



Additive Layer Manufacturing: A Revolution in 3D

3D printers have triggered a new industrial revolution, enabling companies to manufacture complex components more easily and at a lower cost than ever before. At the same time, the process opens up new options for lightweight construction techniques. Car manufacturers, Formula 1, and many other sectors are already making use of this technology, and in the aviation industry, entire engine parts and fuselage sections are made by 3D printing.

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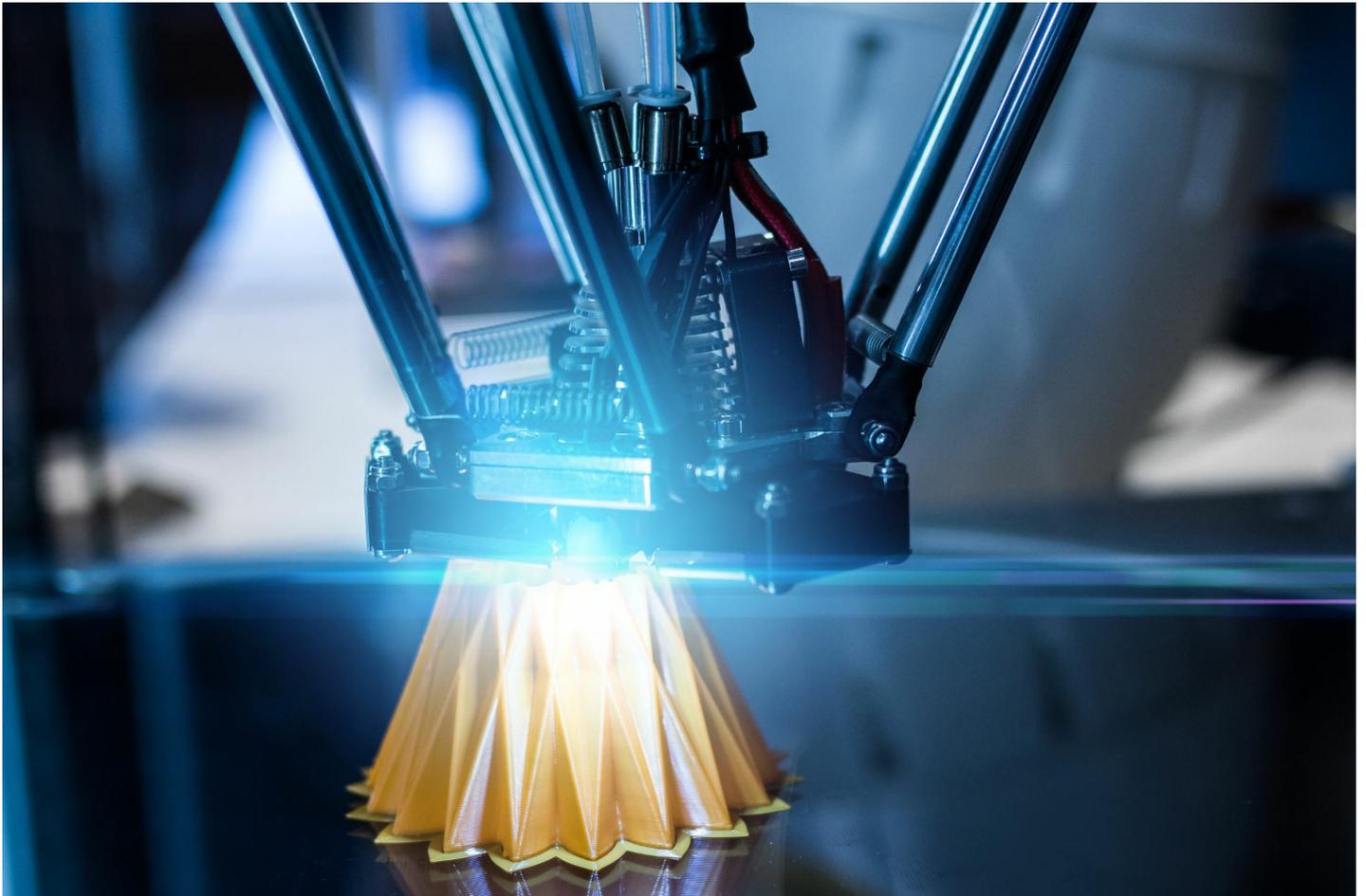
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The 3D printing revolution

Printers for creating three-dimensional objects have become part of our everyday lives, almost without us noticing. Just a few years ago, these 3D printers were rare and comparatively expensive, but in the meantime, prices have fallen and the technology has become established. With a little skill, even private individuals have the capability to design and print three-dimensional objects from their computers – which makes the technology perfect for manufacturing your own small, hard-to-find spare parts in the home. However, the real revolution is taking place in the manufacturing industry, where companies are able to take their manufacturing processes to the next level.

Building the finished object, layer by layer

3D printing is an additive process, often referred to as Additive-Layer Manufacturing (ALM). This means that material is added, laying one layer on top of another until the finished object is formed. Either plastic is forced through a heated nozzle under pressure, or a laser is used to shape layers of metal powder by the application of heat. In each case, the layers are formed by using CAD models, resulting in a plethora of benefits from this printing technology. It enables new structures to be realised, which simply could not be achieved with traditional methods such as moulding processes or milling from a solid block of material. 3D printing opens up new lightweight construction possibilities, saves costs, and enables engineers to innovatively design their products. [The first attempts at 3D printing](#) date back to the early 1980s.



3D printing saves both production and operating costs, e.g. reducing the consumption of aviation fuel by reducing aircraft weight - © iStock.com/BLACKDAY

Car manufacturers print spares

“3D printing enables us to produce very geometrically complex parts, which we could not have manufactured previously,” said [Roland Malek of Volkswagen AG](#) in 2014, commenting on a metal printing process that was then in the trial stage. Since then, the technology has become even more widely implemented, having previously been used primarily to build prototypes and one-off creations, but now [Volkswagen](#) and [Daimler](#), for example, start to use 3D printing to manufacture replacement parts in series production for their older vehicles.

Audi, a subsidiary of the Volkswagen Group, also makes use of 3D printing. Until very recently, it was for a highly specific application – as the car manufacturer was planning no less than landing on the moon! With the [Audi Quattro Lunar](#), the Ingolstadt-based company was taking part in the Google Lunar XPRIZ, with “A 30-million dollar prize awaiting the first people to cover a distance of 500 metres over this hostile terrain, take high-resolution photos of the event, and send them back to earth,” reported [Die Welt in March 2017](#). A 3D printer was used to build the moon buggy in question, with a 400-watt laser building the four wheels from 0.05m thick layers of an alloy of Al-Si10MgSr. Each wheel cost €3,000 and took a day and a half to make. The resulting wheel is so light that the price is insignificant compared to the savings on transportation costs when launching it into space. Although ultimately none of the contest entrants successfully made it to the moon, [with the competition being](#)

cancelled, advances were made in lightweight construction and 3D printing.

Additive layer manufacturing has also made inroads in the world of motorsports, where low weight and high accuracy are vitally important. The Formula 1 racing team, Sauber, has been working with 3D-printed plastics for over a decade, but there is now a new, technological leap forward at the team's base in Hinwil in Switzerland where the team [began using 3D printing with metallic materials](#) at the end of last year in conjunction with its Dutch partner company, Additive Manufacturing.

New possibilities for the aviation sector

For our April calendar page, the photographer, Wolfram Schroll, was invited to visit the Airbus factory in Filton, near Bristol in England, which is dedicated to the wings of a variety of Airbus models. In September 2017, the group reported that a [3D-printed titanium component had entered mass production](#) for the first time. In this case, the component joins the wings and the fuselage of the A350XWB. As part of the DEFACTO research program, the French [Airbus supplier, Stelia Aerospace](#), used 3D printing to manufacture an aluminium fuselage panel that is about a square metre in size.

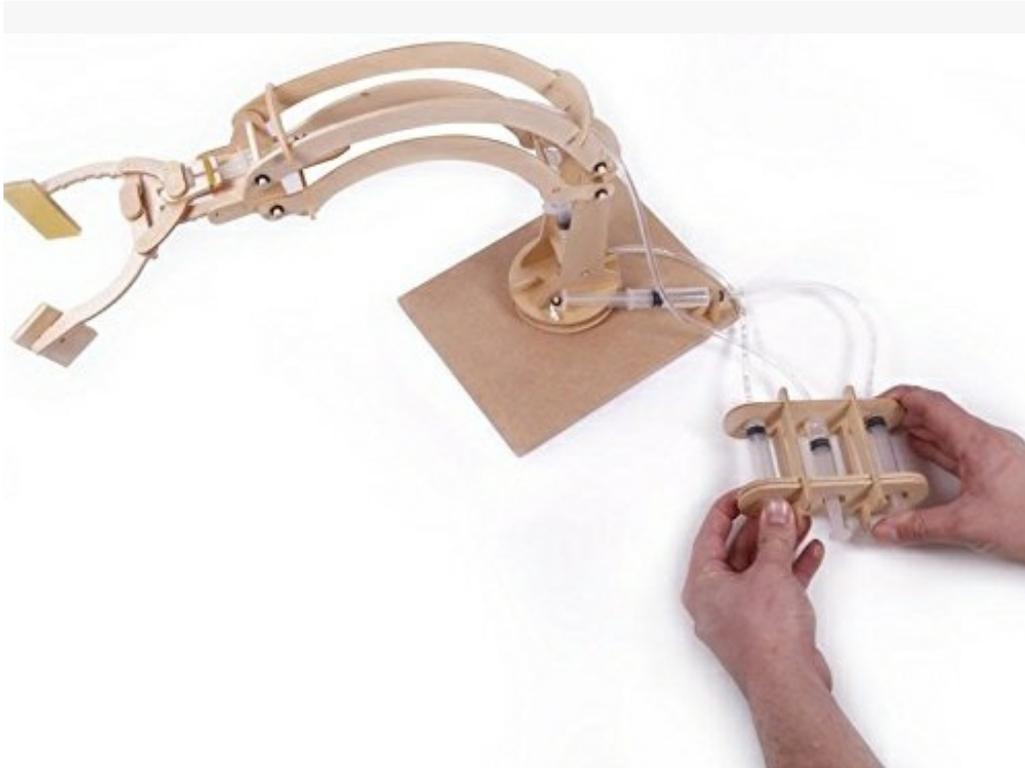
The engine manufacturer, GE Aviation, also uses the benefit of additive component manufacturing. In its new [propeller turbine catalyst](#), 855 individual components were reduced to just twelve, saving weight and reducing fuel consumption. The fuel injector nozzle, for instance, now consists of [just a single component instead of twenty](#). The [engine is manufactured near Prague in the Czech Republic](#) and should power Cessna's planned single turbo prop.

3D printing drives progress in many sectors

The trend towards 3D printing has opened up new business areas for export-oriented mechanical engineering industries. [Wirtschaftswoche](#) magazine asserts that especially Germany is several years ahead of its global competitors in this respect. For example, the Fraunhofer Institute is examining how 3D printing could enable tram roofs to be up to 30% lighter as part of a project supported by the Federal Ministry of the Economy, as every movement of the heavy vehicles uses up valuable energy. Meanwhile, Siemens Mobility has a dedicated department that makes [3D-printed spare parts for trains via an "on demand" process](#).

These new processes are also changing the jobs market, with apprenticeships to become an ["Additive Layer Manufacturing Applications Engineer"](#) or ["Certified Additive Layer Manufacturing Industrial Technician"](#) already on offer.

ARTS awards a hydraulic robotic arm kit



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Good luck!

Sources: 3d-grenzenlos.de | [Airbus](#) | [Audi](#) | [GE Aviation](#) | [ICON](#) | [PLASTVERARBEITER](#) | [Sauber F1 Team](#) | [WELT](#) | [WiWo](#) | [Wikipedia](#) [3d printing]



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