

AddUp and Dassault Aviation: towards an Automated Additive Manufacturing Workshop for Aeronautics

AddUp and Dassault Aviation are collaborating to move metal additive manufacturing processes from “prototyping” to “mass production” for aeronautics. To achieve this, additive technology must be optimized to demonstrate its capabilities in terms of quality, reproducibility, and also productivity, to consider the mass production of metal parts that will then be integrated into aircraft.

The aeronautics industry faces many challenges to maintain and increase its competitiveness: growing global air traffic, increasing scarcity of materials, lightening and optimization of parts, the search for reliability for better quality, and compliance with increasingly demanding regulations, are all issues that must be resolved today. One of the answers to these challenges is the use of metal 3D printing under industrial-scale production conditions.

It is in this context that the collaborative R&D project “AEROPRINT”, coordinated by Dassault Aviation, was set up, with the help of numerous partners, research centers, universities, and industries, of which AddUp is a part. Structured over 5 years, this project aims to develop, qualify and implement a competitive pre-industrial demonstrator of multi-material metal additive manufacturing (Titanium and Aluminum), to manufacture complex aeronautical parts certified in classes 2 and 3. The Dassault Aviation site in Argonay in the Auvergne-Rhône-Alpes region (France) has been identified as a pilot for the implementation of this process.

AddUp, a manufacturer of machines and additive parts, is in charge of developing a new production system based on interoperability and robotization of processes. A real automated workshop that will allow, thanks to additive technology, to produce in series and with two different materials parts for aviation.

The objective is to pool the equipment while ensuring the separation and proper circulation of the two materials chosen. AddUp’s experts are working on a new type of closed enclosure that allows the powder to enter on one side and a tray of metal parts to exit on the other. This future workshop will be composed of two production units of four FormUp® 350 machines based on powder bed fusion technology (L-PBF: Laser Powder Bed Fusion) as well as the necessary finishing means. Two PBF machines manufactured by AddUp have been chosen.

About Dassault Aviation :

With more than 10,000 military and civil aircraft delivered to more than 90 countries over the past century, Dassault Aviation has recognized expertise and experience in the design, development, sale, and support of all types of aircraft, from the Rafale fighter to the Falcon family of high-end business jets and military drones. In 2017, Dassault Aviation’s revenues totaled €4.8 billion. The Group has 11,400 employees. To learn more visit: www.dassault-aviation.com

AEROPRINT Consortium members:

- Industrial partners: Dassault Aviation, Constellium, AddUp, Alprobotic, Tekna, Comefor from WeAre Aerospace group
- Technology Resource Centers: CEA Tech, Manutech
- Academic partners: INP Grenoble, Ecole des Mines de Saint-Etienne, SIGMA Clermont and INSA Lyon
- Competitiveness clusters: CIMES

The 4 major milestones of AEROPRINT:

2021: launch of the demonstrator workshop on the Argonay site

2022: first parts produced by using additive manufacturing in an industrial way

2024: parts produced using optimized additive manufacturing with robotic post-processing

2025: robotized workshop and manufacturing of aeronautical-certified demonstrator parts

After a phase of joint research and development to explore all the requirements of this project, AddUp is now working on the full-size model to verify and validate the principles retained, from mechanical design to autonomy, without forgetting the computer, everything being managed by the computer.

AddUp Manager, with its ergonomic and intuitive interface, equipped with an ultra-fast trajectory generation engine, allows the preparation of production files by accessing more than 250 modifiable variables and customizable fusion strategies. Monitoring, a key issue for such a project, will be carried out using the already available AddUp Dashboards software and enhanced by bricks developed for this purpose. AddUp Dashboards allows you to view all production data in real-time, monitor the shop floor, and quickly analyze any machine event. Among the many pre-configured views offered in the software is a customizable map that shows real-time progress, remaining production time, and current status. Users can thus access data from a production run made a few months earlier and follow production in progress via the same tool.

How does this automated workshop work?

The two metal powders, packaged in industrial containers, are loaded by an operator at a delivery station located outside the workshop. Inside, the production tray is taken over by an automated conditioning station which will insert it into a mobile chamber. It is transported in an inerted shuttle by an Automated Guided Vehicle (AGV) and then placed in each PBF machine, depending on the desired material. When the printing is finished, the shuttle recovers the mobile chamber and takes it to a depowdering station.

This same station allows to remove of the majority of the powder not fused during the printing, and sends it back for the next printing, after a recycling phase. Once the powder is completely removed, the shuttle goes to the conditioning station where the tray carrying the parts is extracted from the chamber to go to the washing and drying station of the parts. The latter receives a new tray and starts printing again. The tray carrying the parts is cleaned more finely before being allowed to leave the workshop where it is taken into charge by the operator.

There are many advantages of an automated workshop. From an HSE point of view (Health, Safety, and Environment), the operators have no contact with the powder at all. They only enter the robotized enclosure for maintenance operations and their operations are done outside of it. From an industrial point of view, once the process has been validated and qualified, the repeatability of production is ensured.

This precursor automated workshop will be the basis of a ready-to-use industrial solution for the deployment of additive manufacturing machines in existing workshops, guaranteeing the best level of productivity and safety.

About AddUp:

AddUp, a joint venture created by Michelin and Fives, is a global metal additive manufacturing OEM offering multi-technology production systems, including the FormUp® range of robust and open-architecture Powder Bed Fusion (PBF) machines, as well as the BeAM Modulo and Magic lines of industrial Directed Energy Deposition (DED) machines.

The combination of these processes allows AddUp customers the flexibility to choose the technology best suited for their specific application while also offering a unique ability to meet technical challenges, such as manufacturing parts combining these complementary technologies. AddUp's FormUp 350 PBF machine is modular and scalable to provide the highest productivity while ensuring user safety. The DED machines are designed for industrial production and equipped with in-house designed and developed nozzles to provide maximum precision and very high productivity. To provide customers with a true Industry 4.0 solution, AddUp also provides a complete monitoring solution providing quality assurances after each and every build.

AddUp is headquartered in Cébazat, France, with its North American subsidiary based out of Cincinnati, Ohio. In addition to the machine design and manufacturing, the AddUp group also offers part production, POC production, metal AM consulting services, AM training, and design for AM, making AddUp your one-stop for metal AM.

To learn more visit:

www.addupsolutions.com



The FormUp 350, a New Generation AddUp PBF machine

AddUp Press Contact:

Sarah PLUMMER

Director of Global Marketing Communications
sarah.plummer@addupsolutions.com