Mission Systems ASE Architecture Review Board

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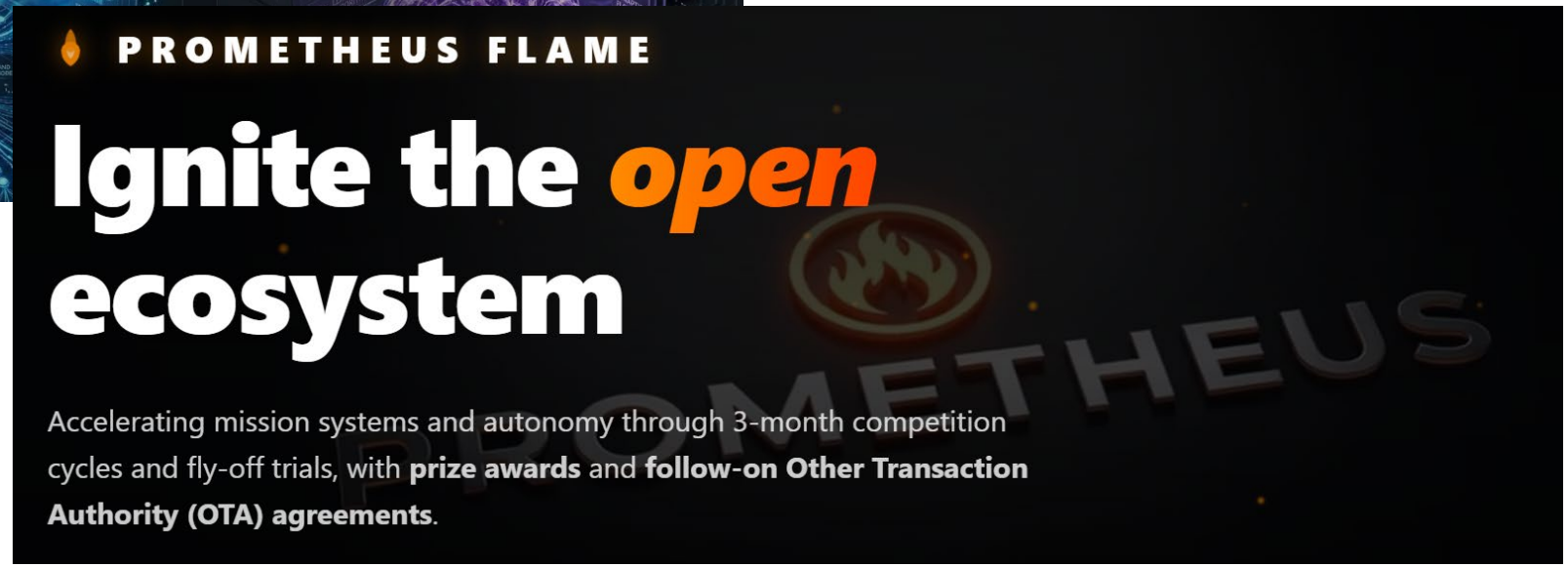
Agenda

- Mission Systems ASE Group Updates
  - Public Release
  - Instantiations
  - DLOS
- Architecture Updates
  - Platform
  - Autonomy
  - UCI
  - Weapons
  - Terrestrial
- Nightwing Phase 3 Priorities
- USG Stakeholder Feedback on Priorities – What's important to you?

Opening Remarks

Public Releasability for Broad Reach



Foster a vibrant ecosystem around open-source, standards-compliant autonomy and mission systems product lines.

Adopting Program Support

F&AA Targeted Support

- F-16 IVIEWS EW Update – Portfolio Management Board (PMB)
  - SOSA aligned chassis, AMS GRA capability
- F-22 Compute Opportunity Planning
- F-15 HST Support
- Teaming w/ F&AA ICTs to adopt open and agile mission systems

MAF Mission Systems Agility

Mobility Fleet Mission Systems Agility

- MAF NEXUS: Open Compute Opportunity
  - Fight Tonight Capability
  - Make it Right Opportunity
- AMS GRA Adopter
- Teaming w/ AMC, PEO Mobility, C3BM, and Big Safari on Nightwing Instantiate

Open Architecture Foothold on F-35

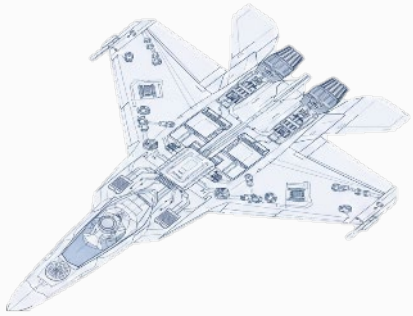
F-35 AMS GRA Exploration

- Initial planning with JPO and LM drives AMS GRA enclave on existing Integrated Core Processor (ICP)
- Demonstrates open compute on current F-35 hardware
- Teaming w/ JPO and LM on Nightwing Instantiate

Mission Systems Architectures

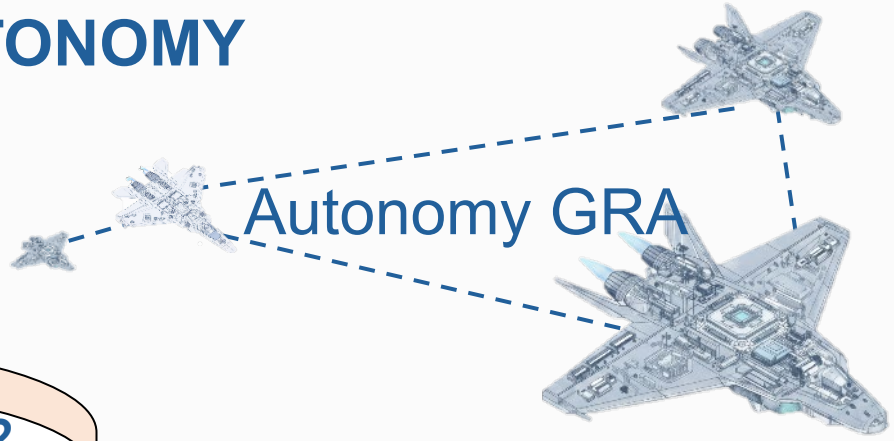
Open and modular avionics to deliver agile battlefield capabilities

1. PLATFORMS



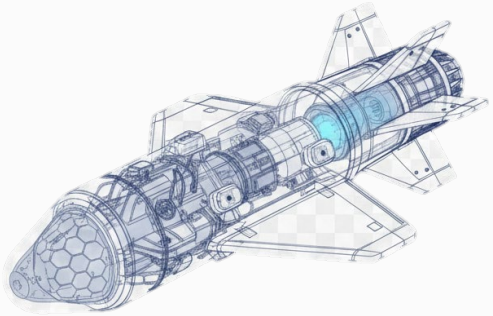
AMS GRA
OMS
UCI
SOSA

2. AUTONOMY



5. Data/Messaging/C2
UCI 3.0

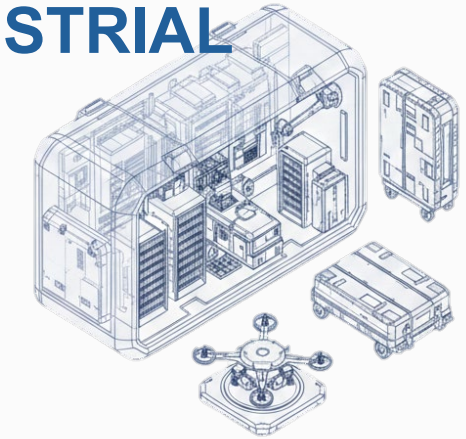
3. WEAPONS



WOSA
UAI

4. TERRESTRIAL

Terrestrial GRA



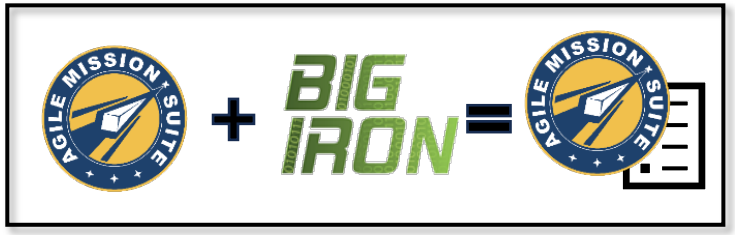
AMS – Agile Mission Systems
GRA – Government Reference Architecture
OMS – Open Mission Systems

UAI – Universal Armament Interface
UCI – Universal Command and Control Interface
WOSA – Weapon Opens System Architecture

Phase 2 Integration Objectives

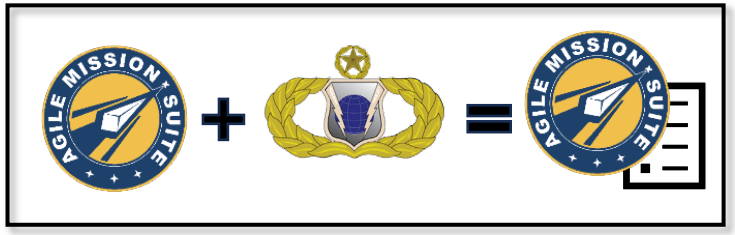
Finish Big Iron 4.0 Integration

- Remaining tech capital for integration into AMS GRA 2026.07+
- Full rationalization of legacy terminology (e.g., transport API, BI managers, BI host system)
- Will result in updated components in AMS 2026.07 SDK and adopters “transition guide



OMS Integration

- Focused on evaluating OMS architecture integration into AMS 2026.07+, SDK
- Rationalize OMS architecture components (e.g., platform services, subsystem services) into AMS GRA architecture components (e.g., minimum procurable units)
- Integration focused on evaluating intent, tech capital, adopter impact



Demo Usability

- Hackathon (sprint 7) to provide demo of architecture integration
  - Obj 1: Integrated service operating in a MASI
  - Obj 2: Machine readable config files – human readable documentation
  - Obj 3: OMS subsystem - - AMS mission system/assembly
    - Big Iron Phase 1 integration tech debt demo (manager functionality, API/schema, etc.)
- OMS and Big Iron adopter transition classroom for Oasis

OV-1: Universal Command and Control Interface (UCI)

UCI Messages

- Service Management (Multiple Classes)
- Supporting Capabilities
- Control
- Tasks
- Mission Plans
- Strike Mission Concepts
- Communications
- Track Management
- Operational Environment
- Products
- Queries / Requests
- Other

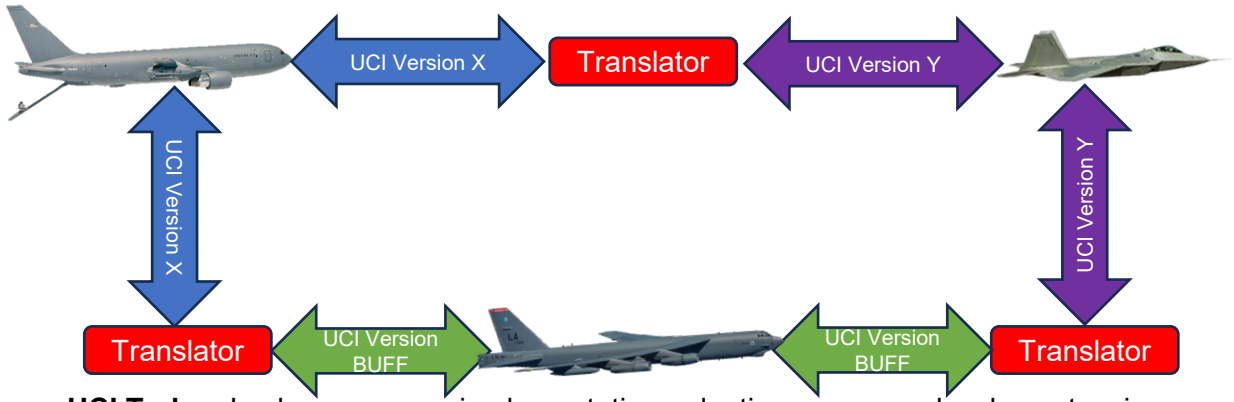
Adopting Platforms: DAF FoS (B-21, F-47, CCA), CMCC, B-2, E-3, E-7, EA-18G, F-15, F-22, F-16, F-18, F-35, MC-130J, MQ-9, MQ-20, MQ-25, NC3, RQ-4, U-2, Phalanx Griffon, others

UCI Core Functions

- Common machine-to-machine message formats
- Enables C2 coordination across weapon systems
- Supports DAF Battle Network
- Ensures Interoperability

UCI enables interoperability across platforms and weapons for joint force lethality

UCI 3.0 Vision



UCI Today: Lacks a common implementation; adopting programs develop extensions, requiring translation for interoperability

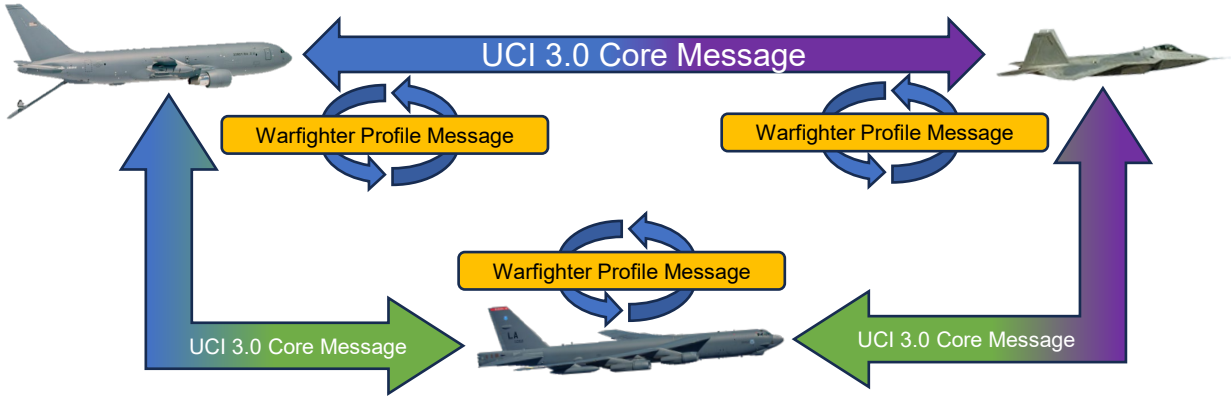
DAF Battle-network Data Model (BDM)

Enterprise Integration Layer (BDM MetaData Wrapper)

UCI v3.0 Core Message Set

Mandated C2 Standard at Tactical Edge (UCI Message)

UCI 3.0: Establishes a "Core Message Set" for mission-level C2; breaks other messages out into "Warfighter Profiles"



UCI 3.0 being developed in tight coordination with C3BM DAF Battle Network

Agile Mission Suite (AMS) GRA

Capability Overview

- Modular & expandable
- Provides robust continuous delivery software pipeline

Advantages:

- **Marketplace**. Any compliant software runs on any compliant hardware
- **Speed**. Iterate at the speed of software (not hardware)

Enables:

- No airworthiness impacts for updates because flight/safety is isolated from mission systems
- Open and common interfaces prevent vendor lock

Big Iron is integrated in the AMS GRA Jan 2026 release!

"Agile weapon systems are **Software Defined and Hardware Enabled**"

Commercial Approach

Militarized Approach

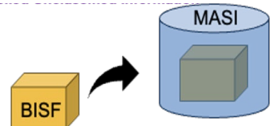
AMS GRA: Created to Outpace Threats through Modularity and Competitive Acquisition

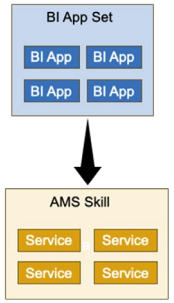
AMS 2026.01

Component Integration

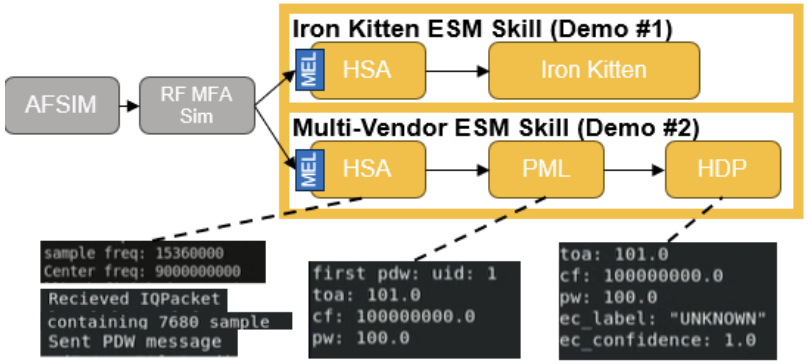
BISF to MASI Rationalization: BISF technical capital has been rolled into MASI

App Set to Skill Rationalization: app sets now act as skills with the intent of providing logical grouping of MPUs to provide a desired capability





Integration Results



Transition Guide

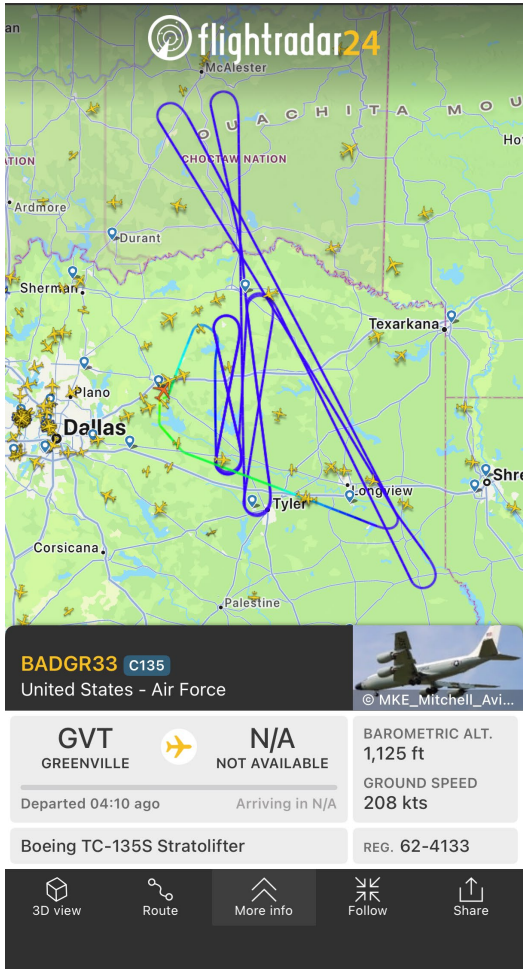
BI to AMS Transition Guide: This guide explains how BI Standard v4.0 and AMS GRA 13.0 were integrated to create AMS GRA 14.0. It is a supplement to the technical volumes, designed to help with the transition to the new AMS GRA compliance.

Value Proposition

The integration of AMS GRA and Big Iron is a **force multiplier** (OMS, and others incoming). We brought BI EW capabilities directly into the AMS environment, while giving the BI community the full power of the AMS framework. This isn't just a concept; we proved it at a live hackathon with industry partners **successfully running** BI Apps natively inside AMS. The result is **unified standard** for governance and compliance that accelerates development and enables **immediate adoption** through our transition guide.

Unifying Legacy and Next Gen platforms to combine their capabilities

AMS GRA MFA Integration on RC-135



First MBeam flight for RC-135 (9 Apr)!

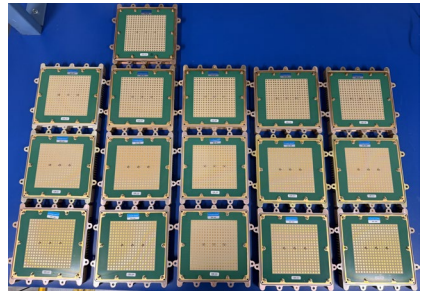
DLOS Updates

- Skill Development
  - Conformance test status
- Antenna Development
  - MIT antenna builds
    - ✓ 8 / 8 prototypes complete
    - 20 / 45 production units by EOM Jul, 35 / 45 by Sep
  - Transition to Production (“FLASH”)
  - Red Tier development
- Crypto Units
  - SRR status
- Ground Nodes
  - 2 / 6 complete; 6 / 6 by Aug
- Test Update
  - ✓ RC-135 MBeam first flight
  - Red Hilt demo to SOF (14 May 26)
    - Ground Node, DHC-6, RC-135
  - SILENT KNIGHT Test (30 Nov – 16 Dec)
- DoW CIO Request For Information

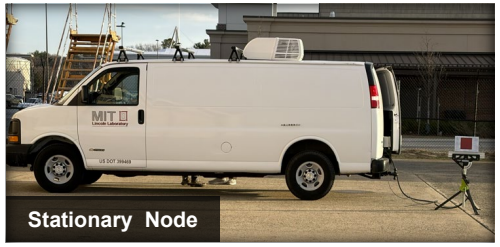
	LM	BAE	L3H	NGMS	RTX
Tests passed*	9 of 14	13 of 14	13 of 14	10 of 14	14 of 14**

* Parameter set 1 only; implementation of parameter sets 2 and 3 by EOM Aug 2026
** Vendor claims – MIT LL verification in work

Vendor skill conformance test status



Baby Falcon II antenna builds in process

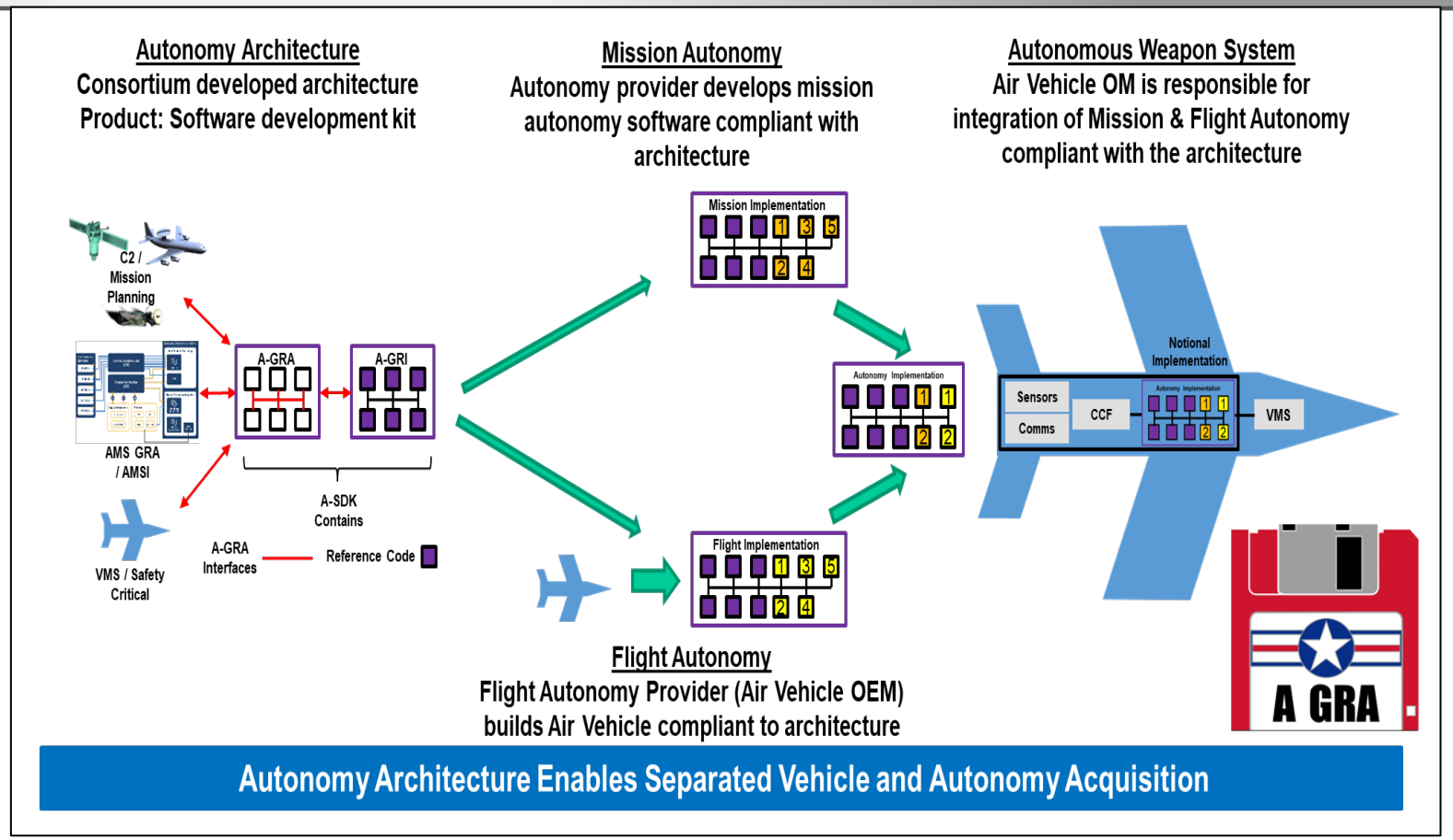


MIT LL Ground Testing

“Red Hilt Demo” planned 14 May

Autonomy GRA

- **Autonomy GRA is:**
  - A platform agnostic messaging standard
  - Adaptable across multiple missions
  - Collaboratively developed with industry
  - Flight proven, government owned
- **Autonomy GRA Enables:**
  - Access to a joint autonomy ecosystem
  - Continuous competition via open and common interfaces
  - Reduced airworthiness impacts - separable mission autonomy and vehicle acquisition
  - Composable with mission systems
  - Same pane of glass across different UAS



Autonomy GRA avoids vendor lock, enables rapid iteration, is extensible to other platforms, & underpins interoperability.

Autonomy GRA Accomplishments

Assure MA, FA, C2, and MS Interoperability

- Refactored model-based A-GRI test harness (a) keeps pace with (vs lags) A-GRA revisions (b) tightens MA, C2, and PIAB CI/CD acquisition loops
- Refined A-GRA L1 precision to reduce MA-C2/QB integration risk via testable pre-conditions and field validation
- Broaden ecosystem through Distro A release (i.e., ICD & test harness), UCI packages, and CTEN-UCI alignment

MBSE Foundations for Rapid Adoption

- Continuous Improvement Process: (a) improved model traceability between L0 and L1 and (b) implemented model quality tracking metrics
- Mission use case and instance patterns enabling tailor L1 interaction compliance for different acquisition programs and mission scenario contexts
- Streamline messages for over-the-air C2/QB/P2P teaming (e.g., acks, auths, status frequency, package status, etc.)

High Priority Flight Test Objectives

- Update Alfa - Charlie mission scenarios to exercise A-GRA/I capabilities in context of stakeholder requirements
- A-GRA Capabilities: L2 Geozone management skill, rapid mission plan updates, error-handling, CASE III Carrier Ops
- A-GRI MP/C2/MD HMI - Added mission plan features for route/task features and mission debrief MVP

MOSA-Driven Innovative Ecosystem

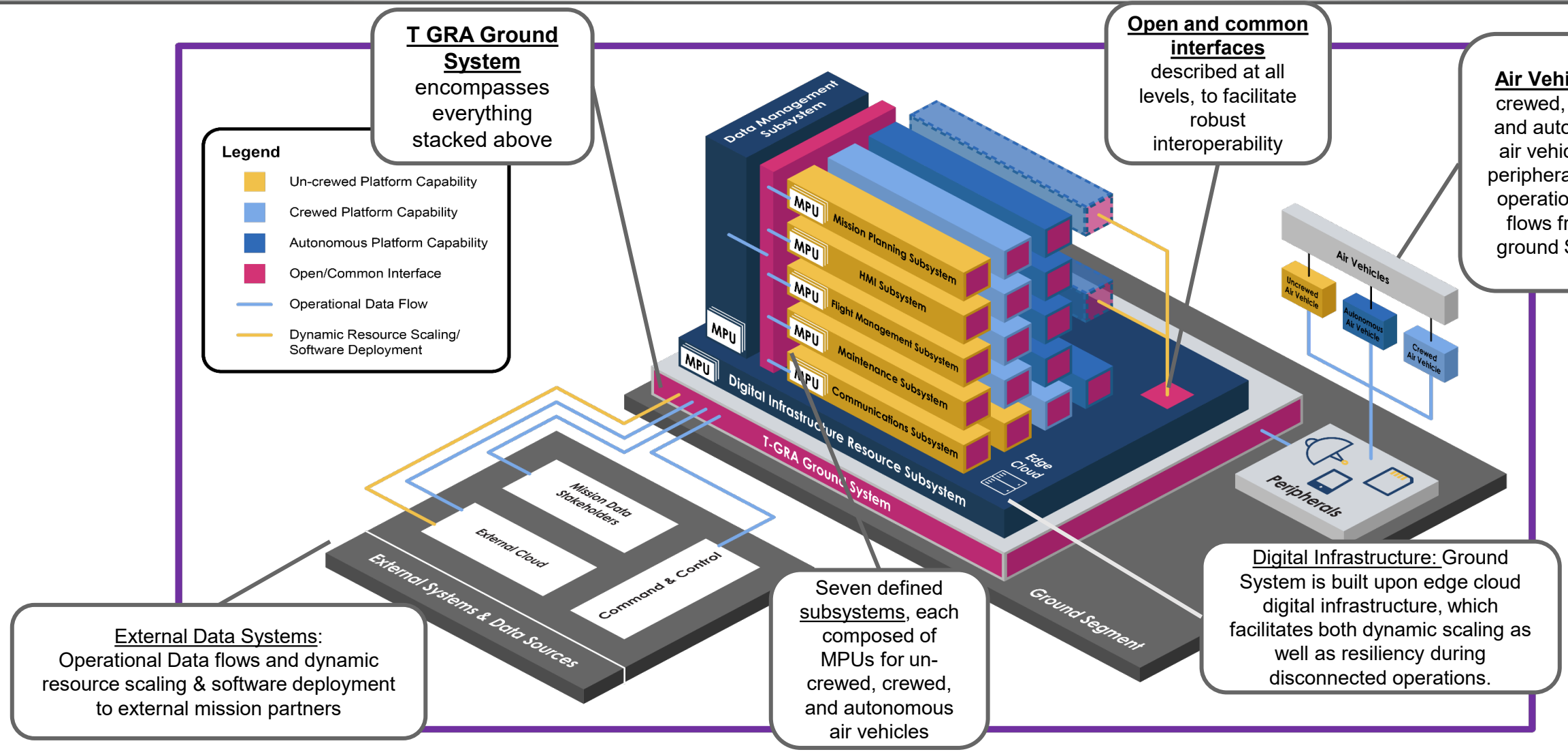
- F-22 Raptor, MQ-20 drone complete manned-unmanned flight exercise
- Talon IQ Testbed Performs Simulated Combat Maneuvers Controlled by Hivemind and Prism Ais
- Northrop Grumman's Talon IQ Swaps Autonomy Skills in Flight with Applied Intuition and Accelint
- Anduril YFQ-44 swaps between Shield AI's Hivemind and Anduril's Lattice
- GA A-GRI on Both Gray Eagle and Eaglets for ELINT and ATR Mission Scenario
- Boeing unveiled at ILA Berlin 2026 the new capabilities within the MQ-28 Ghost Bat's roadmap…

Terrestrial GRA

T GRA Ground System encompasses everything stacked above

Open and common interfaces described at all levels, to facilitate robust interoperability

Air Vehicle: Un-crewed, crewed, and autonomous air vehicles and peripherals pulling operational data flows from the ground Systems

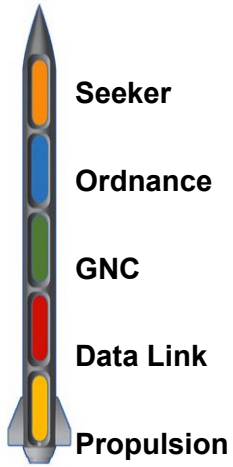


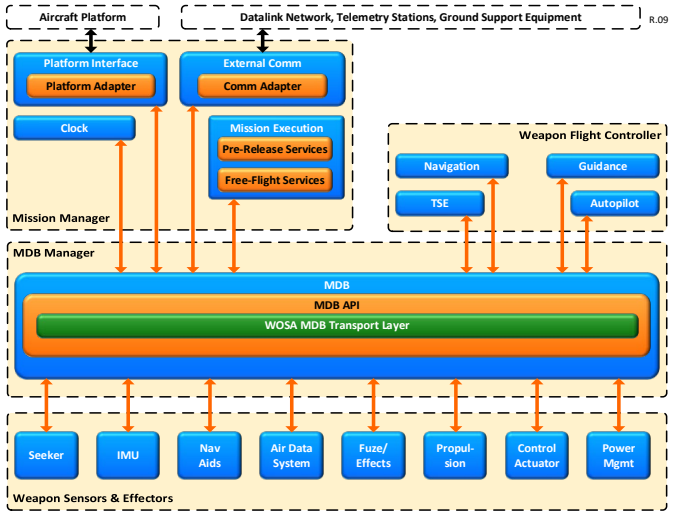
External Data Systems: Operational Data flows and dynamic resource scaling & software deployment to external mission partners

Seven defined subsystems, each composed of MPUs for un-crewed, crewed, and autonomous air vehicles

Digital Infrastructure: Ground System is built upon edge cloud digital infrastructure, which facilitates both dynamic scaling as well as resiliency during disconnected operations.

Weapon Open System Architecture (WOSA)





WOSA is a framework to enable Open Architecture on all munition systems regardless of mission and size constraints built upon three pillars: maintained standards, expertise, and third-party verification

MOATEL is the Munitions Open Architecture Test and Evaluation Laboratory: the third-party V&V cornerstone that has become a critical component of the WOSA Standard – Necessary for safety critical components and architectures

Adopting Weapons / Programs

- 9 AFLCMC/EB 100% Adopting programs - SiAW, FAMM-P, FAMM-L, FAMM-BAR, NGP, SCM, CAMP, classified efforts

Priorities for This Release

- Revamped Modularity Assessment and Scoring Guide v1.5
- Demonstration of **DevSecOps Pipeline for Munitions**; Boeing mission computer integrated and running 6-DOF simulation for inner control loops. Guidance domain swapped based on prior 6-DOF analysis.
- Consolidation of various Navigation Aiding Domains into a single Position, Navigation, and Timing Domain (PNT) to increase modularity of navigation aiding sensors and reduce cost of integration
- Expand to in-flight updates of specific domains and showcase that this is possible through HIL/SIL demonstrations
- October PA Release

Priorities for Next Release

- Analyze new requirements for Swarming behaviors and test verify timing related latency for specific maneuvers
- Perform analysis for Interceptor class weapons – built off prior Air to Air analysis to ensure Open Architecture timing analysis and determinism
- Fault tolerance and AI based guidance law changes in flight – Determine feasibility of detecting damaged parts with respect to air frame control an determine requirements for modifying in-flight guidance laws to compensate
- Focus on heterogeneous swarming activities between FAMM / other vendors to ensure message sets are capable

WOSA enables open and modular designs, provides an acquisition pathway to reduce development time and costs, and requires 3rd party V&V to ensure compliance

*Representative subset of users

Universal Armament Interface (UAI)

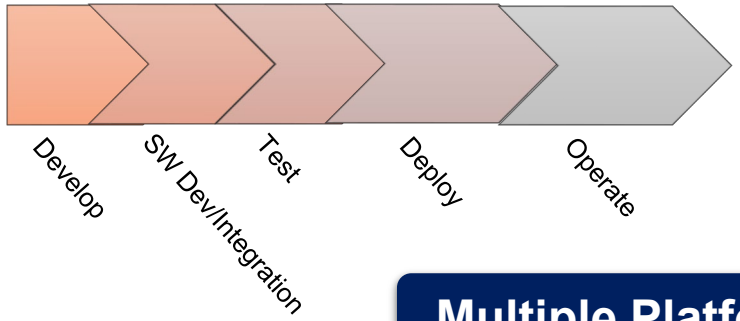
Non-UAI Compliant Store

7.5 Years

VS.

UAI Compliant Store

1.5 Years



SIL time savings (~$1M, 6 months)
S/W dev savings (~$19M, 4.5 years)
ICD dev savings (~2M, 1 year)
Total savings (~$22M, 6 years)

Multiple Platform-Weapon Integrations with UAI are Faster and Cheaper

Nightwing Phase 3 Priorities

Strategic Intent

- Prioritize Adopting Platform Needs: Lower the barrier to entry for adopting platforms by delivering automated compliance tools (UAI Rev 6, AMS GRA), modernized Starter Kits (SKs), DAF BATTLE NETWORK support (UCI 3.0).
- Prototype & Experiment: Aggressively scale up **Instantiate** awards to risk reduce specific adopting platform implementation details (e.g., FPGA CI/CI pipeline, EW pipeline, etc.).
- Secure & Standardize Infrastructure: Consolidate the engineering baseline into the secure Arctic environment to ensure a robust, compliant foundation for all enterprise development.

AMS GRA Priorities

- Resolve tech debt of OMS, AMS integration
- Modernize SDK and security
- Streamline architecture compliance
- AT ICD V&V event
- Targeted COBRA tech capital integration

A GRA Priorities

- ASK 6.0 Tech Debt
- High-priority gaps
- Mature advanced capabilities
- UCI Package and Distro A Sustainment
- A-GRA 6.0 Compliant A-GRI

UAI Priorities

- UAI Rev 6 cert tools
- Non-owning vendor change package streamlining
- Transition to model-based SW
- Productize cert tool processes

UCI Priorities

- Version 3.0 release for DBN functionality
- Develop automated compliance tooling
- Operator focused TAC C2 socialization
- Automatic message translation

T GRA Priorities

- Distro A planning
- Maintenance mission thread modeled to sub-system level
- DI, data mgmt, comms mgmt modeled to MPU-level
- Automate test and compliance tools
- Adopter feedback

Stakeholder Feedback