



# Boeing / OIRA Discussion of Proposed EPA Regulations Regarding DecaBDE

The Boeing Company  
Presentation to U.S. Office of Information and Regulatory Affairs  
February 16, 2011

# Agenda

- **The Boeing Company – An Overview**
- **Current DecaBDE Use**
- **DecaBDE Replacement Status**
- **Impacts of DecaBDE Phase-out Plan and Proposed Rule Making**

# The Boeing Company- Significant Commercial and Military Products



- Design, assemble and support commercial jetliners



- Design, assemble and support defense systems



- Design, assemble and support satellites and launch vehicles



- Design and support unique energy solutions

**Connect and protect people globally**

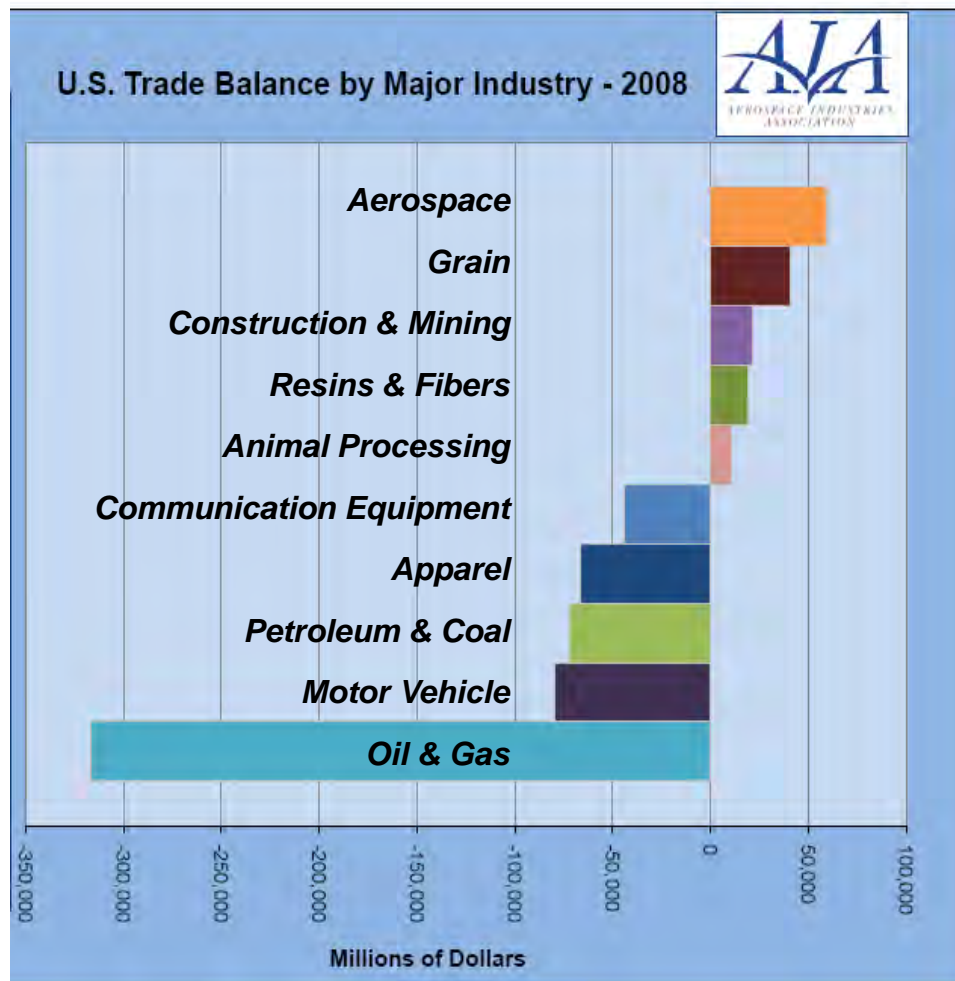
# The Boeing Company – Integral to the U.S. Economy



- **More than 160,000 Boeing employees in 50 states and 70 countries**
  - **95% of these employees are in the U.S.**
- **Customers & research facilities in more than 90 countries**
- **Global supply chain of over 22,000 suppliers and partners globally**
- **Total revenue in 2010: \$64.3 Billion**
- **Export value to the U.S. economy \$28.7 Billion in 2009**

# Boeing and the Aerospace Industry - Contributions to the U.S. Economy

## Exports



## U.S. Jobs

- Over 644,000 aerospace industry employees
- 2.8% of U.S. manufacturing workforce in 2008 tied to aerospace
- Aerospace wages averaged \$79,700 in 2008 (47% more than average manufacturing wage)

# Boeing has Demonstrated a Multi-year Environmental Commitment



## ■ Aerospace Projects

- FAA Continuous Lower Energy, Emissions and Noise Program
- Air Traffic Management Modernization
- Sustainable Aviation Fuel Supply

## ■ Energy Projects

- Regenerative Fuel Cell Technology
- High Efficiency Solar Cell production

Management  
Security

## ■ Internal Operations

ns  
sumption  
Waste Generation  
mption  
ompliance

## ■ Production Product Focus

ted diphenyl ethers (PBDE)

CO2 Emissions

Energy Consumption

Hazardous Waste Generation

(Tons)

— Water Consumption

CO2 Emissions

Energy Consumption

Hazardous Waste Generation

Water Consumption

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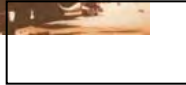
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# Aviation Safety: Flammability Standards Have Become More Stringent Over Time

43 fatalities, 42 survivors



301 fatalities, 2 survivors



55 fatalities, 78 survivors



0 fatalities, 309 survivors

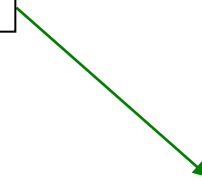


2005  
Air France A340  
Toronto\*

0 fatalities, 115 survivors



2008  
Continental 737  
Denver



**Aerospace standards are designed to address  
fire, toxic fume and heat generation**



# Flame Retardants in Aerospace Products Have Increased Survivability

- Assures safety in flight, if fire occurs
- Assures ability to escape, if aircraft crash occurs
- Meets FAA requirements
  - 14 CFR Part 25 regulations:
    - Section 25.853, Compartment Interiors
    - Section 25.855, Cargo/Baggage Compartment
    - Section 25.856, Thermal/Acoustic Insulation
    - Section 25.869, Wire Flammability
    - Appendix F, Detailed Test Requirements
      - Materials and parts must successfully pass test/s in order to show compliance
      - Nine (9) different tests specified; some materials/parts must pass multiple tests
      - Variations of configurations require individual testing

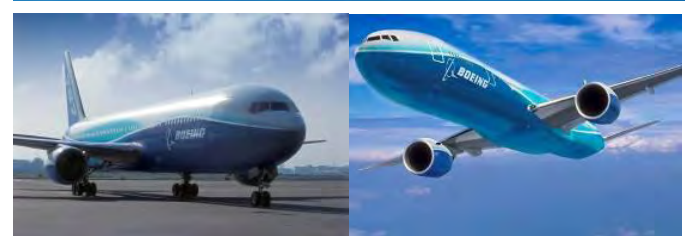
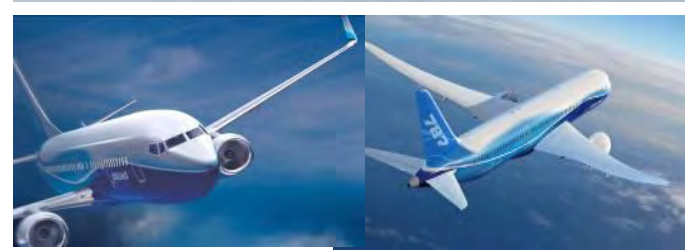


2008 Continental Airlines 737  
0 fatalities, 115 survivors

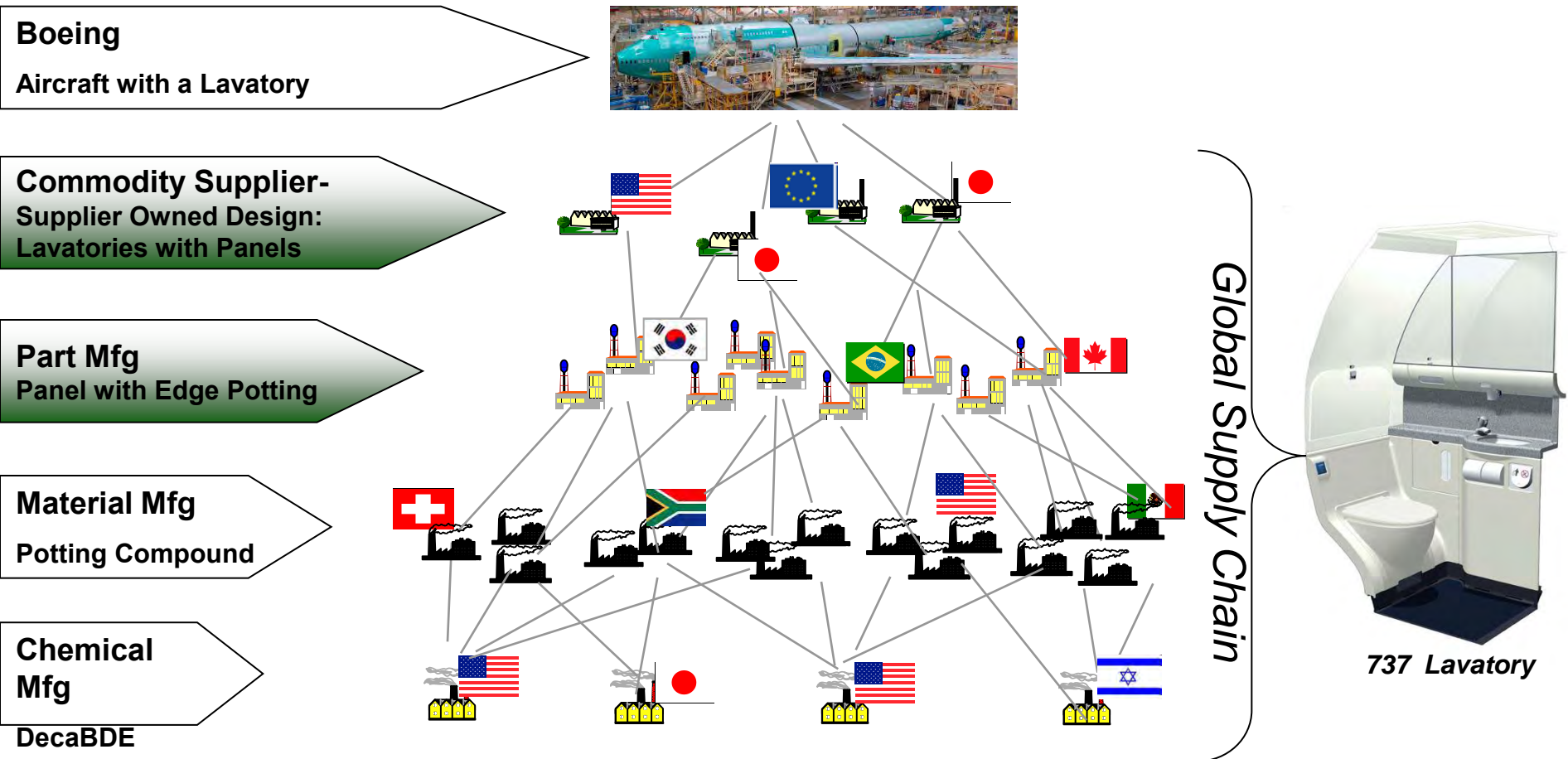
**DecaBDE has become integral to meeting stringent aviation safety requirements**

# DecaBDE is Used in Many Applications in Most Boeing Products

- Adhesives and Tapes
- Composites
- Ducting & Molded Parts
- Electrical/Electronics
- Emergency Equipment
- Fabrics & Films
- Insulation
- Interiors
- Sealants



# Boeing has a Global, Multi-Tiered Supply Chain



**DecaBDE alternative manufacturers & compounders drive the replacement timetable**

# Materials Containing Flame Retardants Must Meet All Technical Requirements

## One Example: Duct Work

- **Physical Properties**
  - Melt Flow
  - Specific Gravity
  - Water Absorption
  - Chemical Resistance Under Stress
  - Ground Resin Particle Size
  - Weight
- **Mechanical Properties**
  - Tensile Strength and Tensile Modulus
  - Flexure Strength and Flexure Modulus
  - Compressive Strength
  - Notched Izod Impact Energy
- **Electrical Properties**
  - Dielectric Strength
  - Dielectric Constant
  - Dissipation Factor
- **Flammability Properties**
  - 60 Second Vertical



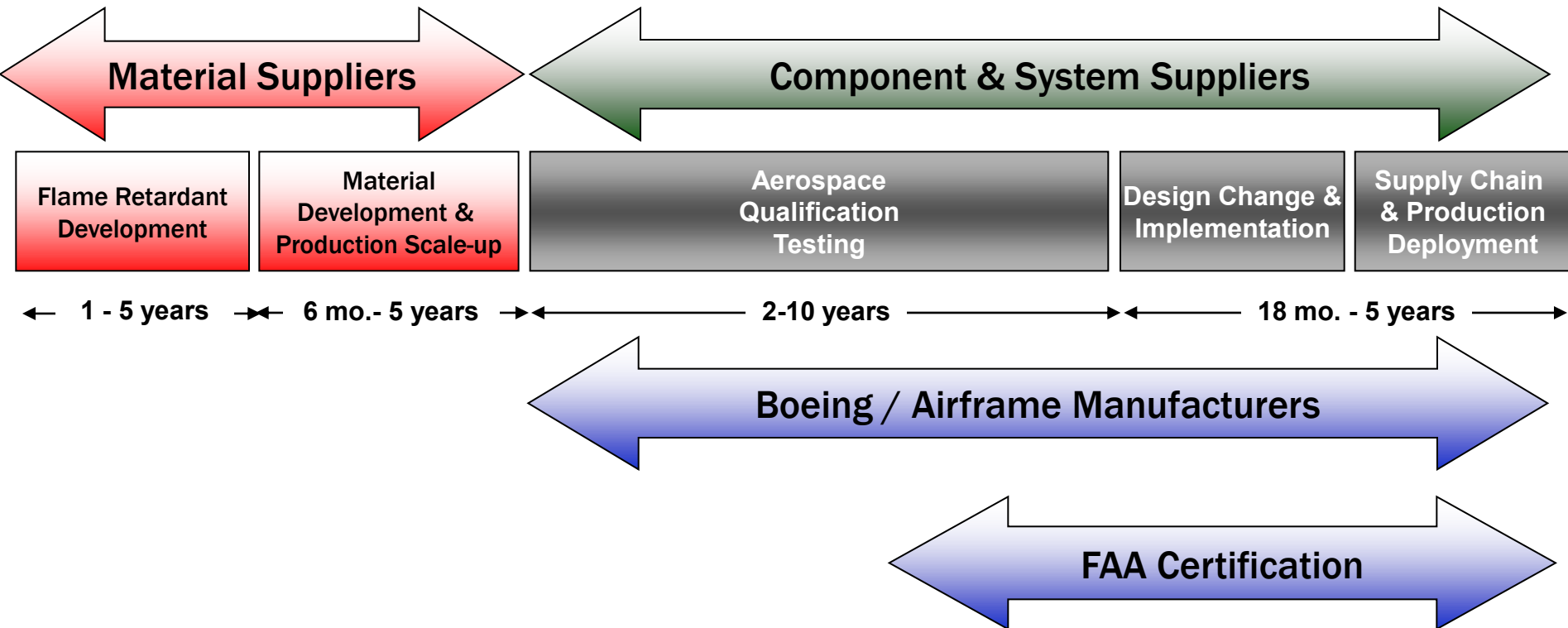
Injection Molded Nylon Part:  
Example part weight ~2 lbs  
DecaBDE content ~41 grams (<5% by wt)

**DecaBDE alternatives cannot compromise other material properties**

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# Flame Retardant Material Development: Qualification, Certification & Implementation is a Multi-Year, Interdependent Process



**Qualification, certification and implementation cannot begin until material suppliers have provided viable new materials**

# Boeing Has Invested in PBDE Elimination Over Many Years

- **2003: Initial, focused investment to qualify non-PBDE containing materials**
- **2004: Boeing directive to restrict brominated flame retardants from 787 design**
  - Despite this directive, decaBDE alternative-containing materials were not found in time for 787 applications
- **2005: Penta- and Octa- eliminated from production**
  - Non-halogenated flame retardants used as substitutes
- **2009 – Present: Research and development investments increased**
  - For Boeing controlled materials, progress has been made in qualifying alternatives. However, 34% of decaBDE-containing materials do not yet have alternatives available.
  - For other parts, decaBDE usage scope and replacement status is being determined

**Boeing continues to invest in alternative materials**

# Boeing Collaboration with Industry Supports Qualification & Implementation of Alternatives

## ▪ Replacement – Boeing Processes

- On-going work with material suppliers to initiate and provide qualified alternatives
- Continued qualification of decaBDE-free alternative materials
- Implementation in commercial and defense products in-work

## ▪ Replacement – Supply Chain

- Continued communication with supply chain to identify current decaBDE usage
- Planned technical support to suppliers as alternatives become available

## ▪ Continuing Collaboration:

- Research Consortia
- Scientific Organizations
- Industry Flammability Groups
- USEPA Design for Environment Deca Project

**Elimination of decaBDE will be a long term effort  
requiring industry-wide collaboration**



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# Current Phase-out Schedule and Proposed Rulemaking Would Impose Significant Costs on Aerospace

- Potential delivery disruptions of qualified products
- Increased raw material costs
- Reduced material availability
- Increased R&D costs to develop alternatives that meet design & certification requirements
- Redesign & re-certification costs to incorporate new materials and processes
- Potential costs for disposal of remaining decaBDE material & part inventories
- Increased product, repair and maintenance costs
- Potential spare part sourcing disruptions
- Potential operational disruptions at airports and military bases
- Test Rule costs



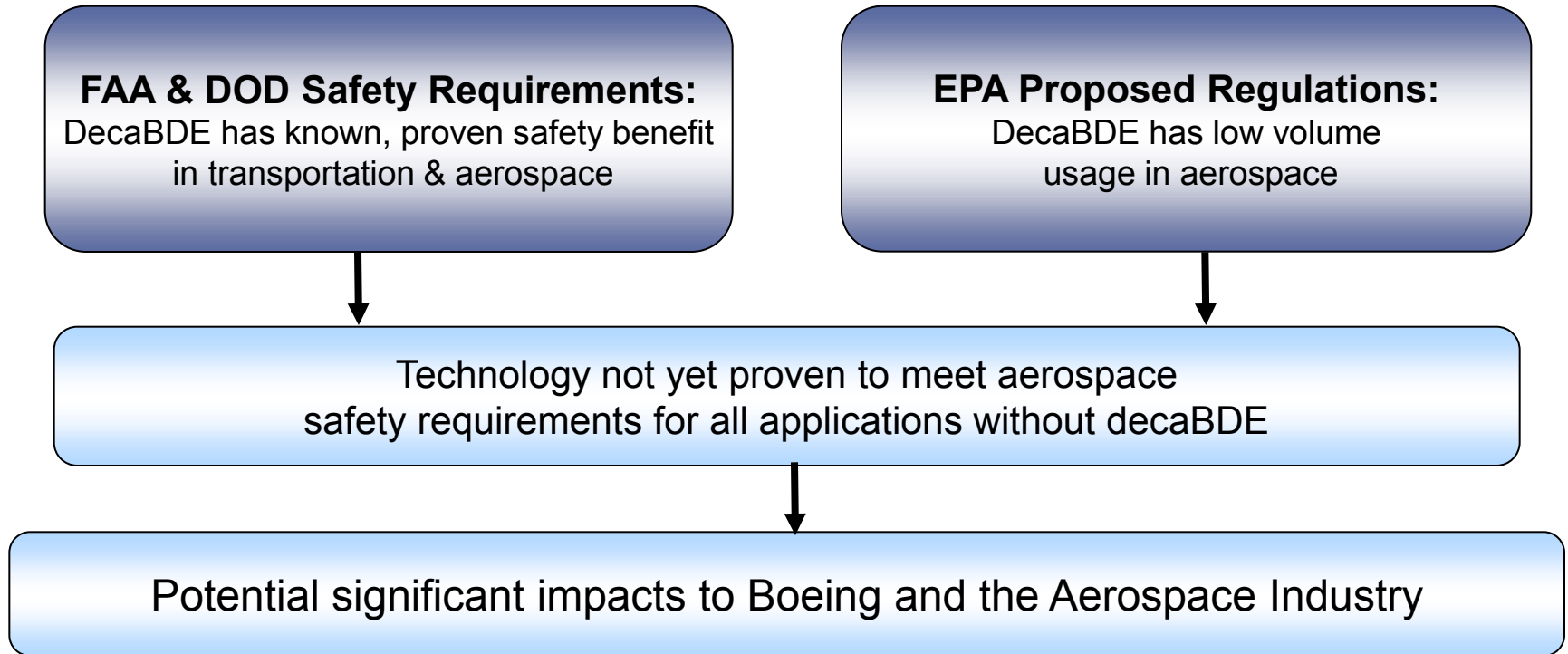
# Proposed Rule Making– The SNUR Must Grandfather On-Going Uses

- Boeing will not have implemented alternative flame retardant materials for all decaBDE uses by the 12/31/2013 deadline.
  - On-going materials and processes used by aerospace must not be considered “new uses” after the effective date
  - To ensure that ongoing aerospace uses are grandfathered, EPA must define ongoing uses as *categories* of materials and parts used in aerospace on the effective date, for example:
    - Emergency Equipment
    - Electrical/Electronic Components
    - Ducting & Molded Parts
    - Insulation
    - Interior Surfaces
    - Sealants
    - Adhesives & Tapes
    - Fabrics & Films
    - Composites

# Proposed Rule Making– The Test Rule Should be Withdrawn or Aerospace Exempted

- The volume of usage for aerospace applications is low, and will continue to decline as the voluntary phase-out takes effect. This low volume of use is likely to be insufficient to justify testing.
  - EPA should withdraw the proposal, and gauge the volume of decaBDE still in commerce and the need for a Test Rule after 2013
  - If the proposed test rule is pursued,
    - Materials used in aerospace applications should be excluded from the test rule
    - For imported articles, EPA should consider the additional complexity and documentation burden on U.S. importers
    - EPA must determine how articles made from recycled decaBDE materials will be addressed

# U.S. DecaBDE Phase-out, Combined with Proposed EPA Regulation, is a Serious Issue for Boeing and Aerospace



**Recommended Solution:**  
**Collaborative industry & EPA approach, with minimal cost & disruption**

# Questions?

