Halon 1301 Contamination in Commercial Aviation

Presented by

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Abstract

▶ Halon 1301 has been used in commercial aviation fire suppression for decades and will likely be an important part of the industry for at least another decade or two. Halon 1301 currently installed on the world's aviation fleet, estimated to be approximately 8 million pounds, has been recycled at least twice to comply with both FAA and US DOT system servicing regulations.

▶ Data collected over the past five years shows a significant amount of Halon 1301 to be contaminated (i.e., product that does not meet ASTM purity specifications.) It is unclear whether this halon is contaminated while on the plane or becomes contaminated during the on-ground handling process.

▶ This presentation will discuss the data collection, its implications for future halon supplies and what can be done to prevent further contamination.

Presenter's Bio

- John Demeter, president and founder of Wesco Hmb, Inc. has spent 45 years in the fire suppression industry – 15 as president of RC Industries, a manufacturer of hand portable fire extinguishers, and 30 as president of Wesco. In 2001 he founded Wesco Oxygen, a distributor of medical oxygen, which was sold to Linde Gas in 2006. He is also one of the founding partners of Comprehensive Fire Technologies, a special hazard fire suppression company. He is a past president of the Fire Suppression System Association (FSSA) and has been an active member of their board of directors for over 10 years. He is currently chair of the FSSA's Education Committee. John also sits on the boards of the Halon Alternative Research Corporation (HARC), where he serves as secretary/treasurer and the Halon Recycling Corporation (HRC). He also served as a member of the Federal Aviation Administrations Halon Aviation Rulemaking Committee (2014).

- John Received his bachelor's degree in Government from Monmouth University and his master's in international Affairs from the City University of New York. He and his wife of 44 years live in New Jersey and have two grown children.

Why This is Important?

▶ 28,000 Aircraft in the Worldwide Commercial Fleet

▶ Containing a total of approximately 5 million pounds of Halon 1301

▶ Expected to grow to about 9 million pounds of Halon 1301 by 2040

▶ Every pound in use, and every pound of projected use, was (will be) taken from a prior suppression application

▶ It's likely to probable that the halon contained in these aviation fire bottles was handled, removed, recycled and returned to the aircraft at least 2 if not 3 times

▶ Leading to a possible high risk of contamination – now and in the future

ASTM D5632-17

Halon Analysis Report

Analysis

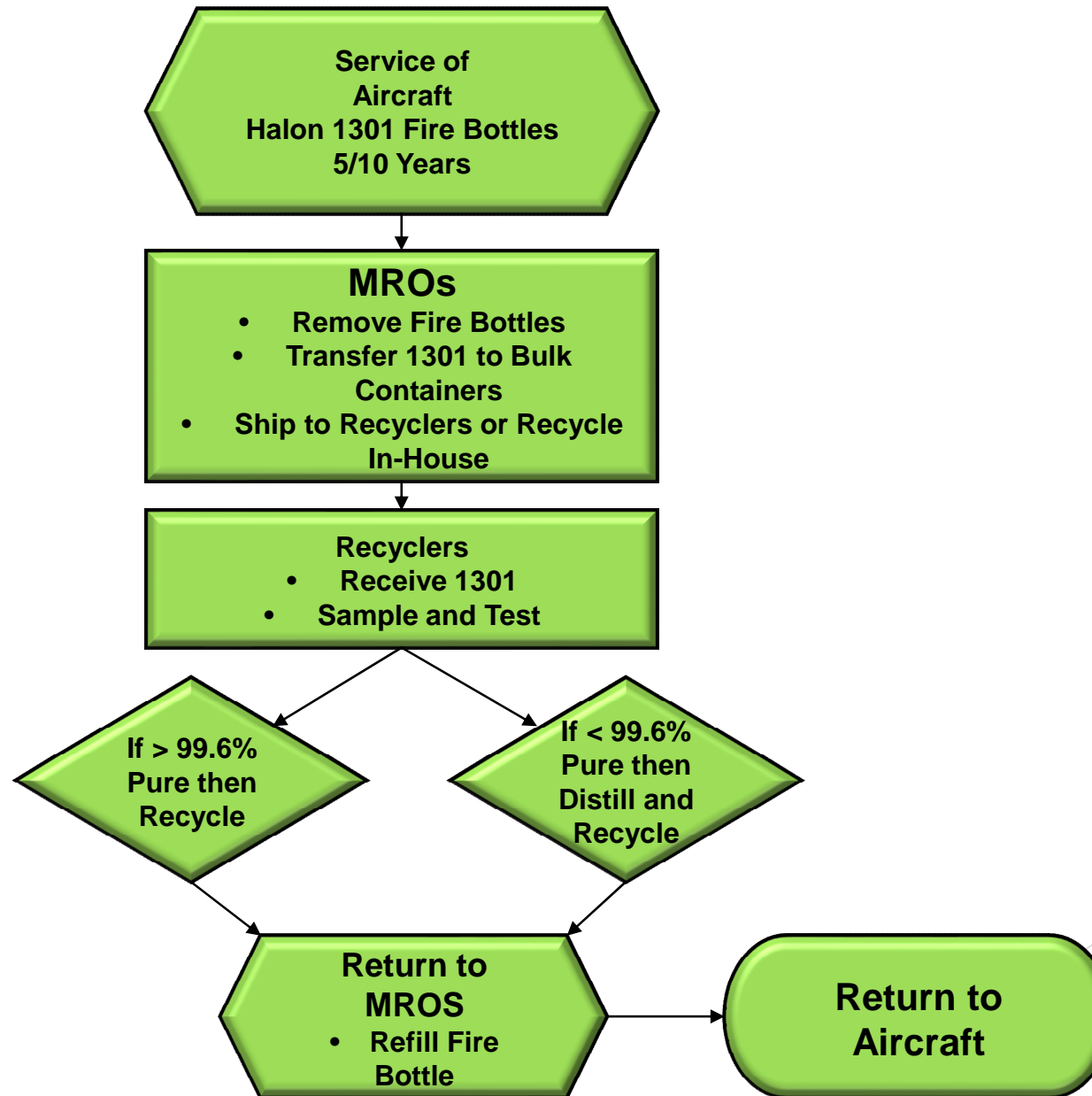| Analysis	Sample Results	ASTM D5632-17 Type I and II Specs.	Results Pass / Fail
Purity (mole %)	99.75	99.6 Min.	PASS
Acidity (parts per million by weight, as HBr)	<0.35	3.0 Max. (1)	PASS
Halogen Ion	PASS	Pass	PASS
Water (parts per million by weight)	10	10 Max.	PASS
NAG (% by volume)	0.69	1.5 Max. (2)	PASS
Nonvolatile Residue (% by weight)	0.002	0.01 Max.	PASS
Suspended Matter or Sediment	NONE VISIBLE	None Visible	PASS
Color (APHA#)	5	Report Value	N/A

(1) <0.2 is below lower detection limit, (2) <0.1 is below lower detection limit

Other

Organic Impurities: Trace organic impurities present are:

R-12:	0.12%	R-125:	0.05%
Methanol:	0.02%	R-22:	0.02%
R-13:	0.02%	R-23:	0.01%
R-12B1:	0.01%		

Aviation Recovery, Recycling & Reclamation Process

In-Bound Sample Protocol

Serial Number	Order #	Received Date	Wesco Weigh-In Gross	Net	Lab Ref #	Result	Purity	R-125	R-11	R-12	R-12B1	R-12B2	R-22	R-13	R-134a	R-143a	R-227	R-113	R-114	R-23	R-30B1	MEOH	UNKWN
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.41	0.01		0.05	0.07		0.03	0.01			0.05		0.01	0.01		0.29	0.05
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	98.46	0.01		0.10	0.03		0.02	0.02			0.03		0.02	0.01		1.27	0.02
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.37	0.11		0.12	0.13		0.03	0.02	0.08					0.01		0.06	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.29	0.52		0.05	0.02		0.04	0.01	0.05		0.02	0.01				0.02	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.51	0.02		0.04	0.04		0.03	0.01	0.01		0.02			0.01		0.29	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.45	0.02		0.05	0.02		0.04	0.01	0.01		0.03	0.01				0.29	0.04
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	98.89	0.24		0.05	0.02		0.06	0.01	0.02		0.02			0.01		0.04	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.47	0.32		0.05	0.02		0.04	0.01	0.01		0.02	0.01				0.03	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	98.97	0.82		0.04	0.04		0.03	0.01	0.01		0.02			0.01		0.04	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.33	0.42		0.05	0.05		0.04	0.01	0.01		0.02			0.01		0.05	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.50	0.02		0.05	0.02		0.04	0.01	0.01		0.02			0.01		0.30	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	70.95	0.01			0.04		0.04	0.01	28.88		0.01		0.01			0.01	0.03
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	69.46	0.01		0.03	0.04		0.02	0.01	30.37		0.01					0.01	0.01
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	98.67	0.01	0.01	0.07	0.12	0.01	0.03	0.01	0.01		0.03					1.02	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.40	0.03		0.07	0.09		0.02	0.01	0.01		0.04		0.01			0.31	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	PASS	99.76		0.01	0.02	0.04	0.11		0.02					0.02			0.01	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	96.67	0.01	0.02	0.05	2.95	0.01	0.03	0.01	0.01		0.03		0.05	0.01		0.02	0.09
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.42	0.01	0.01	0.16	0.17		0.02	0.01	0.01		0.03	0.01				0.14	
CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	CNFDL	FAIL	99.49	0.01		0.09	0.14		0.04	0.01	0.02		0.03	0.01				0.14	

Passed Purity : 1%

Failed Purity : 99%

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CLEAN FIRE SUPPRESSION GASES

Purity Test Results
2017-2021

Purity Results w/ MEOH as Contaminent

5 Year Totals	Passed Purity :	17%
	Failed Purity :	83%

2021	Passed Purity :	1%
	Failed Purity :	99%

2020	Passed Purity :	47%
	Failed Purity :	53%

2019	Passed Purity :	7%
	Failed Purity :	93%

2018	Passed Purity :	15%
	Failed Purity :	85%

2017	Passed Purity :	25%
	Failed Purity :	75%

Purity Results w/o MEOH as Contaminent

5 Year Totals	Passed Purity :	52%
	Failed Purity :	48%

2021	Passed Purity :	42%
	Failed Purity :	58%

2020	Passed Purity :	74%
	Failed Purity :	26%

2019	Passed Purity :	56%
	Failed Purity :	44%

2018	Passed Purity :	59%
	Failed Purity :	41%

2017	Passed Purity :	44%
	Failed Purity :	56%

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Contaminants Ranked

Impurities Present	% of Samples Present In
Halon 1211	81%
R-227ea	78%
R-12	78%
R-22	77%
R-13	76%
MEOH	76%
R-125	67%
R-23	57%
Unknown	22%
R-114	19%
R-11	14%
R-134a	12%
R-12B2	12%
R-143a	6%
R-30B1	5%
R-113	3%
ETOH	3%
R-236fa	1%

How Does This Happen
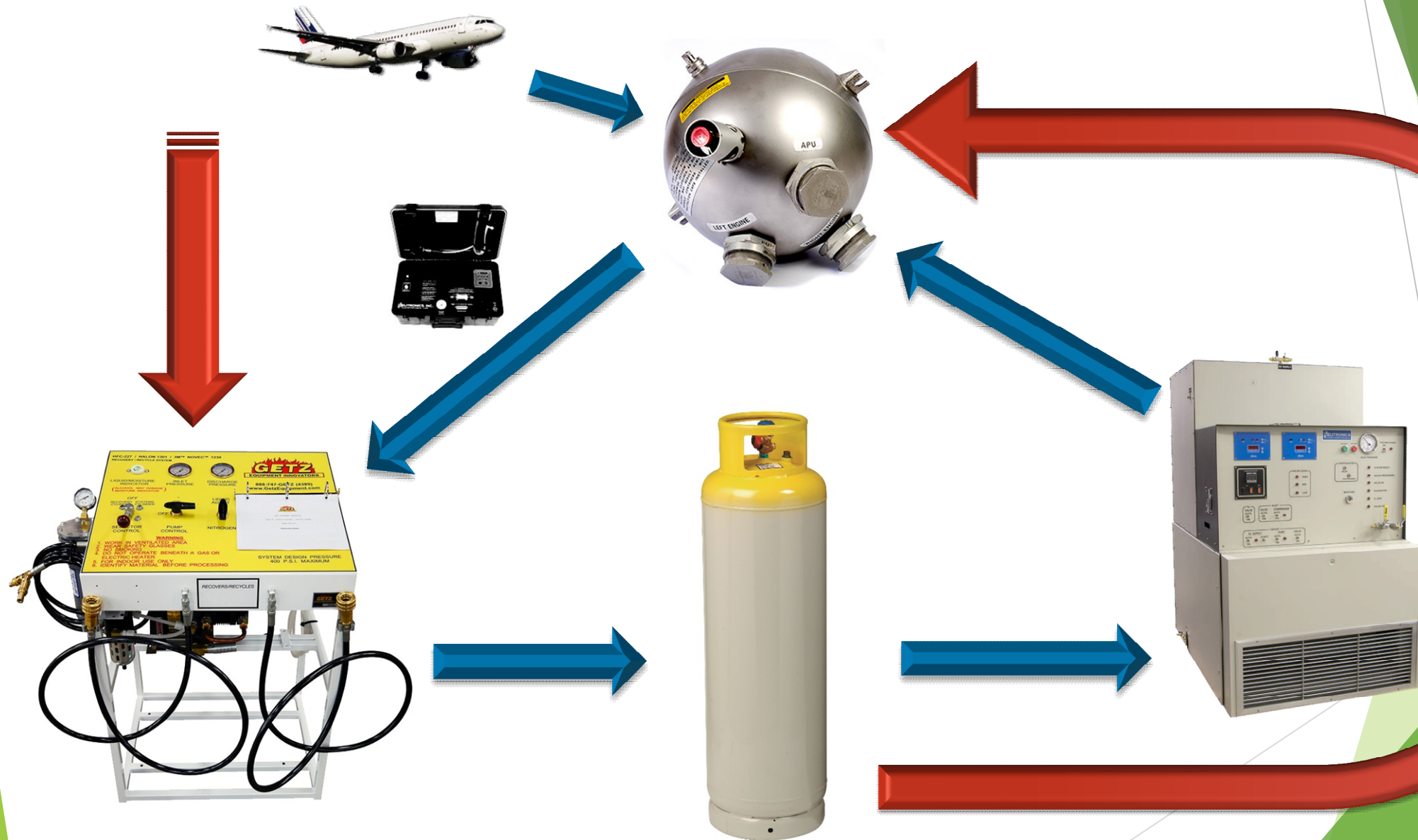
Conclusion

- This is Wesco data and only Wesco data and only representative of what goes through our facility.

- When combined with anecdotal information from industry, we believe it is representative.

- Is it widespread?

- Is it pervasive?

- How bad is the bad?

- Will it put out a fire?

- Should the acceptable standard be lowered?

- How do we prevent this from reoccurring?

- These are the questions we should be asking

Any Questions

For More information, Contact

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or

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