Global Positioning System (GPS)
Public Interface Control Working Group (ICWG) & Public Forum

Held: May 13, 2025
0830-1700 PDT

Released: June 25, 2025

Post-Public ICWG Version

Modified pages are marked with

United States Space Force
Space Systems Command
Positioning, Navigation, and Timing PEO
Daniel Stevenson

Dial-in Information

Primary MS Teams Meeting Link:

https://gov.teams.microsoft.us/l/meetup-join/19%3agcch%3ameeting_7ae7d32ad71f4ba5a8f6ac8eedef185e%40thread.v2/0?context=%7b%22Tid%22%3a%22728ac41d-52a3-4e8c-b431-b300a7a7ee8b%22%2c%22Oid%22%3a%22ffc24286-a31c-46c4-9bb6-b1477914f119%22%7d

Meeting ID: 992 414 074 763

Passcode: YM2gn9Qm

Dial in by phone

+1 571-544-7242,,607943486# United States, Washington

Find a local number: https://dialin.cpc.gov.teams.microsoft.us/a308a631-5ae4-4d4d-804a-cd79c1accfd5?id=607943486

Phone conference ID: 607 943 486#

Alternate Meeting Application (only if needed)

https://dod.teams.microsoft.us/l/meetup-join/19%3adod%3ameeting_135600195021477ca5fc36d7c732ccff%40thread.v2/0?context=%7b%22Tid%22%3a%228331b18d-2d87-48ef-a35f-ac8818ebf9b4%22%2c%22Oid%22%3a%2287a32064-cfb0-4c32-867b-0f7cf2dd1434%22%7d

Meeting ID: 993 820 521 45

Passcode: VY95Re9j

Dial in by phone

+1 410-874-6750,,317889680# United States, Odenton

Find a local number: https://dialin.cpc.dod.teams.microsoft.us/5b01a545-5bfc-47e3-8778-6ea631580160?id=317889680

Phone conference ID: 317 889 680#

Roll Call

Rules of Engagement

UNCLASSIFIED

Proprietary

CUI

Classified

Competition Sensitive

ABSOLUTELY NO PROPRIETARY, CUI, CLASSIFIED, OR COMPETITION SENSITIVE INFORMATION IS TO BE DISCUSSED DURING THIS MEETING.

Rules of Engagement (Cont'd)

- Please place your phones on mute when not speaking to minimize background noise

- For dial-in attendees, DO NOT take calls from phone while on telecom

- Comments aligned with topics listed on the official agenda will get priority during discussion

- Topics that warrant additional discussion may be side-barred

- Walk-on topics may be discussed during the open discussion

- Meeting minutes and final Proposed Change Notices (PCNs) will be generated and distributed as a product of this meeting

- Please announce your name and organization before addressing the group
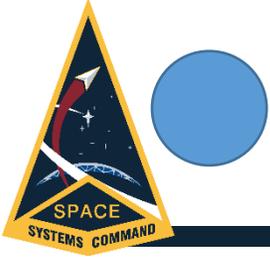
# Rules of Engagement (Cont'd)

- Types of comments to be discussed/dispositioned:
  - Critical (C)
  - Substantive (S)
  - Rejected/Deferred Administrative (A)
- Comments are grouped by sub-topic rather than by comment type
- Refer to the Acronyms list on Slide #166 for any acronyms you do not already know

Rules of Engagement (Cont'd)

The purpose of the meeting is to:

1) Obtain ICWG approval on the proposed language generated for the enterprise RFCs that impact the public documents

2) Discuss any new open forum items against the Public Signals in Space documents
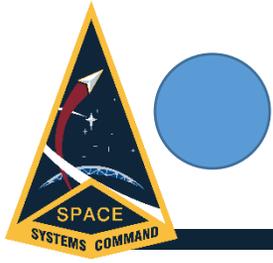
Agenda

Public ICWG (1st Half of Day)	Presenter	Times
GPS Public ICWG and Public Forum Meeting Overview	Dan Stevenson	08:30 08:45
Opening Remarks / GPS Overview	Dan Stevenson	08:45 09:05
2025 Public ICWG RFC Discussion		
• RFC-519 – Civil ISM Formats	Tony Anthony	09:05 11:00
Break		**11:00 11:10**
• ~~ARAIM Background In Support of ISM~~	~~Dr. Hansen~~	~~11:10 11:40~~
Action Item Review		11:40 11:55
Lunch Break (1 hour)		11:55 13:00

Public Forum Presentations (2nd Half of Day)	Presenter	Times
• AODO/WAGE Change	John Taylor	13:00 13:30
• Deferred Work from RFC-495 & RFC-502	Tony Anthony	13:30 14:00
• Correction to CNAV Velocity Calculations	David Allen	14:00 14:20
Break		**14:20 14:30**
Walk-on Topics, Open Discussion	--	14:30 14:40
Action Item Review		14:40 14:55
PRAT - Public Req. Accountability Tool	Tony Anthony	14:55 15:15
Action Item Review		15:15 15:30
Closing Remarks	Dan Stevenson	15:30 15:35

Opening Remarks

Global Positioning System (GPS) Position, Navigation, & Timing Mission Area

May 13, 2025

## Mr. Daniel Stevenson

Chief, Positioning, Navigation and Timing (PNT) Systems Engineering, Integration, and Test (SEIT) Branch

GPS Overview (DoD)

Space Segment

Control Segment

User Segment

Broadcasting since 1978

20 monitoring and control stations worldwide

Reaching over 4 billion users every second

Committed to Cooperation
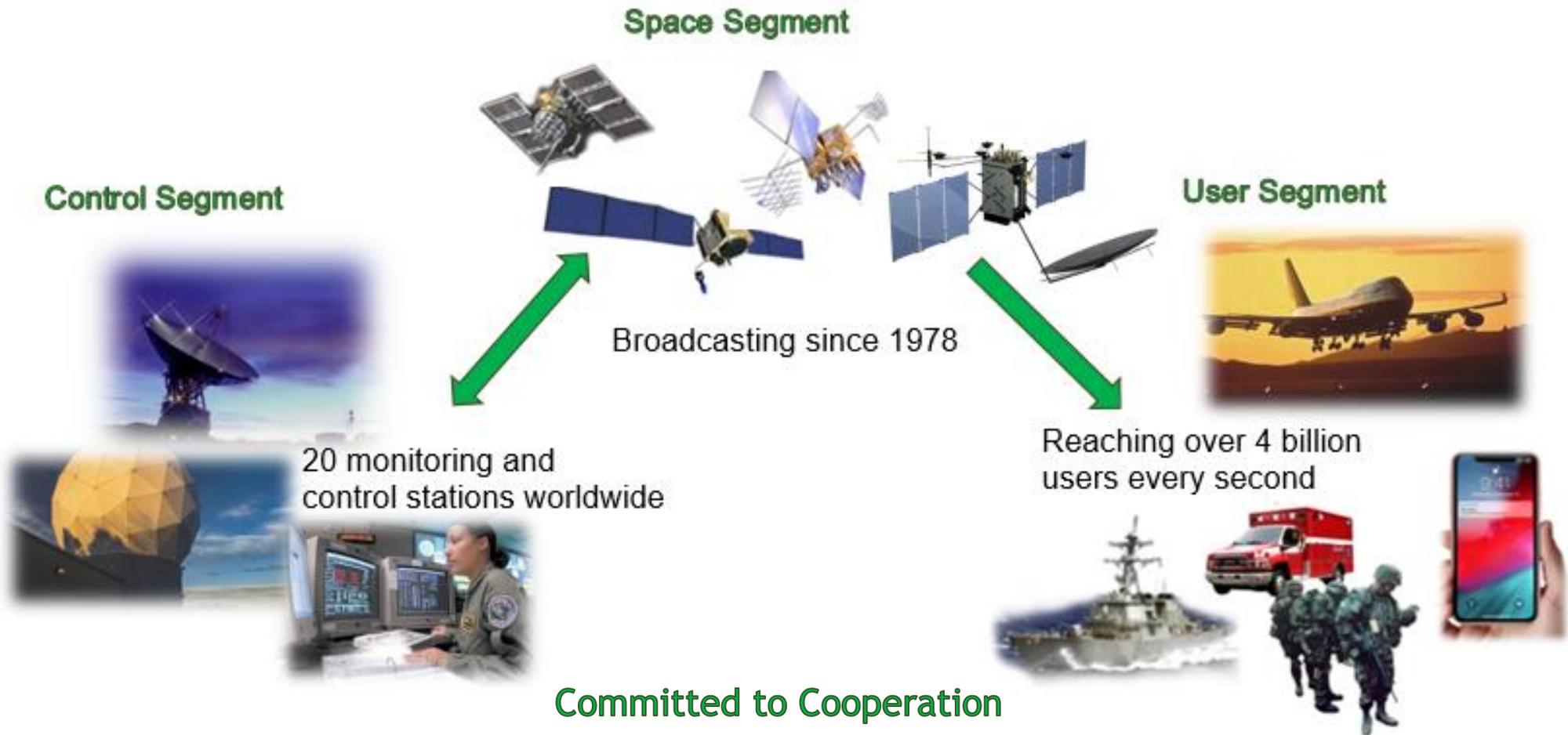
Department of Defense • Army • Navy • Air Force • Space Force • USMC • NGA • DISA • USNO • NSA • PNT EXCOM
National Nuclear Security Administration (NNSA) • Department of Transportation • Federal Aviation Administration
Department of Homeland Security • U.S. Coast Guard • International Civil Aviation Organization
Global Navigation Satellite Systems • Galileo • Beidou • GLONASS • QZSS • NAVIC
International Committee on GNSS • International Telecommunication Union

GPS Overview

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

- GPS is utilized across the world with
- 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 consistently met all technical performance commitments: Accuracy, Integrity, Availability and Continuity Integrity, Availability and Continuity

GLOBAL PERSISTENT COMMUNICATIONS

MILSTAR (5)
WGS (10)
AEHF (6)
MUOS (5)
EPS (2)
DSCS (6)

POSITIONING, NAVIGATION & TIMING

GPS IIR (6)
GPS IIR-M (7)
GPS IIF (12)
GPS III (7)
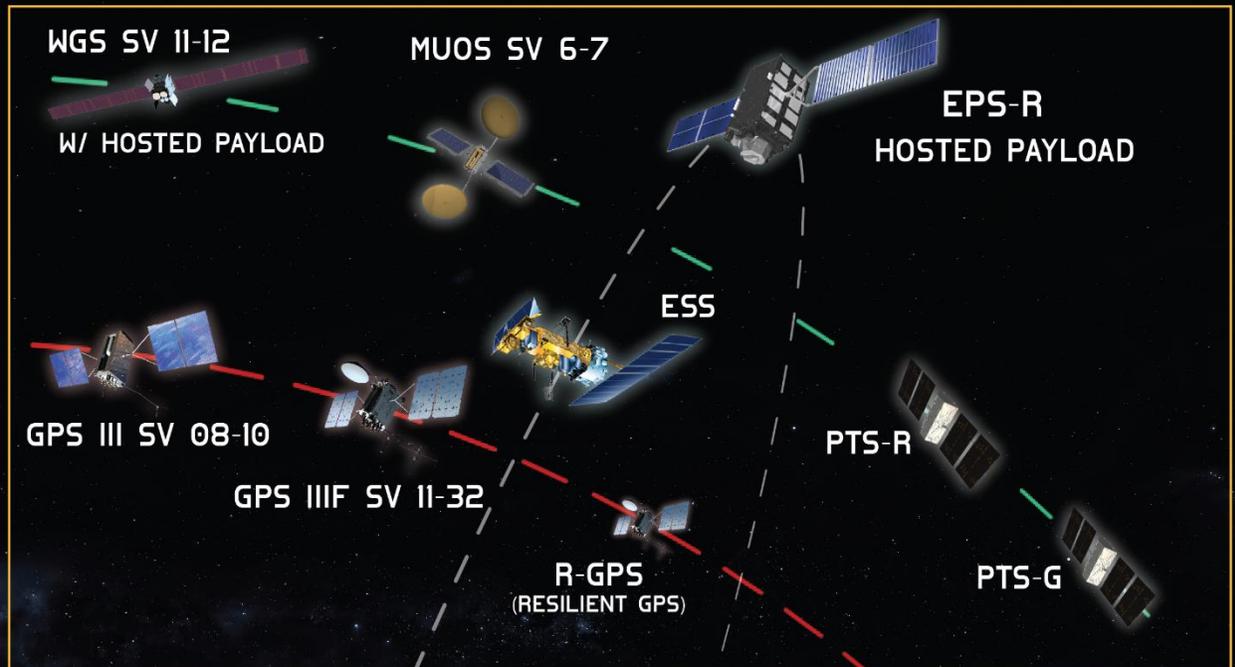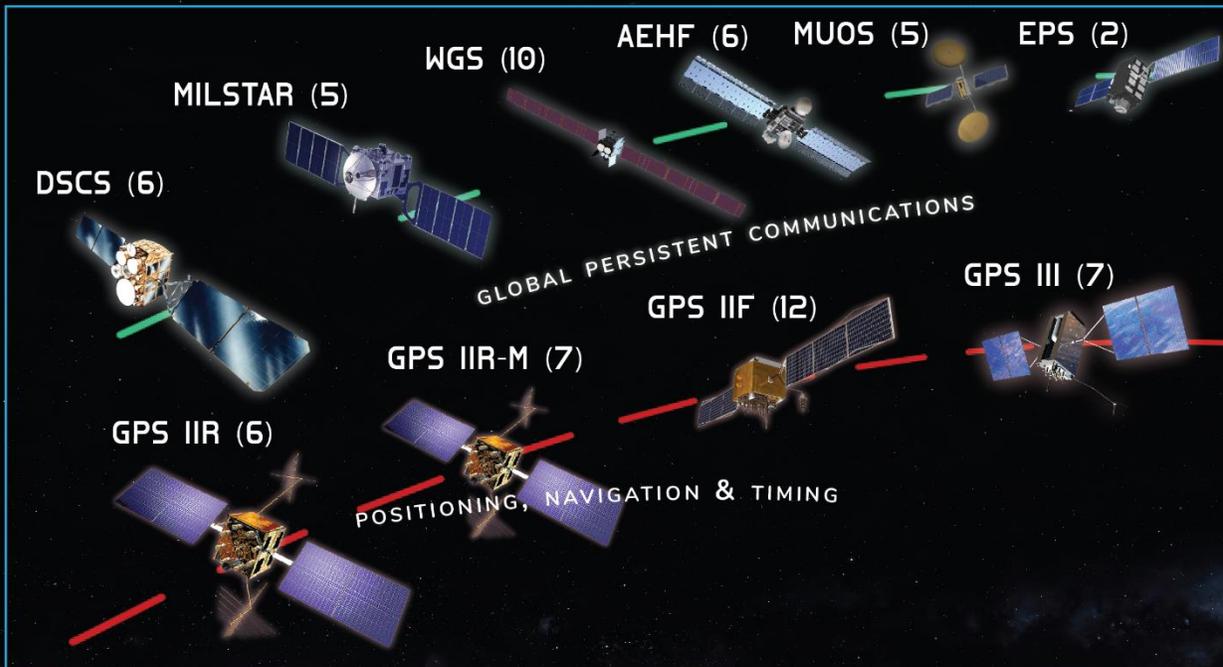
PROGRAMS IN SUSTAINMENT

WGS SV 11-12
W/ HOSTED PAYLOAD
MUOS SV 6-7
EPS-R
HOSTED PAYLOAD
ESS
GPS III SV 08-10
GPS IIIF SV 11-32
R-GPS
(RESILIENT GPS)
PTS-R
PTS-G

PROGRAMS IN DEVELOPMENT/PRODUCTION

TERMINALS

GROUND SYSTEMS

USER EQUIPMENT

AEHF & WGS GROUND
GLOBAL BROADCAST SERVICE
GPS INFORMATION NETWORK (GIN)
LAUNCH, ANOMALY, AND DISPOSAL OPERATIONS(LADO)
SAASM MISSION PLANNING SYSTEM (SMPS)
MUOS GROUND
OCS/AEP
CAPS

GRIFFON
OCX
OCX 3F
PTES
EM&C ENTERPRISE

MGUE INC 1
MGUE INC 2 HANDHELD
MGUE INC 2 MSI RECEIVER

A3M
GPS UE FMS

AFWET
AIRBORNE INTEGRATED TERMINAL GROUP
GROUND MULTI-BAND TERMINAL

GPS USER EQUIPMENT: MILITARY 2+ MILLION / CIVIL 6+ BILLION

AS OF APR 2025

12

GPS Constellation Status

38 Satellites • 31 Set Healthy
Baseline Constellation: 24 Satellites

Satellite Block	Quantity	Average Age (yrs)	Oldest (yrs)
GPS IIR	6 (5*)	23.2	27.7
GPS IIR-M	7 (1*)	17.5	19.5
GPS IIF	11 (1*)	11.2	14.8
GPS III	7	3.9	6.3

*Not set healthy   As of 1 Apr 25

GPS Signal in Space (SIS) Performance
From 1 Apr 24 to 1 Apr 25

Average URE*	Best Day URE	Worst Day URE
29.8 cm	24.5 cm (08 Apr 24)	89.4 cm (25 May 24)

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

GPS III is the newest block of GPS satellites

| GPS Signals |
|---|
| 4 civil signals: L1 C/A, L1C, L2C, L5 |
| 4 military signals: L1/L2 P(Y), L1/L2M |

GPS L5: Safety of Life

Capability	L5 PNT IOC	L5 PNT FOC
Forecast	FY2026	FY2029
Space	18+ L5 SVs • GPS IIF • GPS III	24+ L5 SVs • GPS IIF • GPS III • GPS IIIF
Control	C2 L5 SVs • OCX Blk 1	C2 L5 SVs • OCX 3F
User	Civil Receivers	Civil Receivers

- L5 is designed for safety-of-life applications, offering improved accuracy and reliability

- Today: 18 L5-capable satellites on orbit (11x GPS IIF, 7x GPS III)

- L5 IOC projected for FY2026

- L5 FOC projected for FY2029

GPS Enterprise Roadmap

GPS III Spacecraft

- SV01 Set healthy and available for use on 13 Jan 20
- SV02 Set healthy and available for use on 01 Apr 20
- SV03 Set healthy and available for use on 01 Oct 20
- SV04 Set healthy and available for use on 02 Dec 20
- SV05 Set healthy and available for use on 25 May 22
- SV06 Set healthy and available for use on 16 Feb 23
- SV07 Set healthy and available for use on 22 Jan 25
- SV08 in storage – AFL 10 Jun 21; TLD CY25
- SV09 in storage – AFL 23 Aug 22; TLD CY25
- SV10 in storage – AFL 8 Dec 22; TLD CY25

Seven GPS III satellites declared operational

GPS III Follow-On (GPS IIIF) Spacecraft

- GPS IIIF additional features:
  - Regional Military Protection (RMP)
  - Redesigned Nuclear Detonation (NUDET) Detection System (NDS)
  - Search-and-Rescue (SAR) payload – faster detection and location of distress signals
  - Laser Retroreflector Array (LRA) – provides more precise ranging data
- Total Program Quantity: Up to 22 (10 currently on-contract)
- GPS IIIF Non-Flight Satellite Testbed (GNST+) build-up
  - Completed July 2023
- GNST+ Pathfinding Completed Jul 2024
- SV11 launch forecast for FY2027
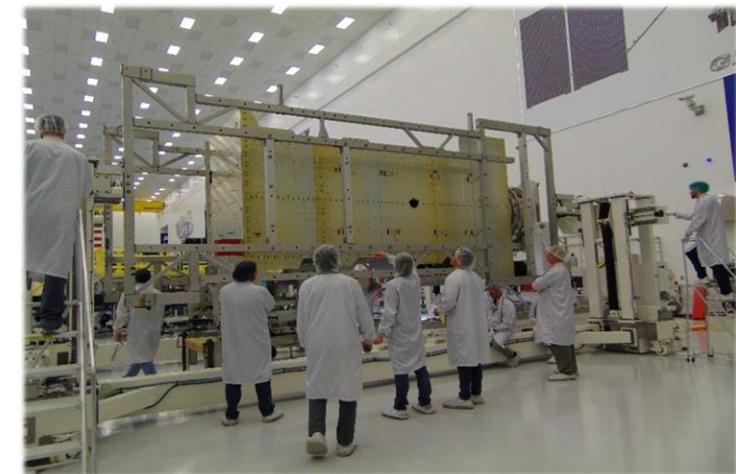
Ensuring the Gold Standard today and into the future

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 IIIF vehicle and new capabilities including RMP
- Current Status
  - OCX Block 1 Site Acceptance Test (SAT) golden dry runs (GDR Phase 2 – MCS/TSF) completed, AMCS (GDR Phase 3) in-progress Integrated System Test (IST) 3-1 Phase 1A complete, IST Phase 1B running in parallel with SAT and Transition Exercise 0 (TE0)
  - Constellation Transfer (CTX) FY26; Operational Acceptance target FY26

OCX program continues to execute and is nearing completion

GPS Enterprise Modernization

SPACE SEGMENT (SATELLITES)

Legacy (GPS IIA/IIR)
• NUDET (Nuclear Detonation) Detection System (NDS)

GPS IIR-M
• 2nd Civil Signal (L2C)
• New Military Signal
• Increased Anti-Jam

GPS IIF
• 3rd Civil Signal (L5)
• Longer Life
• Better Clocks

GPS III (SV01-10)
• Accuracy & Power
• Increased Anti-Jam Power
• Inherent Signal Integrity
• 4th Civil Signal (L1C)

R-GPS
• pMEO satellites
• Legacy & M-Code

GPS IIIF (SV11-32)
• Search & Rescue (SAR) Payload
• Laser Retroreflector Array
• Redesigned NDS Payload
• Regional Military Protection (RMP)

CONTROL SEGMENT (GROUND)

Legacy (OCS)
• Command & Control
• Signal Monitoring

Architecture Evolution Plan (AEP)
• Distributed Architecture
• Increased Signal Monitoring & Accuracy

OCX Block 0
• GPS III Launch & Checkout GPS III Contingency Ops (COps)
• GPS III Mission on AEP
M-Code Early Use (MCEU)

OCX Block 1
• Fly Constellation & GPS III;Control New Signals

OCX Block 2
• Control all signals
• Capability On-Ramps

OCX Block 3F
• Incorporates GPS IIIF Command & Control

USER SEGMENT (RECEIVERS)

Legacy (PLGR/GAS-1/MAGR)
• First Generation System

SAASM-era User Equipment
• Anti-Jam capability
• Electronic Protection

Military GPS User Equipment
• Common GPS Modules
• Increased Access
• Increased Accuracy, Availability, Anti-Tamper Anti-Spoof
• Increased Acquisition in Jamming

19
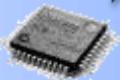
GPS Requirements Management

May 13, 2025

Mr. Daniel Stevenson

Chief, PNT SEIT Branch
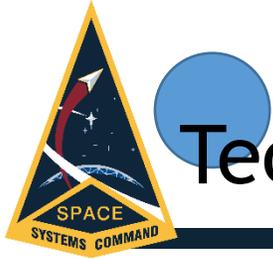
Technical Baseline Change Management Process Flow Chart

Phase 1: Change Initiation

Change Initiation → Lower Level Board Sponsorship → GPS JCRB

Phase 2: Change Development

We Are Here

TIM → Combined Stakeholder Review (PCN Release) → Public ICWG

Phase 3: Change Approval

Lower Level ERB → GPS ERB → Impact Assessment ROM → GPS CCB or Lower Level CCB

Phase 4: Change Implementation

* **GPS CCB-2**

RFP Released → Technical Evaluation → Contract Implementation

JCRB= Joint Change Review Board
ERB= Engineering Review Board
TIM= Technical Interchange Meeting
ROM= Rough Order of Magnitude
PCN= Proposed Change Notice
CCB= Configuration Control Board
ICWG= Interface Control Working Group
RFP= Request for Proposal

Action Items and Feedback

- We will record actions during the discussions and share during the Action Item agenda item

- If you have further actions or feedback after the 2025 PICWG please submit to ssc.cg.picwg@spaceforce.mil

QUESTIONS?

Positioning, Navigation and Timing Mission Public Interface Adjudication Working Group (PICWG) Slides

Template Version 17b – June 3, 2024

ADJUDICATION WORKING GROUP (AWG) for PUBLIC
13-MAY-2025

DOCUMENT CLASSIFICATION
DOCUMENTS: UNCLASSIFIED

REQUEST FOR CHANGE (RFC) NUMBER
RFC-519

RFC TITLE
Civil Integrity Support Message (ISM) Formats

GOVERNMENT POC
Dan Stevenson, SSC/CGEV, 661.731.3267

SE&I POC
Tony Anthony, SSC/CGE/SE&I, 310.418.7693

CM POC
Zena Walker, SSC/CGE/SE&I, 310.386.1964

BLUF - ISM Capability Divided Among RFCs

- ## RFC-519 Civil Integrity Support Message (ISM) Formats
  - ### Action from FAA PMR, support Public document release (Oct), PICWG (Dec)
  - ### Support the development of RTCA/DO-401A and EUROCAE/ED-259B on an earlier schedule
  - ### Mature RFC through PICWG to gain public agreement. No expectation of funding.

Document #	Doc Title (This RFC)	Signal	ISM Message
IS-GPS-200	NAVSTAR GPS Space Segment / Navigation User Segment Interfaces	L2C	MT-40
IS-GPS-705	Navstar GPS Space Segment / User Segment L5 Interfaces	L5	MT-40
IS-GPS-800	NAVSTAR GPS Space Segment / User Segment L1C Interfaces	L1C	SubFrame 3 Page 8

- ## This RFC has been "seeded" by prior RFC ISM work

Tech Baseline Change	Content	Status	Replaced by 519?
RFC-413 – ISM Messages	Original ISM Message RFC	CCB Approved March 2021 (already in our requirements baseline)	✔
RFC 495A – 2022 Public Docs	Included CNAV ISM enhancements	ERB Approved, On-Hold pending Funding	✔
RFC 502 – 2023 Public Docs	CNAV ISM enhancements deferred	Redlines drafted, awaiting a future effort to incorporate in the baseline	

BLUF (cont)

- Future RFC for ISM/ARAIM Content
  - Will allocate functional and performance requirements to all affected segments and programs
  - Will define all interfaces in other non-public documents
  - Will define military-only interfaces
  - Will define implementation plan and cost (to the level of an RFC)

  (Will not be a Public RFC)

Other non-ISM/ARAIM work that was in RFC-495A or RFC-495B or dropped from RFC-502 will be handled in another way per the afternoon Special Topic

RFC-519:
Civil Integrity Support Message (ISM) Formats

DISCOVERY EVENT:	FAA PMR – 30-Jul-2024
RFC CHANGE TYPE:	Correction or Clarification to Baseline

1) PROBLEM STATEMENT:

Complete the Civil Integrity Support Message format portion to enable the ARAIM capability in time to meet FAA's needs in support of RTCA/DO-401A and EUROCAE/ED-259B.

(Pre-RFC-1200, Pre-RFC 1269, partial Pre-RFC-1326)

2) SOLUTION:

Expand and update current related requirements to build solid definitions for the civil ISM messages:
1. L2C and L5 CNAV MT-40 (IS-GPS-200, IS-GPS-705)
2. L1C Subframe 3 Page 8   (IS-GPS-800)

RFC Approval and Schedule

3) APPROVAL AUTHORITY:

☑	Enterprise	Proposed Change (or Variance) affects PNT Delta, PNT Systems Delta, and PEO/TD Technical Baseline documentation. This Enterprise change example will be tri-chaired by both Deltas and PEO/TD.
☐	Inter Delta	Proposed Change (or Variance) affects BOTH PNT Delta and PNT Systems Delta Technical Baseline documentation. This Inter-Delta change example will be bi-chaired by both Deltas.
☐ Intra SYD Delta (Lower Level) SYD3 SYD2	☐ Intra MD 31 Delta (Lower Level) Det 1 31 CDS 31 STS 2d NWS	Proposed Change (or Variance) affects one Contract/Program Technical Baseline or prime contractor documentation

4) SPONSOR, DRIVER & IMPORTANT DATES: THIS RFC IS: ROUTINE

Sponsor: CGEP	Driver Event: H-ARAIM in DFMC SBAS MOPS, RTCA/DO-401A/ED-259B	Driver Event Date: Dec-2025 - 120 days

JCRB	TIM	Stakeholder Review	Comments Due	Resolve Comments	AWG	LL ERB	ERB	JCRB2	Impact Assessment Period	LL CCB	CCB
19 Aug 24	21 Aug 24	Gov 28 Aug 24 / Public 27 Jan 25	Gov 27 Sep 24 / PA Review (2 weeks) / Public 20 Mar25	Gov 11 Oct24 / Public 27 Mar 2025	Gov 22 Oct24 / PICWG 13 May 25	23 Jul 25	06 Aug 25	18 Aug 25	22 Aug 25 – 17 Oct 25	05 Nov25	17 Nov 25

WE ARE HERE

28
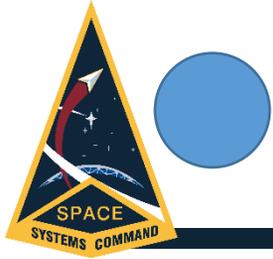
Capabilities Affected

5a) CAPABILITIES AFFECTED: (Ref. GPS E-IMP - hyperlink)

☑ Not Affected | ☐ Affected

		ID	Capability			ID	Capability
		GP-01	Legacy GPS Capabilities Corrected, Sustained and Protected Against Threats			GP-11	First GPS IIIF SV Operational Acceptance Achieved
		GP-02	ERTL of GPS III SV01-SV10 Achieved		★	GP-12	GPS III Enterprise CM FOC Declared
	△	GP-03	Operations Transition from AEP to OCX Completed			GP-13	ERM for GPS IIIF SV 11-32 Achieved
	Ⓜ	GP-04	Full M-Code on OCX Ready for OT&E		★	GP-14	L5 PNT Determination FOC Declared
	△	GP-05	MGUE Increment 1 OT Completed		★	GP-15	L1C PNT Determination IOC Declared
	★	GP-06	GPS III Enterprise CM IOC Declared		★	GP-16	GPS III Enterprise MPO IOC Declared
	★	GP-07	L2C PNT Determination IOC/FOC and DFCN IOC/FOC Declared		★	GP-17	B2EP FOC Declared
	★	GP-08	L5 PNT Determination IOC Declared		★	GP-18	GPS III Enterprise M-Code PNT Determination FOC Declared
	★	GP-09	GPS III Enterprise M-Code PNT Determination IOC Declared		★	GP-19	L1C PNT Determination FOC Declared
	◇	GP-10	MGUE Increment 2 Handheld Receiver Beta Decision Achieved		★	GP-20	GPS III Enterprise MPO FOC Declared

Notes:

No capabilities are affected

LEGEND (per GPS Enterprise Roadmap)

★ IOC/FOC Milestone

Ⓜ MNAV Milestone

△◇ Enterprise Milestones

Coordinated with SE&I Capabilities POC (Wayne Su), Date: 13-MAR-2024

Enterprise Priority Rating (EPR)

5c) ENTERPRISE PRIORITY RATING: 16 Ref. EPR - hyperlink)

The following weighted criteria were chosen to develop this EPR:

Category	Weight	Description
Mission Impact (32.5%)	100	Mission Critical is defined as a requirement vital for the present and/or immediate GPS Enterprise's, Space Force, and/or National Defense goals and objectives. Failure to fund will result in extreme risk or high probability of catastrophic consequences to mission accomplishment and there are no work-arounds or alternative solutions.
	75	Mission Essential is defined as a requirement needed for impending GPS Enterprise's, Space Force, and/or National Defense goals and objectives. Failure to fund will significantly degrade, but not prevent GPS Enterprise's mission accomplishment and there are no acceptable work-arounds or alternative solutions.
	50	Mission Enhancement I (for many or high priority users) is defined as a requirement that will improve or increase future abilities to meet GPS Enterprise objectives; if not funded will not adversely affect the current mission accomplishment.
	25	Mission Enhancement II (for few users) is defined as a requirement that will improve or increase future abilities to meet GPS Enterprise objectives; if not funded will not adversely affect the current mission accomplishment.
	0	No Mission Impact
CDD / Guidance / Capability Impact (32.5%)	100	Not making change precludes system from meeting a KPP or providing a GPS Capability.
	75	Not making change precludes system from meeting a KSA, and/or precludes system from meeting other high level guidance, and/or impairs ability to meet KPP or provide a GPS Capability
	50	Not making change precludes system from meeting an APA, and/or impairs ability to meet other high level guidance.
	25	Not making change reduces supportability of any CDD requirement or GPS capability, can be tolerated with little impact on program objectives.
	0	Change has minimal/no consequences to meeting CDD requirements or delivering GPS Capabilities.

Category	Weight	Description
Performance / Operator Impact / Cyber / NAVWAR (20%)	100	Without change, unable to meet PPS, SPS, or SS-SYS-800 requirements. And/or
		resolves a "Critical" operator issue. And/or
		mitigates an assessed cyber "Very High" or "High".
		mitigates an assessed NAVWAR risk(s) of "Very High" or "High".
	75	Significant performance impact affecting GPS user PNT. And/or
		resolves a "Moderate" operator issue. And/or
		mitigates an assessed cyber "Moderate".
		mitigates an assessed NAVWAR risk(s) of "Moderate".
	50	Minor performance impact affecting GPS user PNT. And/or
		resolves a "Minor" operator issue. And/or
		mitigates an assessed cyber risk(s) of "Low".
		mitigates an assessed NAVWAR risk(s) of "Low".
	25	Minimal performance impact affecting GPS user PNT. And/or
		resolves a "Minimal" operator issue. And/or
		mitigates an assessed cyber "Very Low".
		mitigates an assessed NAVWAR risk(s) of "Very Low".
	0	No performance impact. Does not resolve an operator issue. Does not mitigate a cyber risk. Does not mitigate a NAVWAR risk.
Enterprise or Program Milestone Impact (15%)	100	Without change: unable to meet major enterprise or program milestone.
	75	Without change: impact to major enterprise or program milestone. Significant work-arounds required to achieve milestone. And/or Without change: creates significant lien.
	50	Without change: impact to major enterprise or program milestone, moderate work-arounds required to achieve milestone. And/or Without change: creates moderate lien. And/or Without change: significant impact to other non-GPS enterprise or program milestones. And/or Without change: negative impact to the perception of GPS publicly.
	25	Without change: impact to major enterprise or program milestone, minor work-arounds required to achieve program milestone. And/or Without change: Less than significant impact to other non-GPS enterprise or program milestones.
	0	No impact to major enterprise or program milestone.

Coordinated with SE&I Capabilities POC (Wayne Su), Date: 03-APR-2024

Technical Impacts

6) IMPACTED MISSION/OPERATIONAL/PERFORMANCE (If NOT Approved):
Mission Impact: If the GPS Integrity Support Message (ISM) in IS-GPS-200/705/800 remains uncorrected by RTCA/DO-401A and EUROCAE/ED-259B approval (i.e., ARAIM update to the DFMC SBAS MOPS) minus 4 mo. (12/2025), then Advanced Receiver Autonomous Integrity Monitoring (ARAIM) civil aviation receivers will continue to not support missions requiring Vertical ARAIM service enabling Localizer Performance with Vertical Guidance (LPV) LPV-200 approaches using only GPS or GPS + Galileo and non-safety-of-life ARAIM implementations may be incorrect.   Performance Impact: none

7) ASSOCIATED RISKS/OPEN TECHNICAL ISSUES:

- The ARAIM functionality is being split into RFC-519 detailing the Civil ISM messages and a future RFC, which will detail the rest of the ARAIM functionality at a later time (will support Pre-RFC 1137, Pre-RFC-1326)
  - Military Functionality
    - Military Signal-in-Space Implementation
    - QZSS
  - ISMG Requirements
  - NGA Monitoring Station Requirements including High-Rate Tracking Receivers (HRTR)
  - Space Segment, Control Segment, and User Segment specific requirements
  - Interface changes and additions for all above functions (see Slide 34 for details)
- FAA is now leaning toward using the C/A LNAV signal as one of its dual frequency signals
  - There is no definition for IAURA associated with LNAV ephemeris, which is integral to the ARAIM calculations
  - IS-GPS-200 30.3.1 prohibits GPS receivers from mixing LNAV and CNAV ephemeris related information, so IAURA for a C/A signal must be calculated from the LNAV ephemeris messages
  - This definition work is a "hole" that must be repaired either now or in the future ARAIM RFC (current recommended disposition is Defer)

Technical Impacts

8) ASSOCIATED TRADE STUDIES:
2022 Public ICWG Post Meeting PowerPoint https://smclivelink.losangeles.af.mil/Livelink/llisapi.dll?func=ll&objId=72994400

Stakeholder Review Status

Stakeholder Review Status	Count (%)
No Impact	9 (21%)
No Comments	18 (41%)
Comments Received	8 (19%)
No Response	8 (19%)
Total Stakeholders	**42**
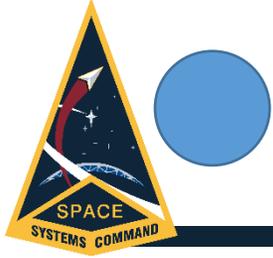
RFC Summary Change

10) SUMMARY OF CHANGES:

Document	# of Reqts Add/Del/Mod	TBD/TBRs (+/-)	Effectivity Changes	# of VCRM Add/Del/Mod	# of Descriptive Text/Table/Figure	Tracing Impacts Up/Down	Notes
IS-GPS-200	5/0/16	0/0	0	5/0/0	44/3/4	0/0	
IS-GPS-705	1/12/2	0/0	0	1/0/0	35/3/1	0/0	
IS-GPS-800	1/12/2	0/0	0	1/0/0	37/3/1	0/0	

- Reworks the ISM definitions for civil signals, reorganizing the vast majority of the description into Appendix 30 of IS-GPS-200
- Reworks the ISM definitions to accommodate future cross-dissemination of other GNSS Integrity Support Data (ISD) over GPS signals

"Refactoring" the Civil Documents Regarding the ISM

- With this major revision of the ISM Message and developments since RFC-413 (2020), we are reorganizing and simplifying Civil SiS interface specifications

  - Reduce overall requirements text volume by eliminating completely duplicate definitions

    - Most descriptions moved to IS-GPS-200's CNAV Appendix 30. The ISM information in IS-GPS-705 (L5 CNAV) and IS-GPS-800 (L1C CNAV-2) is much shorter

  - Provide "hooks" to add support for cross-dissemination of other GNSS's Integrity Support Data (ISD) on the GPS CNAV and CNAV-2 ISM messages and pages

    - Official descriptions for this RFC are limited to GPS and a "Test" message

    - If and when cross-dissemination is added, the description in IS-GPS-200 Appendix 30 will mostly reference other documents

Refactoring Conceptual Diagram

- Cross-dissemination is a likely possibility - Proposing
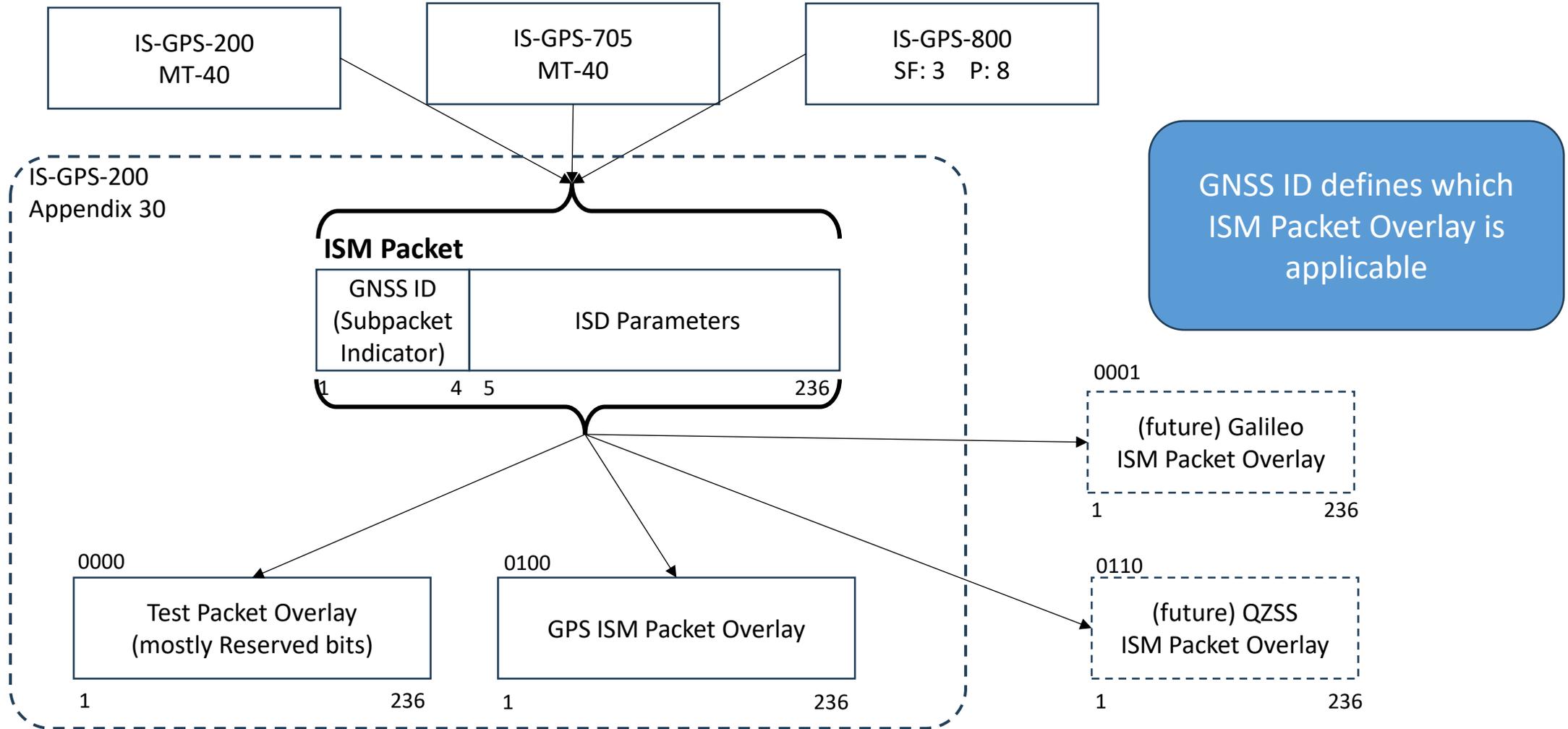
How Short is IS-GPS-705's ISM Section(s) Now?

IS705-196	**20.3.3 Message Content**	Header
IS705-1606		Figure
	* MESSAGE TOW COUNT = 17 MSBs OF ACTUAL TOW COUNT AT START OF NEXT 6-SECOND MESSAGE	
IS705-1608	**Figure 20-14a. Message Type 40 – Integrity Support Message (ISM)**	Figure Caption

IS705-213	**20.3.3.1.1 Message Types 10 and 11 Ephemeris and Health Parameter Content**	Header
IS705-1750	The nominal URA is a conservative estimate of the pseudorange accuracy and is the RSS of an elevation-dependent nominal value of the URA_{ED} component and the nominal value of the URA_{NED} component.	Info-Only

IS705-258	**20.3.3.2.4 Non-Elevation-Dependent (NED) Accuracy Estimates**	Header
IS705-261	The user shall calculate the NED-related URA with the equation (in meters);	Requirement

nominal $URA_{NED} = URA_{NED0}$

$IAURA_{NED} = URA_{NED0} + URA_{NED1} (t - t_{op} + 604{,}800*(WN - WN_{op}))$

for $t - t_{op} + 604{,}800*(WN - WN_{op}) \leq 93{,}600$ seconds

$IAURA_{NED} = URA_{NED0} + URA_{NED1}*(t - t_{op} + 604{,}800*(WN - WN_{op})) + URA_{NED2}*(t - t_{op} + 604{,}800*(WN - WN_{op}) - 93{,}600)^2$

for $t - t_{op} + 604{,}800*(WN - WN_{op}) > 93{,}600$ seconds

where

t is the GPS system time

IS705-1609	**20.3.3.10 Message Type 40 Integrity Support Message (ISM)**	Header
IS705-1613	Message Type 40, as depicted in Figure 20-14a, shall contain the parameters related to GNSS constellation and satellite integrity parameters used for ARAIM algorithms.	Requirement
IS705-1614	The ~~bit~~ISM ~~lengths,~~specific ~~scale~~parameters ~~factors,~~and ~~ranges,~~fields ~~and~~are ~~units~~contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM) may use these parameters ~~are~~for ~~given~~the ARAIM algorithm as referenced in ~~Table~~applicable ~~20-XI~~standards such as TSO, MSO or other standards.	Info-Only
IS705-1745	**20.3.3.10.1 Use of GPS ISM Data**	Header
IS705-1746	The nominal pseudorange error bias (b_{nom}), shall be calculated in accordance with section 30.3.3.10.2 of IS-GPS-200.	Requirement
IS705-1748	Where IAURA in that formula is described in sections 20.3.3.1.1, 20.3.3.1.1.4, and 20.3.3.2.4.	Info-Only

How Short is IS-GPS-800s's ISM Section(s) Now?

IS800-142	**3.5.2 Subframe 1**	Header
IS800-1030		Figure
IS800-1031	**Figure 3.5-8a Subframe 3, Page 8, Integrity Support Message**	Figure Caption
IS800-190	The user shall calculate the NED-related URA with the equation (in meters); nominal URANED = URANED0 IAURANED = URANED0 + URANED1 (t - top + 604,800*(WN - WNop)) for t - top + 604,800*(WN - WNop) $\leq$ 93,600 seconds IAURANED = URANED0 + URANED1*(t - top + 604,800*(WN - WNop)) + URANED2*(t - top + 604,800*(WN - WNop) - 93,600)2 for t - top + 604,800*(WN - WNop) > 93,600 seconds where t is the GPS system time	Requirement

IS800-210	**3.5.3.10 Integrity Assurance**	Header
IS800-211	The L1C message will contain information that ~~allows users to operate~~indicates when integrity is assured to an enhanced level. This is accomplished using an integrity assured URA value in conjunction with an ~~integrity~~Integrity ~~status~~Status ~~flag~~Flag (ISF). The ~~URA~~IAURA value is the RSS of URAED and URANED; ~~URA~~IAURA is integrity assured to the enhanced level only when the ~~integrity status flag~~ISF is "1".	Info-Only
IS800-1189	The nominal URA is a conservative estimate of the pseudorange accuracy and is the RSS of an elevation-dependent nominal value of the URAED component and the nominal value of the URANED component.	Info-Only

IS800-1032	**3.5.4.7 Subframe 3, Page 8- Integrity Support Message (ISM)**	Header
IS800-1035	Subframe 3, Page 8, as depicted in Figure 3.5-8a, shall contain the parameters related to GNSS constellation and satellite integrity parameters used for ARAIM algorithms.	Requirement
IS800-1036	The ~~bit~~ISM ~~lengths,~~specific ~~scale~~parameters ~~factors,~~and ~~ranges,~~fields ~~and~~are ~~units~~contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM) may use these parameters ~~are~~for ~~given~~the ARAIM algorithm as referenced in ~~Table~~applicable ~~3.5-9~~standards such as TSO, MSO or other standards.	Info-Only
IS800-1181	**3.5.4.7.1 Use of GPS ISM Data**	Header
IS800-1182	The nominal pseudorange error bias (bnom), shall be calculated in accordance with section 30.3.3.10.2 of IS-GPS-200.	Requirement
IS800-1184	Where IAURA in that formula is described in sections 3.5.3.10, 3.5.3.5, 3.5.3.8, and 6.2.1.	Info-Only

IS800-296	**6.2.1 User Range Accuracy**	Header
IS800-297	User Range Accuracy (URA) is …	Info-Only
IS800-1185	The composite integrity assured URA (IAURA) value is the RSS of an elevation-dependent function of the upper bound value of the URAED component and the upper bound value of the URANED component.	Info-Only

38
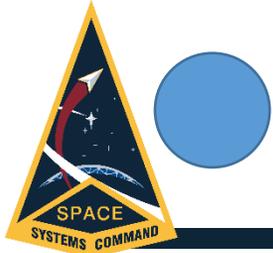
Stakeholder Review
Comment Resolution Matrix (CRM) Status - for PICWG

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:

Disposition/Type	Critical	Substantial	Administrative	Totals	Concurrence	Notes
Accept		15	11	26	26	
Accept with Comment		28	7	35	35	
Reject	2	4		6	6	CRM #151, #152 Showed commenter how info in the GPS ISM Packet Parameters Table allows calculation of the β_{nom} and γ_{nom} values.
Defer			1	1	1	
TBD						
Grand Totals:	2	47	19	68	68	

All Commenters Concurred
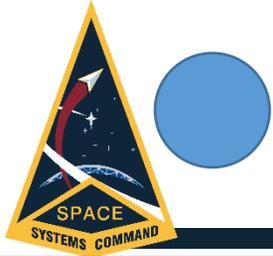
Stakeholder Review
Comment Resolution Matrix (CRM) Status - at PICWG

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:

Disposition/Type	Critical	Substantial	Administrative	Totals	Concurrence	Notes
Accept		1	1	2	2	
Accept with Comment			1	1	1	
Reject						
Defer						
TBD						
Grand Totals:		1	2	3	3	

All stakeholders at PICWG Concurred

Does the IS Packet Overlay Introduction Have to Be a Requirement?

| DOORS ID	IS200-2392, IS200-2393		
Paragraph	30.3.3.10.1.2 ISM Packet Overlay Formats 30.3.3.10.1.2.1 30.3.3.10.1.2.1 Test Packet – GNSS ID = 0000	**Comment Number**	CRM #90, #110, #122, #132
Comment Type	90., 110., 122. Substantive 132. Administrative	**Disposition**	Accept with Comment
Comment Originator(s)	LMCO Concurs SE&I Concurs Raytheon Concurs		
Comment	90. Object Type is inconsistent with text. Suggests this should not be a Requirement. Text has no "shall" statement and is describing the purpose of this section of the document. 110. The object is listed as a Requirement, but doesn't contain a 'shall' statement, and reads like an 'Info Only' statement as a description of what is contained in the subsequent section. Retain the 'IS' verbiage and change Object Type to 'Info Only'. It appears the intent of this object is to describe the content of a section, not to levy a requirement. The specific ISM Packet overlays are the actual requirements that need to be verified. 122. ID is listed as a requirement but does not contain a "shall" statement. Will need to add a "shall" statement to keep as a requirement or change to "Info Only". 132. Object Type looks like "Info Only". Update Object Type to "Info Only".		
Government Response	Accept With Comment. The originally specified DOORS ID is in the introduction to the ISM Packet so it should be Info-Only. However, a larger examination shows that the first paragraph for the Test Packet should be a Requirement in keeping with the overall IS-GPS-200 convention for what is a requirement.		

ISM Packet Overlay & Test Packet Proposal Redlines

Paragraph	IS200-2392, IS200-2393

What Has Been Proposed (in Green)			
	IS200-2389	***30.3.3.10.1.2 ISM Packet Overlay Formats***	Header
	IS200-2392	This section describes the different constellation specific ISM Packet overlays that are currently defined to detail the ISD parameters inside bits 5 through 236 of the ISM Packet.	Info-Only ~~Requirement~~
	IS200-2390	***30.3.3.10.1.2.1 Test Packet – GNSS ID = 0000***	Header
	IS200-2393	The 236-bit Test Packet shall be ~~is~~ applicable when GNSS ID = 0000 (see Figure 30-18). This packet is for test purposes and doesn't contain any data operationally useful to the ARAIM function.	Requirement ~~Info-Only~~
	IS200-2394	If user equipment encounters this packet, it should be ignored.	Info-Only

Does the GPS ISM Packet Have to Have a Requirement?

DOORS ID	IS200-2397		
Paragraph	30.3.3.10.1.2.2	Comment Number	CRM #91, #92, #99, #123, #133
Comment Type	91., 123, 133. Substantive 92. Administrative 99. Administrative	Disposition	91., 123, 133 Accept With Comment 92. Accept 99. Accept
Comment Originator(s)	LMCO Concurs SE&I Concurs Aerospace Concurs Raytheon Concurs		
Comment	91. Object Type is inconsistent with text. Suggests Object Type = Info-Only. Text has no "shall" statement and is describing the purpose of this section of the document. 123. ID is listed as a requirement but does not contain a "shall" statement. Will need to add a "shall" statement to keep as a requirement or change to "info-only". 133. Re-write the statement to include shall. Clarification In the PCN, you could/should add a space between the word "Packet" and the parenthetical reference to Figure 30-19. The Draft UpRev artifacts seem to have the space so no correction needed there. 99. I found this very difficult to parse as written		
Government Response	91., 123, 133. Accept With Comment. While the commenters have a correct point, the SME team decided the 1st statement should be a requirement and a "shall" will be added. The underlying reason is that all statements of this type in the public SiS documents are Requirements. The first sentence would typically be expressed as software in any GPS user segment equipment that implements ARAIM and it affects control segment software that will have to assemble the packet. 92. Accept. Typo 99. Accept. Suggested wording is clearer (see next slide)		

43
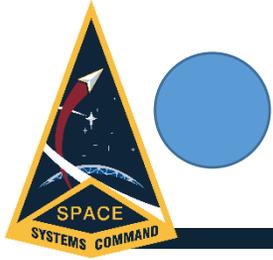
GPS ISM Packet Proposed Redlines

| Paragraph	IS200-2397
As presented at PICWG	30.3.3.10.1.2.2 GPS ISM Packet – GNSS ID = 0100 Each 236-bit GPS ISM Packet (see Figure 30-19) shall be applicable to a specific subset of SVs identified in the GPS PRN Inclusion Mask for the given Service Level, constellation identified by GNSS ID and start time. The GPS ISM Packet overlay format is applicable only when GNSS ID = 0100. *Object Type*: Requirement
As Agreed at PICWG (new changes in Green)	30.3.3.10.1.2.2 GPS ISM Packet – GNSS ID = 0100 Each 236-bit GPS ISM Packet (see Figure 30-19) shall be applicable to a specific subset of SVs identified in the GPS PRN Inclusion Mask for the given Service Level, start time, and constellation identified by GNSS ID, which is and start time. The GPS ISM Packet overlay format is applicable only when = 0100. *Object Type*: Requirement

Should GPS Inclusion Mask Description Be A Requirement or Info-Only?

DOORS ID	IS200-1795		
Paragraph	30.3.3.10.1.2.2.11	Comment Number	CRM #93
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	LMCO Concurs		
Comment	Object Type is inconsistent with text. Text was modified to change "is" to "shall be" but the object type is "Info-Only." If this is an Info-Only object, recommend reverting the "shall be" back to "is." If this is intended to be a requirement, the Object Type should be updated to "Requirement"		
Government Response	Accept With Comments. Will change to Requirement. We specifically changed the wording to a requirement the forgot to change the Object Type		

Bit Description for GPS Inclusion Mask Bit Proposal

Paragraph	IS200-1795

After Govt. AWG	The applicability of each PRN ~~is~~shall be indicated by:
	    0 = Information in ~~the~~this ~~current~~GPS ISM Packet does not apply to this PRN
	    1 = Information in ~~the~~this ~~current~~GPS ISM Packet does apply to this PRN
	Object Type: ~~<blank>~~Info-Only

Current Proposed	The applicability of each PRN ~~is~~shall be indicated by:
	    0 = Information in ~~the~~this ~~current~~GPS ISM Packet does not apply to this PRN
	    1 = Information in ~~the~~this ~~current~~GPS ISM Packet does apply to this PRN
	Object Type: ~~<blank>~~~~Info-Only~~Requirement

Claimed Miss edit

DOORS ID	IS705-1748, IS800-1184		
Paragraph	IS-GPS-705 20.3.3.10.2 IS-GPS-800 3.5.4.7.2	**Comment Number**	CRM #94,#95
Comment Type	Administrative	**Disposition**	Accept
Comment Originator(s)	LMCO Concurs		
Comment	94. Object IS705-1748 is described as "Insertion after object IS705-1747" but IS705-1747 was an RFC-495 object that never got baselined. In the Draft UpRev artifacts, the sequence of object IDs is IS705-1745, IS705-1746, IS705-1748. I know that the PCN description is based on what is in SE&I DOORS, but since object IS705-1747 was never an officially approved object, it seems like the more accurate description is "Insertion after object IS705-1746." 95. Object IS800-1184 is described as "Insertion after object IS800-1183" but IS800-1183 was an RFC-495 object that never got baselined. In the Draft UpRev artifacts, the sequence of object IDs is IS800-1181, IS800-1182, IS800-1184. I know that the PCN description is based on what is in SE&I DOORS, but since object IS800-1183 was never an officially approved object, it seems like the more accurate description is "Insertion after object IS800-1182."		
Government Response	Accept. The observation is a limitation of DOORS which will disappear when the documents are approved and an UpRevs made, but will be hand edited as needed.		

IS-GPS-705 Illustration of No-Longer-Used DOORS IDs

Paragraph	IS705-1748
As in last PCN	**IS705-1748**: Insertion after object IS705-1747 **Section Number:** 20.3.3.10.2.0-3 **WAS:** <INSERTED OBJECT> **Redlines:** Where IAURA in that formula is described in sections 20.3.3.1.1, 20.3.3.1.1.4, and 20.3.3.2.4. *Object Type*: Info-Only
Will Change to (in Green)	**IS705-1748**: Insertion after object IS705-1746 ~~IS705-1747~~ **Section Number:** 20.3.3.10.2.0-3 **WAS:** <INSERTED OBJECT> **Redlines:** Where IAURA in that formula is described in sections 20.3.3.1.1, 20.3.3.1.1.4, and 20.3.3.2.4. *Object Type*: Info-Only

IS-GPS-800 Illustration of No-Longer-Used DOORS IDs

Paragraph	IS800-1184
As in last PCN	**IS800-1184**: Insertion after object IS800-1183 **Section Number:** 3.5.4.7.2.0-3 **WAS:** <INSERTED OBJECT> **Redlines:** Where IAURA in that formula is described in sections 3.5.3.10, 3.5.3.5, 3.5.3.8, and 6.2.1. *Object Type*: Info-Only
Will Change to (in Green)	**IS800-1184**: Insertion after object IS800-1182 ~~IS800-1183~~ **Section Number:** 20.3.3.10.2.0-3 **WAS:** <INSERTED OBJECT> **Redlines:** Where IAURA in that formula is described in sections 3.5.3.10, 3.5.3.5, 3.5.3.8, and 6.2.1. *Object Type*: Info-Only

Is "ISD Data" a Redundancy Mistake?

DOORS ID	IS200-1766, IS200-2387		
Paragraph	30.3.3.10.1.1 Figure 30-17	Comment Number	CRM #96, #101, #102
Comment Type	Administrative	Disposition	Accept With Comments
Comment Originator(s)	Aerospace Concurs LMCO Concurs		
Comment	96. Given that the "D" in "ISD" stands for "Data" …. Should that field just be labeled as "Integrity Support Data"? 101. The "D" is ISD stands for Data so "ISD data" is redundant. Suggests "…The ISM Packet contains the GNSS ID and ISD specific to the constellation's ISD needs." 102. The "D" is ISD stands for Data so "ISD DATA" is redundant. Suggests In all 3 sections of figure, "ISD DATA" -> "ISD"		
Government Response	Accept With Comments. The SME team observed that "ISD Parameters" would provide consistency across the documents. This sidesteps the "D" in "ISD" vs "data" involving redundancy		

ISD Data Redundancy Illustration

Paragraph	IS200-1766, IS200-2387
Post Govt. AWG	 • • • The ISM Packet contains the GNSS ID, and ISD Parameters ~~data~~ specific to the constellation's ISD needs. *Object Type*: Requirement ![diagram showing bit layout with "1", "5", "100" markers, "4 BITS" and "ISD PARAMETERS 96 BITS" circled, arrow pointing to "GNSS ID"]
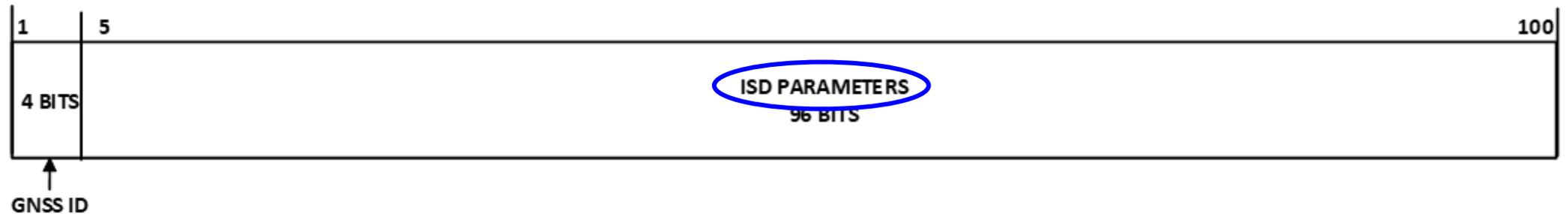
Extra Comma

DOORS ID	IS200-1766, IS705-1614, IS800-1036		
Paragraph	IS-GPS-200 30.3.3.10.1.1 IS-GPS-705 20.3.3.10.1 IS-GPS-800 3.5.4.7.1	Comment Number	CRM #97
Comment Type	Administrative	Disposition	Accept
Comment Originator(s)	Aerospace Concurs		
Comment	For the paragraph that starts with "Users who implement…" there appears to be an extra comma after "(ARAIM)" that should be deleted.		
Government Response	Accept. "who … (ARAIM)" was originally meant to be a restrictive clause, so it took a while to find out there should be no leading or following commas		

Extra Comma Example

| Paragraph	IS200-1766, IS705-1614, IS800-1036
Post Govt. AWG	• • • Users ~~used~~who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM ~~algorithms~~algorithm as referenced in future TSO and MSO. • • •
Newly Proposed	• • • Users ~~used~~who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM)~~,~~ may use these parameters for the ARAIM ~~algorithms~~algorithm as referenced in future TSO and MSO. • • •

Error in Figure Reference

DOORS ID	IS800-1036		
Paragraph	3.5.4.7.1	**Comment Number**	CRM #109
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	LMCO Concurs		
Comment	This Info-Only redline states that "…shown in Figure 30-7 of IS-GPS-200". Figure 30-7 in IS-GPS-200N is Message Type 34 - Clock & Differential Correction and does not identify the SIM specific parameters and fields of the ISM Packet. Instead, use the MT 40 figure…Figure 30-17.		
Government Response	Accept. This is a Typo specific to IS-GPS-800. The corresponding IS705-1614 didn't have this mistake.		

Redline To Correct Figure Reference

Paragraph	IS800-1036
Red Lines for CRM #109 and #97	The ISM specific parameters and fields are contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM algorithm as referenced in future TSO and MSO.
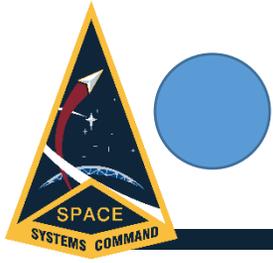
Wants To Replace "future TSO and MSO"

DOORS ID	**IS200-1624**, IS200-1766, **IS705-1551,** IS705-1614, IS800-1036		
Paragraph	IS-GPS-200 **Table 30-XXI**, 30.3.3.10.1.1 IS-GPS-705 **Table 20-XXI**, 20.3.3.10.1 IS-GPS-800 3.5.4.7	Comment Number	CRM #119, #120, #121
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	FAA Concurs		
Comment	119. , 120. 121. Avoid the term "future" TSO. For the government, TSO is not the only way to implement a standard. Replace "future TSO" with "applicable standards such as TSO, MSO or other standards". While it is likely there will be a future TSO, it is not a sure thing there will be one.		
Government Response	Accept With Comments 1. The two tables referenced in the CRM items were deleted with RFC-502, but each of the three SiS documents has "future TSO …" in other places. 2. It is not clear that the proposed language conveys the precision normally associated with an "IS".		
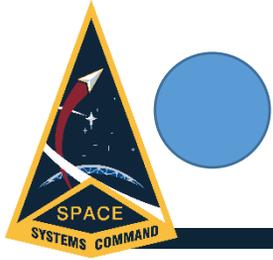
IS-GPS-200 Example of "future TSO and MSO"

| Paragraph	IS200-1766
Proposal at PICWG	The ISM Packet shall contain the parameters related to GNSS constellation and satellite integrity parameters. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM algorithm as referenced in applicable standards such as TSO, MSO or other standards. The ISM Packet contains the GNSS ID, and ISD data specific to the constellation's ISD needs. *Object Type*: Requirement
Agreed At PICWG (in Green)	The ISM Packet shall contain the parameters related to GNSS constellation and satellite integrity parameters. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM)~~,~~ may use these parameters for the ARAIM algorithm as referenced in applicable standards ~~such as~~ (e.g. TSO, MSO~~)~~ ~~or other standards~~. The ISM Packet contains the GNSS ID, and ISD data specific to the constellation's ISD needs. *Object Type*: Requirement
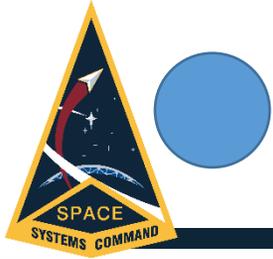
IS-GPS-705 Proposed Change

Paragraph	IS705-1614
Proposal at PICWG	The ISM specific parameters and fields are contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM algorithm as referenced in applicable standards such as TSO, MSO or other standards. *Object Type*: Info-Only
Agreed At PICWG (in Green)	The ISM specific parameters and fields are contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM algorithm as referenced in applicable standards such as (e.g. TSO, MSO) or other standards. *Object Type*: Info-Only

IS-GPS-800 Proposed Change

Paragraph	IS800-1036
Proposal at PICWG	The ISM specific parameters and fields are contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM), may use these parameters for the ARAIM algorithm as referenced in applicable standards such as TSO, MSO or other standards. *Object Type*: Info-Only
Agreed At PICWG (in Green)	The ISM specific parameters and fields are contained in the ISM Packet (reference 30.3.3.10 of IS-GPS-200) whose structure is shown in Figure 30-17 of IS-GPS-200. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM)~~,~~ may use these parameters for the ARAIM algorithm as referenced in applicable standards ~~such as~~ (e.g. TSO, MSO) ~~or other standards~~. *Object Type*: Info-Only

About How GNSS ID Is Described

DOORS ID	IS200-1777		
Paragraph	30.3.3.10.1.1.1	Comment Number	CRM #98, #128
Comment Type	Administrative	Disposition	98. Accept With Comments ~~Reject~~ 128. Accept
Comment Originator(s)	Aerospace Concurs Raytheon Concurs		
Comment	98. It seems strange to be listing so many as "Reserved" individually and then a range of 1000-1111 as "Reserved for other systems" 128. 0000 should be labelled as "For Test Use Only" or "Test Packet" to match description in IS200-2390 and 2393		
Government Response	98. Accept With Comments. Will collapse most "Reserved" values, except the "0001" because it is widely used to represent the GNSS system Galileo and it is somewhat likely that number will be used in the future when cross-dissemination of ISM data is approved for transmission on GPS signals. 128. Accept. Going with "Test Packet (For Test Use Only)"		
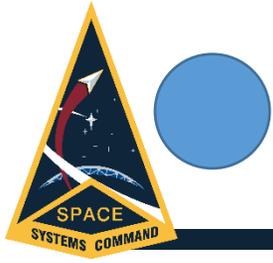
Agreed Result at PICWG about GNSS ID

Paragraph	IS200-1777
Proposal at PICWG	The four bits are defined as follows: 0000 = Test Packet (For Test Use Only) 0001 = Reserved 0010 = Reserved 0011 = Reserved 0100 = GPS 0101 = Reserved 0110 = Reserved 0111 = Reserved 1000 through 1111 = Reserved for other systems
Agreed At PICWG	The four bits are defined as follows: 0000 = Test Packet (For Test Use Only) 0001 = Reserved 0010 through 0011 = Reserved 0100 = GPS 0101 through 1111 = Reserved

Change Bits Label to Singular

DOORS ID	IS200-1816

Paragraph	Table 30-XIc PRN Mapping	**Comment Number**	CRM #100
Comment Type	Administrative	**Disposition**	Accept

Comment Originator(s)	LMCO Concurs
Comment	The column label "Bits" be singular ("Bit"). Each row is only identifying one bit.
Government Response	Accept. Oversite that was supposed to be fixed by CRM #55

Corrected "Bit" Label

Paragraph	IS200-1816
Proposed Change	

Bits	GPS PRN
55	PRN 1
56	PRN 2
57	PRN 3
58	PRN 4
59	PRN 5
60	PRN 6
61	PRN 7
62	PRN 8
63	PRN 9
64	PRN 10
65	PRN 11
66	PRN 12
67	PRN 13
68	PRN 14
69	PRN 15
⋮	⋮

Obsolete Reference Documents for PICWG Process

DOORS ID	IS200-5, IS200-6, IS200-7, IS200-2039, IS705-5, IS705-6, IS705-7, IS705-13, IS-800-7, IS800-8, IS800-9, IS800-1123		
Paragraph	IS-GPS-200 1.2 IS Approval and Changes IS-GPS-705 1.2 IS Approval and Changes IS-GPS-800 1.3 IS Approval and Changes	Comment Number	CRM #103
Comment Type	Administrative	Disposition	Defer
Comment Originator(s)	SE&I Concurs		
Comment	The documents that govern the PICWG process have changed. Change the appropriate text in IS-GPS-200/705/800.		
Government Response	Defer. This change is not exactly on the subject of ISM Message Formats and the subject of this front matter brings up a host of questions about how much detailed process information should be in this front matter.		

Minimum Proposed Edits - Deferred

Paragraph	IS200-TBD, IS200-TBD, IS705-5, IS705-6, IS800-8, IS800-9
IS-GPS-200 IS-GPS-705 Proposed Redlines - Deferred	**1.2 IS Approval and Changes** The Interface Control Contractor (ICC) designated by the government is responsible for the basic preparation, approval coordination, distribution, retention, and Interface Control Working Group (ICWG) coordination of the IS in accordance with PNT-03-001 ~~GP-03-001~~. The ~~Navstar~~ ~~GPS~~ MilComm & PNT Directorate (~~SM~~SSC/CG~~GP~~) is the necessary authority to make this IS effective. ~~SM~~SSC/CG~~GP~~ administers approvals under the auspices of the Configuration Control Board (CCB), which is governed by the appropriate ~~GPS~~ MilComm & PNT Directorate ~~Operating Instruction (OI).~~ Military organizations and contractors are represented at the CCB by their respective segment member. All civil organizations and public interest are represented by the Department of Transportation representative of the ~~SM~~SSC/CG~~GP~~. A proposal to change the approved version of this IS can be submitted by any ICWG participating organization to the GPS Directorate and/or the ICC. The ICC is responsible for the preparation of the change paper and change coordination, in accordance with PNT-03-001 ~~GP-03-001~~. The ICC prepares the change paper as a Proposed Interface Revision Notice (PIRN) and is responsible for coordination of PIRNs with the ICWG. The ICWG coordinated PIRN must be submitted to the ~~GPS~~ MilComm & PNT Directorate CCB for review and approval. **2.1 Applicable Documents** PNT-03-001 Current Version Adjudication Working Group (AWG) And Rough Order Of Magnitude (ROM) / Impact Assessment (IA) Charter ~~GP-03-001 Current Version GPS Adjudication Working Group (AWG) And Rough Order of Magnitude (ROM) / Impact Assessment (IA) Charter~~
IS-GPS-800 Proposed Redlines - Deferred	**1.x IS Approval and Changes** The Interface Control Contractor (ICC) designated by the government is responsible for the basic preparation, approval coordination, distribution, retention, and Interface Control Working Group (ICWG) coordination of the IS in accordance with PNT-03-001 ~~GP-03-001~~. The ~~Navstar~~ ~~GPS~~ MilComm & PNT Directorate (~~SM~~SSC/CG~~GP~~) is the necessary authority to make this IS effective. ~~SM~~SSC/CG~~GP~~ administers approvals under the auspices of the Configuration Control Board (CCB), which is governed by the appropriate ~~GPS~~ MilComm & PNT Directorate ~~Operating Instruction (OI).~~ Military organizations and contractors are represented at the CCB by their respective segment member. All civil organizations and public interest are represented by the Department of Transportation representative of the ~~SM~~SSC/CG~~GP~~. A proposal to change the approved version of this IS can be submitted by any ICWG participating organization to the GPS Directorate and/or the ICC. The ICC is responsible for the preparation of the change paper and change coordination, in accordance with PNT-03-001 ~~GP-03-001~~. The ICC prepares the change paper as a Proposed Interface Revision Notice (PIRN) and is responsible for coordination of PIRNs with the ICWG. The ICWG coordinated PIRN must be submitted to the ~~GPS~~ MilComm & PNT Directorate CCB for review and approval. **2.1 Applicable Documents** PNT-03-001 Current Version Adjudication Working Group (AWG) And Rough Order Of Magnitude (ROM) / Impact Assessment (IA) Charter ~~GP-03-001 (Current Issue) GPS Adjudication Working Group (AWG) And Rough Order of Magnitude (ROM) / Impact Assessment (IA) Charter~~

Inconsistent Section Numbering

DOORS ID	IS705-1745		
Paragraph	20.3.3.10.1	Comment Number	CRM #105
Comment Type	Administrative	Disposition	Accept
Comment Originator(s)	Boeing		
Comment	Section number in the non-redlined version (20.3.3.10.1) doesn't match the redlined version (20.3.3.10.2)		
Government Response	Accept. The number should be 20.3.3.10.1. Will look for this defect in future document productions. Both PCNS for IS-GPS-705/800 use the wrong paragraph number due to limitations of the DOORS tool. This defect in DOORS PCNs and IRNs is fixed by the time it goes to the baselined database and UpRevs. Will hand fix as possible for official documents through CCB.		

Sample of Numbering Problem

Paragraph	IS200-1745
Red Lines	**IS705-1745**: Insertion after object IS705-1612 **Section Number:** 20.3.3.10.2 **WAS:** <INSERTED OBJECT> **Redlines:** *Object Heading*: 20.3.3.10.2 Use of GPS ISM Data *Object Type*: Header **IS:** *Object Heading*: 20.3.3.10.2 Use of GPS ISM Data *Object Type*: Header **Rationale:** 10/28/2024 Per the AWG, added GPS to indicate the following formula is only relevant to GPS signals. (T. Anthony) 10/10/2022 Create "Use of ISM Data" section to define the formula for bnom. (T. Anthony)

Should all be 20.3.3.10.1

Singular vs Plural "Figures" & Recommendation for "See Text"

DOORS ID	IS200-1770		
Paragraph	Table 30-XIa	**Comment Number**	CRM #106, #107, #129, #130
Comment Type	106., 107. Administrative 129., 130. Substantive	**Disposition**	106., 107., 130. Accept 129. Reject
Comment Originator(s)	Boeing Concurs LMCO Concurs Raytheon Concurs		
Comment	106. In the single asterisk '*' footnote, "Figure' is incorrectly being changed to plural "Figures". It should remain singular because it is only referring to one figure. 107. The letter 's' was added to the word 'Figure' which indicates that multiple Figure 30-19s exist. In the UpRev document there is only one Figure 30-19. Recommend changing "Figures 30-19" to "Figure 30-19'. 130. * GPS ISM Packet is described in Figure 30-19, remove the extra "s" after the word "Figure" 129. Valid Range column for "WNISM". Suggested Text is "See Text"		
Government Response	106., 107., 130. Accept 129. Reject. At CRM #66 during the Government AWG, this very field was discussed with a decision in the opposite direction. This is a full range field, and that commenter did not feel any reference to "see text" was needed.		

Recommended Deletion in Green

Paragraph	IS200-1770
Red Lines	

Parameter	No. of Bits** *	Scale Factor (LSB)	Valid Range*** *	Units
WN_{ISM}	13	1		weeks
TOW_{ISM}	6	4	0 to 164	hours
t_{correl}	4		~~0 to 12~~ See text	~~hours~~
~~b~~β_{nom}	4	0.1	~~0 to 2~~	meters
γ_{nom}	4	0.05	~~0 to 2~~	dimensionless
R_{sat}	4		~~1x10⁻³ to 3.16x10⁻¹⁰~~ See text	~~/hours~~
MFD_{sat}	4		See text	
PR_{const}	4		See text	
MFD_{const}	4		~~0.25 to 24~~ See text	~~hours~~
Service Level***	3		See text	
GPS PRN Inclusion Mask ****	63		See text	
Reserved For ISM	87		See text	
ISM CRC	32		See text	

* See Figures 30-19 ~~14a~~ for complete bit allocations in the GPS ISM Packet ~~Message Type 40~~

** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor

*** See Table 30-XIb for Service Level Descriptions

**** See Table 30-XI~~b~~c for GPS PRN Inclusion Mask bit mapping

Inconsistency in "RESERVED FOR"

DOORS ID	IS200-2130		
Paragraph	30.3.3.10.1.2.2.12	Comment Number	CRM #108
Comment Type	Substantive Administrative	Disposition	Accept With Comments
Comment Originator(s)	LMCO Concurs		
Comment	The inserted object identifies bits 118-204 as "reserved for future ISD use". The figure has "reserved for ISM". Because this is a technical document, it really should be precise. The description of the figure should match the figure's wording. Either change the figure or change this description. Probably change the figure to read: "**RESERVED FOR FUTURE ISM USE…83 BITS**" and change the identifier under bits 201-204 to say "**RESERVED FOR FUTURE ISM USE**"		
Government Response	Accept With Comments. SME Team decided on "RESERVED FOR ISM". This should be sufficient to discourage anyone from trying to take over these bits for some other purpose yet doesn't imply ISM has any particular future plan for these bits. How the packet is made with a CRC makes use of these bits for some purpose other than ISM impractical.		

Illustration of RESERVED FOR Issue

Paragraph	IS200-2398, IS200-2130
IS200-2398 Current Proposal	
IS200-2130 Current Proposal	Bits 118 through 204 of the GPS ISM Packet are Reserved for ISM reserved for future ISD use.
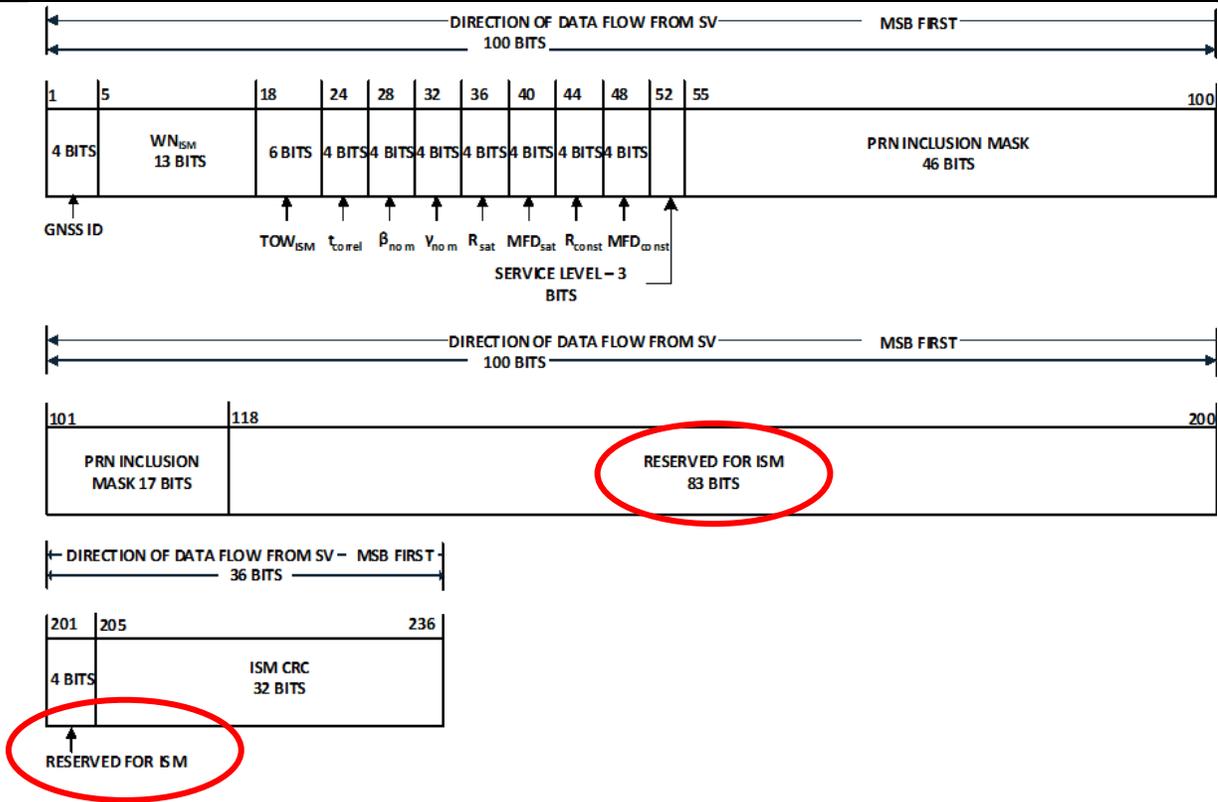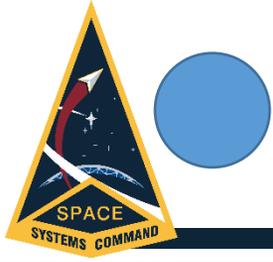
Define "Nominal URA" & Enhanced Integrity

| DOORS ID	IS200-1943, IS200-2401, IS705-639, IS705-1750, IS-800-211, IS800-1189		
Paragraph	IS-GPS-200 30.3.3.1.1 IS-GPS-705 20.3.3.1.1 IS-GPS-800 3.5.3.10	Comment Number	CRM #111, #113, #115
Comment Type	Substantive	Disposition	Accept ~~With Comment~~
Comment Originator(s)	FAA Concurs		
Comment	**Nominal URA** 111. The IS document does not give guidance on calculating nominal URA. Add guidance to Section 30.3.3.1.1. It should probably go in the paragraph on IAURA. 113. (assumed similar but for IS-GPS-800) **Enhanced Integrity** 115. IS-GPS-800 is Missing concept of enhanced level. Always integrity assured, flag indicates assurance to an enhanced level.		
Government Response	Accept ~~With Comments~~ ~~The RE is struggling to determine if~~ ~~1. This belongs in a section on IAURA when it begins with "The nominal URA …". URA in defined is 6.2.1~~ ~~2. Why are we using a term like "Nominal" in defining this URA? This seems imprecise. This implies there are more non-nominal URAs that should have formulae applicable in what are non-nominal conditions.~~		

Nominal URA – Addition to IS-GPS-200

| Paragraph	IS200-1943 (plus new DOORS ID IS200-2401)
Red Lines of IS200-2401 Inserted after IS200-1943	The CNAV messages contain information that allows users to take advantage of situations when integrity is assured to the enhanced level. This is accomplished using a composite integrity assured URA value in conjunction with an integrity status flag. The composite integrity assured URA (IAURA) value is the RSS of an elevation-dependent function of the upper bound value of the URA_{ED} component and the upper bound value of the URA_{NED} component. The composite IAURA value is assured to the enhanced level only when the integrity status flag is "1"; otherwise the IAURA value is assured to the legacy level. Bit 272 of Message Type 10 is the Integrity Status Flag (ISF). A "0" in bit position 272 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the current broadcast IAURA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour. A "1" in bit-position 272 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the current broadcast IAURA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour. The probabilities associated with the nominal and lower bound values of the current broadcast URA_{ED} index, URA_{NED} indexes, and related URA values are not defined. The nominal URA is a conservative estimate of the pseudorange accuracy and is the RSS of an elevation-dependent nominal value of the URA_{ED} component and the nominal value of the URA_{NED} component. *Object Type:* Info-Only

Nominal URA – Addition to IS-GPS-705

| Paragraph	IS705-639 (plus new DOORS ID IS705-1750)
Red Lines of IS705-1750 Inserted after IS705-639	The CNAV messages contain information that allows users to take advantage of situations when integrity is assured to the enhanced level. This is accomplished using a composite integrity assured URA value in conjunction with an integrity status flag. The composite integrity assured URA (IAURA) value is the RSS of an elevation-dependent function of the upper bound value of the URA_{ED} component and the upper bound value of the URA_{NED} component. The composite IAURA value is assured to the enhanced level only when the integrity status flag is "1"; otherwise the IAURA value is assured to the legacy level.
	Bit 272 of Message Type 10 is the Integrity Status Flag (ISF). A "0" in bit position 272 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the current broadcast IAURA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour.
	A "1" in bit-position 272 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the current broadcast IAURA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour. The probabilities associated with the nominal and lower bound values of the current broadcast URA_{ED} index, URA_{NED} indexes, and related URA values are not defined.
	The nominal URA is a conservative estimate of the pseudorange accuracy and is the RSS of an elevation-dependent nominal value of the URA_{ED} component and the nominal value of the URA_{NED} component.
	Object Type: Info-Only

Integrity Enhanced Level & Nominal URA Definition – IS-GPS-800

| Paragraph	IS800-211 plus IS800-1189 (new DOORS ID)
CRM #115 Red Lines IS800-211	The L1C messages ~~will~~ contain information that ~~indicates~~ allows users to take advantage of situations ~~operate~~ when integrity is assured to ~~an~~ the enhanced level. This is accomplished using an integrity assured URA value in conjunction with an integrity status flag. The URA value is the RSS of URA_{ED} and URA_{NED}; URA is integrity assured to the enhanced level only when the integrity status flag is "1".
CRM #113 Red Lines IS800-1189 Inserted after IS800-211	The nominal URA is a conservative estimate of the pseudorange accuracy and is the RSS of an elevation-dependent nominal value of the URA_{ED} component and the nominal value of the URA_{NED} component. *Object Type:* Info-Only

Add URA$_{NED}$ Formula

DOORS ID	IS200-572, IS705-261, IS800-3.5.3.8		
Paragraph	IS-GPS-200 30.3.3.2.4 Non-Elevation-Dependent (NED) Accuracy Estimates IS-GPS-705 20.3.3.2.4 IS-GPS-800 3.5.3.8	**Comment Number**	CRM #112, #114, #158
Comment Type	Substantive	**Disposition**	Accept With Comments
Comment Originator(s)	FAA Concurs		
Comment	Added equation for nominal URA$_{ned}$ in section with equations for IAURA$_{ned}$. Clarify paragraph with equation. 158. There are formulae where multiply is obvious, but "*" is not shown. Since so many formulae with multiplication use "*" explicitly, all formulae would be held to that standard.		
Government Response	Accept With Comments. The commenter is not precise on exactly where they want the new formula ~~The commenter is not clear why the word "nominal" needs to appear in the equation. Why is "nominal" important? What is "not nominal"?~~ At PICWG decision was made to make the RHS of the new equation to be prefixed by "nominal"		
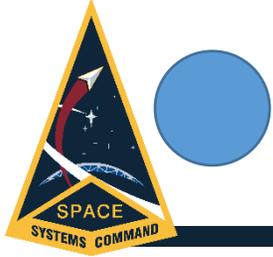
# Nominal URA$_{NED}$ Formula and Explicit Multiplier

Paragraph	IS200-572, IS705-261, IS800-190
Red Lines + + PICWC Changes made during the PICWG are (in Green)	The user shall calculate the NED-related URA with the equation (in meters); nominal URA$_{NED}$ = nominal URA$_{NED0}$ IAURA$_{NED}$ = Upper Bound URA$_{NED0}$ + URA$_{NED1}$*(t - t$_{op}$ + 604,800*(WN - WN$_{op}$)) for t - t$_{op}$ + 604,800*(WN - WN$_{op}$) ≤ 93,600 seconds IAURA$_{NED}$ = Upper Bound URA$_{NED0}$ + URA$_{NED1}$*(t - t$_{op}$ + 604,800*(WN - WN$_{op}$)) + URA$_{NED2}$*(t - t$_{op}$ + 604,800*(WN - WN$_{op}$) - 93,600)^2 for t - t$_{op}$ + 604,800*(WN - WN$_{op}$) > 93,600 seconds where t is the GPS system time
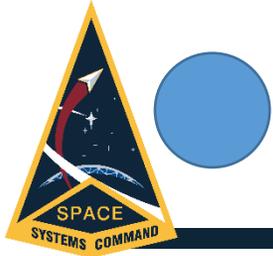
Example of URA$_{NED}$ Formula From IS-GPS-800

Paragraph	IS800-190
Red Lines + Change made by CRM #158 (in Green)	The user shall calc[...] [...]uation (in meters); nominal URA[...] IAURA$_{NE[...]}$[...]$(t - t_{op} + 604,[...]_{[...]op}))$ for $t - t_{op}$[...]N[...]seconds IAURA$_{N[...]}$[...]$_{[...]}$ + URA$_{NE[...]}$[...][...]$_{op}))$ + URA$_{NED2}*(t - t_{op} + 604,800*(WN - WN_{op}) - 9[...]$ for $t - t_{op}$ + [...][...]$_{op}) > 93,60[...]$ where t is the GPS system time[...]

NO LONGER NEEDED
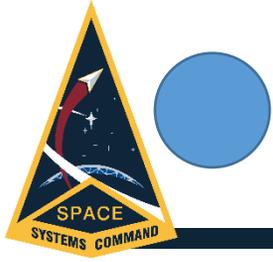
Improve the Description in the Service Level Table = "Risk"

DOORS ID	IS200-1774		
Paragraph	Table 30-XIb	Comment Number	CRM #116, #117, #118
Comment Type	Substantive	Disposition	Accept
Comment Originator(s)	FAA Concurs		
Comment	116. terminology used in Table 30-XIb, "integrity" should be "integrity risk", in rows for "Level 3", column of "Description". integrity risk should be less than or equivalent to H-ARAIM solutions 117. terminology used in Table 30-XIb, "integrity" should be "integrity risk", in rows for "Level 4", column of "Description". integrity risk should be less than or equivalent to V-ARAIM solutions 118. terminology used in Table 30-XIb, "integrity" should be "integrity risk", in rows for "Level 5", column of "Description". integrity risk should be less than or equivalent to H-ARAIM and V-ARAIM solutions		
Government Response	Accept		

Redlines for Table 30-Xib Service Table

Paragraph	IS200-1774			
Red Lines				

Service Level	Severity	Description	Notes/Applicability
Level 1	No Data Available	Broadcast ISD parameter values are invalid. Applicable performance commitments remain valid	Any ISD parameter received for the associated GNSS ID with an effectivity time stamp earlier than the Service Level 1 effectivity time stamp (WN_{ISM} and TOW_{ISM}) is invalid. The Service Level 1 applies to ISD parameters for all other Service Levels
Level 2	Non-Safety of Life Use	These parameters are for non-safety of life (i.e., uncertified ARAIM) applications	
Level 3	Safety of Life Use (Horizontal)	These parameters are for applications requiring integrity risk less than or equivalent to H-ARAIM solutions	ISD parameters for GPS for Service Level 3 are valid for use with elevation angles greater than or equal to 2 degrees
Level 4	Safety of Life Use (Vertical)	These parameters are for applications requiring integrity risk less than or equivalent to V-ARAIM solutions	ISD parameters for GPS for Service Level 4 are valid for use with elevation angles greater than or equal to 2 degrees
Level 5	Safety of Life Use (Horizontal and Vertical)	These parameters are for applications requiring integrity risk less than or equivalent to H-ARAIM and V-ARAIM solutions. These parameters apply to both Service Level 3 and Service Level 4	

Partially Implement PRAT 2020-03 – Common Exponent Notation

DOORS ID	IS200-1798, IS200-1789		
Paragraph	30.3.3.10.1.2.2.6 Satellite Fault Rate 30.3.3.10.1.2.2.8 Constellation Fault Rate	Comment Number	CRM #104
Comment Type	Administrative	Disposition	Accept
Comment Originator(s)	SE&I Concurs		
Comment	We should change exponents in keeping with PRAT 2020-03 for all DOORS IDs already being added/modified		
Government Response	Accept. After Implementing these changes, remaining places to change the exponent by document are: IS-GPS-200 5 exponents IS-GPS-705 10 exponents IS-GPS-800 10 exponents		

Modified Values for R_{sat}

Paragraph	IS200-1798	
Red Lines	**Currently In The PCNs**	**Proposed**
	The four bits are defined as follows: 0000 = 1 x 10^{-8} /hour 0001 = 3.16 x 10^{-8} /hour 0010 = 1 x 10^{-7} /hour 0011 = 3.16 x 10^{-7} /hour 0100 = 1 x 10^{-6} /hour 0101 = 3.16 x 10^{-6} /hour 0110 = 1 x 10^{-5} /hour 0111 = 3.16 x 10^{-5} /hour * 1000 = 1 x 10^{-4} /hour * 1001 = Reserved 1010 = Reserved 1011 = Reserved 1100 = Reserved 1101 = Reserved 1110 = Reserved 1111 = Reserved	The four bits are defined as follows: 0000 = 1.00E-8 /hour 0001 = 3.16E-8 /hour 0010 = 1.00E-7 /hour 0011 = 3.16E-7 /hour 0100 = 1.00E-6 /hour 0101 = 3.16E-6 /hour 0110 = 1.00E-5 /hour 0111 = 3.16E-5 /hour * 1000 = 1.00E-4 /hour * 1001 = Reserved 1010 = Reserved 1011 = Reserved 1100 = Reserved 1101 = Reserved 1110 = Reserved 1111 = Reserved

Modified Values for R_{const}

Paragraph	IS200-1789	
	Currently In The PCNs	**Proposed**
	The four bits are defined as follows: $0000 = 3.16 \times 10^{-10}$ /hour $0001 = 1.00 \times 10^{-9}$ /hour $0010 = 3.16 \times 10^{-9}$ /hour $0011 = 1.00 \times 10^{-8}$ /hour $0100 = 3.16 \times 10^{-8}$ /hour * $0101 = 1.00 \times 10^{-7}$ /hour * $0110 = 3.16 \times 10^{-7}$ /hour * $0111 = 1.00 \times 10^{-6}$ /hour * $1000 = 3.16 \times 10^{-6}$ /hour * 1001 = Reserved 1010 = Reserved 1011 = Reserved 1100 = Reserved 1101 = Reserved 1110 = Reserved 1111 = Reserved	The four bits are defined as follows: $0000 = 3.16E-10$ /hour $0001 = 1.00E-9$ /hour $0010 = 3.16E-9$ /hour $0011 = 1.00E-8$ /hour $0100 = 3.16E-8$ /hour * $0101 = 1.00E-7$ /hour * $0110 = 3.16E-7$ /hour * $0111 = 1.00E-6$ /hour * $1000 = 3.16E-6$ /hour * 1001 = Reserved 1010 = Reserved 1011 = Reserved 1100 = Reserved 1101 = Reserved 1110 = Reserved 1111 = Reserved
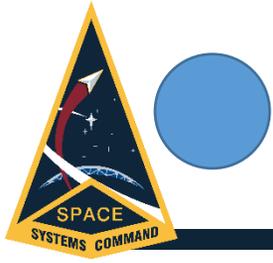
ISM CRC Section Has no "Shall"

DOORS ID	IS200-2136		
Paragraph	30.3.3.10.1.15	**Comment Number**	CRM #124, #135, #159
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	SE&I Concurs Raytheon Concurs		
Comment	124. ID is listed as a requirement but does not contain a "shall" statement. Will need to add a "shall" statement to keep as a requirement or change to "info-only". 135. Is this object really a "Requirement"? If so, recommend re-writing "...ISM CRC may be represented...." to "...ISM CRC shall be represented...". Otherwise, change the object type to "Info Only". 159. At PICWG, stakeholders wanted the ISM CRC paragraph divided into 3 Parts 1. An Info-Only lead in so the requirement stands out more. 2. The Requirement portion 3. The formulae (again Info-Only) Also wants "may be" to be replaced by "are"		
Government Response	124., 125. Accept with Comments. The decision is to reword the 2nd sentence to a "shall" since the subject of this sentence most directly defines how to compute the ISM CRC. 159. Accept New request is accommodated with all stakeholders at the PICWG concurring		
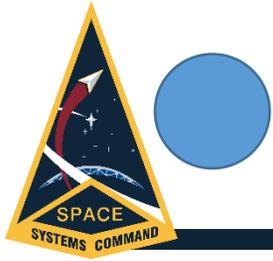
Suggested Redlines

Paragraph	IS200-2136
What was proposed at PICWG	This sequence of bits and the ISM CRC may be represented as polynomials of a bit position operator X (the powers of which denote the distance of the bit from the end of the applicable bit sequence) with coefficients from the Galois field of two elements, or GF(2). GF(2) is the finite field constructed on the set {0,1} and the operations of modulo-2 addition and modulo-2 multiplication. In this representation, the ISM CRC shall be ~~is~~ the remainder polynomial r(X) left over from the polynomial division of the ISM Packet bits 1 through 204 (right-padded with 32 zeros and represented as $m(X) \cdot X^{32}$) by a generator polynomial g(X). The generator polynomial, g(X), which does not depend on the specific ISM Packet data, is: $g(X) = X^{32} + X^{31} + X^{24} + X^{22} + X^{16} + X^{14} + X^8 + X^7 + X^5 + X^3 + X + 1$ If the terms b_1 through b_{204} signify bits 1 through 204 of the GPS ISM Packet, the information field, m(X), is: $m(X) = b_1 X^{203} + b_2 X^{202} + b_3 X^{201} + ... + b_{203} X + b_{204}$ • • •
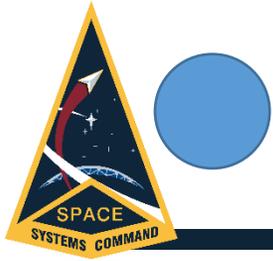
PICWG Requirement Split Agreement

Paragraph	IS200-2402, IS200-2136, IS200-2403
Split Requirements per PICWG IS200-2402	This sequence of bits and the ISM CRC ~~may be~~ are represented as polynomials of a bit position operator X (the powers of which denote the distance of the bit from the end of the applicable bit sequence) with coefficients from the Galois field of two elements, or GF(2). GF(2) is the finite field constructed on the set {0,1} and the operations of modulo-2 addition and modulo-2 multiplication. *Object Type:* Info-Only
IS200-2136	In this representation, the ISM CRC shall be the remainder polynomial r(X) left over from the polynomial division of the ISM Packet bits 1 through 204 (right-padded with 32 zeros and represented as $m(X) \cdot X^{32}$) by a generator polynomial g(X). The generator polynomial, g(X), which does not depend on the specific ISM Packet data, is: *Object Type:* Requirement
IS200-2403	$g(X) = X^{32} + X^{31} + X^{24} + X^{22} + X^{16} + X^{14} + X^8 + X^7 + X^5 + X^3 + X + 1$ If the terms b_1 through b_{204} signify bits 1 through 204 of the GPS ISM Packet, the information field, m(X), is: $m(X) = b_1 X^{203} + b_2 X^{202} + b_3 X^{201} + ... + b_{203}X + b_{204}$ If the terms b_{205} through b_{236} signify bits 205 through 236 of the GPS ISM Packet, the remainder polynomial, r(X), is: $r(X) = b_{205}X^{31} + b_{206}X^{30} + b_{207}X^{29} + ... + b_{235}X + b_{236}$ The ISD in the GPS ISM Packet is valid when the ISM CRC matches r(X) in the following equation: $r(X) = m(X) \cdot X^{32} \bmod g(X)$ *Object Type:* Info-Only

Formula Is A Requirement Without A "Shall"

DOORS ID	IS200-2133, IS200-2134, IS705-1746, IS800-1182		
Paragraph	IS-GPS-200 IS-GPS-705 IS-GPS-800 3.5.4.7.2	Comment Number	CRM #125, #134, #126, #136, #127, #137, #157
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	SE&I Concurs Raytheon Concurs EuroControl Concurs		
Comment	125. ID is listed as a requirement but does not contain a "shall" statement. Will need to add a "shall" statement to keep as a requirement or change to "info-only". 126., 127. ID is listed as a requirement but does not contain a "shall" statement. Will need to add a "shall" statement to keep as a requirement or change to "info-only". 134. Re-write the statement to include shall 136., 137. Recommend re-writing the texts in the requirement format 157. The object type (of the formula) is labelled info-only while it reads as an element of the above requirement. Do you plan to change that equation to something else? As an example, the equations for the CRC are part of the requirement.		
Government Response	Accept With Comments. Since the formula dictates how the target system will function, these all need to be requirements and will have "shall" added as needed. 157. Accept With Comments. In keeping with the other comments, we are making the lead-in sentences to the formula a Requirement rather than the formula itself. If a DOORS ID is wholly made of formulae, it is not generally designated a requirement. The ISM CRC is a special case involving a mixture of sentences (one of which has a shall) and formulae.		

Proposed Formulae in Requirement Wording Redlines

Paragraph	IS200-2133, IS705-1746, IS800-1182
IS-GPS-200 Proposed Redlines (from published PCN)	To calculate the nominal pseudorange error bias (b_{nom}), ~~use~~ the following equation <u>shall be used</u>: *Object Type*: Requirement $$b_{nom} = \beta_{nom} + \gamma_{nom} \text{ IAURA}$$ *Object Type*: Info-Only
IS-GPS-705 Proposed Redlines (from published PCN)	~~To calculate the~~ <u>The</u> nominal pseudorange error bias (b_{nom})~~, see~~ <u>shall be calculated in accordance with section</u> 30.3.3.10.2 of IS-GPS-200. *Object Type*: Requirement
IS-GPS-800 Proposed Redlines (from published PCN)	~~To calculate the~~ <u>The</u> nominal pseudorange error bias (b_{nom})~~, see~~ <u>shall be calculated in accordance with section</u> 30.3.3.10.2 of IS-GPS-200. *Object Type*: Requirement
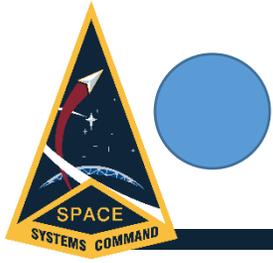
CS "Requirement" Is Ambiguous

DOORS ID	IS200-1768		
Paragraph	30.3.3.10.1.1	**Comment Number**	CRM #131, #160
Comment Type	Substantive	**Disposition**	#131. Accept With Comments #160. Accept
Comment Originator(s)	Raytheon Concurs		
Comment	131. What conditions are considered as "when necessary"? 160. PICWG wanted to entirely drop this requirement as not actionable by any existing GPS module.		
Government Response	131. Accept With Comments. While the comment originator has a point, the stakeholder team decided it was better to delete the requirement than modify it as originally proposed, so CRM #160 is deleting it. 160. Accept. The DOORS ID is being deleted.		
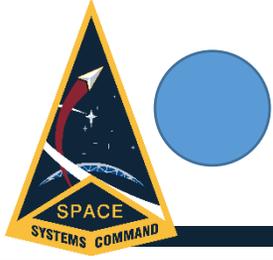
Recommended Responsive Redlines

Paragraph	IS200-1768
Contents in Public PCN	The CS shall upload the current ISM parameters, when necessary, to the SVs.
Final Decision at PICWG	\<Deleted Object\>
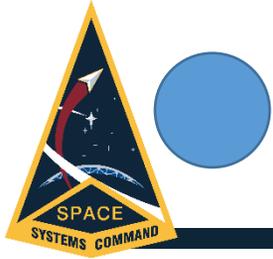
"±" Should Be Added To R_{sat}, MFD_{sat}, R_{const}, MFD_{const} Definitions

DOORS ID	IS200-1797, IS200-2127, IS200-1788, IS200-1800		
Paragraph	30.3.3.10.1.2.2.6, 30.3.3.10.1.2.2.7, 30.3.3.10.1.2.2.8, 30.3.3.10.1.2.2.9	Comment Number	CRM #138, #139, #140, #141
Comment Type	Substantive	Disposition	~~Reject~~ Accept
Comment Originator(s)	ARL UT Concurs		
Comment	138., 139., 140., 141. The GPS Standard Positioning Service (SPS) Performance Standard (PS) defines the integrity fault threshold as ±4.42 times the IAURA (SPS PS Section 2.3.4). This "±" is important or else negative URE values could be unbounded. I agree it's a technicality and the meaning is understood, but the "±" should be included.		
Government Response	~~Reject~~ Accept. Corresponding formulae in the SPS PS also use "±"		
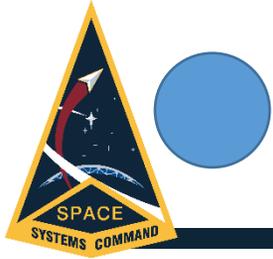
R_{sat}, MFD_{sat}, R_{const}, MFD_{const} Definition "±" Redlines

Paragraph	IS200-1797
IS200-1797 Redlines baselined from PCN	Bits 36 through 39 of the GPS ISM Packet shall provide the Satellite Fault Rate (R_{sat}) value for use consistent with the other parameters in the ISM packet. R_{sat} is the onset rate at which the instantaneous URE of any given satellite exceeds $\pm$4.42 times the IAURA. *Object Type*: Requirement
Redlines IS200-2127	Bits 40 through 43 of the GPS ISM Packet shall provide the mean duration of a satellite fault (MFD_{sat}) value for use consistent with the other parameters in the ISM packet. MFD_{sat} is the mean duration the instantaneous U8669RE of any given satellite exceeds $\pm$4.42 times the IAURA without a timely notification issued to the user. *Object Type*: Requirement
Redlines IS200-1788	Bits 44 through 47 of the GPS ISM Packet shall provide the constellation fault rate (R_{const}) value for use consistent with the other parameters in the ISM packet. R_{const} is the onset rate at which the instantaneous URE of two or more satellites exceed, due to a common cause, $\pm$4.42 times the IAURA. *Object Type*: Requirement
Redlines IS200-1800	Bits 48 through 51 of the GPS ISM Packet shall provide the mean duration of a constellation fault (MFD_{const}) value for use consistent with the other parameters in the ISM packet. MFD_{const} is the mean duration the instantaneous URE of two or more satellites exceed, due to a common cause, $\pm$4.42 times the IAURA without a timely notification issued to the user. *Object Type*: Requirement

Collision of multiple Rationales for MFD$_{sat}$

DOORS ID	IS200-2128		
Paragraph	30.3.3.10.1.2.2.7	Comment Number	CRM #142
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	ARL UT Concurs		
Comment	Under "rationale", item 3 states, "Rather than advancing lexicon values by doubling, as we initially chose in January 2023, we decided to pick SQRT(2) to get a more fine grained reading". However the table still seems to be doubling. Item 2 refers to a value of 5.7 which is not in the table, but would be in the table if SQRT(2) were used. Are rationale items 2/3 somehow "overcome by events" or is the new "Is" text incorrect?		
Government Response	Accept With Comments. Rationale is meant to be monotonically increasing, keeping a record of all changes made over time. However, sometimes (as in this case), readers get confused, by the team changing its mind over time. The second to top comment is in-fact correct as written and it dominates all conflicting comments below it. However, I will remove the note #3 to reduce reader confusion.		

Collision of multiple Rationales for MFD$_{sat}$ Illustration

Paragraph	IS200-2128

	Current Text	Rationale Change
	The four bits are defined as follows: 0000 = 0.25 hour 0001 = 0.5 hour 0010 = 1.0 hour 0011 = 2.0 hours * 0100 = 4.0 hours * 0101 = 6.0 hours * 0110 = 8.0 hours * 0111 = Reserved 1000 = Reserved 1001 = Reserved 1010 = Reserved 1011 = Reserved 1100 = Reserved 1101 = Reserved 1110 = Reserved 1111 = Reserved * Values inconsistent with GPS performance commitments are included to support Service Level 4 operations.	10/08/2024 CRM #75 Change RESERVED to mixed case (T. Anthony) At the 2023 PICWG Special Topic, it was confirmed this list of values would double until 2 hour intervals were reached (T. Anthony) As part of the Pconst to Rconst Conversion, the message format has been modified to accommodate MFDsat. (T. Anthony) This lexicon is influenced by three factors 1. A contingency upload will rarely be shorter than 15 minutes, and 2. Six hours is the maximum fault length permitted by the performance standards, which is reasonably well represented by 5 hours 3. Rather than advancing lexicon values by doubling, we initially chose in January 2023, we decided to pick SQRT(2) to get a more fine grained reading (T. Anthony)

Rationale to Delete

Rationale that dominates
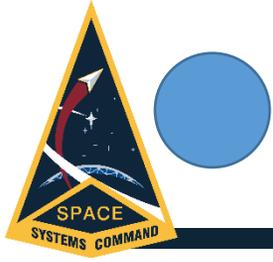
IAURA$_{NED}$ Contradiction?

DOORS ID	IS200-572, IS200-1952		
Paragraph	30.3.3.2.4	Comment Number	CRM #143
Comment Type	Substantive	Disposition	Accept With Comment (Alternative C)
Comment Originator(s)	Thales Concurs		
Comment	Equations provided in section 30.3.3.2.4 to compute the IAURA$_{NED}$ value seem in contradiction with the following sentence: [...] Integrity properties of the IAURA$_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA$_{NED0}$ index, URA$_{NED1}$ index, and URA$_{NED2}$ index (see 30.3.3.1.1). If it is indeed the upper bound values of the URA$_{NED0}$ index that defines IAURA$_{NED}$, it is suggested to use a different notation to explain the computation of IAURA$_{NED}$ (and change the sentence as there is no upper bound for URA$_{NED1}$ and URA$_{NED2}$ indices). If not, it is suggested to keep the equations as they are, but correct the sentence.		
Government Response	Accept With Comment. Stakeholders agreed on Alternative C developed in the PICWG (Slide 97)		

Alternative A Suggested

Paragraph	IS200-572, IS200-1952
Suggested Red Lines for IS200-572	The user shall calculate the NED-related URA with the equation (in meters); $$\text{IAURA}_{NED} = \underline{\text{IA}}\text{URA}_{NED0} + \text{URA}_{NED1} (t - t_{op} + 604{,}800*(WN - WN_{op}))$$ for $t - t_{op} + 604{,}800*(WN - WN_{op}) \leq 93{,}600$ seconds $$\text{IAURA}_{NED} = \underline{\text{IA}}\text{URA}_{NED0} + \text{URA}_{NED1}*(t - t_{op} + 604{,}800*(WN - WN_{op})) + \text{URA}_{NED2}*(t - t_{op} + 604{,}800*(WN - WN_{op}) - 93{,}600)^2$$ for $t - t_{op} + 604{,}800*(WN - WN_{op}) > 93{,}600$ seconds where t is the GPS system time
Suggested Red Lines for IS200-1952	The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the IAURA_{NED} are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA_{NED0} index, <u>and nominal values of the</u> URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1). ⋮

Alternative B Suggested

Paragraph	IS200-1952
Red Lines	The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the $IAURA_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) ~~upper bound~~ nominal values of the URA_{NED0} index, URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1). • • •
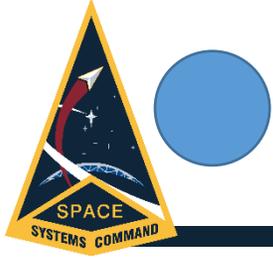
Alternative C – Final Decision

| Paragraph	IS200-572, IS200-1952
Red Lines Agreed to at PICWG for IS200-572	The user shall calculate the NED-related URA with the equation (in meters); $IAURA_{NED} = $ Upper Bound ~~IA~~$URA_{NED0} + URA_{NED1} (t - t_{op} + 604{,}800*(WN - WN_{op}))$ for $t - t_{op} + 604{,}800*(WN - WN_{op}) \leq 93{,}600$ seconds $IAURA_{NED} = $ Upper Bound ~~IA~~$URA_{NED0} + URA_{NED1}*(t - t_{op} + 604{,}800*(WN - WN_{op})) + URA_{NED2}*(t - t_{op} + 604{,}800*(WN - WN_{op}) - 93{,}600)^2$ for $t - t_{op} + 604{,}800*(WN - WN_{op}) > 93{,}600$ seconds where t is the GPS system time
Red Lines Agreed to at PICWG for IS200-1952	The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the $IAURA_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA_{NED0} index, and ~~nominal~~ values of the URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1). ⋮
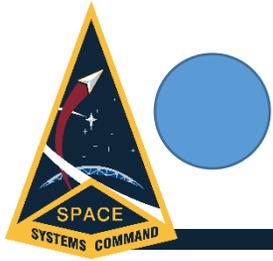
Complaint About URA$_{ED}$ Accuracy by Index

DOORS ID	IS200-1946, IS200-576		
Paragraph	30.3.3.1.1.4 30.3.3.2.4	Comment Number	CRM #144, #145
Comment Type	Substantive	Disposition	~~Reject~~ Accept With Comments
Comment Originator(s)	Thales Concurs		
Comment	144. For N = -15, X = 0.0110 However, the table defining the lower and upper bounds for URAED defines for index -15 URAED ≤ 0.01 There is a contradiction between the nominal value and the integrity assured value. It is suggested to increase the upper bound for index -15 (and lower bound for index -14) or to modify the nominal URAED value for index -15. 145. Same comment for the URANED0. For index -15, the nominal URANED0 value exceeds the associated upper bound.		
Government Response	~~Reject~~ Accept With Comments. Added "-15" to the DOORS IDs in the sentence about the special values of N instead of prior suggestions. Also, turned "alongtrack" and "crosstrack" into hyphenated words which are generally used.		
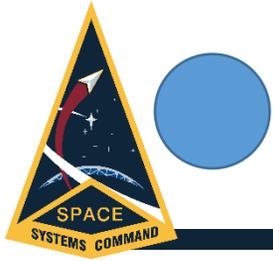
Modification of URA$_{ED}$ Description

Paragraph	IS200-1946
Redlines agreed at PICWG	For each URA$_{ED}$ index (N), users may compute a nominal URA$_{ED}$ value (X) as given by: • If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$, • If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$, • N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk. For N = -15, 1, 3, and 5, X should be rounded to .01, 2.8, 5.7, and 11.3 meters, respectively. The nominal URA$_{ED}$ value (X) is suitable for use as a conservative prediction of the RMS ED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement deweighting, RAIM, FOM computations). Integrity properties of the IAURA$_{ED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the broadcast URA$_{ED}$ index (see 30.3.3.1.1). For the nominal URA$_{ED}$ value and the IAURA$_{ED}$ value, users may compute an adjusted URA$_{ED}$ value as a function of SV elevation angle (E), for $E \geq 0$, as follows: Adjusted Nominal URA$_{ED}$ = Nominal URA$_{ED}$ (sin(E+90 degrees)) Adjusted IAURA$_{ED}$ = IAURA$_{ED}$ (sin(E+90 degrees)) URA$_{ED}$ and IAURA$_{ED}$ account for SIS contributions to user range error which include, but are not limited to, the following: CNAV LSB representation/truncation error, CNAV along-track ephemeris errors, and cross-track CNAV ephemeris errors. URA$_{ED}$ and IAURA$_{ED}$ do not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.
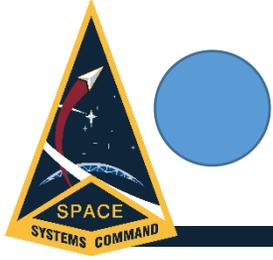
Modification of URA$_{NED0}$ Description

Paragraph	IS200-576
Redlines agreed at PICWG	For each URA$_{NED0}$ index (N), users may compute a nominal URA$_{NED0}$ value (X) as given by: • If the value of N is 6 or less, but more than -16, X = $2^{(1 + N/2)}$, • If the value of N is 6 or more, but less than 15, X = $2^{(N - 2)}$, • N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk. For N = -15, 1, 3, and 5, X should be rounded to .01, 2.8, 5.7, and 11.3 meters, respectively.

Suggested "GPS" and "GNSS ID="

DOORS ID	IS200-2397, IS200-2396, IS200-2399		
Paragraph	30.3.3.10.1.2.1 30.3.3.10.1.2.2	Comment Number	CRM #146, #147, #148
Comment Type	Substantive	Disposition	Reject
Comment Originator(s)	EuroControl Concurs		
Comment	146. The constellation is defined at this point inside the document as mentioned in the header of 30.3.3.10.1.2.2. The text leaves some ambiguity. It is proposed to add "GPS" before SVs and to delete "constellation identified by GNSS ID" as it is defined under that section. 147. The figure works only for GNSS ID = 0000 as per the logic provided in 30.3.3.10.1.2. It is proposed to add "=0000" inside the figure and next to "GNSS ID" 148. The figure works only for GNSS ID = 0100 as per the logic provided in 30.3.3.10.1.2. It is proposed to add "=0100" inside the figure and next to "GNSS ID"		
Government Response	Reject. We specifically did not insert any of the extra text suggested in these comments in order to future proof the document so QZSS support could be added with a minimum of rewriting. Taken as a whole, none of these additions are needed to make the document clear or unambiguous and adding any of this will possibly make for more work in the future.		

Suggested Redlines – Not Done

Paragraph	IS200-2396, IS200-2397, IS200-2399
IS200-2396 Redlines baselined to public PCN	Figure 30-18 Test Packet with GNSS ID = 0000
IS200-2397 Redlines baselined to public PCN	Each 236-bit GPS ISM Packet (see Figure 30-19) is applicable to a specific subset of GPS SVs identified in the GPS PRN Inclusion Mask for the given Service Level, constellation identified by GNSS ID and start time. This packet is applicable only when GNSS ID = 0100.
IS200-2399 Redlines baselined to public PCN	Figure 30-19 GPS ISM Packet with GNSS ID = 0100

Wants To Enforce Timestamps In The Past

DOORS ID	IS200-1990		
Paragraph	30.3.3.10.1.2.2.2	Comment Number	CRM #149
Comment Type	Substantive Administrative	Disposition	Accept
Comment Originator(s)	EuroControl Concurs		
Comment	Work on-going in RTCA and EUROCAE can take credit of the following statement: "All time stamps should be in the past". Can you clarify if this is a real "statement" which in that case is not really of interest or if it could be clarify that time stamps are in the past? This is of interest in the frame of GNSS equipment robustness toward RFI.		
Government Response	Accept. It is inevitable that the suggested change will be true. However, at this time, the promoted requirement will not be allocated to a GPS segment or subsystem.		

Redlines To Promote To Shall

Paragraph	IS200-1990
Red Lines baselined to public PCN	Users should use the ISM parameters with the most recent WN_{ISM} and TOW_{ISM} time stamp. All time stamps ~~should~~ shall be in the past. *Object Type*: ~~Info-Only~~ Requirement
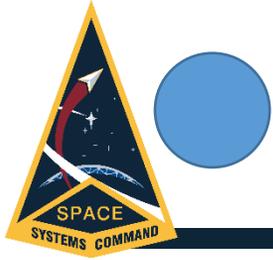
Wants to Remove t_{correl} Parameter from the GPS ISM Packet

DOORS ID	IS200-1792		
Paragraph	30.3.3.10.1.2.2.3	Comment Number	CRM #150
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	EuroControl Concurs		
Comment	The correlation time parameter is only mentioned in this section. No other part of the document refers to it. The DFMC SBAS MOPS (ED-259B) includes in its current draft a description of the ARAIM algorithm in its Appendix R. Tcorrel is also not defined there. Can you explain why this parameter is defined and is allocated with 4 bits as defined in 30.3.3.10.1.2.2.3? Aviation is not using it so the associated bits could be saved.		
Government Response	Accept With Comments. Although this comment is worded as a question there is an implied request to remove t_{correl} from the GPS ISM Packet. The SME Team has stated this value has other uses than aviation. The FAA has proposed an alternate wording that may sufficiently mitigate the commenter's concern. Based on FAA's insistence t_{correl} is needed, the comment originator reluctantly concurred with keeping this parameter		

Correlation Time Constant Section - Proposed Alternate Wording

Paragraph	IS200-1790, IS200-1791, IS200-1792
Proposed Red Lines	**30.3.3.10.1.2.2.3 Correlation Time Constant** Bits 24 through 27 of the GPS ISM Packet shall provide the Correlation Time Constant (t_{correl}) value for <u>the errors characterized by the URA for</u> use consistent with the other parameters in the <u>associated</u> ISM packet. The four bits are defined as follows: 0000 = 0.25 hours 0001 = 0.33 hours 0010 = 0.50 hours 0011 = 0.67 hours 0100 = 0.83 hours 0101 = 1.00 hour 0110 = 1.17 hours 0111 = 1.33 hours 1000 = 1.50 hours 1001 = 2.10 hours 1010 = 3.00 hours 1011 = 4.20 hours 1100 = 6.00 hours 1101 = 8.50 hours 1110 = 12.00 hours 1111 = Reserved

Thinks The Valid Values Column for β_{nom} and γ_{nom} Need "See Text"

DOORS ID	IS200-1804, IS200-1807, IS200-1770		
Paragraph	30.3.3.10.1.2.2.4 30.3.3.10.1.2.2.5 Table 30-XIa	Comment Number	CRM #151, #152
Comment Type	Critical	Disposition	Reject
Comment Originator(s)	EuroControl		
Comment	151. The change associated with beta_nom in Table 30-XIa together with the removal in 30.3.3.10.1.2.2.4 of the beta_nom bits definition make the definition of the parameter unclear and ambiguous. A minimum value needs to be defined at least so that the scale factor can be used to deduce the rest of the parameter coding definition. Fix beta_nom definition either updating Table 30-XIa or this section 30.3.3.10.1.2.2.4 152. The change associated with beta_nom in Table 30-XIa together with the removal in 30.3.3.10.1.2.2.5 of the gamma_nom bits definition make the definition of the parameter unclear and ambiguous. A minimum value needs to be defined at least so that the scale factor can be used to deduce the rest of the parameter coding definition.		
Government Response	Reject. The table's No of Bits, Scale Factor and Units define perfectly what each bit pattern means. For β_{nom}, take the 4 bits representing 0 to 15, multiply by the .1 scale factor and you have your result meters. For γ_{nom}, the scale factor is .05 and the result is dimensionless. During the TIMs, FAA specifically requested that we supply this information in the table instead of a lexicon to be consistent with other parameter tables.		

Paragraph	IS200-1770

As of the Public PCN

Parameter	No. of Bits*	Scale Factor (LSB)	Valid Range**	Units
WN_{ISM}	13	1		weeks
TOW_{ISM}	6	4	0 to 164	hours
t_{correl}	4	See text		
β_{nom}	4	0.1		meters
γ_{nom}	4	0.05		dimensionless
R_{sat}	4	See text		
MFD_{sat}	4	See text		
R_{const}	4	See text		
MFD_{const}	4	See text		
Service Level***	3	See text		
GPS PRN Inclusion Mask ****	63	See text		
Reserved For ISM	87	See text		
ISM CRC	32	See text		

*   See Figures 30-19 for complete bit allocations in the GPS ISM Packet

**   Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor

***   See Table 30-XIb for Service Level Descriptions

****   See Table 30-XIc for GPS PRN Inclusion Mask bit mapping

Observed Problem with SERVICE LEVEL – 3 in GPS ISM Packet

DOORS ID	IS200-1798, IS200-2128, IS200-1789, IS200-1801		
Paragraph		Comment Number	CRM #153, #154, #155, #156
Comment Type	Substantive	Disposition	Accept With Comments
Comment Originator(s)	EuroControl		
Comment	153. The logic for the star and associated coding is not understood. The upper section 30.3.3.10.1.2.2 starts with figure 30-19 in which the service level is set to 3. I understood it as the rest of the definition is to be linked to service level 3.		
	If right, the codings associated with stars should be removed as misleading.		
	If wrong, the figure 30-19 should be fixed to make it more generic and service level independent. Note that if that solution is preferred, it provides less flexibility in the evolution of the ICD with respect to new service level.		
	Removal of the Rsat coding with stars and removal of the star.		
	154. Same but MFDsat		
	155. Same but Rconst		
	156. Same but MFDconst		
Government Response	Accept With Comments. After consulting the SMEs, we think an unfortunate text field wrap caused a misinterpretation of what was meant by "SERVICE LEVEL – 3" which was supposed to be seen as "SERVICE LEVEL – 3 BITS". Redrawing Figure 30-19 should fix this problem.		

Corrected Figure 30-19 GPS ISM Packet

Paragraph	IS200-2398 Figure 30-19 GPS ISM Packet
Proposed Corrected Version	
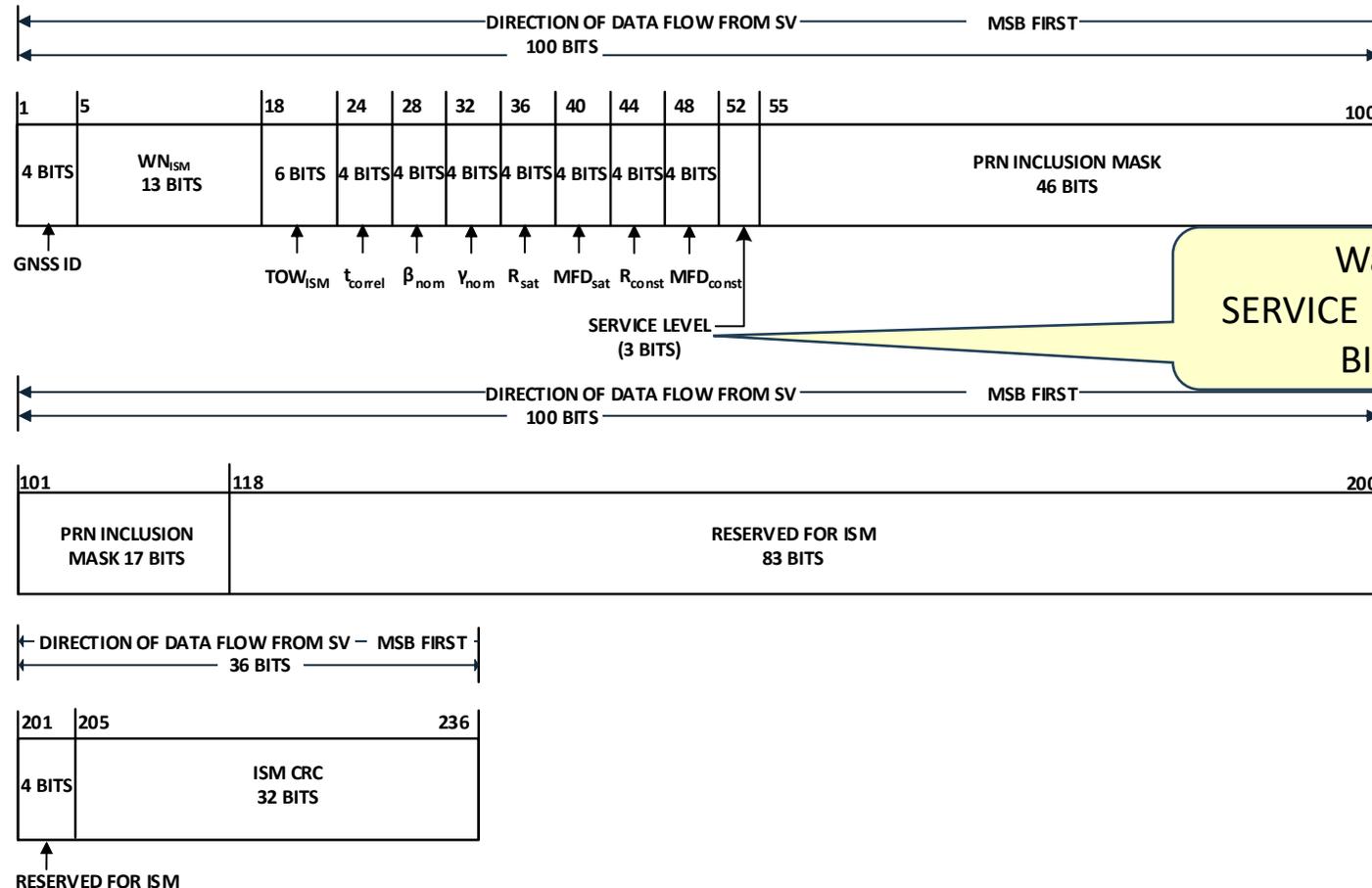
Open RFC-519 Discussion

QUESTIONS & COMMENTS?

Action Item Review

10 MINUTE BREAK

Positioning, Navigation and Timing Mission Public ICWG Slides

Template Version 16 .1a –Jan 2023

SPECIAL TOPICS

U.S. Department of Transportation
Volpe Center

ARAIM Background in Support of ISM

2025 GPS PICWG

Andrew Hansen

13 May 2025

Standards Progress

- ICAO SARPS development
  - (Jan. 2023) H-ARAIM SARPS amendment approved by ICAO NSP/7 [2]
    - Amendment under Air Navigation Commission review and state letter coordination process. Expect treaty applicability in Nov 2025.
  - Draft V-ARAIM SARPS presented to Navigation System Panel (NSP) for feedback
    - NSP work plan targeting baseline development (prototype) standards in Q4 2028 and complete standards in Q4 2030. FAA proposing to accelerate these dates as our development timeline is shorter than this.

- ARAIM MOPS development
  - H-ARAIM is targeted for inclusion in publication of the first revision to the DFMC SBAS MOPS, ED-259B. MOPS Final Review and Comment (FRAC) scheduled for Dec 2026.
    - Intent to reference the GPS Interface Standards for the ISM message. **Requires IS publication**.
  - RTCA/EUROCAE currently planning to include V-ARAIM in ED-259C with target by Q1 2029. However, this deliverable is not included in their formal work plan (i.e. ToR) yet.

Current Significant Activities (FAA Background)

- ARAIM ISM Generator (ISMG) "giver" specification under development.

- Developing FAA Acquisition Management System (AMS) documentation required for ISMG investment decision (e.g. requirements, schedule, costs, safety, etc.)

- V-ARAIM requirements validation

  - Coordinating open validation issues with standards bodies and other stakeholders

  - Planning additional testing and analysis activities need to close validation on ISMG

1. ARAIM Ad Hoc Group, "IP 14: Advanced Receiver Autonomous Integrity Monitoring (ARAIM) Concept of Operations," ICAO NSP JWGs/10, ver. 1.4, Montreal, Canada, May 2023.
2. Gary Berz, et al. "WP 40: Validation of ARAIM Baseline Development Standard," ICAO NSP/7, rev. 5, Montreal, Canada, Jan. 2023 requirements

Questions?

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U.S. Department of Transportation
Volpe Center

Our Purpose
Advancing transportation innovation for the public good.

OUR CORE VALUES

- Public Service
- Innovative Solutions
- Collaboration and Partnering
- Professional Excellence
- Employee Well-Being

Open RFC-477 Discussion

QUESTIONS & COMMENTS?

Action Item Review

LUNCH BREAK

Positioning, Navigation and Timing Mission Public ICWG Slides

Template Version 16 .1a –Jan 2023

AFTERNOON
SPECIAL TOPICS

Legacy Navigation
Age of Data Offset (AODO) and Navigation Message Correction Table (NMCT) a.k.a Wide Area GPS Enhancement (WAGE)

13-May-2025

Mr. John Taylor

PNT SE&I

Background and Current Status

- 2 NWS began conducting more frequent uploads to improve SiS accuracy Spring 2024

- WAGE accuracy improvement negligible, slowed 2 NWS upload process, limited constellation to 31 SVs
  - WAGE turned off Fall 2024 & AODO set to max value
  - PNT Mission Partner requires valid AODO which is tied to WAGE per IS-GPS-200

- AEP 25Q1 adds capability to broadcast valid AODO with WAGE OFF

- IS-GPS-200
  - Research on-going for suggested redline updates to document this configuration

- NIWC-PAC testing Fall 2024 showed nominal UE (military & civil) performance with WAGE OFF & valid AODO

WAGE / AODO *POAM*

IS-GPS-200N
Redlines
completed
2025 / 2026

PICWG
Special Topic
May 2025

AEP 25Q1
(Valid AODO)
May 2025

RFC created
Apr 2025

WAGE turned
off SiS
Oct 2024

Completed Event

Current Event

Future Event
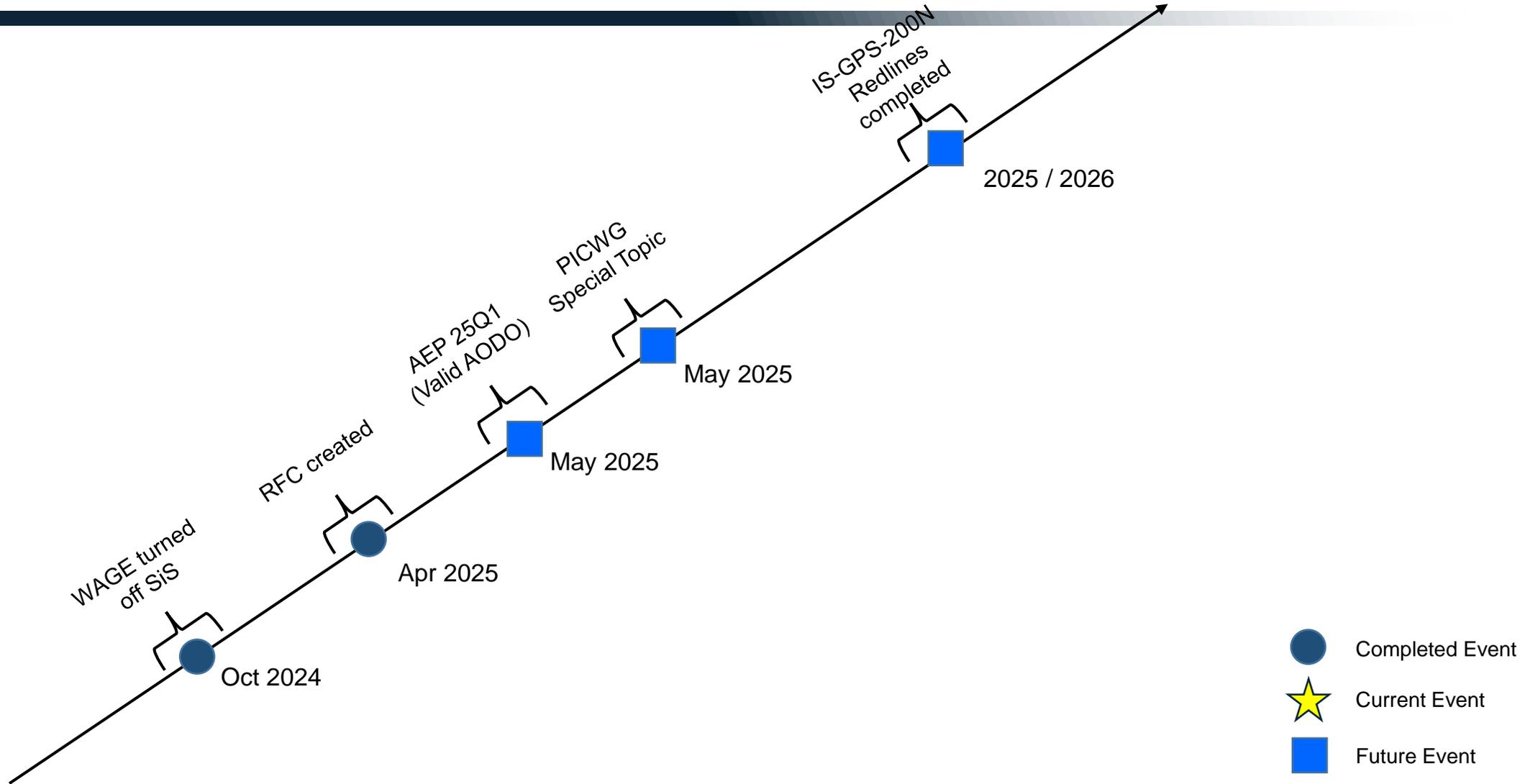
Discussion
- or -
Questions?

Public ICWG Special Topic
Deferred Work from RFC-495 & RFC-502

13-MAY-2025

Tony Anthony

SE&I Senior Principal Systems Engineer

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CM POC
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Deferred Work From RFC-495 and RFC-502

- RFC-495B "Text Message" – Reverted back to Concern 628
  - Cost to each of the Control, Space and User Segments to implement

- RFC-495A
  - CORE CEI (Clock Ephemeris Integrity)
    - 200, 705 and 800 need WN_{op} added
    - Clarified CM-code and CL-code signal health
  - General/Administrative – 11 statements
    - fixed a botched requirement split
    - rename WN to Week Number
    - Formatting problem
    - Wrong document reference (version off by one letter)
    - Multipoint clarification to IS-GPS-200 **6.4.6.2.2 Specific Alarm Indications**

- RFC-502
  - CEI (Clock Ephemeris Integrity) 18 changes explain the Core CEI better

RFC-495B "Text Message"

- Reverted back to Concern 628 due to unfunded costs
  - Not expected to be funded for an extended period of time
    - Control Segment cost might be moderate, but is mandatory
    - Any Space Segment software cost is expensive and mandatory
    - Military UE could skip implementing
    - Civil UE could implement using its own funds
  - The Concern is being tracked by 31 STS in one of its WICs (Watch Item Catalog)
  - The proposed technical changes currently in DOORS under RFC-495B are complete and correct as of this moment
- An alternative is to create a completely new binary message
  - This is likely to

Summary of Remaining Deferred Items

Category of Change/Fix	# DOORS IDS	Level of Review	Mandatory Cost Associated	Consequence of Not Implementing
RFC-495A				
CORE CEI (Clock Ephemeris Integrity)				
200, 705 and 800 need WN_{op} added	3	Ent. ERB	None	None
Clarified CM-code and CL-code signal health	1	Ent. ERB	None	None
General/Administrative – 11 statements				
Fix a botched requirement split	1	Ent. ERB	None	None
Rename WN to Week Number	5	Ent. ERB	None	None
Formatting problem	1	Ent. ERB	None	None
Wrong document reference (version off by one letter)	1	Ent. ERB	None	None
Removed PRN37 as an alert mechanism from SPS PS since it's not included as an alert in Section 6.4.6.	2	Ent. ERB	None	None
Multipoint clarification to IS-GPS-200 **6.4.6.2.2 Specific Alarm Indications**	5	Ent. ERB	Optional Only for UE	UE may miss some alarms
RFC-502				
CEI 18 changes explain the Core CEI better	13	Govt. AWG	Optional Only for UE	UE may miss-estimate assured

New Admin Only Public SiS RFC is Possible

- Propose an Admin-Only RFC for the Public SiS documents while the future ARAIM RFC is executing
  - IS-GPS-200
  - IS-GPS-705
  - IS-GPS-800

- Could be placed on contracts at the program managers' discretion
  - The Public could use this information right away because all substantive changes are just more accurately describing the SiS and what it means

- One Govt TIM to review what we propose updating
  - RFC – 495A changes outlined on prior slide
  - RFC – 502 changes outlined on prior slide
  - Small number of other Admin / vetted changes – still to be investigated

- No need for separate Public & Govt. processing threads
  - PCNs would go to the Public & Govt. reviewers at the same time

- Normal PICWG at appropriate time in 2026

Open RFC-477 Discussion

QUESTIONS & COMMENTS?

Public ICWG Special Topic

Corrections to the Calculation of Satellite Velocity for Modernized Navigation Messages

13-MAY-2025

David Allen

Aerospace

Open RFC-477 Discussion

QUESTIONS & COMMENTS?

10 MINUTE BREAK

Walk-on Topics

May 13, 2025

(In separate presentations, if any)

Action Item Review

Public ICWG PRAT Item Status

13-MAY-2025

Tony Anthony

SE&I Senior Principal Systems Engineer

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Public Requirements Accountability Tool (PRAT)

- Status and Discussion of Closure of Existing Items 2018 through 2022
  - Total of 12 Open PRAT Items
- New PRAT Items for 2025
  - Only available after the 2025 Public ICWG

Public Requirements Accountability Tool (PRAT)

- 12 Items Open as of the PICWG

- 2 Deferred Work
  - PRAT 2021-03   Remove Inter Signal Corrections from Core CEI
  - PRAT 2023-03   Investigate all Changes that have been Deferred from RFC-502

- 3 Recommended to Close – RFC-502 Completion
  - PRAT 2021-05   Data ID Issue
  - PRAT 2022-03   Investigate CNAV Schedules Technical Baseline changes for future Public Documents Updates
  - PRAT 2023-05   Investigate Impact of PRN 34 and 37 Rule (ref. 3.2.1.3 C/A-Code)

- 1 Recommended to Close – RFC-477 Completion
  - PRAT 2018-01   Update GPS products in ICD-GPS-870, Table 3-I

- 2 Recommended to Close – Other
  - PRAT 2022-01   Reassess the relevance of the ISF 5.73 factor to the definition of MSF
  - PRAT 2023-04   Status RFC-495B Text Message Changes for Completion

- 1 Tied to RFC-519 Completion
  - PRAT 2023-01   Drive ISM Message Formats to Final State

- 3 Remaining Open
  - PRAT 2020-03   Normalize Power of 10 Notation
  - PRAT 2021-02   Almanac Ephemeris URE
  - PRAT 2023-02   Investigate CNAV-2 Schedules Technical Baseline changes for future Public Documents Updates

PRAT Items

Deferred Work

- PRAT 2021-03   Remove Inter Signal Corrections from Core CEI
- PRAT 2023-03   Investigate all Changes that have been Deferred from RFC-502

PRAT 2021-03   Remove Inter Signal Corrections from Core CEI

Yr	2021	**Number**	3	**Status**	In Progress

Originator	Mr. Karl Kovach (Aerospace Corporation)	**POC**	Karl Kovach (Aerospace)

Description   *Investigate the removal of Inter Signal Corrections from the Core CEI Data in the public documents and develop any requirements baseline changes needed to satisfy any consistency shortfalls or operational needs*

Livelink

Notes

31 May 23: The proposed CEI changes from RFC-502 have been placed on hold by GPS leadershp at ERB, but can be considered for future implementation.

27 Sep 23: In Progress. Still Open.

26 Oct 22: The Special Topic presentation advanced the subject, but had specific recommendations for baseline requirements changes. Will consider Pre-RFC-1201 for 2023 Public Documents Update RFC. Include Denis Bouvet, Rhonda Slattery and Jeff Stevens during investigation.

Related to PRAT 2023-03 *Changes that have been Deferred from RFC-502* **which is Complete**

PRAT 2023-03 Changes that have been Deferred from RFC-502

Yr	2023	**Number**	3	**Status**	Complete	

Originator	Rhonda Slattery
POC	Tony Anthony

Description *Investigate the Inclusion of all Changes that have been Deferred from RFC-502*

Livelink

Notes 13 May 25: The Special Topic given at this PICWG has completed this investigation and it is closed.

27 Sep 23: CEI Data Set Parameter notes plus other items

Related to PRAT 2021-03 *Remove Inter Signal Corrections from Core CEI* **which we are leaving open**

PRAT Items

Recommended to Close – RFC-502 Completion

- PRAT 2021-05   Data ID Issue
- PRAT 2022-03   Investigate CNAV Schedules Technical Baseline changes for future

    Public Documents Updates
- PRAT 2023-05   Investigate Impact of PRN 34 and 37 Rule (ref. 3.2.1.3 C/A-Code)

PRAT 2021-05   Data ID Issue

Yr	2021	**Number**	5	**Status**	Complete

Originator Mr. Denis Bouvet (Thales Group)   **POC**   Karl Kovach (Aerospace)

Description *Investigate the Data ID Issue and develop any requirements baseline changes needed to satisfy any consistency shortfalls or operational needs*

Livelink

Notes   13 May 25: This PRAT item is completed and closed.

4 Jan 24: This item is complete with the approval of RFC-502 the publishing of IS-GPS-200's IRN-003 to GPS.GOV

27 Sep 23: Closure is contingent on RFC-502 CCB approval.

26 Oct 22: Assessed to remain open, Karl provided special topic presentation for document changes in the 2023 PICWG.

Mr. Albert H. Hayden (SE&I) accepted an action to write a concern regarding the backward compatibility of transmitting a Data ID other than 2.

PRAT 2022-03 Investigate CNAV Schedules Technical Baseline changes

Yr	2022	**Number**	3	**Status**	Complete	

Originator 2022 PICWG Team **POC** Bert Hayden (Aerospace)

Description *Investigate CNAV Schedules Technical Baseline changes for future Public Documents Updates.*

Livelink

Notes 13 May 25: This PRAT item is closed.

4 Jan 2024: This item is complete with the approval of RFC-502 and publishing IS-GPS-200's IRN-003 to GPS.GOV. CNAV-2 is handled separately.

27 Sep 23: Closure is contingent on RFC-502 CCB approval.

A follow-on PRAT 2023-2 covers similar work for CNAV-2.

26 Oct 22: Include Jason Burns, CGJ (Army, Navy, Civils), SE&I (Straton), PNT-MAT during this investigation.

PRAT 2023-05 Impact of PRN 34 and 37 Rule

Yr	2023	**Number**	5	**Status**	Complete

Originator Dr. Andrew Hansen (DOT)   **POC**   Bert Hayden

Description *Investigate Impact of PRN 34 and 37 Rule*

Livelink

Notes 13 May 25: This PRAT item is completed and closed.

4 Jan 2024: This item is complete with the approval of RFC-502 and publishing IS-GPS-200's IRN-003 on GPS.GOV (ref. 3.2.1.3 C/A-Code)

27 Sep 23: Addresses changes anticipated to be approved in RFC-502

PRAT Items

Recommended to Close – RFC-477 Completion

- PRAT 2018-01   Update GPS products in ICD-GPS-870, Table 3-I.

PRAT 2018-01   Update
# GPS Products in ICD-GPS-870, Table 3-I.

Yr	2018	**Number**	1	**Status**	Complete	

Originator CWO Rebecca Ruch/ Rick Hamilton (USCG) **POC** Stephan Hillman (Aerospace)

Description *Consider updating GPS products depicted in ICD-GPS-870 to reflect the modernized formats described in ICD-GPS-870, Table 3-I.*

Livelink

Notes 13 May 25: This PRAT item is closed.

4 Mar 24: This item is complete with the CCB approval of RFC-477 and the publishing of ICD-GPS-870 IRN-001 on GPS.GOV

27 Sep 23: Closure is contingent on RFC-477 CCB approval.
26 Oct 22: RFC 477 will hold an out-of-cycle PICWG in early 2023. US Gov working to gain PA approval on material, We will release to the Public as soon as possible.
13-Jan-2022: Being solved as part of RFC-477
17 Sep 20: Government plans to work XML changes or products in new RFC "2021 Public Document Proposed Changes". Scope was removed from RFC-395.
5 Jun 19: Currently in-work under RFC-395 (2019 PICWG). Note: XML Schemas may be updated independent of the document to account for the modernized GPS products.
12 Sept 18: This topic is documented in SE&I internal concerns; to be worked in the 2019 Public RFC.

PRAT Items

Recommended to Close – Other

- PRAT 2022-01   Reassess the relevance of the ISF 5.73 factor to the definition of MSF
- PRAT 2023-04   Status RFC-495B Text Message Changes for Completion
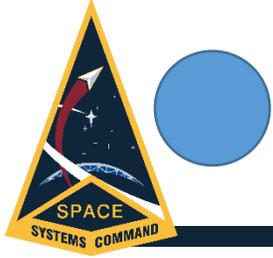
PRAT 2022-01 Relevance of ISF 5.73 factor to the definition of MSF

Yr	2022	**Number**	1	**Status**	Cancelled	

Originator 2022 PICWG Team

POC Karl Kovach (Aerospace)

Description *Reassess the relevance of the ISF 5.73 factor to the definition of MSF and develop any requirements baseline changes needed to satisfy any consistency shortfalls or operational needs*

Livelink

Notes   13 May 25: Closed without action because there is no relevance to the 5.73 factor.

13 Mar 25: The reassessment determined there are no plans for SVs with the capability of ISF = 1. This means the 5.73 factor has no relevance.

27 Sep 23: Closure of this PRAT item is conditioned on the resolution of pending changes to the definition of the ISM in the GPS technical baseline. Current definitions of Rsat and MFDsat need revision to reflect than an MSF is defined as IURE > 4.42 x URA for the computation of these parameters.

26 Oct 22: Initiated at the 2022 Public ICWG. Consider developing a special topic presentation for the 2023 Public ICWG.

PRAT 2023-04 Status RFC-495B Text Message Changes

Yr	2023	**Number**	4	**Status**	Cancelled
Originator	Dr. Andrew Hansen (DOT)			**POC**	Jason Bolger

Description *Status RFC-495B Text Message Changes for Completion*

Livelink

Notes 3 Mar 25: Per a CCB Special Topic, RFC-495B status changed from on-hold to cancelled. The RFC had matured through ERB 24 Apr 24. The Concern is closed and the item is being externally tracked by 31 STS. This PRAT item is cancelled with no further action planned.

27 Sep 23: This small set of requirements changes greatly expands the printable character codes and will allow Text Messages to be treated as binary coded messages since all 256 8-bit character codes are allowed in all character code positions, regardless of their printability.

PRAT Items

Tied to RFC-519 Completion

- PRAT 2023-01   Drive ISM Message Formats to Final State

PRAT 2023-01 Drive ISM Message Formats to Final State

Yr	2023	Number	1	Status	In Progress

Originator	Calvin Miles	**POC**	Dan Stevenson/Tony Anthony

Description *Drive ISM Message Formats to Final State*

Livelink

Notes

9 Aug 24: Rescoped due to the RFC-519 JCRB to include only public facing interfaces so it can more directly respond to RFC-519 which itself was rescoped to define the ISM message formats. Can be closed once RFC-519 is complete.

27 Sep 23: Complete the system engineering for a PRN/IRN set and update the technical baseline. Refer to the 2023 Public ICWG Special Topic on the associated RFCs for the current state. This supersedes PRAT 2021-4 which never had its associated RFC-495A CCB approved. This PRAT Item will replace the ISM related changes from RFC-495A and the ISM related changes deferred from RFC-502.

PRAT Items

Remaining Open

- PRAT 2020-03   Normalize Power of 10 Notation
- PRAT 2021-02   Almanac Ephemeris URE
- PRAT 2023-02   Investigate CNAV-2 Schedules Technical Baseline changes for future Public Documents Updates

PRAT 2020-03   Normalize Power of 10 Notation

Yr	2020	Number	3	Status	In Progress
Originator	Rhonda Slattery			POC	Tony Anthony (SE&I)

Description *Make documents consistent between using the notation "x10^-1" and "1E-1". Choose one option an make all other ocassions consistent.*

Livelink

Notes
13 Mar 25: The number of changes recommended for change (after RFC-519 completes) are as follows:
IS-GPS-200 - 5 places
IS-GPS-705 - 10 places
IS-GPS-800 - 10 places
ICD-GPS-240 - 3 places
ICD-GPS-870 - 6 places

27 Sep 23: This work item was not included in RFC-502 for the 2023 Public ICWG. Still Open.

26 Oct 2022: Discussed at 2022 Public ICWG. Assess for feasiability with public documents 1st, then address the rest of the baseline.   Give public documents priority.
30 Sep 2020: Action derived from RFC 413 comment. Will explore how many objects are affected

PRAT 2021-02 Almanac Ephemeris URE

Yr	2021	**Number**	2	**Status**	<mark>In Progress</mark>

Originator Mr. Albert H. Hayden (SE&I)   **POC** Bert Hayden (Aerospace)

Description *Investigate the Almanac Ephemeris URE Table in IS-GPS-200 20.3.3.5.2.1 Almanac for RFC 467 and develop any requirements baseline changes needed to satisfy any consistency shortfalls or operational needs.*

Livelink

Notes   13 May 25: The Special Topic on this subject to be presented at the May 2025 PICWG was unable to be presented. This subject will be addressed at a future time.

27 Sep 23: In Progress. Still Open. Will consider Pre-RFC-1202 for future Public Documents Update RFC.

26 Oct 22: Assessment not complete. Will consider Pre-RFC-1202 for 2023 Public Documents Update RFC.
29 Sep 21: Mr. Albert H. Hayden (SE&I) accepted an action to investigate the information on Table 200-2078 for RFC 467.

PRAT 2023-02   Investigate CNAV-2 Schedules Technical Baseline Changes

Yr	2023	**Number**	2	**Status**	In Progress

Originator Rhonda Slattery   **POC** Bert Hayden

Description *Investigate CNAV-2 Schedules Technical Baseline changes for future Public Documents Updates*

Livelink

Notes 18 Dec 24: Bert Hayden initiated a biweekly integrated team meeting on this subject and will report progress in the future. GPS leadership is deferring cost items like this until needed. The predicted need is some time after L1C IOC (currently estimated 2030/2031).

27 Sep 23: Prior item is PRAT 2022-3 but only for CNAV.

PRAT Items

New 2025 PRAT Items
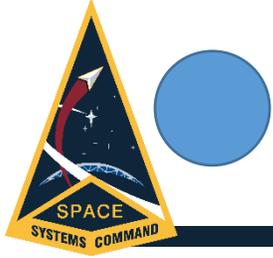
PRAT 2025-0 Investigate PRAT Handling Mechanisms

Yr	2025	**Number**	1	**Status**	In Progress
Originator	Rhonda Slattery			**POC**	Emily Hendrickson

Description *Investigate more effective mechanisms to handle and discharge PRAT items and public document oriented Concerns.*

Livelink

Notes 14-May-2025: SSC/CGEP has fewer resources to effect change to the requirements baseline than in the past. This applies both PRAT items and pre-RFCs and Actions against the public documents, which are stacking up without getting implemented or acted on for years.
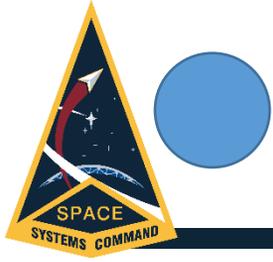
PRAT 2025-02   CNAV Velocity Correction

Yr	2025	**Number**	2	**Status**	In Progress
Originator	TBD			**POC**	Tony Anthony / David Allen (Aerospace)

Description *Implement the CNAV velocity formula corrections in the public Signal-in-Space documents*

Livelink

Notes 14-May-2025: Per David Allen's Special Topic on mistakes in several CNAV velocity formulae, these formulae need to be corrected in all places in the public Signal-in-Space documents well before CNAV IOC is declared.

Action Item Review

Closing Remarks

Backup Slides

Acronyms

2 NWS	2nd Navigation Warfare Squadron		ISM	Integrity Support Message
AEP	Architecture Evolution Plan		JTLV	Joint Light Tactical Vehicle
AFL	Available for Launch		LCS	Launch and Checkout System
AODO	Age of Data Offset		MGUE	Military GPS User Equipment
ASIC	Application Specific Integrated Circuit		MOPS	Minimum Operational Performance Standards
CCB	Configuration Control Board		MSF	Major Service Failure
CDD	Capability Development Document		MSI	Miniature Serial Interface
CDR	Critical Design Review		NIWC-PAC	Naval Information Warfare Center -Pacific
CEI	Clock/Ephemeris/Integrity		NMCT	Navigation Message Correction Table
CNAV	Civil Navigation		OCX	Operational Control System
CUI	Controlled Unclassified Information		OT	Operational Testing
CY	Calendar Year		PCN	Proposed Change Notice
DAGR	Defense Advanced GPS Receiver		PDR	Preliminary Design Review
DDG	Arleigh Burke Guide Missile Destroyer		PICWG	Public Interface Control Working Group
DFMC	Dual-Frequency Multi-Constellation		PNT	Positioning, Navigation, and Timing
DT	Developmental Testing		PRAT	Public Requirements Accountability Tool
ERB	Engineering Review Board		PRN	Pseudo-Random Noise
EUROCAE	European Organization For Civil Aviation Equipment		RFC	Request for Change
FAA	Federal Aviation Administration		RTCA	Technical Commission for Aeronautics
FOT&E	Follow-on Operational Test and Evaluation		SBAS	Space Based Augmentation System
FQT	Formal Qualification Testing		SIS	Signal in Space
FUE	Field User Evaluation		SV	Space Vehicle
GNST+	GPS IIIF Non-flight Satellite Test Bed		TIM	Technical Interface Meeting
GRAM–S/M	GPS Receiver Application Module – Standard Elec Module/Modernized		TLD	Target Launch Date
			TRV	Technical Requirements Verification
HH	Handheld		UE	User Equipment
HPE	Hewlett Packard Enterprise		URA	User Range Accuracy
IAURA	Integrity Assured User Range Accuracy		URE	User Range Error
IBM	International Business Machines		USAF	United States Air Force
IBR	Integrated Baseline Review		USMC	United States Marine Corps
IDR	Implementation Design Review		USN	United States Navy
ISF	Integrity Status Flag		WAGE	Wide Area GPS Enhancement