



Turning Complexity into Competitive Advantage

Lockheed Martin Space
Emma Lysek
Systems Engineering Manager

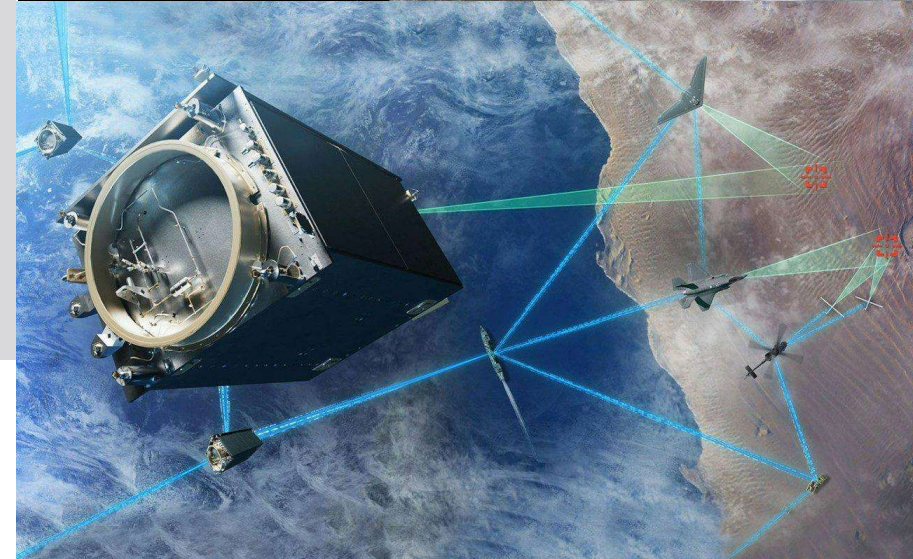
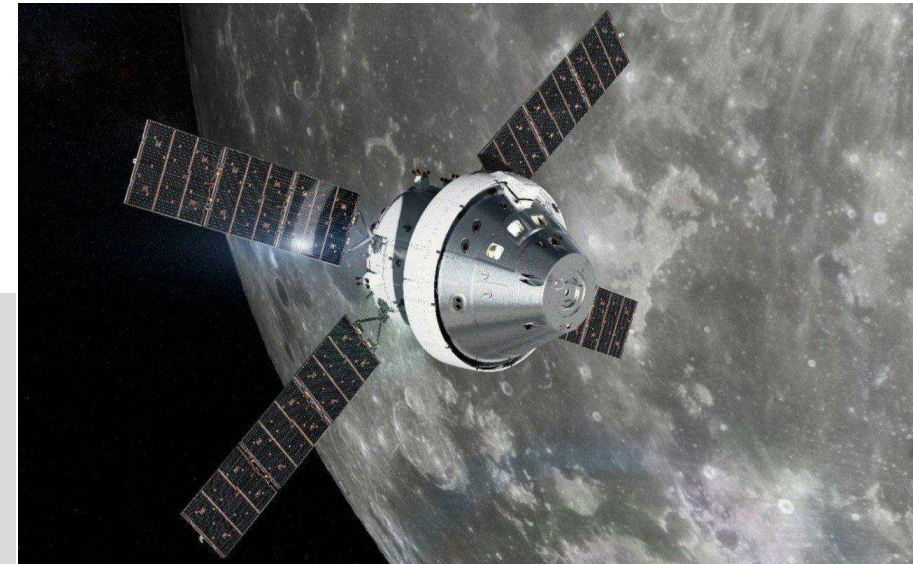


Introduction



Emma Lysek

- Lockheed Martin Space
- Background:
 - Software Engineering
 - Systems Engineering
- *Systems Engineering Fundamentals and Acceleration Manager*
 - Product Line Engineering (PLE) efforts



Agenda

- Understanding “The Problem”
- Understanding “The Solution”
 - Why Product Line Engineering (PLE)?
 - Why Pure Variants?
- PLE Strategy at Lockheed Martin Space
- PLE Challenges at Lockheed Martin Space
- Turning Complexity into Competitive Advantage



The Problem

The Solution

PLE Strategy

Challenges

Competitive
Advantage

Understanding “The Problem”

Lockheed Martin Businesses

Our corporation, headquartered in Bethesda, Maryland, is organized around our core business areas specializing in defense tech.



Aeronautics, with approximately \$30.3 billion in 2025 sales which includes tactical aircraft, airlift, sustainment and aeronautical research and development lines of business.



Missiles and Fire Control, with approximately \$14.4 billion in 2025 sales, which includes innovative and competitive integrated air and missile defense, strike, precision fires, air superiority and close combat weapon systems.



Rotary and Mission Systems, with approximately \$17.3 billion in 2025 sales, which includes Sikorsky helicopters, maritime systems, sensors, radar systems, command and control, combat simulation and training, undersea systems and full-spectrum cyber capabilities.



Space, with approximately \$13 billion in 2025 sales, which includes development of national security, civil, commercial and weather spacecraft, strategic and missile defense solutions and hypersonics missions.

“The Problem” - Current State

Large enterprise, Business Areas

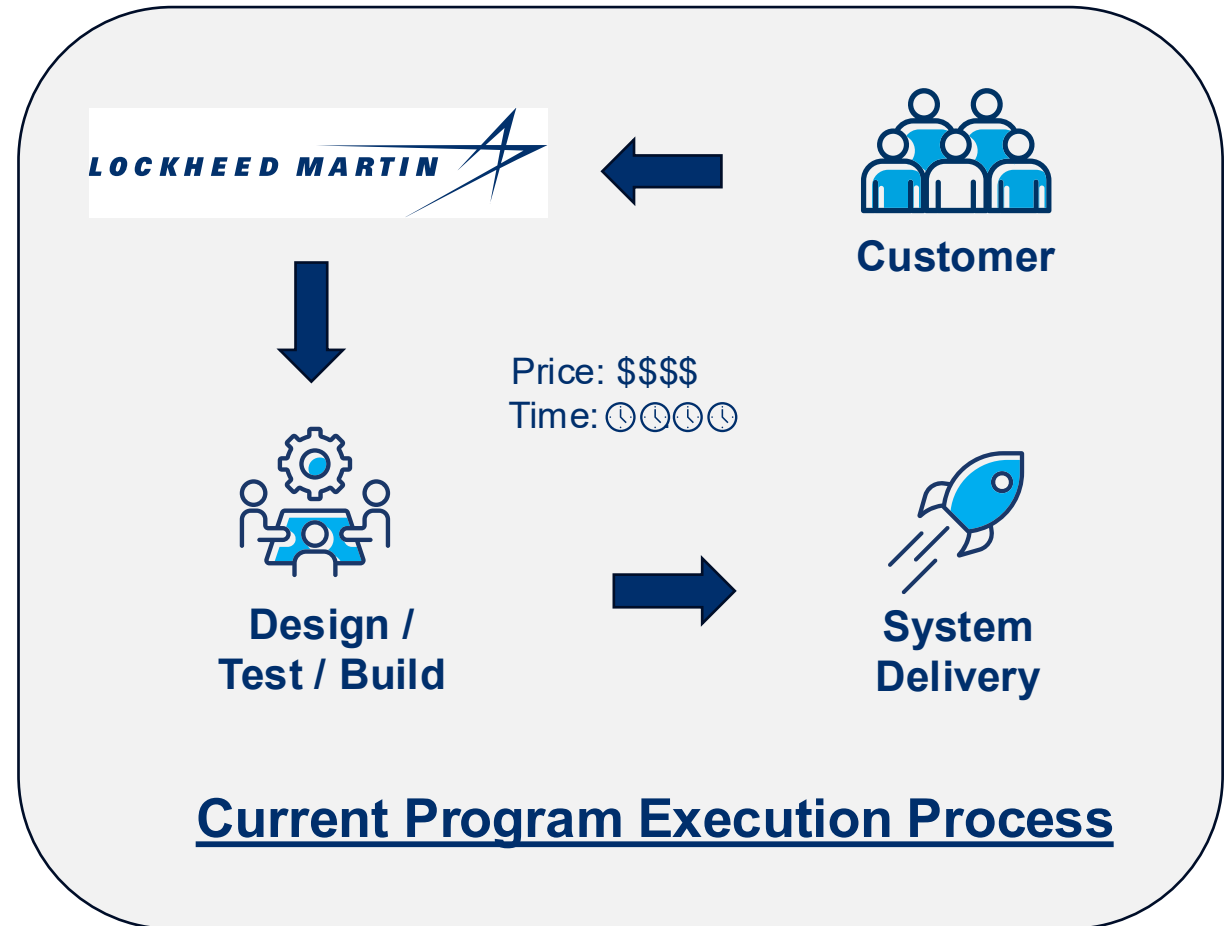
- Many programs within a Business Area

Current Approach

- Program centric
- Customer centric
- “Clone and own”

Customer Needs

- Increased volume
- Decreased cost
- Faster delivery
- Custom, made-to-order solutions



How do we change our approach to more effectively meet customer needs?

The Problem

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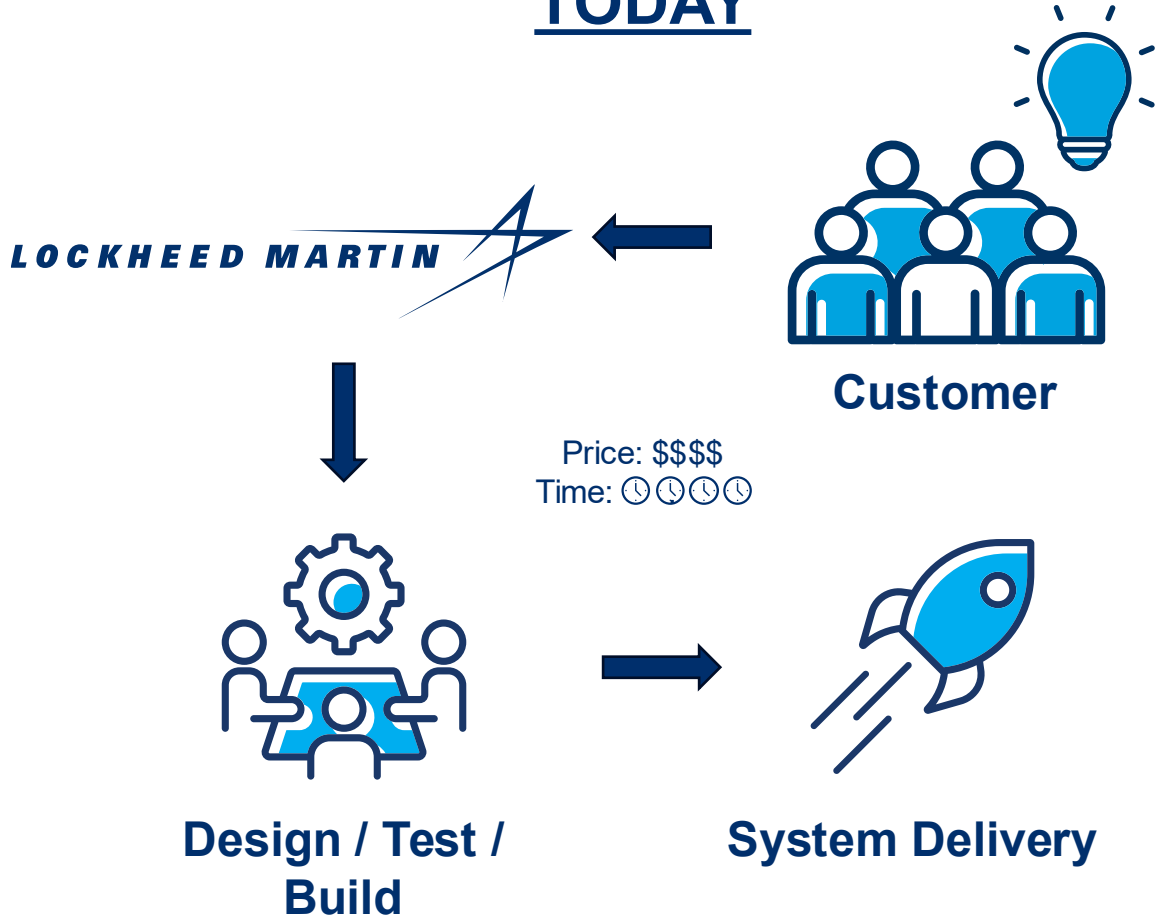
Competitive
Advantage

Understanding “The Solution”

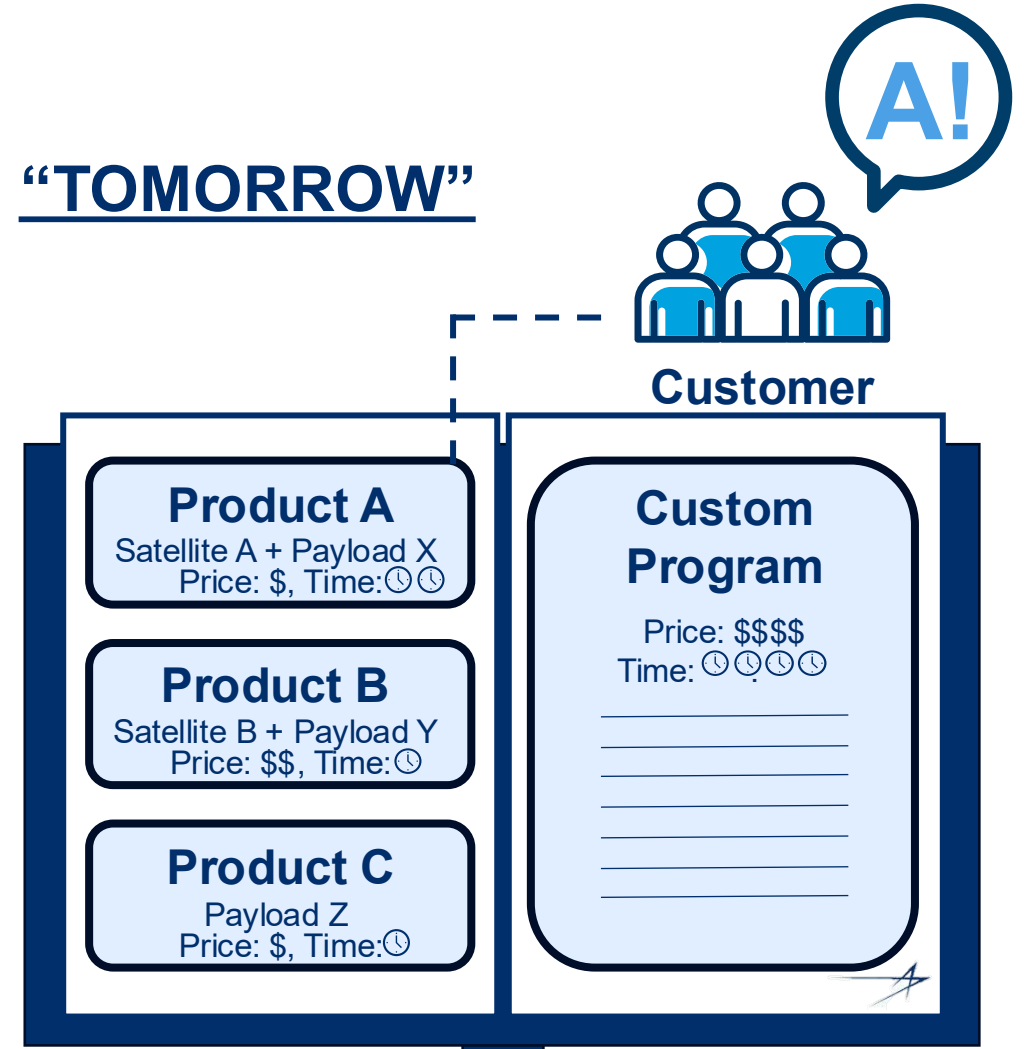
Why Product Line Engineering?

Product Line Engineering Vision

TODAY

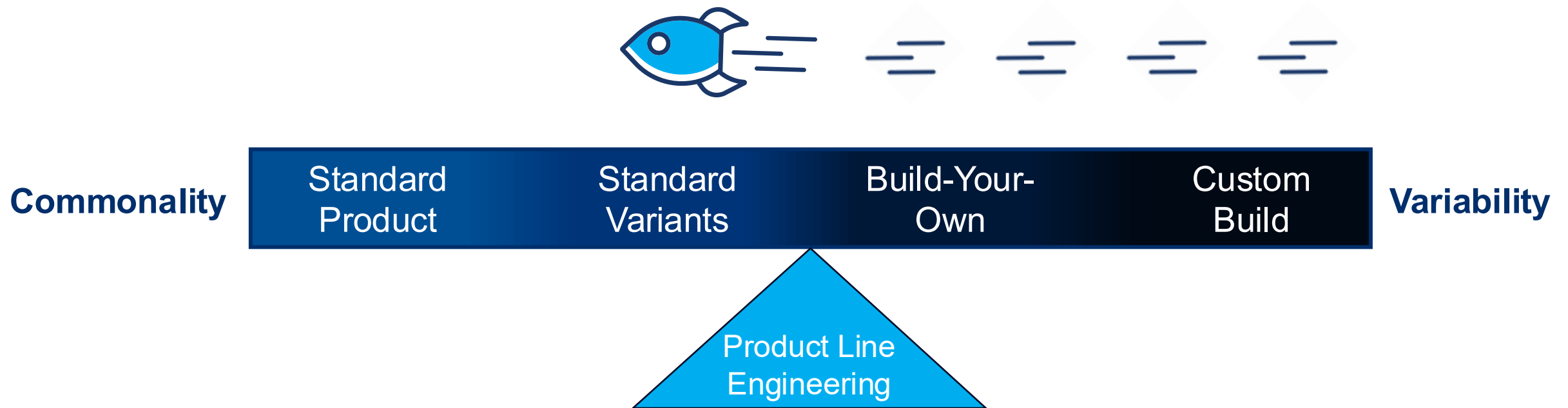


"TOMORROW"



PLE enables Lockheed Martin to meet mission needs faster and cheaper

PLE Spectrum



Product Line Engineering involves striking the balance between variability and commonality

The Problem

The Solution

PLE Strategy

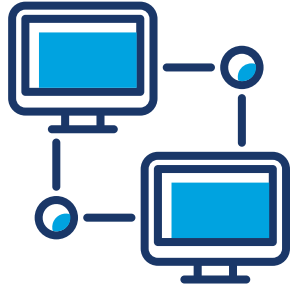
Challenges

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Understanding “The Solution”

Why Pure Variants?

Why Pure Variants?



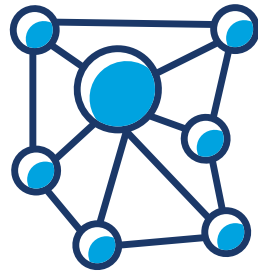
Highest Potential for Reuse

(Diverse connectors)



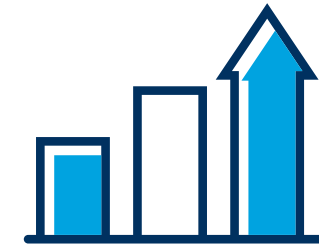
Accelerate Development Timeline

(streamlines design reuse)



Traceability Across Domains

(single source of truth)



Increase Technical Confidence

(lower integration risk)

Pure Variants is Lockheed Martin's enterprise-wide variation management tool.

The Problem

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Product Line Engineering Strategy at Lockheed Martin Space

PLE Strategy

① Strategic Vision

- Establish top-down support
- Establish policy alignment (MBSE, Concurrent Engineering, Digital Threads, etc.)

② Methodology Setup

- Establish:
 - Processes
 - Governance
 - Organization functions (R&Rs)

③ Infrastructure Setup

- Establish:
 - Tools
 - Networks
 - Capabilities

④ Product Line Identification

- Perform domain analysis & identify market opportunities
- Define product line scope
- Define value proposition

⑤ “First Movers” / Pilot Implementation

- Prove value with representative use cases
- Drive towards a “mission focused” approach

⑥ Institutionalize & Scale

- Formalize governance
- Expand adoption
- Expand offerings

Lockheed Martin recommends a phased PLE Strategy that continuously evolves/adapts.

The Problem

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PLE Strategy

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Product Line Engineering Challenges at Lockheed Martin Space

PLE Challenges



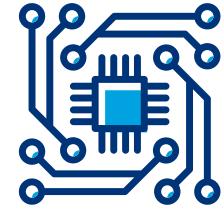
People

- Culture shift
- Organizational structure



Process

- Paradigm shift for business operations
 - e.g. capture, business dev
- Mission-focused engineering



Technology

- Infrastructure
 - e.g. unclassified, classified assets
- Scalability
- Tool complexity
- Data movement

Effective implementation of PLE requires reshaping almost all aspects of the company.

The Problem

The Solution

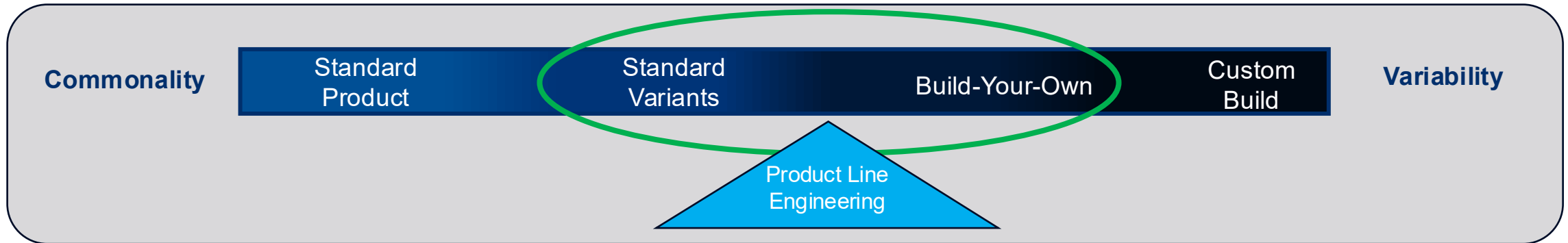
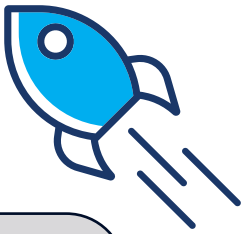
PLE Strategy

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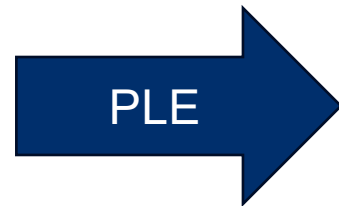
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The Complexity

- PLE complexity
 - Many different variants
 - Many different assets
 - Many different programs / BA
 - Many different customers / missions
 - Standards, Compliance
 - Rapid technology changes
- Customer needs complexity



Competitive Advantage

- PLE Strategy
 - Centralize & systemically capture knowledge / artifacts
 - Improve speed, cost, quality, adaptability, flexibility
- **Measurable PLE Savings**
 - Combat system: 53% cost avoidance for requirement changes
 - Radar program: 33% reduction in product labor cost
 - Satellite proposal: configuration time savings, weeks → hours

(cited from 2019 internal Lockheed Martin White Paper)

PLE empowers teams to deliver diverse, high-performance systems faster and with greater confidence.

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