

Space and Missile Systems Center

Global Positioning Systems Directorate

GPS / PNT Modernization Progress:
State of GPS III, MGUE, Accelerating
M-Code, and Resilient PNT

National Space-Based
Positioning, Navigation, and
Timing Advisory Board Meeting
16-17 May 2018

Lt Col Andy Menschner, Materiel Lead
Global Positioning Systems Directorate





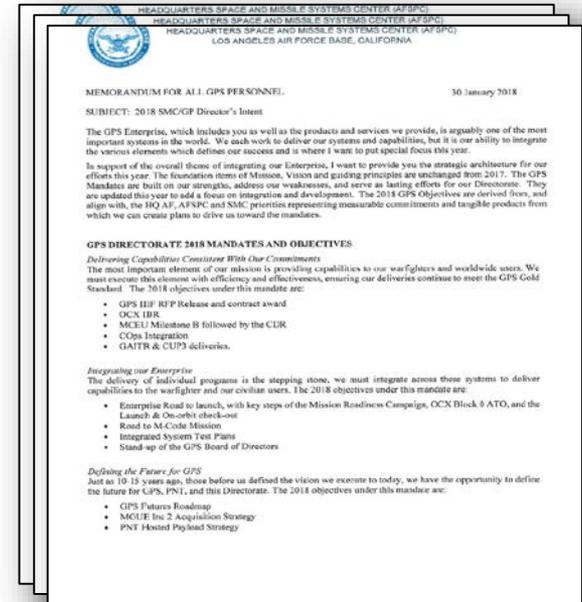
2018 SMC/GP Director's Intent

SPACE AND MISSILE SYSTEMS CENTER

Mandates & Objectives

- Delivering Capabilities
- Integrating our Enterprise
- Defining the Future
- Developing Professionals & Leaders

“Our ability to integrate the various elements defines our success...”





Focus Areas

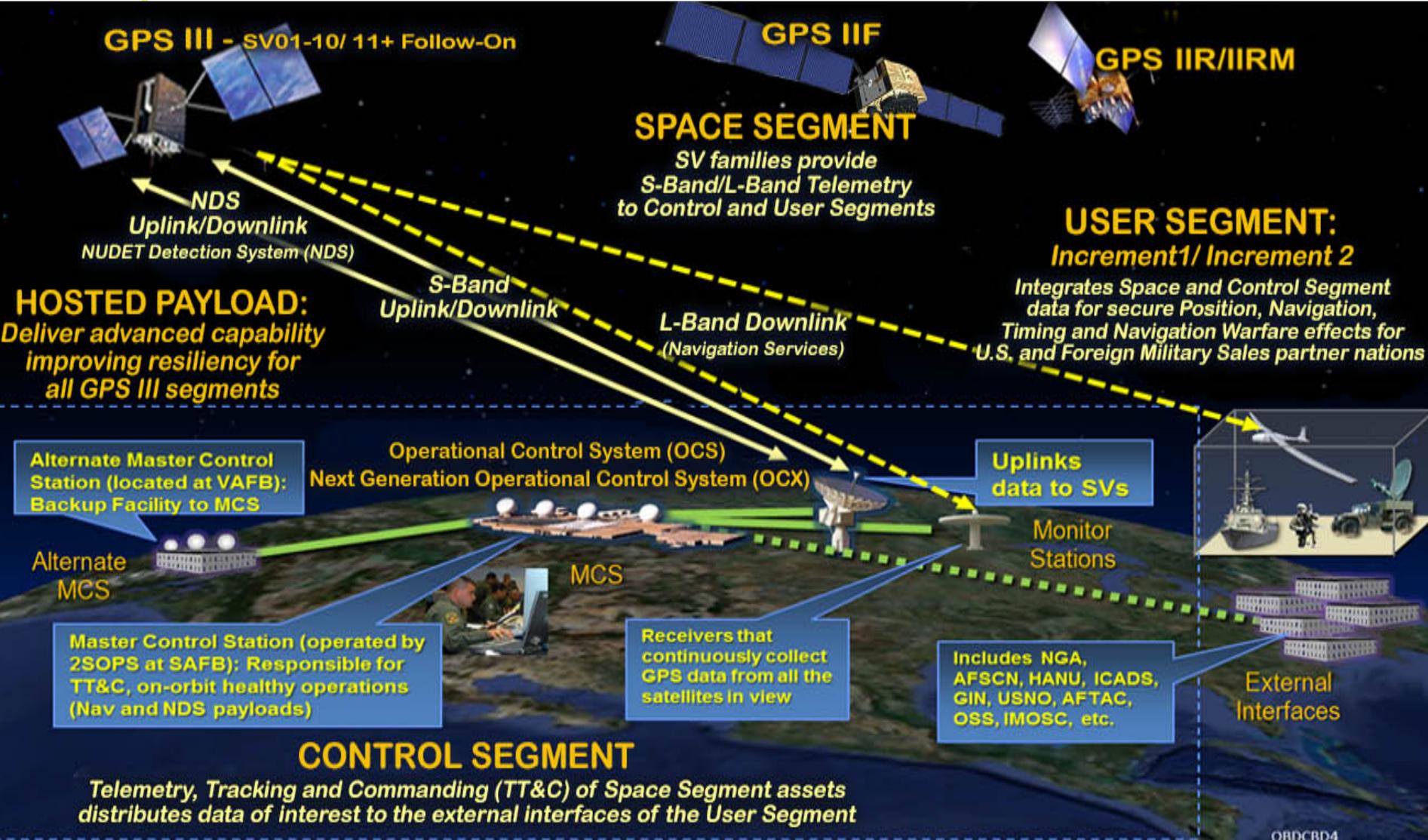
SPACE AND MISSILE SYSTEMS CENTER

- **Our Goal - deliver M-Code into the hands of the warfighter by 2020**
- **Our Focus - delivering 3rd Generation of GPS**
 - Validating M-Code keys from NSA
 - Delivering 1st GPS III satellite to orbit in this year
 - Adding M-Code to OCS while completing OCX
 - Completing Military GPS User Equipment Increment 1 development
- **Our immediate challenge – smart integration across programs, contracts, and organizations to deliver warfighting effects**
- **What comes next– lay the foundation for the future**

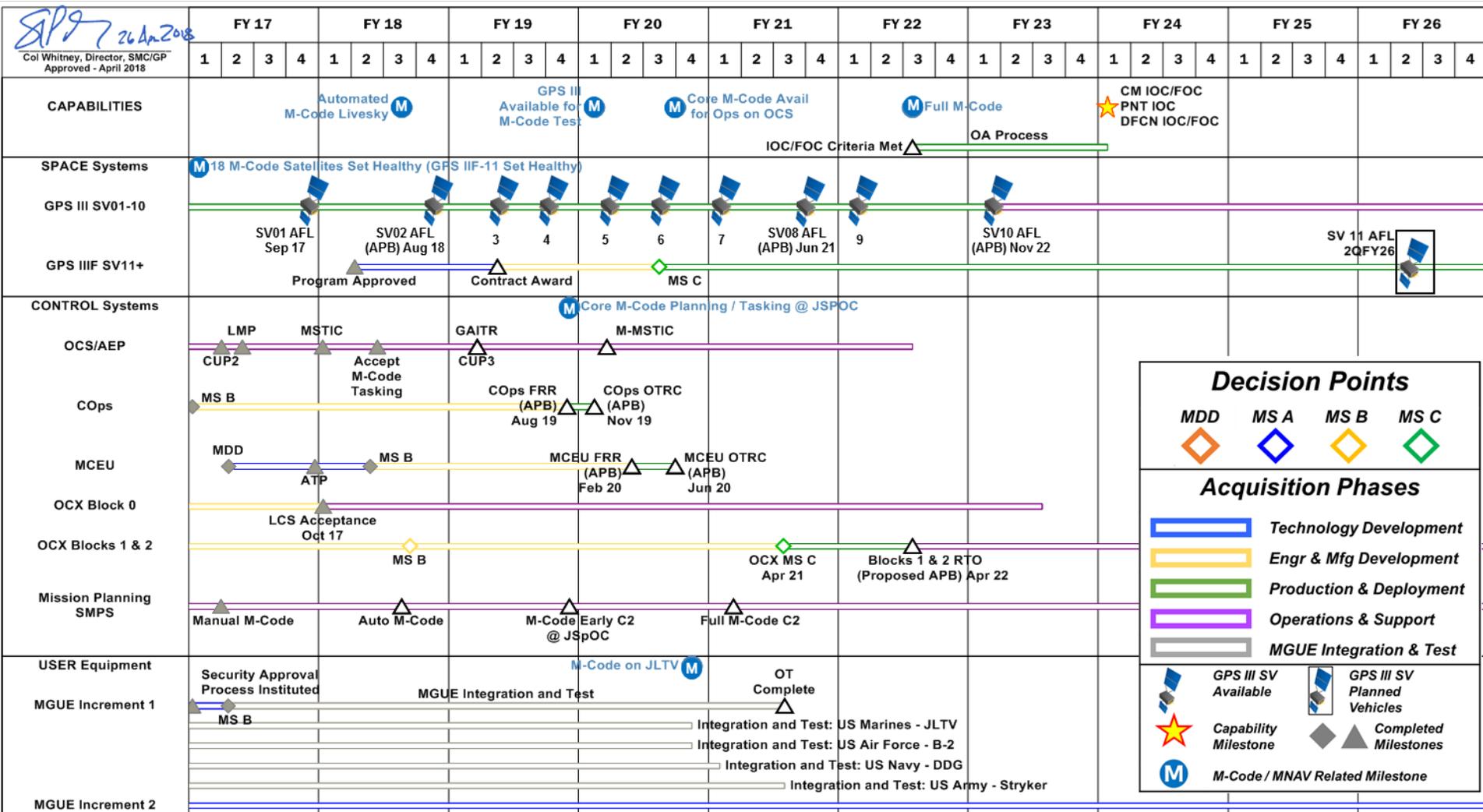


GPS Enterprise Operational View

SPACE AND MISSILE SYSTEMS CENTER



GPS Enterprise Roadmap



Decision Points

◇ MDD
 ◇ MS A
 ◇ MS B
 ◇ MS C

Acquisition Phases

▬ Technology Development
▬ Engr & Mfg Development
▬ Production & Deployment
▬ Operations & Support
▬ MGUE Integration & Test

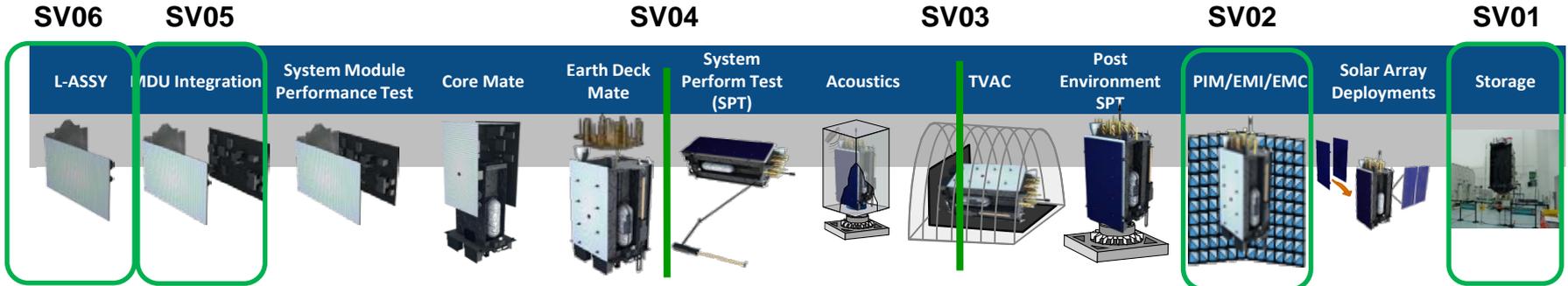
▬ GPS III SV Available
 ▬ GPS III SV Planned Vehicles
★ Capability Milestone
 ◆ Completed Milestones
M M-Code / MNAV Related Milestone

AEP	Architecture Evolution Plan	CUP	COTS Upgrade Project	GPS IIF	GPS III Follow On	M-Code	Military Code	OCS	Operational Control System
AFL	Available for Launch	DDG	Guided Missile Destroyer	IOC	Initial Operating Capability	MDD	Material Development Decision	OTRC	Ops Test Readiness Certification
APB	Acquisition Program Baseline	DFCN	Dual-Frequency Civil Navigation	JLTV	Joint Light Tactical Vehicle	MGUE	Military GPS User Equipment	OT	Operational Test
ATP	Authority to Proceed	FOC	Full Operational Capability	JSPOC	Joint Space Operations Center	M-MSTIC	Modernized Monitor Station Tech	PNT	Position, Navigation & Time
C2	Command & Control	FRR	Fielding Readiness Review	LCS	Launch & Checkout System	Milestone	Improvement & Capability	RTO	Ready for Transition to Ops
CM	Constellation Management	GAITR	Ground Antenna Interface Technical Refresh	LMP	LADO Modification Project	MS	Milestone	SMPS	SAASM Mission Planning System
COps	Contingency Operations	MCEU	M-Code Early Use			OA	Operational Acceptance	SV	Space Vehicle



State of the GPS III Space Vehicles

SPACE AND MISSILE SYSTEMS CENTER



- SV01 awaiting launch call up (May 18)
- SV02 completed TVAC (Dec 17)
 - Final SPT completed 20 Mar 18
 - PIM/EMI/EMC ongoing; ECD 14 May 18
- SV03 TVAC ongoing (ECD Jun 18)
- SV04 completed Core Mate (Feb 18)
 - Post-Mate SPT estimated completion date Jun 18
 - TVAC testing scheduled to begin Aug 18
- SV05 is currently in MDU integration stage
 - On track for core mate mid Jun 18
- SV06 is currently in L-Assembly buildup stage



6 SVs in Various Phases Within The Single Line Flow; SV07 Build Begins in May 18

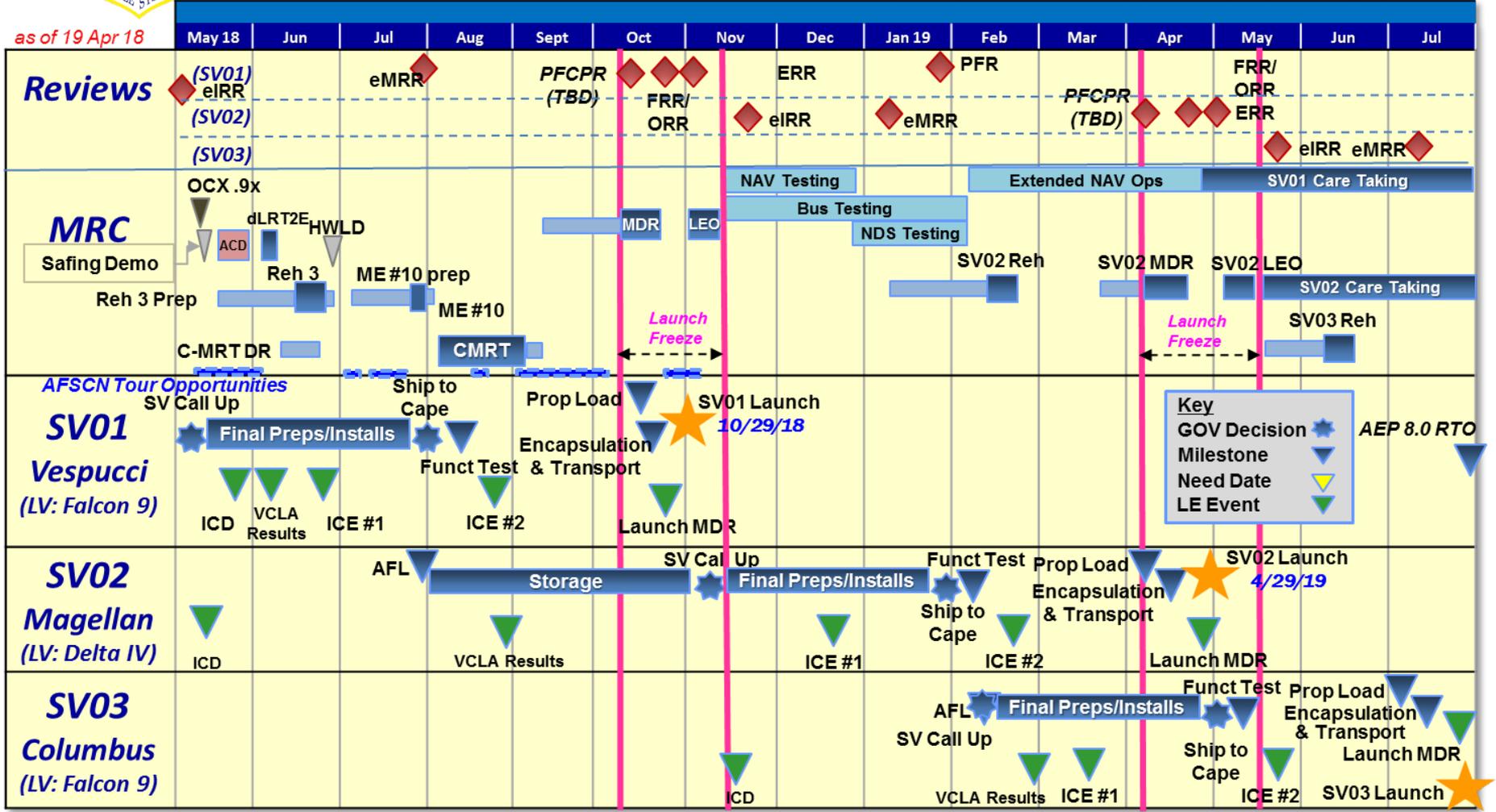
Enterprise Road to Launch (ERTL) Schedule

(Launch Dates -- SV01: Oct 18, SV02: Apr 19, SV03: Jul 19)



SPACE AND MISSILE SYSTEMS CENTER

as of 19 Apr 18



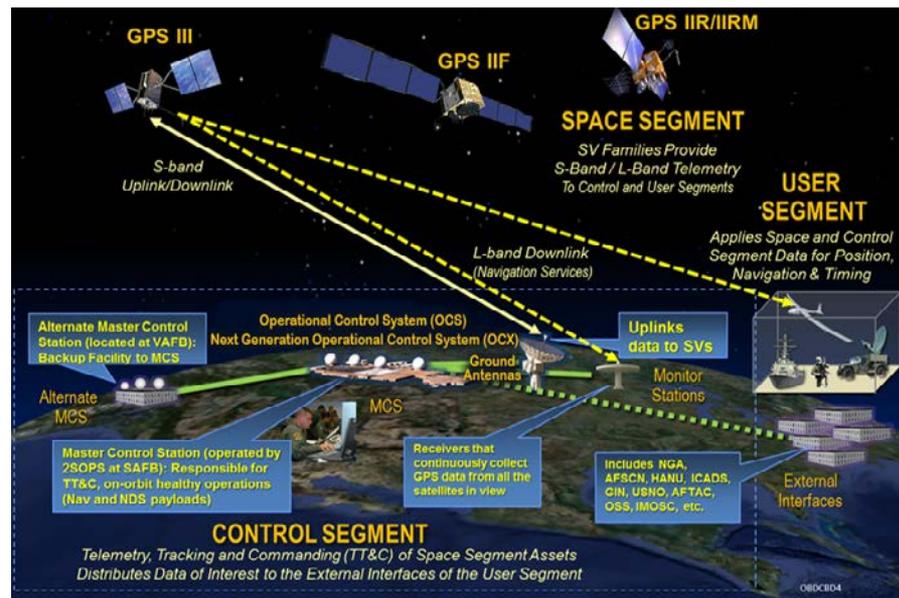
Prep/Analysis/Margin | MRC Event | OCX (DCS) | Cyber Security | OOC | AFSCN Tours: 5/10, 5/15 5/31, 6/28, 7/5, 7/9, 9/6, 9/13, 9/20, 9/27, 10/11, 10/18, 10/25



GPS III Contingency Operations (COps)

SPACE AND MISSILE SYSTEMS CENTER

- Limited operations for GPS III Space Vehicles until OCX Block 1 delivery
 - Provides legacy and modernized civil signal operations
 - Relies on OCX Block 0 for GPS III launch, major anomaly, and disposal capabilities
 - Available for operations projected in Apr 2019
- Software Development
 - Risk reduction modification to current Operational Control System (OCS)
 - Four incremental software builds
- Current Status: on track
 - Software development complete
 - Component Integration Testing ongoing
 - Operational Test Readiness Certification (OTRC) objective Nov 19



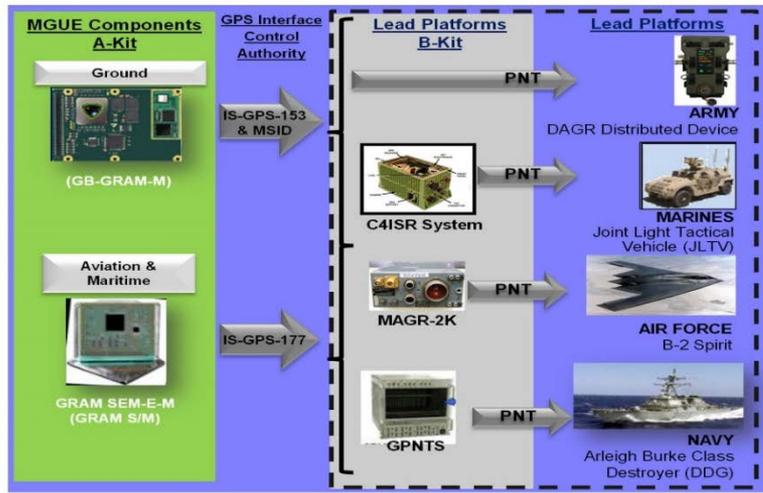
COps is a critical bridge, enabling sustainment of legacy signals for GPS III



Military GPS User Equipment (MGUE)

SPACE AND MISSILE SYSTEMS CENTER

- Competitive market-driven acquisition approach
- Three vendors developing modernized receiver cards
 - Ground form factor
 - Aviation/Maritime form factor
- Current Status
 - Developmental testing ongoing
 - Conducting early integration activities to support Service-nominated Lead Platforms
 - Increment 2 Capability Development Document signed Apr 18; acquisition strategy under development





Why Core M-Code is Needed

SPACE AND MISSILE SYSTEMS CENTER

Jamming GPS Signals Is Illegal, Dangerous, Cheap, and Easy

Gizmodo.com, 24 Jul 2017

WORLD | MIDDLE EAST

Exclusive: Iran hijacked US drone, says Iranian engineer

In an exclusive interview, an engineer working to unlock the secrets of the captured RQ-170 Sentinel says they exploited a known vulnerability and tricked the US drone into landing in Iran.

By Scott Peterson, Staff writer | Payam Faramarzi*, Correspondent | DECEMBER 15, 2011



GPS WORLD

GNSS POSITION NAVIGATION TIMING

Follow Us: Facebook, Twitter, LinkedIn, YouTube, RSS

Search the Site... subscribe

OEM | UAV | Survey | Mapping | GNSS | Defense | Mobile | Machine Control/Ag | Transport



U.S. Air Force jamming GPS in Southwest sky this week and next

February 5, 2018 - By GPS World Staff Est. reading time: 2 minutes

Facebook | Twitter | Google+ | LinkedIn | 2 Comments

USA TODAY @USATODAY Follow

Experts say there are scenarios where GPS hacks could have been used to foil ships' navigations systems:

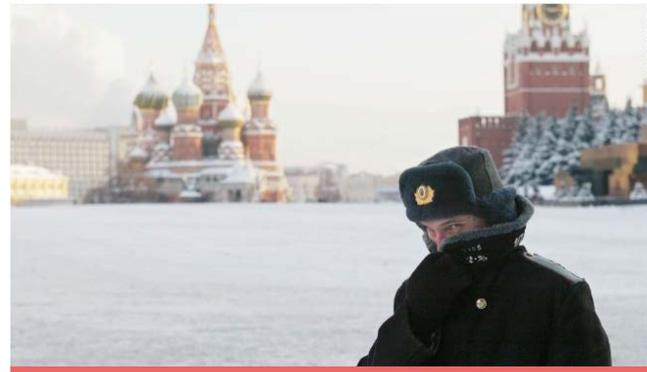


Could hackers be behind the U.S. Navy collisions? Was a hack attack behind two separate instances of Navy ships colliding with commercial vessels? Experts say it's highly unlikely, but not impossible. usatoday.com

Did Russia make this ship disappear?

by Muhammad Darwish @CNNTech

November 3, 2017: 6:32 AM ET



GPS spoofing: Is this the new cyberweapon?

Social Surge - What's



Investing

Take Control of Yo

ETRADE

Are GPS Jamming Incidents a Growing Problem for Aviation?

By Woodrow Bellamy III | January 31, 2017

In recent years, the number of reports filed by pilots to NASA's aviation safety reporting system regarding incidents of GPS signal loss or disruption for private and commercial aircraft have increased. But how big of a problem is GPS signal disruption for commercial and general aviation aircraft flying in the U.S. National Airspace System and around the world, and what is the industry doing to address this problem?



Aviationtoday.com, 31 Jan 2017

WSJ PRO CYBERSECURITY

WHO IS IT FOR | DAILY NEWSLETTER | NEW & INSIGHT | TRAINING | WHITE PAPER

Shipping Firms Fend Off GPS Interference as Cyber Regulations Approach



GPS Director's Perspectives

SPACE AND MISSILE SYSTEMS CENTER



- GPS is the Global Utility
 - Committed to maintaining uninterrupted service
 - “The Gold Standard”
- Accelerate the deployment and adoption of M-Code to the warfighter
- Continue to enhance GPS resiliency by:
 - Addressing near-term needs with current efforts
 - Identifying opportunities for resiliency improvements
 - Maturing technical needs for future use
- Integrate across programs, contracts, and organizations to deliver warfighting effects
- Appreciate the need for alternative PNT sources, and challenge the community (labs, industry, others) to propose & explore solutions

Delivering Capabilities, Integrating our Enterprise, Defining the Future



the men and women of the
GLOBAL POSITIONING SYSTEMS DIRECTORATE



Acquisition professionals delivering the Gold Standard in Space-Based PNT & NDS Services