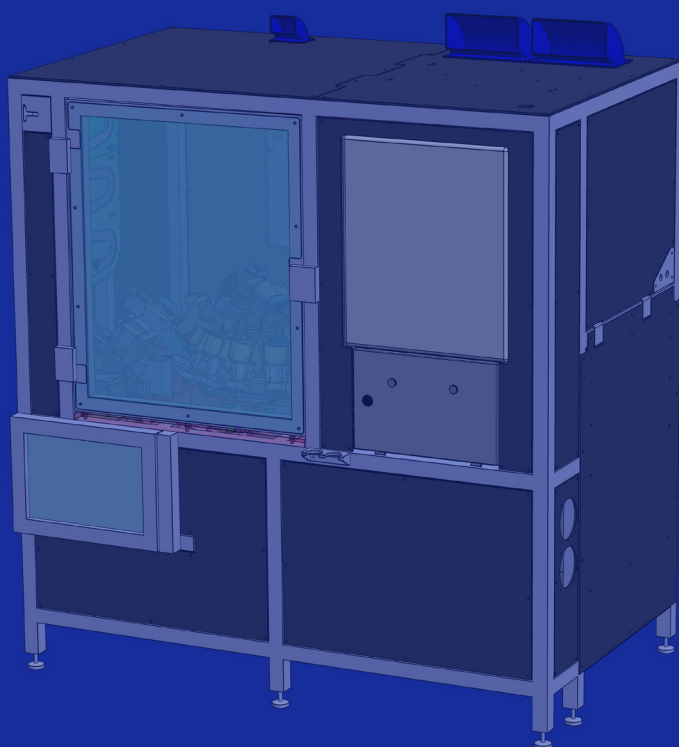


CRMA AERO REPAIR

INNOVATING IMPROVED AIRCRAFT MAINTENANCE TECHNOLOGIES WITH SOLIDWORKS SOLUTIONS

Case Study



Using SOLIDWORKS Professional design software, the CRMa C.Lab has delivered 25 major aircraft maintenance improvement technologies since its founding in 2018, completing 250 prototyping research projects each year and establishing itself as a Center of Excellence within Air France Industries KLM Engineering & Maintenance.

Challenge:

Establish the CRMa C.Lab as a Center of Excellence within Air France Industries KLM Engineering & Maintenance and invent and develop safer, more efficient, and more cost-effective aircraft maintenance technologies and methodologies.

Solution:

Implement SOLIDWORKS Professional design software.

Results:

- Delivered 25 major aircraft maintenance improvement technologies
- Completed 250 prototyping research projects each year
- Saved 1,000 hours annually on aircraft brake piston cleaning
- Accelerated prototyping, testing, and machine design

As a Center of Excellence within Air France Industries KLM Engineering & Maintenance, subsidiary CRMa Aero Repair offers maintenance, repair, and overhaul (MRO) services to a range of aviation customers worldwide, including original equipment manufacturers (OEMs), part traders, airlines and affiliates, and independent MRO contractors. With the support of the parent company's Design & Innovation Department, CRMa industrializes new repairs for its customers, including innovating aircraft maintenance technologies that are safer, more environmentally friendly, more efficient, and more cost-effective. Aircraft engines that are currently serviced by CRMa technologies include the GENx, Trent XWB, Trent 1000, CFM56 series, GE90, and GP7000.

Established in 2018, the CRMa C.Lab, which is part of the company's Industrial Development & Strategy Department and MRO Lab Network, provides CRMa with R&D and rapid prototyping and testing capabilities in pursuit of its mission to investigate, prototype, and test the best aircraft maintenance improvement ideas submitted by aircraft maintenance professionals. Employee-driven innovation is part of the company's DNA



"With SOLIDWORKS, we can design parts very fast, and it's also quick and easy to make prototypes from SOLIDWORKS models. We also value the SOLIDWORKS large assembly design and dynamic motion capabilities because of our growing use of robotics. With these tools, we can make sure there are no interferences or collisions between parts, and simulate the movements of assemblies containing robotics to ensure that the robot moves and operates as designed."

– Erwan Guerin, Innovation & C.Lab Manager

and is encouraged by continuous improvement programs, through which any staff member can submit and implement innovative ideas.

The C.Lab is tasked with adapting the best aircraft maintenance ideas to deliver practical innovations and improvements. In addition to receiving ideas from aviation maintenance professionals and employees, CRMa works with startups, universities, and manufacturers to deliver high value-added solutions. In short, the C.Lab is charged with delivering aircraft maintenance innovations that help the parent company offer competitive solutions designed for optimum performance.

When the C.Lab was established, the first order of business was to implement a design system that would support the lab's rapid prototyping and testing efforts, according to Innovation & C.Lab Manager Erwan Guerin. "Before we launched the C.Lab, it could take eight to 10 months before an improvement idea was fully investigated," Guerin explains. "With the C.Lab, we design, prototype, and test emerging ideas immediately, which is why we needed a design system that supports fast prototyping and testing, as well as machine design, tooling, and fixture development. To meet those goals, we chose SOLIDWORKS® software."

CRMa selected SOLIDWORKS Professional design software to drive the C.Lab's efforts because the software is easy to use, minimizing training requirements; provides robust large assembly

and dynamic motion capabilities, enabling the C.Lab to leverage robotics technology more fully; and supports rapid prototyping and fast tooling development. "We use SOLIDWORKS software to design, prototype, and test aircraft maintenance improvement ideas quickly and cost-effectively," Guerin stresses.

"Our focus is entirely on evaluating ideas and inventing new aircraft maintenance technologies quickly, utilizing our 3D printing, laser cutting, and CNC milling capabilities," Guerin adds. "We've used SOLIDWORKS since we started the lab and have been very successful using it for our purposes."

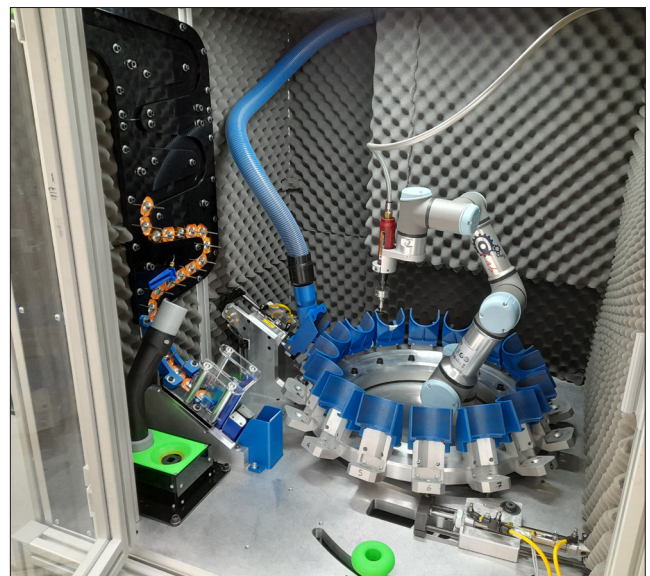
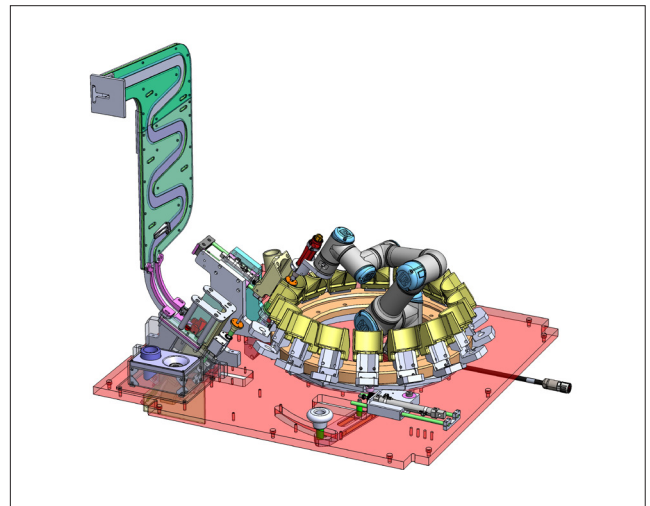
FAST DESIGN AND PROTOTYPING MARK C.LAB'S SUCCESS

Since implementing SOLIDWORKS Professional software, the C.Lab has delivered 25 major aircraft maintenance improvement technologies and completes roughly 250 design, prototyping, and testing research projects each year. "With SOLIDWORKS, we can design parts very fast, and it's also quick and easy to make prototypes from SOLIDWORKS models," Guerin notes.

"We also value the SOLIDWORKS large assembly design and dynamic motion capabilities because of our growing use of robotics," Guerin continues. "With these tools, we can make sure there are no interferences or collisions between parts, and simulate the movements of assemblies containing robotics to ensure that the robot moves and operates as designed."

BRAKE PISTON CLEANING TECHNOLOGY SAVES 1,000 HOURS ANNUALLY

Although many of the aircraft maintenance innovations delivered by the C.Lab involve engine maintenance, a robotics-based machine that cleans aircraft brake pistons not only saves maintenance organizations roughly 1,000 hours of maintenance time each year but also removes a potential employee hazard. Aircraft brake pistons become clogged with carbon and oil deposits, which must be ground out with a grinding disk before the pistons are placed back into service.



With SOLIDWORKS Professional design tools, CRMa C.Lab engineers can quickly research, innovate, prototype, and develop safer, more efficient, and more cost-effective aircraft maintenance technologies and methodologies, such as the robotic technology for cleaning aircraft brake pistons shown here. The technology saves 1,000 hours annually and delivers important health and safety benefits to maintenance employees.

"While saving 1,000 hours of maintenance time annually is the improvement that initially gets everyone's attention, the biggest advantages of our aircraft-brake-piston-cleaning technology are the health and safety benefits," Guerin says. "Grinding out the pistons creates hazardous dust, which requires operators to wear some form of respiratory protection. Also, the vibration associated with the process can adversely affect maintenance employees who complete this repetitive task over many years."

FROM FAB LAB TO INNOVATION CENTER OF EXCELLENCE

Using SOLIDWORKS Professional software, the C.Lab has transformed from a basic fabrication and prototyping unit to an innovation Center of Excellence by delivering three or four large pieces of equipment that improve aircraft maintenance each year. "When the C.Lab was established, it was expected to be just a fab lab running prototypes," Guerin explains. "However, when we developed a highly impactful robotic-based machine during the first year, which was viewed as a success, our focus shifted from just prototyping to making prototypes, machinery, and equipment.

"Today, we have mechanical, electrical, and robotics designers working in concert in SOLIDWORKS to make the best ideas for improving aircraft maintenance into concrete technologies that make maintenance safer, cleaner, more efficient, and less costly for our customers," Guerin says.

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