



## **P3 HAFEX – development and qualification of a halon-alternative 5BC cabin handheld fire extinguisher for commercial aircraft with 2BTP**

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## Background P3 Group

- P3 GROUP is an engineering & consultant company with focus on services & products for the aviation, automotive, defense and marine industry with **highly complex products**.
- Our products & services cover OEM, Supplier and Aftermarket.
- Our products for the aviation industry include, among others, the integration, design, qualification & delivery of **emergency equipment** for large aircraft.



## Challenge for Halon-1211 replacement 5BC fire extinguishers in cabin

### Main requirements for 1211 halon replacement in cabin:

- Zero or low ODP & Low GWP (2BTP: ODP 0.0028 / GWP 0.005)
- Achieve FAA Minimum Performance Standard (MPS): Hidden-Fire Test, UL 711 5B and 2B Cold Fire Test
- Replacement fire extinguisher fits in same envelope as Halon 1211 extinguisher



### Airbus specific requirements (extinguisher & bracket):

- Small max. space envelope of 350 x 125 x 95mm (13,78 x 4,92 x 3,74 in)
- Small max. weight of 2500g (5.5lb)

### Our challenge:

- design has to achieve MPS with less 2BTP-filling and different filling ratio than current proven products with 2BTP
- development of smallest possible 5BC fire-extinguisher with 2BTP to allow highest drop-in rate in Airbus civil aircraft

→ P3 Group formed a cooperation with ANAF Group and Firemark Ltd. end of 2014 and started to develop the smallest & lightest possible 5BC fire-extinguisher with 2BTP, the P3 HAFEX.

## A joint effort for development and production

### Cooperation

The project commenced in 2014, working in cooperation with 2 European fire extinguisher specialists. The partnership now comprises:

- *P3 Group* with global Certification, Qualification, aircraft installation and aviation experience.
- *ANAF Group*, Italy with high quality manufacturing capability and extinguisher design experience.
- *Firemark Limited*, UK with Halon alternative and extinguisher manufacturing experience.



With each party bringing their expertise to the table we are able to deliver:

- Unique fire extinguisher cylinder design and production capabilities, in addition to valve dimension and mass benefits.
- The latest knowledge in Halon alternative options.
- Expertise in aviation bracket design, integration and qualification to the aviation standards.

→ **These combined attributes gave us the confidence we could deliver against the specification.**

## Development & testing of P3 HAFEX

### First Development:

Obviously with a new product such as this the project is a complex mix of certification, technical, manufacturing and commercial elements.

Prototype work and pre-testing FAA MPS fires in the UK gave us the confidence to arrange Certification tests at UL in Chicago in August 2015

### Testing & Qualification:

A significant milestone in the project was the successful achievement of the FAA fire tests. Our design afforded us the ability to accommodate the same amount of 2BTP in a smaller space envelope as per the previously achieved tests.

This was the first goal.

***Our theory and experience however made us believe we could improve this performance.***



**FAA Minimum Performance Standard Hidden-Fire Test  
→ achieved August 2015 at UL**



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**UL 711 2B Cold Fire Test**  
→ achieved August 2015 at UL



## UL 711 5B Fire Test

→ achieved August 2015 at UL

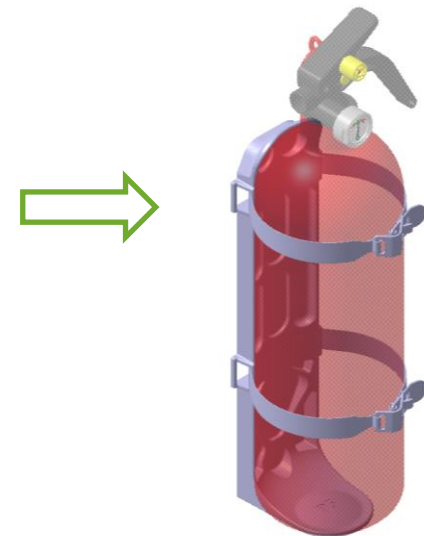




## P3 HAFEX – Summary

- We developed the **smallest and lightest** halon-alternative 5BC fire extinguisher with 2BTP (see table below).
- We **proved our design by achieving FAA MPS-qualification** in accordance with UL711 in August 2015.
- We were **chosen by Airbus** to deliver our P3 HAFEX for line fit and retrofit of all civil Airbus aircrafts, starting mid of 2016.

Agent	UL 711 Rating	Total Weight (lb)	Dimensions (H x W x D)	ODP	GWP (100 year)
Halon 1211*	5 BC	3.93	17 x 4.8 x 3.25	7.9	1890
<b>2BTP (P3 HAFEX)</b>	<b>5 BC</b>	<b>4.66</b>	<b>13.7 x 4.5 x 3.5</b>	<b>0.0028</b>	<b>0.005</b>
2BTP*	5 BC	5.6	15.75 x 5 x 3.5	0.0028	0.005
Halotron 1 (HCFC Blend B)*	5 BC	9.3	15 x 5 x 4.25	0.01	77
FE-36 (HFC-236fa)*	5 BC	9.5	15.9 x 8 x 4.5	0	9820
FM-200 (HFC-227ea)*	5 BC	9.8	16.6 x 6.5 x 4.4	0	3580



\* Ref. for all data in the table with grey background:

Presentation of Mike Madden during FAA Systems Meeting in Köln, Germany, May 11-12, 2011:

„Halon Replacement for Airplane Portable Fire Extinguishers - Progress Report“, File: Madden-0511-BTP.pdf

## Questions?

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