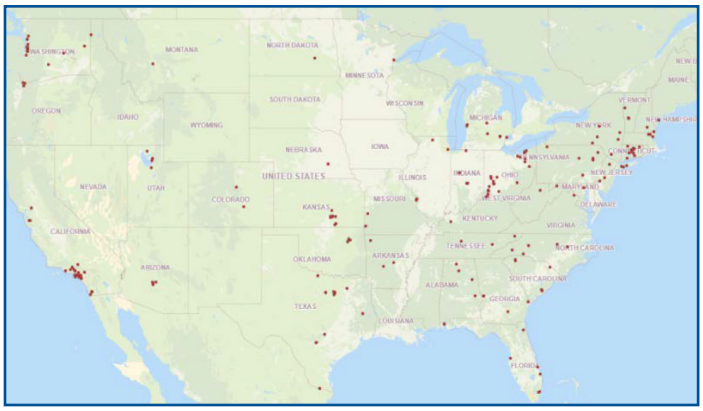
Aerospace Product and Parts Manufacturing and Maintenance

P2 National Emphasis Area (FY22-23)
P2-TRI Fact Sheet

EPA adopted six national emphasis areas (NEAs) for the FY 2022/2023 pollution prevention (P2) grant cycle. This fact sheet summarizes environmental and P2 information for one of the NEAs: **the aerospace product and parts manufacturing and maintenance sector** (NAICS 3364 for manufacturing and NAICS 488190 for maintenance facilities). According to the Census Bureau, the aerospace manufacturing portion of this NEA includes 1,773 establishments.[1,2] About 15 percent of these establishments (facilities) reported to the Toxics Release Inventory (TRI) for 2020.[1] TRI tracks the management of toxic chemicals as reported by U.S. industrial facilities. Annually, facilities report to TRI how much of each chemical is recycled, combusted for energy recovery, treated, and disposed of or otherwise released to the environment.

Locations of Aerospace Manufacturing Facilities Reporting to TRI, 2020



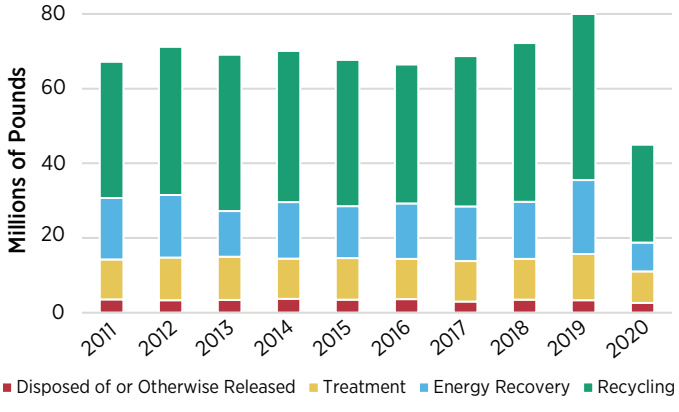
TRI Quick Facts for 2020

	Aerospace Manufacturing	All Sectors
Number of TRI Facilities	269	21,022
Total Production-Related Waste Managed (lb)	45.1 million	28.3 billion
Total On-site and Off-site Disposal or Other Releases (lb)	2.5 million	3.0 billion
Total On-site (lb)	1.5 million	2.7 billion
• Air (lb)	1.5 million	550 million
• Water (lb)	2,294	194 million
• Land (lb)	37,252	1.95 billion
Total Off-site (lb)	1.0 million	348 million

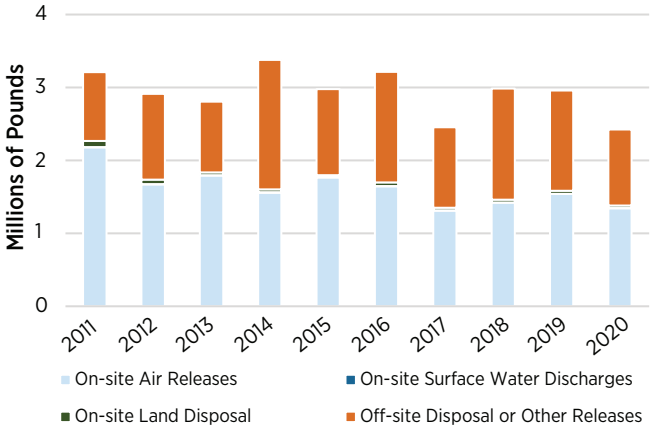
EPA encourages facilities to first eliminate the production of waste at its source (source reduction) prior to recycling, energy recovery, treatment, or disposal. The charts below show quantities of TRI chemicals released or otherwise managed as waste by the sector as reported to TRI. P2 technical assistance providers and others may be able to use the information below to identify opportunities that prevent chemical releases through source reduction activities. Information can be explored in more depth at EPA's TRI P2 Search Tool.

Aerospace Manufacturing

Waste Management Approaches



Total Releases by Media



For more information on P2 and the EPA's P2 Program, please contact the P2 Hub at: p2hub@epa.gov or 202-566-0799 or visit www.epa.gov/P2

[1] Data sources: U.S. EPA, 2020 TRI National Analysis data released October 2021; and U.S. Census Bureau, 2017 Economic Census.
[2] Aerospace maintenance facilities are not covered by TRI and therefore are not included in this fact sheet.

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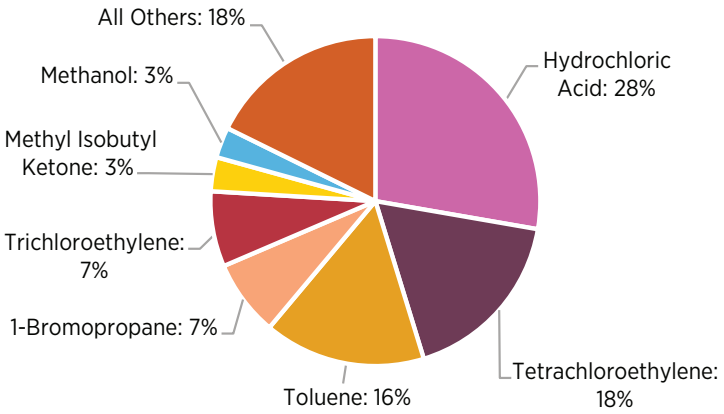
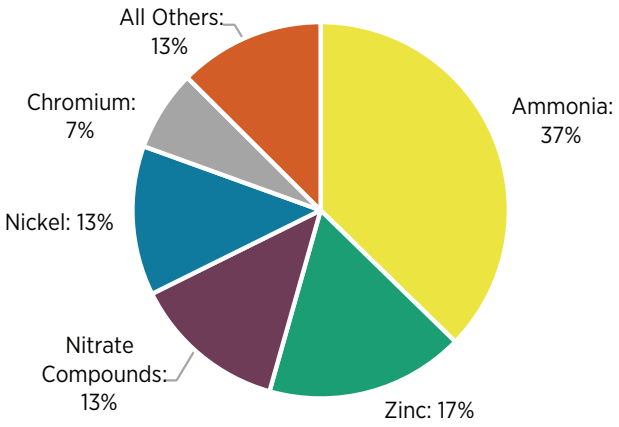
The following charts show the TRI chemicals released on site to air and water by facilities in the aerospace manufacturing sector. In these charts, each metal and its compounds are combined.

Aerospace Manufacturing

Releases to Air, 2020
1.5 million pounds



Releases to Water, 2020
2,294 pounds

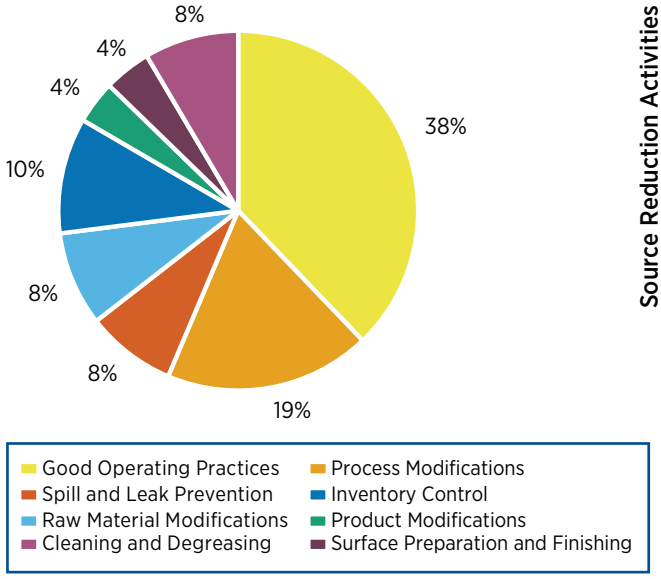


P2 Activities Reported to TRI

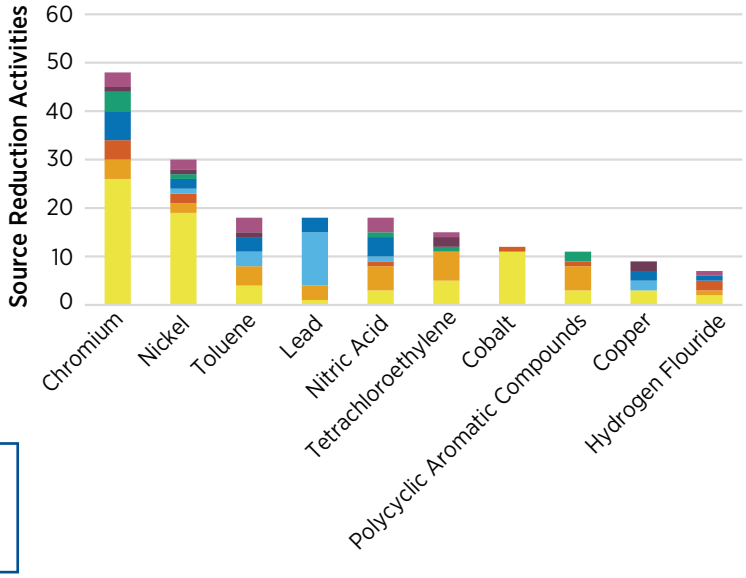
The figures below illustrate the source reduction activities reported to TRI by the aerospace manufacturing sector for 2016 - 2020. In the bar chart, each metal and its compounds are combined.

Aerospace Manufacturing, 2016-2020

Source Reduction Activities



Source Reduction Activities by Chemical



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P2 Opportunities

Due to the nature of manufacturing processes used in the aerospace industry, P2 initiatives from the metal fabrication sector may be applicable to aerospace manufacturing facilities. See the "Metal Manufacturing and Fabrication Fact Sheet" for scrap metal, coolant and plating P2 opportunities that may apply to facilities in the aerospace sectors.

Note that **aerospace manufacturing facilities are subject to guidelines set by the Federal Aviation Administration (FAA)**, which might limit the processes that facilities can alter when considering P2 activities.

Examples of P2 achievements made by facilities in the aerospace sector from published sources are listed below. Some of the sources below link to non-EPA web sites. EPA cannot attest to the accuracy of non-EPA sources and providing links to a non-EPA source is not an endorsement by EPA of the source or the information it contains.

- **Reducing or eliminating trichloroethylene (TCE) degreasing.** Aerospace manufacturers engage in degreasing operations to clean metal parts in preparation for further finishing operations. Facilities operating in the sector might be using TCE, a volatile organic compound that is characterized by EPA as carcinogenic. Certain aqueous cleaning systems or high-pressure steam cleaning may be effective degreasers and are considered acceptable alternatives by the FAA.
    - To assist facilities in identifying alternatives, EPA published a fact sheet with Case Studies on Safer Alternatives for Solvent Degreasing Applications. One case study featured an aircraft parts manufacturer that replaced several degreasers with aqueous and semi-aqueous cleaning systems.
- **Replacing traditional metal parts with plastic composites.** Facilities have reported reducing their metal waste generated when they transition from metals to plastic composites for the manufacturing of certain aircraft parts. The TRI Pollution Prevention Search tool includes several examples of facilities reporting a switch from copper to plastic composites for aircraft parts.
- **Replacing hexavalent chromium in plating baths.** Hexavalent chromium, a known human carcinogen, is still widely used in plating bath operations. Exploring P2 for this use would be beneficial. Trivalent chromium is generally not considered to be as toxic as hexavalent chromium and could be an incrementally preferred replacement. The only necessary equipment modification is the addition of new plating bath electrodes. However, other P2 approaches in this area should be explored as well.
    - Pollution Prevention Technology Profile: Trivalent Chromium Replacements for Hexavalent Chromium Plating gives an overview of the plating process, regulatory requirements, and pollution prevention research regarding chromium plating alternatives with a focus on trivalent chromium alternatives.

For more information on P2 resources for the sector, go to:

- TRI's Aerospace Sector P2 webpage which summarizes the sector's TRI data and provides links to additional resources.
- EPA's P2 Resources Search tool for a compilation of P2 case studies and other resources.
- TRI's Pollution Prevention Search tool to explore P2 activities reported to TRI.