DANGEROUS GOODS PANEL (DGP)
MEETING OF THE WORKING GROUP OF THE WHOLE

Montréal, 15 to 19 April 2013

Agenda Item 2: Development of recommendations for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2015-2016 Edition

2.8 : Part 8 — Provisions Concerning Passengers and Crew

MEDICAL DEVICES CONTAINING LITHIUM BATTERIES

(Presented by J. McLaughlin)

SUMMARY

This paper provides supplemental information and analysis to WG/13-WP/19 proposing revisions to the carriage of medical devices containing lithium batteries in Part 8 of *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) (TIs).

1. INTRODUCTION

1.1 Working Paper WG/13-WP/19 notes that the current TIs limit spare lithium ion batteries intended for use with portable medical electronic devices to two spares while no such limit is imposed on spares not exceeding 100 Wh intended for use with portable electronic devices carried for personal use. Taking into account that the provisions of the TIs apply to the batteries and not to the equipment in which the batteries are used, it is illogical to place more restrictive limitations on the passenger carriage of lithium ion batteries intended for use with portable medical electronic devices than for other devices.

2. ISSUE WITH A LIMIT OF TWO SPARE LITHIUM ION BATTERIES FOR MEDICAL DEVICES

2.1 The Panel has already recognized the growing use of lithium batteries in portable medical electronic devices and the TIs permit their carriage by airline passengers with certain limits. However the current limits on the number of spare batteries (≤100 Wh) permitted by airline passengers has the unintended effect of precluding the effective use of those medical devices. To illustrate this, the U.S. examined the impact on passengers requiring medical oxygen inflight who use Portable Oxygen Concentrators (POCs). POCs are small, portable devices that work by separating oxygen from nitrogen and other gases in the air and provide the user with oxygen at a concentration of more than 90 percent. In many cases, POCs have replaced oxygen cylinders as the preferred option for airline passengers who

require medical oxygen. This both increases passenger convenience and reduces potential risks aboard aircraft associated with the use of pressurized oxygen cylinders.

2.2 Most POCs today are powered by lithium ion batteries not exceeding 100 watt-hours and while in use on the aircraft, the POCs can operate on batteries or on aircraft electrical power. The number of lithium ion batteries needed varies based on the duration of the trip planned, the nominal life of the battery, and the maximum oxygen flow rate established by the user's doctor. However, for a POC to be effective on longer flights (i.e. a flight lasting 6 + hours) a passenger would need more than two spare batteries to cover the duration of the trip and any unanticipated delays. The current limit on spare lithium batteries for portable medical electronic devices precludes the carriage of sufficient batteries to power POCs for the duration of such journeys.

2.3 To further illustrate the need for sufficient battery life on typical flights, information obtained from the U.S. DOT Bureau of Transportation Statistics indicates that in 2011, nearly 54% of international departures from the U.S. involved flight durations longer than 6 hours and nearly 11.000 passengers on such flights required supplemental oxygen (a figure that is expected to rise). Information obtained from POC manufacturers indicates that the average battery life at the typical setting used inflight would require a minimum of four spare batteries, in addition to the POC's internal battery, in order to meet the minimum that may be required for a six-hour flight.

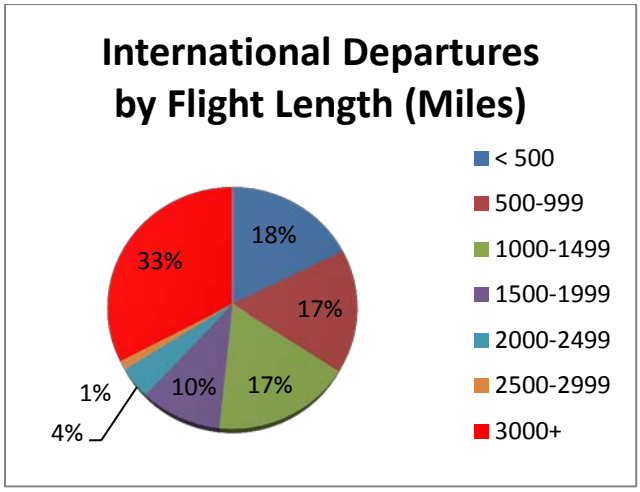
2.4 The Panel is invited to review the supporting data and to consider aligning the provisions for the carriage of spare lithium ion batteries not exceeding 100 watt-hours used for portable medical electronic devices with those used for portable electronic devices.

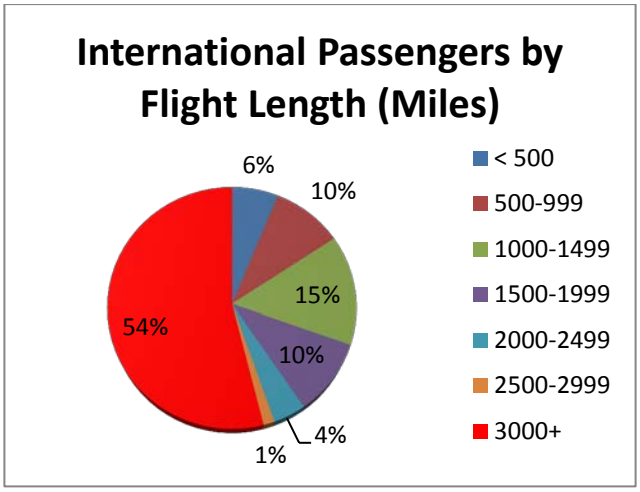
3. SUPPORTING DATA

International Departures and Passengers by Length of Flight, 2011

Flight Length (miles)	Departures		Passengers	
	Number	Percent	Number	Percent
< 500	229,526	17.7%	10,332,493	6.2%
500-999	214,847	16.5%	15,718,361	9.5%
1000-1499	226,617	17.4%	24,443,079	14.7%
1500-1999	133,017	10.2%	16,846,279	10.1%
2000-2499	54,648	4.2%	6,803,344	4.1%
2500-2999	15,047	1.2%	2,303,019	1.4%
3000+	424,978	32.7%	89,550,143	53.9%
Total	1,298,680	100.0%	165,996,718	100.0%

Note: Excludes flights on aircraft with fewer than 30 seats.
Source: BTS T-100 Segment database tabulations.





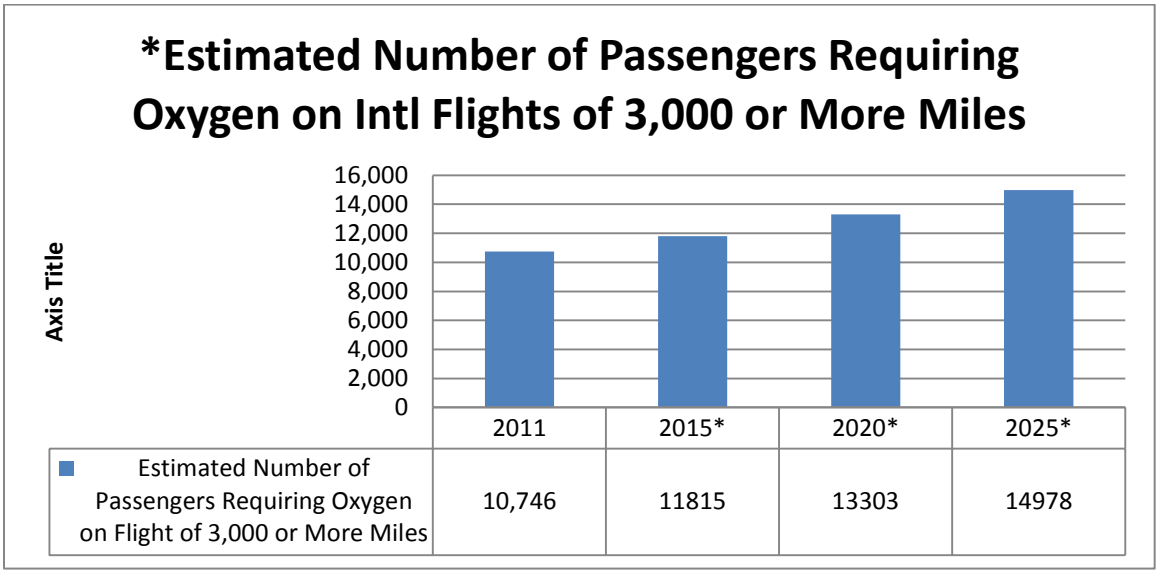
2011

1. Total number/percentage of **passenger enplanements on international flights of 3,000 or more miles in 2011 was 89,550,143 or 54%**.

2. Information obtained from Airlines for America (A4A) through DOT's 2005 rulemaking on medical oxygen indicates that the **oxygen service rate for enplanements is 0.012%**

3. Estimated number of passengers who required oxygen on international flights of 3,000 or more miles in 2011 is **10,746 (89,550,143 enplanements x .012% oxygen service rate).**

4. Information obtained from A4A through DOT's 2005 rulemaking on medical oxygen indicates that the number of oxygen enplanements is expected to **increase at a rate of 2.4% per year**.



5. Average expected flight duration for a flight of 3,000 is **6 hours**.

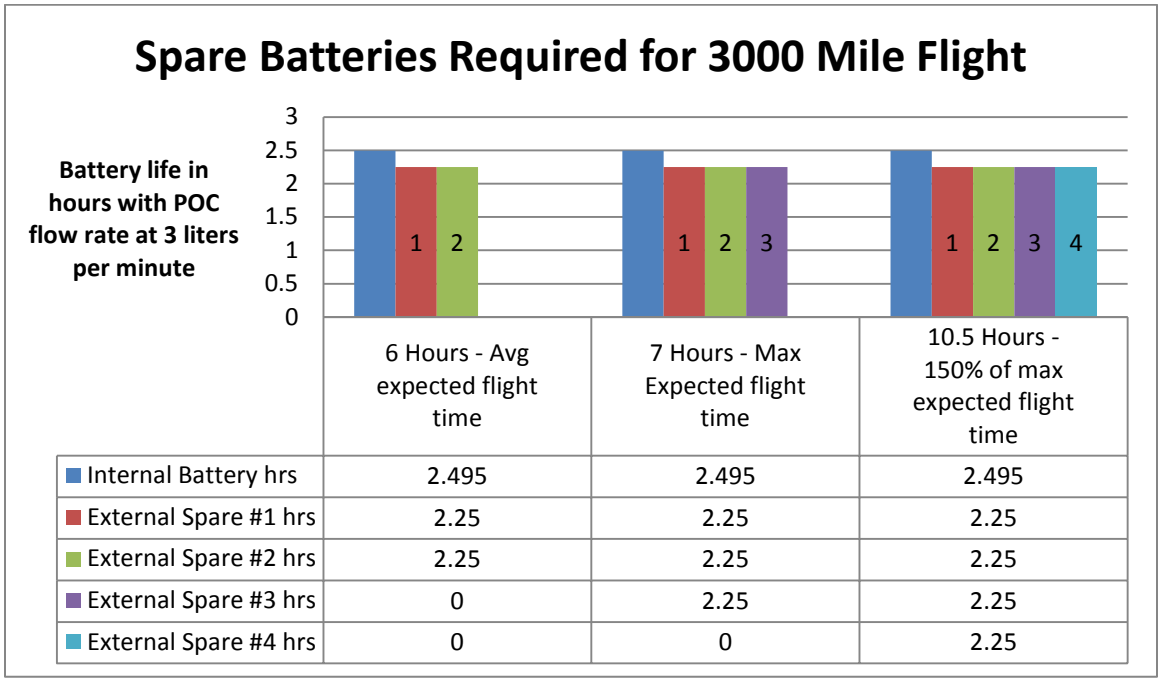
6. Expected maximum flight duration (including ground taxi time and anticipated traffic delays) for a flight of 3,000 miles is **7 hours**.

7. 150% of maximum expected flight duration for a flight of 3,000 miles is **10.5 hours**.

8. Average flight air speed is **500 mph**.

9. Typical POC flow rate setting during a flight – **3 liters per minute (LPM)**.

10. Average POC internal/spare battery life at 3 LPM setting – **2.495 hrs. per internal/spare battery and 2.25 hrs.** per external battery.



	6 Hours - Avg expected flight time	7 Hours - Max Expected flight time	10.5 Hours - 150% of max expected flight time
Internal Battery hrs	2.495	2.495	2.495
External Spare #1 hrs	2.25	2.25	2.25
External Spare #2 hrs	2.25	2.25	2.25
External Spare #3 hrs	0	2.25	2.25
External Spare #4 hrs	0	0	2.25

11. Data about estimated average POC battery life.

Estimated Average POC Battery Life

POC Models	**Hours of POC Battery Life @ 3 LPM setting**	**Hours of Additional POC Battery Life @ 3 LPM setting with external battery**
AirSep FreeStyle	2.0	--
AirSep FreeStyle 5	1.5	--
AirSep LifeStyle	0.83	--
Inogen One	2.5	--
Inogen One G2 12 Cell	2.7	--
Inogen One G3 8 Cell	3.0	--
Inova Labs LifeChoice	2.0	--
Inova Labs LifeChoice	5.0	(External battery) 2.0
Invacare XPO2	2.0	--
Oxus RS-00400	2.5	--
Precision Medical EasyPulse	2.5	(External battery) 2.5
Philips Respironics EverGo	3.0	--
DeVilbiss Healthcare iGo	4.0	--
Invacare Solo2	3.0	--
Oxlife Independence	1.4	--
Philips Respironics SimplyGo	3.1	--
Sequal Eclipse	3.0	
Sequal Saros	0.88	
Average Hours of POC Battery Life @ 3 LPM setting	**2.495 hrs. per internal/spare battery**	**2.25 additional hrs. per external battery**

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