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EMMA SYSTEMS

Aircraft Sanding Reimagined

THE FUTURE OF SURFACE PREPARATION

FASTER SANDING FOR COMMERCIAL, BUSINESS, & MILITARY AIRCRAFT

EMMA Floor Mounted Rail Providing Artisans a Faster, Safer, and Better Sanding Experience

DELIVERS CONSISTENT RESULTS

Higher quality and consistent results all day, every day. Every artisan on every shift consistently produces a superior surface finish to the point where you can read a reflection off the newly painted fuselage.

SAFETY FIRST

EMMA works safely alongside artisans wherever she is in the hangar. EMMA sees and reacts to the plane and environment in real time, avoiding personnel and obstacles. Improved dust collection also reduces toxic dust released into the environment.

ACCELERATES THE PRODUCTION SCHEDULE

EMMA systems have reduced the scheduled calendar time for a wide-body de-paint by 63%, and some planes are done sanding even faster.

EFFICIENCY

In the same amount of time, artisans using EMMA sand a greater area than artisans manually sanding. EMMA's surface finish quality reduces defects and the need for costly rework, further reducing the time needed to completely sand a plane.

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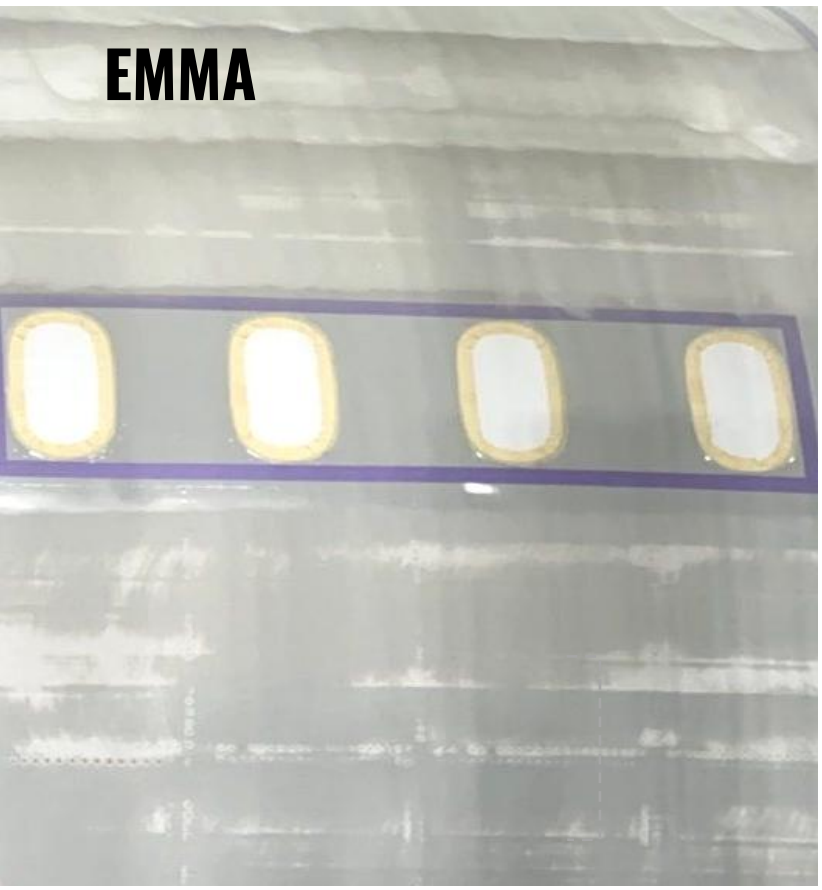
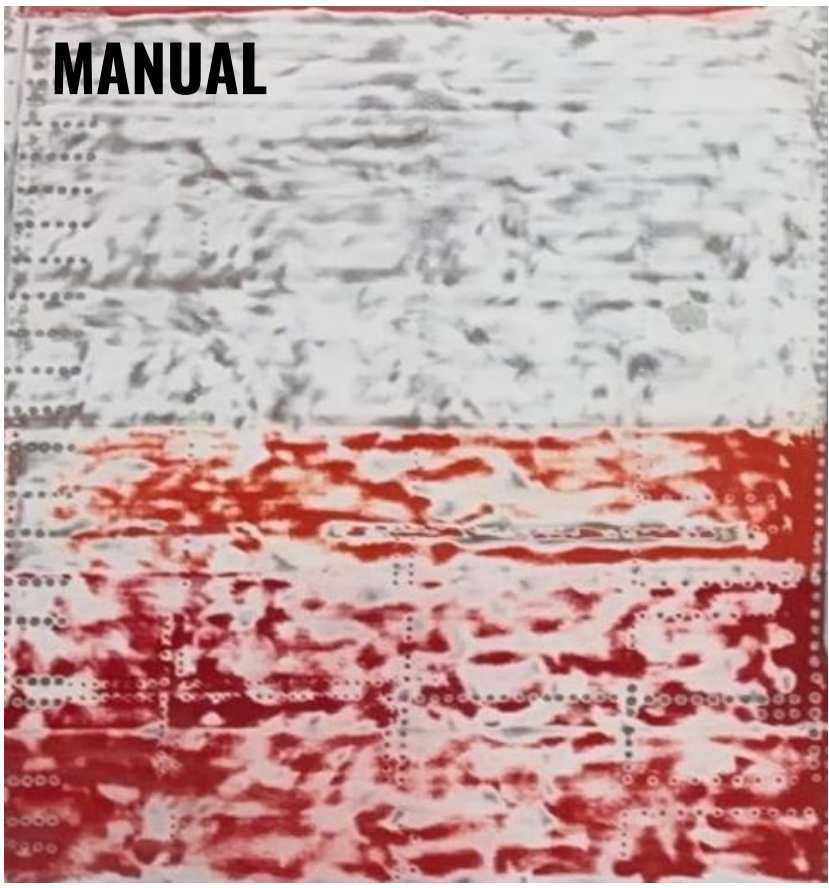
VISIBLY HIGHER QUALITY

SIGNIFICANTLY BETTER FINAL SURFACE FINISH

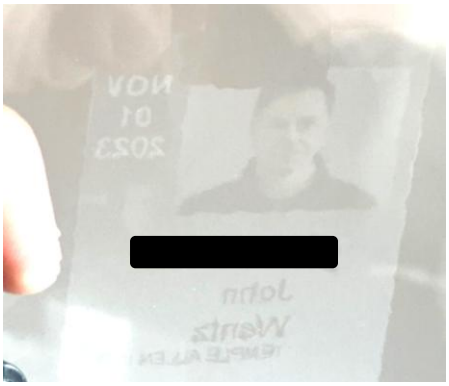




These photos are from **adjacent** areas of the **same** aircraft

EMMA SUBSTANTIALLY REDUCES INSTANCES OF SURFACE AND AIRPLANE DAMAGE DURING SANDING

VASTLY IMPROVED DISTINCTIVENESS OF IMAGE



EMMA FACILITATES PAINT SO SMOOTH YOU CAN READ A REFLECTION

EMMA PREVENTS:

DIVOTING – CUPPING – DISHING – SCALLOPING

EMMA REMOVES EXACTLY THE LAYERS YOU WANT WHILE ELIMINATING REWORK

WHILE USING UP TO 40% LESS SANDPAPER

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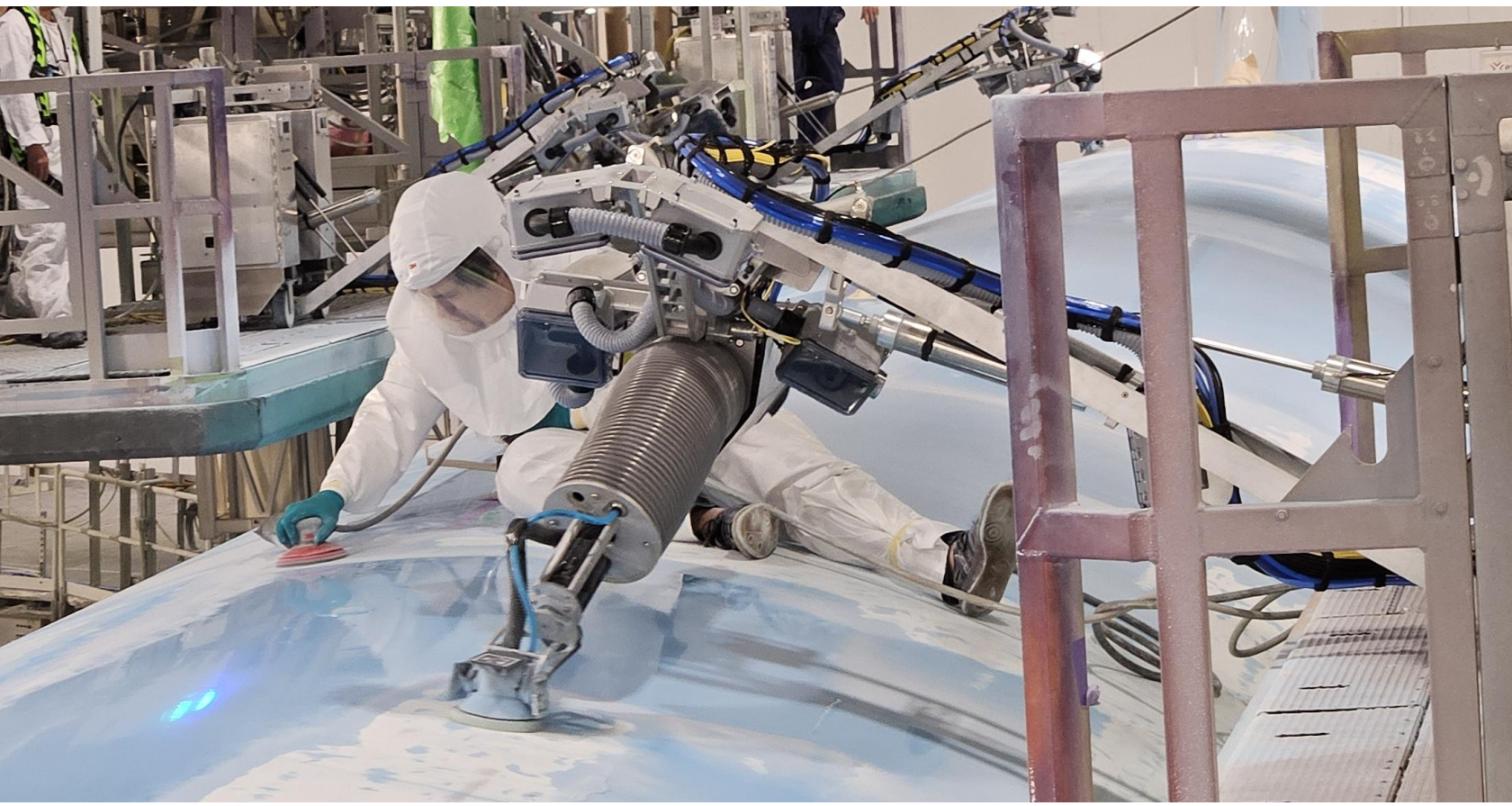
ADVANCED SAFETY & CONTROL

TECHNOLOGY THAT PROTECTS BOTH PERSONNEL & THE PLANE



EMMA is the world's first sanding system that allows artisans to work alongside her

ALWAYS ON SAFETY OVERSIGHT

EMMA sees her immediate surroundings and responds to the presence of the aircraft and personnel in real time. EMMA's "Always on Safety Oversight" capabilities allow artisans to work right alongside her.

SAFE IN HAZARDOUS ENVIRONMENTS

EMMA Systems are available, configured, and certified for safe operation in all types of hazardous aerospace environments – C1D1, ATEX, IECEx, etc. Temple Allen equipment has been safely operating in such environments for over 20 years.

ELIMINATES SANDING INJURIES

All the injuries and issues related with manual sanding such as, high grip forces, vibration exposure, repetitive stress, awkward postures, and fatigue, go away when the artisan no longer wields the sander.

EMMA TABLET INTERFACE

EMMA's intuitive tablet interface allows artisans to monitor and control her directly, without the need for extensive training or engineering support. The ease of use of the tablet enables artisans to focus constantly on the quality of the surface.

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FLEXIBLE DEPLOYMENT OPTIONS

BUILT FOR HANGARS, PRODUCTION LINES, AND PANEL SHOPS

EMMA DEPLOYS FROM

- Tele Platforms/Stackers
- Overhead Gantries
- Fixed Platforms
- Wing Stands
- Scissor Lifts
- Boom Lifts
- Tail Stands
- Railings
- Ground

WHOLE PLANE WITHIN REACH

Different configurations of EMMA systems can reach different areas of the plane.
With the right combination of EMMA configurations, the whole plane can be sanded.

EMMA Scissor Lift reaches the sides and bottom of canoes as well as the full underside of wing

EMMA Boom Lift Systems reach from the crown down to the cargo door and top of the wings

EMMA CAN ACCESS

- Belly
- Wings
- Crown
- Radome
- Wingbox
- Horizontal Stabilizer
- Wing To Body Fairing
- Fuselage
- Vertical Tail
- Control Surfaces
- Off-plane Parts
- Cowlings
- Tooling

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EMMA DOLLY SYSTEMS

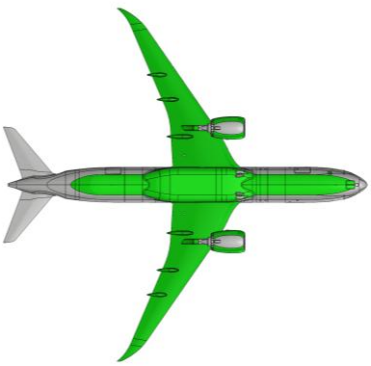
FROM TOP OF WINDOW BELT DOWN & UNDERSIDE OF WINGS

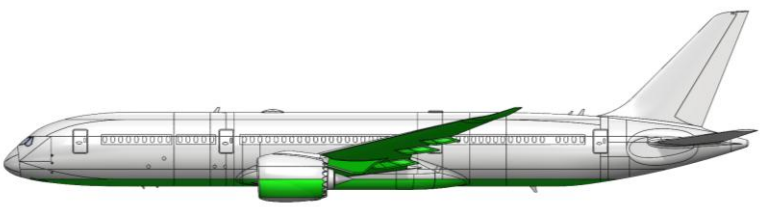
The EMMA Parallelogram Dolly sands Narrowbody planes, including Boeing 737, Airbus A220/A320 Families, and more

The EMMA Telescoping Dolly sands Widebody planes, including Boeing 777/787, Airbus A330/A350 Families, and more

EMMA DOLLY SYSTEMS ADDRESS

- Widebody and Narrowbody underbelly of fuselage and wingbox up to cargo doors
- Widebody and Narrowbody underside of wings in hangars with wing stands, and portions of the engines
- Sands the complex curves of the nose and tail sections
- Sands inner-spar areas of wings and stabilizers as well as control surfaces of leading and trailing edges
- Sands sides and bottom of canoes along the underwing





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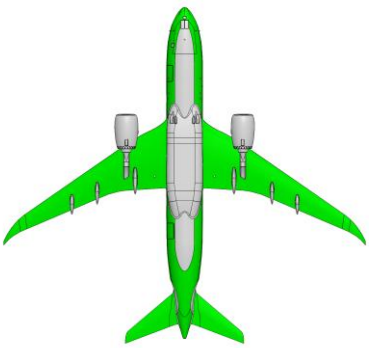
EMMA SCISSOR LIFT SYSTEMS

FROM TOP OF WINDOW BELT DOWN & UNDERSIDE OF WINGS

EMMA can easily operate from a 26’ scissor lift, sanding from cargo door to window belt

EMMA SCISSOR LIFT SYSTEMS ADDRESS

- Widebody and Narrowbody fuselage sides from cargo door up to above window belt
- Widebody and Narrowbody underside of wings and stabilizers and portions of the engines
- Sands between windows and on doors
- Sands the complex curves of the nose and tail sections
- Sands inner-spar areas of wings and stabilizers as well as control surfaces of leading and trailing edges
- Sands sides and bottom of canoes along the underwing



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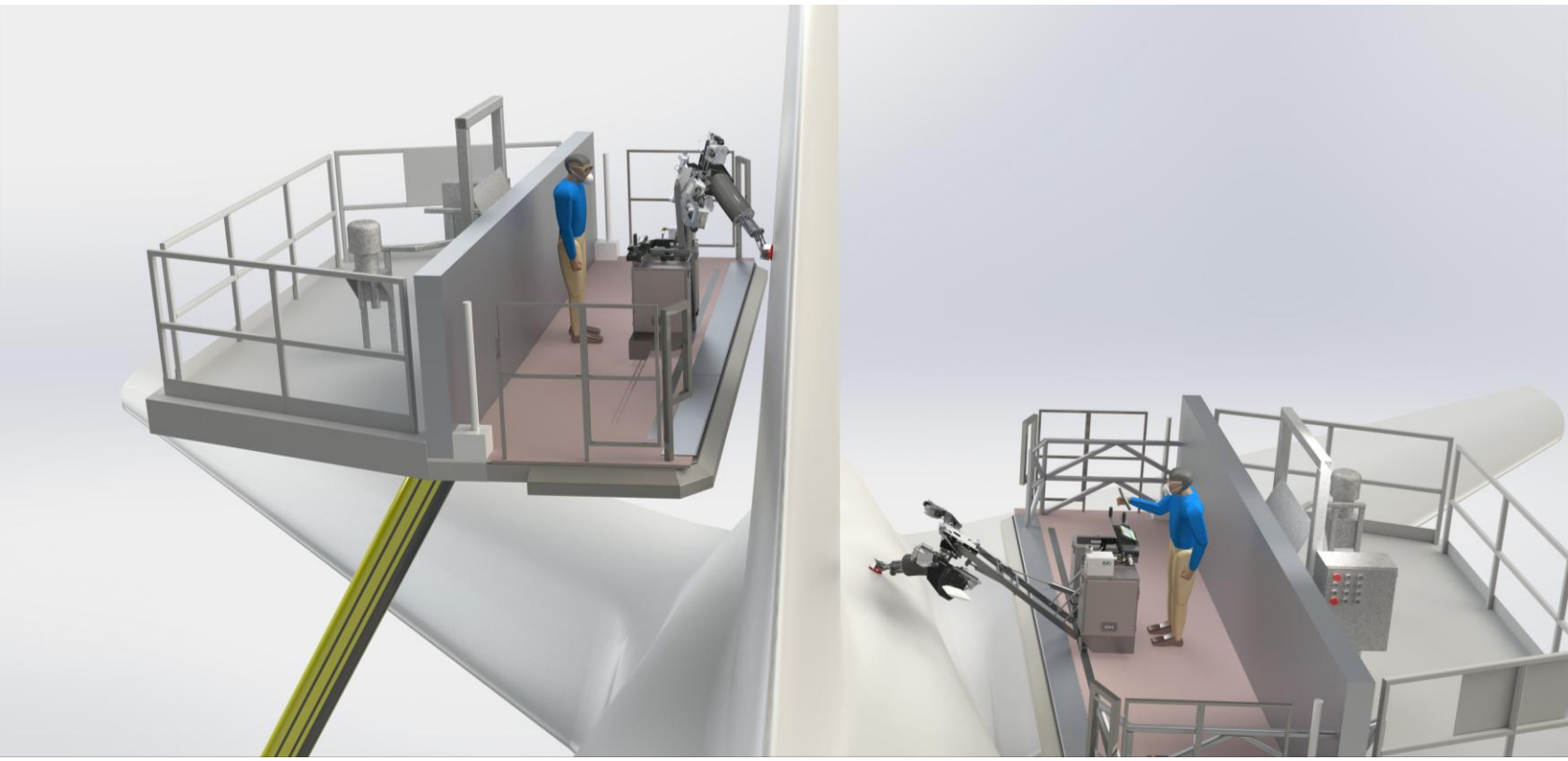
EMMA FLOOR MOUNTED RAIL SYSTEMS

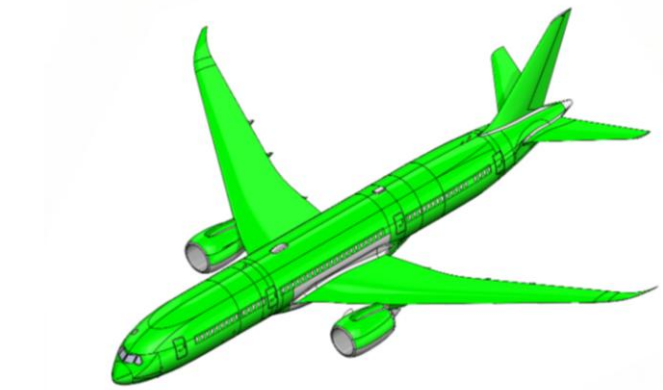
FROM THE BELLY TO THE CROWN

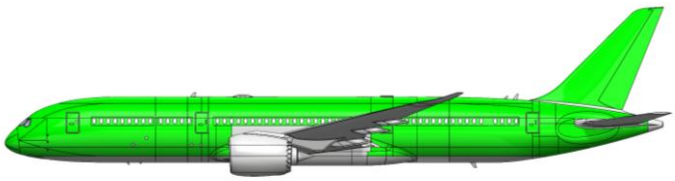


EMMA Floor Mounted Rail Systems can sand the entire fuselage & more

EMMA FLOOR MOUNTED RAIL SYSTEMS ADDRESS

- Widebody and Narrowbody fuselage from the bottom of the cargo door up to the crown and on the vertical fin
- Sands between windows and on doors
- Sands and avoids antennas and fins
- Sands the complex curves of the nose and tail sections





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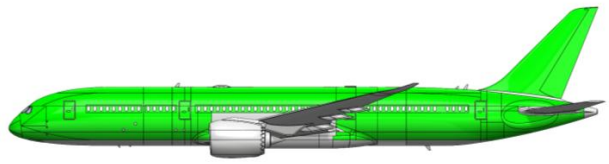
EMMA BOOM LIFT SYSTEMS

FROM THE WINDOW BELT TO THE CROWN & TOPS OF WINGS AND STABILIZERS

EMMA Boom Lift Systems can sand the from bottom of the passenger door up to the crown and on the vertical fin

EMMA BOOM LIFT SYSTEMS ADDRESS

- Widebody fuselage from bottom of the passenger door up to the crown and on the vertical fin
- Sands between windows and on doors
- Sands and avoids antennas and fins
- Sands the complex curves of the nose and tail sections
- Sands full top surface of wings and stabilizers
- Sands inner-spar areas of wings and stabilizers as well as control surfaces of leading and trailing edges
- Sands sides and top of engines



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POWERING THE DAILY HANGAR WORKFLOW

A MORE PRODUCTIVE DAY FOR ARTISANS, SUPERVISORS, & MANAGEMENT

Coordinated Sanding Strategy lets everyone finish at the same time

PROACTIVE PREVENTATIVE MAINTENANCE & SERVICES

The Proactive Preventative Maintenance & Services (PPM&S) package provides scheduled maintenance to keep EMMA operating reliably and reduces unplanned downtime. Maintenance is scheduled proactively and around the facilities operation.

OPTIMIZED SANDING STRATEGY

Temple Allen offers above-the-shop-floor support - Optimized Sanding Strategy that can reduce the burden on planning and operations staff.

DATA ANALYTICS AND SANDING SUMMARIES

EMMA is able to provide detailed reports at the end of each sanding operation on abrasive use, sanding modes, tool time, and crew performance. While above-the-shop-floor benefits include activity tracking, quality and production trends, and sanding status reports.

UTILITY REQUIREMENTS

EMMA needs just shop air & 110/120 or 220/240-volt AC power to operate, while an ethernet cable & Wi-Fi enable advanced features.

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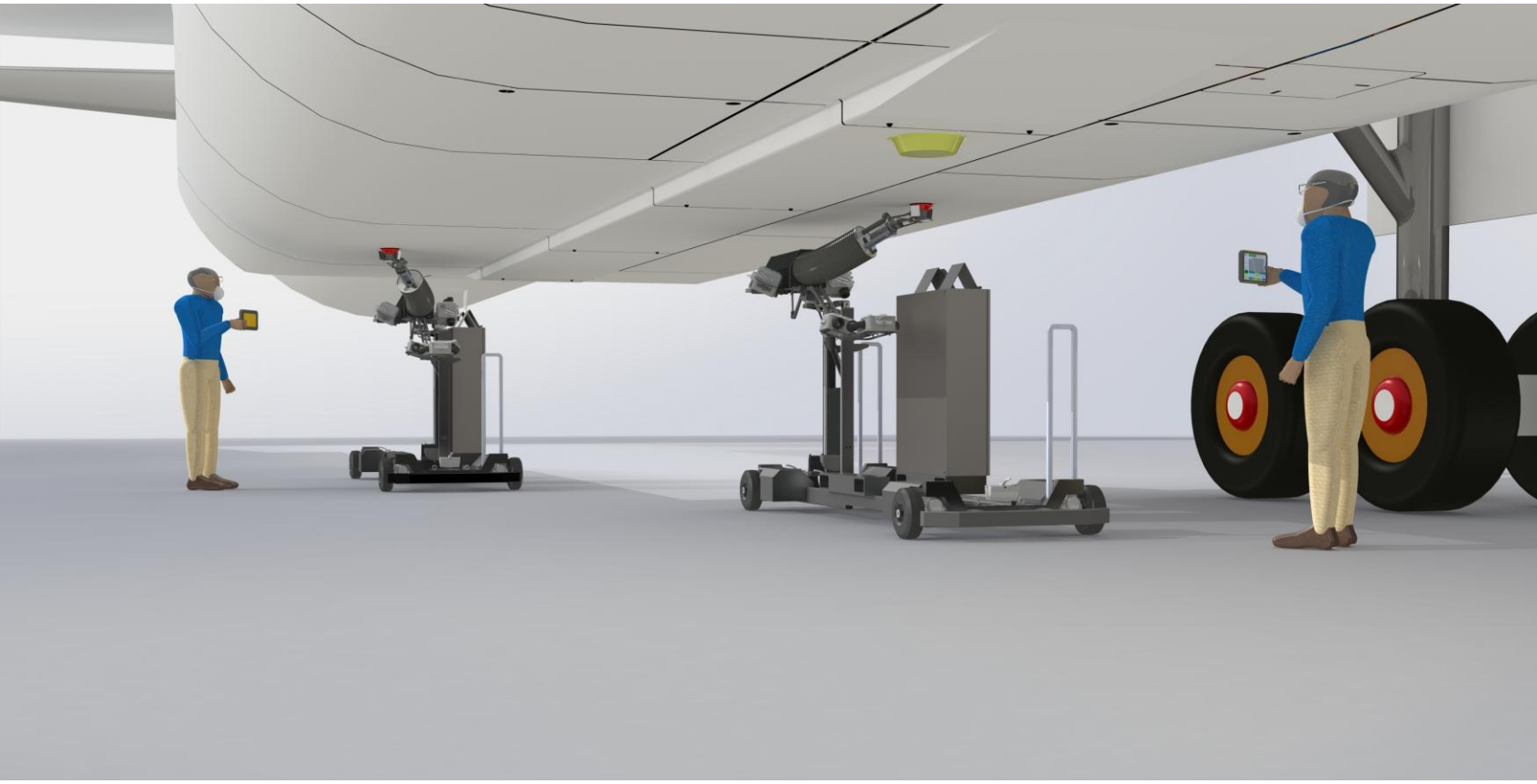
HANGAR OPERATION ADVANTAGES

FASTER, SAFER, & PREDICTABLE



EMMA eliminates awkward postures while sanding, creating a healthier environment

HEALTHIER WORKFORCE AND WORK ENVIRONMENT

EMMA removes all the ergonomic issues with manual sanding, since artisans no longer hold the sander, they stay healthy and stay on the job longer. EMMA creates a safer and healthier work environment which not only retains artisans but also attracts new talent.

KNOW HOW LONG SANDING WILL TAKE

Sanding performance is so consistent that EMMA coverage areas can be adjusted so that all EMMA systems, and artisans, finish at the same time. This allows managers to not only have a better idea of the schedule, but also better management on human resource.

FASTER BY DESIGN

EMMA doesn't require model-based programming or pre-sand scanning. She maintains alignment to the surface, even while the platform she is on moves. EMMA eliminates expensive rework and, without fatigue issues, artisans perform any remaining hand sanding more quickly.

FULLY AUTONOMOUS DECISION MAKING

EMMA will have the autonomous decision-making ability to sand the airplane without requiring constant support from the artisan. This allows greater parallel workflow and reduces schedule even more.

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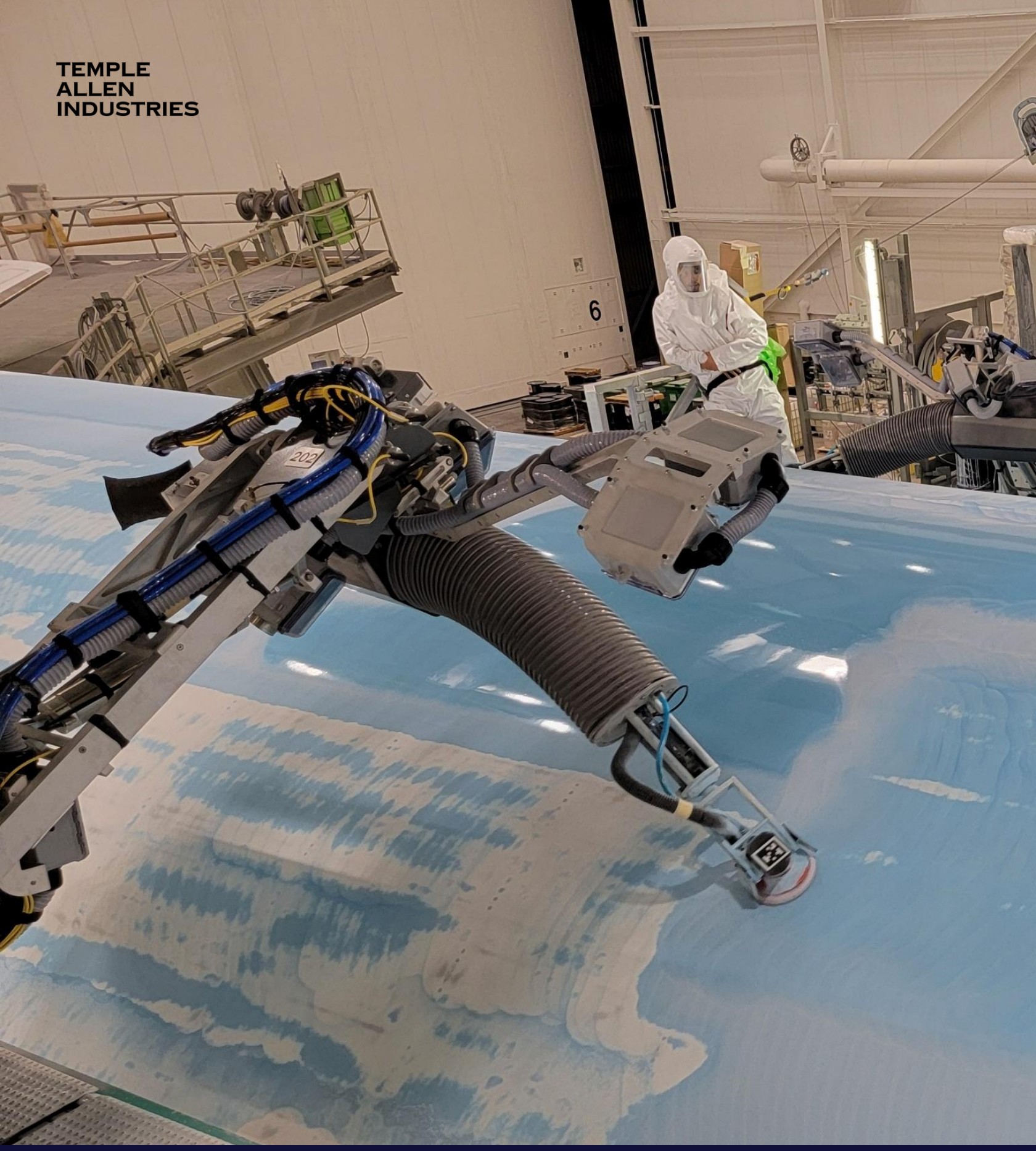

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