



# Halon Replacement for Airplane Portable Fire Extinguishers - Progress Report

## International Aircraft Systems Fire Protection Working Group Conference

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Mike Madden  
Robin Bennett

# Objective

**Provide a progress report on development of BTP  
(2-bromo-3, 3, 3-trifluoropropene),  
a promising new environmentally progressive  
Halon 1211 replacement agent for handheld fire extinguishers**

# Agenda

→ **Steps to Commercialization**

→ **BTP Development Time Line**

→ **Current Progress**

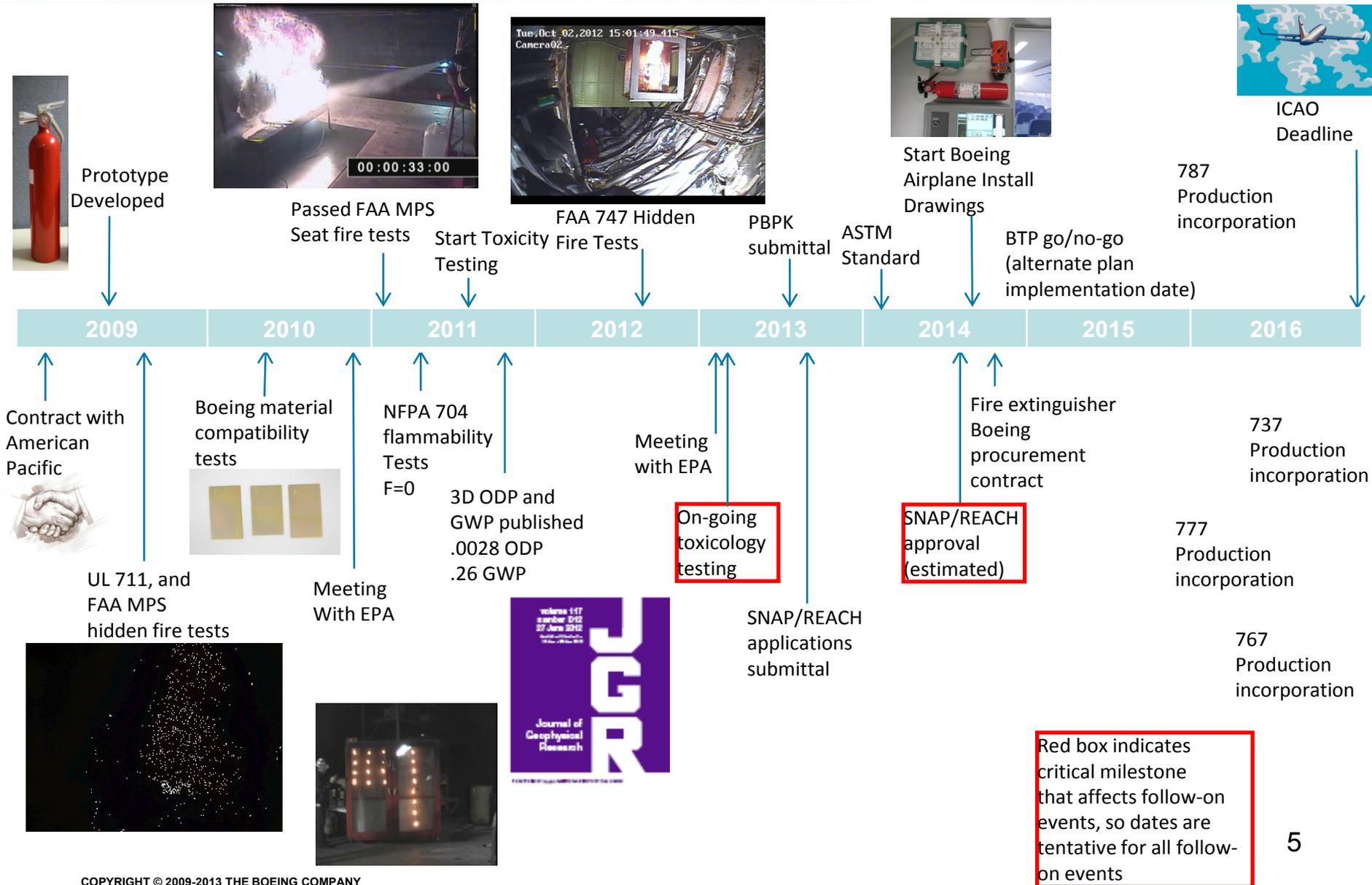
→ **Future**

→ **Questions**

# Steps to Commercialization

- ✓ Cup burner testing - 2002
- ✓ Initial toxicity tests (Ames, cardiotox...) - 2002
- ✓ 2D ODP, GWP and atmospheric lifetime - 2004
- ✓ Prototype extinguisher, near drop-in replacement for Boeing 1211 extinguisher - 2009
- ✓ UL 711 5B pan fire tests - 2009
- ✓ UL 711 cold temperature pan fire test - 2009
- ✓ FAA MPS AR-01/37 hidden fire tests - 2009
- ✓ 3D model analysis of ODP and GWP - 2010
- ✓ FAA MPS AR-01/37 seat fire toxicity tests - 2011
- ✓ ASTM flammability tests (per NFPA 704) - 2011
- ✓ Airplane material compatibility tests - 2011
- ✓ Synthesis of BTP for toxicology testing - 2011
- ✓ Publication of 3D ODP scientific paper - 2011
- ✓ Additional BTP physical properties testing – 2011
- ❑ **PBPK testing and modeling – ECD 2013**
- ❑ **Toxicology testing– ECD 2013**
- ❑ **Provide PBPK data to FAA for inclusion in AC 20-42D and FAA/AR-08/3 – ECD 2013**
- ❑ US EPA TSCA inventory listing
- ❑ US EPA SNAP approval
- ❑ EU REACH approval
- ❑ 3.25” diameter bottle
- ❑ UL 2129 fire extinguisher bottle tests and UL listing
- ❑ **ASTM standard for BTP**

# BTP Development Time Line



# BTP Current Progress

## ☐ TOXICOLOGY TESTING:

- ✓ **COMPLETED:** 14 day rangefinder, skin irritation, eye irritation, acute dermal, mouse lymphoma, 90 day sub-chronic inhalation, reproductive/developmental screen, LOAEL blood levels, blood and tissue partition coefficient measurements, biodegradation, activated sludge respiration inhibition, soil absorption, hydrolysis.
- ➔ **IN WORK:** Report development- 90 day sub-chronic inhalation, report development - reproductive/developmental screen, ecotoxicity, PBPK modeling.

# BTP Current Progress

## ☐ 90 Day Inhalation :

- 6 hours/day, 5 days/week exposure
- No treatment related deaths
- Slight effects were noted in a small number of test animals at the lowest exposure concentrations
- Possible impact to long term worker exposure level

## ☐ Reproductive Screen:

- 6 hours/day, 7 days/week exposure
- Not mutagenic and no birth defects noted
- Effects to reproductive cycle observed
- Possible impact to long term worker exposure level

***Ongoing evaluations - additional testing may be required***

# BTP Current Progress

## □ Ecotoxicology Testing:

- Difficulties with test protocols due to BTP solubility and boiling point
- Currently testing: acute fish toxicity, acute daphnia, acute algae

## □ PBPK Modeling:

- Blood/air partitions completed
- Modeling (should be complete by FAA Meeting date)

***Completion by June 2013***

# Future

**Further updates will be provided  
at the FAA Triennial Conference  
in December 2013**

# Questions?

## Contact:

**Mike Madden**

**The Boeing Company**

**[mike.r.madden@boeing.com](mailto:mike.r.madden@boeing.com)**

**425-342-2517**