



# *Global Positioning System Update to the PNT Advisory Board*

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Commander, PNT Delta (Provisional)**

**06 Dec 2023**



# Agenda

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- ***Integrated Mission Delta - What & Why***
- ***Enterprise Status***
- ***Upcoming Capabilities***
- ***The Next Year...***



# *Integrated Mission Delta (IMD): Why?*

“I have one piece of immediate direction for each of you. Every person and organization in the Department, starting today, needs to consider these questions:

- If asked to go to war today against a peer competitor, are we as ready as we could be?
- What can we change in each of our units and organizations to be more ready?

These should not be looked upon as theoretical or academic questions. The fact is that this is why the Air Force and Space Force exist.”

*SECAF memo to Airmen and Guardians,  
5 September 2023*



SECAF Kendall at the Air & Space Forces Association’s 2023 Air, Space and Cyber Conference

***“We must be ready for a kind of war we have no modern experience with.”***

*- SECAF Kendall, AFA, 11 Sep 23*

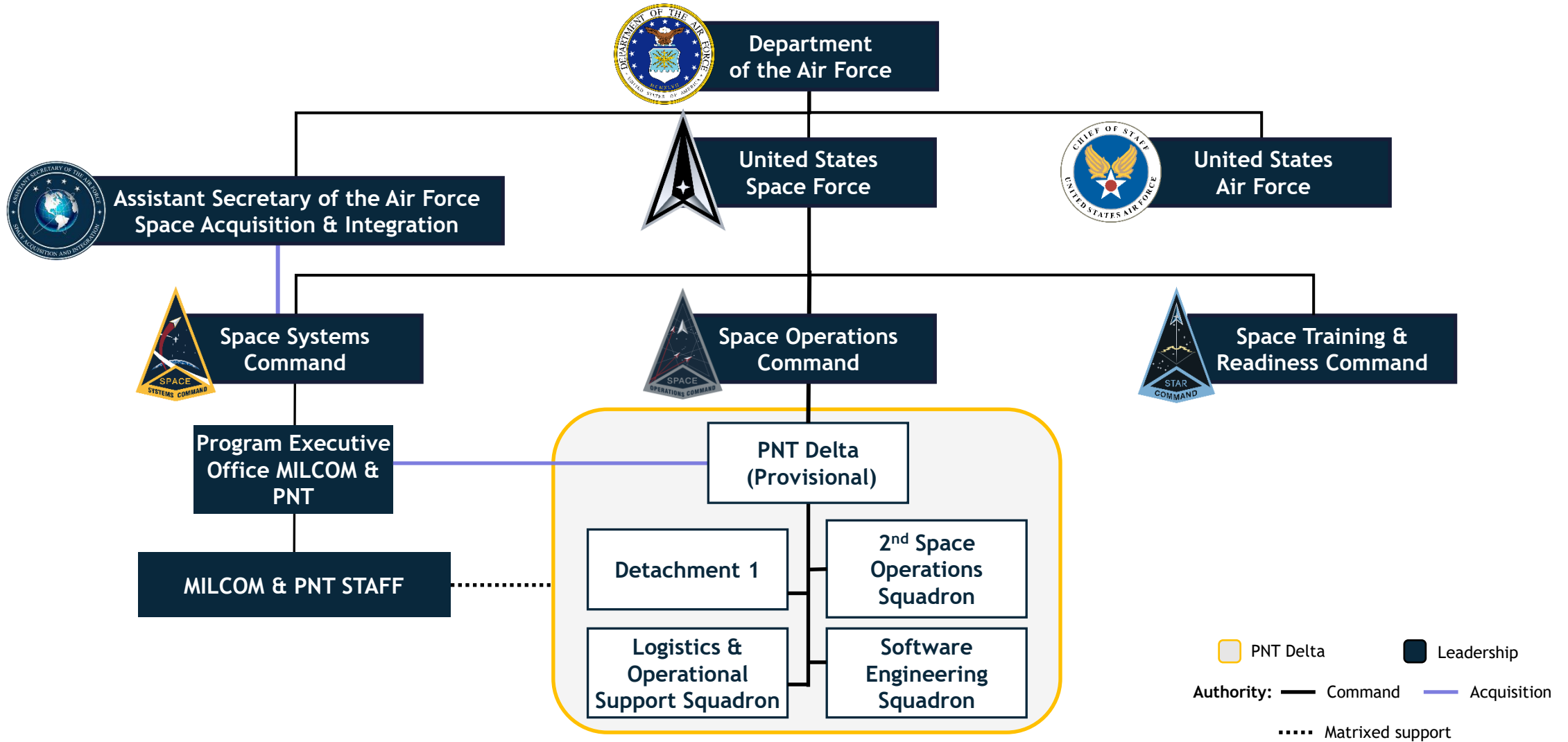


# *Integrated Mission Delta (IMD): Why?*

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- ***Unified Mission Readiness*** (UMR) will strengthen unity of command for readiness and energize unity of effort for capability development by organizing U.S. Space Force activities around mission areas, rather than functional specialties.
- To achieve UMR, the U.S. Space Force will prototype two new types of Deltas: ***Integrated Mission Deltas*** (IMDs) for readiness and ***System Deltas*** (SYDs) for capability development.

# Command Structure





# *Unity of Effort Across Mission Areas*

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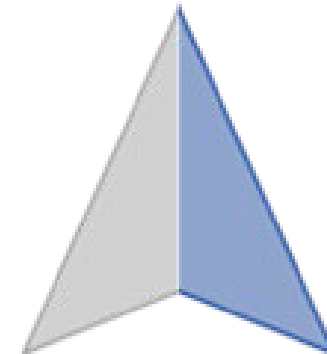
## **System Delta (SYD)**



**Functions:** Design, Develop, Deliver

**Activities:** Requirements development, source selection, tech maturation, risk reduction, engineering design and development, assembly, integration, test, systems acquisitions, block upgrades, new capabilities

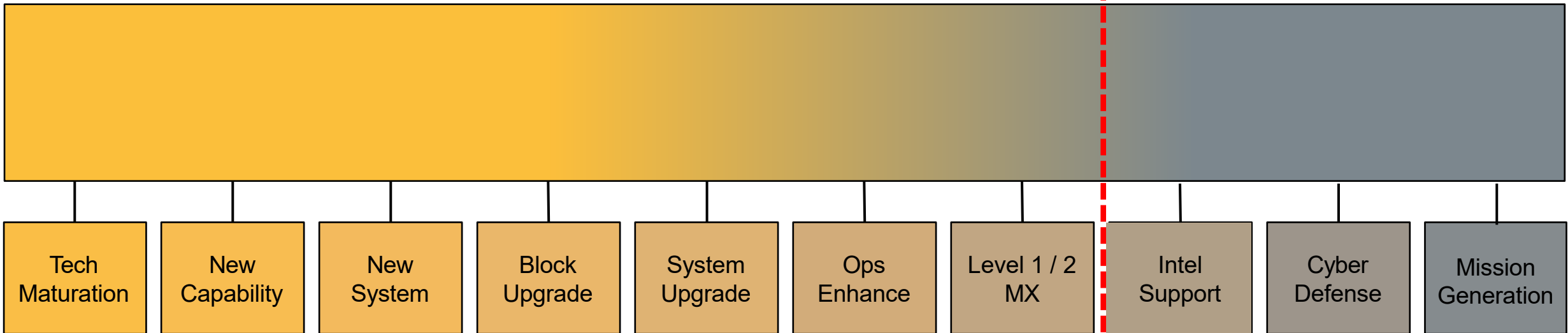
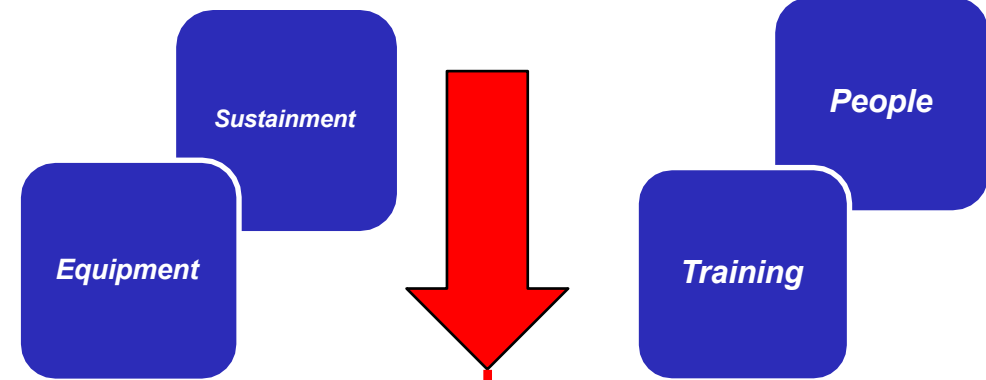
## **Integrated Mission Delta (IMD)**



**Functions:** Generate, Maintain, Enhance

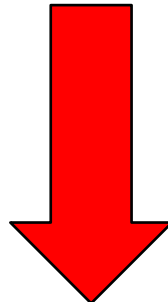
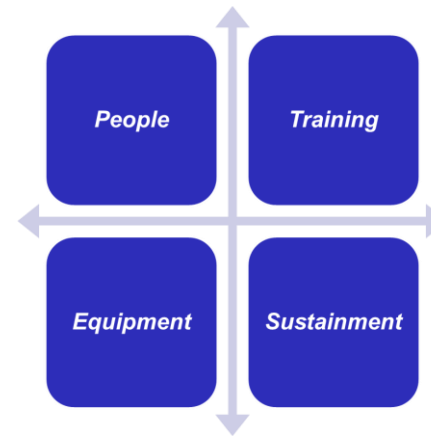
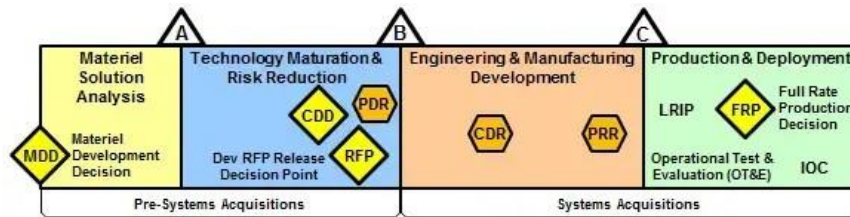
**Activities:** Force generation, combat training, intelligence support, cyber defense, preventive maintenance, anomaly resolution, operations enhancements, mission planning tools

# PREVIOUS Distribution of Workload



Readiness Fragmented

# CURRENT Distribution of Workload



**System Delta**

**Integrated Mission Delta**

Tech Maturation

New Capability

New System

Block Upgrade

System Upgrade

Ops Enhance

Level 1 / 2 MX

Intel Support

Cyber Defense

Mission Generation

**Unity of Effort for Capability Development**

**Unity of Command for Readiness**





# *PNT Mission Area: SYD and IMD Deltas*

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## **System Delta:**

**TBD**

- Military GPS User Equip
- GPS IIF (Follow-on)
- Future development

## **Integrated Mission Delta:**

**PNT Delta (Provisional)**

- GPS Satellite Operations: 2 SOPS / 2 Combat Squadron
- OCX Dev/Transition/Ops: Software Engineering Sq.
- PNT System Sustainment: Logistics & Ops Sustainment Sq.
- GPS III Launch & Early Orbit Ops/Test: Detachment 1



# *IMD Challenges & Successes (So Far)*

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## **Challenges**

- Continue to Delineate Roles and Responsibilities of PEO, SYD, and IMD Organizations in U.S. Space Force Structure

## **Successes**

- Direct Ops involvement positively impacting acquisition programs (OCX)
- Improved SpOC PNT MAT insight into OCX program status & activities
- Single focal point for product support integration status reporting and required acquisition documentation



# GPS Overview

## *Global Positioning Satellites: Encompassing the DoD and Civil Industry Partners*

- GPS is utilized across the world 6B+ users.
- GPS impacts almost every industry, some of these industries include:
  - Agriculture
  - Maritime
  - Public Safety
  - Recreation
  - Space
  - Aviation
  - Finance
  - Telecommunications
  - Telematics
  - Oil/Gas
- GPS economic benefit ~\$1.4 Trillion\*



**GPS meets all technical performance commitments:  
Accuracy, Integrity, Availability and Continuity**



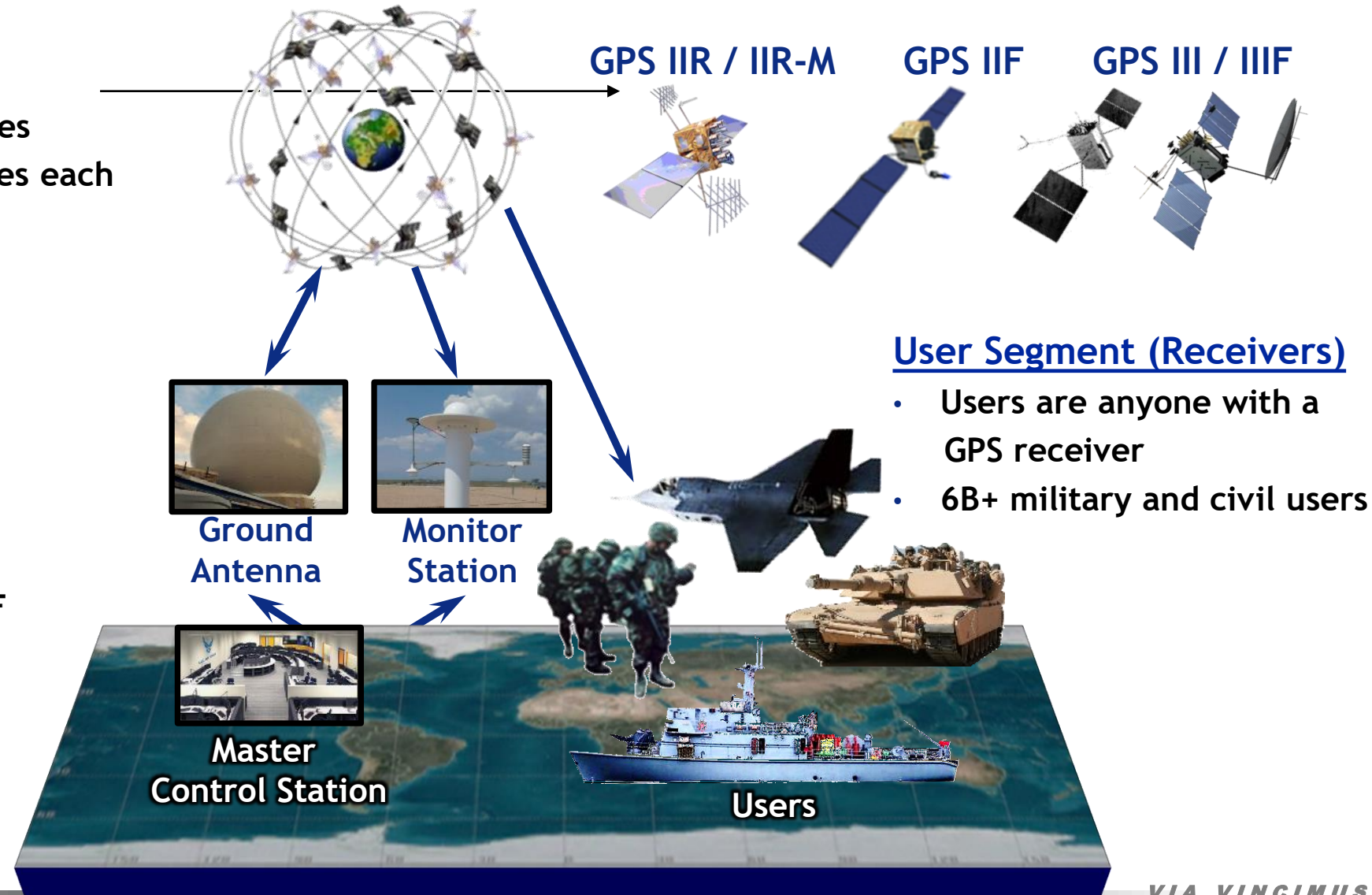
# GPS Enterprise Architecture

## Space Segment (Satellites)

- Required: 27 ops-ready satellites
  - 6 orbital planes, 4/5 satellites each
  - Semi-synchronous orbit
- Current: 31 broadcasting, plus residuals (6)

## Control Segment (Ground)

- Master Control Station (MCS)
  - Schriever SFB, CO
- Ground Antennas (4) and USSF Monitor Stations (17)
- Backup facility
  - Vandenberg SFB, CA



## User Segment (Receivers)

- Users are anyone with a GPS receiver
- 6B+ military and civil users



# GPS Constellation Status

**37 Satellites • 31 Set Healthy**  
**Baseline Constellation: 24 Satellites**

Satellite Block	Quantity	Average Age (yrs.)	Oldest
GPS IIR	7	21.7	26.1
GPS IIR-M	7	16.1	17.9
GPS IIF	11	9.6	13.3
GPS III	6	2.9	4.7

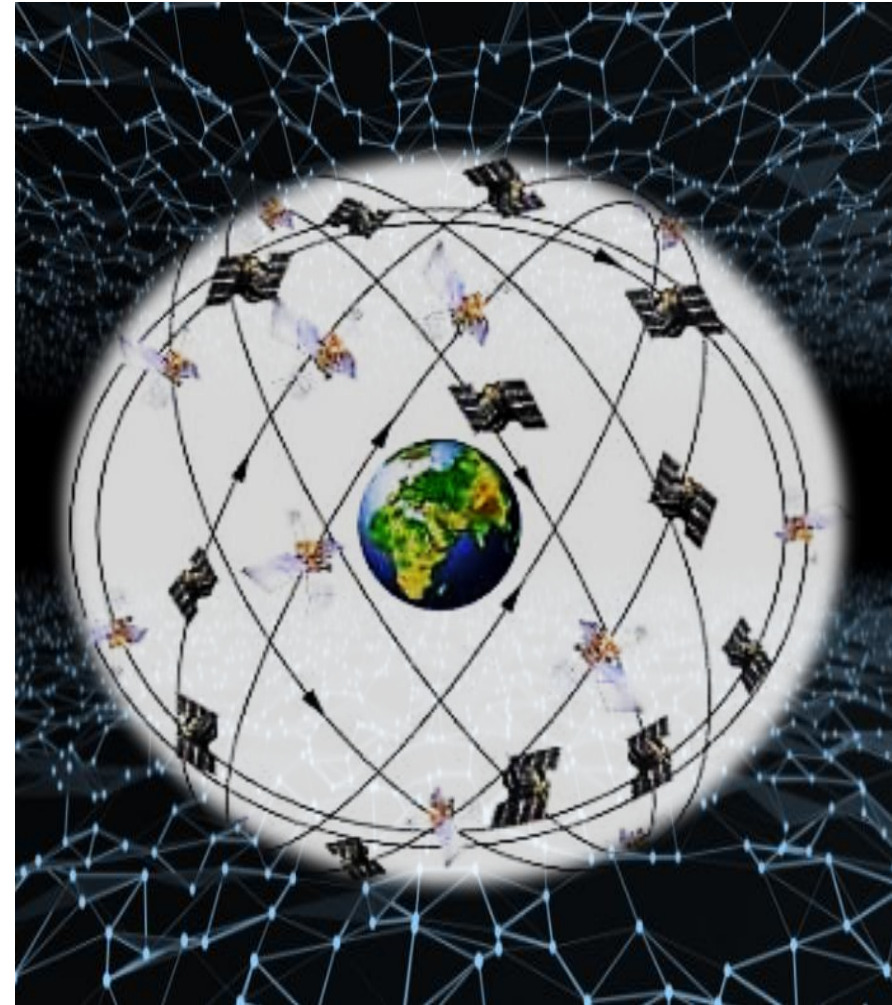
*As of 12 Oct 2023*

## GPS Signal in Space (SIS) Performance

1 Jan - 23 Oct 2023

Average URE*	Best Day URE	Worst Day URE
48.4 cm	34.1 cm 23 Jun 23	163.7 cm 25 Jan 23

\*All User Range Errors (UREs) are Root Mean Square values

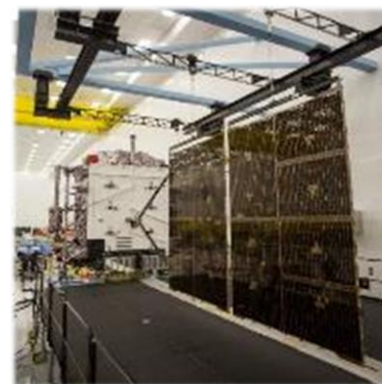




# GPS III Program

- GPS IIIs on orbit:
  - SV01 Set healthy and available for use on 13 Jan 20
  - SV02 Set healthy and available for use on 1 Apr 20
  - SV03 Set healthy and available for use on 1 Oct 20
  - SV04 Set healthy and available for use on 2 Dec 20
  - SV05 Set healthy and available for use on 25 May 22
  - SV06 Set healthy and available for use on 16 Feb 23
- All remaining GPS IIIs in storage & Available For Launch
  - SV07 - AFL 20 May 21; TLD Summer 2024
  - SV08 - AFL 10 Jun 21; TLD FY25
  - SV09 - AFL 23 Aug 22; TLD FY26
  - SV10 - AFL 8 Dec 22; TLD FY26

- AFL - Available For Launch; TLD - Target Launch Date



Six GPS III satellites declared operational



# Improved Civil Signals

## Three New Navigation Signals designed for civilian use



L1 (Legacy)

L2C - Commercial Needs - enables ionospheric correction, improving accuracy

L5 - Safety-of-life transportation - compatible with the Federal Aviation Administration (FAA) Wide Area Augmentation System (WAAS) supporting Civil Aviation in the National Airspace



L1C - Interoperability between GPS and international satellite navigation systems





# GPS III Follow-On (GPS IIIF) Program

- GPS IIIF additional features:
  - Regional Military Protection (RMP) and redesigned Nuclear Detonation Detection System (NDS)
  - Search-and-Rescue (SAR) payload - faster detection and location of distress signals
  - Laser Retroreflector Array (LRA) - provides more precise ranging data
  - Partnering with Air Force Research Laboratory (AFRL) for future technology opportunities
    - Demo on Navigation Technology Satellite (NTS-3)
      - Digital Reprogrammable Payloads
  - Total Program Quantity: Up to 22 (Procured SVs 11 thru 20)
  - SV11 launch forecasted for FY2027



Ensuring the Gold Standard today and into the future





# Next Generation Operational Control System (OCX)

- Next-generation command, control, and cyber-defense for GPS
  - Enhanced command and control capability
  - Modernized architecture
  - Robust information assurance and cyber security
- Incremental Development
  - OCX Block 0: Launch and Checkout System (LCS) for GPS III
  - OCX Blocks 1 and 2: Controls and manages all GPS spacecraft and signals
  - OCX 3F: Adds support for GPS IIF vehicle and new capabilities including RMP
- Current Status
  - LCS successfully supported Launch and Checkout for GPS III SV01-SV06
  - OCX Block 1 completed factory integration and initiated Run For Record factory qualification
  - Delivery/DD250 June 2024; Ready to Transition to Ops (RTO) Feb 2025



OCX program continues to execute and is nearing completion



# User Equipment



MGUE Increment 1 on track to deliver on combat ready platforms (B-2, DDG, Stryker) in CY25  
MGUE Increment 2 (small form factor) acquisition proceeding on schedule



# *The Next Year...*

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- ✓ PNT Delta (Provisional) IOC Achieved 09 Nov 2023
- GPS III Completed; GPS IIIF Ramping up, Progressing Toward OCX Operational Acceptance and MGUE Delivery
- Continue to Build & Shape PNT Delta (P) Organizational Construct toward FOC (Nov 2024)



# The Team!





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***Thank You To Our Partners!***



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*Questions?*