



# THE VIRTUAL TWIN EXPERIENCE FOR AEROSPACE & DEFENSE

Optimizing operations by connecting the real and virtual worlds

AN INDUSTRY IN EVOLUTION

KEY TRENDS IN AEROSPACE & DEFENSE MANUFACTURING AND OPERATIONS

7 ADVANTAGES OF VIRTUAL TWINS IN AEROSPACE & DEFENSE MANUFACTURING

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INNOVATION TIME HORIZONS

SETTING NEW STANDARDS FOR QUALITY MANAGEMENT AND INSPECTION

- IMPROVING ASSEMBLY PROCESS ENGINEERING

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The Aerospace & Defense (A&D) industry is arguably one that was most immediately and severely impacted by the coronavirus crisis, especially in the commercial aircraft segment. It is evident that a lack of data and visibility in operations and manufacturing led to the inability of many A&D companies to pivot and make fast and optimal remedial decisions.

While passenger confidence is slowly returning, getting the commercial aviation industry back on track has to be done in a smart and cost-effective way. In addition, supply chains must be transformed to improve visibility and agility in order to be able to deliver on time, on quality and with less cost—to achieve the ultimate goal of operational resilience.

Resiliency is critical in these disruptive times to not only be able to weather disruptions but to also ensure business continuity and efficient operations, even when demand is constrained. A&D leaders and manufacturers can achieve this by digitalizing their operations and leveraging a virtual twin solution that enables them to visualize the perfect plans for new products, facilities and production processes in order to run optimized operations.

In this eBook, you will learn about:

-  **Key trends in Aerospace & Defense manufacturing**
-  **The advantages of using the Virtual Twin Experience to plan and manage operations**
-  **How the Virtual Twin Experience can drive competitive advantages**



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**Modern disruptions have amplified particular challenges that impact the longevity of future business. To achieve the “next normal,” A&D manufacturers need to consider the following:**

- Adopt new manufacturing solutions to maintain business continuity
- Prioritize knowledge capture to increase worker skill ramp-up and satisfaction
- Include advanced solutions such as augmented reality and artificial intelligence to improve accuracy and efficiency
- Address supply chain resiliency to optimize operations and remain agile in economically difficult situations
- Use virtual twin technology to reduce costs, increase accuracy and deliver outstanding customer experiences

# KEY TRENDS IN AEROSPACE & DEFENSE MANUFACTURING AND OPERATIONS

A&D companies already know that the path to resiliency and future-proof operations is built on digital transformation, with virtual solutions increasingly supporting operations. This development has given rise to several key trends that will drive the future of A&D manufacturing and operations:

1

## **Transform for agile and efficient supply chains**

Improving supply chain visibility unlocks improved agility and more cost-efficient operations that consistently deliver on time and at high quality.

2

## **Invest in Lean processes to be more competitive**

Restructuring processes for leaner and more efficient operations helps companies accomplish more with fewer resources, increasing their competitiveness.

3

## **Accelerate investment in new technologies**

Digital twin technology has proven crucial to the future of manufacturing, and driving increased operational efficiency and innovation in any industry.

4

## **New possibilities created by augmented reality (AR)**

Augmented reality solutions have given A&D companies new ways to overcome long-standing industry challenges such as production ramp-up and workforce shortage.

5

## **Optimize supply chains to be more sustainable**

Supply chain optimization can reduce a product’s carbon footprint by reducing transport miles and emissions, lowering costs.

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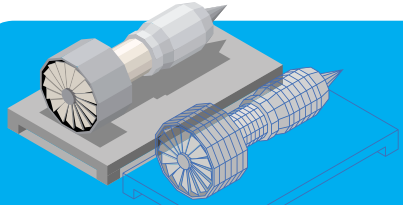
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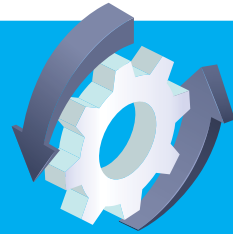
# 7 ADVANTAGES OF VIRTUAL TWINS IN AEROSPACE & DEFENSE MANUFACTURING



1

## UNLIMITED SIMULATION

Simulate and compare plans for optimal configurations of facilities and processes in a digital environment, saving precious time and resources.



2

## CONTINUOUS IMPROVEMENT

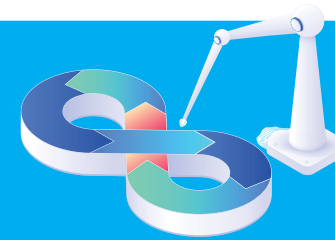
Enable a closed-loop connection between the virtual and real world—supported by IIoT integration and AR solutions—allowing faster, steady and error-free execution



3

## IMPROVED HUMAN FACTORS

Discover and prevent potential safety concerns through virtual simulations of shop floor processes and worker operations, creating better working conditions for personnel.



4

## ADDED AGILITY

Simulate operations and preventive maintenance to identify the quickest and most cost-efficient course of action, minimizing downtime while improving flexibility.



5

## GLOBAL COLLABORATION

Bridge the divide between engineering and manufacturing with cloud-based virtual twins that facilitate improved cross-department collaboration, minimizing rework.



6

## IIOT INTEGRATION

Provide complete visibility to engineers and managers over real-time shop floor data, improving traceability while reducing the risk of errors and non-conformances.



7

## KNOWLEDGE RETENTION

Preserve operational knowledge in the cloud and leverage AR work instructions to accelerate worker onboarding and skill ramp-up while improving job satisfaction.

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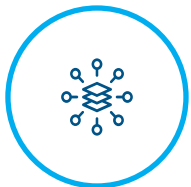
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# THE VIRTUAL TWIN EXPERIENCE

The **3DEXPERIENCE** platform is what our applications and solutions run on—it is the foundation for supporting model-based design, planning and execution. This cloud-based platform provides what we call the Virtual Twin Experience. In the **Virtual Twin Experience**, the virtual world enables users to see what they want to accomplish through modeling, simulation and visualization, which can then be implemented and executed in the real world. At the same time, experience and data collected in the real world is used to update the virtual twin model and maintain it as a perfect twin that can be used to improve all aspects of real-world operations. This convergence of the virtual and real worlds and the continuous cycle of information between the two achieves a closed-loop capability that enables optimization in virtually any scenario.



**Achieve Sustainable Innovation and Excellence**



**Support Creation of Value Network**



**Empower the Workforce of the Future**



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#### What the Virtual Twin Experience enables for A&D manufacturers:

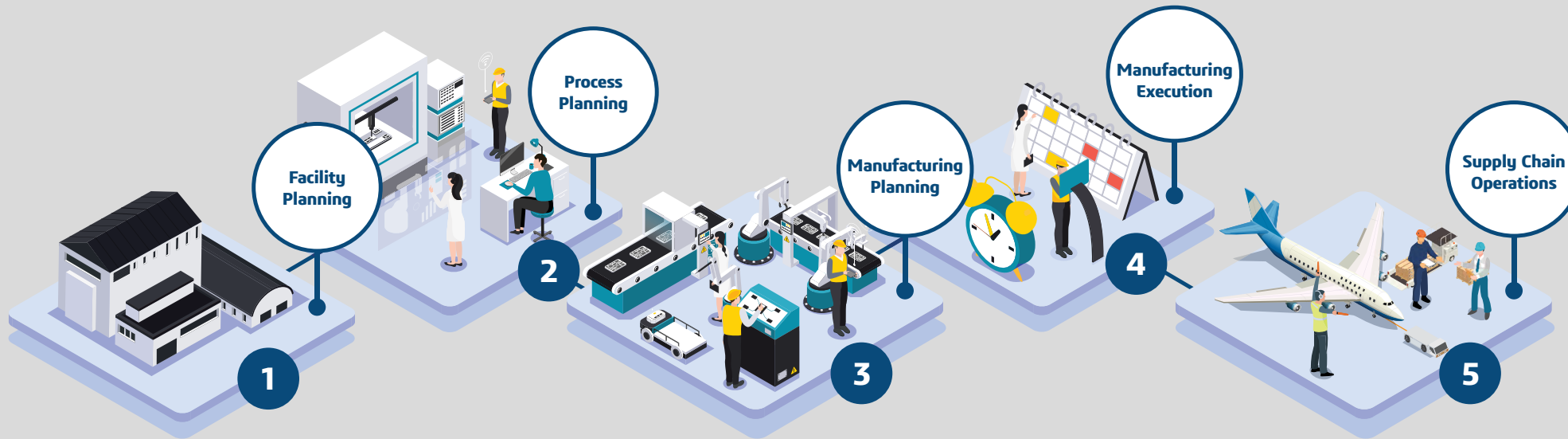
- Assess **new assembly operations** and address **potential changes** in production
- Assess **manufacturing strategies** and capacity to evaluate new manufacturing technologies
- Determine the impact of **demand and supply disruptions** to prepare for sustainable business operations

#### How this is achieved:

- Create a **virtual model** to control and operate in the real world for improvements
- Ensure layout **efficiency** for operator **safety**
- Leverage simulation as a lever for **continuous improvement**
- Simulate facility flow to **increase flexibility** and productivity
- **Optimize layouts**, work centers and process plans

#### Where the solution applies:

- Value networks: suppliers, contract manufacturers, original equipment manufacturers (OEMs), line builders, machine builders, robotic vendors and system integrators
- Facilities, warehouses, construction projects, etc.



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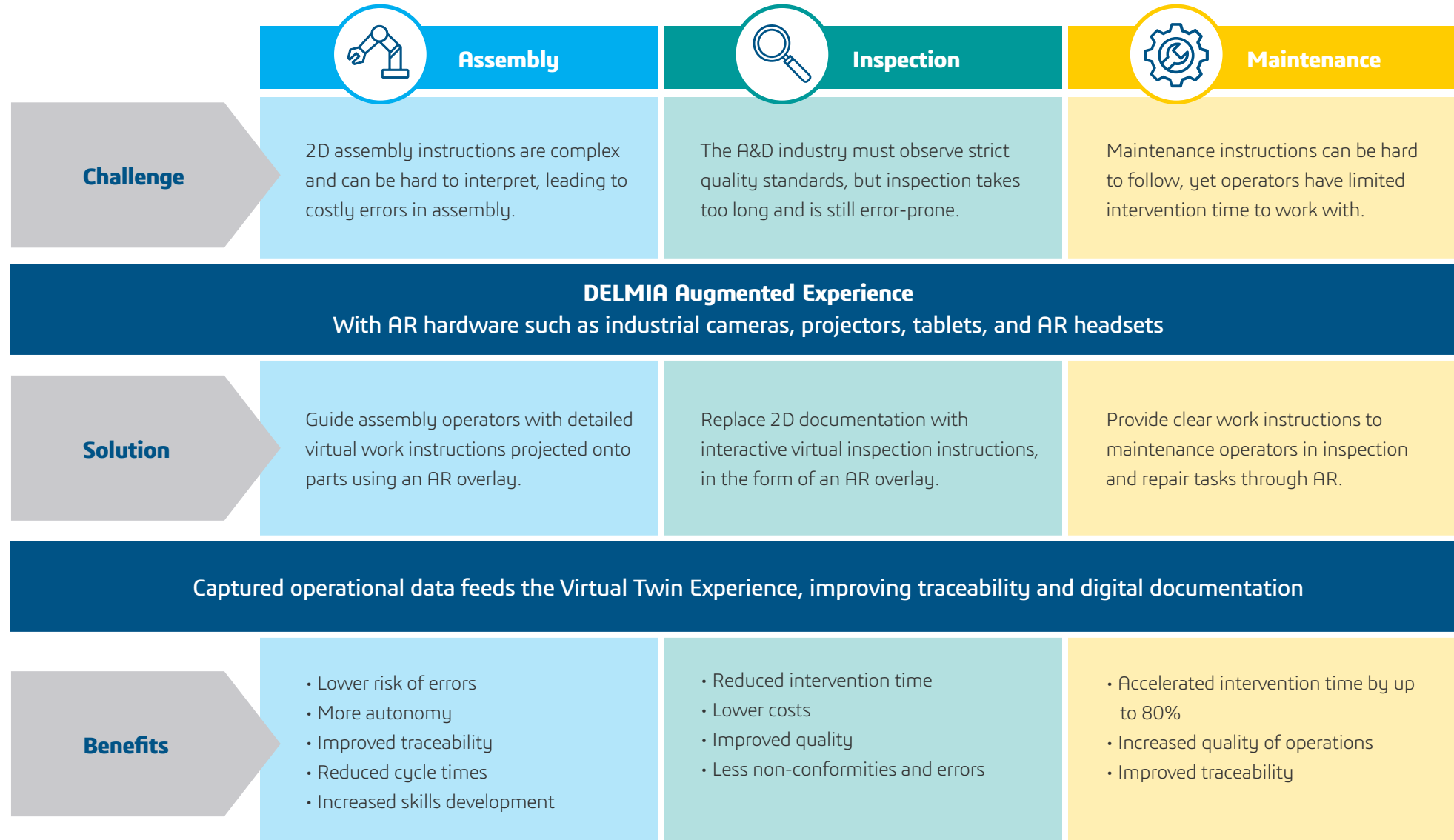
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# INNOVATION TIME HORIZONS

The **3DEXPERIENCE** platform features solutions that help A&D manufacturers at every stage of a product’s life cycle, from the initial planning phase to manufacturing execution, delivery, and maintenance. The platform keeps A&D manufacturers informed in their strategic decision-making—which involves planning in the virtual world—and their tactical decision-making regarding execution in the real world.

# SETTING NEW STANDARDS FOR QUALITY MANAGEMENT AND INSPECTION

With the Virtual Twin Experience, powered by DELMIA Augmented Experience, A&D manufacturers can equip their operational teams with the latest AR-based solutions to improve their assembly, inspection and maintenance operations tremendously.



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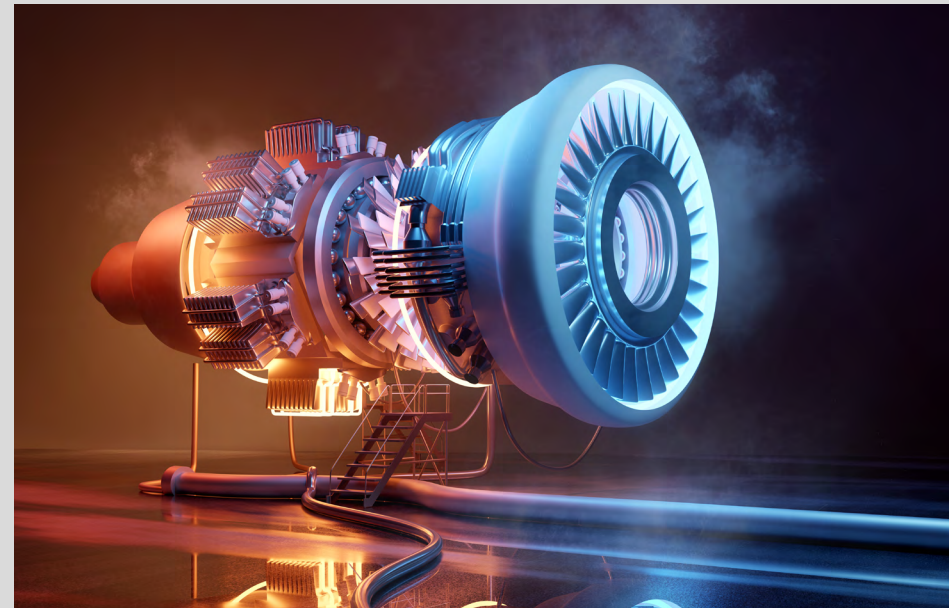
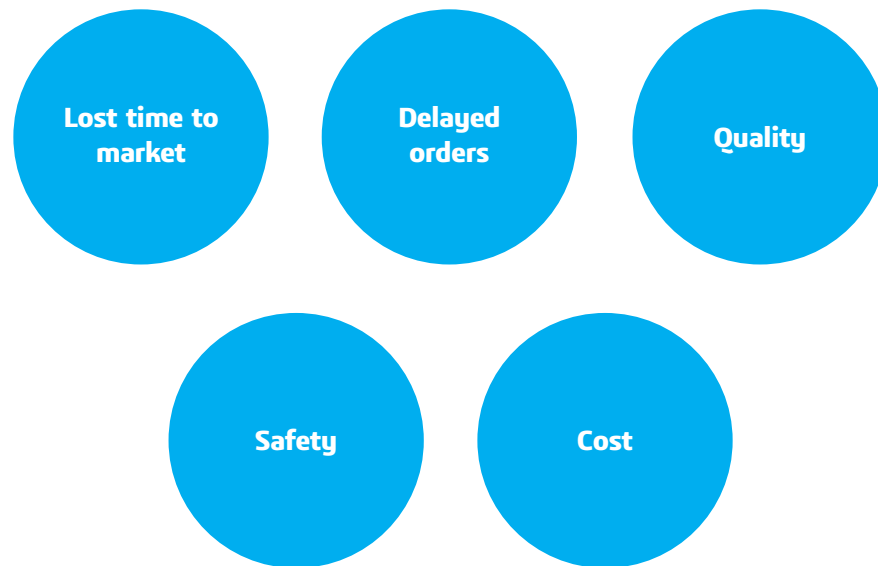


# IMPROVING ASSEMBLY PROCESS ENGINEERING

How can we optimize production processes to maximize efficiency, cost, and quality?

To truly gain value from digital transformation in A&D manufacturing, companies need to optimize production and the assembly process—to maximize overall operational efficiency to meet cost and quality guidelines. This requires close cooperation between engineering and manufacturing, which is a challenge as both sides use different tools that do not always connect.

With both sides operating in silos, this could negatively impact production in terms of:



Bridging this digital divide is critical to driving efficiency in production and can be achieved by leveraging assembly process engineering and virtual build. This strategy facilitates the validation of product builder visualization, assembly, and process plan to help companies achieve first-time-right manufacturing.

All this is made possible with the **3DEXPERIENCE** platform, which also equips manufacturers with the capability to virtually simulate process plans and identify potential issues early so that companies can minimize risk.

When supported by the AR-powered **DELMIA Augmented Experience**, companies will find more opportunities to reach new levels of efficiency at the operational level. Detailed virtual work instructions enable operators to confidently tackle complex assembly operations for faster delivery of higher quality products with a significantly reduced risk of error.

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# MAJOR IMPROVEMENTS THROUGH THE VIRTUAL TWIN EXPERIENCE



## CASE STUDY 1: AIRCRAFT ENGINE MANUFACTURER

### Challenge

The company needed a lean, unified and flexible collaboration environment to meet demand while maintaining the highest standards and managing costs—but their various production sites operated in distinct ways, lacking efficient communication between them.

### Strategy

The company implemented the **3DEXPERIENCE** platform as a single secure collaborative environment, ensuring efficient submission of engineering design changes into the system.

### Results

A unified collaborative environment for managing all manufacturing data was achieved. This enabled digital continuity from engineering to manufacturing, with efficient configuration management of all shop floor deliverables.



## CASE STUDY 2: AERONAUTICS COMPANY

### Challenge

The company needed to build a new factory and its virtual twin model for a next-generation production line. This would enable them to deliver first-time-right quality, within budget, and on schedule.

### Strategy

The company introduced virtual production, installation and inspection, which helped them to manage quality and time deviations in real time.

### Results

The company identified significant savings in work-in-progress, labor, quality costs and outstanding work by 10% to 40%.

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Customers who have implemented the Virtual Twin Experience have reported significant benefits in the following areas:



**50%** reduction in product development lead time

Through virtual twin and simulation



**\$36M** reduction in inventory

Through improved material synchronization and real-time visibility to production



**15%** reduction in line commissioning time

Through virtual modeling of operations



**90%** improved quality

Through improved visibility, defect detection and real-time feedback



**45%** increase in on-time production

Improved planning/scheduling and fast response to demand changes



**50%** faster skill ramp-up rate

Through augmented reality operator guidance

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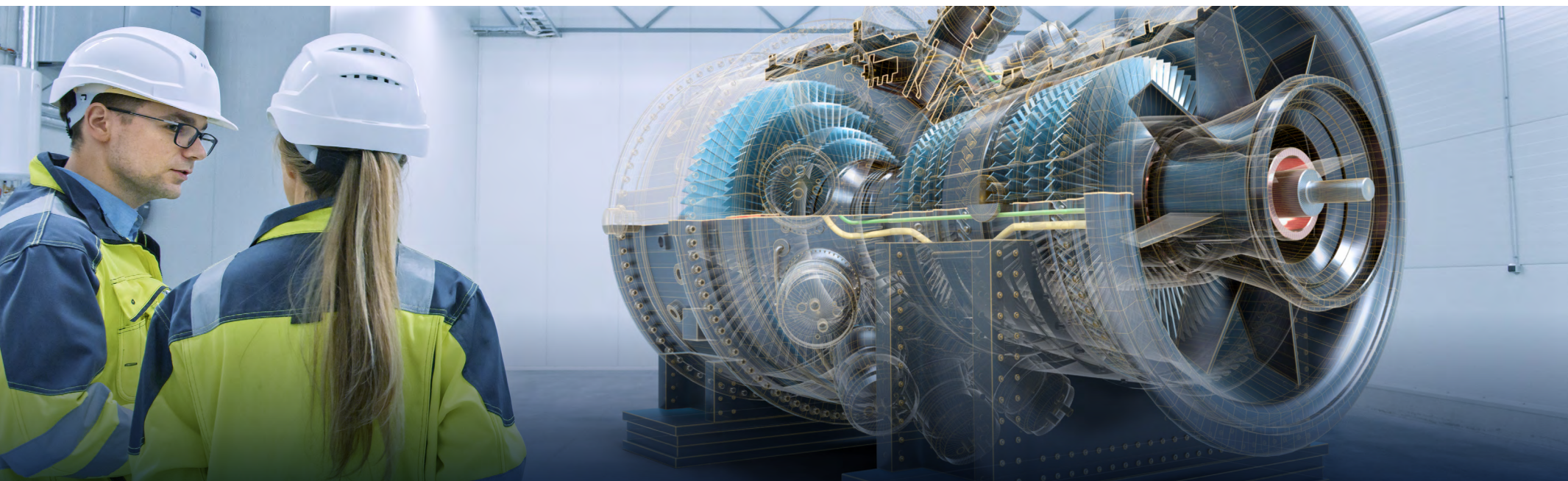
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## CONCLUSION

With demand in Aerospace & Defense gradually returning, manufacturers know that now is the time to embrace digital transformation in their supply chains.

The Virtual Twin Experience has proven to be an essential investment and a key transformation enabler for industrial leaders. As a result, A&D companies are sure to discover opportunities to build agility and resiliency in their manufacturing and operations to gain a competitive advantage over business rivals.

With DELMIA, A&D manufacturers can optimize operations and maximize returns by leveraging the endless possibilities of the Virtual Twin Experience, powered by the **3DEXPERIENCE** platform. In addition, new capabilities offered by our augmented reality solution could help A&D companies generate even greater returns by bringing significant productivity improvements to assembly, inspection, and maintenance operations.

DELMIA's solutions for the A&D industry can be configured and customized to help your organization achieve its unique outcome-based objectives. We are confident that our service can help your organization achieve a high level of agility and synchronization to soar above the competition and take innovation to greater heights.

Learn more about our solutions for the Aerospace & Defense industry at:  
<https://www.3ds.com/products/delmia>



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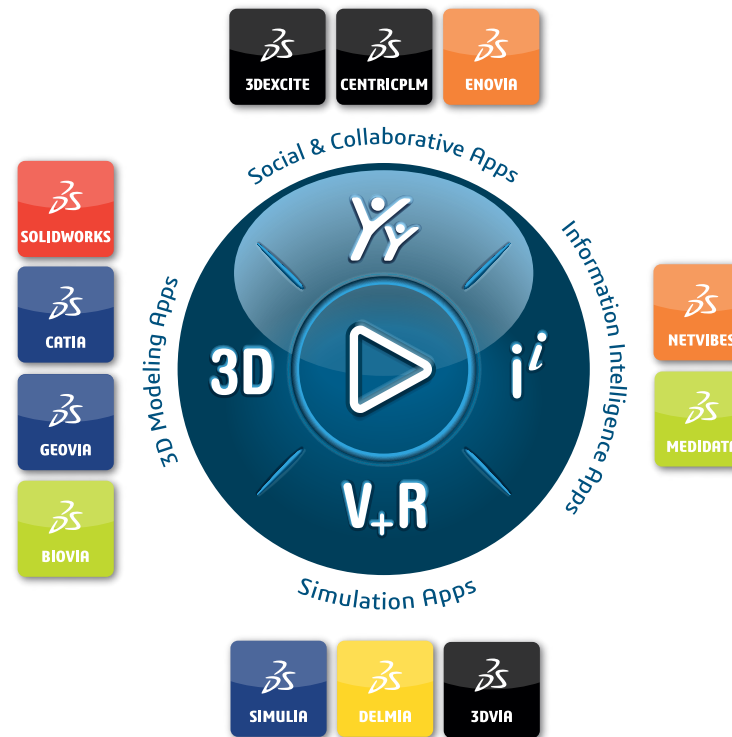
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Our **3DEXPERIENCE**® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

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.

Dassault Systèmes brings value to more than 300,000 customers of all sizes, in all industries, in more than 150 countries. For more information, visit [www.3ds.com](http://www.3ds.com).



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