



| Aerospace & Defense @Siemens

Siemens Aerospace & Defense vertical overview for SFS

Businesses and Services of Siemens AG

Industrial Business

Digital Industries



Smart Infrastructure



Mobility



Siemens Healthineers¹



Portfolio Companies



Siemens Advanta



Services

Siemens Financial Services



Siemens Real Estate



Global Business Services



¹ Publicly listed subsidiary of Siemens; Siemens' share in Siemens Healthineers: 75%

Our market-leading Business Units address our customers' needs for software, automation, and services

Key figures FY21: €16.5bn Revenue | 72,700 Employees



Software (industrial)
#1 market position



Factory Automation
#1 market position



Motion Control
#1 market position



Process Automation
#2 market position



Customer Services

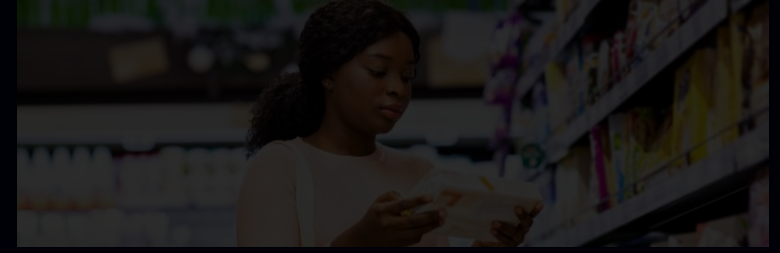
Digital Industries Provides Solutions to Many industries



Aerospace and Defense



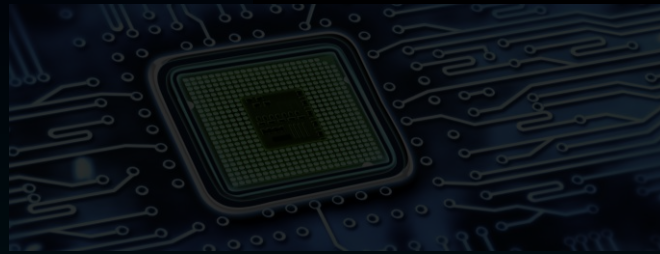
Automotive and Transportation



Consumer Products and Retail



Battery



Electronics and Semiconductors



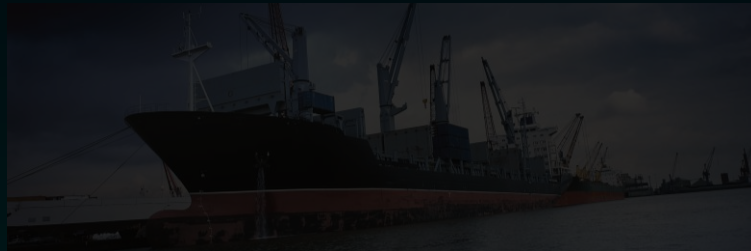
Energy and Utilities



Heavy Equipment



Industrial Machinery



Marine



Medical Devices

Trusted partner for the future of aerospace & defense



Aerospace & Defense Industry Challenges

Deliver products faster at far less cost



Complexity



Sustainability



Supply chain



Workforce

Aerospace Market segmentation according to applications

Overview on customer segments

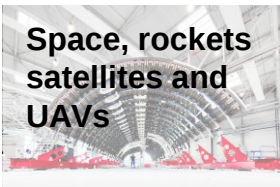
Detailing of segments



- Civil and military aircraft vehicles
 - Program and process design, simulation and validation
 - Structural and Final assembly line with painting process
 - Maintenance and repair business, MRO



- Engine manufacturing and assembly
 - Program and process design, simulation and validation
 - Engine assembly process
 - Maintenance and repair business, MRO



- Space and UAV manufacturing and assembly
 - Program and process design, simulation and validation
 - Assembly process
 - Maintenance and repair business, MRO



- Manufacturing of aircraft components e.g.
 - Landing gears, wing assembly, winglet, mechanical actuator, electronic engine control unit,
 - Fasteners, structural parts, springs, pipes, turbine blades, circuit boards, wiring, electronic components

DF/PD market potential, approx.

Civil: 30%



Military: 15%



Engine: 30%



Space: 5%



Tiers: 20%



Market Overview – Future of Aerospace

Start-up technologies are developing the industry's future

Many start-up companies and technologies lead the future of Aerospace



Significantly increasing focus on the developing space segment



Alternative forms of transportation emerging within the Aerospace industry, especially air taxis and UAVs



K I T T Y H A W K



The future of Aerospace will require an embrace of the digital enterprise in engineering, manufacturing, and product support

The Aerospace market is changing & the US is nearly 50% of the global A&D market – Demand for commercial single aisle jets is ramping up / Defense is growing rapidly

Boeing said this month it had stabilized 737 production at 31 per month, with plans to ramp production up to approximately 50 per month in the 2025-2026 timeframe.



+ 19
airplanes/month
until 2026

Air India places order for 800 LEAP engines for 400 narrow-body planes: GE Aerospace

The ramp-up effects as well GE Aerospace/Safran (CFM) with their delivery of LEAP Engines for the 737Max



GE Aerospace



SAFRAN
AEROSPACE · DEFENCE · SECURITY

US Army Taps Bell Textron for Helicopter of the Future

- Beat Lockheed-Boeing to build faster, stronger rotorcraft
- Aircraft market projected at \$60 billion to \$90 billion



Figure 2 shows annual growth in the aerospace sector, with the global market for the current fleet of aircraft being superseded by a market for ultra-efficient aircraft from the early 2030s. There is then a further shift towards zero-carbon aircraft from 2040 onwards.

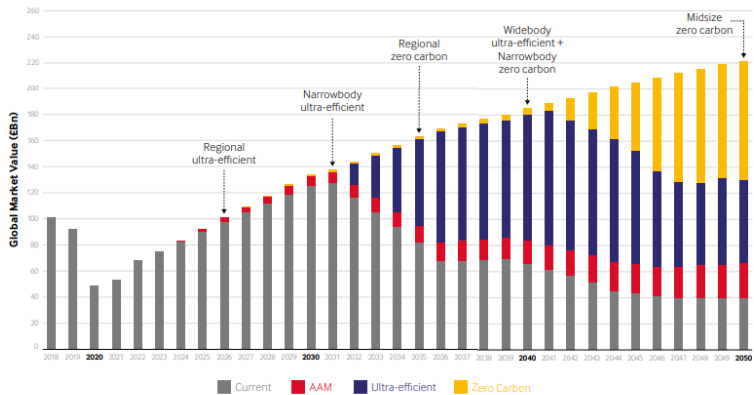
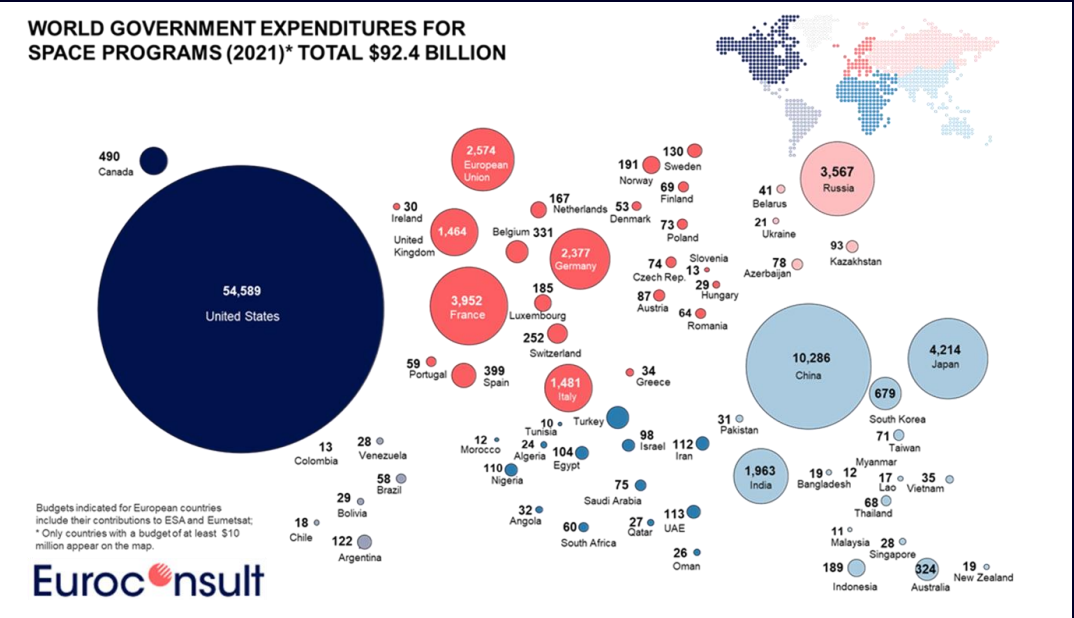


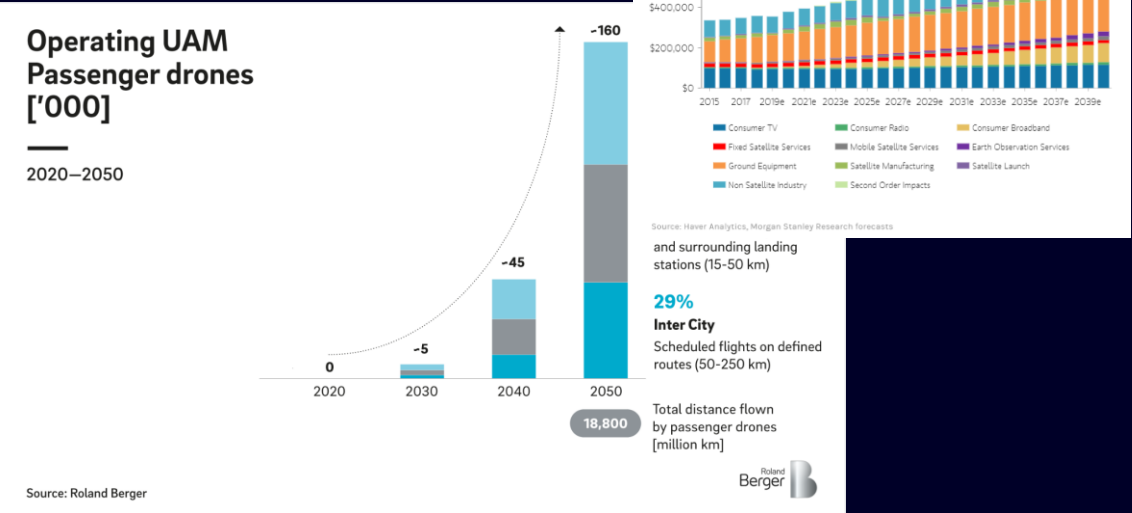
Figure 2: Global aerospace market – current, ultra-efficient and zero-carbon deliveries, 2022-2050 (Forecasted entry into service of new aircraft types highlighted above the chart)

...with Advanced Air Mobility (AAM) growing at 25% CAGR and SPACE is ramping up Early phases but we need to place our portfolio early on to be part of the success story



AAM technology	Description	2050 market opportunity	CAGR 2022 - 2035	CAGR 2035 - 2050
Propulsion	Propulsion provides the largest market opportunity for the AAM sector, with the development of efficient and quiet electric motors.	£9.3 bn	25.1%	4.6%
Aerodynamic structures	Highly integrated structures, making use of high-rate, high quality digital manufacturing systems. These structures will require lightweight composite and metallic materials.	£6.6 bn		
Aircraft integration & assembly	The integration of structures and systems at a rate close to that seen in the high-end automotive sector.	£5.3 bn		
AAM systems	This includes high voltage electrical systems, safety & sensing and increased automation in the future for control and operation.	£5.3 bn		

Table 3: Market opportunity for advanced air mobility technology



Aerospace Vertical

Creating customer value through one holistic approach

Transparency | Speed

Software: Data backbone, Digital Twin product, Manufacturing Intelligence, cloud, end-to-end ...



Support

Customer Service: Shop Floor digitalization, Integral Plant Maintenance, security, consulting ...



Best in Class Automation

Machine Tools, Robots, Additive Manuf., Assembly lines, Tape Laying, Autoclaves, AGVs, Cranes | SCADA, Edge, Tool Mgmt.



Value creation

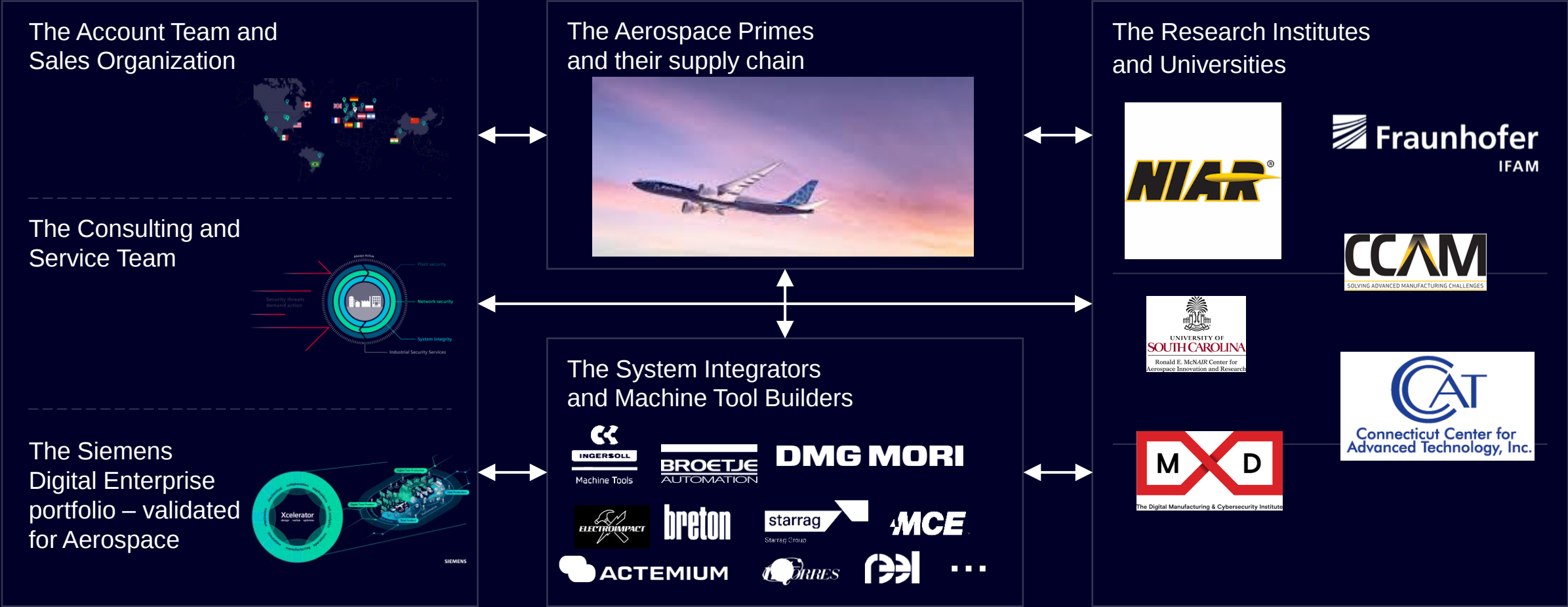


Smart Infrastructure

Safety, Air, Energy Management, Battery charging infrastructure, recycling

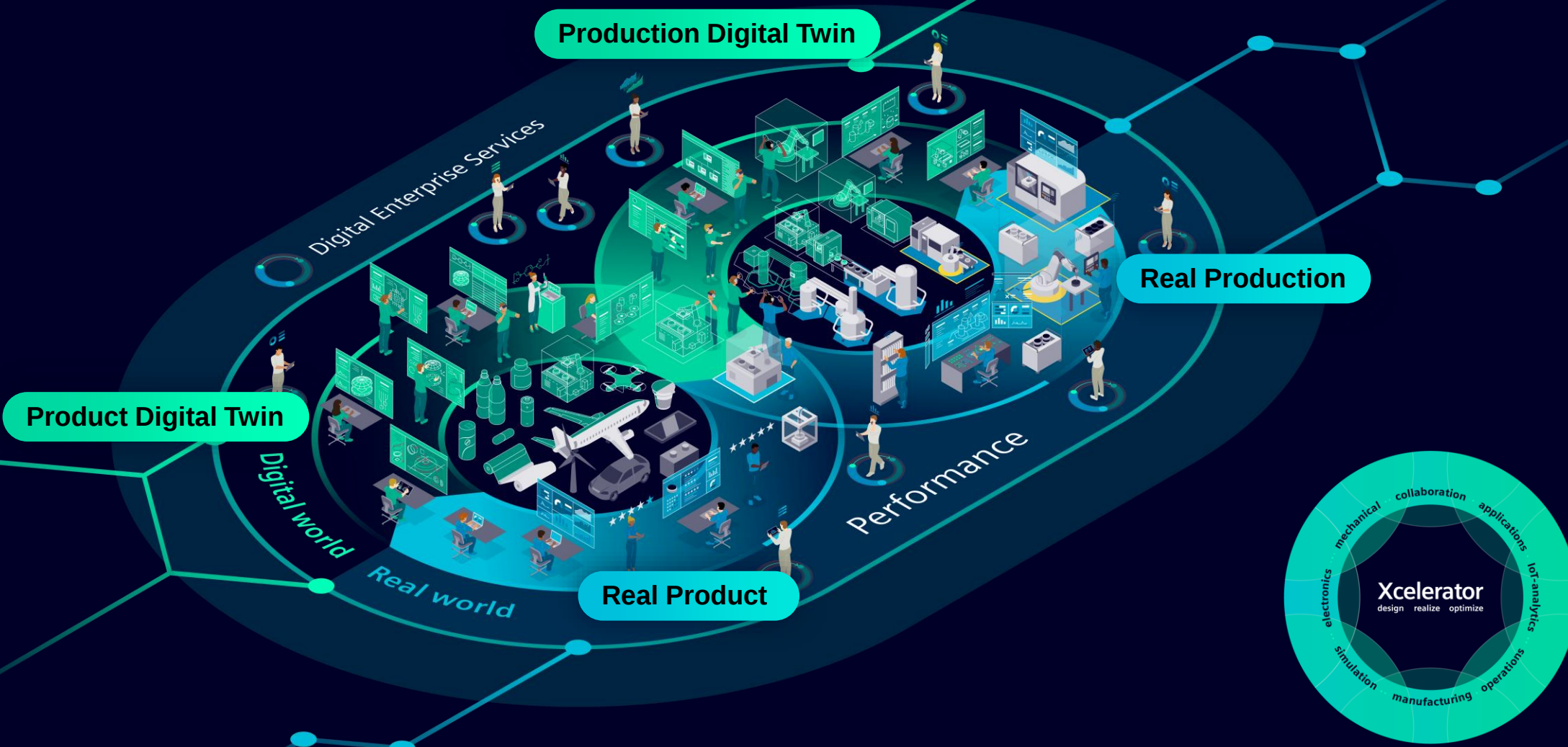


The Siemens Eco System

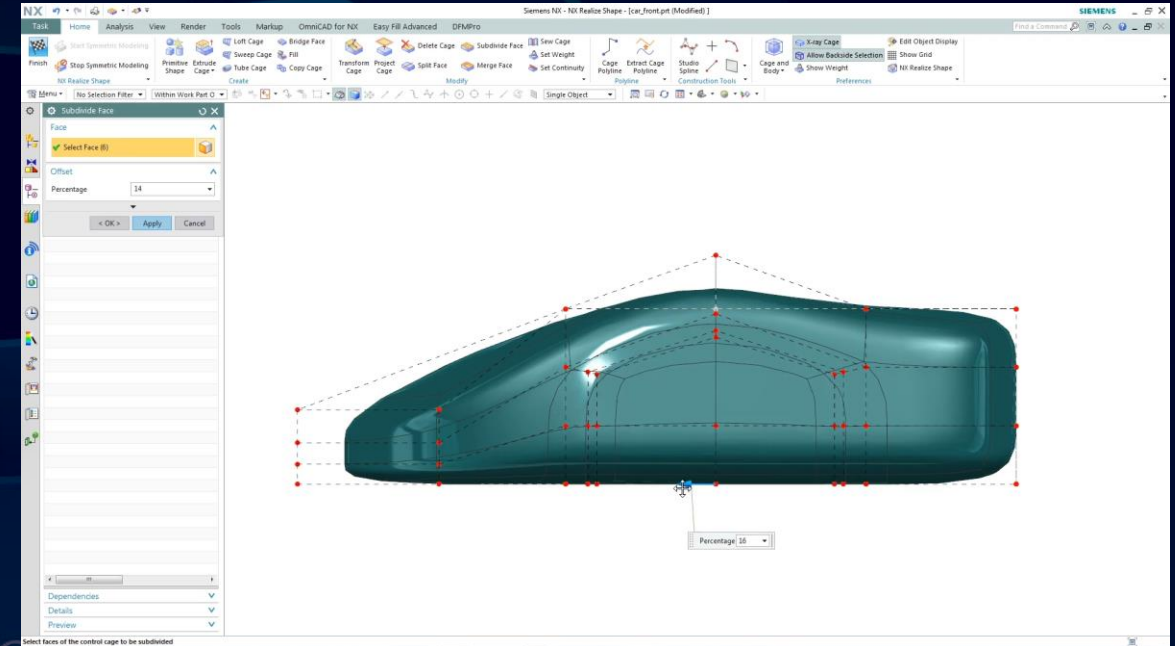
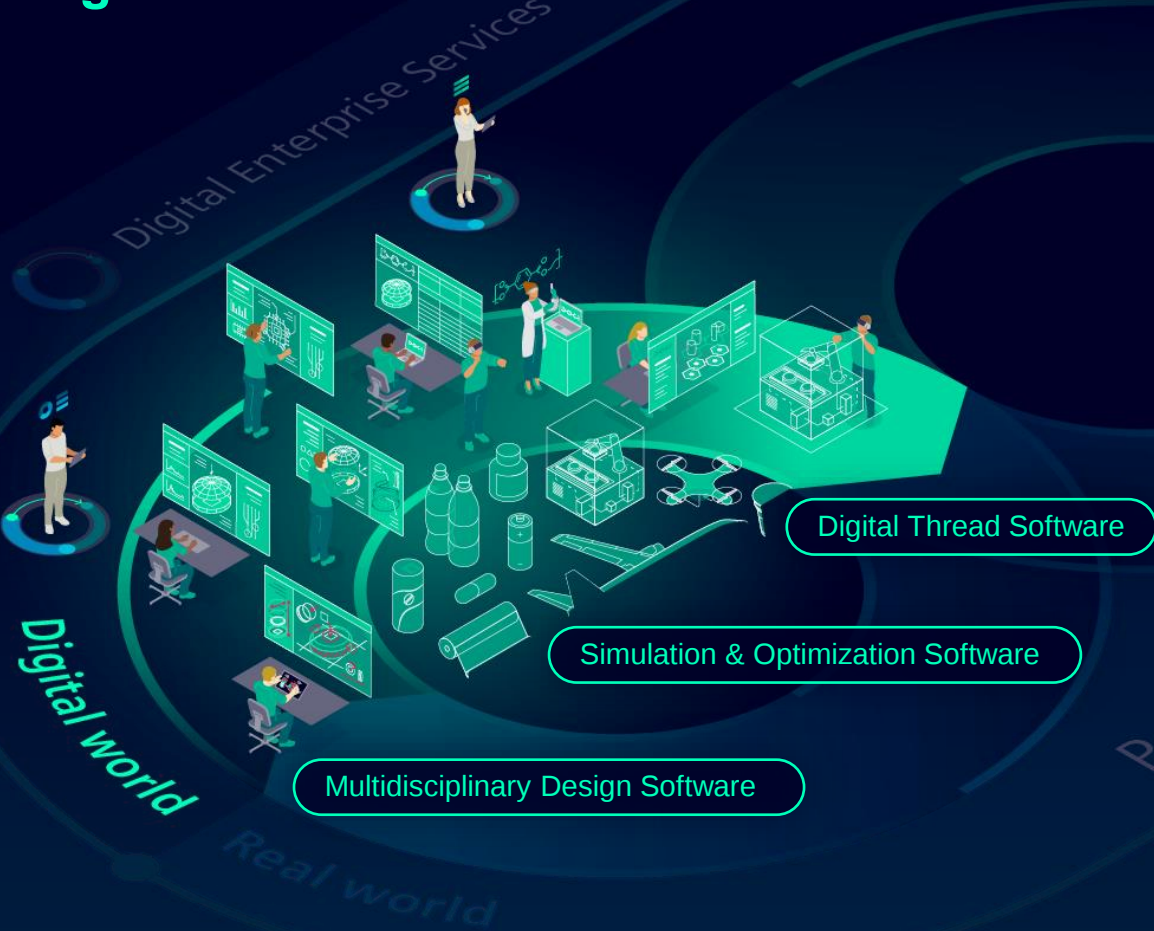


Digital Enterprise

The comprehensive Digital Twin approach



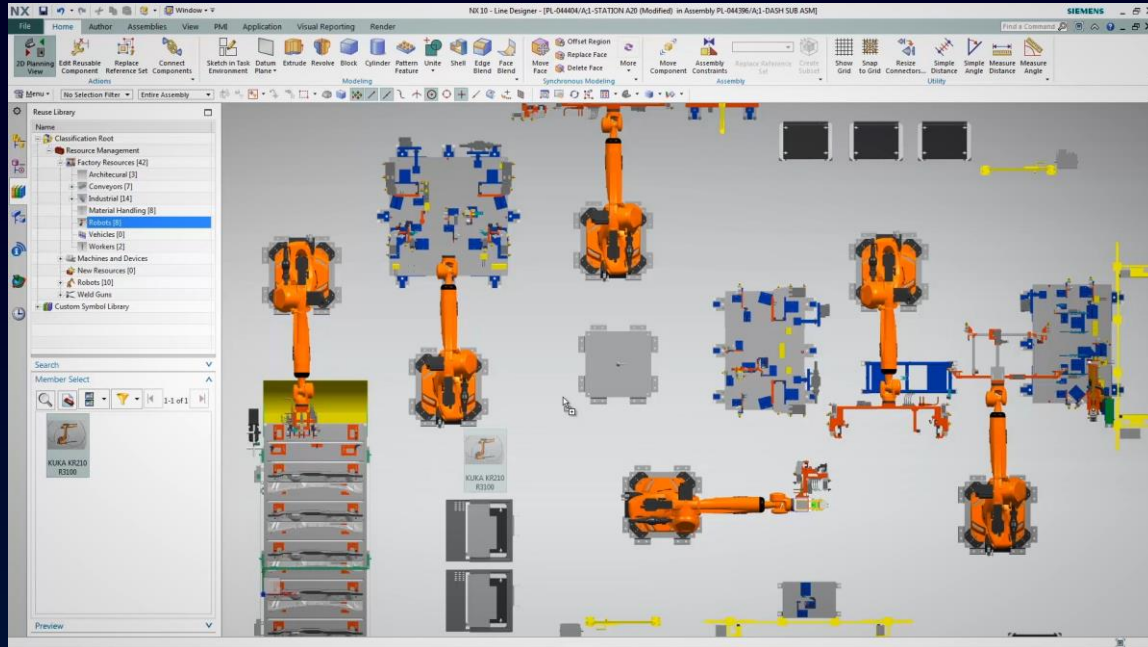
Digital Enterprise The Digital Twin Product



Design, simulate, and verify products digitally, including mechanics and multi-physics, electronics and management of software

Digital Enterprise

The Digital Twin Production



Plan, simulate, predict and optimize production digitally with PLC code generation and virtual commissioning.

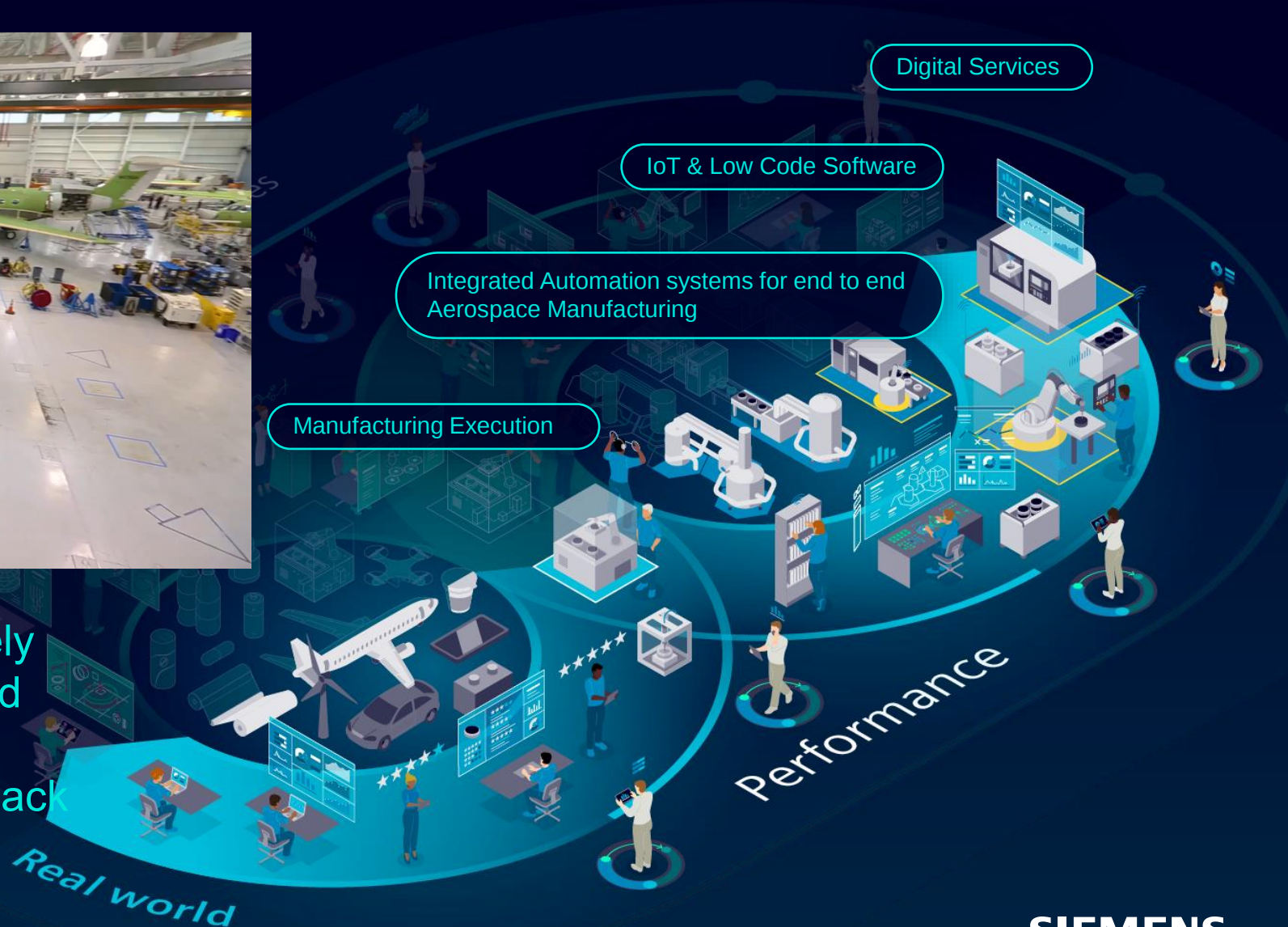


Digital Enterprise

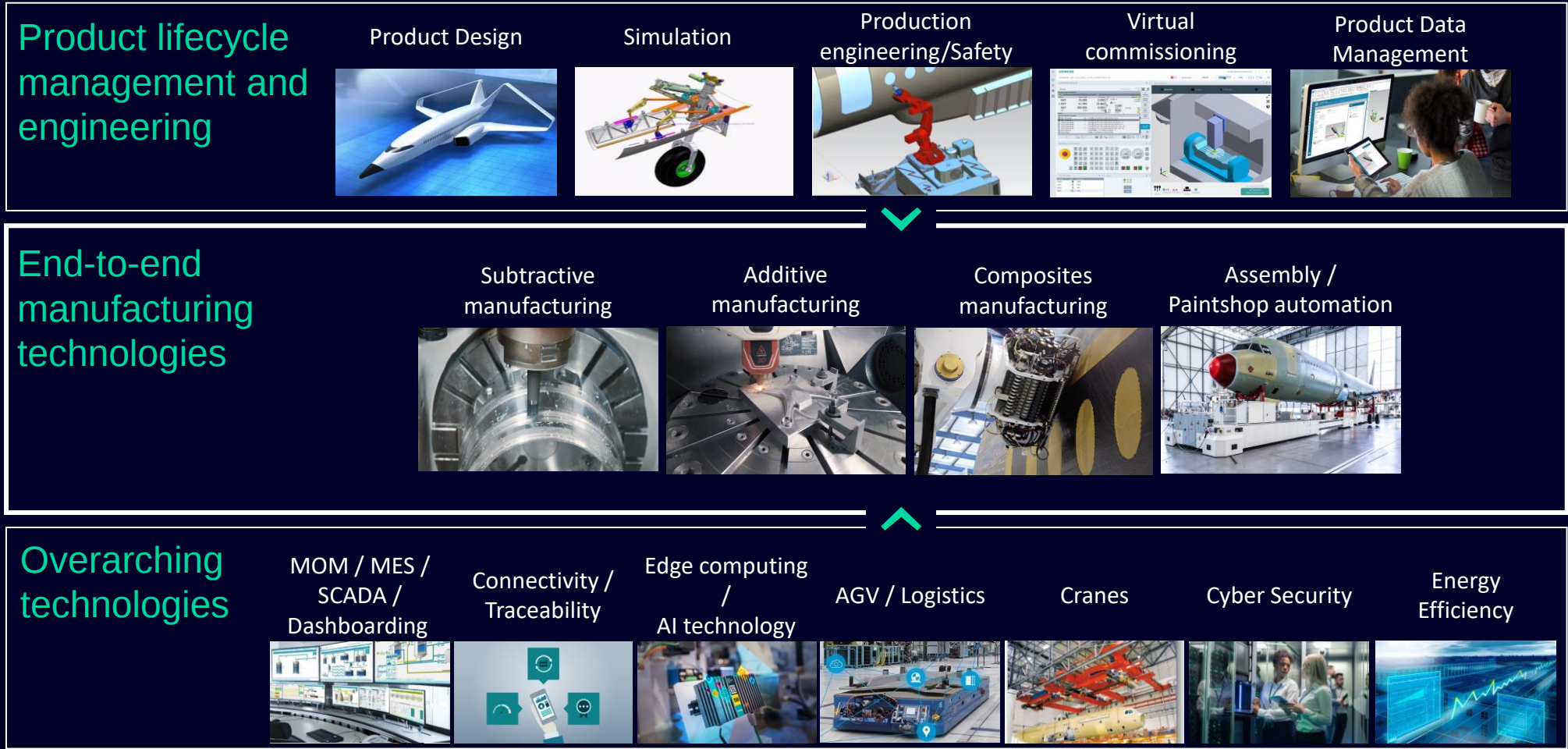
The real product and production



Run production efficiently and securely with Totally Integrated Automation and optimize product and production with data insights plus performance feedback



Siemens offers a holistic portfolio for various manufacturing and production fields in the aerospace industry



Smart Infrastructure

Building Products

Electrical products

Distribution Systems

Trusted Partner for the Digital Transformation in Aerospace and Defense



100% of US National Security Launch Vehicles on Siemens



100% of US Submarine and Aircraft Carriers on Siemens



100% Manned Space Flights on Siemens



95% of Commercial Aero Engines on Siemens



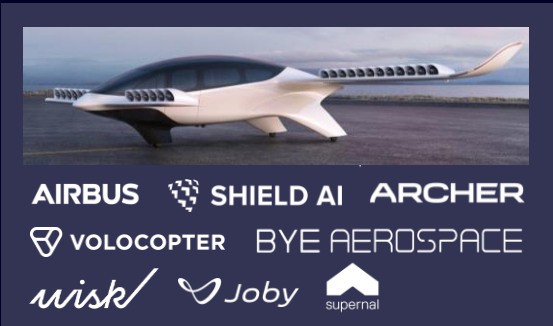
Major Avionics leaders and Suppliers on Siemens



Airframers & Unmanned Aerial Vehicle leaders on Siemens



Land Systems leaders and Suppliers on Siemens



eAircraft and eVTOL Start-ups leveraging Siemens

Aerospace Vertical Setup

Account Managers support end customers in their key regions

Global Account Management Team

14 Regional Aerospace Organizations

34 Account Managers in the region

>100 Key end customers



📍 HQ 📍 Aerospace setup 📍 CAM/GAM

Siemens Digital Industries USA Aerospace & Defense Vertical Team



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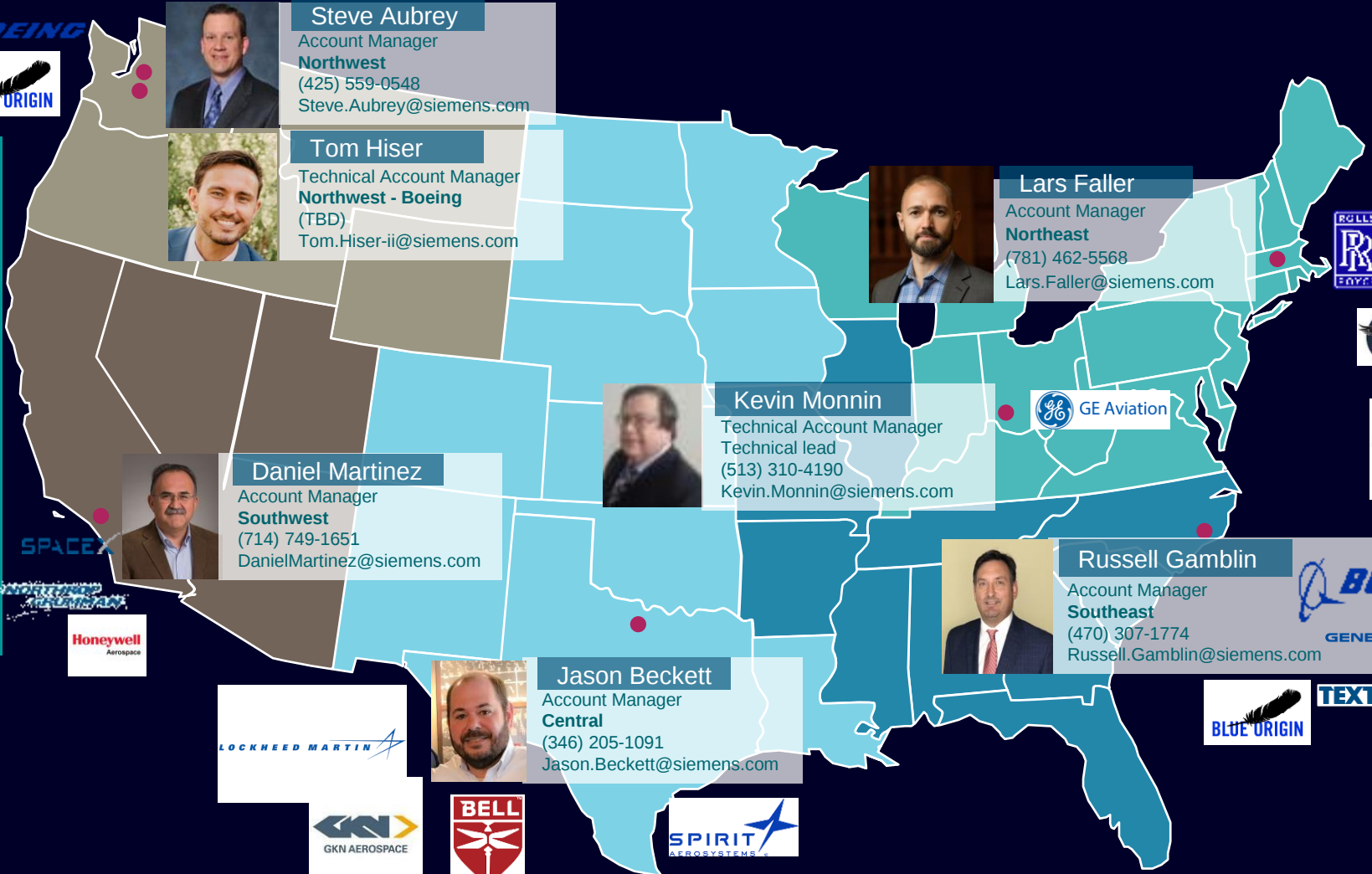
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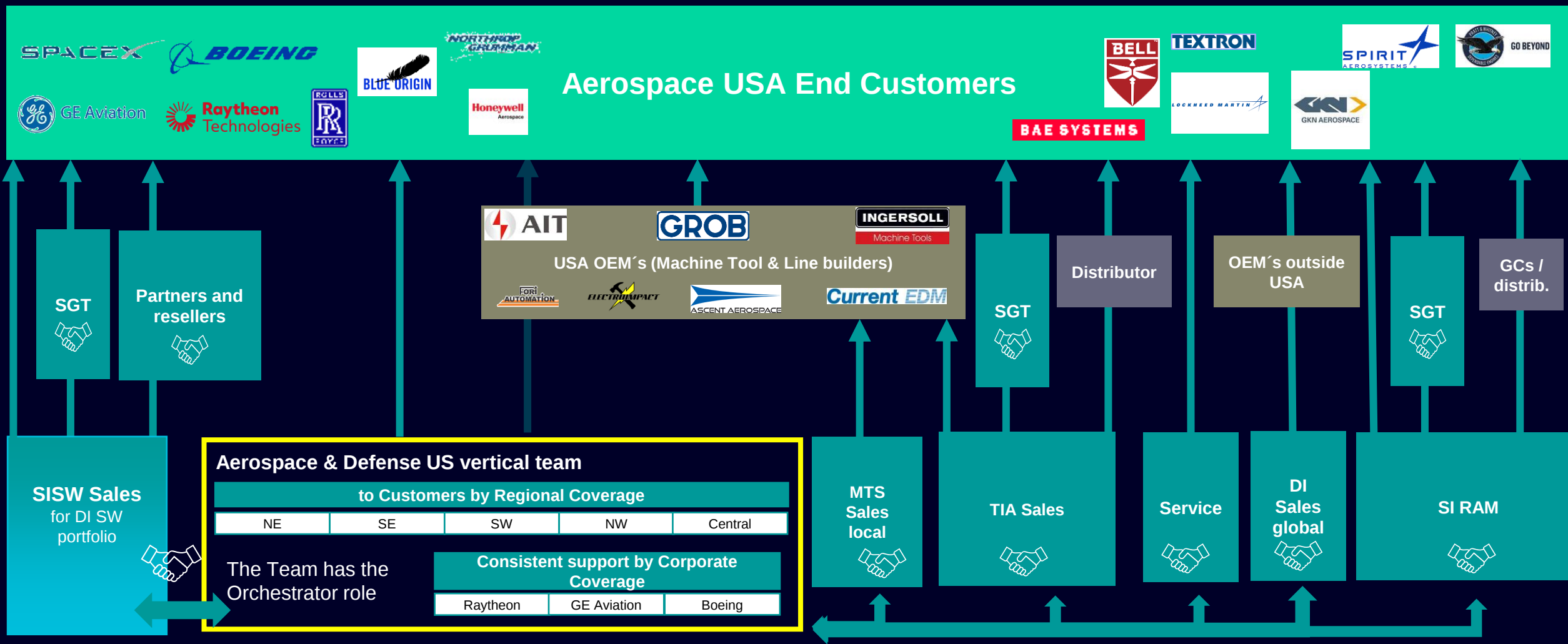




Unrestricted | © Siemens 2022 | A&D Vertical Market |

SIEMENS

DI USA Vertical Aerospace Framework today



PW Asheville update



Siemens holistic partnership at Pratt & Whitney Greenfield in Asheville NC



GO BEYOND

Pratt & Whitney to invest in greenfield blade manufacturing facility

Siemens DI existing relationship:



Pratt & Whitney Geared Turbo Fan (GTF) engine

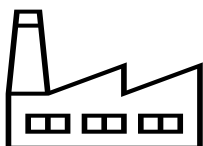
- 3D model w/ Siemens NX
- Engineering data managed with Siemens Teamcenter
- 3D simulation with Siemens Simcenter
- Complex parts machined with Siemens Sinumerik CNC control



Siemens DI vertical



Siemens DI SW



Generic hot section turbine airfoil

~ 30M+ Euro

Software



- NX CAM and Teamcenter expanded, ShopFloor Connect, Process Simulate, Plant Simulation

~ \$4M new SW secured in FY22

Factory Automation



- Potential for future automation

Motion Control



- Siemens 840Dsl 5-axis spec selected (~70+ new machine tools)
- Omatic ACM on Grinders

~\$4M through FY23

10 machines delivered in FY22, 35 more for FY23, remainder in FY24

Customer Services



- ✓ Sinumerik training program
- Service Agreement, Digi roll out, etc.

Estimated ~ \$1M

Smart Infrastructure



- Siemens LV & MV power infrastructure - Gas Insulated Switchgear + transformer / busway
- Siemens SI building management

~ \$20M in for SI

Defense Deep Dive: Army's Future Vertical Lift modernization program

“Future long-range assault aircraft,”: The successor to LM Sikorsky’s UH-60 Black Hawk helicopter. won’t just replace 2,000 UH-60s in the Army fleet; most likely will be preferred candidate to replace aging utility helicopters in the other military services and the fleets of allies.

Two teams competing (most likely Sept 2022 decision):

Bell Textron (Bell V-280 Valor) -> Opened a manufacturing technology center

Rolls-Royce for propulsion - WINNER

Boeing + Lockheed (Sikorsky) (Defiant X)

Honeywell for propulsion



Defiant X, the Boeing-Sikorsky offering to replace Black Hawk. BOEING

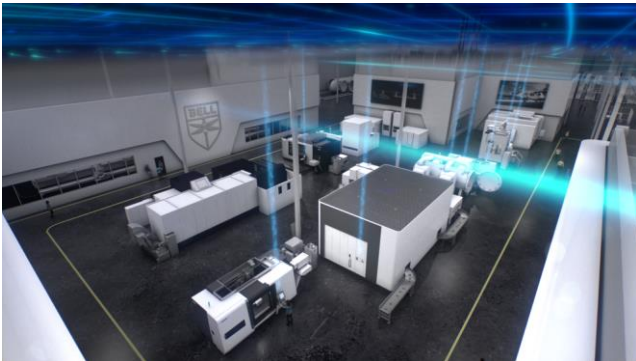


<https://fortworthreport.org/2022/06/02/bell-lockheed-martins-sikorsky-compete-for-billions-in-contracts-to-modernize-army-helicopters/>

SIEMENS

Bell Textron's win of Future long-range assault aircraft program:

<https://news.bellflight.com/en-US/190850-bell-unveils-new-manufacturing-technology-center>



- The largest helicopter procurement decision in 40 years
- Final configuration due 2025
- Replacement of ~2000 Black Hawks
- Initially worth ~\$7B, but program worth ~\$70B
- Will result in greenfield manufacturing facility based off the Manufacturing Technology Center (MTC)'s future factory initiatives

| Rob Stiefel

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