

# **The Boeing Company**

Please see attached comments for the Rulemaking - Informal Comment Period on Chapter 173-443 WAC from The Boeing Company.

March 16, 2020

Linda Kildahl  
Rulemaking Lead  
Air Quality Program  
Washington State Department of Ecology  
300 Desmond Drive SE  
Lacey, WA 98503

RE: Informal Comment Period on Chapter 173-443 WAC

Dear Ms. Kildahl,

Thank you for the opportunity to submit informal comments on the rulemaking for hydrofluorocarbons (HFC) under Chapter 173-443 of the Washington Administrative Code. While Boeing shares some of the same HFC uses one would find in any commercial or industrial buildings, such as refrigeration and air conditioning, there are some uses specific to aerospace products that present technical challenges under any HFC regulation. Some of these specific aerospace concerns, such as fire extinguishing agents, were addressed in the 2019 legislation (HB 1112), whereas others will be addressed in the rulemaking that Ecology is conducting now.

### **Aerospace Employs Hydrofluorocarbons in Multiple Applications**

In addition to fire extinguishing and suppression uses, HFC are present in aircraft refrigeration or cooling equipment, which may be found in galleys, cargo compartments, and passenger cabins. The equipment is supplier-furnished, and the primary refrigerant used in the appliances is HFC-134a, a non-flammable substitute for ozone depleting substances. Both the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the United States Department of Transportation (DOT) consider HFC-134a to be non-flammable, a critical property for safe air transportation. As a contrasting example, the refrigerant HFO-1234yf, developed by its manufacturers as an alternative to HFC-134a, is not only designated as slightly flammable, but it releases strong, toxic acids when released to the atmosphere or when burned. Such properties are almost certain to make it unsuitable for aerospace uses.

### **Clarification on Rule Applicability is Needed to Eliminate Regulatory Uncertainty and Ensure Compliance across the Supply Chain**

The use of HFC refrigerants for aerospace equipment and applications is a small fraction of other consumer and commercial uses. Aerospace uses do not fall clearly into any of the industrial sectors and end uses that the United States Environmental Protection Agency (EPA) identifies on its Significant New Alternatives Policy (SNAP) web site or in Appendices U and V of 40 CFR 82. Because of this, it is unclear which, if any, restrictions imposed by HB 1112 apply and at what dates.

We request a discussion with Ecology to review opportunities for clarification about the classification of this equipment for the purposes of Washington State's pending HFC rulemaking, including whether aerospace was intended to be covered in the future report, mandated by Section 8 of HB 1112, on mobile source and other HFC use in Washington.



Aerospace Equipment	Possible Classifications
Galley refrigeration (refrigerators, freezers, and wine chillers)	<ul style="list-style-type: none"> <li>• Refrigerated transport</li> <li>• Retail food refrigeration</li> <li>• Vending machines</li> <li>• Positive displacement chillers</li> <li>• Centrifugal chillers</li> <li>• Household refrigerators and freezers</li> <li>• Other</li> </ul>
Supplemental cooling units	<ul style="list-style-type: none"> <li>• Industrial process refrigeration</li> <li>• Motor vehicle air conditioning</li> <li>• Positive displacement chillers</li> <li>• Centrifugal chillers</li> <li>• Other</li> </ul>
Cargo refrigeration units	<ul style="list-style-type: none"> <li>• Refrigerated transport</li> <li>• Positive displacement chillers</li> <li>• Centrifugal chillers</li> <li>• Other</li> </ul>

### Hydrofluorocarbon Alternatives for Aerospace are Not Yet Developed

When the EPA proposed HFC restrictions in 2016, Boeing submitted comments to highlight some of the specifics of fire extinguishing agents and to support EPA’s proposal to allow four- to five-year extensions of allowable use of HFC for military, space, and aeronautical applications (outside of fire extinguishing or suppression). As we noted in this June 13, 2016 comment letter, Boeing does not manufacture foam blowing agents or chillers, but our suppliers do and may face significant technical hurdles in researching, identifying, testing, and certifying alternatives that meet Federal Aviation Administration, National Aeronautics and Space Administration, or defense requirements. The 2017 *Mexichem Fluor* decision caused EPA to stay the affected listing decisions for some refrigeration and cooling related end uses, which created confusion regarding need for development of alternatives to HFC. EPA has not yet provided guidance on how it will move forward with implementation of the SNAP program in light of *Mexichem Fluor*. HB 1112 states that alternatives for HFC are readily available and cost-effective, and that may be true for many traditional refrigeration or building end uses. However, this is not true for the aerospace applications at this time.

### Aerospace Applications Require an Extension of Effective Dates and, if No Safe Alternatives are Identified, HFC Use Conditions

In agreement with our 2016 comments, and assuming that non-fire extinguishing aerospace applications are in scope of HB 1112, we would make the same comment to Ecology now: (1) that more time is needed for non-fire-extinguishing aerospace HFC applications of HFC and (2) that even after good-faith efforts to identify alternatives, there may be no safe and viable substitutes for HFC, and in such cases, the relevant HFC use may need an aerospace-specific use condition.

It is possible that there are alternatives to restricted HFC, but aerospace suppliers will need time to assess their safety (flammability foremost), feasibility, and effects on performance and design. Furthermore, approval from regulatory agencies will also need to be taken into consideration. If an alternative to HFC is identified, the overall effects on greenhouse gas emissions would also need to be estimated and considered (e.g., changes in fuel use as

refrigerant efficiency or weight changes occur). We believe that the legislation provides for both an extension and a use conditions in HB 1112 Section 3(3) (emphasis added):

- (3) The department may by rule:
- (a) Modify the effective date of a prohibition established in subsection (2) of this section if the department determines that the rule reduces the overall risk to human health or the environment and reflects the earliest date that a substitute is currently or potentially available;
  - (b) Prohibit the use of a substitute if the department determines that the prohibition reduces the overall risk to human health or the environment and that a lower risk substitute is currently or potentially available;
  - (c) (i) Adopt a list of approved substitutes, use conditions, or use limits, if any; and (ii) Add or remove substitutes, use conditions, or use limits to or from the list of approved substitutes if the department determines those substitutes reduce the overall risk to human health and the environment; and
  - (d) Designate acceptable uses of hydrofluorocarbons for medical uses that are exempt from the requirements of subsection (2) of this section.

Based on our experience with other efforts on chemical substitutions for aerospace use, we anticipate that the overall approval process would take six to eight years once underway. Because of this, the effective dates for any aerospace uses should be codified to be no earlier than January 1, 2028, if an acceptable alternative to HFC is found.

- Identify alternatives ½ to 1 year
- Evaluate alternative refrigerants for flammability and efficiency ½ to 1 year
- Redesign equipment to work with alternative refrigerant 1 to 1½ years
- Qualify new equipment (e.g., refrigerators, chillers) 2 to 3 years
- Certify for airplane programs 1 to 1½ years

## Conclusion

We look forward to working with Ecology to determine applicability of HB 1112 and the department's implementing regulations. If any aerospace equipment is included in the Washington State HFC rules, we urge Ecology to adopt language to allow for appropriate timing in light of aerospace specifications and certification requirements and allow for consideration of overall impact to human safety and the environment, as intended by the legislature.

Sincerely,



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