



# **Aerospace**

## Additive Manufacturing Opportunities in 2018–23



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# Aerospace AM is Taking Off

The market for additive manufacturing in the general and commercial aerospace industry has undergone several radical changes over the past three years, all targeted toward implementing the AM process in part manufacturing. Although following very different dynamics, these changes concern both the metal AM and the polymer AM (metal replacement and composite) segments.

Most of the new evolutions in the AM market indicate a continued and sustained growth in the adoption of metal 3D printing systems, along with rapid technological evolutions primarily on three major fronts: speed, size and process automation.

The number of hardware system suppliers has increased dramatically; the number of adopters for end-use part production is also now increasing more rapidly.

AM for civil aviation is now **closer to serial part production** for both polymers and metals. While actual serial production by AM is still limited in size, several processes have been implemented to industrialize, understand and optimize the process.

Advancements in CAD, CAE, CAM and PLM software are also driving the need for AM in general and commercial aviation manufacturing. More optimized, complex shapes and the need for a

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more automated production process make AM ideal for a growing number of production requirements.

AM technologies are continuing to prove key for weight optimization and production automation. Topology optimization is now starting to be an integral part of part design in civil aviation. Thus the Market for AM technologies and materials in civil aviation is set to grow steadily driven by record demand for new aircrafts over the forecast period. It is expected that more parts will be produced by AM in a market segment which is expected to continue experiencing record growth.

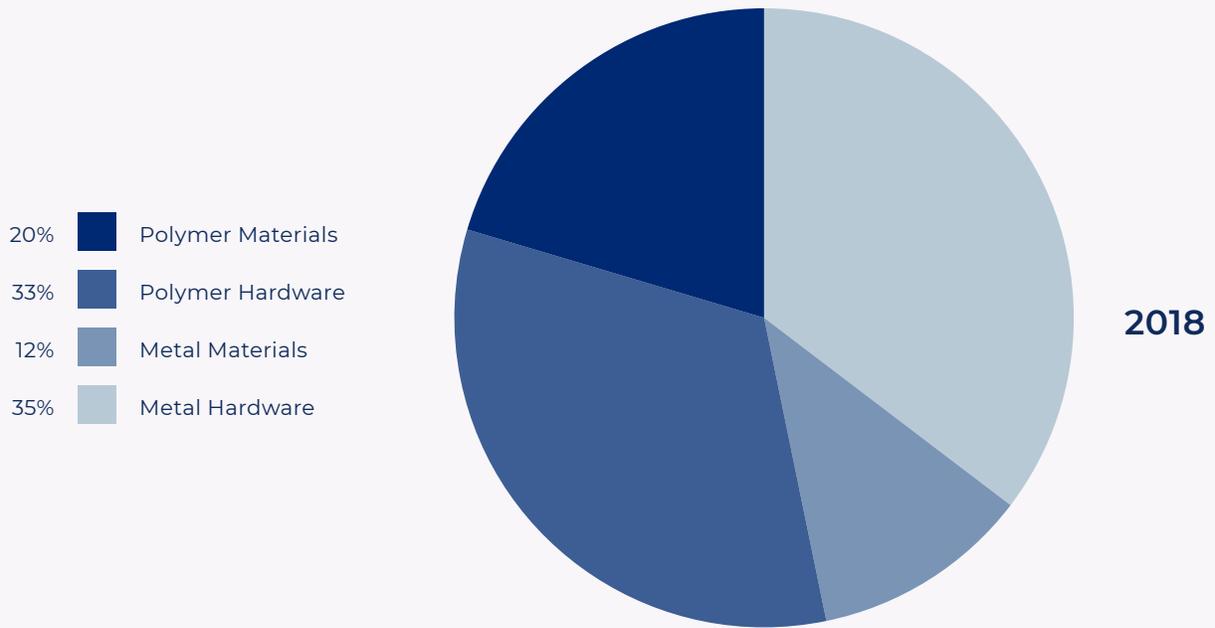
Several challenges still need to be overcome in terms of AM process industrialization, standardization and certification. Major civil aviation OEM’s and tier 1 manufacturers have completed extensive research cycles and

the process for validating and certifying a safety-critical part is expected to be shortened significantly. Demand for metal- and polymer-based hardware in civil aviation expected to increase significantly, due to increased efficiency of the validation and certification processes.

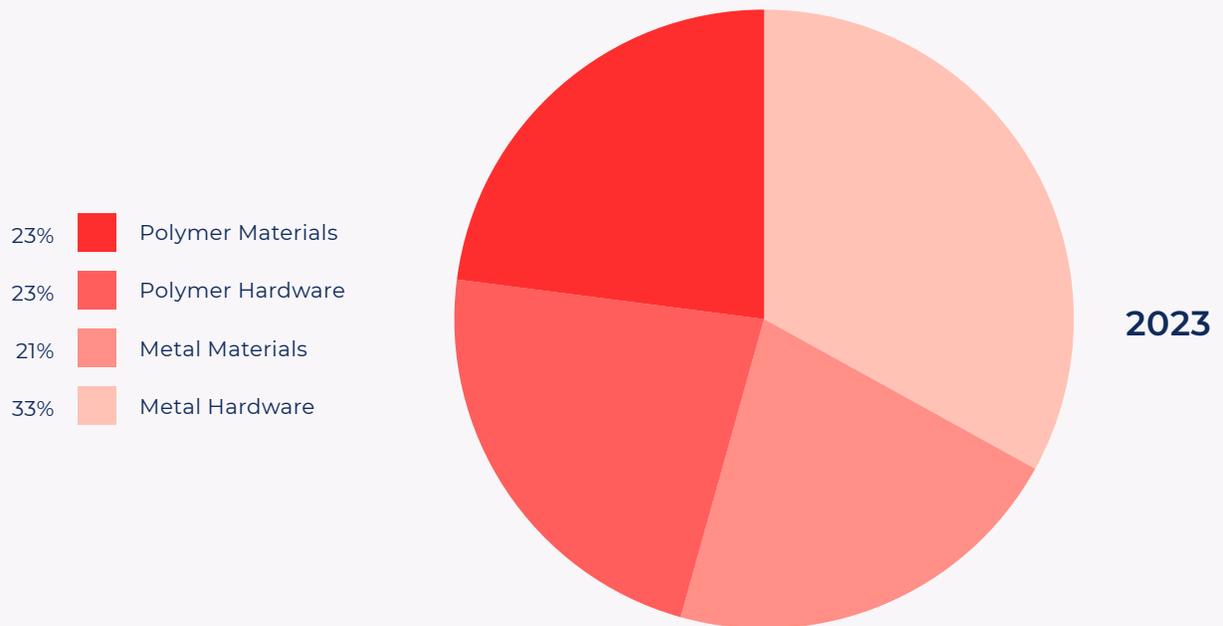
Very significant new investments have from large companies in AM for aviation manufacturing. **Airbus** and **Boeing** are leading, along with engine manufacturers such as **GE Aviation** and Safran. Several tier 1 suppliers are also conducting AM process optimization and industrialization research.

We are also seeing increased interest for use of composite materials in AM part production for civil aviation. While metal remains the primary are of interest, AM of metal replacement polymers, especially carbon fiber and glass fiber

## Aerosapce AM Market Share by Segment



Source: Smartech Publishing



Source: Smartech Publishing

composites, is gathering momentum for lightweighting applications in civil aviation.

The commercial Aviation industry benefiting from implementation of both safety-critical and non-safety-critical component in general aviation manufacturing. Due to even smaller part number requirements, private planes began even earlier than commercial airliners in implementing some 3D printing of end use parts.

In terms of AM hardware evolution, **PBF Metal AM systems** are becoming larger and faster. OEM's investing in multiple laser development and larger bed sizes. **DED Systems** now also focusing more on AM part production. While they were already being used for part repair, the high deposition rate from powder and wire fed metal AM technology is now seen as strategic for production of large components in small batches.

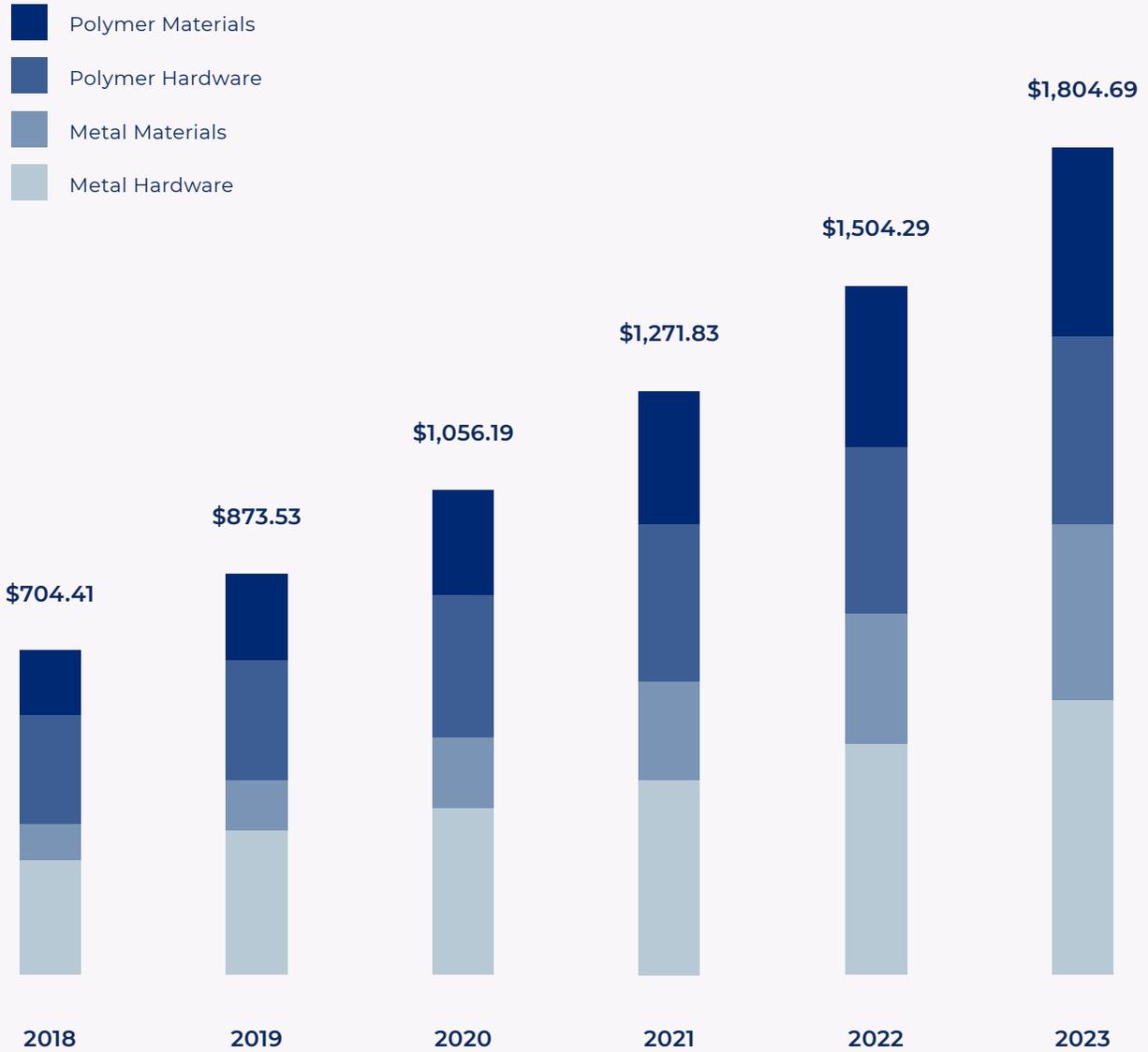
In polymers, **FDM systems** are taking a front seat in non-safety critical interior

part production. The use of high performance (flame retardant) materials such as **ULTEM** and – eventually – **PEEK** is already providing a solution for production of parts for the aircraft cabin's interiors.

After engine parts, metal AM processes are now moving toward safety-critical and major structural components. Metal deposition and plastic extrusion technologies already enable production of very large parts with no molds required.

Process and system industrialization still needs to advance further for serial part production in civil aviation to really take off. Both powder bed and powder fed technologies still have limitations in terms of process efficiency and reliability. The establishment of “AM Factories” for civil aviation part production with full production process capabilities and multiple production systems installed has begun.

## Total AM in Civil Aviation Market Value (\$USM)



Source: Smartech Publishing

# Full Report

[See Report](#)

Manufacturing of civil aircraft – that is planes for commercial and general aviation – has already emerged as the first industry sector where additive manufacturing is an established manufacturing modality.

We continue to see important new opportunities emerge in this area in both metal AM and the polymer AM (metal replacement and composite). This report identifies and quantifies the business potential of these new trends in additive manufacturing in aerospace.

The aerospace segment has seen larger than ever before investments in AM hardware and materials and these trends continue to indicate that

the market for AM in commercial and general aviation is still only at the very beginning of its potential growth curve.

This report is based on extensive interviews in the “additive aerospace” sector as well as on SmarTech’s extensive database of information and proprietary market forecasts in this space. The report will be highly valuable to marketing, business development and production executives at 3D printer makers, AM material companies, specialist service bureau, as well as within the aerospace industry itself.

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