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The Next Generation(NG)

Aerospace Integrated Digital Enterprise(IDE)

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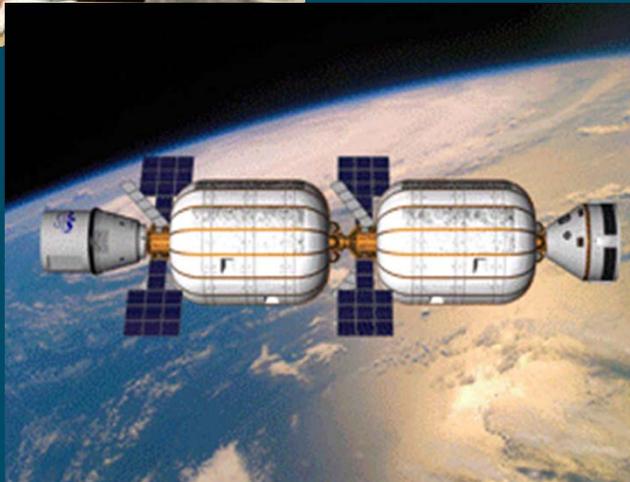
Smarter decisions, better products.

Inclusion



1. A&D Trends
2. Implications
3. Improvement Possibilities
4. NG/IDE Case Studies
5. Future of NG/IDE
6. Summary

A&D Trends



- Productivity
- Secure Collaboration
- Concurrent processes
- Operational and Multi-Domain/Enterprise Efficiency
- Performance-based logistics
- Total Cost of Ownership
- Public Private Partnerships
- Secure International Collaboration

Development

Production

Product Support

Integrated Digital Enterprise

Implications: Domain/Operation Efficiency



- Development Costs
- Production Costs
- Product Support Costs
- Supply Chain Costs
- Total Ownership Costs

Cost Breakdown:
 20% Produce
 80% Support

Production	1 st 5-yrs	2 nd 5-yrs	3 rd 5-yrs	4 th 5-yrs	5 th 5-yrs
40%					
20%					

Estimated Cost Breakdown

Design/Engineer/Mfr/Test/Ship			Lifecycle Product Support				
Design/Eng		20%					
Prod. Plg		7%		Support Plg		10%	
Assem/Tes/Ship		13%		Re-assem/Test/Ship		20%	
Purchased Material		60%		Repair/Refurbish		17%	
				Purchased Material		53%	
Total Delivery Costs		100%		Total Prod Support		100%	
		X1				X4	
Purchased Material		60				212	272
Touch Labor		13				80	93
Repair/Refurbish		-				68	68
Planning		7				40	47
Design/Eng		20				-	20

Cost Index



Aerospace Lifecycle Cost Profile: Non-Linearity



Cost Breakdown:
20% Produce
80% Support

Possibilities: Total Enterprise Productivity



- Integrated Enterprise
- Integrated Supply Chain
- Commercial Airlines,
- Fleet Operators, Leasing
- Military
- ALC's, Depots, Shipyards

Development

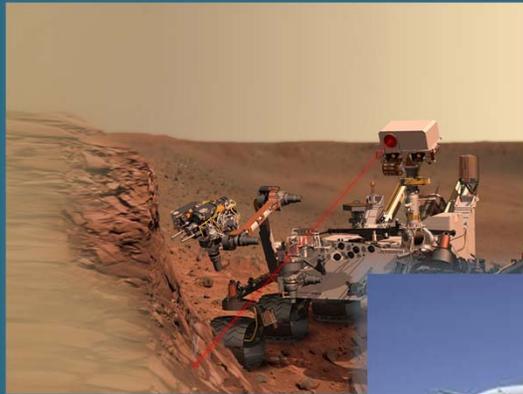
Production

Product Support

Integrated Digital Enterprise

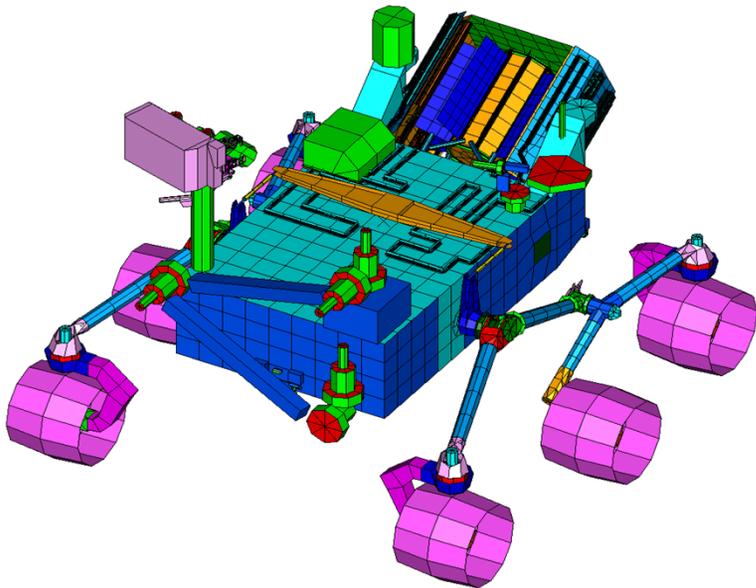


Case Studies - Solution Examples



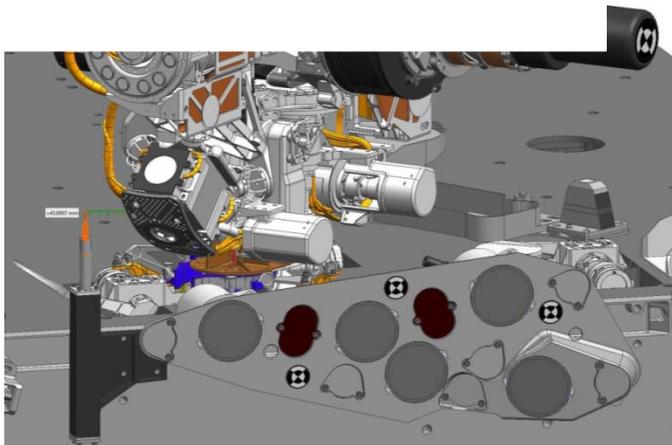
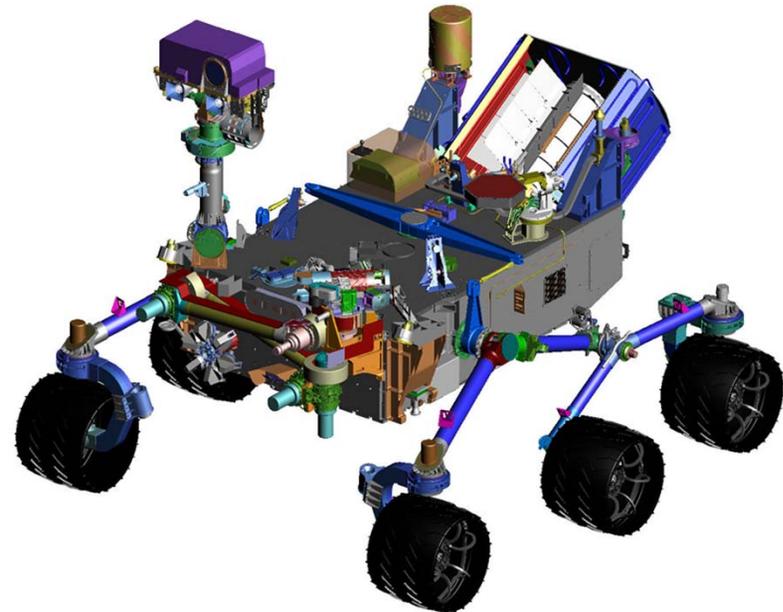
- **A. JPL MSL Curiosity:**
 - Integrated Multiple Disciplines
 - Single Site
- **B. JSF F-35 Global Coalition**
 - Integrated Global Defense
 - Multiple Sites w/ ITAR
- **C. Russian Space Center;**
 - Integrated Space Operation
- **D. Other Industries: Automotive**
 - Integrated Global Commercial
- **E. Clouds for Supply Chain**

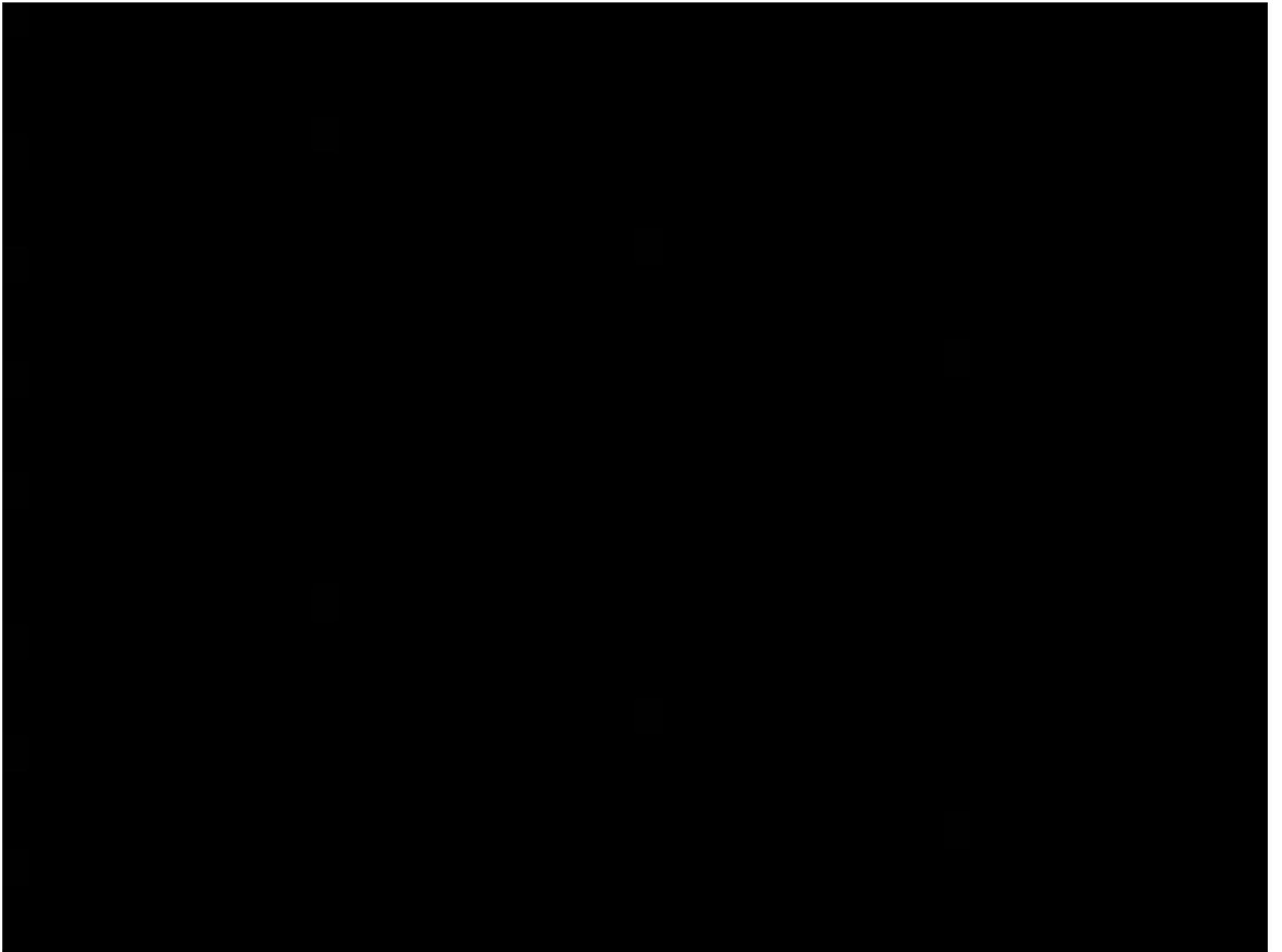
JPL – Curiosity



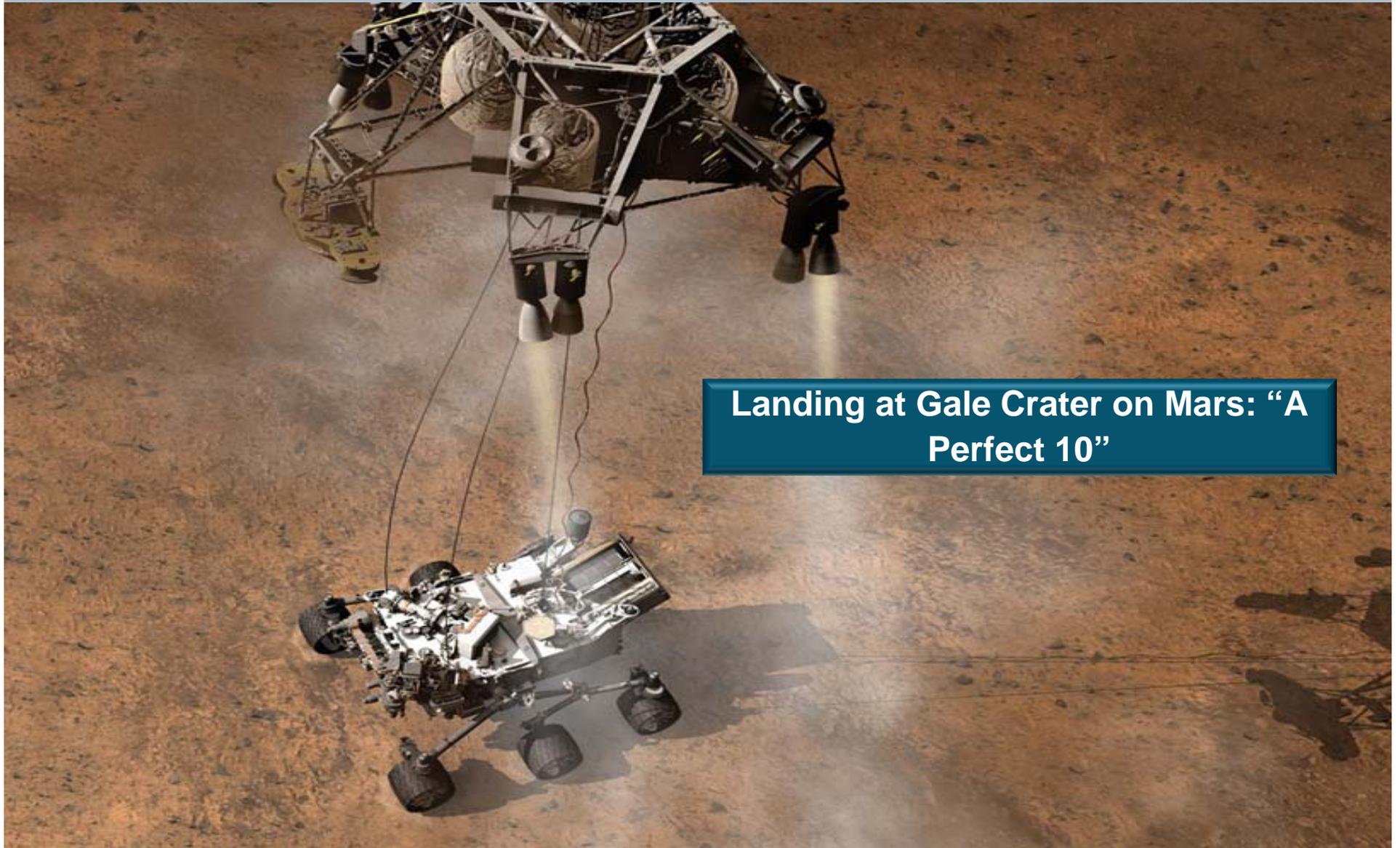


JPL – Curiosity

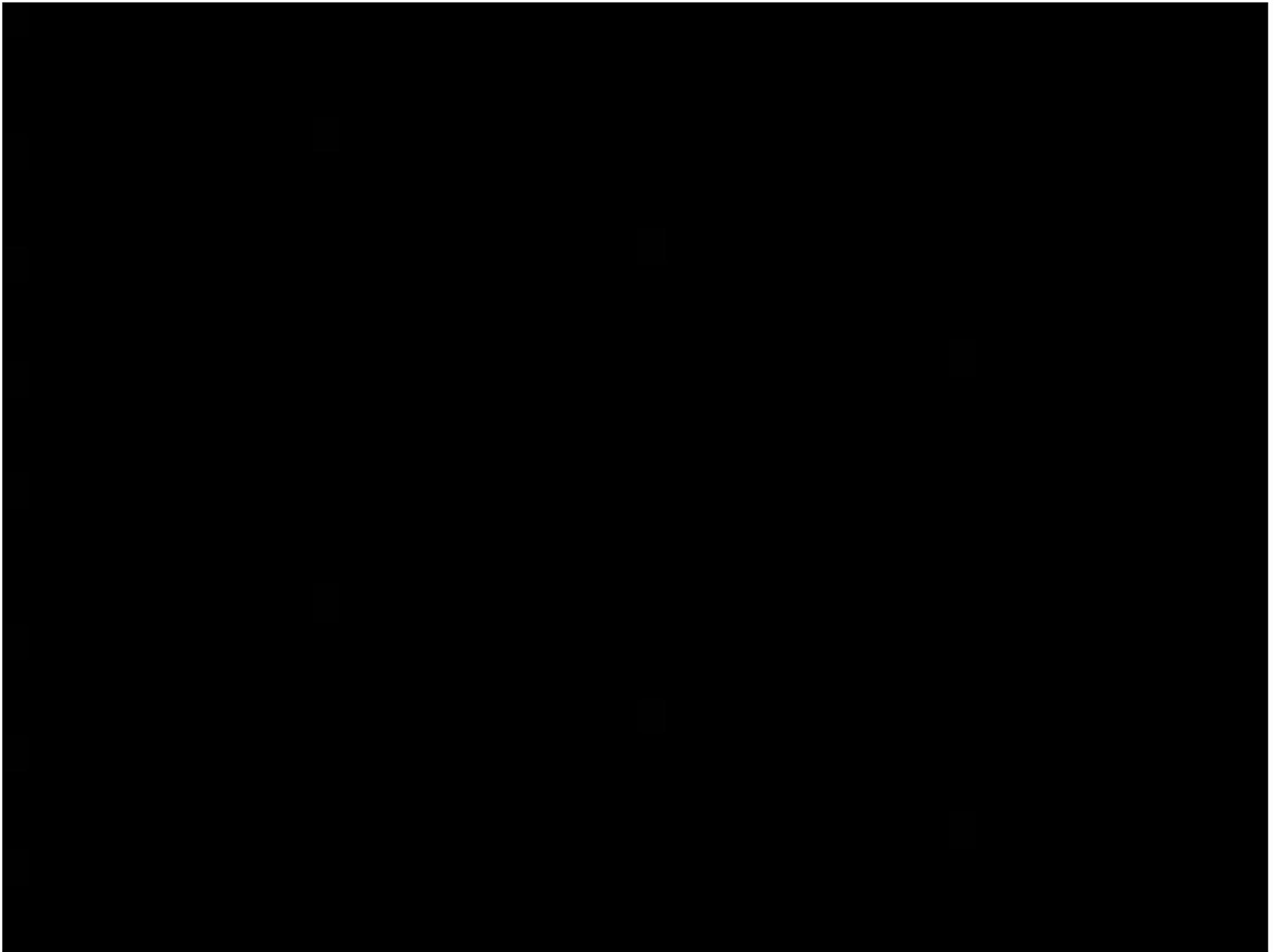




JPL – Curiosity



Landing at Gale Crater on Mars: “A Perfect 10”



A. NAA 2012 Collier Trophy, May 9th, 2013



The Collier Trophy, the “Greatest Award in Aviation,” has been the benchmark of aviation and aerospace achievement for over 100 years.

Awarded annually “....for the **greatest achievement in aeronautics or astronautics in America,**”

Past winners include the crews of Apollo 11 and Apollo 8, the Mercury 7, Scott Crossfield, Elmer Sperry and Howard Hughes.

B. JSF F-35 International Coalition



- International Coalition
- Family of Three 5FG Fighters
- Supersonic, stealth
- 30+ IPT's
- 3,000 plus aircraft
- 10 partner countries
- Design team:
 - 9 countries, 140+ sites
- Production Infrastructure:
 - Four pre-assembly sites
 - Two+ final assembly sits

Transforming Industries & Enterprises



B. Lockheed Martin-led JSF Global Coalition: - Transforming the Aerospace Industry

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Challenge:

- Global Coalition
- Scalability
- ITAR compliant
- Proven Experience
- COTS Functionality

Current Enterprise:

- 140 sites
- 6,500 users
- 112 workflows
- 70,000 ITAR events/wk

Future Enterprise:

- 600 suppliers
- 20,000 users
- 100-year lifecycle
- ~ 5,000 aircraft, 200+ per year

Largest secure and synchronized global A&D virtual enterprise

C. Russian Space Center IDE



Khrunichev Space Center:

In 6 Russian Federated Regions:

- Moscow City
- Moscow Region
- Vladimir Region
- Omsk Region
- Vorenezh Region
- Archangelsk Region

Transforming Industries & Enterprises

C. Russian Space Center:IDE

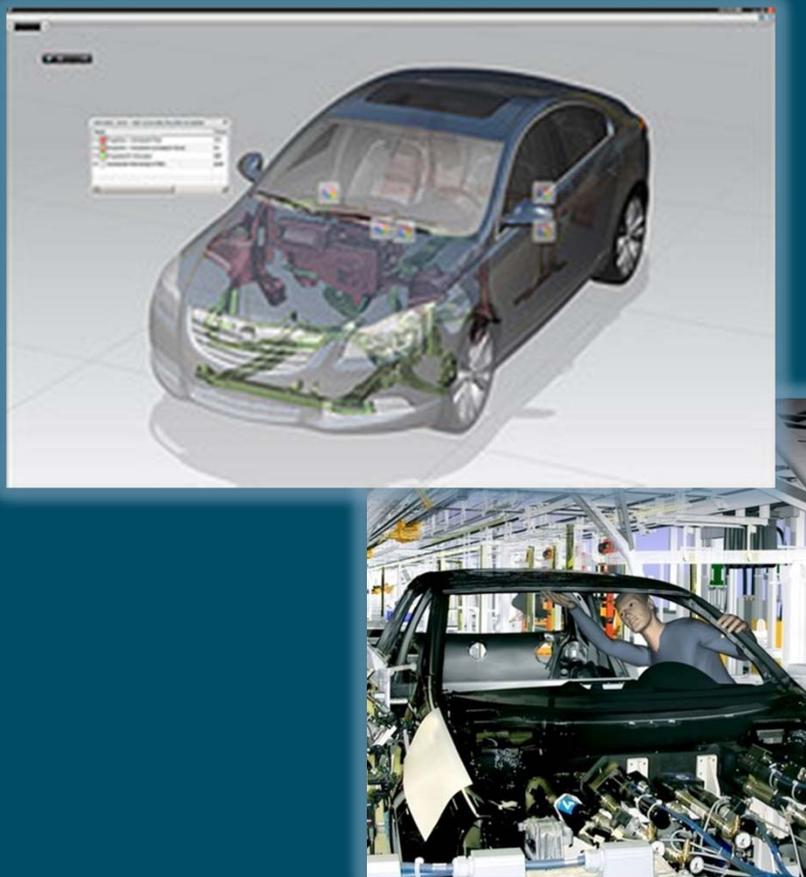


- **Roles:**
- Development, batch production & operations:
 - Light and heavy-lift rocket carriers,
 - Space probes for:
 - Earth exploration and communications
- **Center includes:**
 - Rocket production facility,
 - Salyut Design Bureau,
 - Space operations facility,
 - 9 divisions



Transforming Industries & Enterprises

D. Automotive OEM Global IDE



- 19 Engineering Center
- 48 Collaboration Rooms
- 15 Countries
- 9 time zone
- 30,000+ eng. work stations

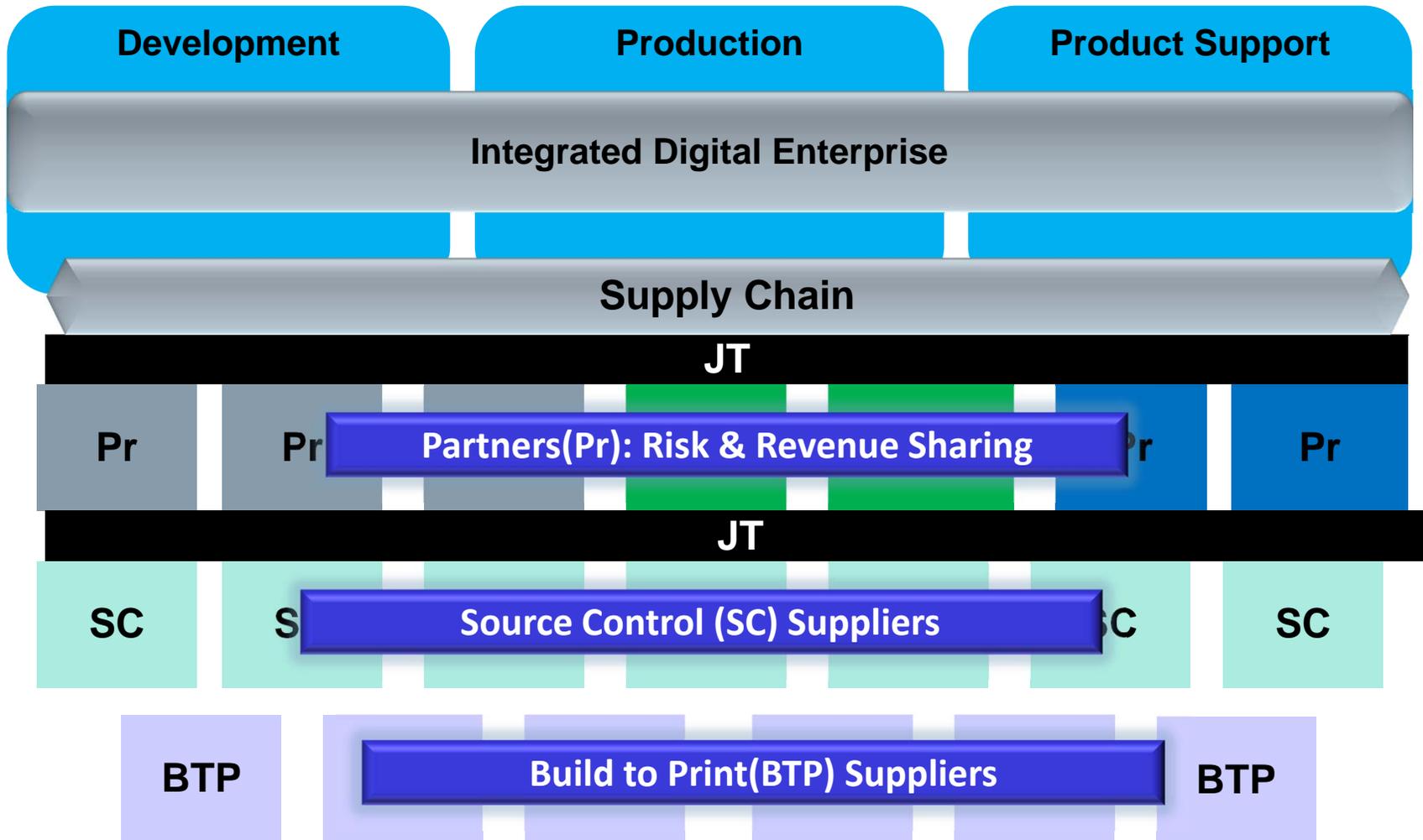
Future IDE's



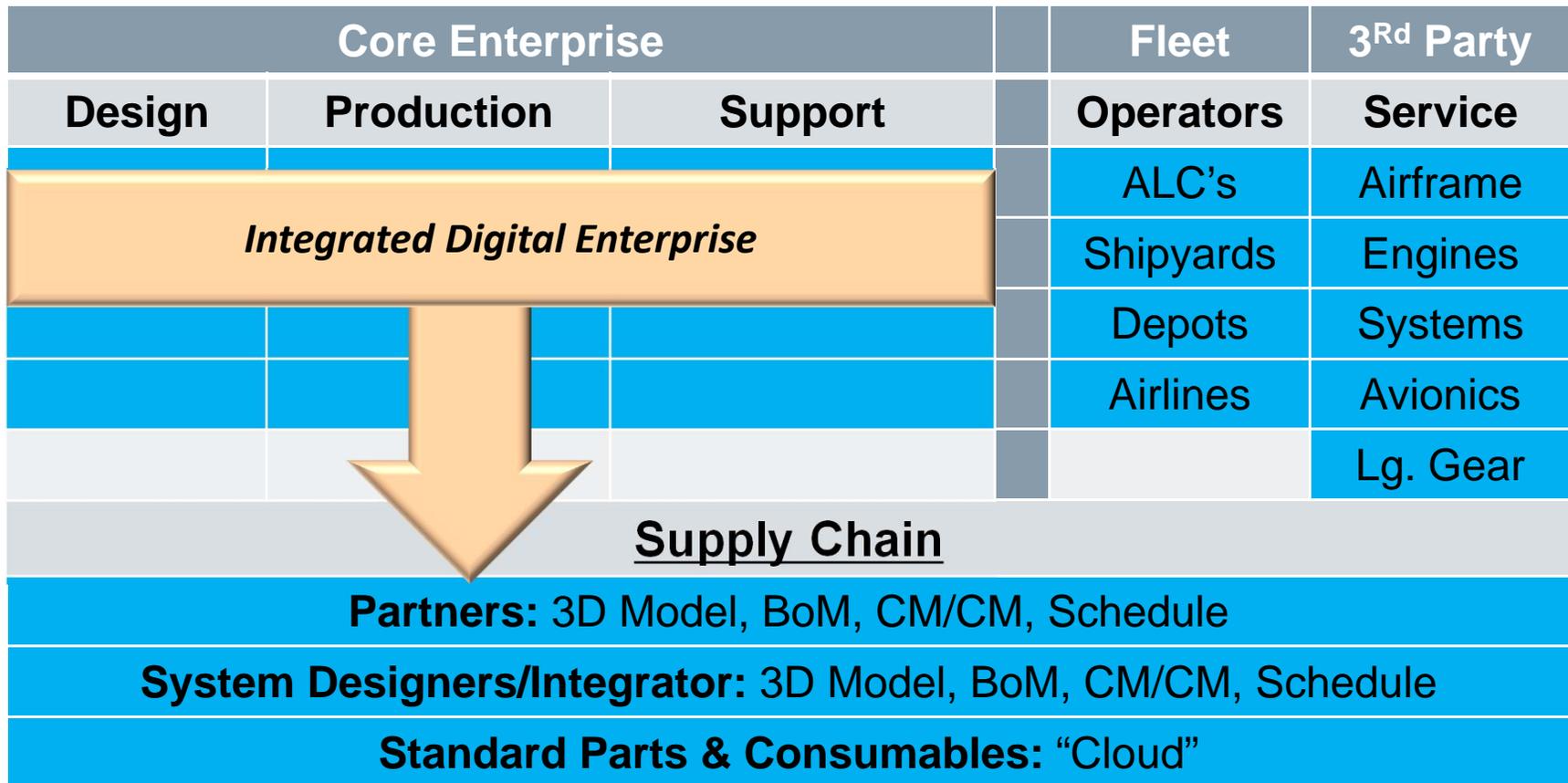
- Total Enterprise
- All operating domains
- Partners(Pr): Risk & Revenue Sharing
- Source Control (SC) Suppliers
- Build to Print(BTP) Suppliers
- Standards & Consumables
- Link by ISO Std: JT & Cloud
- Link with service enterprises
- Knowledge Retention & Re-use
- Systems Eng/Req Mgt/CM-CM

**Transforming Industries & Enterprises
New Paradigm for the 21st Century**

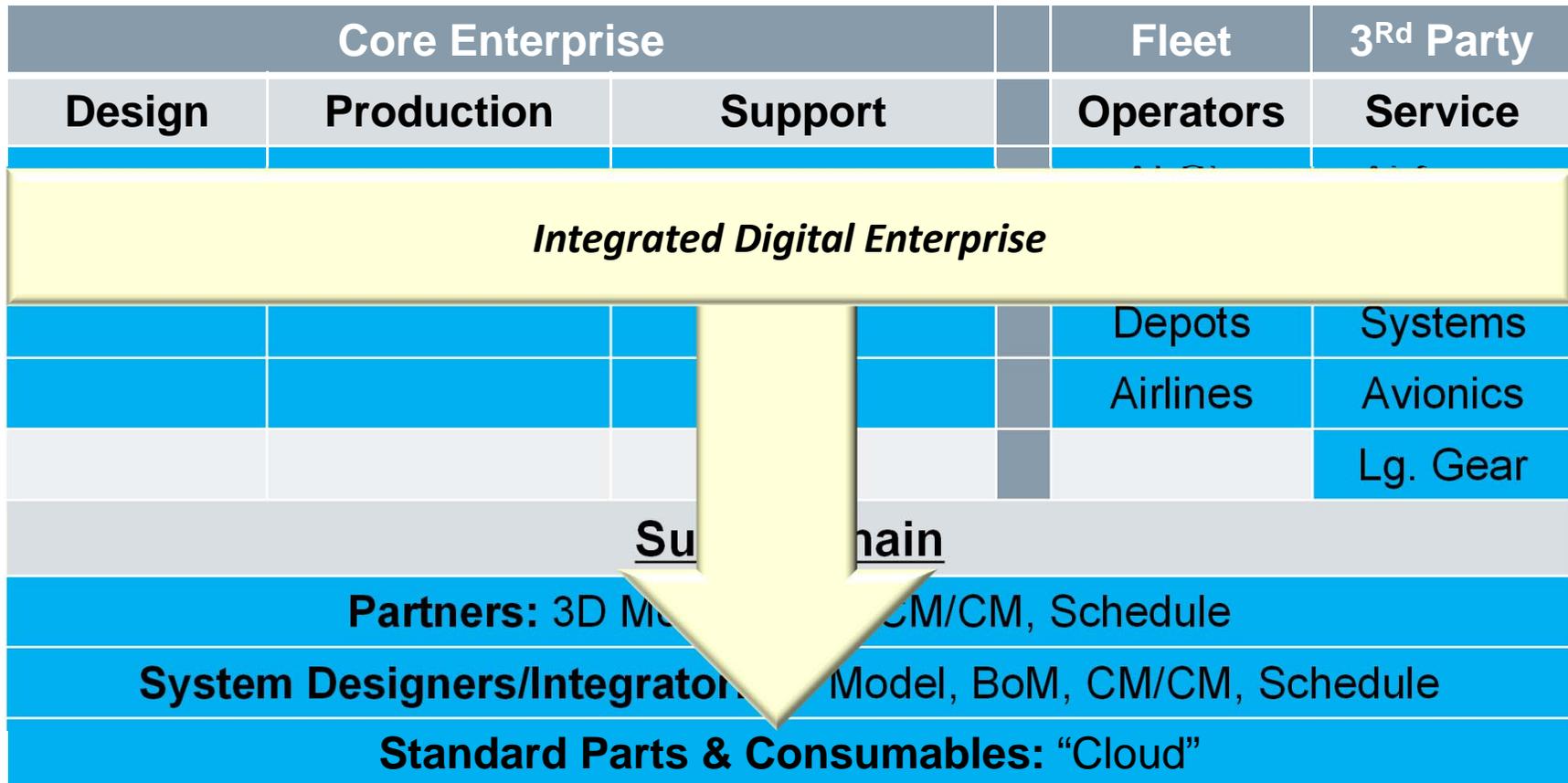
Aerospace Integrated Enterprise



Future Aerospace Enterprise



Future Aerospace Enterprise



Potential Value of NG IDE for Aerospace

w/o Supply Chain					w/ Supply Chain			
Op	%	Imp%	Impact		Op	%	Imp%	Impact
Dev	4%	10	0.4		Dev	4	10	0.4
Prod	4%	10	0.4		Prod	16	10	1.6
PS(int)	12%	10	1.2		PS(int)	40	10	4.0
PS(ex)	12%	10	1.2		PS(ex)	40	10	4.0
Total Impact: points imp't			3.2		Total Impact: points imp't			10.0
Difference: More than 3.0X Improvement in Total Productivity								

Summary: Aerospace Integrated Digital Enterprise



- Total Enterprise Productivity
- Lowest Total Ownership Cost
- Secure Collaboration: ITAR
- Systems Eng/Req Mgt/CM-CM
- Smarter Decisions
- Better Products
- LOTAR
- Future Platforms: More Cost Competitive



