Mission Critical AI

Achieving Mission Speed Through AI-Enabled Rigor

NORTHROP GRUMMAN

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2 November 2026

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Who Are We?



Jeremy Knupp

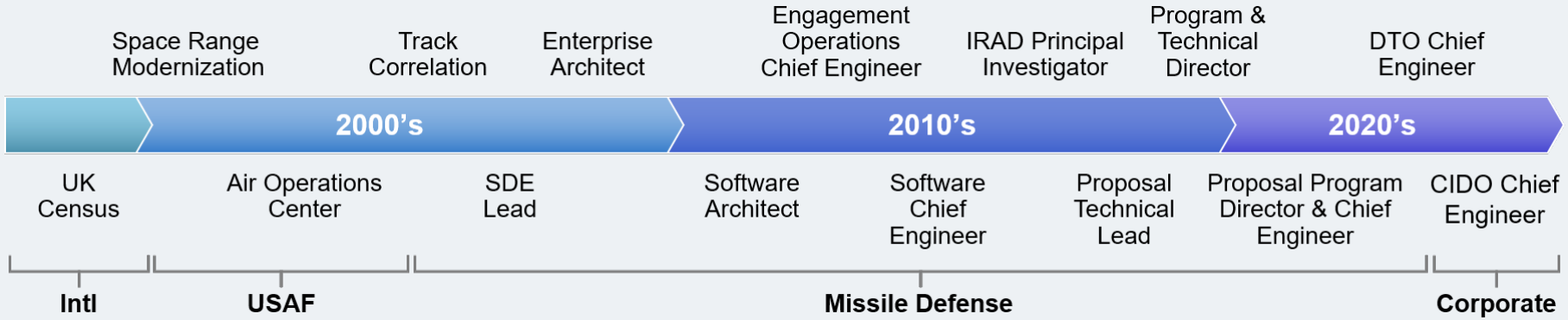
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Northrop Grumman Overview

https://www.northropgrumman.com/who-we-are/the-facts

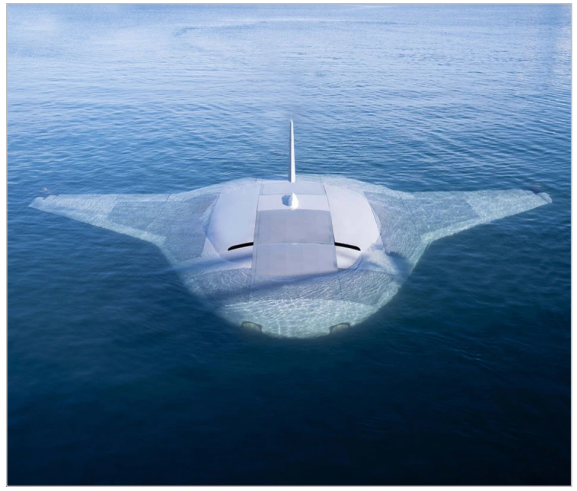


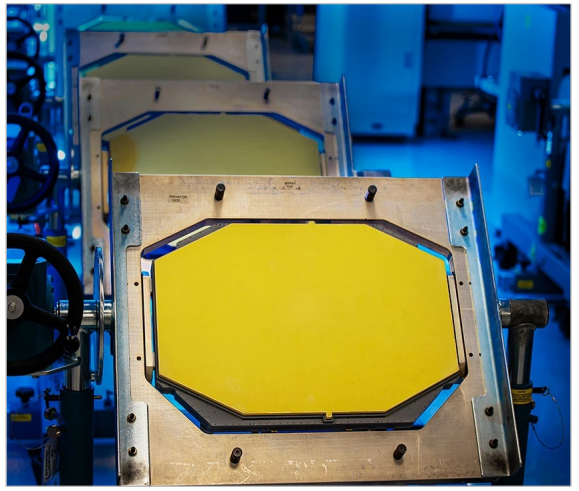


Northrop Grumman Jobs	Supplier Partners	Mission-Driven Engineers	US Manufacturing	R&D & Infrastructure	Total Impact
96K	**10K**	**43K+**	**30M sq ft**	**$13.5B**	**$116.8B**



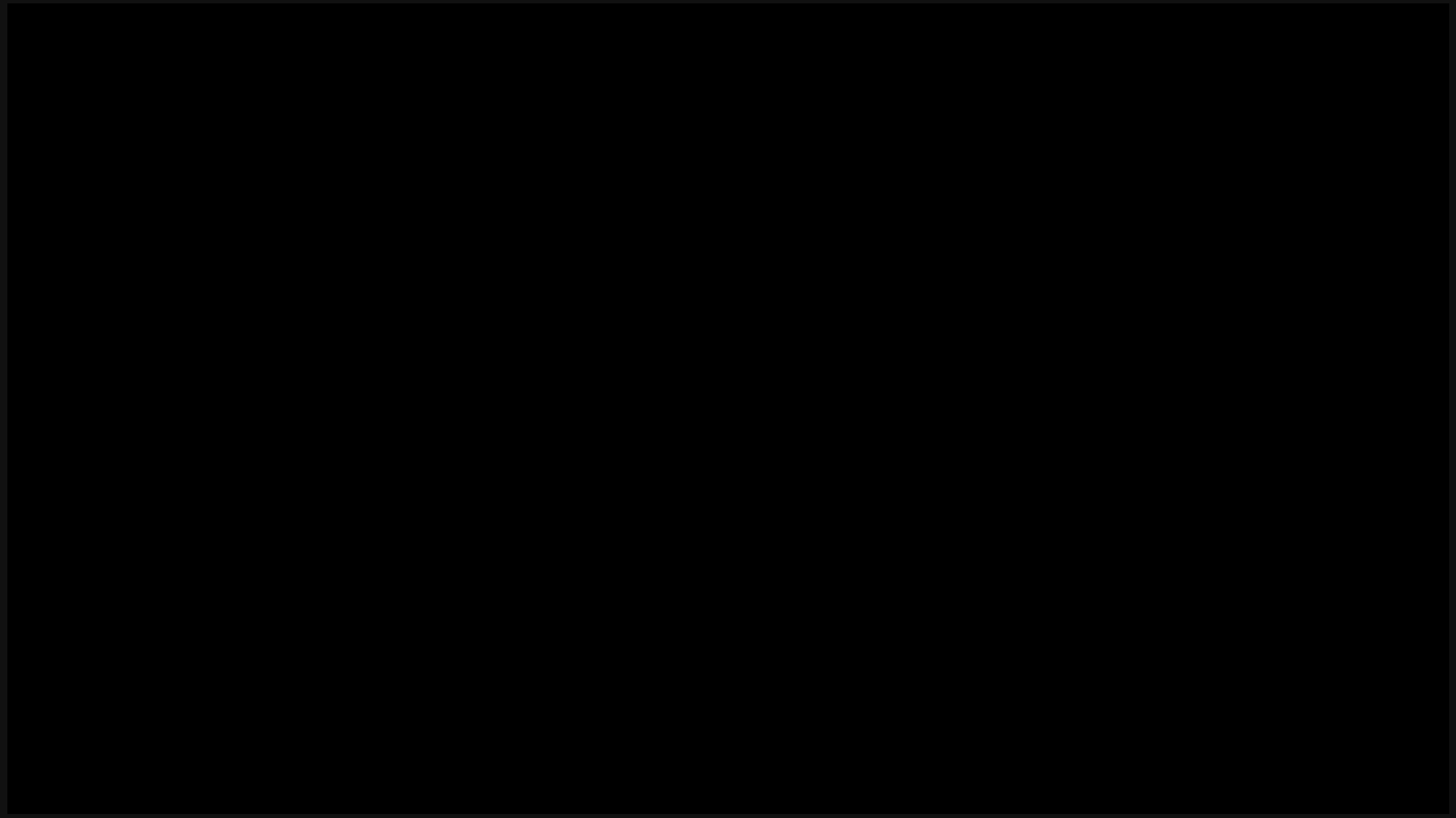






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Northrop Grumman AiON™ Automated Defense Solution



Rapidly Evolving Mission

Open Architecture
- Quickly add new or enhanced capabilities
- Rapid tech insertion

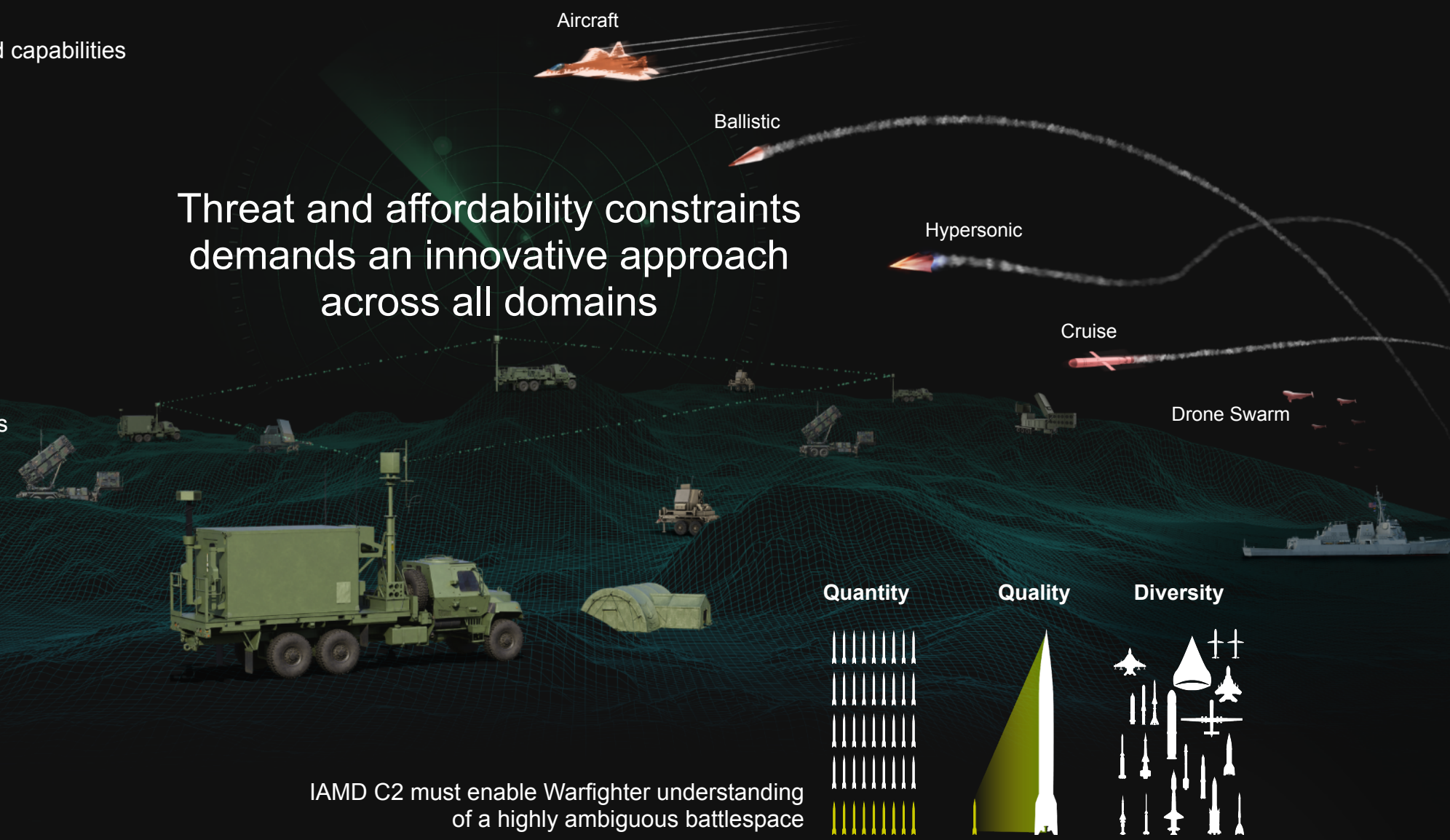
Mobility
- Rapid deployment
- Flexible configuration

Cost Effective
- Cost effective integration
- Weapon target pairing options
- Reduced lifecycle cost

Production Surge
- Active production lines
- Urgent surge ability

Battle Command
- Common at all echelons
- Fratricide avoidance

Threat and affordability constraints demands an innovative approach across all domains



IAMD C2 must enable Warfighter understanding of a highly ambiguous battlespace

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Rapid Innovation – Speed at Mission Quality

Mission Capability

- Autonomous Counter Unmanned Aerial Systems (CUAS) Defense
- FireAnt - a scalable platform for distributed CUAS payloads
- AiON – mission-critical C2 / **Any Sensor** → **Any Effector** integration

Robotic CUAS Solution – Powered by AiON™

Live Mission Execution Scenario

1. ANTSNet deploys sUGVs to forward passive ISR locations
2. AiON integrates acoustic & RF sensor feeds
3. Drone enters AOR and is detected, AiON forms track
4. Drone enters NDZ, AiON automatically activates RF mitigation, drone crashes or returns home
5. AiON reports last known position in AAR, operator deploys FireAnt to survey for Battle Damage Assessment



3x Squarehead Acoustic Sensors



NG DRAKE EW System



Commercial hardware. Misson-grade integration. Strategic advantage.

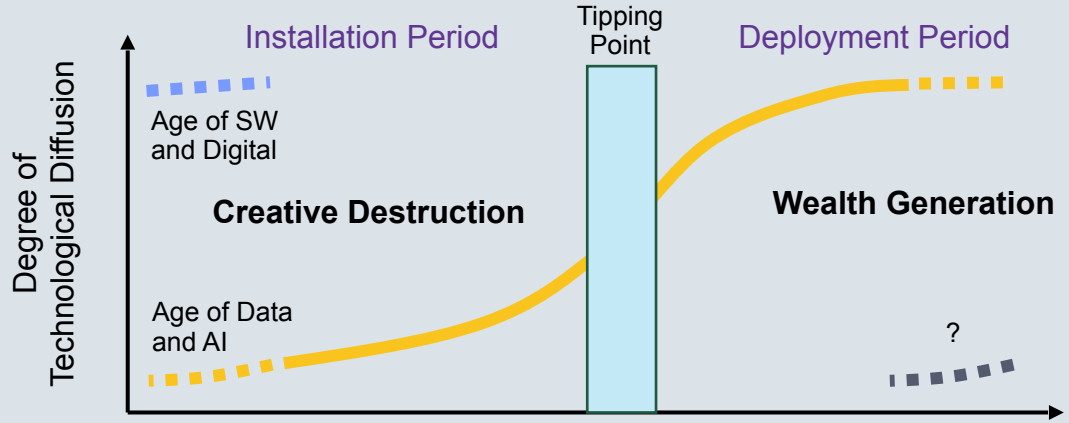
Incrementally Optimizing Cost of Production

Global Economic Transformations

	Installation Period	Tipping Point	Deployment Period
		1793-1801	
Industrial Revolution	Canal Mania	▲	Great British Leap
		1848-1850	
Age of Steam and Railways	Rail Mania	▲	Victorian Boom
		1890-1895	
Age of Steel and Heavy Engineering	Global Market Industrial Build-up	▲	Progressive Era
		1929-1943	
Age of Oil and Mass Production	Roaring Twenties	▲	Post War Boom
		2000-2010	
Age of Software and Digital	Dotcom / Internet Mania	▲	Cloud, Big Data, Social Media
		2024-…	
Age of Data and AI	Generative AI / Agentic	▲	…

Adapted from Perez and Kersten

Shape of Transformation



Adapted from Perez and Kersten

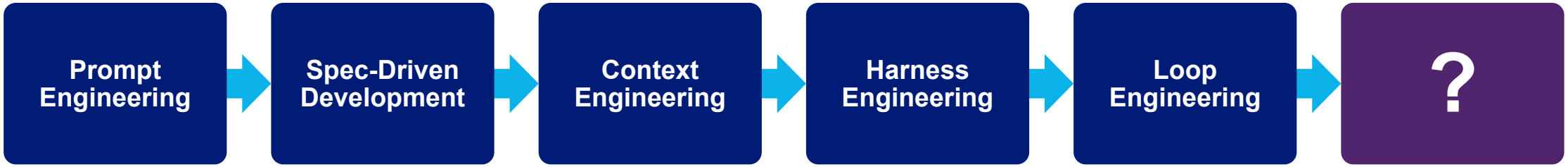
Agentic Engineering → Age of Data and AI	DevOps → Age of SW and Digital
Product Design and Development	**Product Delivery (Build, Test, Deploy)**
Create new products and services that solve customer problems using hypothesis-driven delivery, modern UX, design thinking	Enable fast flow from development to production and reliable releases by standardizing work, reducing variability, and batch sizes
Feature design and implementation may require work that has never been done before	Integration, test, and deployment must be performed quickly and continuously
Estimates are highly uncertain	Cycle time should be well-known and predictable
Outcomes are highly variable	Outcomes should have low variability
Change Committed into Version Control	

Adapted from Forsgren, Humble, Kim, Willis

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Riding the Agentic AI Improvement Waves



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Nondeterminism – The Great Promise / The Great Problem

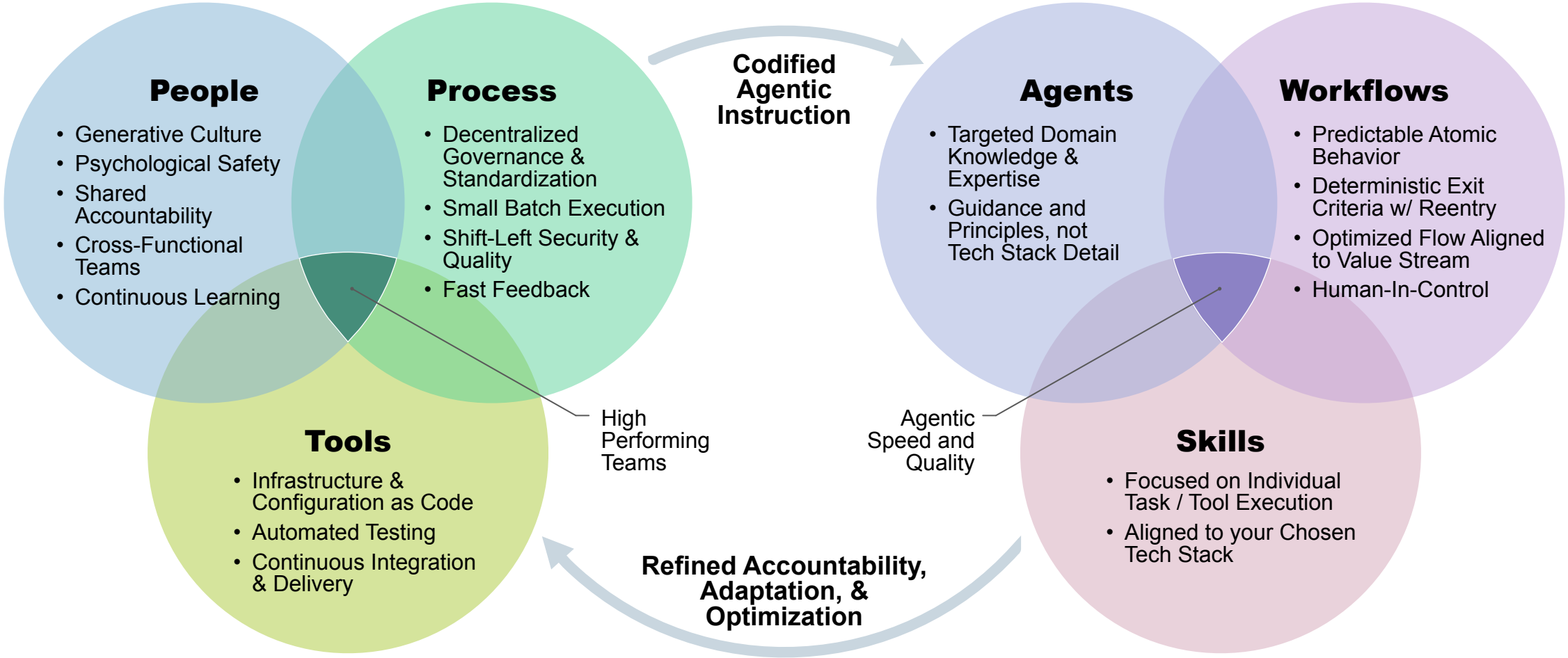
The Anchorman Challenge:

They've done studies you know,

60% of the time – it works every time.

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Core Foundations Tailored for Agentic Execution



Realized Through: Leadership, Documentation, Training, & Experience

Realized Through: Value Stream Measurement, CM'ed Definitions, Behavioral Validation, & Dependency Management

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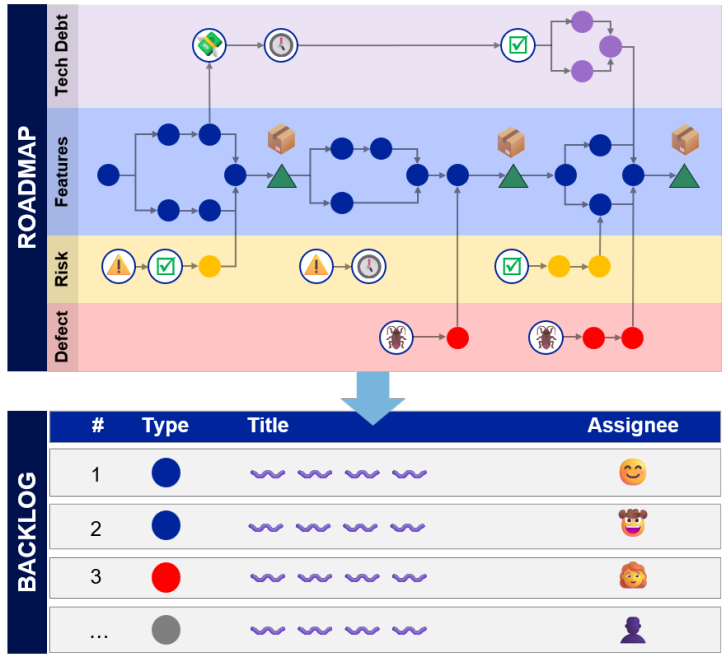
AI Accelerating Full System Lifecycle Execution

Strategic Vision “North Star”



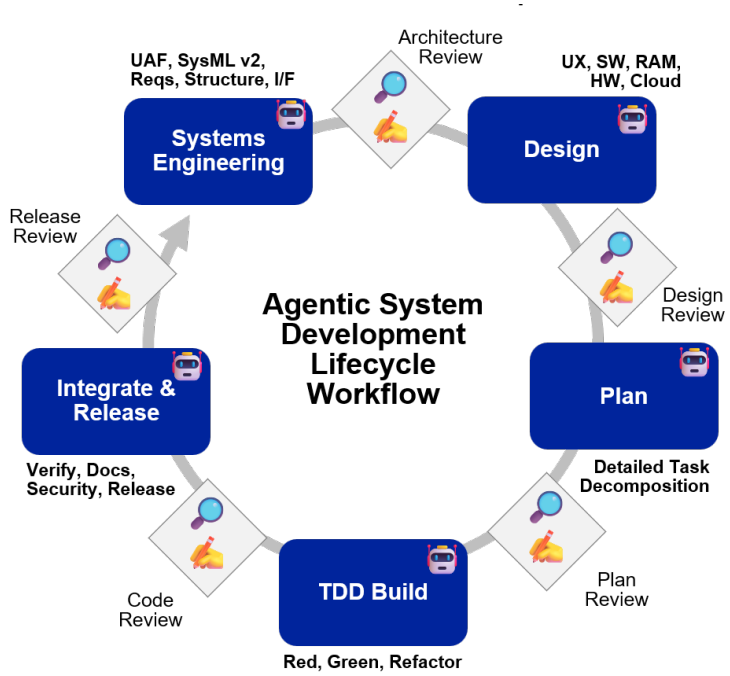
Unified Architecture Framework (UAF)
Strategic & Operational Views

Executable Strategy “Outer Loop”



Discrete Integrated Planning
Dynamic Issue Tracking

Iterative Execution “Inner Loop”

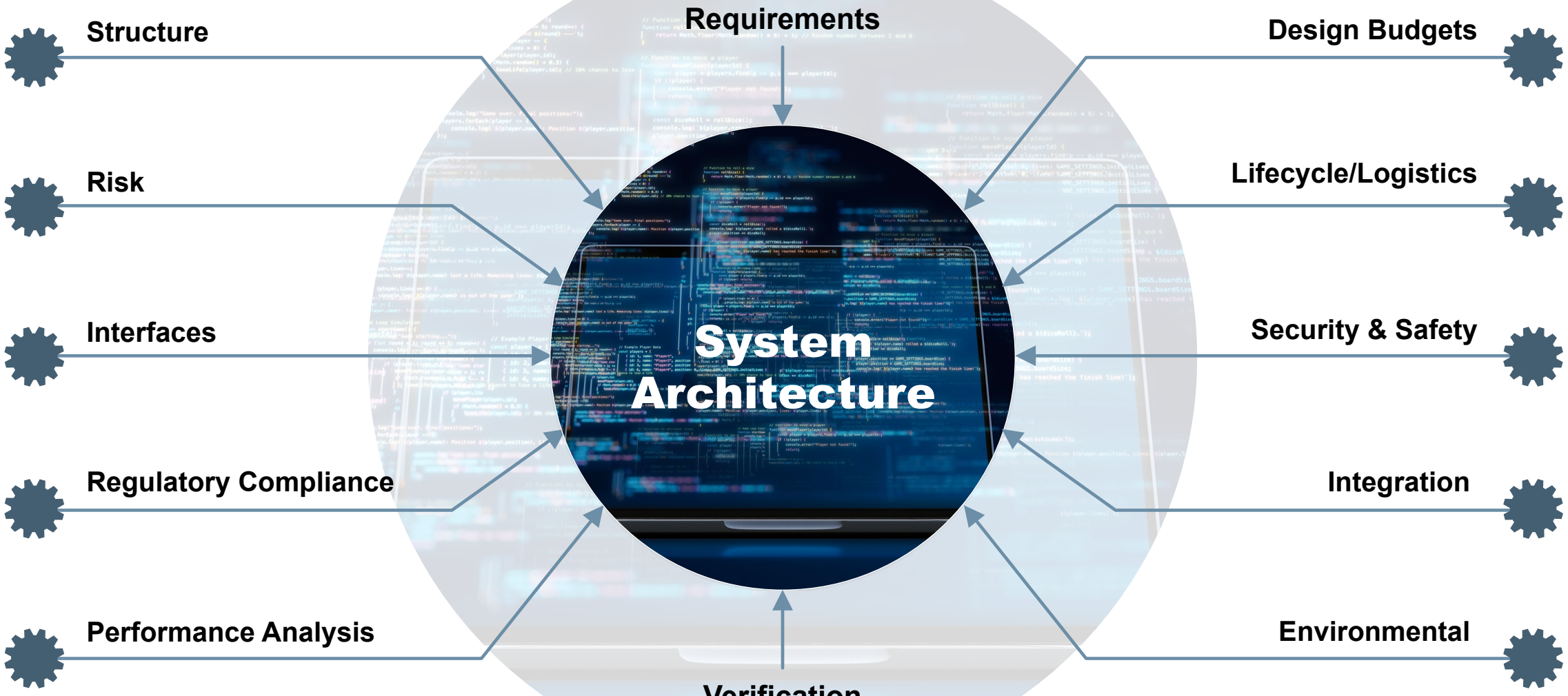


System Modelling Language (SysML) v2
Resource & Design Views
Fully Traceable Requirements / Implementation / Test

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Agentic Model-Based System Engineering



SysML v2 Standard → Architecture-as-Code → Agentic Engineering

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Cross-Domain Deterministic Agentic Workflows

Anatomy of a Workflow

1. Codify the value stream



- Decompose complexity
- Simplify / Linearize
- Eliminate where feasible

2. Define agent execution steps

Title
Domain Agent
Actions
Exit Criteria Loops
Transitions

3. Define human-in-control gates

Title
Evaluation
Transitions

Enterprise AI

	Agentic Execution			Human-In-Control
Phase 1 Architecture & System Engineering	Needs Analysis	Logical Architecture	Physical Architecture and Trade Analysis	Architecture Gate
Phase 2 Multi-Domain and Specialty Design	UX Design	SW Design	HW / Cloud Design	RAM Analysis	Design Gate
Phase 3 Planning	Current State Analysis	Target State Analysis	Task Definition & Phasing	Plan Gate
Phase 4 Test Driven Development	Define Acceptance Test	Build Minimal Implementation	Quality Refactor	Code Gate
Phase 5 Int / Test, Documentation, & Release	Architecture Conformance	Cyber Analysis	Verification Analysis	Docs	Release Gate

Mission AI

	Agentic Execution			Human-In-Control
Situational Awareness	Sensor Mgmt	Defended Area Mgmt	Threat Assessment	Alert Gate
Mission Planning	Resource Utilization	Weapon Target Pairing	Integrated Defense Plan	Asset Commit Gate
Engagement Management	Resource Tasking	Consequence Management	Battlespace Assessment	Effect Validation Gate

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Our Requests to this Community



Embrace Architecture Driven AI Engineering Rigor
- System development & operations truths remain valid
- Agentic control & human accountability

Agentic Version Control & Dependency Management
- We need a standardized AI package manager

Standardize Agentic Workflows
- Develop and mature deterministic agentic workflow definition standards

Continue to Innovate & Share
- Open-Source
- Community Knowledge Sharing
- Let's talk - tell us what works for you

What do you do when…

Rigor ~~Code~~ is free?

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