

Manufacturing & Supply Chain for Advanced Air Mobility

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OUTLINE



- Aerospace and defense state-of-the-art
- Keys to AAM manufacturing & supply chain success
- Collaboration opportunities

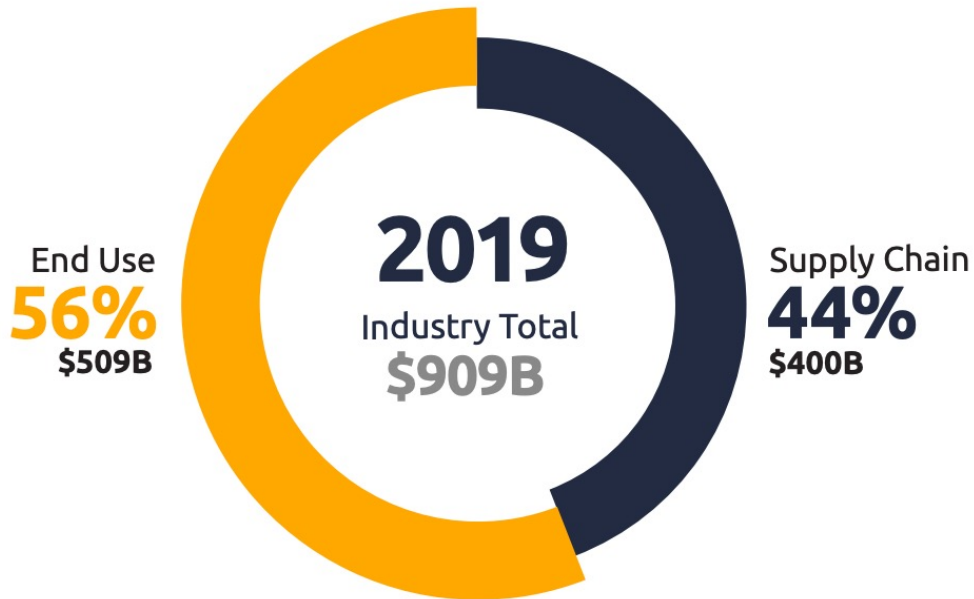
Aerospace and Defense Industry Outlook

- \$909B Revenue, \$148B exports, and \$77.6B trade difference
- \$400B contributed by supply chain (44%)

Employment



Supply Chain	1,275,100
End-Use	922,619
Aeronautics/Aircraft	602,072
Space	81,704
Land & Sea Systems	152,893
Cyber	85,948



Supply Chain	\$400B
Aeronautics/Aircraft	\$387B
Space	\$42B
Land & Sea Systems	\$61B
Cyber	\$19B

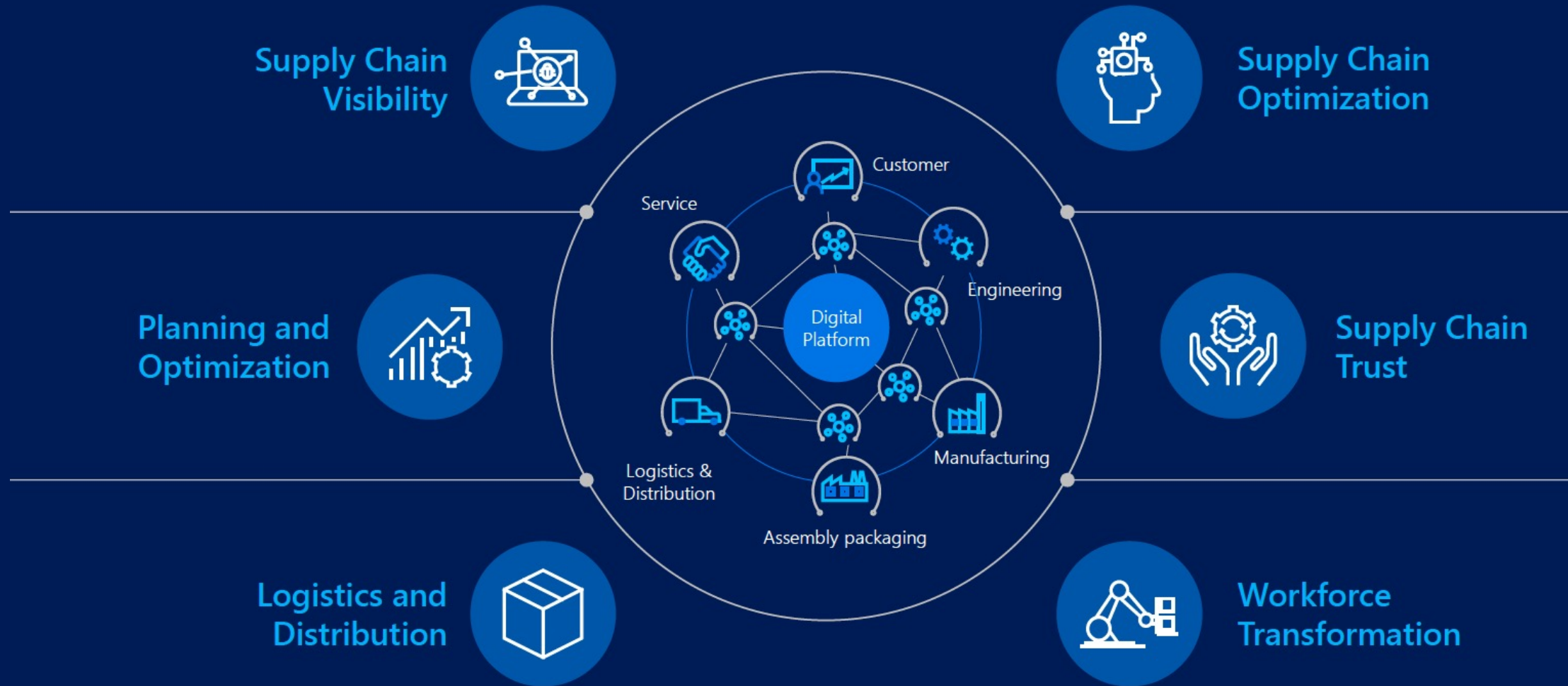
Reference: AIA 2020 Industry Outlook

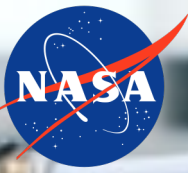
7 Keys to Manufacturing and Supply Chain Success in AAM



- Digitization
- 3D Printing
- Composites
- Supply chain resiliency
- Modeling and simulation
- MRO strategy
- Standardization

Digitization and Model-based Everything





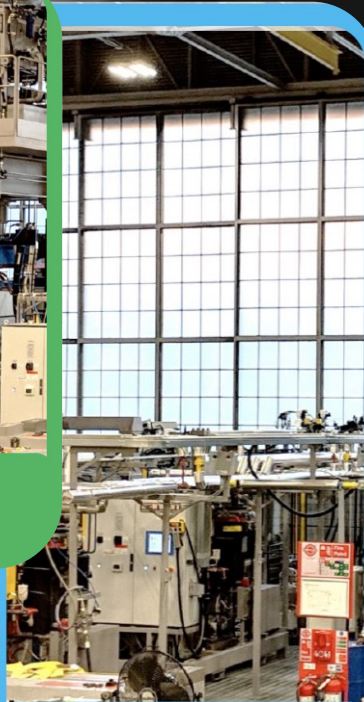
3D Printing



Composites



PREFORMER LINE
(aka Small Press)
Max Force 330T



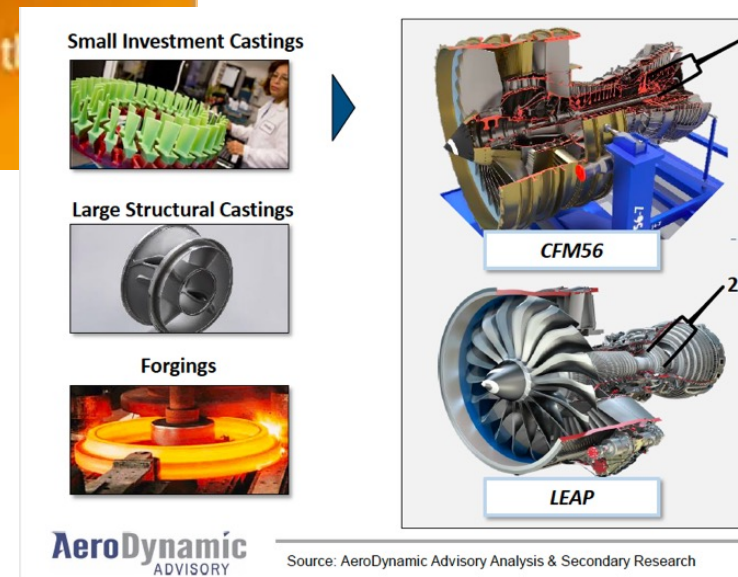
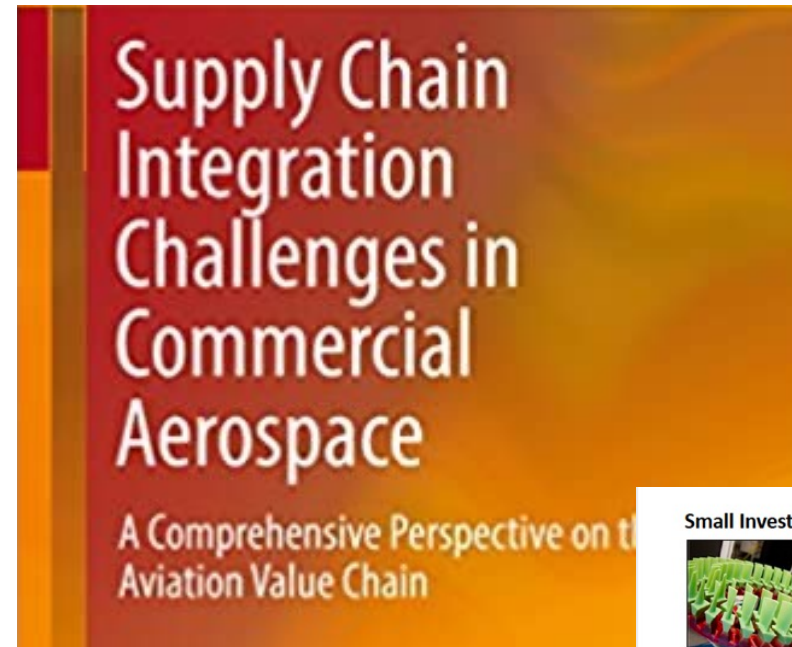
INJECTION



BIG PRESS
Max Force 3600T

Examples of “Challenged” Supply Chain

- Small drone industry
- Eclipse aircraft
- Ball bearing
- Castings and forgings
- Casing for engines
- Lavatories
- Printed Circuit Boards and Printed Wired Boards
- Microelectronics
- Batteries
- Electric motors
- Actuators
- Auxiliary Power Units (APUs)
- Disasters (e.g., Fukushima, Covid, Wildfires)



US Competitiveness and Leadership is at Risk

Supply Chain Challenges and Strategies

Supply Chain Challenges

- Dependence on sole-source or limited suppliers
- Long lead time
- Financial challenges across the supply chain
- Large inventory needs
- No visibility in lower tiers
- Collaboration across complex supply chain
- Cyber and security
- Geopolitical considerations
- Natural disasters
- Foreign dependency
- Product security
- Gap in human capital

References:

- EY – A&D Edge, Supply Chain Management in Aerospace and Defense (Feb 2018)
- California Manufacturing Network (2018)
- Maine Pointe (Feb 2020) and many other references

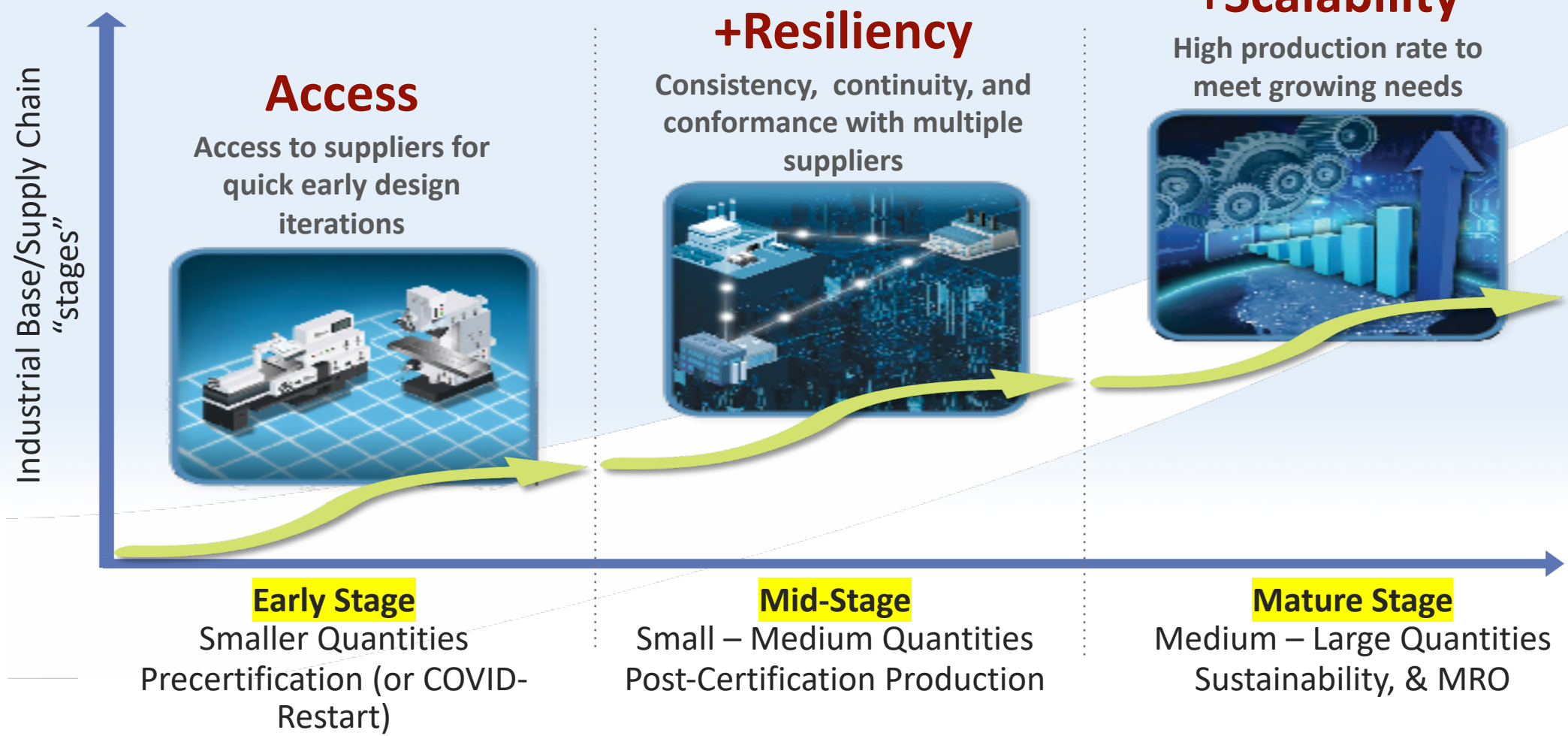
Strategies*

- **Adoption of digital technologies**
- **Integration (data and supply chain network)**
- **Readiness assessment**
- **Enhance visibility in demand, supply, and constraints**
- **Provide and encourage proactive analytics, collaboration, and decision making**
- **Modeling, simulation, and analysis**
- Curriculum and training
- Monitor security
- Risks-sharing partnerships
- Cross-sourcing
- Multiple sourcing
- Local players in supply network

*Possible contributions are highlighted.

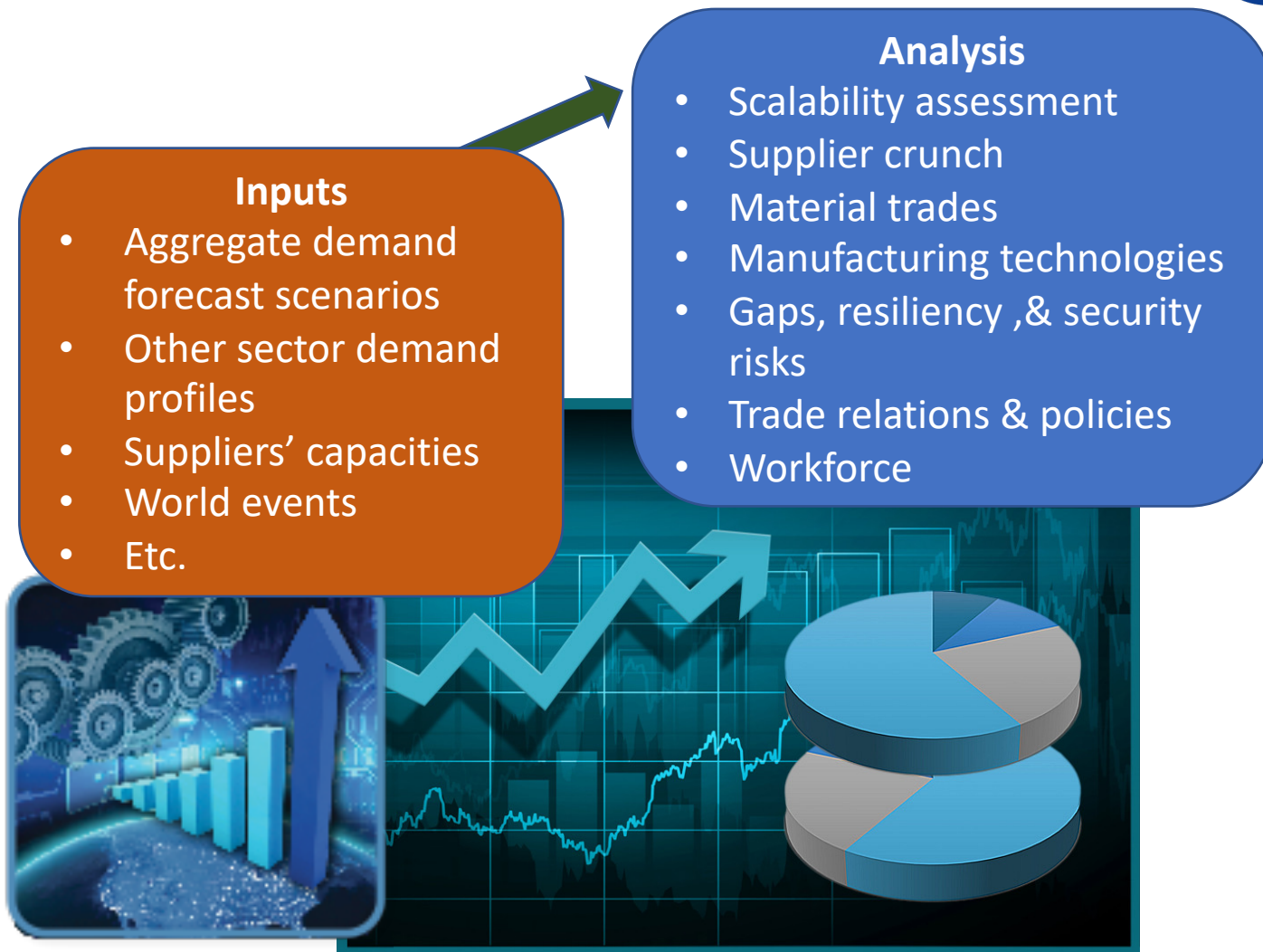
Resilient Supply Chain

Aero Supply Chain Stages

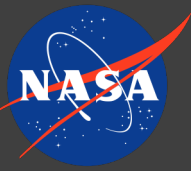


Supply Chain Modeling and Simulation Platform

- Connection through tiers
- Analytics
- Visualization
- Internal needs
- Industry needs

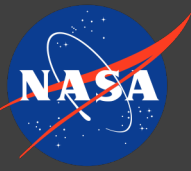


Capability to analyze current bottlenecks and gather information for future proofing

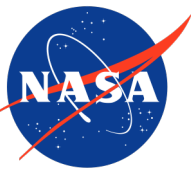


MRO Strategy for AAM

Design to Sustained Operations



Standardization



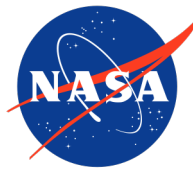
Opportunities for Collaboration

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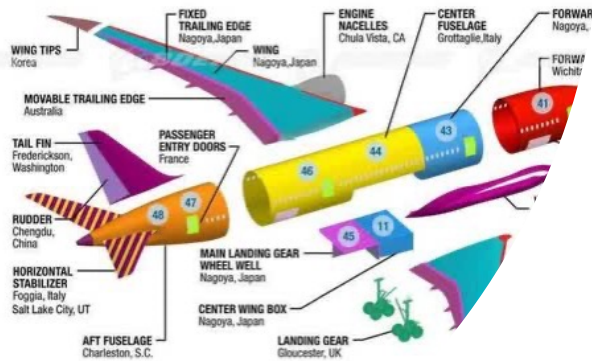


Back Up



THE COMPANIES

U.S.	CANADA	AUSTRALIA	ASIA
Boeing	Boeing	Boeing	Kawasaki
Spirit	Messier-Dowty		Mitsubishi
GE			Fuji
Goodrich			KAL-ASD
			Chengdu Aircraft Industrial



Part 1 Outline

- Supply chain overview
- Aerospace and defense industry outlook
- Aero supply chain stages
- Supply chain challenges and strategies
- Presidential Executive Orders
- Proactive Approach

Part 1: Aero Supply Chain Overview, Importance, and State-of-the-Art

Supply Chain Terminology

Keith Oliver, 1982



Consists of all parties, resources and activities involved



Ecosystem of different supplier tiers



Includes manufacturers, suppliers, transporters, warehouses, etc.



Supply chain management refers to coordination of all activities

