

HOW NEW BUSINESS
MODELS HAVE AFFECTED
MRO IN AEROSPACE &
DEFENSE

MAIN OBSTACLES TO THE SERVICE CONTINUITY OF AEROSPACE & DEFENSE

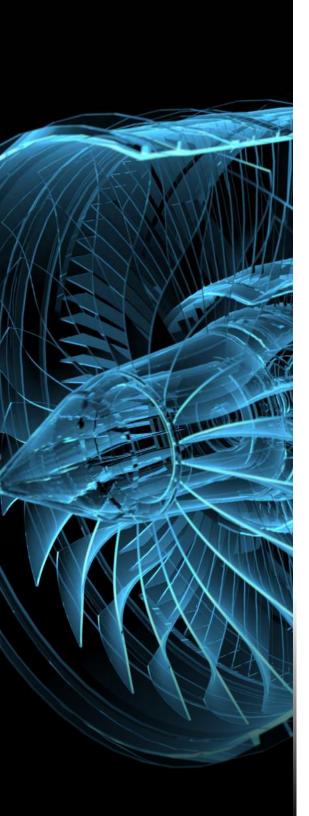
OPPORTUNITIES TO EVOLVE MRO THROUGH DIGITAL TRANSFORMATION

EXPLORING THE FUTURE OF MRO FOR AEROSPACE & DEFENSE WITH DELMIA AND THE KEEP THEM OPERATING INDUSTRY SOLUTION EXPERIENCE

THE BENEFITS OF DIGITALIZING MRO WITH DELMIA AND THE KEEP THEM OPERATING INDUSTRY SOLUTION EXPERIENCE

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HOW NEW BUSINESS MODELS HAVE AFFECTED MRO IN AEROSPACE & DEFENSE

The Aerospace & Defense (A&D) industry is at the forefront of innovation, representing a model for operational excellence particularly in its use of data analytics. Over the past 10 years, A&D has experienced significant growth in terms of profit, safety and efficiency in managing capacity and fuel demand. Now, the industry continues to seek clear skies for sustained growth and innovation while recovering from the pandemic and its aftermath.

Despite progress, A&D companies still face significant operational roadblocks. The annual operating cost for airlines in 2023 is expected to reach \$22.4 billion, more than double the \$10.1 billion operating profit estimated for 2022.¹ On top of that, the commercial air transport MRO (maintenance, repair and overhaul) market is projected to reach \$87.6 billion this year.² These challenges impact various aspects of operations, causing quality problems, maintenance delays and wasted mechanic hours, which hinder profitability, safety, punctuality and pose a risk during economic downturns.

In addition, A&D is seeing the transformation of its business models, with a greater focus on "fly-by-hour" and running hour leasing contracts, particularly for aircraft engines. Furthermore, these models are evolving to include more services as opposed to product-based offerings, with customers prioritizing efficiency, cost savings, the reduction of spare parts and the optimization of maintenance time.

Moving forward, the industry must set its sights on addressing these challenges by maximizing the operational availability of assets to improve MRO operations.

In this eBook, you'll discover:



Obstacles to service continuity in A&D and strategies to overcome them



Opportunities to transform MRO sustainably through digitalization



How digitalizing MRO with **DELMIA** and the **Keep Them Operating Industry Solution Experience** can drive unparalleled efficiency in asset management and maintenance

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¹ "Airline Profitability Outlook Strengthens." IATA. June 5, 2023

²"2023 MRO Market Outlook by Region." Shay, Lee Ann. Aviation Week. December 15, 2022.

MAIN OBSTACLES TO THE SERVICE CONTINUITY OF AEROSPACE & DEFENSE

Historically, original equipment manufacturers (OEMs) were responsible for designing and building aircraft and their associated systems. They would typically also provide maintenance and repair services, while the service department works to define the necessary service components, including the service bill of materials, maintenance activities and illustrations.

However, the industry's mindset and approach have shifted. Now, the production and maintenance of aircraft components and engines are increasingly supported by manufacturers based on the fly-by-hour principle. This allows the service department to influence the initial design, aiming for more efficient maintenance processes later on.

The MRO landscape in commercial aviation and defense



Commercial aviation

Approaches to maintenance may vary across different airlines; some have in-house services while others outsource to MRO and OEM service companies that charge based on the flu-bu-hour principle.



Defense

Higher readiness to adopt modern digital tools and advanced Systems of Systems (SoS) data analytics, with a focus and investment in building digital twins of old aircraft to utilize the information for MRO purposes.

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Embracing this new approach to asset availability and service continuity – leveraging digital tools for predictive maintenance and optimized asset management – can directly address several operational inefficiencies in A&D. Here are some of the key challenges A&D companies face today and the strategies that can be employed to allay them.

Challenges

- · Lower aircraft availability and mission readiness
- High operational costs due to unexpected maintenance, affecting profitability, safety and punctuality
- Shorter product life due to inadequate field maintenance, resulting in reduced fleet availability
- · Lengthy delays when unforeseen maintenance is required
- Shortage of spare parts for repairs and replacements
- Shortage of skilled manpower

Strategies

- Implementing digital solutions to enhance MRO effectiveness,
 leading to improved fleet availability and punctuality
- Utilizing data analytics to optimize maintenance quality, safety and performance
- Creating virtual twins to simulate the behavior and condition of assets, predicting when maintenance will be necessary
- Monitoring systems digitally to rapidly identify issues and define required work
- Enabling predictive maintenance to anticipate the types and quantities of spare parts needed

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The integration of digital transformation brings forth a range of promising opportunities to revolutionize MRO practices in A&D, allowing companies to incorporate the outlined strategies to enhance asset management and maintenance operations.



Support and Service Engineering:

Utilize digital tools to determine optimal maintenance strategies, influence design for serviceability and develop comprehensive support systems.



Preparations for Maintenance Execution:

Define precise workscopes for assets, optimize planning and scheduling and enhance work order execution through digital platforms.



Monitor Systems and Predictive Maintenance:

Leverage virtual twins with model-based simulation and Machine Learning (ML) to predict asset behavior, enabling proactive maintenance.



Maintenance Execution Enhanced by AR:

Enhance maintenance quality and mechanics' skill development through Augmented Reality (AR) solutions.



In-Service Feedback and Maintenance Optimization:

Use historical data for scenario simulations, optimizing future maintenance and refining operations based on past experiences.



Manage Service Contracts with a 360° View:

Enhance global operations visibility and collaboration by employing digital platforms for comprehensive service contract management.



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Capitalizing on the opportunities presented by digital transformation facilitates optimized MRO in A&D for improved asset availability, fast decision-making and effective disruption response – while allowing businesses to strategically embrace sustainability imperatives.

With **DELMIA** and the Keep Them Operating Industry Solution Experience, A&D operators can further enhance these advantages and their MRO capabilities. DELMIA's unique ability to consolidate contextualized data into a comprehensive virtual model empowers data-driven decisions, proactive measures and seamless management of complex maintenance requirements.

Through advanced simulation capabilities, strategic optimization of maintenance operations and a holistic view of the maintenance landscape, DELMIA solutions for MRO help propel your organization's asset management and maintenance to newer and greater heights.

Extend your MRO capabilities with DELMIA			
Capability	Scope	Solution	
Virtual Asset Modeling	Process EngineeringFabricationErgonomicsRoboticsGlobal ProcessManagement	 DELMIA Augmented Experience Drives efficient MRO execution with visual work guidance in maintenance and repair works through to final quality inspection. Enables Life of Type Extensions (LTEs) to maximize asset value and lifespan by making informed decisions on maintenance, upgrades and replacements. 	
Unfettered Collaboration	 Lean Team	 DELMIA 3DLean Empowers seamless lean collaboration across all actors involved in asset management and asset maintenance for improved efficiency and overall performance. 	

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Extend your MRO capabilities with DELMIA			
Capability	Scope	Solution	
Unmatched Optimization	 Integrated Business Planning Logistics & Workforce Planning Master Scheduling Detailed Production Planning Analytics & Predictive Intelligence 	 Support and Service Planning Optimizes service schedules, maintenance and workers for synchronized MRO operations. Support and Service Engineering Enables Systems of Systems (SoS) models to optimize maintenance and resource allocation, improve decision-making and enhance operational efficiency, safety and cost-effectiveness by identifying potential risks and streamlining maintenance activities. 	
Flawless Execution	 Production Quality Material Synchronization & WMS (Warehouse Management System) Maintenance Machine Connectivity 	 MRO Execution (Quality, Warehouse and Line Supply Management) Integrates operations management and execution for efficient maintenance planning, scheduling and optimization. Ensures high-quality execution of plans while maximizing labor utilization and optimizing inventory management for streamlined maintenance operations. 	

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Capability	Scope	Solution	
Innovation for the future	 Modeling Simulation and Visualization Predictive Maintenance 	360° Operations Excellence with the Virtual Twin Experience A cloud-based platform, rooted in the 3DEXPERIENCE platform, the Virtual Twin Experience enhances MRO capabilities in A&D through the convergence of the virtual and real worlds of operations to seamlessly bridge the gap between planning and execution, enabling: Model-based design and planning for optimized maintenance processes. Visualization and simulation of maintenance operations to identify challenges. Direct implementation of virtual plans in the real world. A continuous feedback loop between real-world data and the virtual model. Ongoing optimization and performance improvement through data exchange. A closed-loop capability for refining maintenance strategies. Scenario testing and analysis for informed decision-making.	

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Optimize revenue and reduce service/maintenance costs through manpower optimization

- → Increase service revenue by 5%-20%
- → Reduce MRO costs by 5%–15%

2

Improve the efficiency of maintenance operations and enable remote support with AR

→ Decrease Turn Around Time (TAT) by up to 20%

5

Reduce the number of spare parts in inventory

- → Reduce idle inventory by 20%
- \rightarrow 90%–100% of right spare parts at the right place

4

Optimize the maintenance process for speed and quality

- → Achieve first-time-right quality 85%–100% of the time
- → Reduce non-conformances by 20%-30%

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MAXIMIZING ASSET AVAILABILITY THROUGH OPTIMIZED MRO

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Competitive Value with AR Leveraging DELMIA Augmented Experience

reduction in product development lead time through Virtual Twin and Simulation

reduction in line commissioning time through virtual modeling of operations

increase in on-time MRO execution – improved 45% planning and scheduling and faster responses to demand changes

reduction in inventory (combined value) through \$36M improved material synchronization and real-time visibility of MRO execution

Up to improved quality through improved visibility, defect detection and real-time feedback

Up to faster skill ramp-up rate through augmented 50% reality operator guidance

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Safran Landing Systems

An international high-technology group operating in the aviation, defense and space markets, Safran Landing Systems needed to improve efficiency and quarantee optimum quality of its procedures.

As aeronautical equipment maintenance follows specific rules and processes from manufacturer-provided manuals, the interpretation of regulatory documentation and manual preparation were challenging and time-consuming tasks for the company.

Upon implementing DELMIA for some of the key stages of the MRO process – including inspection, repair, reporting and traceability – Safran Landing Systems was able to:

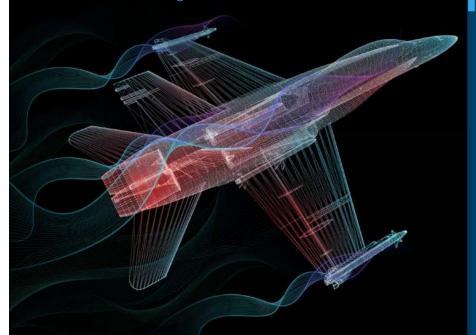
- Improve efficiency through the use of digital instructions and 3D models to streamline the repair process.
- Enhance quality and compliance by ensuring the correct work instructions for each product configuration.
- Reduce cognitive load among operators and optimize the learning curve through step-by-step guidance, thanks to digital assistance.
- Drive effective digital traceability and data consolidation through systematic task recording and personalized reporting, enabling in-depth analysis of product behavior during service.

been confirmed with our operators and inspectors in terms of quality, productivity and work ergonomics, and are now used on a daily basis for many use cases. Building on this success, we at Safran Landing Systems have initiated a deployment plan in all of our repair sites around the world.

Francis Rossignol VP SMART Factory solutions, Industry Direction Safran Landing Systems



Watch the case study video here



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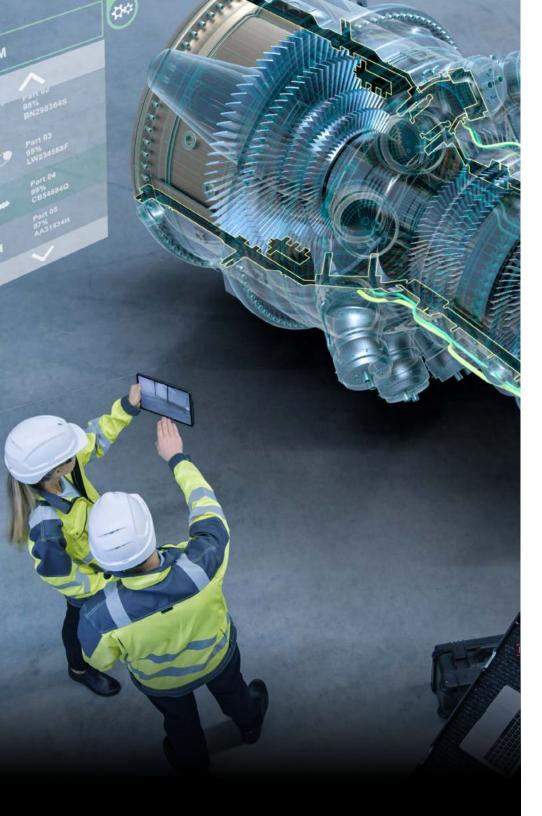
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MAXIMIZING ASSET AVAILABILITY THROUGH OPTIMIZED MRO

The digitalization of MRO signifies the pulsating heart of the future for Aerospace & Defense. Businesses that want to remain competitive in this dynamic and fast-paced market now need to channel their efforts in developing smarter and more effective ways of managing MRO to meet the demands of an industry in continuous evolution. This relies on companies' ability to chart a course towards optimized asset availability, swift decision-making and resilient operations – all the while driving more sustainable practices.

Beyond operational efficiency, optimizing asset availability and MRO operations profoundly impacts the bottom line. Therefore, it must be approached with a clear understanding of the associated costs and potential financial gains by integrating metrics and cost models to guide and measure the optimization process based on your business' unique needs and goals.

With DELMIA, A&D companies can redefine their MRO operations through the orchestration of advanced simulation, strategic optimization and cohesive data models that empower proactive decisions and streamlined operations that help strategically improve their profitability. Gain access to the innovative solutions you need to navigate complexity and elevate asset management and maintenance for competitive, innovative and more sustainable operations.

Learn more about our MRO solutions for the Aerospace & Defense industry at: https://www.3ds.com/industries/aerospace-defense/aircraft-maintenance

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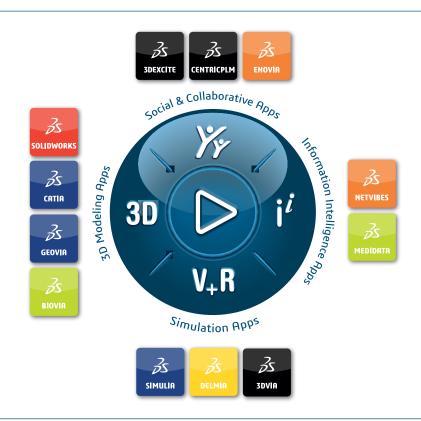
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Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating virtual twin experiences of the real world with our **3DEXPERIENCE** platform and applications, our customers can redefine the creation, production and life-cycle-management processes of their offer and thus have a meaningful impact to make the world more sustainable. The beauty of the Experience Economy is that it is a human-centered economy for the benefit of all –consumers, patients and citizens.

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Europe/Middle East/Africa

10, rue Marcel Dassault 78946 Vélizy-Villacoublay Cedex

Asia-Pacific

Dassault Systèmes K.K. ThinkPark Tower 2-1-1 Osaki, Shinagawa-ku, Tokyo 141-6020

Waltham, Massachusetts

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Dassault Systèmes 175 Wyman Street 02451-1223 USA







