Written Testimony of Dr. Gwen Gross, Ph.D.,
Senior Technical Fellow, Boeing
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Good morning, Chairman Babin, Ranking Member Lofgren, and members of the Committee. Thank you for the opportunity to testify.

I am Dr. Gwen Gross, a Senior Technical Fellow at Boeing for Composites and Chemical Technology. Prior to joining Boeing, I completed my doctoral studies at the Center for Process Analytical Chemistry at the University of Washington.

I serve as a chief chemist within Boeing's advanced research and development (R&D) organization. I am an expert in formulation and production of aerospace critical organic materials. I have worked the complete lifecycle of materials integration from idea to implementation, and as an intermediary between Boeing and our suppliers.

Boeing proudly develops, manufactures, and services commercial airplanes, defense products, and space systems. As the largest manufacturing exporter in America, Boeing supports more than a million American jobs, contributes $97 billion annually to the U.S. economy, and partners with nearly 10,000 businesses across all 50 states. Approximately eighty percent of Boeing's supply chain spending and eighty-five percent of its workforce are based in the United States, while approximately eighty percent of our commercial aircraft production is exported to international customers.

Safety and quality are at the core of everything we do. Boeing is committed to complying with environmental laws and regulations and continually improving our environmental, health, and safety systems, while also creating economic opportunities and driving industry innovation.

Boeing is a downstream user of chemicals. We do not manufacture the chemical formulations that we use. Instead, as we develop new, innovative aerospace products and services, we rely on our chemical suppliers to develop and bring forward new chemical technologies that may meet our stringent performance requirements. Those suppliers are responsible for obtaining all relevant regulatory chemical approvals from around the world, including Toxic Substances Control Act (TSCA) approvals for new chemicals or new chemical uses in the United States. Any delays they experience in obtaining those approvals, delay the aerospace innovations that Boeing is working every day to advance.

Once promising candidate chemical products are offered, we thoroughly evaluate them to ensure they will meet our performance requirements, as well as those of the Federal Aviation Administration (FAA) and military specifications, and can be safely incorporated into our manufacturing processes and product design. Boeing uses chemical materials in a variety of ways in its products, including composites, sealants, adhesives, and specialty coatings.

The aerospace industry faces unique challenges when it comes to chemical material use and replacement due to complex FAA certification requirements and military specifications that govern our products and services. The FAA's rigorous and lengthy certification process is integral to aviation safety. This process includes consideration of the performance of the chemicals used in a commercial aircraft's design, including its component parts.

Let me provide an example of what this means for the chemical materials used in commercial airplanes. Appropriately, Boeing must demonstrate that materials are both suitable for the application they are being used in and that they are also durable, including under the environmental conditions where they will be used. In practice, that means polymeric materials, like the carbon fiber composite materials used for wings, that sit in the hot sun on the runway in Phoenix, Arizona in July, must be capable of equal performance at 30,000 feet in sub-freezing temperatures. And it must be able to go through that cycle under such variable conditions multiple times a day for potentially decades.

Finding a replacement for a chemical used in the formulation of such a resilient composite system can be a challenging and lengthy process that includes identification, testing, and qualification of alternative formulations developed by our suppliers. Even when this is complete, Boeing must then comply with necessary FAA regulations for drawing changes, first part qualifications, part certification testing, and performance metrics before that new composite formulation can be incorporated into an airplane that will be delivered to an airline. All of this is incredibly time consuming. For example, I began working on a new candidate for a next generation carbon fiber composite material when my daughter was two years old. Boeing is just now finishing the qualification on that material and my daughter is now eighteen.

As a result, if regulatory changes impacting chemical material use and replacement or changes in the chemical marketplace happen too fast, aerospace companies may not have sufficient time to find viable replacements and to demonstrate that they satisfy all of our regulatory and contractual requirements. It is important that the chemical management frameworks used by regulatory agencies, such as at the Environmental Protection Agency (EPA), take into account this complex and lengthy process, which includes FAA requirements that are integral to aviation safety. It is also important that agencies supporting R&D for science and technology have these timelines in mind when discussing development opportunities and future research.

Aerospace manufacturers are also impacted by delays in new chemical reviews and restrictions on new chemicals. A recent example is the replacement of fire suppression chemicals used onboard aircraft. Fire suppression is critical to safety of flight, and Boeing has devoted considerable time and resources to developing alternatives to the industry standard agent, halon. Halon is an ozone depleting substance that remains in wide use in the industry due to its unique performance attributes that have proven difficult to replicate. In low concentrations, halon is very effective at extinguishing a variety of fire types, including liquids and electronics. In addition, it is acceptable for use in occupied spaces, and safe to use on sensitive aerospace equipment.

Boeing worked closely for over 20 years with our suppliers to develop the halon replacement 2-bromo-3,3,3-trifluoro-1-propene (2-BTP) for use as a fire extinguishing agent for use onboard aircraft. As a new chemical, 2-BTP received EPA approvals under TSCA as well as its Significant New Alternatives Policy Program (SNAP) as a replacement for an ozone depleting substance. Approximately eight years ago, the FAA certified it for handheld extinguisher use in aircraft cabins and the flight deck where it is deployed globally today. However, the approvals limited its use in other aircraft applications, such as in cargo holds. Notwithstanding the findings that this halon replacement compound was found to be acceptable for use around passengers and crew, it still needs two additional approvals from the EPA for use in cargo holds. We very much appreciate that some progress has recently been made as the EPA recently published a proposed SNAP rule on November 10, 2025 that would allow future cargo use. Once EPA's regulatory approvals are in hand, Boeing can pursue further efforts to mature this technology and satisfy FAA certification requirements.

Boeing has also experienced challenges when evaluating new chemicals under the TSCA exemption for R&D. Boeing supports that exemption because it allows Boeing to evaluate novel chemical materials early in their development cycle to determine suitability for new aircraft applications needed for our future aircraft. However, reliance on the R&D exemption introduces regulatory uncertainty into Boeing's technology development process, which operates on a multi-year timeline to ensure that once mature, a new chemical technology will meet both performance and certification requirements.

If there is uncertainty whether an R&D chemical will be approved by EPA, in order to meet internal technology development milestones for certification of a future aircraft model, our researchers may choose to exclude that candidate chemical early in the development process and choose one that is already approved by EPA. This reduces risk to the certification schedule for our future aircraft, but at the cost of potentially significant improvements to that aircraft model's performance if the R&D chemical had been chosen instead of an existing chemical technology. The impact of these decisions can be far reaching.

For example, not utilizing a new R&D epoxy resin for a composite material could result in an alternative material being selected at the cost of additional weight being added to the aircraft's certified design. Over the decades long lifetime of that airplane, even small weight increases can result in significant increases in fuel consumption, emissions, and operating costs for our customers. As a result, the uncertainty in the timing of regulations, such as EPA authorizing R&D chemicals for full scale production, has long-term consequences. Boeing would welcome regulatory changes to give aircraft manufacturers more certainty early in our development process, such as visibility into whether R&D exempt chemicals will obtain timely EPA decisions for use in aerospace production.

In closing, thank you again for the opportunity to speak with you about how the current regulatory environment for chemicals impacts the aerospace industry. I look forward to your questions.