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October 31, 2024

ELECTRONICALLY FILED VIA REGULATIONS.ORG

Sarah Soliman
Office of Pollution Prevention and Toxics
Environmental Protection Agency,
1200 Pennsylvania Ave. NW
Washington, DC 20460–0001

Re: Pre-Prioritization and Consideration of Existing Chemical Substances for Future Prioritization Under the Toxic Substances Control Act (TSCA)
89 Fed. Reg. 68894 (August 28, 2024); Docket EPA-HQ-OPPT-2023-0606

Dear Ms. Soliman:

The Chemical Users Coalition ("CUC") is providing the enclosed comments on EPA's Pre-Prioritization activities, which were announced in the Federal Register on August 28, 2024.

CUC is an association of companies from diverse industries that are interested in chemical management policy from the perspective of those who use, rather than manufacture, chemical substances.[1] CUC encourages the development of chemical-regulatory policies that protect human health and the environment while simultaneously fostering the pursuit of technological innovation. Aligning these goals is particularly important in the context of chemical management policy in a global economy.

The CUC appreciates your consideration of these comments. If you have any questions relating to this submission, please feel free to contact me.

Sincerely,

Judah Prero

Enclosure

[1] The members of CUC are Airbus S.A.S., The Boeing Company, Carrier Corporation, HP Incorporated, IBM Company, Intel Corporation, Lockheed Martin Corporation, National Electrical Manufacturers Association, RTX Corporation, Sony Electronics Inc., and TDK U.S.A. Corporation.

Before the
Environmental Protection Agency (EPA)
Pre-Prioritization and Consideration of Existing Chemical Substances for Future Prioritization under the Toxic Substances Control Act (TSCA)
EPA-HQ-OPPT-2023-0606
October 31, 2024

Comments of the Chemical Users Coalition

The Chemical Users Coalition[1] ("CUC") appreciates the opportunity to provide these comments regarding the U.S. Environmental Protection Agency's ("EPA's" and "the Agency's") process to gather information on a list of candidate chemicals substances being considered for future prioritization action under the Toxic Substances Control Act (TSCA), information that will then be used by the EPA to either designate a chemical substance as being "high priority" for immediate further risk evaluation, or "low priority," for which risk evaluation would not be warranted at the time.

CUC is an association of companies from diverse industries focused on chemical regulatory policy from the perspective of users and acquirers, rather than manufacturers, of chemical substances. CUC advocates for regulators, like the EPA, to build a comprehensive understanding of chemical substances under regulatory consideration, including detailed insight into their conditions of use. When regulators seek, gather, and carefully evaluate this information, they are better positioned to create and implement requirements that protect health and the environment effectively and efficiently. This approach also allows the regulated community to drive technological innovation simultaneously with sustainable economic growth in the United States.

CUC members possess practical knowledge and information on how many of the identified candidate substances are used across various industries represented by their members. As the EPA gathers information to determine priority designations, CUC strongly encourages the Agency to draw on insights from previous Risk Evaluations. It is essential that the EPA not only seek information but also recognize the ongoing, real-world uses of these candidate chemical substances in the marketplace, particularly in sectors represented by CUC members. CUC is pleased that the EPA is collecting data proactively—before any risk evaluation begins—since doing so equips the Agency to gain a comprehensive understanding of actual usage conditions in both the marketplace and the workplace. This information underscores the critical role these substances play across commercial, industrial, and consumer sectors. Beyond basic data, the EPA should also gather and assess information on the effort involved in developing specialized products for technical, complex equipment, including those designed to meet government-

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[1] The members of CUC are Airbus S.A.S., The Boeing Company, Carrier Corporation, HP Incorporated, IBM Company, Intel Corporation, Lockheed Martin Corporation, National Electrical Manufacturers Association, RTX Corporation, Sony Electronics Inc., and TDK U.S.A. Corporation.

mandated specifications within CUC members' sectors. This approach will enable the EPA to more accurately anticipate the potential impacts of any decisions to regulate the use of a specific substance or category of substances.

To support the EPA in understanding the uses of the candidate substances, CUC is providing information in Appendix A with supplemental information in Appendices B and C. This data reflects initial feedback from CUC members and does not comprehensively cover all products or situations where the identified substances may be used or present. In some cases, these substances are only found in trace amounts. CUC may provide additional information to EPA even after the comment period closes, should more information become available. CUC encourages the EPA to take the necessary time to examine all ongoing and potential uses of these substances, the workplace controls in place during their manufacture, processing, and use, and their importance in essential applications. A thorough investigation into whether technically feasible alternatives exist for the listed substances in the identified uses is a crucial part of this review.

For future pre-prioritization and/or prioritization announcements, CUC suggests that the EPA provide a list of applicable CASRN even for chemical categories, such as lead & lead compounds, to stakeholders. While this list may not be exhaustive, it would serve as a foundational resource for industry analysis. This is essential as industry relies on the inclusion of CASRN in safety data sheets (SDS) to assess the presence of these substances within their supply chain.

CUC appreciates EPA's interest in seeking public input regarding its prioritization of chemical substances for potential Risk Evaluations, and CUC would be pleased to meet with EPA personnel to discuss these comments.

Appendix A

Chemical Name	CASRN	Conditions of Use	Applicable Controls/Standards	Additional Information
1-Hexadecanol	36653-82-4	• Surfactant		
4-*tert*-Octylphenol	140-66-9	• Present in oil-soluble phenolic resins and surfactant raw materials		• Cadenza Document • SVHC_AXVREP_4-tert-octylphenol_public
Benzene	71-43-2	• Present in photolithography coating chemicals used in the semiconductor manufacturing process • Used as a solvent for synthetic resins and rubbers • Present in adhesives, films, modules, lenses, protection seals, printed wire boards	• OSHA Benzene regulation, requires workplace controls (regulated areas, access controls, PPE, medical monitoring), worker training, and air monitoring • OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH - TLV 0.02ppm, confirmed human carcinogen	
TBPH	26040-51-7	• Used as part of a PVC material • Used in harnesses		

Bisphenol A	80-05-7	• Used in non-process related factory uses. Used as low concentration (<5%) component in adhesives used for repairs. Bisphenols are used as starting compounds to synthesize polymeric uses that may not be identified as Bisphenol A • Used as part of polycarbonate resins and epoxy resin raw materials • Used as vinyl chloride resin additives, polyester resin intermediates, and flame retardants • Present in detectors, connectors, lenses, cables, adaptors, power units, tapes, modules		• Information on Candidate List substances in articles - ECHA • See Appendix B
DnOP	117-84-0	• Present in a calibration standard used by microcontamination • Used as a plasticizer • Present in cable, cords, remotes	• OSHA Hazard Communication defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training	
Ethylbenzene	100-41-4	• Used in manufacturing in lower concentrations (<5%) in products including:	• OSHA Hazard Communication allows a de minimis quantity for non-carcinogens at 1.0%,	

		◦ Adhesives, in some packaging steps ◦ Coatings ◦ Aerosol mold cleaning agents ◦ Specialized process labelling steps used in production of military products ◦ Facilities maintenance products that are not used in manufacturing ◦ Present in niche lubricants and coats in small amounts • Used in styrene monomer raw material, solvent for paint, ink, adhesive, lacquer thinner • Present in Converters, Switch blocks, Display, Detector, Power Unit, Converters, Cables, Sensors, Lenses, Lithium Batteries, Adapters, Brackets, Covers, Grips, Headbands •	and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH TLV 20ppm, confirmed animal carcinogen unknown human relevance	
Naphthalene	91-20-3	• Used in die attach adhesives • Spin-on dielectrics • Used as a raw material for dye intermediates and phthalic anhydrides. • Present in adaptors, printed wire boards, cables, covers, lenses	• OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation	

			testing, and worker training • ACGIH TLV 10ppm, confirmed animal carcinogen unknown human relevance	
p,p'-Oxybis(benzenesulfonyl hydrazide)	80-51-3	• Used as a foam adhesive or vinyl chloride past additives		
Styrene	100-42-5	• Present in photolithography coating chemicals used in the semiconductor manufacturing process • Used as raw materials for polystyrene resin, ABS resins, synthetic rubbers, painted resin, lubricants • Present in sensors, modules, adaptors, batteries, panels, optical units, connectors, harnesses, tapes, microphones	• OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH TLV 10ppm, confirmed animal carcinogen unknown human relevance	
Tribromomethane	75-25-2	• Present in a calibration standard used by microcontamination	• OSHA Hazard Communication allows a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training	

			• ACGIH TLV 0.5ppm, confirmed animal carcinogen unknown human relevance	
Triglycidyl isocyanurate	2451-62-9	• Used in epoxy at very low levels • Used as part of powder coatings. • Used as part of inks, flame retardant plastic stabilizers, epoxy resins. • Present in printed wire boards, camera units, microphones, headsets •	• OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH TLV 0.05mg/m3	
m-Xylene	108-38-3	• Used as part of paints and adhesives • Used as a solvent • Present in adaptors, housings and drivers		
o-Xylene	95-47-6	• Used as a raw material for phthalic anhydride • Used in lubricants, coatings, and in painted resin • Present in adaptors, cables and panels		
p-Xylene	106-42-3	• Present in a calibration standard used by microcontamination • Used in paints, adhesives, and in insulating films • Found in adapters, cables, chargers, microphones, power units	• OSHA Hazard Communication defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation	

		• Used as a solvent used in coatings	testing, and worker training • ACGIH TLV 20ppm, not classifiable as human carcinogen	
Antimony and Antimony Compounds	Category	• Used as hardening agents in some wire and lead frame in the assembly steps and in finished product • Used in lead free solder applications, in solders and solder-pastes	• OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH TLV 0.5mg/m3	[European Commission report]()
Arsenic and Arsenic Compounds	Category	• Used as a dopant to add charge bias to silicon. It is ubiquitous on all silicon-based semiconductor production. • Used in thin film deposition	• OSHA Arsenic regulation, requires workplace controls (regulated areas, access controls, PPE, medical monitoring), worker training, and air monitoring • OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training	

			• OSHA Respiratory Protection regulation, requires risk assessment, medical monitoring, fit testing and training • ACGIH - TLV 0.1mg/m3, confirmed human carcinogen	
Cobalt and Cobalt Compounds	Category	• Used in dicing blades and many other specialized parts of manufacturing equipment • Used in final semiconductor products from specialized packaging metal structures • Used in ceramic headers • Used as an implant metal for many advanced semiconductors • Used in sputter thin films • Uses in electroplating • Used in batteries	• OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% • OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH TLV 0.02mg/m3, Confirmed animal carcinogen with unknown relevance to humans	
Lead and Lead Compounds	Category	• Used in some specialized solders, solder balls and solder pastes for products used in harsh duty or for maximum reliability	• OSHA Lead regulation, requires workplace controls (regulated areas, access controls, PPE, medical monitoring), worker training, and air monitoring • OSHA Hazard Communication regulation defines a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1%	• RoHS Directive

			• OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • ACGIH - TLV 0.05mg/m3, confirmed animal carcinogen with unknown relevance to humans	
Medium-chain chlorinated paraffins	Category	• Present in cameras and audio systems		• See Appendix C
Bisphenol S	80-09-1	• Found as a trace component in photoresists		
Hydrogen Fluoride	7664-39-3	• Used in high volume in all silicon-based semiconductor manufacturing as a wet etch • Present in both wet and dry etch and/or cleaning applications used in the semiconductor manufacturing process • Substantial footprint as a byproduct • Used as part of coatings, painted resins, platings, etching agents. • Found in headphones and drivers • Used in metal pretreatment	• OSHA Hazard Communication allows a de minimis quantity for non-carcinogens at 1.0%, and for carcinogens at 0.1% OSHA PPE regulation, requires PPE selection based on permeation testing, and worker training • OSHA Respiratory Protection regulation, requires risk assessment, medical monitoring, fit testing and training • ACGIH TLV 0.5ppm, 2ppm Ceiling Limit	

February 15, 2021

<u>Submitted via comments.echa.europa.eu</u>

RE: Call for Comments and evidence on 4,4'-isopropylidenediphenol (Bisphenol A) and structurally related bisphenols of similar concern for the environment

The Aerospace Industries Association (AIA) welcomes the opportunity to provide comments to ECHA on its *Call for Evidence seeking to investigate the manufacture, import, use and placing on the market of Bisphenol A (BPA) and structurally related bisphenols of similar concern for the environment, as well as on the possibility for substitution, potential alternatives and on the socio-economic impacts of substitution*.

Founded in 1919, AIA is the premier trade association representing over 300 of the United States of America's leading manufacturers and suppliers of civil, military, and business aircraft and aircraft engines, helicopters, unmanned aerial systems, missiles, and space systems. While AIA's membership is comprised of U.S. companies, many of our members have significant operations throughout the EU and serve a wide array of European commercial and military customers. Further, given the complex and interconnected global aerospace supply chain, many components of U.S. aerospace products are sourced from European suppliers, and vice-versa.

To inform these comments, members of AIA have completed an assessment of uses of BPA. Overall, responding AIA members conclude that they rely on these chemical substances in a significant way and that BPA and structurally similar bisphenol substances are critical to direct manufacturing as well as to the manufacturing of upstream formulations and fabricated parts provided by our supply chain. In many cases, the use of these chemical substances is necessary to achieve desired outcomes to conform with customer specifications, internal performance requirements, and certification/safety requirements.

Based on the information provided, the use of BPA and other structurally similar bisphenols found in formulations and fabricated parts provide structural integrity, improved safe use, increased energy efficiency and other attributes to the high-performance materials used by the aerospace and defense industry. Examples includes:

BPA and Structurally Similar Bisphenols	EC#	CASRN	Aerospace and Defense Identified Applications
1,1'-isopropylidenebis(p-phenyleneoxy) dipropan-2-ol	204-137-9	116-37-0	• Paints and adhesives
2,2',6,6'-tetra-tert-butyl-4,4'-methylenediphenol	204-279-1	118-82-1	• Hydraulic Fluids to conform with MIL-PRF-87252 • Dielectric Coolants • Synthetic Lubricants • Greases/Oils and other fluids
4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]diphenol; *bisphenol AF*	216-036-7	1478-61-1	• Synthetic rubber and fluoropolymer elastomers commonly used in seals and other molded or extruded goods useful at high temperatures and contact with oils and fuel such as Viton FKM, VC-30 Viton and others

4,4'-isopropylidenebis[2-allylphenol]	217-121-1	1745-89-7	• Prepreg resins
4,4',4''-(ethan-1,1,1-triyl)triphenol	405-800-7	27955-94-8	• Temperature Sensitive Lacquers
Phenolphthalein	201-004-7	77-09-8	• pH indicators included neat and other formulations where pH indicators are necessary such as heat sensitive lacquers and indicator fluids • Test kits (sulfites, chlorides, alkalinity) requiring pH indication
2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol	201-236-9	79-94-7	• High temperature film adhesives designed for bonding metallic and composite structures • Prepreg Resins • Adhesive Films • Epoxy Resins (used as a flame retardant found in circuit boards) • Corrosion resistant paints
4,4'-isopropylidenediphenol, *BPA*	201-245-8	80-05-7	• Electronic and microelectronic bonding and sealing applications that require superior electrical and mechanical properties • Electrically conductive films • Electrically conductive thermal materials • Epoxy Resins (numerous including those containing BADGE) • Structural Adhesives • Potting Compounds • Adhesive Films • Miscellaneous Epoxy Coatings • Inks • Paints • Adhesives • Molding and Filler Compounds • Curing agents • Phenolic resin dispersants • Adhesive hardeners • Foam kits
6,6'-di-tert-butyl-4,4'-thiodi-m-cresol	202-525-2	96-69-5	• Laboratory solvent • Molding and Filler Compounds

The identification and use of alternatives are largely unknown as no suitable replacements have been identified by responding AIA members for the chemical substances listed in the ECHA notice.

AIA would like to stress that the information collected by member companies and contained within this response does not represent a complete list of AIA member applications and that there may be further uses – including critical uses for which there are no substitutes – that have not yet been identified.

AIA has previously provided more detailed information on aerospace uses of BPA in 2018, as part of our comments on ECHA's 9th draft recommendation. A copy of those comments follow this response.

David Hyde, Director of Environmental Policy
Aerospace Industries Association.

AIA Comments on BPA in Response to ECHA's Draft 9th Recommendation – 2018

Prioritisation – Public consultation on SE impacts

Q1. Please fill-in the name of the substance on which you comment. Specify if your replies concern more than one substance (e.g. a group of substances with similar uses):

Bisphenol A

Uses

Q2. What is (are) the use(s) of the substance (sectors, types of uses, categories of products, etc.)?
- In general?
- By your company? *(only for companies)*

BPA is found in a broad variety of materials used by aerospace and defense OEMs and suppliers. The industry relies upon Safety Data Sheet information to identify the presence of specific substances. Using this method, all major AIA companies that responded to an internal survey have identified over 700 formulations which report the presence of BPA. These formulations include: epoxy resins and pre-impregnated (prepreg) materials (epoxy and bismaleimide) used to manufacture composite structures; adhesives (pastes and films) for structural bonding as well as numerous formulations for specific applications and substrate combinations; potting compounds and edge-filling materials for reinforcement in honeycomb composite panels; fairing compounds used for aerodynamic smoothing; coatings formulated for specific product applications such as primers for fuel tanks and military products, structural adhesive bonding; and inks for marking and identification of parts including electronic assemblies.

Uses include semiconductor fabrication, electronic components, component staking on circuit card assemblies, sealing voids in castings, general bonding, structural bonding, composite fabrication and metal finishing.

Note: Due to the reliance upon SDS information for chemical identification, the list of materials does not include formulations used by suppliers to manufacture their designed components (electronics and equipment) nor items that do not require an SDS like thermoplastic materials.

Q3. Can you specify the use in terms of volume/value?
- Overall in the EU?
- By your company? *(only for companies)*

Q4. Is the substance essential for certain uses (in terms of being indispensable for the product or process, for ensuring safety of the production process)? Which ones? Please be specific on which property/function of the substance makes it essential.

From an aerospace and defense OEM perspective, the criticality of a specific substance function is not information that is readily available. The industry does not dictate constituents of formulations. We rely upon the expertise of the material suppliers to determine the best combination of substances to meet the performance and application requirements for the specific product being designed. It is the formulations that contain these substances that are essential to the ability to manufacture as well as the performance, reliability, durability and safety of our products. The aerospace and defense industry has years of in-service experience to validate and verify that these formulations meet the extremely stringent and demanding product and use requirements. If a formulation does not perform in-service, the OEM assesses the failure mechanism, and may ask the material supplier to reformulate the material or modify the product design, depending upon the root cause of the failure. Reformulation to replace a specific substance may have significant unanticipated consequences when placed in service. Laboratory testing attempts to simulate and predict performance in a controlled setting but cannot emulate the variables and conditions encountered in-service.

As stated in response to Question 2, BPA has been identified in formulations including epoxy resins. Epoxy film adhesives have the essential properties of controlled bond line thickness, electrical/thermal conductivity, ability to cut piece parts to precisely fit complicated mating substrates.

Epoxy primers qualified to military specifications (MIL-PRF-23377 and MIL-DTL-53022) are essential for airborne and surface defense systems for corrosion protection and topcoat adhesion when hexavalent chromium containing primers are prohibited. Both primers are used in systems requiring Chemical Agent Resistant Coating (CARC) for protection against nuclear, biological and chemical agents.

For BPA, many of the resin and prepregs formulations are used in the manufacturing of structural components of the product. The criticality of these types of structures requires significant additional testing to establish the design performance boundaries and capabilities. These capabilities are then tested as part of the product demonstration/certification. Depending upon the product application, this can require destructive testing of major sections of the product to demonstrate damage tolerance and the ability to withstand predicted operational conditions.

A sample of artifacts that illustrate some of the validation requirements for composite structures which may need to be replicated with a change in resin formulation are listed below:

- "Advanced Certification Methodology for Composite Structures" [DOT/FAA/AR-96/111, 1997] https://apps.dtic.mil/dtic/tr/fulltext/u2/a326762.pdf
- "Workshop Proceedings on Composite Aircraft Certification and Airworthiness" (1988) https://apps.dtic.mil/dtic/tr/fulltext/u2/a209321.pdf
- "Guidelines for the development of process specifications, instructions, and controls for the fabrication of fiber-reinforced polymer composites" [DOT/FAA/AR-02/110, March 2003] http://www.tc.faa.gov/its/worldpac/techrpt/ar02-110.pdf
- ICAS Biennial Workshop 2011 - Certification and Continued Airworthiness Issues for Composite Structures http://www.icas.org/media/pdf/Workshops/2011/ICAS%20Workshop%20presentation%2001%20Minter.pdf
- Status of FAA's Actions to Oversee the Safety of Composite Airplanes [GAO-11-849, 2011) https://www.gao.gov/assets/590/585341.pdf

- “Composite Materials-The Safe Design and Use of Monocoque SandwichSanwich Structures in Principal Structural Element Applications [EASA CM-S-010, November 2018] https://www.easa.europa.eu/sites/default/files/dfu/CM-S-010%20Issue%2001.pdf

Since the properties of the composite structure are heavily dependent upon the processing used in manufacturing, introduction of new or modified formulations or processes in the supply chain will require ‘First Part Qualification (FPQ)’ as verification that the first production part manufactured by the processor/supplier is following the fabrication,procedures, inspection procedures and techniques and are in compliance with the Engineering drawings and specifications. This activity is intended to ensure compliance and correct deficiencies at the start of production while demonstrating the supplier’s ability to meet OEM requirements and may involve on-site visits by the OEM. Production cannot begin without each supplier successful completion of FPQ. This is an additional component of implementation that requires additional time, planning, coordination and resources to proliferate changes in the supply chain.

Q5. Is the substance present in a finished article? If yes, at what concentration?

According to Page 8 of the ECHA Draft background document for BPA, ECHA assumes that BPA present in epoxy hardeners react and are consumed during processing and release from finished articles is unlikely. SDS information on these types of materials indicate the initial concentration of these products are extremely low (<5%). Although the initial concentration of BPA in hardeners for coatings and potting compounds are typically higher (10-60%), industry assumes similar chemical behaviour and that the remaining BPA is negligible after cure.

For BPA, literature appears to indicate < 0.1% w/w concentration may be present in the finished article. Further consultation/investigation will likely be necessary.

References:

“Residual Level of Bisphenol A in polycarbonate Products” https://www.covestro.com/-/media/covestro/country-sites/global/documents/products/productstatements/emea/covestro_deutschland_ag_residual_level_of_bisphenol_a_in_polycarbonate_products_1707.pdf?la=en&hash=3272BC4E317EEDF6903F0EC17B5CDFBD732D79B8

“Epoxy Resins-Assessment of Potential BPA Emissions – Summary Paper” https://epoxy-europe.eu/wp-content/uploads/2016/09/epoxy_erc_bpa_whitepapers_summarypaper.pdf

Q6. Do(es) the use(s) of the substance imply any risks/exposure/releases for workers, consumers or environment?

Typical applications of products containing bisphenol A involve 2-part products that are mixed and then cured upon application. Examples are adhesives, epoxy resins, potting compounds and coatings. Occupational exposure risks are primarily from the unreacted components of the bisphenol A and can be a result of inhalation or dermal exposure.

Risk of environmental release is primarily from improper disposal of unreacted components or accidental release.

Q7. What measures have been put in place to prevent these risks/exposure/releases?

Typical mitigations for employee exposure include the following:

- Limiting quantity of use to the smallest amount necessary. This prevents excess unreacted product and also limits opportunity for employee exposure to large quantities of bisphenol A
- Engineering controls including local exhaust for processes that could result in employee exposures above the applicable Occupational Exposure Limit. This would apply to application of uncured material rather than materials that are in a cured state.
- Requiring the use of PPE, including nitrile gloves, to prevent exposure to material.
- Selection of products with low volatility for large applications, e.g. floor coatings
- Adequate general ventilation and industrial hygiene monitoring for large applications, e.g. floor coatings.
- Respiratory protection for applications where exposure to bisphenol A could exceed Occupational Exposure Limits.
- Storage of materials is performed with approved containers only. Secondary containment is used where needed or appropriate.
- Collection and processing of uncured materials per established Hazardous Waste procedures. This ensures final disposal at approved locations only.
- Unexpected releases, e.g. spills, are handled according to local emergency response and containment procedures. Environmental impact is addressed per federal regulations and government policy.

Availability of alternatives

Q8. Are there alternative substances, processes or technologies currently available for the use(s) of the substance? If yes, what are these alternatives and, what are their hazard properties compared to the substance in question?

Although there are academic papers being written about BPA-free resin development, none of the OEMs surveyed reported any proposed or ongoing evaluation of alternatives. Industry recommendations for other sectors include Bisphenol-F and bisphenol-S. These are already in use in some products and having known performance differences as compared to BPA. There are also early indications in the mass media that concerns around the toxicity of these alternative chemistries are starting to come to light for consumer products. It is unlikely that they will offer a stable, long term alternative for aerospace OEM's.

Q9. Would the use of this (these) alternative(s) substances, processes or technologies lead to a more sustainable production/ a more sustainable consumption?

Q10. Are you aware of their use/testing?
- In the EU or in non-EU countries?
- By your company? *(only for companies)*

Q11. Are you planning to substitute the substance in the coming five years? (Only for companies)

No

Q12. Are there uses for which there are no alternatives (substances, processes or technologies)?

AIA and its member companies do not have knowledge of qualified alternatives for substances, processes or technologies at this time.

Q13. If there are no alternatives, are you aware of any R&D work in attempt to develop them? If so, how long do you expect that the development / testing can take?

- In the EU or in non-EU countries?
- By your company? *(only for companies)*

Aerospace manufacturers rely upon supplier's material formulation expertise for the development of qualified alternatives but need to provide the technical performance requirements to formulators that materials need to meet.

This is an iterative process and the time to identify alternative formulations, test them against performance requirements, and validate their use as a qualified and certified alternative can take many years depending on the specific use of a material/component. For structural applications, validation may require additional full-scale demonstration article testing. See answer to Q4.

Market and Supply Chain

Q14. What is the volume/value of the substance that is placed on the EU market/manufactured in the EU/ imported into EU/ exported from EU (per annum), or, used?

- Overall in the EU?
- By your company? *(only for companies)*

AIA does not have any information relating to the volume of these substances.

Q15. Linked to Q14, please specify the sector in which you are using the substance and describe the supply chain where the substance is used. *(only for companies)*

AIA represents companies involved in the design and manufacture of aerospace and defense products, that will use these substances in the manufacture, operation, maintenance, repair and overhaul of Aviation Products that meets the airworthiness certification requirements.

Given the complex nature of these products, supply chains can be very long and involve several levels of different companies, some large and some small, who are all responsible for supplying each other.

Q16. Linked to Q14 and 15, can you provide data on the turnover of the concerned sectors and the number of people employed? What is the turnover of the substance/substance-related products vs. the total turnover of the sector?

Q17. Can you estimate the relative weight of SMEs in the concerned sectors (in terms of number of companies and employment) in your country /in the EU?

Q18. Are the manufacturers of the substance or downstream users concentrated in a single/limited number of Member States or in a limited number of regions?

Competitiveness

Q19. What would be or has been the overall costs of substitution for the particular use you are providing information on or you are involved in (including if relevant the need of changes in the production process, need for new product testing and certification) and to how long period this cost would be or has been spread?

AIA cannot provide specific costs related to substitution, as this would vary from company to company and depend on the specific use. Aerospace products have very strict performance and certification requirements. Many materials and components used in our products have 'allowables', or 'design windows', which specify how a product must perform under conditions relevant to use and specific application.

Q20. What is the expected impact of substitution costs on the costs of your inputs or final products? What is expected impact on your sales in the EU/outside the EU countries. *(only for companies)*

AIA is not able to give specific figures on substitution costs, as these would vary from product to product and company to company. Given the very high cost of aerospace products however, any requirement to substitute a substance that disrupted production of a final product and resulted in reduced sales could easily run in to billions of euros.

Q21. Please describe the typical length of the order cycle / investment cycle.

- To the concerned sectors?
- To your company? *(only for companies)*

Aerospace products have very long lifecycles that amount to several decades, and coupled with the extensive design and market considerations that factor into whether to initiate development of a new aircraft, this means the oldest aircraft in production today were first designed over fifty years ago. New product lines (e.g. new or derivative aircraft models) are regularly launched but are spaced several years apart.

Q22. Please describe what the impacts of including the substance in Annex XIV of REACH would be? (in terms of changes in the competitive position with respect to non-EU competitors on the EU market and on third markets)

- To the concerned sectors?
- To your company? *(only for companies)*

Other impacts of inclusion in Annex XIV (innovation and business opportunities)

Q23. If the substance is included in Annex XIV to be eventually phased out, would it create business opportunities (e.g. higher market share, development of alternative substances /products / production techniques)?

- In your sector?
- For your company? *(only for companies)*

Q24. What effects do you expect on enterprises' capacity to innovate? (The capacity to produce more efficiently and/or higher quality and a larger scale of products and services and the capacity to bring R&D to the market)

The exact effects will differ from company to company, though AIA would like to highlight that the substantial time and resource implications of identifying, validating, and certifying changes to products would result in there being less resources available for wider R&D activities, including those that could have substantial benefits for the environment such as developing, designing, testing and certifying new propulsion technologies.

Q25. Are you aware of any likely effects on recycling /the sustainable use of by-products?

Application for authorisation – (only for industry actors)

Q26. If the substance is included in Annex XIV, would you consider applying for an authorisation? In case of negative answer, are you aware if your suppliers/downstream users consider to apply?

AIA envisages that our member companies would actively support development and submission of applications for authorization for their uses where they do not have alternatives. As discussed in Q27, members would not necessarily seek authorisation themselves but rather as part of joint upstream applications.

Q27. How would you envisage that the submission of an application for authorisation could be organised, considering your/the specific uses and the structure of the supply chain: would you envisage an application by manufactures/importers of the substance or formulators (upstream the supply chain)/ or application by downstream users or a combination of all)?

Upstream applications supported by OEMs are essential for business continuity in the aerospace sector. Aerospace supply chains are complex with many actors at different levels. OEMs control the end user requirements for the products they produce. Upstream actors in the chemical supply chain (e.g formulators, importers of formulations), however, are better placed to hold Authorisations and distribute chemicals to the various users (e.g. processors, component manufactures, OEMs, etc.) of the substances.

Downstream applications may be filed in limited circumstances with unique requirements.

Q28. What main challenges in preparing an application do you expect for your specific case? Would you envisage applying for your own uses or would you apply to cover uses of your downstream users?

The main challenge in preparing an upstream application is obtaining detailed information about site operations for lower tier suppliers of OEMs. A typical aerospace supplier chain may have four or five or more tiers or levels of companies that supply each other. Each tier of the supply chain is responsible for establishing contracts with lower tiers to obtain products that meet their requirements, but they do not necessarily share sensitive business information (like supplier identity) that can inhibit their competitiveness or intellectual property management. This structure allows for the deliberate flow of requirements, but not of sensitive business information (such as employee exposure data, socioeconomic business date, etc) essential for authorisation applications.

The aerospace sector relies instead on surveys and encourages affected downstream users (DUs) to collaborate in authorisation consortia (by joining or contributing) and voluntarily provide relevant data to third party consultants that aggregate the available data. In the short 18 to 24 month timeframe after substance listing on Annex XIV and the Last Application Date ,there is not always sufficient time to encourage enough supply chain actors to develop a thorough and comprehensive application.

Regulatory options

Q29. Do you consider that other regulatory options could better address the concerns for which the substance is recommended for inclusion in Annex XIV? What are these regulatory options? Explain why?

Other remarks

Q30. Would you like to provide additional comments/information on the possible socio-economic impacts?

*****

Introduction

ASD and AIA would like to thank the German authorities for this opportunity to provide comments on their preparation of this restriction proposal.

ASD is the voice of European Aeronautics, Space, Defence and Security Industries and AIA represents the American aerospace and defense industry.

General comments

The use of BPA (including derivative compounds, polymers and related bisphenols), within the EU, is critical for the production, maintenance and repair of Aerospace and Defence products throughout their extremely long service lives – 20-50 years on average, and decades longer for some defence equipment.

BPA (including derivative compounds, polymers, and related bisphenols) are used in a variety of different materials for the manufacture, maintenance and repair of aerospace and defence products and currently, no alternatives exist. It should be noted, even if it is possible in future to move away from BPA-based materials/formulations in new designs, there is likely to be reliance for the maintenance and repair of existing products, expected to be in service decades after initial entry into service.

Uses further described in the sections below and reported in the online questionnaire will take place both in and outside the EU (with import of resulting affected aerospace and defence articles). Uses take place both directly at sites of member companies, throughout the supply chain, and third-party repair and maintenance facilities.

For the uses described below and in the questionnaire, no alternatives are available. As such, if aerospace and defence uses of BPA-based formulations/materials and/or aerospace and defence articles were found to contain levels above the proposed limit of any of the substances in scope of the final restriction, then it would not be possible to move away from the BPA-based materials to reduce concentration limits. **Therefore, we request any restriction consider this and allow provision for aerospace and defence products to continue to be imported, manufactured, and repaired in the EU until successful alternatives can be found by the formulators, then qualified and certified by aerospace and defence companies for each use. A 24-month transition period would be insufficient, as new alternatives must go through these required steps.**

Challenges of assessment and likely impacts of the proposed restriction on Aerospace and Defence

Whilst we have provided information on expected impact to the aerospace and defence uses of BPA chemistries insofar as we have visibility, we would like to bring to your attention, the challenges for providing the level of information requested in the call for evidence whilst highlighting to you the potential impact were our uses of and products reliant on BPA-based chemistries to fall in scope of a restriction.

Provision of volume information

Providing volume information is challenging currently since there are many formulations and articles that might (or might not) exceed the 10 ppm residual BPA level proposed. It is difficult to identify which of the formulations we use, and articles that we manufacture/purchase/import, would exceed the 10 ppm limit due to lack of data in the supply chain for declaring currently at such low levels (i.e. below 0.1% declaration threshold we do not have good visibility as downstream users). Testing for residual levels of bisphenols in formulations we use or articles we manufacture has never been required or performed in our industry (or likely most industries). Moreover, the cure state may vary amongst articles that use the same epoxy resin, rendering data from upstream suppliers on residual BPA content and its migration unrepresentative.

Whilst it is possible to identify dependencies on BPA chemistries such as in epoxy formulations containing BPA-derived substances & polymers, that therefore may have residual BPA, we are reliant on formulators to advise if those products can meet the 10 ppm level or will meet it when fully reacted/cured. Preliminary information that we are aware of suggests that some of the formulations used in our sector may exceed 10 ppm and investigations with formulators are ongoing to try to further quantify and precise the affected formulations and resulting impact on articles, however this information is not expected to be available in the near term.

Comments on migration limit testing for BPA in aerospace and defence articles

We do not have data for migration limit testing of BPA in our products and parts. It is important to stress that any testing (by upstream manufacturers of the BPA-derived materials and formulations, as suggested in the call for evidence) would need to account for the varied and extreme operating environments where the many (potentially) affected parts are used, as well as the long lifespans of aerospace and defence products. Currently no test scenarios for these environmental conditions are existing and would need to be prepared, evaluated and agreed in our sector to ensure a harmonized approach. It is highly unlikely that upstream manufacturers would be capable of performing the environmental testing required to duplicate aerospace and defence related exposures. Similar to testing that is done to qualify any new formulation, it is anticipated that a formulator would perform more general tests, but the burden of testing specific uses would likely fall on the aerospace and defence hardware manufacturers. These tests are expected to be costly, time-consuming and complex due to a combination of physical and environmental operating parameters. However, estimates are not currently possible until more specifics about the actual test methods are available.

Additionally, since there are not alternatives available for aerospace and defence uses in any case, we would question the value in requiring such testing – the industry would not be able to bring those products into compliance – please refer to the following sections for detail regarding alternatives challenges and BPA removal.

A further consideration concerns complex articles and the potential for multiple sources, and therefore possibly multiple data on BPA residuals and migration limits to be managed, for a single aerospace and defence part, assembly or product. For example, a single complex article might contain residual BPA from composites, adhesives, electrical components, coatings etc.

Alternatives work for replacement of BPA based chemistries in aerospace and defence products and processes

Whilst some formulations used within our sector that contained BPA itself (for example as hardeners in resin systems) have been able to be reformulated to remove the intentional BPA, there are further formulations where replacements are not possible due to the requirements for the extreme conditions in which the aerospace and defence parts operate.

For BPA-based chemistries in general (BPA-derived polymers and epoxies), there are not known alternative formulations currently available that can replicate the functionality and properties of existing products. Most alternatives investigated e.g. for epoxy resins have been “BPA analogue”, which are also considered in this restriction proposal. Additionally, the uses of BPA-based chemistries in formulations across aerospace and defence products are multiple and widespread, which makes replacement extremely intensive due to the myriad affected parts, systems and repairs for which alternatives requirements will vary.

If it were possible in future to develop alternatives to BPA-based chemistries for use in aerospace and defence products, multiple different alternatives will be needed to replace one (epoxy) formulation due to the broad range of different parts and operating environments where these formulations are used.

A further concern for alternatives development in aerospace and defence applications is for the broadband use of BPA across materials, parts and products. It is unlikely that the necessary myriad alternatives could be developed in parallel due to the wide range of applications that testing would need to be completed for. Due to the volume of alternatives testing expected to be needed, it is foreseen that only isolated solutions and their phased introduction would be possible *if* viable alternative formulations/materials were found.

Regarding the alternatives suggested in the background documents to the call for evidence, we are unable to provide comment as to their viability. Some could be excluded due to other regulations restricting their use (e.g. Penta BDE, boric acid). It is important to convey that our Aerospace and Defence uses of these chemistries rely predominantly on whole formulations, which undergo strict airworthiness qualifications to be used in Aerospace and Defence products. As such, when we are assessing alternatives, it is an alternative to the formulation as a whole that, rather than specific ingredients, that we need to assess and qualify for viability in our systems. Technical challenges of alternatives include the interactivity of all constituents in a formulation, which are each added for specific performance criteria. If formulators changed ingredients in an existing formulation (to address the restriction), this would require us to test and re-qualify the whole formulation across all parts and processes where it is used, to ensure that it still performs equal to the existing formulation in all scenarios, therefore assuring those existing certifications and safety are not jeopardised. In the worst-case scenario, for example for epoxy resin-based aircraft fuselage, the full certification of an aircraft type would need to be renewed.

In the first instance, we would need to rely on formulators of affected products used in aerospace and defence to screen those alternatives suggested and advise on initial suitability to take forward for further assessment by both the formulators and the aerospace and defence manufacturers.

Challenges and timelines for alternatives qualification in aerospace and defence products

Full replacement of formulations containing Bisphenols in Aerospace & Defence products requires time far exceeding the proposed 24-month transition period. As an example of the time requirements to develop and insert innovative chemistries into our products, the sector has been working for more than 30 years to replace hexavalent chromium compounds, and 15 years to replace lead in solder.

To help convey the challenges involved in alternatives development and deployment in aerospace and defence products and processes, we call your attention to a paper produced by the Global Chromates Consortium for Aerospace's (GCCA), titled Aerospace & Defence Qualification Process Impacts on Ability to Substitute Cr(VI) Substances[1].

Please note this particular paragraph of the GCCA paper:

"Aerospace and defence (A&D) products operate and carry people in extreme environments over extended timeframes, while having to fulfil extremely challenging technical, reliability, and safety requirements. To ensure the safety and reliability of aerospace products, comprehensive airworthiness regulations have been in place globally for decades. **These regulations require a systematic and rigorous framework to be in place to qualify all materials and processes to meet stringent safety requirements that are subject to independent certification and approval through EASA and other agencies requirements.** Air, ground and sea-based defence systems, and also space systems, are subject to similar rigorous qualification requirements. Changes to A&D hardware offer unique challenges that are not seen in other industries."

Although the GCCA paper was written to support hexavalent chromium Authorisation applications, the qualification and certification processes described are also applicable to alternatives development to replace other substances, including BPA and formulations/materials potentially affected by the proposed restriction. The following illustration, which has been adapted from the GCCA paper provides a simplified overview of alternatives development steps and typical timelines:

[1] The entire paper can be found here on the GCCA website.

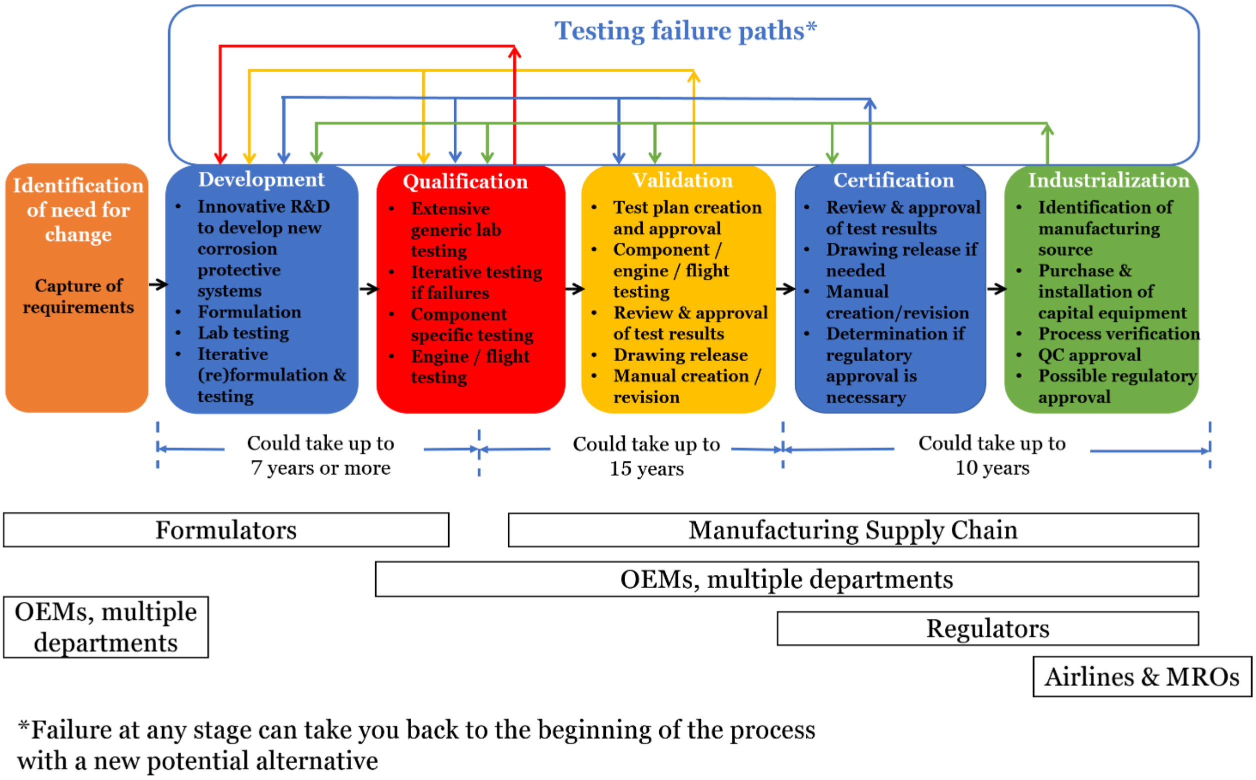

Figure 1. Illustration of the development, qualification, validation, certification and industrialisation process required in the aerospace industry – adapted from the GCCA paper on Aerospace & Defence Qualification Process Impacts on Ability to Substitute Cr(VI) Substances[3] & Joint Analysis of Alternatives and Socio-Economic Analysis, Authorisation application 0203-02[4] .

As also indicated in the GCCA paper, "The complex relationship between each component (in aerospace and defence systems) and its performance requirements within its own unique design parameters requires certification of each substitution individually (see Figure 2). Qualification in one particular application does not guarantee that use in another application is qualified. Every application must be individually assessed to determine that requirements are met. This process must be independently replicated across all A&D products by each A&D company. A&D products (e.g. a specific aircraft model) may be in service for 30-50 years (even longer in defence uses), requiring maintenance, repair and spare parts over their entire service lives. Any changes to these parts or processes must be fully validated and certified to ensure safety and performance are not compromised."

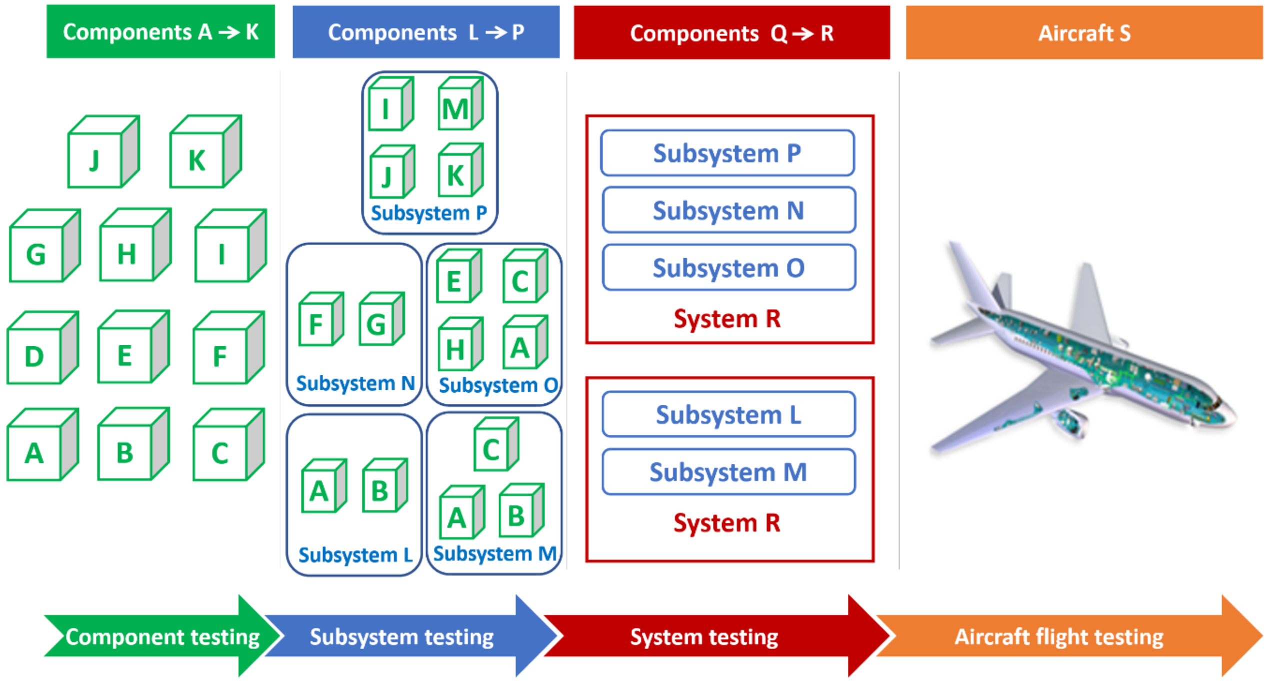

Figure 2. Systems assessment and validation overview, reproduced from the GCCA paper on Aerospace & Defence Qualification Process Impacts on Ability to Substitute Cr(VI) Substances[3].

Possible socioeconomic impacts in the case that aerospace and defence products and processes fall within scope of the proposed restriction

Currently, it is difficult to provide values on the potential impacts of the proposed restriction on Aerospace and Defence due to the reasons previously outlined regarding industry's ability to fully identify and assess the possible impacts. However, we can offer a general view on possible impacts if aerospace and defence product and processes were within the scope of the restriction and therefore no longer able to be used or imported into the EU.

In such a non-use scenario, production and repair of the aerospace and defence products that rely on affected formulations, that cannot meet the proposed residual or migration limits, would have to cease within the EEA. Import of articles found to exceed the migration limit would also need to cease. This would, in effect, prevent the repair of existing aircraft and defence products in the EEA and would prohibit the manufacture and import of certain new, replacement or refurbished A&D components and products to the EEA. This non-use scenario would lead to the grounding of aircraft and defence systems with devastating implications for Civil Aerospace and Defence

The possible economic impacts, were aerospace and defence products and processes no longer able to take place/be used/placed on the market in the EU as a result of BPA restriction before alternatives were able to be developed and implemented, would be substantial. It would affect not just aerospace and defence companies, their supply chains and third-party MRO (Maintenance, Repair and Overhaul) facilities, but would also have significant impacts for customers (including airlines and defence agencies) and those who rely on the products and services provided by the industry.

Possible economic impacts within the aerospace and defence sector would include:

- Job losses and loss of profits – OEMs, suppliers, airlines, repair and maintenance facilities, etc.
- Costs associated with unused stock disposal
- Costs for relocation of work outside of EEA – OEMs, suppliers, repair and maintenance facilities, etc.

- Penalties for failures to meet contracts (e.g., where servicing cannot be completed leading to aircraft being grounded)
- Economic consequences of commercial and freight aircraft groundings and flight cancellations, including reduced tourism

There would be interruptions to new product delivery and to the maintenance and repair (servicing) of existing products, until alternative formulations and materials could be certified for the uses on the potential myriad parts and repair/maintenance schemes affected. The widespread implications for such a scenario cannot be understated and are likely to include:

- Cease in production of aerospace and defence products within the EEA
- Cease in delivery of aerospace and defence products and spare parts to the EEA
- Inability to service and repair existing aerospace and defence products in the EEA or to import repaired and refurbished components to the EEA – aircraft would be grounded, including defence fleets.
- Loss of functioning aerospace and defence equipment in EEA
- Premature retiring from service of aerospace and defence equipment in EEA This would also be contradictory with the circular economy action plan as it would reduce the service life of products.
- National security implications for Member States if they cannot maintain, deploy or operate affected defence products containing residual BPA above the proposed limits
- Reduced supply and increased costs of perishable goods transported by air.
- Price increase and reduced schedules for passenger flights and air freight
- Loss of jobs
- Closure of EEA-based facilities

To provide some context for the associated monetary impact in the case that aerospace and defence products and processes are affected by the restriction (prior to successful alternatives being certified), the EU REACH Authorisation application number 0203-02 serves as an example. This Authorisation application included estimated values in the case of non-use of OPE (Octyl Phenol Ethoxylate) in sealants for manufacture and repair of aerospace & defence products. Although BPA based chemistries are used in different formulations/materials to the OPE, the effect of non-use on parts manufacture and repair across the industry are at least comparable, if not more severe (as the affected parts and products would be much wider). The joint AOA and SEA document[2] within the OPE Authorisation application puts a conservative value on the loss to the aerospace and defence industry in the several billion Euros region, with further (non-quantified) impacts for other industries and bodies that rely on the smooth functioning of the aerospace and defence industry (air travel, cargo, tourism, national defence, humanitarian relief missions etc).

Information on aerospace and defence uses identified

Uses of BPA with regard to Polymers

BPA-based polymers and/or polymers containing BPA additives are widely used for the production and repair of aerospace and defence products. We highlight examples of the wide range of product and part types where these materials are found below.

[2] Joint Analysis of Alternatives and Socio-Economic Analysis (non-confidential report) - EU REACH Authorisation application number 0203-02 concerning Mixing, by Aerospace and Defence Companies, and their associated supply chains, including the Applicants, of base polysulfide sealant components with OPE-containing hardener, resulting in mixtures containing < 0.1% w/w of OPE for Aerospace and Defence uses that are exempt from authorisation under REACH Art. 56(6)(a).

- ***Polycarbonates***
    - Aircraft windshields
    - Windows and window slides
    - Cockpit shields
    - Cockpit displays
    - Lenses and lens covers
    - Consoles
    - Shield reflectors
    - Light covers
    - Doorframes and Doors
    - Interior panels
    - Electrical insulators
    - Injection moulded thermoplastics and transparencies

  Changes to composition and use of alternative substances can change the optical properties of the material such as light colour and refractive index, which are critical properties of components such as lenses, light guiding elements for example.

- **Polysulfones**
    - Insulators
    - Wire insulation
    - Battery shells
    - Oxygen masks
    - Aircraft fuel systems
    - High-voltage capacitors
    - Intermediate Structures, Mountings, Doorframes and Doors
    - interior aircraft parts
    - Structural composite materials
    - Membrane technologies
    - FRP moulded products
- **Polyarylates**
    - Aircraft windows
    - Aircraft Electrical components
    - Carbon reinforced plastic composites
- **Polyetherimides (also tradenamed as Ultem).**

  There are multiple uses of this polymer identified, it is used because it exhibits high resistance to heat and flame and has a high dielectric withstanding capability. Applications include:

- Electrical Connectors
- Electrical Insulators
- Injection-molded engine components
- Semi-structural – helmet mounted camera supports
- Multiple mechanical parts
- Air and fuel valves
- Composite & injection moulded plastic parts
- Flight control equipment
- Fuel systems

- **Polybenzoxazin resins**
    - Chemical and heat resistant coatings
    - Adhesives
    - Composite tooling materials
    - Prepregs
    - Laminates for circuit cards
- **Phenolic resins**
    - Electrical components
    - Electrical insulators
    - Electrically insulating structural components
    - Rocket motor nozzles
    - Composite armour systems
    - Glues
    - Seals
    - Electrically isolating potting materials
    - Composite parts
    - Circuit board material
    - Adhesives
    - Laminating resins
    - Interior aircraft composite materials
- **Polycyanurates**
    - Fibre enforced composites
    - Structural & semi-structural composites
    - Radome structures
    - Adhesives

- **Vinyl ester resins**
  - Structural composite materials
  - Adhesives
  - Possible uses in runway patch materials
- ***Epoxy resins***

  BPA-derived substances identified in use in epoxy resins include (but are not limited to):
  - Bisphenol A diglycidyl ether (BADGE - CAS 1675-54-3)
  - Bisphenol A epichlorohydrin polymer (CAS 25068-38-6)
  - Bisphenol A diglycidyl ether polymer (CAS 25036-25-3)

Information published by the ERC[3] indicates that it may be expected for formulations of liquid epoxy resins to meet 10 ppm for residual BPA but not necessarily solid epoxy resins which may reach 65ppm. However, as downstream users of these formulations, we do not have definitive information on residual BPA limits, and we cannot be assured that we do not rely on BPA-derivatives in formulations where the residual BPA exceeds 10 ppm.

When the formulations that we use and which contain BPA-derived substances are used in the manufacture, maintenance and repair of aerospace and defence products, we understand that curing will consume any residual BPA present. However, as is the case for formulations, we do not have assurance of whether residual BPA could remain in articles above 10 ppm.

The types of formulations and materials that are used for the manufacture and maintenance of aerospace and defence products, and that contain these BPA-derivative substances include, but are not limited to:

- Specialist coatings including anti-corrosion paints and primers, attrition coatings, intumescent paints, insulation paints, erosion resistant paints
- Adhesives such as film adhesives, paste adhesives, structural adhesives, retaining adhesives
- Fillers
- Damping compounds
- Resins/composite materials
- Bonded dry film lubricants
- Potting compounds
- Moulding and filler compounds
- Pre-preg materials
- Phenolic resin dispersants
- Curing agents
- Hydraulic fluids, oils, greases and lubricants
- Dielectric coolants

[3] Ref: ERC white paper here: [Epoxy_ERC_BPA_WhitePapers_SummaryPaper.pdf (epoxy-europe.eu)]

- Synthetic rubber and fluoropolymer elastomers such as Viton (FKM)
- Temperature sensitive lacquers
- pH Indicators
- Electrically conductive films
- Inks
- Speciality tapes

The types of aerospace and defence articles relying on the use of BPA-derivative substances in the formulations/materials described above include:

- Aero engine components – affecting a wide range of different parts, responsible for a range of different functions in the engine including (but not limited to) nuts and bolts, fairings, panels and casings, blades, guide vanes, containment wrap, fan cases, nacelles, thrust reversers, pipes and electronic componentry
- Airframe components including structural panels and lining materials
- Naval marine components – a wide range of different parts including (but not limited to) nuts and bolts, panels and casings, blades, pipes and electronic componentry
- Defence components, including shelters, enclosures, antenna structures, radomes, launcher tubes, and rocket motors

Overarching considerations for replacement/modification to composition of aircraft BPA-based polymers is that parts made using such materials for aircraft applications must fulfil the highest requirements in respect of self-extingishing/non fire acceleration, smoke or toxicity in the event of fire. A change of the material properties may influence these safety properties in a negative way.

Additionally, changes in the mechanical properties of the materials can affect the strength/endurance of parts in terms of, for example; their load-bearing ability, temperature resistance, vibration resistance, tensile and compressive strength.

The materials must continue to meet the required performance standards for such functionality throughout the duration of their operational lives and whilst operating in extreme environments within aerospace and defence products.

Uses of BPA with regard to the production of other chemicals

See above information regarding BPA-derived substances used in epoxy resins

Uses of BPA as an additive

Some formulations used for the manufacture and repair of aerospace and defence products contain BPA that is intentionally present as hardeners for resins/adhesives and activators for epoxy coatings.

The concentration of BPA as an additive in these types of 2-part formulations is typically below 3%, which is further diluted when mixed prior to use and is expected to be consumed (reacted) when the products are fully cured.

Uses of BosC where the use can be regarded as a substitute use for BPA (for example the use of BPS in thermal paper)

The use of BPA AF (CAS 1478-61-1) as Viton (FKM) in seals and moulded extruded products

Uses of BosC where there are no comparable uses of BPA

The following aerospace and defence uses of BoSC have been identified:

- 2,2'-diallylbisphenol A (CAS 1745-89-7) in prepregs and adhesives
- 4,4'-methylenebis(2,6-di-tert-butylphenol) (CAS 118-82-1) in fire resistant hydraulic fluids and lubricating oils

- Tetrabromobisphenol A (TBBA – CAS 79-94-7)
  - TBBA is present as the fire retardant in epoxy/glass laminate used in PCBs. TBBA is understood to be chemically bound into the epoxy and so cannot leach out.
  - TBBA is found in sealants, prepregs and adhesives for aerospace and defence uses.
  - TBBA is used for electronic component packaging, which is required to support high temperature reflow and durability. Certifying authorities require use of flame-resistant materials; FR4 is the current standard to meet flammability, durability, and reliability. For this particular application of TBBA, phosphorous-based alternatives have been tested but failed the reliability requirements; examples of failure include lifting of electronic components from the PC board, failure to survive manufacturing reflow processing, and growing conductive whiskers. Other possible alternatives that could be looked into, such as polyimide, ceramic, or Teflon would be heavier, costlier, and less reliable, which is not in line with reducing weight, fuel usage, and carbon dioxide emissions.

[Signature on file], Jan Pie, ASD Secretary General, 21st December 2021

[Signature on file], David Silver, AIA Vice President, Civil Aviation, , 21st December 2021

November 7, 2021

Submitted via comments.echa.europa.eu

RE: Call for Comments and evidence on medium-chain chlorinated paraffins (MCCP)

The Aerospace Industries Association (AIA) appreciates the opportunity to provide comments to ECHA on its Call for Evidence seeking to investigate the manufacture, use and placing on the market of medium-chain chlorinated paraffins (MCCPs) in substances, mixtures, and articles, as well as on the possibility for substitution, potential alternatives, and substitution costs.

Founded in 1919, AIA is the premier trade association representing over three hundred of the United States of America's leading manufacturers and suppliers of civil, military, and business aircraft and aircraft engines, helicopters, unmanned aerial systems, missiles, and space systems. While AIA's membership is comprised of U.S. companies, many of our members have significant operations throughout the EU and serve a wide array of European commercial and military customers. Further, given the complex and interconnected global aerospace supply chain, many components of U.S. aerospace products are sourced from European suppliers, and vice-versa.

AIA members are fully committed to the practice of safe and sustainable chemical management and share the goal of identifying ways to address, and, where necessary, mitigate and minimize the risks associated with MCCPs chemistries. Our members support a science-based, comprehensive, and integrated approach to managing risks associated with MCCPs, including specific measures to prioritize, evaluate, monitor, innovate, advance best practices, and regulate them. To inform these comments, members of AIA have completed an assessment of uses of MCCPs found in aerospace and defense products, parts, and supplies. AIA members use products and formulations that contain MCCPs in a controlled manner that comply with national, regional, and local laws related to environmental control as well as worker exposure. Examples include:

Medium-chain chlorinated paraffins (MCCP)	**EC#**	**CAS#**	**Aerospace and Defense Identified Applications**
Alkanes, C14-17, chloro	287-477-0	85535-85-9	• Dry film Lubricants • Polyurethane foam sealants • Stripping paints (at airports) • Tapping and cutting fluids / machine working fluids
Alkanes, C14-16, chloro		1372804-76-6	• Tapping and cutting fluids / machine working fluids

Alkanes, chloro	263-004-3	61788-76-9	• Dry film Lubricants • Tapping and cutting fluids / machine working fluids • Honing oils • Urethane adhesives • Standards media for viscosity testing and laser labs • Polyurethane foam sealants
Paraffin waxes, chloro		63449-39-8	• Sealants/caulk (including foam sealants) for use in testing and fire-retardant sealants/caulk • Tapping and cutting fluids / machine working fluids • Tamper proof sealants • Elastomeric coatings / moisture barrier coatings • Composite pinhole filler • Greases (including waterproof grease) • Tapes • lubricants • Ink/marker products • Paints and other surface coatings (conforming) • Gap filling foams • Hot Forming oils • Film adhesives • Static conditioners • Neoprene based adhesives • Rust inhibitors
Alkanes, C24-28, chloro		1402738-52-6	• Tapping and cutting fluids / machine working fluids
Alkanes, C20-28, chloro		2097144-43-7	• Tamper proof sealants
Alkenes, polymd., chlorinated		68410-99-1	• Tapping and cutting fluids / machine working fluids • Fire retardant paint
Alkanes, C18-28, chlcoro	287-478-6	85535-86-0	• Elastomeric coatings / moisture barrier coatings • Tamper proof sealants • Dry (solid) film lubricants • Tapping and cutting fluids / machine working fluids

AIA would like to stress that the information collected by member companies and contained within this response does not represent a complete list of AIA member applications and that there may be further uses – including critical uses for which there are no substitutes – that have not yet been identified.

AIA members and our suppliers have been actively working to identify and implement alternatives. Several uses have been phased out in recent years. However, critical uses remain due to the stringent safety and regulatory and requirements. MCCPs are crucial for ensuring certain products meet the certification requirements of the EU aviation safety agency (EASA), Federal Aviation Administration (FAA), and other regulators. In cases where alternatives to the use of MCCPs do exist, the development, qualification, and certification process for aerospace products and components can take several years. For example, there are no alternatives to MCCP-containing adhesives and tapes that meet flammability requirements.

To summarize AIA's position on this matter, our industry uses these substances for critical applications without alternatives. In the cases that viable alternatives may exist, transition takes lengthy performance validation for each application would take several years with no guarantee of success. This could pose significant risk to production and operational continuity. There is also the challenge of finding substances with an equivalent technical performance and proliferation within a complex supply base.

Thank you for your consideration of these comments,

Kind regards,

Mark Sudol

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