multidisciplinary meeting highlighted the importance of considering the certified capabilities of aircraft in determining appropriate restrictions on various dangerous goods, including lithium metal batteries. The aircraft manufacturers' certification assumptions for cargo fire

protection do not specifically address the risks posed by the carriage of dangerous goods. The approval process for carriage of dangerous goods is not within the scope or control of aircraft manufacturers and there has been an assumption that restrictions placed on dangerous goods by the DGP and State regulatory

authorities provide an acceptable level of safety. The process for determining restrictions on dangerous goods, including lithium metal batteries, has been evaluated on a package level and not on whether aircraft fire protection features are capable of controlling fires involving dangerous goods, including lithium metal batteries.”

2.2 This recommendation and explanation highlight the need for coordination among the various relevant requirements, as a general principle.

2.3 Limitations on fire protection capability are not as easily stated as other operational limitations, such as gross weight and maximum airspeed. Nonetheless, the airplane manufacturer can communicate to some extent the limits on the protection provided by airplane systems and equipment, and this information can enable the operator to choose the types and quantities of cargo they can safely carry.

2.4 Basic limitations on cargo loading are contained in an airplane weight and balance manual, which is an extension of the flight manual. The requirements for the contents of weight and balance manuals focus on the weight, location and distribution of cargo permitted within the structural capability of the airplane. The limitations do not address the flammability or potential for ignition of the cargo carried.

2.5 Important factors regarding the ability of the fire protection systems to be effective are:

- The maximum sustained temperature within the cargo compartment for which the fire suppression system will be effective at protecting systems necessary for continued safe flight and landing.
- The maximum acceptable pressure within the cargo compartment.
- Knowledge of the dangerous goods permissible under Annex 18 and the quantities that could cause the above limitations to be exceeded. Guidelines for the operator to assess their risk for any dangerous goods they elect to carry, including the cumulative effect of multiple shipments and including proximity to other allowable flammable dangerous goods.
- The effectiveness of the fire suppression agent in preventing an explosion of flammable gases that may accumulate in a confined space.

2.6 Airframe manufacturers have expressed a concern regarding the fire protection limitations of their aircraft as well. The International Coordinating Council of Aerospace Industries Association and the two largest airframe manufacturers issued statements to inform operators that the fire suppression capabilities of current passenger airplanes are not sufficient to cope with a lithium battery fire. While extremely important, these communications do not actually define what the capabilities are.

3. CONCLUSION

3.1 As discussed above, the airplane manufacturer or design approval holder must communicate limitations necessary for safe operation to the operator in the form of aircraft manuals. In addition, the need for a coordinated approach to defining dangerous goods permissible as cargo is now well recognized within the aviation industry. So, the precedent and justification for adding fire protection limitations to those limitations already identified is clear. Nonetheless, the limitations for cargo fire protection are not readily characterized, even if there is good coordination among the airworthiness,

operations and dangerous goods specialties. It is considered a best practice for airframe manufacturers to supply additional information to the operator on important factors regarding the ability of fire protection systems to be effective, which the operator can use when determining what cargo operators will not carry.

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