



# **INTERNATIONAL MULTIDISCIPLINARY LITHIUM BATTERY TRANSPORT COORDINATION MEETING**

## **THIRD MEETING**

**Montréal, 28 to 30 July 2015**

### **REPORT OF THE THIRD MEETING**

#### **1. INTRODUCTION**

1.1 The third meeting of the International Multidisciplinary Lithium Battery Transport Coordination Meeting was opened by Mr. Steven Creamer, Director, Air Navigation Bureau on 28 July 2015 in Montréal. The meeting was co-chaired by Mr. Enzo Canari of the European Aviation Safety Agency (EASA) and Mr. Richard Hill of the Federal Aviation Administration (FAA) William J. Hughes Technical Center.

#### **2. ATTENDANCE**

2.1 The meeting was attended by experts in the fields of dangerous goods, operations, airworthiness, safety management systems, aircraft cargo fire safety research and development and representatives of the airframe manufacturer and lithium battery industries. A list of participants is provided in Appendix C.

#### **3. GOALS AND OBJECTIVES**

3.1 The meeting was provided with background information on recommendations made by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) and the International Federation of Air Line Pilots' Associations (IFALPA) to the 2015 Working Group Meeting of the Dangerous Goods Panel (DGP-WG/15, Montréal, 27 April to 1 May 2015) related to their concerns with the risks posed by lithium batteries transported by air (see extract of the DGP-WG/15 Report provided in Appendix D). It was reported that since that time, two major airframe manufacturers had provided notices to operators warning of the potential for a fire involving high density lithium batteries to exceed the capability of aircraft cargo compartment fire protection systems. Representatives from both manufacturers supported the recommendations made by ICCAIA and IFALPA to DGP-WG/15, which included a prohibition on the carriage of high density packages of lithium ion batteries and cells on passenger aircraft until such time as safer methods of transport were implemented. Both manufacturers recommended in their notices that operators who choose to carry lithium batteries as cargo conduct a safety risk assessment. The manufacturer's notices provided some guidance on considerations that should be taken into account in conducting the risk assessment. It was noted that several large operators had

already instituted bans on the transport of lithium ion batteries. Recognizing that the ultimate goal was to permit the transport of lithium batteries by air, performance standards, including packaging standards, needed to be developed as part of a comprehensive strategy to mitigate risks posed by lithium batteries. The primary focus of the multidisciplinary meeting was packaging performance standards.

3.2 The need for a definition for high density shipments of lithium batteries was raised at DGP-WG/15 during discussions on the ICCAIA recommendation (see Appendix D, paragraph 3.5.1.2.5). The multidisciplinary meeting acknowledged that determining a single quantifiable measurement for high density was not possible because of the variable effects battery chemistry, cargo compartment characteristics, and loading configurations had on the potential for and degree of thermal propagation. The meeting therefore supported the explanation provided by ICCAIA and IFALPA at DGP-WG/15, i.e. "...quantities of lithium batteries which had the potential to overwhelm the cargo compartment fire protection features" and recommended this be taken into account when performing safety risk assessments (see Appendix D).

#### 4. PRESENTATIONS

4.1 The following documents were submitted for discussion during the meeting:

- a) [Issues regarding performance-based standard for air transportation of lithium batteries](#); and
- a) [IFALPA position on the adoption of a performance packaging standard for lithium battery shipments](#).

4.2 The following presentations were delivered to the meeting:

- a) [Outline for lithium ion and lithium metal cell/battery performance-based standard; and](#)
- b) [The aircraft hazards of flammable gasses produced by lithium batteries in thermal runaway](#).

#### 5. PERFORMANCE PACKAGING STANDARDS

5.1 It was noted that performance standards would need to be developed which balanced the need for detailed instructions on how to achieve them while being general enough to allow for flexibility in effectively achieving them. The meeting developed high-level performance standards as a basis for the development of more detailed standards.

##### 5.2 High level standards

*Note.— Some quantitative text has been placed in square brackets to indicate further consideration is needed.*

5.2.1 There was no consensus on whether there should be consideration of effects of an external fire event on the package. Some believed consideration was needed based on FAA Technical Centre test results which demonstrated that direct involvement in a fire event originated by cargo other than lithium batteries/cells or heat from an externally-suppressed fire could cause batteries to emit gases (see paragraph 6.4.4). Others believed that an external fire standard would be impractical to implement

and suggested that there was no precedent for such a standard for any other types of dangerous goods in the Technical Instructions and was therefore unwarranted.

5.2.2 The meeting agreed the following standards to be appropriate to mitigate the risks posed by a fire developing inside a package containing lithium batteries or cells and determined that they could be met at either the package or battery/cell level:

- a) No hazardous amount of flame is allowed outside the package;
- b) The external surface temperature of the package cannot exceed the amount that would ignite adjacent packing material or cause batteries or cells in adjacent packages to go into thermal runaway [100°C];
- c) No hazardous fragments can exit the package and the package must maintain structural integrity; and
- d) The quantity of flammable vapour must be less than the amount of gas that when mixed with air and ignited could cause a pressure pulse in a [2.83 m<sup>3</sup>] volume that could dislodge the overpressure panels of the compartment or damage the cargo liner [3.45 kPa].

*Note.— [2.83 m<sup>3</sup>] volume is representative of the empty volume in the forward cargo compartment of a 737-200 aircraft with a 70 percent cargo load factor which when ignited could cause a pressure pulse that, according to airframe manufacturers' specifications, could dislodge the overpressure panels of the compartment or damage the cargo liner [3.45 kPa].*

It could be assumed that smoke released outside the package may not be a consideration if the event is contained within the package.

## 6. INTERIM RECOMMENDATIONS

6.1 Noting that the development of performance standards could take several years to develop, the meeting was asked to consider interim measures that operators could consider as part of a risk mitigation strategy. The need for a multi-layered mitigation strategy was emphasized.

6.2 The meeting recommended that operators perform a safety risk assessment in order to establish if they could manage the risks associated with the transport of lithium batteries as cargo on passenger or all-cargo aircraft to an acceptable level of safety. In order to perform a safety risk assessment, information on the types and quantities of lithium batteries and cells being transported would need to be considered. The very limited capabilities of the fire protection system in a lithium battery fire event would also need to be considered.

6.3 The meeting also recommended that guidance on how to conduct and evaluate a safety risk assessment be developed for operators and regulators.

## 6.4 Mitigation measures

6.4.1 Some mitigation measures were suggested, including shipping lithium ion batteries at a reduced state of charge and introducing additional cargo loading controls.

### *Reduced state of charge*

6.4.2 The results of tests conducted at the FAA Technical Centre demonstrated that propagation of thermal runaway did not occur for the majority of cells tested when the state of charge was reduced to 30 per cent. Representatives of the battery industry reported, however, that a 30 per cent state of charge was not appropriate for all battery types and that reducing it to that level could introduce a new safety risk if the battery was not shipped from origin to final destination within a short period of time as their test results had shown the potential for cell degradation at lower states of charge for certain cells and batteries. Regardless, there was agreement that transporting lithium ion batteries at a reduced state of charge could be an effective mitigation measure for certain cells and batteries, whilst recognizing that regulating and overseeing this type of a measure would be difficult.

### *Cargo loading controls*

6.4.3 Other interim measures suggested included additional cargo loading controls such as limiting the number of batteries loaded in one place and segregating them from other dangerous goods. The feasibility of implementing such measures for batteries shipped under Section II of the packing instructions for lithium batteries was raised, recognizing that these batteries are not fully declared dangerous goods. Likewise, illegally undeclared and both intentionally and unintentionally misdeclared lithium batteries effected the feasibility of implementing such measures. The subject of Section II batteries and misdeclared/undeclared batteries was also raised in relation to safety risk assessments and risk mitigation and whether or not an operator could perform an effective assessment and implement effective mitigation measures without knowing what quantities or types of batteries were being offered for transport.

6.4.4 Loading lithium batteries under fire resistant containment covers or unit load devices equipped with fire suppression systems was considered as another potential mitigation measure, although the FAA Technical Centre test results demonstrating the potential for flammable gases emitted from venting lithium ion cells to collect, ignite and result in an explosion in closed compartments needed to be considered. Further testing by the FAA Technical Centre revealed that the gas vented from eight 18650 cells was enough to cause such a condition. It was reported, however, that new developments in fire resistant containment covers and ULD construction for freighter aircraft were showing the potential to safely contain the hazards from lithium ion cells.

## 7. CONCLUSIONS

7.1 The meeting concluded that detailed performance standards based on the high-level standards outlined by the meeting (see paragraph 5.2) needed to be developed. Whether or not an ICAO working group or an external standard setting organization should develop these detailed standards would need to be determined by ICAO. In the meantime, operators should perform a safety risk assessment to determine whether risks associated with the transport of lithium batteries as cargo on passenger or cargo aircraft can be mitigated to achieve an acceptable level of safety before accepting them for transport (see paragraph 6.2).

7.2 Representatives of the airframe manufacturers stated that the concerns raised in their notices to operators and recommendations which were provided to them would remain until safer

conditions were established and implemented to safely transport lithium batteries. A formal proposal would be brought to the Twenty-Fifth Meeting of the Dangerous Goods Panel (DGP/25, Montréal, 19 to 30 October 2015) in line with their recommendations. A representative from the International Federation of Air Line Pilots' Associations (IFALPA) echoed this statement.

7.3 The report of this meeting would be provided to the DGP, the Flight Operations Panel (FLTOPSP) and the Airworthiness Panel (AIRP).

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## APPENDIX A

### LETTER OF INVITATION

Tel.: +1 514 954-8080

Ref.: AN 11/2.12 – ANB/SAF/OPS

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Dear [Name],

I wish to inform you that the International Civil Aviation Organization (ICAO) will convene the Third International Multidisciplinary Lithium Battery Transport Coordination Meeting from 28 to 30 July 2015 at ICAO Headquarters in Montréal, Canada.

The purpose of this meeting will be to continue the work from the recent ICAO Dangerous Goods Panel Working Group Meeting (DGP-WG/15), held from 27 April to 1 May 2015, in Montréal, Canada. Working Paper 4, presented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) and the International Federation of Airline Pilots' Association (IFALPA), facilitated discussion on continuing concerns that existing cargo compartment fire protection systems, as currently certified, are not capable of suppressing or extinguishing a fire involving certain types and quantities of lithium batteries (Attachment A refers).

The ICCAIA recommendations, which IFALPA endorsed, were:

- e) that appropriate packaging and shipping requirements be established to more safely ship lithium ion batteries as cargo on passenger aircraft;
- f) that high density packages of lithium ion batteries and cells (UN 3480) not be transported as cargo on passenger aircraft until such time as safer methods of transport are established and followed; and
- g) that appropriate packaging and shipping requirements be established to more safely ship lithium metal and lithium ion batteries as cargo on freighter aircraft.

Recognizing these safety concerns and Recommendations 2/14, 3/14 and 8/14 from the Second ICAO International Multidisciplinary Lithium Battery Meeting (reproduced in Attachment B), the DGP-WG/15 fully supported the need to develop performance-based Standards founded on the principle that hazardous effects from the batteries would be contained within the package. The DGP-WG/15 also determined the need for an informal working group to address these recommendations specifically and developed Terms of Reference (see Attachment C). An extract from the report of the DGP-WG/15 Meeting is presented in Attachment D.

ICAO has determined that the most effective means to address the recommendations of the ICCAIA and related recommendations from the Second ICAO International Multidisciplinary Lithium Battery Meeting as well as the DGP's request for an informal working group is to call a third meeting of the multidisciplinary group. This initiative will, in addition, begin to address the request of the Air

Navigation Commission to develop a comprehensive strategy for the carriage of lithium batteries on both passenger and cargo aircraft.

Accordingly, the Third International Multidisciplinary Lithium Battery Transport Coordination Meeting will consider Recommendations 2/14, 3/14 and 8/14 from the Second International Multidisciplinary Lithium Battery Transport Coordination Meeting with particular emphasis on the development of a Standard for performance-based packaging for lithium batteries. This will be through input from experts in the fields of dangerous goods, safety management, operations and airworthiness (particularly aircraft cargo compartment fire safety) and from representatives of the aircraft and battery manufacturing industries. The report of the meeting will be submitted to the DGP for their consideration at the Twenty-fifth Meeting of the Panel (Montréal, 19 to 30 October 2015) and to the Flight Operations and Airworthiness Panels, for their information, and action if appropriate.

Noting the multidisciplinary nature of the meeting and that your State has experts on the Airworthiness, Dangerous Goods and/or Flight Operations Panels, I would like to extend an invitation and ask that you select appropriate representatives to attend this meeting. Please confirm by e-mail at [ops@icao.int](mailto:ops@icao.int) by **3 July 2015**.

Further details of the meeting, which will be conducted in English, together with the agenda will be circulated shortly. The ICAO focal point will be Mr. John Illson, Chief, Operational Safety Section. Should you require further information, please contact his office by e-mail at [ops@icao.int](mailto:ops@icao.int).

I wish to thank you for your support and look forward to your active participation in this event.

Yours sincerely,

Stephen P. Creamer  
Director  
Air Navigation Bureau

**Enclosures:**

- A — DGP-WG/15-WP/4
  - B — Extract of Recommendations of the Second International Multidisciplinary Lithium Battery Transport Coordination Meeting
  - C — Terms of Reference
  - D — Extract from DGP-WG/15 Report
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## APPENDIX B

## AGENDA

**THIRD INTERNATIONAL MULTIDISCIPLINARY  
LITHIUM BATTERY TRANSPORT COORDINATION MEETING**

Montréal, Canada, 28 to 30 July 2015

<i>Day 1 – Tuesday, 28 July 2015</i>	
0900 – 0920	<ul style="list-style-type: none"> <li>• Welcome and introduction</li> </ul>
0920 – 0940	<ul style="list-style-type: none"> <li>• Overview of goals and objectives               <ul style="list-style-type: none"> <li>○ Develop way forward based on:                   <ul style="list-style-type: none"> <li>▪ Recommendations from the second meeting</li> <li>▪ ICCAIA recommendations</li> </ul> </li> </ul> </li> </ul>
0940 – 1030	<ul style="list-style-type: none"> <li>• Discuss interim recommendations               <ul style="list-style-type: none"> <li>○ Passenger aircraft ban</li> <li>○ State of charge</li> <li>○ Cargo loading controls/other</li> </ul> </li> </ul>
<b><i>1030 – 1050</i></b>	<b><i>Coffee Break</i></b>
1050 – 1230	<ul style="list-style-type: none"> <li>• Continue discussion</li> </ul>
<b><i>1230 – 1400</i></b>	<b><i>Lunch Break</i></b>
1400 – 1520	<ul style="list-style-type: none"> <li>• Discuss the bounds (scope) of a performance packaging standard               <ul style="list-style-type: none"> <li>○ Define densely packaged</li> <li>○ Discuss potential impact on Section 2 and any other UN standards</li> </ul> </li> </ul>
<b><i>1520 – 1540</i></b>	<b><i>Coffee Break</i></b>
1540 – 1700	<ul style="list-style-type: none"> <li>• Continue discussion</li> </ul>

<i>Day 2 – Wednesday, 29 July 2015</i>	
0900 – 1030	<ul style="list-style-type: none"> <li>• Discuss performance packaging standard               <ul style="list-style-type: none"> <li>○ Containment of thermal runaway in package                   <ul style="list-style-type: none"> <li>▪ Containment pass/fail</li> <li>▪ Battery state of charge</li> <li>▪ Non-propagating cells</li> </ul> </li> </ul> </li> </ul>
<i>1030 – 1050</i>	<i>Coffee Break</i>
1050 – 1230	<ul style="list-style-type: none"> <li>• Continue discussion</li> </ul>
<i>1230 – 1400</i>	<i>Lunch Break</i>
1400 – 1520	<ul style="list-style-type: none"> <li>• Continue discussion</li> </ul>
<i>1520 – 1540</i>	<i>Coffee Break</i>
1540 – 1700	<ul style="list-style-type: none"> <li>• Discuss performance packaging standard               <ul style="list-style-type: none"> <li>○ External fuel fire requirement</li> <li>○ Alternate means of compliance</li> </ul> </li> </ul>

<i>Day 3 – Thursday, 30 July 2015</i>	
0900 – 1030	<ul style="list-style-type: none"> <li>• Continue discussion on external fuel fire requirement</li> </ul>
<b><i>1030 – 1050</i></b>	<b><i>Coffee Break</i></b>
1050 – 1230	<ul style="list-style-type: none"> <li>• Discuss system safety assessment for cargo aircraft</li> </ul>
<b><i>1230 – 1400</i></b>	<b><i>Lunch Break</i></b>
1400 – 1520	<ul style="list-style-type: none"> <li>• Develop recommendations regarding: <ul style="list-style-type: none"> <li>○ Any short term/interim action</li> <li>○ Performance packaging standard</li> <li>○ System safety assessment</li> </ul> </li> </ul>
<b><i>1520 – 1540</i></b>	<b><i>Coffee Break</i></b>
1540 – 1700	<ul style="list-style-type: none"> <li>• Continue development of recommendations</li> </ul>

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**APPENDIX C**  
**LIST OF ATTENDEES**

<b>STATE/ORGANIZATION</b>	<b>NAME OF ATTENDEE</b>	<b>E-MAIL ADDRESS</b>
BRAZIL	Paulo Fabrício Macário	<a href="mailto:paulo.fabricio@anac.gov.br">paulo.fabricio@anac.gov.br</a>
CANADA	France Bernier	<a href="mailto:france.bernier@tc.gc.ca">france.bernier@tc.gc.ca</a>
CANADA	Marc Casas Cordero	<a href="mailto:marc.casas-cordero@tc.gc.ca">marc.casas-cordero@tc.gc.ca</a>
CHINA	Pui Shan (Candy) Chan	<a href="mailto:candy_chan@cathaypacific.com">candy_chan@cathaypacific.com</a>
CHINA	Chunyu Ding	<a href="mailto:cding@icao.int">cding@icao.int</a>
JAPAN	Hiromitsu Sugimoto	<a href="mailto:sugimoto-h2vt@mlit.go.jp">sugimoto-h2vt@mlit.go.jp</a>
JAPAN	Hajime Yoshimura	<a href="mailto:HYoshimura@icao.int">HYoshimura@icao.int</a>
SINGAPORE	Alan Foo	<a href="mailto:afoo@icao.int">afoo@icao.int</a>
SINGAPORE	Nicholas Lum	<a href="mailto:NLum@icao.int">NLum@icao.int</a>
UNITED KINGDOM	Ian Bryer	<a href="mailto:ian.bryer@vca.gov.uk">ian.bryer@vca.gov.uk</a>
UNITED KINGDOM	Ross McLachlan	<a href="mailto:ross.mclachlan@caa.co.uk">ross.mclachlan@caa.co.uk</a>
UNITED STATES	Jeff Gardlin	<a href="mailto:jeff.gardlin@faa.gov">jeff.gardlin@faa.gov</a>
UNITED STATES	Shane Kelley	<a href="mailto:shane.kelley@dot.gov">shane.kelley@dot.gov</a>
UNITED STATES	Kevin Leary	<a href="mailto:kevin.leary@dot.gov">kevin.leary@dot.gov</a>
UNITED STATES	Janet McLaughlin	<a href="mailto:Janet.McLaughlin@faa.gov">Janet.McLaughlin@faa.gov</a>
UNITED STATES	Timothy Shaver	<a href="mailto:Tim.shaver@faa.gov">Tim.shaver@faa.gov</a>
EASA	Enzo Canari	<a href="mailto:enzo.canari@easa.europa.eu">enzo.canari@easa.europa.eu</a>
FAA TECH CENTRE	Richard Hill	<a href="mailto:richard.hill@faa.gov">richard.hill@faa.gov</a>
FAA TECH CENTRE	Harry Webster	<a href="mailto:harry.webster@faa.gov">harry.webster@faa.gov</a>
FEDEX	Mark Petzinger	<a href="mailto:mrpetzinger@fedex.com">mrpetzinger@fedex.com</a>
GEA	Alex McCulloch	<a href="mailto:alex.mcculloch@europe.ups.com">alex.mcculloch@europe.ups.com</a>
IATA	Dave Brennan	<a href="mailto:Brennand@iata.org">Brennand@iata.org</a>
IATA	Mike Comber	<a href="mailto:comberm@iata.org">comberm@iata.org</a>
IATA	Patrick Oppenheimer	<a href="mailto:pat.oppenheimer@fedex.com">pat.oppenheimer@fedex.com</a>
IATA	Rodolfo Quevedo	<a href="mailto:quevedor@iata.org">quevedor@iata.org</a>
IATA	Marc Stumboeck	<a href="mailto:marc.stumboeck@dlh.de">marc.stumboeck@dlh.de</a>
ICCAIA	Doug Ferguson	<a href="mailto:douglas.e.ferguson@boeing.com">douglas.e.ferguson@boeing.com</a>
ICCAIA	Paul Rohrbach	<a href="mailto:Paul.Rohrbach@airbus.com">Paul.Rohrbach@airbus.com</a>
IFALPA	Mark Rogers	<a href="mailto:dgchair@ifalpa.org">dgchair@ifalpa.org</a>

STATE/ORGANIZATION	NAME OF ATTENDEE	E-MAIL ADDRESS
IFALPA	Scott Schwartz	<a href="mailto:scott.schwartz@alpa.org">scott.schwartz@alpa.org</a>
PRBA/NEMA	Marcus Boolish	<a href="mailto:marckboolish@energizer.com">marckboolish@energizer.com</a>
PRBA/NEMA	Claude Chanson	<a href="mailto:cchanson@rechargebatteries.org">cchanson@rechargebatteries.org</a>
PRBA/NEMA	George Kerchner	<a href="mailto:Gkerchner@wileyrein.com">Gkerchner@wileyrein.com</a>
PRBA/NEMA	Celina Mikolajczak	<a href="mailto:celinam@teslamotors.com">celinam@teslamotors.com</a>
PRBA/NEMA	Kathleen O'Shei	<a href="mailto:koshei@greatbatch.com">koshei@greatbatch.com</a>
PRBA/NEMA	Craig Updyke	<a href="mailto:Craig.Updyke@Nema.org">Craig.Updyke@Nema.org</a>
UPS	Keith Stehman	<a href="mailto:kstehman@ups.com">kstehman@ups.com</a>
ICAO	Henry Defalque	<a href="mailto:HDefalque@icao.int">HDefalque@icao.int</a>
ICAO	Elizabeth Gnehm	<a href="mailto:EGnehm@icao.int">EGnehm@icao.int</a>
ICAO	John Illson	<a href="mailto:jillson@icao.int">jillson@icao.int</a>
ICAO	Lynn McGuigan	<a href="mailto:LMcGuigan@icao.int">LMcGuigan@icao.int</a>
ICAO	Katherine Rooney	<a href="mailto:KRooney@icao.int">KRooney@icao.int</a>
ICAO	Shyh Syaun Sebastian Wong	<a href="mailto:SWong@icao.int">SWong@icao.int</a>
ICAO	Rosa Tajés	<a href="mailto:rtajes@icao.int">rtajes@icao.int</a>
ICAO	Yusuke Urano	<a href="mailto:yurano@icao.int">yurano@icao.int</a>

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## APPENDIX D

## EXTRACT FROM DGP-WG/15 REPORT

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**3.5.1.2.1 Transport of Lithium Batteries as Cargo via Air  
(DGP-WG/15-WP/4 and DGP-WG/15-WP/33)**

3.5.1.2.1.1 Continued concerns with respect to cargo compartment fire protection, particularly in relation to the carriage of high density packages of lithium batteries as cargo, were raised by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) and the International Federation of Air Line Pilots' Associations (IFALPA). Recommendations for addressing these concerns were presented to the working group.

3.5.1.2.1.2 ICCAIA's position was that the fire protection capabilities and certification of original equipment manufacturers' (OEMs) airframes and systems were developed considering the carriage of general cargo and not the unique hazards associated with the carriage of dangerous goods, including lithium batteries. Test data was cited which identified that existing cargo compartment fire protection systems certified to European and American regulations were unable to suppress or extinguish a fire involving significant quantities of lithium batteries, resulting in reduced time for safe flight and landing of an aircraft to a diversion airport.

3.5.1.2.1.3 Concerns related to lithium battery hazards included:

- a) the inability of packaging currently required by the Technical Instructions to contain a lithium battery fire or to prevent the propagation between adjacent packages of batteries;
- b) the potential for an uncontrolled lithium battery fires to negate the capability of current aircraft cargo fire protection systems, leading to a catastrophic failure of the airframe; and
- c) new test results from the Federal Aviation Administration (FAA) William J. Hughes Technical Centre (FAA Tech Centre) which demonstrated the potential for electrolyte gases exhausted during the propagation of both lithium metal and lithium ion batteries to create an explosive atmosphere regardless of the presence of Halon when contained inside an enclosed space such as a unit load device or cargo compartment.

3.5.1.2.2 Applying the safety risk model provided in the *Safety Management Manual (SMM)* (Doc 9859) (hereafter referred to as the "Safety Management Manual"), the presenters determined that immediate action to mitigate the unacceptable risks posed by lithium batteries was necessary.

3.5.1.2.3 The ICCAIA recommendations, which IFALPA endorsed, were:

- a) that appropriate packaging and shipping requirements be established to more safely ship lithium ion batteries as cargo on passenger aircraft;
- b) that high density packages of lithium ion batteries and cells (UN 3480) not be transported as cargo on passenger aircraft until such time as safer methods of transport were established and followed; and
- c) that appropriate packaging and shipping requirements be established to more safely ship lithium metal and lithium ion batteries as cargo on freighter aircraft.

3.5.1.2.4 A separate working paper submitted by IFALPA recommended extending the restriction in sub-paragraph b) above to all-cargo aircraft. It was stated that while lithium ion batteries were carried as cargo on both passenger and cargo aircraft, the majority of large shipments were transported on cargo aircraft. This, combined with the fact that cargo aircraft were not required to be outfitted with cargo compartments having an active fire suppression system, made the risk to cargo aircraft even greater than to passenger aircraft. It was argued that the principles in the Safety Management Manual for States to develop practices to ensure the safe operation of aircraft did not distinguish between passenger and cargo aircraft. For this reason, IFALPA also recommended that the current prohibition on UN 3090 — **Lithium metal batteries** from transport on passenger aircraft be extended to all-cargo aircraft.

3.5.1.2.5 Clarification on what was meant by the term “high density” was sought during discussion of the working paper. It was explained that high density was meant to describe quantities of lithium batteries which had the potential to overwhelm the cargo compartment fire protection features. The outcome of a thermal runaway event had been demonstrated to be variable depending on battery chemistry, cargo compartment characteristics, and loading configurations. Tests had demonstrated that some configurations with an accumulation of packages containing less than 5 kg each of 18650 lithium ion cells had the potential to lead to significant or catastrophic damage of an aircraft. Quantifying a limitation for “high density” that would apply to every situation was therefore impossible. It was suggested that the inability to determine a safe limit for every situation was the reason that several large operators had recently introduced complete bans on the transport of lithium ion batteries as cargo.

3.5.1.2.6 A question was raised in relation to how the ICCAIA determined that the likelihood of a cargo fire involving lithium batteries was “occasional” when conducting their risk assessment. Others also questioned this value, suggesting that a large number of lithium battery incidents involved undeclared or non-compliant batteries. It was explained that the value was based on reports of three aircraft accidents involving lithium batteries which supported the description for “occasional” provided in Doc 9859 as an event that occurred infrequently. It was stressed that the likelihood was not based solely on a lithium battery *causing* a fire, it was based on the potential for a lithium battery to be *involved* in a fire.

3.5.1.2.7 Another panel member expressed concern that many of the operators he spoke to within his State had not undertaken a risk assessment on the likely consequences and impacts before imposing a prohibition. A team in his State had conducted their own risk assessment on the transport of lithium metal and ion batteries. Their findings were that the risks were heightened either from hidden dangerous goods which included lithium batteries which could become the source of a fire or from other dangerous goods which could cause a fire and threaten the shipment of declared batteries. He suggested that a ban on lithium batteries would have the unintended consequence of more undeclared shipments of lithium batteries and therefore result in an increased risk. Some expressed disagreement with the notion that a large number of people or organizations would break the law and continue to ship batteries if they were banned. They reported that data from their States indicated that the percentage of deliberate non-compliance was low. The Secretary reminded the working group of the need for data. She emphasized

that the ANC and the Council had become increasingly concerned when arguments were made without data to substantiate them.

3.5.1.2.8 The idea that undeclared and mis-declared lithium batteries were a risk was not disputed by anyone; however, those not supporting the notion that a prohibition would increase non-compliance and therefore the risk stressed that the potential for a suppressed fire being an ignition source for batteries to go into thermal runaway applied to all batteries regardless of whether or not they were compliant. They deemed the continued allowance of unrestricted quantities of even compliant lithium batteries in cargo compartments knowing that a fire could exceed the capabilities of the fire protection system to be unacceptable.

3.5.1.2.9 Those who supported the need for immediate action to mitigate the risks emphasized that their goal was not to ban the transport of lithium batteries permanently but rather to find a way to transport them safely. Recognizing the need for a layered approach towards mitigation, it was suggested that coordination with the Flight Operations (FLTOSP) and Airworthiness Panels (AIRP) would be necessary to accomplish this. The Secretariat was asked to provide feedback on how this could be accomplished. She noted that the information contained in DGP-WG/15-WP/4, including the position of ICCAIA and IFALPA, had been provided to FLTOSP and AIRP. Both panels were also provided with the recommendations developed by the Second International Multidisciplinary Lithium Battery Transport Coordination Meeting (Cologne, Germany, 9 to 11 September 2014 (subsequently referred to as the Second Multidisciplinary Lithium Battery Meeting or Multidisciplinary Meeting)). She would be providing the DGP with feedback from both panels once she had received it.

3.5.1.2.10 Although there was disagreement on the level of risk posed by fully compliant shipments of lithium batteries, there were no objections to the problem statement developed by the Multidisciplinary Meeting which affirmed that a fire involving significant quantities of lithium batteries (UN 3090 and UN 3480) could exceed the fire suppression capability of the aircraft and could lead to a catastrophic failure of the air frame. The working group fully supported the need to develop performance-based standards based on the principle that hazardous effects from the batteries would be contained within the package. Terms of reference for a group of experts made up of all interested parties were developed. The group was tasked with providing subject matter expertise on aircraft cargo compartment fire safety and the safe transport of lithium batteries in aircraft. The terms of reference are provided in Appendix D to this report. They were developed with the aim of allowing for a flexible solution that would address the varying degree of risks posed by different battery types and sizes. The Secretary asked that DGP members indicate their interest in attending such a meeting. It was noted that a multidisciplinary approach employing a layered mitigation approach was necessary to address risks posed by lithium batteries. This would involve focusing on the source of the threat (battery) and expanding outward (i.e. packaging, cargo unit load device, cargo compartment, aircraft). For this reason, the Secretary noted participation from FLTOSP and AIRP members would be essential

3.5.1.2.11 Recognizing that the joint ICCAIA/IFALPA working paper recommended that high density packages of lithium ion batteries and cells should not be transported as cargo on passenger aircraft until such time as safer methods of transport were established and followed, the working group was asked to indicate their level of support for this recommendation. The member nominated by IFALPA reminded the group that his organization recommended extending this prohibition to cargo aircraft for lithium ion batteries and to also impose a prohibition on lithium metal batteries on cargo aircraft. Some panel members, while not opposing the joint recommendation, were unable to support it on the basis that it had not been identified as a formal proposal in accordance with standard DGP procedures, and therefore there had been insufficient time to conduct the necessary consultation with relevant experts within their States. Some of these members reiterated the argument that a prohibition would only increase the number of undeclared shipments and also stated that they could not support a proposal referring to high density

packages without a clear definition for the term. The IFALPA/ICCAIA representatives repeated that it was impossible to determine a quantitative limit for high density that would apply to every situation because of the number of variables involved. These included differing battery chemistries, differing characteristics of cargo compartments, and differing loading configurations. This was exacerbated by the fact that there was no way to control the number of packages of Section II batteries loaded on the aircraft.

3.5.1.2.14 The IFALPA representative expressed disappointment with the lack of support for the recommendations of his organization and of the ICCAIA. Representatives of both organizations indicated that a formal proposal would be developed for DGP/25 which would allow adequate time for consultation with States. Both organizations would participate fully in the working group on performance-based packaging standards and would ensure that their proposal would take the recommendations of that working group into account. The ICCAIA representatives acknowledged the concerns raised in relation to the lack of a quantifiable definition for high-density packages and offered to work on further refinement of the concept for consideration at DGP/25.

3.5.1.2.13 Dates and a venue for the working group tasked with performance-based packaging standards for the safe transport of lithium batteries by air would be determined by the Secretariat in the near-term through coordination with the members involved.

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