Global Positioning System (GPS)

Public Interface Control Working Group (ICWG) & Public Forum

September 27, 2023
0830-1700 PDT

Controlled by: USSF
Controlled by: SSC/CG
CUI Category: N/A
Distribution: Approved for Public Release; distribution unlimited.
POC: SSC/CG

United States Space Force
Positioning, Navigation, and Timing Mission Area
Major Cobb Brandon
Captain Rick Merchant

Dial-in Information

LIVE MEETING LINK:

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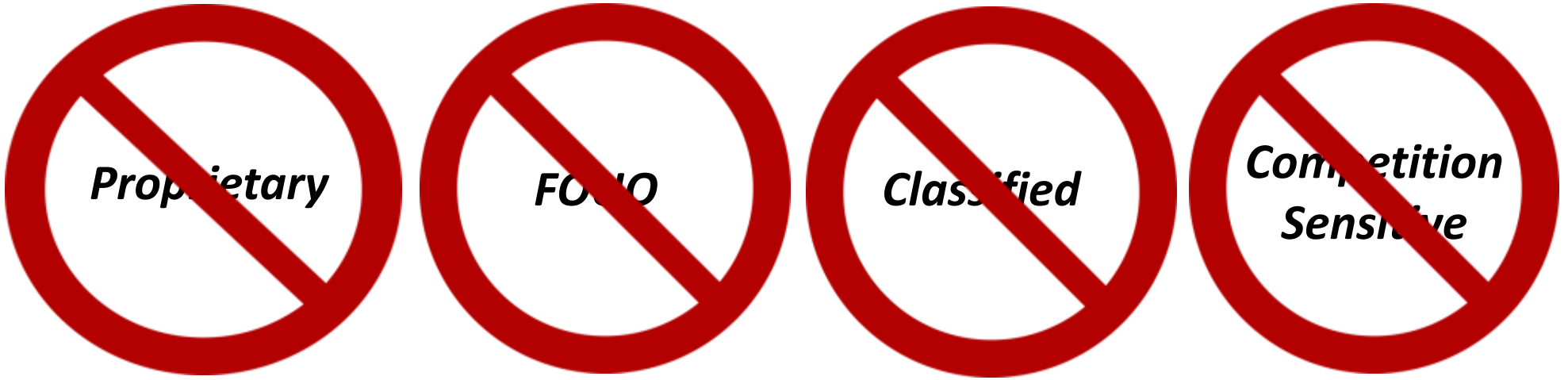
Rules of Engagement

UNCLASSIFIED



ABSOLUTELY NO PROPRIETARY, FOUO, 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 against the 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

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	Capt. Rick Merchant	08:30 08:45
Opening Remarks / GPS Overview	Maj. Stewart Brandon	08:45 09:05
2023 Public ICWG RFC Discussion		
• RFC-502 - 2023 Proposed Changes to the Public Documents	Tony Anthony	09:05 10:30
Break		**10:30 10:40**
• RFC-477 - OCX XML Products For Civil Users	Danny Froerer	10:40 11:00
Action Item Review		11:00 11:15
Lunch Break (1 hour)		**11:15 12:15**

Public Forum Presentations (2nd Half of Day)	Presenter	Times
• Status – ISM Proposed Changes to the Requirements Baseline	Capt. Merchant	12:15 12:35
• ISM CSOC IPT Recommendation	Dr. Hansen	12:35 13:05
• Next Generation OCX XML	S. Hillman	13:05 13:25
• USCG Presentation	--	13:25 13:45
Break		**13:45 13:55**
• PRN Expansion	Karl Kovach	13:45 14:05
Walk-on Topics, Open Discussion	--	13:55 14:25
PRAT - Public Req. Accountability Tool	Tony Anthony	14:25 14:55
Action Item Review		14:55 15:15
Closing Remarks	Maj. Brandon	15:15 15:20

Opening Remarks

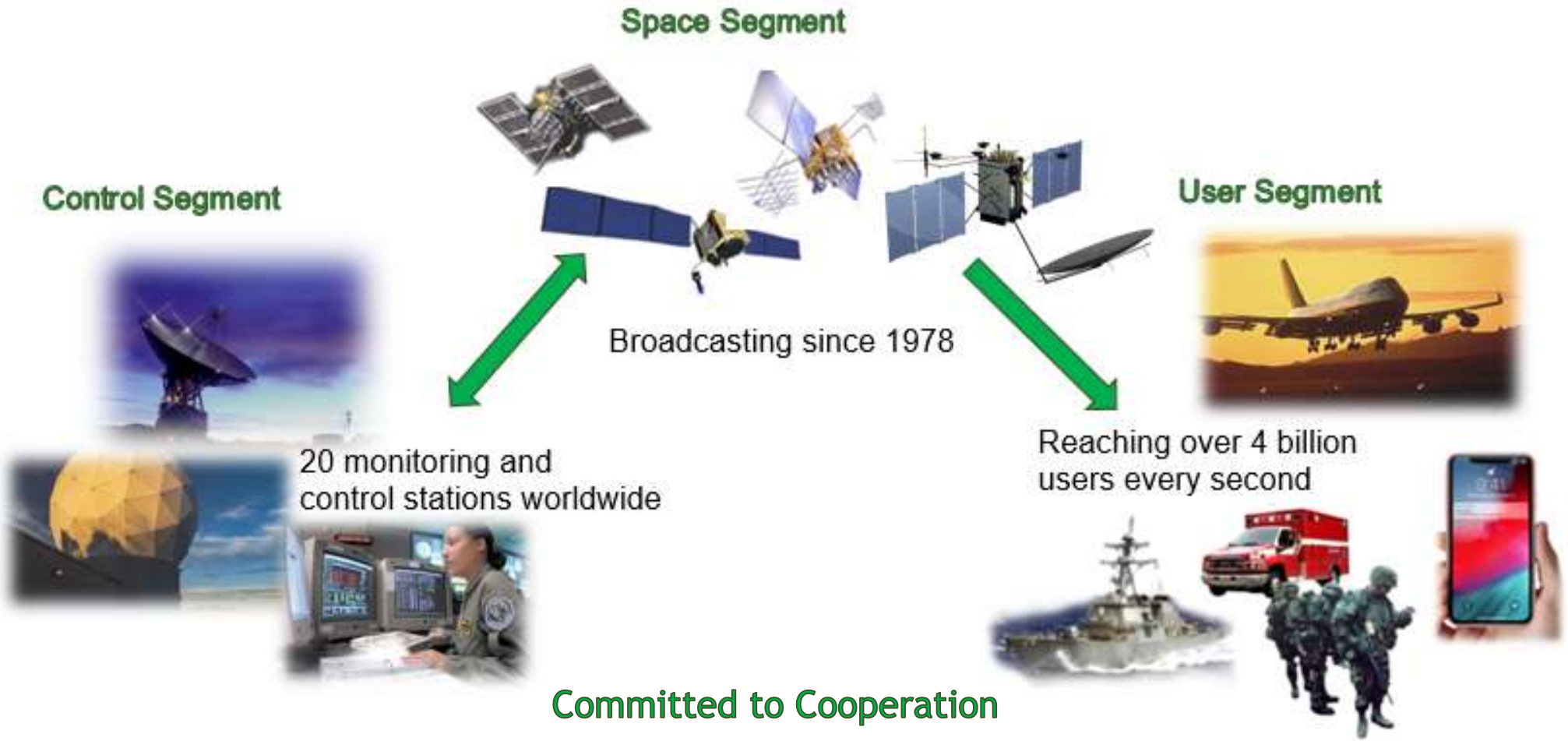
Global Positioning System (GPS) Position, Navigation, and Timing Mission Area

September 27, 2023

Major Stewart C. Brandon

Chief, Positioning, Navigation and Timing Requirements and Integration Branch

GPS Overview (DoD)



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

GPS Constellation Status

38 Satellites • 31 Set Healthy
Baseline Constellation: 24 Satellites

Satellite Block	Quantity	Average Age (yrs)	Oldest
GPS IIR	13 (5*)	20.7	26.1
GPS IIR-M	8 (1*)	14.9	17.9
GPS IIF	11 (1*)	8.6	13.3
GPS III	5	2.4	4.7

*Not set healthy

As of 2 Aug 23

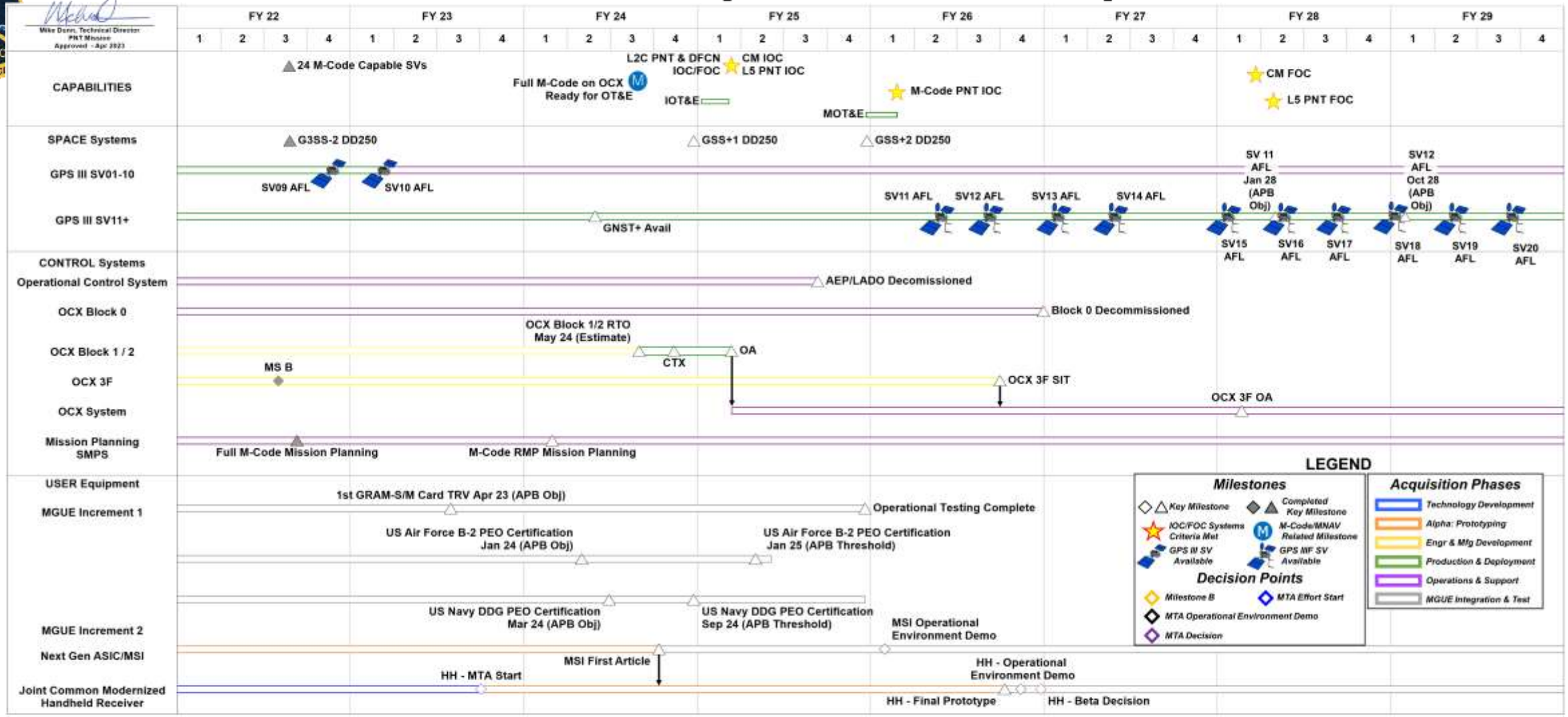
GPS Signal in Space (SIS) Performance

Week ending on 3 Sept 23

Average URE*	Best Day URE	Worst Day URE
49.1 cm	31.5 cm (20 Apr 21)	64.8 cm (20 May 22)

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

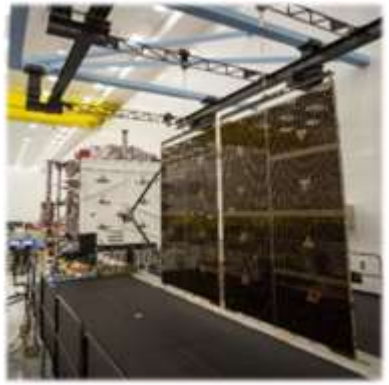
GPS Enterprise Roadmap



AEP	Architecture Evolution Plan	DFCN	Dual-Frequency Civil Navigation	HH	Handheld	MOT&E	Multi-Service Operational Test & Evaluation	PNT	Positioning, Navigation & Timing
AFL	Available for Launch	FOC	Full Operational Capability	IOC	Initial Operating Capability	MSI	Miniature Serial Interface	RMP	Regional Military Protection
APB	Acquisition Program Baseline	GRAM-S/M	GPS Receiver Application Module – Standard Elec Module/Modernized	IOT&E	Initial Operational Test & Evaluation	MTA	Middle Tier Acquisition	RTO	Ready for Transition to Ops
ASIC	Application-Specific Integrated Circuit			JLTV	Joint Light Tactical Vehicle	OA	Operational Acceptance	SMPS	SAASM Mission Planning System
CM	Constellation Management	G3SS	GPS III Satellite Simulator	LADO	Launch, Anomaly, and Disposal Operations	OCX	Next Gen Operational Control System	SIT	System Integration Test
CTX	Constellation Transfer	GNST+	GPS IIF Non-Flight Satellite Testbed	M-Code	Military Code	OT&E	Operational Test and Evaluation	SV	Space Vehicle
DDG	Arleigh Burke Guided Missile Destroyer	GSS	GPS Satellite Simulator	MGUE	Military GPS User Equipment	PEO	Program Executive Officer	TRV	Technical Requirements Verification

GPS III

- SV01 Set healthy and available for use on 13 Jan 20
- SV02 Set healthy and available for use on 1 Apr 20
- SV03 Set healthy and available for use on 1 Oct 20
- SV04 Set healthy and available for use on 2 Dec 20
- SV05 Set healthy and available for use on 25 May 22
- SV06 Set healthy and available for use on 16 Feb 23
- SV07 in storage – AFL 20 May 21; TLD June 2024
- SV08 in storage – AFL 10 Jun 21; TLD Q1 FY25
- SV09 in storage – AFL 23 Aug 22; TLD FY26
- SV10 in storage – AFL 8 Dec 22;TLD FY26



Six GPS III satellites declared operational

GPS III Follow-On (GPS IIIF)

- GPS IIIF additional features
  - Regional Military Protection (RMP) and redesigned Nuclear Detonation Detection System (NDS)
  - Search-and-Rescue (SAR) payload – faster detection and location of distress signals
  - Laser Retroreflector Array (LRA) – provides more precise ranging data
  - Partnering with Air Force Research Laboratory (AFRL) for future technology opportunities
    - Demo on Navigation Technology Satellite (NTS-3)
      - Digital Reprogrammable Payloads
      - Advanced Clocks
  - Status: Milestone C Completed 13 Jul 20; GPS IIIF Non-Flight Satellite Testbed (GNST+) build-up completed Jul 23; SV11 launch forecasted for FY2027

Ensuring the Gold Standard today and into the future

Next Generation Operational Control System (OCX)

- Next-generation command, control and cyber-defense for GPS
  - Enhanced command and control capability
  - Modernized architecture
  - Robust information assurance and cyber security
- Incremental Development
  - OCX Block 0: Launch and Checkout System (LCS) for GPS III
  - OCX Blocks 1 and 2: Controls and manages all GPS IIR, GPS IIR-M, GPS IIF, and GPS III spacecraft; and controls all legacy and new GPS signals
  - OCX 3F: Adds support to OCX for GPS IIIF vehicle and new capabilities including Regional Military Protection
- Current Status
  - LCS successfully supported Launch and Checkout for GPS III SV01-SV05
  - OCX Block 1 completed factory integration and in Golden Dry Run for factory qualification
  - Constellation Transfer (CTX) 4QFY24; Operational Acceptance target FY25

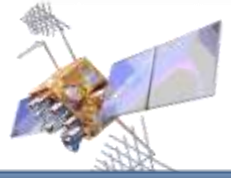
OCX program continues to execute and is nearing completion

GPS Modernization

SPACE SEGMENT (SATELLITES)

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

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



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)
- Longer Life
- Improved Clocks

GPS IIIF (SV11-32)
- Unified S-Band Telemetry, Tracking, & Commanding
- Search & Rescue (SAR) Payload
- Laser Retroreflector Array
- Redesigned NDS Payload
- Regional Military Protect (RMP)

CONTROL SEGMENT (GROUND)

Legacy (OCS)
- Mainframe System
- Command & Control
- Signal Monitoring

Architecture Evolution Plan (AEP)
- Distributed Architecture
- Increased Signal Monitoring Coverage
- Security & Accuracy
- Launch And Disposal Operations

OCX Block 0
- GPS III Launch & Checkout

GPS III Contingency Ops (COps)
- GPS III Mission on AEP

M-Code Early Use (MCEU)
- Update OCS to operationalize Core M-Code on AEP

OCX Blocks 1 and 2
- Fly GPS IIR/-M, GPS IIF, GPS III
- Modernize Cyber Architecture
- Operationalize Civil Signals (L1C, L2C, L5)
- Full M-Code

OCX Block 3F
- Incorporates GPS IIIF Command & Control
- Integrates new capabilities

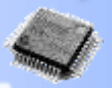
USER SEGMENT (RECEIVERS)

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

Visit GPS.gov for more info

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

Military GPS User Equipment
- M-Code Receivers
- Common GPS Modules
- Increased Access Power w/ M-Code
- Increased Accuracy
- Increased Availability
- Increased Anti-Tamper Anti-Spoof
- Increased Acquisition in Jamming



GPS Requirements Management

September 27, 2023

Major Stewart Brandon

Chief, Positioning, Navigation, and Timing Requirements and Integration Branch

GPS Requirements Team

Space Force

- Maj Stewart Brandon, Chief, Positioning, Navigation and Timing Requirements & Integration Branch
- Maj Adam Rich, Deputy Chief, Positioning, Navigation and Timing Requirements & Integration Branch
- Capt Rick Merchant, Chief, PNT Spectrum Management
- 2d Lt Zachary Carroll, Chief, PNT Requirements & Technology

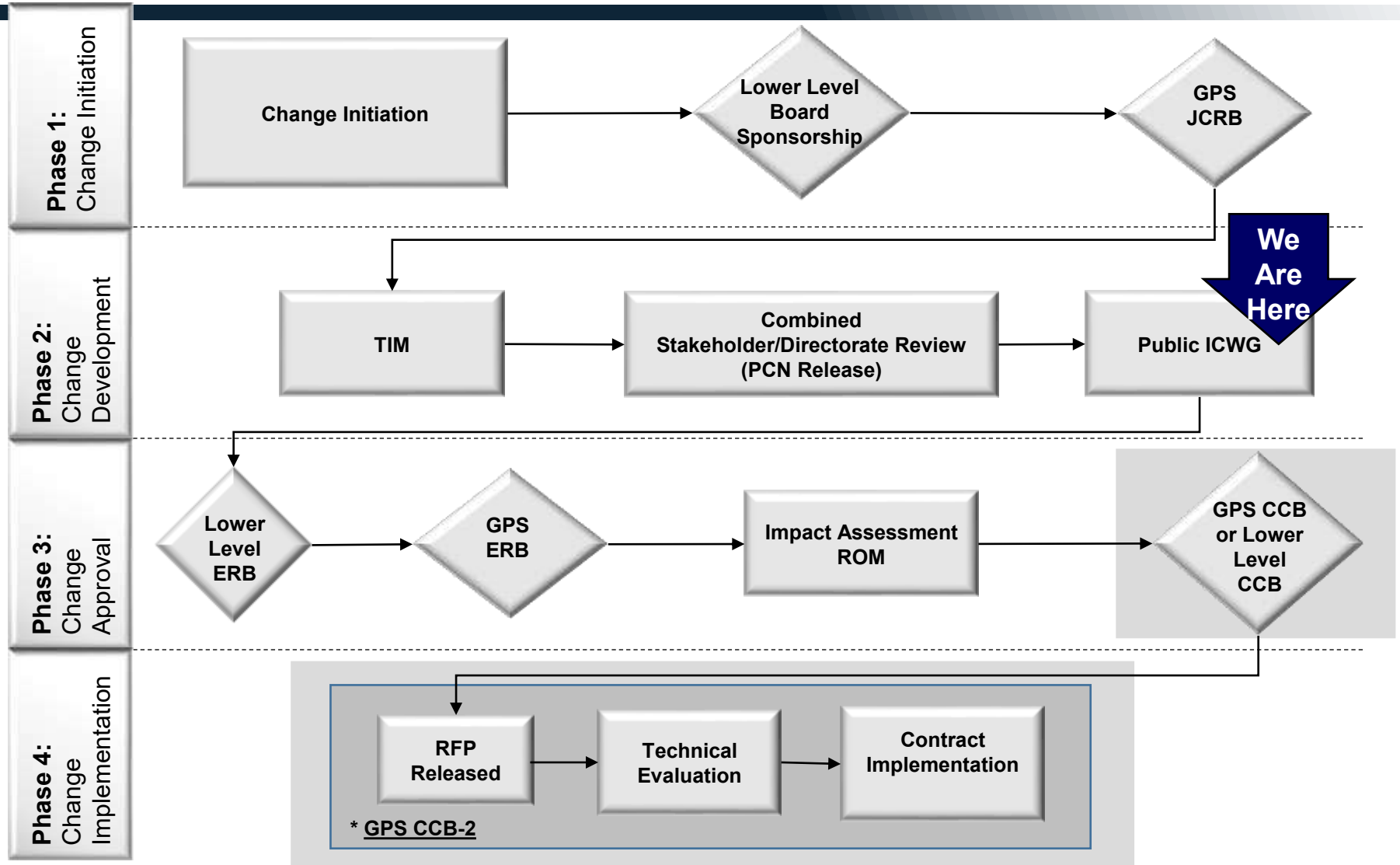
Aerospace

- Dr. Rhonda Slattery, Enterprise Requirements Lead
- Mr. Karl Kovach, Civil Requirements Lead
- Mr. Bert Hayden, Senior Engineer Specialist

Systems Engineering and Integration (SE&I)

- Mr. Don Latterman, Senior Technical Advisor
- Mr. Tony Anthony, Responsible Engineer
- Mr. Danny Froerer, Responsible Engineer

Technical Baseline Change Management Process Flow Chart



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 2023 PICWG please submit to ssccgepr@spaceforce.mil

QUESTIONS?

RFC-502 Positioning, Navigation and Timing Mission Public ICWG Slides

PUBLIC-ICWG/AWG #2
27-SEP-2023

DOCUMENT CLASSIFICATION
Unclassified

REQUEST FOR CHANGE (RFC) NUMBER
RFC-502

RFC TITLE
2023 Proposed Changes to the Public Documents

GOVERNMENT POC
Capt. Rick Merchant, SSC/CGEP, 310.653.1871
SE&I POC
Tony Anthony, SSC/CGE/SE&I, 310.418.7693
CM POC
Veronica Quebedeaux, SSC/CGE/SE&I, 310.414.2856

Bottom Line Up Front

- Being a Public RFC supporting the Public ICWG, this RFC's path and approvals are more complex than for most RFCs – many steps are doubled
- The Public Interface Control Working Group meeting today serves the purpose of the official Adjudication Working Group as defined for the TBCMP
- What is agreed to today will most likely be applied to the public documents
  - IS-GPS-200
  - IS-GPS-705
  - IS-GPS-800

RFC-502: 2023 Proposed Changes to the Public Documents

RFC CHANGE TYPE: Correction or Clarification to Baseline			
1) PROBLEM STATEMENT:			
Item	**Problem**	**Pre-RFC**	**PRAT***
1	Finalize the CNAV Schedules Technical Baseline changes	1187	2022-03
2	Determine if a clarifying note is needed on the equal applicability of the b_{nom} computation to LNAV and CNAV; provide note as needed	1266	2022-04
3	Resolve the Data ID Issue (a commercial vendor did not want Data IDs other than 2)	1203	2021-05
4	Add the maximum power for GPS III/IIIF SVs to IS-GPS-200	1231	
5	Accommodate all administrative fixes possible from Boeing's list of fixes	--	

*** PRAT – Public Requirements Accountability Tool**

RFC-502: 2023 Proposed Changes to the Public Documents

2) SOLUTION:

Make updates to public documents IS-GPS-200, IS-GPS-705, IS-GPS-800 as appropriate

Item	Problem
1	Update the CNAV message schedule information
2	Publish the resolution for the Data ID Issue to IS-GPS-200
3	Add the maximum power for GPS III/IIIF SVs to IS-GPS-200
4	Fix the two figures that have the most readability problems

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

Sponsor: CGEP	Lead Driver Event: L2C PNT IOC/FOC and Dual Frequency Civil Navigation (DFCN) IOC/FOC & L5 PNT IOC	Lead Driver Event Date: 2025

JCRB	TIM	Stakeholder Review	Comments Due	Resolve Comments	AWG	LL ERB	GPS ERB	Impact Assessment Period	LL CCB	CCB
6 Feb 23	15 Feb 23 1 Mar 23	15 Mar 23	14 Apr 23	30 Apr 23	17 May 23 (Gov AWG)	31 May 23 "vector check"	1 Nov 23	3 Nov 23 – 3 Jan 24	17 Jan 24	23 Jan 24
		7 Jul 23	11 Aug 23 & 22 Aug 23	25 Aug 23	27 Sep 23 P-ICWG	25 Oct 23				

4) APPROVAL AUTHORITY: (Select one)

✓	Enterprise	Proposed Change (or Variance) affects multiple Segments' Technical Baseline(s), prime contractor documentation or external agencies outside of the GPS Directorate
	Lower Level	Proposed Change (or Variance) affects one Segment's Technical Baseline or prime contractor documentation

RFC-502 Stakeholder Review Status

15) REVIEW STATUS

Office	Response Required	No Impact	No Comments	Comments	No Response
CGJA (PCA; GPA)	RR		X		
CGJC (ZACS-Civil; GPC)	RR	X			
CGJG (ZACS-NGA; GPD)	RR		X		
CGEP (ZACS-PNT; GPE)	RR		X		
CGEV (PCET; GPEV)	RR		X		
CGCC OCX 3F (PCCC)	RR		X		
CGCC SMPS (PCCC; GPGC)	RR		X		
CGCX (PCCX; GPGX)	RR		X		
CGL (PCL; GPL)	RR		X		
CGG (ECPG; GPL)	RR			X	
CGJN (PCV; GPN; PCN)	RR		X		
CGX (PCT; GPT)	RR		X		
CGU (PCU; GPU)	RR			X	
CGV3 (PCM3; GPV3)	RR			X	
CGVF (PCMF; GPV4)	RR			X	
SNWN (PCCN; GPGN)	RR		X		
SNPB	RR				
AEROSPACE	RR			X	
MITRE	RR			X	
SE&I	RR		X		
EXTERNAL STAKEHOLDERS					
PM-PNT (Army)		See CGJA (PCA; GPA) Response			
NIWC PAC		See CGJN (PCV; GPN) Response			
USNO		See CGJN (PCV; GPN) Response			
USMC		See CGJN (PCV; GPN) Response			
NAWCAD		See CGJN (PCV; GPN) Response			

EXTERNAL STAKEHOLDERS	Response Required	No Impact	No Comments	Comments	No Response
USSF, SpOC 2 SOPS (SPOC 2 SOPS)	RR			X	
Space Delta 8 (was 50OG)	RR			X	
SpOC/PNT-MAT (was SpOC/S5M)	RR	X			
National Security Agency (NSA)	RR		X		
NGA	RR		X		
PNT—PO (ADAP, MAGR, DAGR); EGI-M	RR		X		
AFLCMC/EBD			X		
USSF/S5R	RR				
DOT/FAA	RR			X	
PRIME CONTRACTORS					
GPS IIR/IIR-M/III/IIIF On Orbit Sust - LM	RR			X	
GPS IIF On-Orbit Sust - Boeing	RR		X		
GPS III - LM	RR			X	
GPS IIIF - LM	RR			X	
GCS II – Sust - LM	RR	X			
OCX 1/2 - RTX	RR		X		
OCX 3F - RTX	RR		X		
MGUE Inc 1 - KTR A	RR		X		
MGUE Inc 1 - KTR B	RR		X		
MGUE Inc 1 - KTR C	RR			X	
MGUE Inc 2 MSI - BAE	RR			X	
MGUE Inc 2 MSI - L3H	RR		X		
MGUE Inc 2 MSI - RTX	RR		X		
SMPS Development - BAH	RR	X			
SMPS Sust - Lockheed Martin	RR	X			
USNDS Ground 6 / ICADS 7 - Sandia	RR	X			

Stakeholder Review Comment Resolution Matrix (CRM) Status – at May 31st, 2023 Lower Level Board

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:						
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**	**Notes**
Accept	**5**	**17**	**19**	**41**	**41**	
Accept with Comment	**2**	**29**	**7**	**38**	**38**	
Reject	**3**	**15**	**2**	**20**	**20**	
Defer	**1**	**5**		**6**	**6**	
Question		**2**		**2**	**2**	
Grand Totals:	**11**	**68**	**28**	**107**	**107**	

Stakeholder Review Comment Resolution Matrix (CRM) Status – at This Review

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:						
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**	**Notes**
Accept		**8**	**5**	**13**	**12**	
Accept with Comment	**1**	**8**	**3**	**12**	**12**	
Reject		**2**		**2**	**2**	
Defer		**4**	**1**	**5**	**5**	
Question	**2**		**1**	**3**	**3**	
Withdrawn	**1**	**1**	**3**	**5**	**5**	
Grand Totals:	**4**	**23**	**13**	**40**	**39**	

WN and WN_{op} Fixes to all CEI Data Set Parameter Tables

DOORS ID	IS200-1639, IS705-1521, IS800-917		
Paragraph	Table 30-I Message Types 10 and 11 Parameters Table 20-I Message Types 10 and 11 Parameters Table 6.2-18 CEI Data Set Parameters	**Comment Number**	CRM #156, 164, 165
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	FAA		
Comment	156 Incorrect description of the WN term in the table describing MT-10 , Data Sequence Propagation Week Number -> Week Number 164 Table should include WN_{op} with parameter name “CEI Data Sequence Propagation Week Number” 165 WN parameter incorrectly characterized, Data Sequence Propagation Week Number -> Week Number		
Government Response	Accepted. These specific changes were vetted in RFC-495A. Although the CEI Data Set Notes changes were deferred from this RFC, these corrections to WN and WN_{op} do not constitute changes to the Notes and will be corrected with this RFC.		

WN and WN_{op} Fixes to all CEI Data Set Parameter - Redlines

Paragraph IS200-1639, IS705-1521, IS800-917

IS-GPS-200 Redlines

Symbol	Parameter Name	Subframe	Message
…			
WN	~~Data Sequence Propagation~~ Week Number	1	10
T_{GD}	Group Delay Differential	1	30
WN_{OP}	CEI Data Sequence Propagation Week Number	N/A	30-37
…			

IS-GPS-705 Redlines

Symbol	Parameter Name	Message
…		
WN	Week Number	10
…		
T_{GD}	Group Delay Differential	30
WN_{OP}	CEI Data Sequence Propagation Week Number	30
…		

IS-GPS-800 Redlines

Symbol	Parameter Name	Subframe
…		
T_{GD}	Group Delay Differential	2
WN_{OP}	CEI Data Sequence Propagation Week Number	2
…		
WN	~~Data Sequence Propagation~~ Week Number	2

Fixing WN in Tables

DOORS ID	IS200-552, IS800-159		
Paragraph	Table 30-I Message Types 10 and 11 Parameters Table 3.5-1 Subframe 2 Parameters	**Comment Number**	CRM #145, 163
Comment Type	Substantive Administrative	**Disposition**	Accept
Comment Originator(s)	FAA		
Comment	145 Table 30-I WN description of WN in Type 10 message is incorrect, describes WN_{op}, not WN 163 WN parameter incorrectly characterized Data Sequence Propagation Week Number -> Week Number		
Government Response	Accept		

WN Table Fixes Redlines

Paragraph	IS200-552, IS800-159

IS-GPS-200 Table 30-I Redlines

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	~~Data Sequence Propagation~~ Week Number	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
⋮	⋮	⋮	⋮	⋮	⋮

IS-GPS800 Table 3.5-1 Redlines

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	~~Data Sequence Propagation~~ Week Number	13	1		weeks
ITOW	Interval time of week	8		0 to 83	(see text)
⋮	⋮	⋮	⋮	⋮	⋮

WN and WN_{op} In The Acronym Lists

DOORS ID	IS200-1488, IS705-1496		
Paragraph	6.1 Acronyms	**Comment Number**	CRM #152, 151, 161
Comment Type	Substantive	**Disposition**	Reject Accept with Comments
Comment Originator(s)	FAA		
Comment	151, 161 Table should include WN_{op}. WN_{op} is required in the calculation of IAURA. 152 WN is labeled incorrectly. Data Sequence Propagation Week Number -> Week Number		
Government Response	The overarching decision after deliberation with the SMEs is that WN, WN_{op} and other Parameters such as the CEI Data Set parameters are not Acronyms and should not be in the Acronym List. If WN were somehow used as a general term for Week Number it might be able to stay in the Acronym List, but all uses of WN in all these documents are clearly referring to the CEI Parameter. All of these suggestions made by these comments would be rejected except that #152 is pointing out a clear naming error. Other parameters that may be in the Acronym Lists will not be removed at this time. 152 Because a naming error is being pointed out we will remove WN (and WN_e which isn't used at all in this document) from the Acronym List.		

WN and WN_{op} In The Acronym Lists - Redlines

Paragraph	IS200-1488
Red Lines	

.
.
.

UTC	-	Coordinated Universal Time
WGS 84	-	World Geodetic System 1984
~~WN~~	~~-~~	~~Data Sequence Propagation Week Number~~
~~WN_e~~	~~-~~	~~Extended Week Number~~

PRNs 33 and 37

DOORS ID	IS200-1334, IS200-1335		
Paragraph	6.4.3 PRNs 33 and 37	**Comment Number**	CRM #146, 150
Comment Type	Substantive Administrative	**Disposition**	Accept with Comments
FAA	FAA		
Comment	146 Section does not say what the user should do if a satellite broadcasts PRN-33. It is also not clear how this relates to section 6.4.4 and why section 6.4.4 only requires PRNs 33 - 63 to be synchronized with GPS time. 150 Should remove PRN37 as an alert mechanism from SPS PS since not included as an alert in Section 6.4.6. Also, if PRN37 is not being used for SATZAP, then should remove reference in IS, although this is not critical.		
Government Response	Is in RFC-495A, but this new wording has been modified to more accurately state the intent, which addresses the point of CRM #146		

PRNs 33 and 37 - Redlines

Paragraph	IS200-1334, IS200-1335
Baseline	**6.4.3 PRNs 33 and 37** PRN 33 should not be used by satellites because of its prior use in specialized ground applications. PRN 37 should not be used by satellites until after PRN 37 is no longer needed for SATZAP purposes.
RFC-495A Proposed Redlines	**6.4.3 PRN~~s~~ 33 ~~and 37~~** PRN 33 should not be used by satellites because of its prior use in specialized ground applications. ~~PRN 37 should not be used by satellites until after PRN 37 is no longer needed for SATZAP purposes.~~
Current Proposed IS	**6.4.3 PRN 33** Currently, the control segment should not command PRN 33 for satellites because of its prior use in specialized ground applications. Future users should include PRN 33 tracking capability in receivers and be able to use PRN 33 if it is included in the broadcast almanac.

Important Changes From RFC-495A

DOORS ID	N/A		
Paragraph	N/A	**Comment Number**	CRM #147, #157
Comment Type	Critical	**Disposition**	Question
Comment Originator(s)	FAA		
Comment	147 There are important comments that were accepted as part of RFC-495. Either provide clarity on whether these will be added to the next revision of IS-200 or add to RFC-502 changes. These comments follow. (CRM #148 through #154) 157 There are important comments that were accepted as part of RFC-495. Either provide clarity on whether these will be added to the next revision of IS-705 or add to RFC-502 changes. These comments follow. (Items #158 through #161)		
Government Response	148, 153, 154 Are included below 149 Is now included below 150 Is now included above 151, 152 Are not being included - these changes were never planned for RFC- 495A 158 Was not in RFC-495A but is now included below 159 Was not in RFC-495A but is now included below 160 This administrative reformatting is below the threshold for reformatting 161 CEI Notes changes were officially deferred per the PNT LLB		

Specific Alarm Indications – From RFC-495A

DOORS ID	IS200-1640		
Paragraph	6.4.6.2.2 Specific Alarm Indications	**Comment Number**	CRM #148, 153, 154
Comment Type	Substantive	**Disposition**	Accepted with Comments
Comment Originator(s)	FAA (repeated Thales comment from RFC-495A)		
Comment	148 Repeats RFC-495A comment about CM-code signal (d) 153 Repeats RFC-495A comment about Note 5 which applies to C/A-Code or P(Y)-Code Signal (a) (originally from Hamza Abdulsalam) 154 Repeats RFC-495A comment about C/A-Code or P(Y)-Code Signal (c) (originally from Denis Bouvet)		
Government Response	Taken together, these comments implement the change that was vetted at RFC-495A's Engineering ERB, except for the Note 6 that was added in RFC-495A and administrative wording changes. Since Note 6 is only relevant to Block IIA SVs which are no longer in the constellation, Note 6 is being removed. The administrative changes are still relevant, so we are going to keep them. (see next slide for final redlines)		

Specific Alarm Indications - Redlines

Paragraph	IS200-1760
Redlines	~~The following alarm indications are specific to the code signals listed below.~~ C/A-Code or P(Y)-Code Signal (a) The failure of parity on 5 successive words of LNAV data (3 seconds) (see paragraphs 20.3.5 and 40.3.5). (See Note 5) (b) The broadcast IODE does not match the 8 LSBs of the broadcast IODC (excluding normal data set cutovers, see paragraph 20.3.3.4.1). (c) ~~The~~Bits ~~transmitted~~61 ~~bits~~through 298 transmitted in words 3-10 in subframe 1, 2, or 3 are all set to 0's or all set to 1's. (d) Default LNAV data is being transmitted in subframes 1, 2, or 3 (see paragraph 20.3.2). (e) The 8-bit preamble does not equal 100010112, decimal 139, or hexadecimal 8B (see paragraph 20.3.3). CM-Code Signal (a) The failure of the cyclic redundancy check (CRC) on 5 successive CNAV messages (60 seconds) (see paragraph 30.3.5). (b) The broadcast time of ephemeris (toe) is not current (i.e. not within the current curve-fit) or does not match the broadcast time of clock (toc) (excluding normal data set cutovers, see paragraphs 30.3.3.1.1 and 30.3.4.4). (c) The broadcast t_{op} is not consistent across the Message Types 10, 11 and Type 30's messages which comprise the current (i.e. not within the current curve-fit) CEI data set (excluding normal data set cutovers, see paragraph 30.3.4.4). (d) The transmitted bits (bits 39~~-~~ through 276) in one or more of Message Types 10, 11 and ~~Type~~ 30~~'s~~ through 37 are all set to 0's or all set to 1's. (e) The 8-bit preamble does not equal 100010112, decimal 139, or hexadecimal 8B (see paragraph 30.3.3). Notes: 1. *A SIS alarm indication exists when the satellite is not trackable because it is not transmitting the standard PRN code modulation on the L-band carrier signal. These SIS alarm indications are specifically called out above because of their relatively high probability of occurrence.* 2. *The SIS alarm indications related to the LNAV and CNAV message data are considered "weak" indications since receivers do not necessarily continuously read each satellite's LNAV or CNAV message data either by design or by circumstance (e.g., radio-frequency interference [RFI] can prevent reading LNAV or CNAV message data). These weak SIS alarm indications are assumed to have a five-minute lag time before receivers take notice of them for alerting purposes.* 3. *The SIS alarm indications related to the LNAV or CNAV message data are indicative of a problem onboard the satellite. GPS receivers may perceive similar indications caused by local effects that are unrelated to the broadcast SIS.* 4. *In addition to SIS alarm indications, other conditions may also cause GPS signals to become temporarily untrackable, such as ionospheric signal fades, local signal masking, or local interference.* 5. *An alarm indication (see C/A-Code or P(Y)-Code Signal (a)) does not apply to the default navigation data described in paragraph 20.3.2, when in subframes 4 or 5. Application of the user parity algorithm at paragraph 20.3.5.2 will result in failed parity checks for words 3-10 because the default LNAV data pattern is applied to bits 61~~-~~ through 298. According to a) and d) default LNAV data broadcast in subframe 4 or in subframe 5 will not be considered as a do-not-use condition, and the user equipment may continue using the GPS L1 measurement as healthy so long as none of the other conditions leading to a GPS UNHEALTHY determination are present.*

“Marginal Indications” Update

DOORS ID	IS200-1672		
Paragraph	6.4.6.3 "Marginal Indications"	**Comment Number**	CRM #149
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	FAA		
Comment	Is there additional guidance on how to apply this marginal criteria? While receiver might be able to confirm a MT-0, it is difficult to determine that it replaced one of these message types, especially if the receiver fails to correctly decode some messages. Are there other cases were an MT-0 might replace a MT-31 to MT-39 due to lack of information other than clock information?		
Government Response	This change differs from the RFC-495A wording significantly. Under “The health of the CM-code and CL-code signals”, Point 1 wording is quite a bit different plus it refers to Notes 1 and 2 that did not exist before. After study, these additional changes have been accepted. Note: there are administrative changes from RFC-495A that enhanced the explanation of Message Types, which we are keeping.		

“Marginal Indications”- Redlines

Paragraph	IS200-1762
RFC-495A Significant Redlines	… The health of the CM-code and CL-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present: 1. The CM-code signal broadcast does not have a current and consistent CEI data set within three times the maximum broadcast interval defined in paragraph 30.3.4.1 in accordance with toc, toe and t_{op} rules in 30.3.4.4. Default CNAV data (i.e., Message Type 0) ~~is~~may ~~being~~be transmitted in lieu of ~~Message Type~~any ~~10,~~message ~~11~~type ~~and/or~~when ~~Message~~the ~~Type~~correct ~~30’s~~data ~~on~~for the ~~CM-code signal~~message ~~(e.g.,~~type ~~a~~is ~~current~~unavailable ~~and~~or ~~consistent~~when ~~CEI~~no ~~data~~other ~~set~~message is ~~not~~scheduled. ~~available within~~UE might be unable to confirm the ~~maximum~~satellite broadcast ~~interval~~of ~~defined~~a ~~in~~consistent ~~paragraph~~data ~~30.3.4.1).~~set when ~~See~~local ~~paragraph~~conditions ~~30.3.3~~prevent correctly receiving and decoding a continuous set of messages. 2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the CM-code signal URA components do not apply to the CM-code and CL-code signals. This means the CM-code and CL-code signal URA may be worse than indicated by the URA index components transmitted in Message ~~Type~~Types 10 and ~~Message~~30 ~~Type~~through ~~30’s~~37. See paragraph 30.3.3. 3. Either or both the URAED index in Message Type 10 and the URANED0 index in Message ~~Type~~Types 30~~’s~~ through 37 transmitted in the CM-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4. The P(Y)-code SIS health is marginal when the P(Y)-code SIS would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present: …
Current Proposed Redlines	… The health of the CM-code and CL-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present: ~~1. Default CNAV data (i.e~~1.~~, Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30’s on~~ The ~~the~~satellite ~~CM-code~~does ~~signal~~not ~~(e.g.,~~broadcast a current and consistent CEI data set ~~is not~~within ~~available~~three ~~within~~times the maximum broadcast interval defined in paragraph 30.3.4.1~~).~~ (see Notes 1 ~~paragraph~~and ~~30.3.3.~~2) 2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the CM-code signal URA components do not apply to the CM-code and CL-code signals. This means the CM-code and CL-code signal URA may be worse than indicated by the URA index components transmitted in Message ~~Type~~Types 10 and ~~Message~~30 ~~Type~~through ~~30’s~~37. See paragraph 30.3.3. 3. Either or both the URAED index in Message Type 10 and the URANED0 index in Message ~~Type~~Types 30~~’s~~ through 37 transmitted in the CM-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4. Note 1: Default CNAV data (i.e. Message Type 0) may be transmitted in lieu of any message type when the correct data for the message type is unavailable or when no other message is scheduled. Note 2: UE might be unable to confirm the satellite broadcast of a consistent data set when local conditions prevent correctly receiving and decoding a continuous set of messages.

CEI Data Set Note Deferral

DOORS ID	IS200-1513, IS200-1649, IS200-1644, IS200-1645		
Paragraph	6.2.9 Clock, Ephemeris, Integrity (CEI) Data Set 6.2.9.1 Core CEI Data Set 20.3.4.4 Data Sets 30.3.4.4 Data Sets	**Comment Number**	CRM #155
Comment Type	Substantive, Administrative	**Disposition**	Deferred
Comment Originator(s)	FAA		
Comment	155 These four sections all reference NOTE1 to Table 6-I-1 although the intent of the sections have two or three different meanings. Add additional NOTEs to clarify the intent and meaning of the concepts referenced in the various sections. Rationale: Clarify system operation to support IOC and MOPS development		
Government Response	All changes categorized as CEI Parameter Notes have been deferred per the PNT LLB.		

Specific Alarm Indications in IS-GPS-705

DOORS ID	IS705-1603		
Paragraph	6.4.5.1.2 Specific Alarm Indications	**Comment Number**	CRM #158
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	FAA		
Comment	For I5-code signal, clarify that any of the MT-10, 11, 3xs are all 0's or all 1's, then this is an alert. As written, it requires all of these to be all 0's or all 1's to be considered an alert. Suggests: (d) The transmitted bits (bits 39-276) in one or more of Message Types 10, 11 ~~and~~ or 30's are all set to 0's or all set to 1's.		
Government Response	This had not been considered as part of RFC-495A which was an oversight. This paragraph should closely match IS-GPS-200 **6.4.6.2.2 Specific Alarm Conditions** To more closely match IS-GPS-200: 1. "39-276" will be expanded to "39 through 276" 2. the "30's" will be expanded to "30 through 37". Document production problems with IS-GPS-705J where the Notes aren't numbered will be fixed as well **QUESTION** Do we want to change "and" to "or" in the equivalent paragraph sub-item in IS-GPS-200?		

IS-GPS-705 Specific Alarm Indications - Redlines

Paragraph	IS705-1603
Proposed Redlines	The following alarm indications are specific to the code signals listed below. I5-Code Signal (a) The failure of the CRC on 5 successive CNAV messages (30 seconds) (see paragraph 20.3.5). (b) The broadcast toe is not current (i.e. not within the current curve-fit) or does not match the broadcast toc (excluding normal data set cutovers, see paragraphs 20.3.3.1.1 and 20.3.4.4). (c) The broadcast t_{op} is not consistent across the Message Types 10, 11 and Type 30's messages which comprise the current (i.e. not within the current curve-fit) CEI data set (excluding normal data set cutovers, see paragraph 20.3.4.4). (d) The transmitted bits (bits 39~~-~~ through 276) in one or more of Message Types 10, 11 ~~and~~or ~~Type~~ 30~~'s~~ through 37 are all set to 0's or all set to 1's. (e) The 8-bit preamble does not equal 100010112, decimal 139, or hexadecimal 8B (see paragraph 20.3.3). Notes: *1. A SIS alarm indication exists when the satellite is not trackable because it is not transmitting the standard PRN code modulation on the L-band carrier signal. These SIS alarm indications are specifically called out above because of their relatively high probability of occurrence.* *2. The SIS alarm indications related to the CNAV message data are considered "weak" indications since receivers do not necessarily continuously read each satellite's CNAV message data either by design or by circumstance (e.g., radio-frequency interference [RFI] can prevent reading CNAV message data). These weak SIS alarm indications are assumed to have a five-minute lag time before receivers take notice of them for alerting purposes.* *3. The SIS alarm indications related to the CNAV message data are indicative of a problem onboard the satellite. GPS receivers may perceive similar indications caused by local effects that are unrelated to the broadcast SIS.* *4. In addition to SIS alarm indications, other conditions may also cause GPS signals to become temporarily untrackable, such as ionospheric signal fades, local signal masking, or local interference.*

"Marginal" Indications

DOORS ID	IS705-1605		
Paragraph	6.4.5.2 "Marginal" Indications	**Comment Number**	CRM #159
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	FAA		
Comment	Is there additional guidance on how to apply this marginal criteria? While receiver might be able to confirm a MT-0, it is difficult to determine that it replaced one of these message types, especially if the receiver fails to correctly decode some messages. Are there other cases were an MT-0 might replace a MT-31 to MT-39 due to lack of information other than clock information?		
Government Response	We had never considered changes to this requirement in any recent RFC, but after consideration, this request to rework list item 1 into the associated notes has been accepted as requested to improve clarity. Also, the list numbering missing from IS-GPS-705J will be restored.		

"Marginal" Indications - Redlines

Paragraph	IS705-1605
Proposed Redlines	The health of the I5-code and Q5-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present: 1. The satellite does not broadcast a current and consistent CEI data set within three times the maximum broadcast interval defined in paragraph 20.3.4.1. Note 1: Default CNAV data (i.e., Message Type 0) is may being be transmitted on in the lieu I5-code of signal any in message lieu type of when Message the Types correct 10, data 11 for and/or the Type message 30's type (e.g., is a unavailable current or and consistent when CEI no data other set message is not scheduled. available within Note 2: UE might be unable to confirm the maximum satellite broadcast interval of defined a in consistent paragraph data 20.3.4.1). set when See local paragraph conditions 20.3.3 prevent correctly receiving and decoding a continuous set of messages. 2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the I5-code signal URA components do not apply to the I5-code and Q5-code signals. This means the I5-code and Q5-code signal URA may be worse than indicated by the URA index components transmitted in Message Type 10 and Type 30's. See paragraph 20.3.3. 3. Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30's transmitted in the I5-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 20.3.3.1.1.4 and 20.3.3.2.4. A more restrictive 'marginal indications' (e.g., the transmitted URA index in Subframe 1 greater than or equal to 8) may apply in the context of specified minimum performance standards such as are given in the GPS Standard Positioning Service Performance Standard (SPS PS).

Clock Correction and Accuracy Parameters – Reformat Request

DOORS ID	IS705-257		
Paragraph	Table 20-III. Clock Correction and Accuracy Parameters	**Comment Number**	CRM #160
Comment Type	Administrative	**Disposition**	Defer
Comment Originator(s)	FAA		
Comment	Table rows do not align in the pdf. Just correct so the that parameter names are on the same lines as the parameter values.		
Government Response	Below the current threshold for improving text alignment and formatting.		

Deferred CEI Data Set Parameter Notes

DOORS ID	IS200-2140, IS705-1515, IS705-1524, IS705-1522, IS800-918, IS800-912, IS800-920		
Paragraph	Numerous	**Comment Number**	CRM #162, 166, 184
Comment Type	Substantive	**Disposition**	Defer
Comment Originator(s)	FAA LM O&S		
Comment	162 (ref IS-GPS-705 6.2.8, 6.2.8.1, and 20.3.4.4) These three sections all reference NOTE1 to Table 6-I-1 although the intent of the sections is for two or three different meanings. Add additional NOTEs to clarify the intent and meaning of the concepts referenced in the various sections. 166 (ref IS-GPS-800 3.5.5.2, 6.2.8, and 6.2.8.1) These four sections all reference NOTE1 to Table 6.2-18 although the intent of the sections is for two or three different meanings. Add additional NOTEs to clarify the intent and meaning of the concepts referenced in the various sections. 184 (ref IS-GPS-200 6.2.1.0-5) Add a 4th note to accommodate instantaneous URE bounding. Suggested adding: "Note #4: The URA will only bound the instantaneous URE with the stated probability when the user applies all of the broadcast parameters in the same CEI data set as defined in IS-GPS-200 Section 20.3.4.4 Data Sets for LNAV or 30.3.4.4 Data Sets for CNAV.		
Government Response	162, 166, 184 All these paragraphs have been worked on as part of RFC-502 and all the CEI Data Set Parameter Notes work was deferred by the PNT LLB 184 This was included in an earlier PCN and deferred by the PNT LLB. The specific misspelling has been corrected if this work ever comes back.		

Correcting the Rule for Cutovers

DOORS ID	IS200-2090		
Paragraph	20.3.4.1. Paging and Cutovers 3rd Paragraph	**Comment Number**	CRM #167, 171, 173, 180
Comment Type	Substantive	**Disposition**	Accept, Accept with Comments
Comment Originator(s)	DOAN (Hutsell), LM O&S, Aerospace		
Comment	167 The proposed added wording appears to exclude IIR, but include IIR-M (modernized) Block types, however to my understanding no difference exists between IIR-M and IIR Block types with respect to the requirement stated in the paragraph. 171 If the intent is to provide "relief" to the IIR Block type from the cutover on 30 second boundries, then IIR-M should also be removed from the sentence. 173 Remove IIR-M from the proposed redlines. 180 Rephrase for consistency in GPS SV vehicle block name terms and avoid potential for misinterpretation by a hasty reader. Specific suggestion for lead-in is: “For Block IIR-M, Block IIF, Block III/IIIF, and all future GPS SVs, cutovers …”		
Government Response	This was a recent addition because an RSAM related warning came up in a system that had implemented the cutover rule as an RSAM check. This prompted us to state which SVs will implement the rule correctly and specifically not include the offending SVs. 167, 171, 173 all wanted Block IIR-M SVs to not be in the lead-in to the sentence because IIR-M does not execute the rule correctly all the time. 180 Just wanted to rephrase the lead-in without dropping IIR-M. We will follow the lead from the CRM #167, #171 and #173. (see next slide)		

Correcting the Rule for Cutovers - Redlines

Paragraph	IS200-2090
July PCN Redlines	~~Cutovers~~For Block IIF/IIR-M, GPS III/IIIF and all future SVs, cutovers to newly updated data for subframes 1, 2, and 3 occur on frame boundaries (i.e., modulo 30 seconds relative to end/start of week). Newly updated data for subframes 4 and 5 may start to be transmitted with any of the 25 pages of these subframes.
Current PCN Redlines	~~Cutovers~~For Block IIF~~/IIR-M~~, GPS III/IIIF and all future SVs, cutovers to newly updated data for subframes 1, 2, and 3 occur on frame boundaries (i.e., modulo 30 seconds relative to end/start of week). Newly updated data for subframes 4 and 5 may start to be transmitted with any of the 25 pages of these subframes.

Paging and Cutovers Administrative Correction

DOORS ID	IS200-669, IS705-370		
Paragraph	IS-GPS-200 30.3.4.1.0-1 Paging and Cutovers IS-GPS-705 20.3.4.1.0-1 Paging and Cutovers	**Comment Number**	CRM #178
Comment Type	Administrative	**Disposition**	Accept with Comments
Comment Originator(s)	Aerospace		
Comment	Should not preclude MT 30 from being broadcast more frequently.		
Government Response	178 Agreed that the suggested wording more exactly reflects what was meant. This comment was originally made against IS-GPS-705, but it applies equally to the corresponding paragraph in IS-GPS-200 (see next slide)		

Paging and Cutovers Administrative Correction - Redlines

Paragraph	IS200-669, IS705-370
IS-GPS-200 Current Redlines **Green text represents the recent CRM #178 change**	The ~~system B~~broadcast schedule of ~~messages~~CNAV message types is completely arbitrary~~,~~ but sequenced to provide optimum user performance.~~-~~ Message ~~Types~~types 10, 11, and ~~11~~a clock message shall be broadcast at least once every 60 seconds (with a nominal rate of 48 seconds) to provide system users the clock, ephemeris and integrity (CEI) data needed to access GPS. Among the broadcast clock messages, an MT 30 message will be broadcast at least once every 300 seconds. Other message types may not be broadcast, but when they are scheduled for broadcast, they will be broadcast in between these CEI messages. If a message type is scheduled for broadcast on L2C from a satellite, that satellite will broadcast that message type on L2C at least every 20 minutes, unless a message generation failure results in its replacement with a Message Type 0. CNAV message broadcast schedules may differ between satellites, and between L2C and L5I on the same satellite.
IS-GPS-705 Current Redlines	The ~~system B~~broadcast schedule of ~~messages~~CNAV message types is completely arbitrary~~,~~ but sequenced to provide optimum user performance.~~-~~ Message types 10, 11, and ~~11~~a clock message shall be broadcast at least once every 30 seconds (with a nominal rate of 24 seconds) to provide system users the clock, ephemeris and integrity (CEI) data needed to access GPS. Among the broadcast clock messages, an MT 30 message will be broadcast at least once once every 150 seconds. Other message types may not be broadcast, but when they are scheduled for broadcast, they will be broadcast in between these CEI messages. If a message type is scheduled for broadcast on L5I from a satellite, that satellite will broadcast that message type on L5I at least every 10 minutes, unless a message generation failure results in its replacement with a Message Type 0. Message types with constellation data (like almanac and differential corrections) will cycle through any allotted broadcast slots in these 10-minute intervals, and therefore, will take longer than 10 minutes to complete the broadcast of the entire data set. CNAV message broadcast schedules may differ between satellites, and between L2C and L5I on the same satellite.

Substituting GGTO Type ID for GNSS Type ID

DOORS ID	IS800-655, IS800-236, IS200-663, IS705-364		
Paragraph	n.n.n or Table n or Figure n	**Comment Number**	CRM #174, 175
Comment Type	Administrative	**Disposition**	Accept
Comment Originator(s)	Aerospace		
Comment	174 GNSS Type ID was not changed consistently throughout section 3.5.4.2.1 175 Table 3.5-4 should change "GNSS Type ID" to "GGTO ID" to be consistent with the redline for IS800-875.		
Government Response	Accept. A change was needed because the Public SiS documents had two different definitions for GNSS Type ID. One with 3-Bits and one with 4-Bits. It was decided that renaming the 3-Bit version to GGTO Type ID was the less disruptive choice. We failed to catch all the changes first time around. This oversite extends to other locations in IS-GPS-200 and IS-GPS-705		

IS-GPS-200 GGTO Type ID - Redlines

Paragraph	IS200-663
IS-GPS-200 Table 30-XI. GPS/GNSS Time Offset Parameters	

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2^{-35}		seconds
A_{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2^{-51}		sec/sec
A_{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2^{-68}		sec/sec^2
t_{GGTO}	Time data reference Time of Week	16	2^{4}	0 to 604,784	seconds
WN_{GGTO}	Time data reference Week Number	13	2^{0}		weeks
GGTO ~~GNSS~~ ID	GGTO ~~GNSS~~ Type ID	3			see text

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;

** See Figure 30-8 for complete bit allocation;

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

IS-GPS-705 GGTO Type ID - Redlines

Paragraph	IS705-364
IS-GPS-364 Table 20-XI. GPS/GNSS Time Offset Parameters	

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2^{-35}		seconds
A_{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2^{-51}		sec/sec
A_{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2^{-68}		sec/sec^2
t_{GGTO}	Time data reference Time of Week	16	2^{4}	0 to 604,784	seconds
WN_{GGTO}	Time data reference Week Number	13	2^{0}		weeks
GGTO ~~GNSS~~ ID	GGTO ~~GNSS~~ Type ID	3			see text

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB

** See Figure 20-8 for complete bit allocation

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

IS-GPS-800 GGTO Type ID - Redlines

Paragraph	IS800-655, IS800-236
3.5.4.2.1GGTO Parameter Content Redlines	Subframe 3, page 2 shall contain the parameters related to correlating GPS time with other GNSS time. Bits 15 through 17 of subframe 3, page 2 shall identify the other GPS-like navigation system to which the offset data applies. The three bits are defined as follows: 000 = no data available, 001 = Galileo, 010 = GLONASS, 011 through 111 = Reserved in order to preserve the use of these values in a future version of this IS. Until such a revision, a developer developing to this version of this IS should interpret these values as indicating that the GPS/GNSS Time Offset Parameter data, to which the ~~GNSS Type~~GGTO ID applies, is presently unusable.
IS-GPS-800Table 3.5-4. GPS/GNSS Time Offset Parameters Redlines	

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2^{-35}		seconds
A_{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2^{-51}		sec/sec
A_{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2^{-68}		sec/sec^2
t_{GGTO}	Time data reference Time of Week	16	2^{4}	0 to 604,784	seconds
WN_{GGTO}	Time data reference Week Number	13	2^{0}		weeks
GGTO ~~GNSS~~ ID	GGTO ~~GNSS~~ Type ID	3			see text

* Parameters so indicated shall be in two's complement notation;

** See Figure 3.5-3 for complete bit allocation;

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

Core CEI Data Set Reference Correction

DOORS ID	IS200-1649, IS705-1524		
Paragraph	6.2.9.1 Core CEI Data Set 6.2.8.1 Core CEI Data Set	**Comment Number**	CRM #176, 177
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Boeing		
Comment	176 The deletion of Table 30-XII in IS-GPS-200 also affects IS-GPS-200 section 6.2.9.1 which references Table 30-XII. Section 6.2.9.1 must be updated to remove the table reference and possibly provide a difference reference for a user to ascertain the information. 177 The deletion of Table 20-XII in IS-GPS-705 also affects IS-GPS-705 section 6.2.8.1 which references Table 20-XII. Section 6.2.8.1 must be updated to remove the table reference and possibly provide a difference reference for a user to ascertain the information.		
Government Response	These changes were removed in response to the CEI Notes descoping from PNT LLB, but a portion of this particular change can be reconsidered for implementation as part of RFC-502. (see next slide)		

Core CEI Data Set Reference Correction - Redlines

Paragraph	IS200-1649, IS705-1524
IS-GPS-200 Redlines	**6.2.9.1 Core CEI Data Set** A Core CEI Data Set are the CEI parameters necessary for a satellite to be used for a position solution (non-almanac); broadcast to users with the shortest broadcast interval for CNAV -- see ~~Table~~ 30~~-XII~~.3.4.1. The t_{op} term provides the epoch time of week of the state data utilized for CEI data, except for parameters marked with a NOTE1 in Table 6-I-1.
IS-GPS-705 Redlines	**6.2.8.1 Core CEI Data Set** A Core CEI Data Set are the CEI parameters necessary for a satellite to be used for a position solution (non-almanac); broadcast to users with the shortest broadcast interval -- see ~~Table~~ 20~~-XII~~.3.4.1. The t_{op} term provides the epoch time of week of the state data utilized for CEI data, except for parameters marked with a Note1 in Table 6-I-1.

Change in P-Code and C/A Code Upper PRN Rules

DOORS ID	IS200-25, IS200-29		
Paragraph	3.2.1.1 P-Code 3.2.1.3 C/A-Code	**Comment Number**	CRM #181, 182
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Aerospace		
Comment	181 Intent of Original Text in relation to P(Y) Code is no longer needed 182 Entire sense of the 2nd paragraph about C/A-Code is changed		
Government Response	This is a recent comment about paragraphs in ICD-GPS-200 that have not been recently changed or proposed for change.		

P-Code - Redlines

Paragraph	IS200-25
Proposed Redlines	**3.2.1.1 P-Code** The PRN P-code for SV ID number i, for i = 1 to 37, is a ranging code, Pi(t), of 7 days in length at a chipping rate of 10.23 Mbps. The 7 day sequence is the modulo-2 sum of two sub-sequences referred to as X1 and X2i; their lengths are 15,345,000 chips and 15,345,037 chips, respectively. The X2i sequence is an X2 sequence selectively delayed by 1 to 37 chips thereby allowing the basic code generation technique to produce a set of 37 mutually exclusive P-code sequences of 7 days in length. Assignment of these code phase segments by SV ID number is given in Table 3-Ia. (NOTE: previous versions of this document reserved PRNs 33 through 37 for other uses. Due to increased system capability, PRNs 33 through 37 are being redesignated to allow for use by SVs.) ~~An initial almanac collected from P(Y)-code in the upper PRNs must be obtained from PRNs 35, 36, or 38 through 63.~~

C/A-Code - Redlines

Paragraph	IS200-29
Proposed Redlines	**3.2.1.3 C/A-Code** The PRN C/A-code for SV ID number i is a Gold code, Gi(t), of 1 millisecond in length at a chipping rate of 1023 kbps. The Gi(t) sequence is a linear pattern generated by the modulo-2 addition of two sub-sequences, G1 and G2i, each of which is a 1023 chip long linear pattern. The epochs of the Gold code are synchronized with the X1 epochs of the P-code. As shown in Table 3-Ia, the G2i sequence is a G2 sequence selectively delayed by pre-assigned number of chips, thereby generating a set of different C/A-codes. Assignment of these by GPS PRN signal number are given in Table 3-Ia and Table 3-Ib. ~~An initial almanac collected from C/A-code in the upper PRNs must be obtained from PRNs 35, 36, or 38 through 63.~~ CS will prevent the simultaneous transmission of PRNs 34 and 37 of C/A-code~~.~~ to any point on the Earth's surface.

Open RFC-502 Discussion

QUESTIONS & COMMENTS?

Action Item Review

10 MINUTE BREAK

Positioning, Navigation and Timing Mission Public ICWG Slides

Template Version 16 .1a –Jan 2023

ADJUDICATION WORKING GROUP

27-SEP-2023

DOCUMENT CLASSIFICATION

UNCLASSIFIED

REQUEST FOR CHANGE (RFC) NUMBER

RFC-477

RFC TITLE

OCX XML Products for Civil Users

GOVERNMENT POC
Capt. Rick Merchant, SSC/CGEP, 310.653.1871

SE&I POC
Danny Froerer, SSC/CGEP, 310.414.2823

CM POC
Jeff Thomas, SSC/CGEP, 310.353.6355

Bottom Line Up Front

- The GPS Control Segment (CS) currently distributes four data products as defined in ICD-GPS-240 via the USCG Navigation Center. The 2nd Space Operations Squadron (2SOPS) also makes these products available as well as the Anti-Spoof (A-S) file.
- In the OCX era, all five data products will be consolidated into four schema-based XML Information Products defined in ICD-GPS-870 and distributed via the USCG Navigation Center.
- The OCX-era Information Products:
  - Were designed to conform with the National Information Exchange Model (NIEM)
  - Have an associated Information Exchange Package Documentation (IEPD)
  - Will be digitally signed using DoD PKI

RFC-477: OCX XML Products for Civil Users

RFC CHANGE TYPE: As-Built or As-Designed Baseline Update

1) PROBLEM STATEMENT:

1. The technical baseline does not reflect OCX as-built. The five GPS data products distributed in the AEP era are the Notice Advisory to Navstar Users (NANU), the Operational Advisory (OA), the Almanac (SEM & YUMA), the Satellite Outage File (SOF), and the Anti-Spoof (A-S) file. These data products are formatted in plain text and they:
   a. Are being deprecated i.e., further updates and support are discontinued while ensuring backwards compatibility
   b. Do not conform to the requisite National Information Exchange Model (NIEM) Naming and Design Rules
2. There is no communication mechanism to alert external stakeholders of changes happening due to the transition from AEP to OCX

Linked Pre-RFCs. 1016: Namespace entries in XML files should look like government URLs and 1152: Public XML for ICD-GPS-870

2) SOLUTION:

1. Update the technical baseline to reflect OCX as-built. Consolidate the five, plain text data products into four, XML based data products for distribution. The four new data products are the GPS Advisory (NANU), GPS Advisory Collection (SOF), Ops Status (OA), and the Public Common Almanac (SEM, YUMA, and A-S)
   a. Provide a Validate and Transform Utility (VATU), ensuring backwards compatibility
   b. Baseline the NIEM Information Exchange Package Documentation (IEPD) specification which contains schemas, documentation, business rules, metadata, and samples
2. Notify the external stakeholders of the transition from AEP to OCX so they can implement the necessary changes

RFC-477: OCX XML Products for Civil Users

3) SPONSOR, DRIVER & IMPORTANT DATES:								THIS RFC IS: ROUTINE		
Sponsor: SSC/CGCX				Lead Driver Event: OCX Constellation Transfer (CTX)				Lead Driver Event Date: 2024		
JCRB	**TIM**	**Stakeholder Review**	**Comments Due**	**Resolve Comments**	**AWG**	**LL ERB**	**GPS ERB**	**Impact Assessment Period**	**LL CCB**	**CCB**
19 Apr 21	17 Feb 22	15 Mar 22 (Non-Public) 7 Jul 23	14 Apr 22 (Non-Public) 11 Aug 23 & 22 Aug 23	28 Apr 22 (Non-Public) 25 Aug 23	12 May 22 (Non-Public) 27 Sep 23 P-ICWG	25 Oct 23	1 Nov 23	3 Nov 23 – 3 Jan 24	17 Jan 24	23 Jan 24

4) APPROVAL AUTHORITY: (Select one)		
	Enterprise	Proposed Change (or Variance) affects multiple Segments' Technical Baseline(s), prime contractor documentation or external agencies outside of the GPS Directorate
	Lower Level	Proposed Change (or Variance) affects one Segment's Technical Baseline or prime contractor documentation

RFC-477 Stakeholder Review Status

15) REVIEW STATUS

Office	Response Required	No Impact	No Comments	Comments	No Response
CGJA (PCA; GPA)			X		
CGJC (ZACS-Civil; GPC)	RR		X		
CGJG (ZACS-NGA; GPD)			X		
CGEP (ZACS-PNT; GPE)	RR		X		
CGEV (PCET; GPEV)					
CGCC OCX 3F (PCCC)	RR			X	
CGCC SMPS (PCCC; GPGC)	RR		X		
CGCX (PCCX; GPGX)	RR			X	
CGL (PCL; GPL)		X	X		
CGG (ECPG; GPL)	RR	X			
CGJN (PCV; GPN; PCN)					
CGX (PCT; GPT)					
CGU (PCU; GPU)					
CGV3 (PCM3; GPV3)					
CGVF (PCMF; GPV4)					
SNWN (PCCN; GPGN)					
SNPB					
AEROSPACE	RR			X	
MITRE	RR			X	
SE&I	RR			X	
EXTERNAL STAKEHOLDERS					
PM-PNT (Army)		See CGJA (PCA; GPA) Response			
NIWC PAC		See CGJN (PCV; GPN) Response			
USNO		See CGJN (PCV; GPN) Response			
USMC		See CGJN (PCV; GPN) Response			
NAWCAD		See CGJN (PCV; GPN) Response			

EXTERNAL STAKEHOLDERS	Response Required	No Impact	No Comments	Comments	No Response
USSF, SpOC 2 SOPS (SPOC 2 SOPS)					
Space Delta 8 (was 50OG)	RR		X		
SpOC/PNT-MAT (was SpOC/S5M)					
National Security Agency (NSA)					
NGA					
PNT—PO (ADAP, MAGR, DAGR); EGI-M					
AFLCMC/EBD					
DHS USCG (NAVCEN)	RR				
DOT/FAA	RR				
PRIME CONTRACTORS					
GPS IIR/IIR-M/III/IIIF On Orbit Sust - LM					
GPS IIF On-Orbit Sust - Boeing					
GPS III - LM					
GPS IIIF - LM					
GCS II – Sust - LM	RR	X			
OCX 1/2 - RTX	RR				
OCX 3F - RTX	RR				
MGUE Inc 1 - KTR A					
MGUE Inc 1 - KTR B					
MGUE Inc 1 - KTR C					
MGUE Inc 2 MSI - BAE					
MGUE Inc 2 MSI - L3H					
MGUE Inc 2 MSI - RTX					
SMPS Development - BAH	RR				
SMPS Sust - Lockheed Martin					
USNDS Ground 6 / ICADS 7 - Sandia					

Stakeholder Review Comment Resolution Matrix (CRM) Status – at May 12th, 2022 Non-Public AWG

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:						
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**	**Notes**
Accept	**2**	**2**	**1**	**5**	**5**	
Accept with Comment	**8**	**16**	**18**	**42**	**42**	
Reject	**0**	**3**	**1**	**4**	**4**	
Defer						
Grand Totals:	**10**	**21**	**20**	**51**	**51**	

Stakeholder Review Comment Resolution Matrix (CRM) Status – for RFC-477 at This Review

16) CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS:						
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**	**Notes**
Accept			**1**	**1**	**1**	
Accept with Comment						
Reject						
Defer						
Grand Totals:			**1**	**1**	**1**	

VATU .zip File Signature Error

DOORS ID	N/A		
Paragraph	N/A	**Comment Number**	CRM #52
Comment Type	Administrative	**Disposition**	Accept
Comment Originator(s)	Aerospace		
Comment	There was a minor problem with the ValidateTransformUtility.zip file that was initially provided with the RFC-477 artifacts. With help from Michael Cole, the issue was identified and fixed. It wasn't with the software itself, just the way the .zip file was signed. The signature should now validate using the same product.pem file provided. Michael was able to verify the file validates (wrt the embedded digital signature) with the jarsigner tool, with the updated .pem file.		
Government Response	Accepted and repaired		

Open RFC-477 Discussion

QUESTIONS & COMMENTS?

Action Item Review

LUNCH BREAK

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

September 27, 2023
0830-1700 PDT

United States Space Force
Positioning, Navigation, and Timing Mission Area

Status Integrity Support Messages (ISM) Proposed Changes to the Requirements Baseline

September 27, 2023

Capt. Rick Merchant

Status of all ISM proposed changes to the Baseline

- The Government's Technical Baseline Change Management Process (TBCMP) requires funding for CCB Approval
- Here is the status of all ISM related changes to the baseline:

Proposed Tech Baseline Change	Status	Way Forward
RFC 413 – [CNAV] Integrity Support Messages (ISM)	CCB Approved, not implemented on any contract	Awaiting program to identify funding and contract for implementation.
RFC 495 – 2022 Public Docs (Contains CNAV ISM additions [495A])	ERB Approved, On-Hold pending Funding	Awaiting program to identify funding and contract for implementation.
Post 495 CNAV ISM additions [502B]	Redlines drafted, awaiting a future effort to incorporate in the baseline	These ISM additions are available for future RFC effort

- Government considering a future effort to combine all ISM proposed changes into one effort

PNT TBCMP Funding References

- Excerpts from the TBCMP (Link to GPS.gov) for funding:
  - ROM & Impact Assessment (ROM/IA): “This letter possess a response due date, which is typically prior to the planned GPS CCB (with sufficient margin, so that if funding is required, availability may be determined prior to the GPS CCB).
  - IPT-PM: “Ensures funding is available upon receipt of the ROM/IA”
  - CCB: “Upon ROM/IA receipt, the LLB is held to determine funding availability and obtain LLB Chair concurrence to proceed to the GPS CCB”

Per TBCMP: Funding Availability is a requirement for CCB approval

QUESTIONS & COMMENTS?

Integrity Support Message
CSOC IPT Recommendation

Public Interface Control Working Group Meeting
27 September 2023

Andrew Hansen
SSC/CGJC

Background

Integrity Support Message (ISM) Background

- Used to support Advanced Receiver Autonomous Integrity Monitoring (ARAIM)
- Introduced in RFC-413 and included in CNAV as Message Type 40 in IS-GPS-200 Revision M and in IS-GPS-705 Revision H, and in CNAV2 in Subframe 3, Page 8 in IS-GPS-800 Revision H
- Additional changes presented at PICWG in October 2022
  - Deferred resolution of several comments
  - Deferred implementation in IS documents
- This brief shows proposed update to ISM baseline
  - Where changes are marked, changes are from the RFC-413 baseline
  - Represents current ISM planning for update in a future revision cycle
  - Request any additional comments

Summary of Major Updates

- 2022 PICWG briefed parameter changes from P_{const} to R_{const} and addition of MFD_{const}
- Make this ISM format only applicable to GPS
  - Different constellations may use different values/format
- Additional modification of parameter values after 2022 PICWG
- Align ISM package sizes between CNAV and CNAV2
- Added elevation angle applicability
- Clarified action on receipt of Service Level 1

Briefing identifies IS-200, IS-705, and IS-800 sections for each content area

Integrity Support Message

30.3.3.10 / 20.3.3.10 Message Type 40 ISM

- Figure 30-14a [20-14a] contains the structure of Message Type 40, Integrity Support Message (ISM). The contents of Message Type 40 are defined below, followed by material pertinent to the use of the ISM data. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM) may use these parameters for the ARAIM algorithm as referenced in future TSO and MSO.

3.5.4.7 Subframe 3, Page 8 - ISM

- Figure 3.5-8a contains the structure of the Subframe 3, Page 8 message. The contents are defined below, followed by material pertinent to the use of the Integrity Support Message (ISM) data. Users who implement Advanced Receiver Autonomous Integrity Monitoring (ARAIM) may use these parameters for the ARAIM algorithm as referenced in future TSO and MSO.

No Change from RFC-413

ISM Parameter Content

30.3.3.10 / 20.3.3.10

- Message Type 40 shall contain the parameters related to GNSS constellation and satellite integrity parameters used for ARAIM algorithms.
- The bit lengths, scale factors, ranges, and units of these parameters are given in Table 30-XIa [Table 20-XIa].
- The CS shall upload the current ISM parameters, when necessary, to the SVs.
- Users should use the ISM parameters with the most recent WN_{ISM} and TOW_{ISM} time stamp. All time stamps should be in the past.

3.5.4.7.1

- Same content, except message is Subframe 3, Page 8 and parameter definitions are given in Table 3.5-9

No Change from RFC-413

Table 30-XIa / Table 20-XIa / Table 3.5-9

WAS: RFC-413 implementation

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
GNSS ID	4			
WN_{ISM}	13	1		weeks
TOW_{ISM}	6	4	0 to 164	hours
t_{correl}	4		0 to 12	hours
b_{nom}	4		0 to 2	meters
γ_{nom}	4		0 to 2	
R_{sat}	4		$1x10^{-3}$ to $3.16x10^{-10}$	/hours
P_{const}	4		$1x10^{-3}$ to $3.16 x10^{-10}$	
MFD	4		0.25 to 24	hours
Service Level*	3			
Mask****	63			

* See Table 30-XIb for Service Level Descriptions

** See Figure 30-14a for complete bit allocation in 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 Mask bit mapping

To: Current Planning

Parameter	No. of Bits*	Scale Factor (LSB)	Valid Range**	Units
GNSS ID	4	See text		
WN_{ISM}	13	1	0 to 8191	weeks
TOW_{ISM}	6	4	0 to 164	hours
t_{correl}	4	See text		
β_{nom}	4	0.1	0 to 1.5	Meters
γ_{nom}	4	0.05	0 to 0.75	
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		
PRN Inclusion Mask ****	63	See text		

* See Figure 30-14a for complete bit allocation in 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-XIc for PRN Inclusion Mask bit mapping

- Change from P_{const} to R_{const}, added Mean Fault Durations (MFD_{sat}/MFD_{const})
- New nomenclature for β_{nom}
- Update parameter ranges, included in parameter definitions

30.3.3.10.1.1 [20.3.3.10.1.1] GNSS Constellation ID

- Bits 39 through 42 of Message Type 40 [Bits 15 through 18 of Subframe 3, Page 8] shall identify the GNSS service to which the associated ISM parameters apply.
- The four bits are defined as follows:
  - 0000 = No Data Available
  - 0001 = Reserved
  - 0010 = Reserved
  - 0011 = Reserved
  - 0100 = GPS
  - 0101 = Reserved
  - 0110 = Reserved
  - 0111 = Reserved
  - 1000 through 1111 = Reserved
- If users see four bits of '0000', users will ignore the entire ISM.

Described ISM format and bit allocations only applicable to GPS
If provide ISM information for other constellations, will need to add constellation, specific format

ISM Effectivity Time Stamp

- **30.3.3.10.1.2 / 20.3.3.10.1.2 Week Number**
- Bits 43 through 55 of Message Type 40 shall provide the ISM Week Number (WN_{ISM}) applicable to the start of the time of validity for a given ISM data issue.
- This parameter describes the time stamp, in terms of weeks, for the ISM parameters.
- **3.5.4.7.1.2**, Bits 19 through 31 of Subframe 3, Page 8 …..

- **30.3.3.10.1.2 / 20.3.3.10.1.2 Time of Week**
- Bits 56 through 61 of Message Type 40 shall provide the ISM Time of Week (TOW_{ISM}) applicable to the start of the time of validity for a given ISM data issue.
- This parameter describes the time stamp, in terms of hours, for the ISM parameters.
- **3.5.4.7.1.3**, Bits 32 through 37 of Subframe 3, Page 8 …..

No Change from RFC-413

Correlation Time Constant

- **30.3.3.10.1.4 / 20.3.3.10.1.4**
- Bits 62 through 65 of Message Type 40 shall provide the assumed Correlation Time Constant (t_{correl}) value for the ARAIM at the current time for the associated GNSS constellation.
- 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 hour
  - 1110 = 12.00 hours
  - 1111 = RESERVED
- **3.5.4.7.1.4** Bits 38 through 41 of Subframe 3, Page 8 shall ….

No Change from RFC-413

IAURA-Independent Additive Term for Nominal Pseudorange Error Bias

- **30.3.3.10.1.5 / 20.3.3.10.1.5**
- Bits 66 through 69 of Message Type 40 shall provide the assumed IAURA-Independent Additive Term (βnom) value for ARAIM at the current time for the ~~associated~~GPS ~~GNSS~~satellites ~~constellation~~indicated in the PRN Inclusion Mask. The IAURA-Independent Additive Term (βnom) bounds additive biases in the instantaneous URE that do not scale with IAURA, which is defined in section 30.3.3.1.1.
- The four bits are defined as follows:
  - 0000 = 0.00 meters
  - 0001 = 0.10 meters
  - 0010 = 0.20 meters
  - 0011 = 0.30 meters
  - 0100 = 0.40 meters
  - 0101 = 0.50 meters
  - 0110 = 0.60 meters
  - 0111 = 0.70 meters
  - 1000 = 0.80 meters
  - 1001 = 0.90 meters
  - 1010 = 1.00 meter
  - 1011 = 1.10 meters
  - 1100 = 1.20 meters
  - 1101 = 1.30 meters
  - 1110 = 1.40 meters
  - 1111 = 1.50 meters
- **3.5.4.7.1.5** Bits 42 through 45 of Subframe 3, Page 8 shall ….

Clarify definition and Parameter Values changed from RFC-413

Scalar Term for Nominal Pseudorange Error Bias

- **30.3.3.10.1.6 / 20.3.3.10.1.6**
- Bits 70 through 73 of Message Type 40 shall provide the assumed Scalar Term (γ_{nom}) value for ARAIM at the current time for the ~~associated~~ ~~GNSS~~ GPS satellites ~~constellation~~ indicated in the PRN Inclusion Mask. The Scalar Term (γ_{nom}) bounds normalized additive biases in the instantaneous URE that scale with IAURA, which is defined in section 30.3.3.1.1.
- The four bits are defined as follows:
  - 0000 = 0.00
  - 0001 = 0.05
  - 0010 = 0.10
  - 0011 = 0.15
  - 0100 = 0.20
  - 0101 = 0.25
  - 0110 = 0.30
  - 0111 = 0.35
  - 1000 = 0.40
  - 1001 = 0.45
  - 1010 = 0.50
  - 1011 = 0.55
  - 1100 = 0.60
  - 1101 = 0.65
  - 1110 = 0.70
  - 1111 = 0.75
- **3.5.4.7.1.6** Bits 46 through 49 of Subframe 3, Page 8 shall ….

Clarify definition and Parameter Values changed from RFC-413

Satellite Fault Rate

- **30.3.3.10.1.7 / 20.3.3.10.1.7**
- Bits 74 through 77 of Message Type 40 shall provide the assumed satellite fault rate (R_{sat}) value for ARAIM at the current time *for the associated GNSS constellation*.
- R_{sat} is the onset rate at which the instantaneous URE of any given satellite exceeds 4.42 times the IAURA (or 5.73 times the IAURA when the conveying signal is provided with an enhanced level of integrity assurance).
- The four bits are defined as follows:
  - 0000 = 1×10^{-8} /hour
  - 0001 = 3.16×10^{-8} /hour
  - 0010 = 1×10^{-7} /hour
  - 0011 = 3.16×10^{-7} /hour
  - 0100 = 1×10^{-6} /hour
  - 0101 = 3.16×10^{-6} /hour
  - 0110 = 1×10^{-5} /hour
  - 0111 = 3.16×10^{-5} /hour*
  - 1000 = 1×10^{-4} /hour*
  - 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.

- **3.5.4.7.1.7** Bits 50 through 53 of Subframe 3, Page 8 shall ….

Clarify definition and Parameter Values changed from RFC-413

Mean Duration of a Satellite Fault

- **30.3.3.10.1.8 / 20.3.3.10.1.8**
- Bits 78 through 81 of Message Type 40 shall provide the assumed mean duration of a satellite fault (MFD_{sat}) value for ARAIM at the current time *for the associated constellation as per GNSS ID*.
- MFD_{sat} is the mean time the instantaneous URE of any given satellite exceeds 4.42 times the IAURA (or 5.73 times the IAURA when the conveying signal is provided with an enhanced level of integrity assurance) without a timely notification issued to the user.
- The four bits are defined as follows:
  - 0000 = 0.25 hours
  - 0001 = 0.50 hours
  - 0010 = 1.00 hours
  - 0011 = 2.00 hours*
  - 0100 = 4.00 hours*
  - 0101 = 6.00 hour*
  - 0110 = 8.00 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.

- **3.5.4.7.1.8** Bits 54 through 57 of Subframe 3, Page 8 shall ….

Added MFDsat, revised parameters after PICWG 2022

Constellation Fault Rate

- **30.3.3.10.1.9 / 20.3.3.10.1.9**
- Bits 82 through 85 of Message Type 40 shall provide the assumed constellation fault rate (R_{const}) value for ARAIM *at the current time for the associated GNSS constellation*.
- R_{const} is the onset rate at which the instantaneous URE of two or more satellites exceed, due to a common cause, 4.42 times the IAURA (or 5.73 times the IAURA when the conveying signal is provided with an enhanced level of integrity assurance)..
- The four bits are defined as follows:
  - 0000 = 3.16×10^{-10} /hour
  - 0001 = 1×10^{-9} /hour
  - 0010 = 3.16×10^{-9} /hour
  - 0011 = 1×10^{-8} /hour
  - 0100 = 3.16×10^{-8} /hour*
  - 0101 = 1×10^{-7} /hour*
  - 0110 = 3.16×10^{-7} /hour*
  - 0111 = 1×10^{-6} /hour*
  - 1000 = 3.16×10^{-6} /hour*
  - 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.

- **3.5.4.7.1.9** Bits 58 through 61 of Subframe 3, Page 8 shall ….

Changed to Rconst, revised paramaters after PICWG 2022

Mean Duration of a Constellation Fault

- **30.3.3.10.1.10 / 20.3.3.10.1.10**
- Bits 86 through 89 of Message Type 40 shall provide the assumed mean duration of a constellation fault (MFD_{const}) value for ARAIM *at the current time for the associated GNSS constellation*.
- MFD_{const} is the mean time the instantaneous URE of two or more satellites exceed, due to a common cause, 4.42 times the IAURA (or 5.73 times the IAURA when the conveying signal is provided with an enhanced level of integrity assurance) without a timely notification issued to the user.
- The four bits are defined as follows:
  - 0000 = 0.25 hours
  - 0001 = 0.50 hours
  - 0010 = 1.00 hours
  - 0011 = 2.00 hours*
  - 0100 = 4.00 hours*
  - 0101 = 6.00 hour*
  - 0110 = 8.00 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.

- **3.5.4.7.1.8** Bits 62 through 65 of Subframe 3, Page 8 shall ….

Added MFDsat, revised parameters after PICWG 2022

Service Level

- **30.3.3.10.1.11 / 20.3.3.10.1.11**
- Bits 86 through 88 of Message Type 40 shall provide the Service Level, as described in Table 30-XIb, applicable to a given page of the ISM data issue.
- Three bits are allocated to the four identified service levels as follows:
  - 000 = Level 1
  - 001 = Level 2
  - 010 = Level 3
  - 011 = Level 4
  - 100 = RESERVED
  - 101 = RESERVED
  - 110 = RESERVED
  - 111 = RESERVED

- **3.5.4.7.1.8** Bits 66 through 68 of Subframe 3, Page 8 shall
  ….

Changed message bit location from RFC-413

Service Level

[Table 30-XIb][Table 20-XIb] [Table 3.5-10]

Service Level	Severity	Description	Notes/Applicability
Level 1	No Data Available	Service Level indicates that users may resort to the Performance Values for integrity solutions instead of this ISM. Users should not use this ISM	On receipt of Service Level 1, users should invalidate or clear any ISM 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}). The Service Level 1 applies to ISM parameters for all other Service Levels.
Level 2	Non-Safety of Life Use	Service Level indicates that users may only use these parameters for non-safety of life (i.e., uncertified ARAIM) applications.	
Level 3	Safety of Life Use (Horizontal)	Service Level indicates that the user should only use these parameters for the applications requiring integrity less than or equivalent to H-ARAIM solutions.	ISM 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)	Service Level indicates that the user should only use these parameters for the applications requiring integrity less than or equivalent to V-ARAIM solutions.	ISM parameters for GPS for Service Level 4 are valid for use with elevation angles greater than or equal to 5 degrees

PRN Inclusion Mask

- **30.3.3.10.1.11 / 20.3.3.10.1.11**
- Bits 86 through 88 of Message Type 40 shall provide the Service Level, as described in Table 30-XIb, applicable to a given page of the ISM data issue.
- Three bits are allocated to the four identified service levels as follows:
  - Table 30-XIc

Bits	GPS
93	PRN 1
94	PRN 2
…	…
154	PRN 62
155	PRN 63

  - Table 3.5-11

Bits	GPS
69	PRN 1
70	PRN 2
…	…
130	PRN 62
131	PRN 63

- **3.5.4.7.1.12** Bits 69 through 131 of Subframe 3, Page 8 shall …. Refer to Table 3.5-11 …

Only identify GPS PRNs and changed message bit numbers

Reserved for ISM

- **30.3.3.10.1.12 / 20.3.3.10.1.12**
- Bits 156 through ~~244~~ 242 of Message Type 40 are reserved for future ISM use.

- **3.5.4.7.1.12**
- Bits 132 through 218 of Subframe 3, Page 8 are reserved for future ISM use.

Added placeholder for reserved bits and aligned ISM sizes between CNAV/CNAV2 reserved bits

ISM Cyclic Redundancy Check

- **30.3.3.10.1.14 / 20.3.3.10.1.14**
- Bits 243 ~~245~~ through 274 ~~276~~ of Message Type 40 are a 32-bit Cyclic Redundancy Check (CRC) specific to the ISM parameters. The ISM CRC will cover only the ISM parameters in Message Type 40 (bits 39 through 242 ~~244~~).
- Bits 275 through 276 are reserved.

- **3.5.4.7.1.14**
- Bits 219 through 250 of Subframe 3, Page 8 are a 32-bit Cyclic Redundancy Check (CRC) specific to the ISM parameters. The ISM CRC will cover only the ISM parameters in Subframe 3, Page 8 (bits 15 through 218).

Updated assigned bits, removed reference to RTCA documents, and aligned ISM sizes between CNAV/CNAV2 reserved bits

Use of ISM Data

30.3.3.10.2 / 20.3.3.10.2

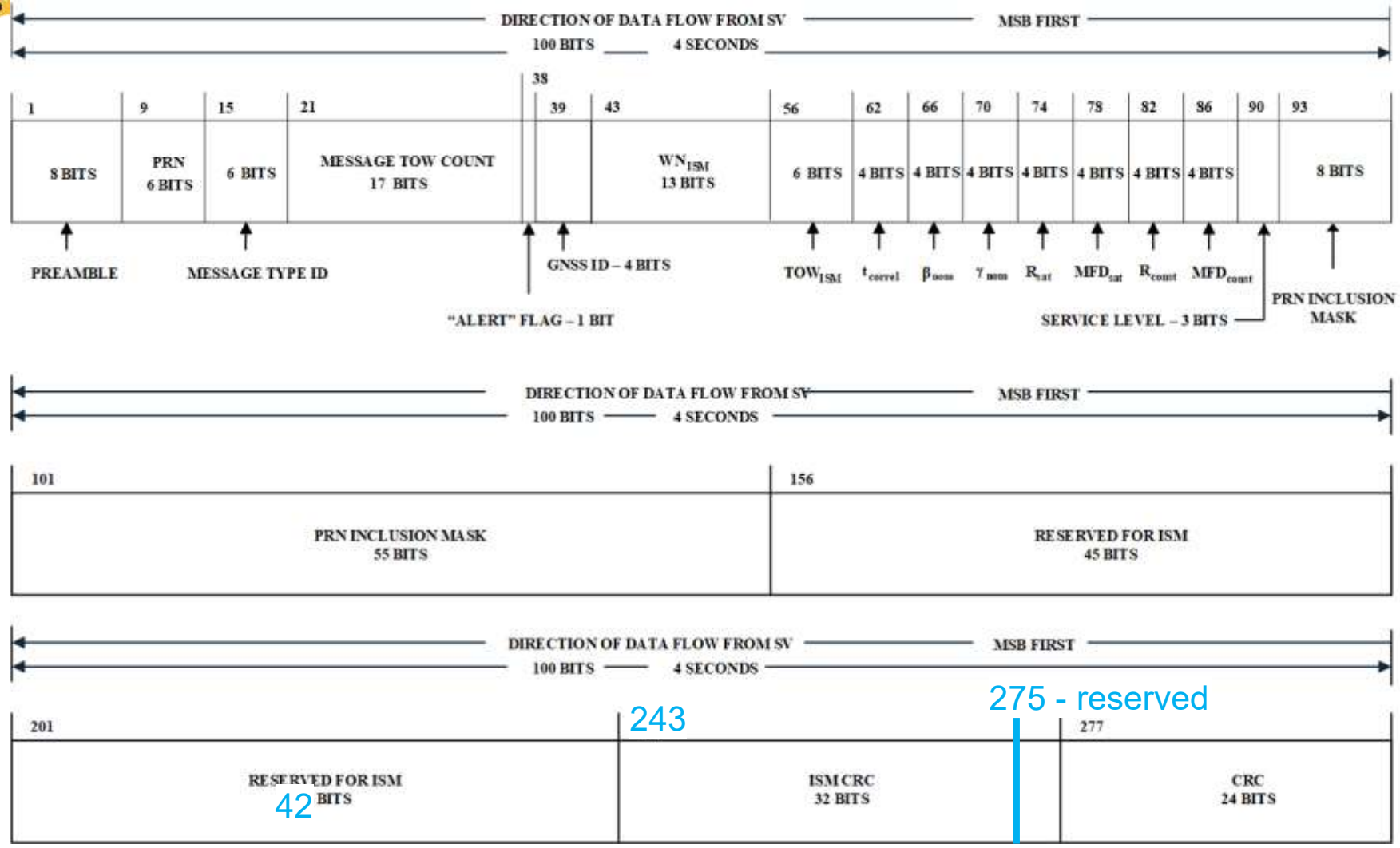
- To calculate the nominal pseudorange error bias (b_{nom}), use the following equation
  - $b_{nom} = \beta_{nom} + \gamma_{nom} * IAURA$
  - IAURA is defined in section 30.3.3.1.1 [section 20.3.3.1.1]

3.5.4.7.1

- To calculate the nominal pseudorange error bias (b_{nom}), use the following equation
  - $b_{nom} = \beta_{nom} + \gamma_{nom} * IAURA$
  - IAURA is defined in section 6.2.1.
- **6.2.1**
- 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.

Added equation for use of the data

Figure 30-14-a [Figure 20-14a]



QUESTIONS & COMMENTS?

Next Generation GPS - OCX
Public Release Data Products

Public Interface Configuration Working Group

27-SEP-2023

Points of Contact

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The Raytheon Corporation

Review Materials 1 of 2

- The materials for this review are contained within several zip archives as well as individual files:

- 870-IEPDs.zip
  - Contains signed zip archives for each of the three ICD-GPS-870 IEPDs
  - The contents of each IEPD is described in detail later in this briefing
- ValidateTransformUtility.zip
  - Contains Validate And Transform Utility (VATU) as well as the VATU User Guide
  - The VATU executable can be found within the ValidateAndTransformUtility sub-directory
    - "ValidateAndTransformUtility.exe"
  - The VATU is a stand-alone utility intended to function on Windows and Linux platforms per Section 3.3 of ICD-GPS-870
- Cert_PEM_Files.zip
  - Contains the *.pem files for two certificates
  - Both certs are provided to support validation of the signed files, either using the provided VATU or through independent means
    - "product.pem" – signing cert for the IEPD and Transform Utility zip archives as well as the sample GGA XML files provided within each IEPD
    - "productNegativeTest.pem" – provided so a failure can be observed when using the incorrect cert to attempt validation of the digital signatures

Review Materials 2 of 2

- Review materials continued:

- Sample products provided for this review are signed using a Raytheon generated certificate with a 10-year validity. In operations, these products will be signed using a standard DoD PKI certificate.
- In operations the IEPDs, VATU, and *.pem files corresponding to the signing certificates will be made available to the public via the USCG Navigation Center (NAVCEN) web site
  - Details of the NAVEN distribution front-end are in work and will be made available in future.

Background

- GPS Control Segment (CS) currently distributes four data products as defined in ICD-GPS-240 via the USCG Navigation Center:
  - Notice Advisory to Navstar Users (NANU)
  - Operational Advisory (OA)
  - Almanac (SEM & YUMA)
  - Satellite Outage File (SOF)
  - See: https://www.navcen.uscg.gov/?pageName=gpsAlmanacs
- The 2d Space Operations Squadron (2SOPS) also makes these products available as well as the Anti-Spoof (A-S) file.
  - See: https://gps.afspc.af.mil/gps/conststatus.html
- In the OCX era, all five data products will be consolidated into four schema-based XML Information Products defined in ICD-GPS-870 and distributed via the USCG Navigation Center:
  - GPS Advisory (equivalent NANU content)
  - GPS Advisory Collection (equivalent SOF content)
  - Ops Status (equivalent Ops Advisory content)
  - Public Common Almanac (equivalent SEM, YUMA, and A-S content)

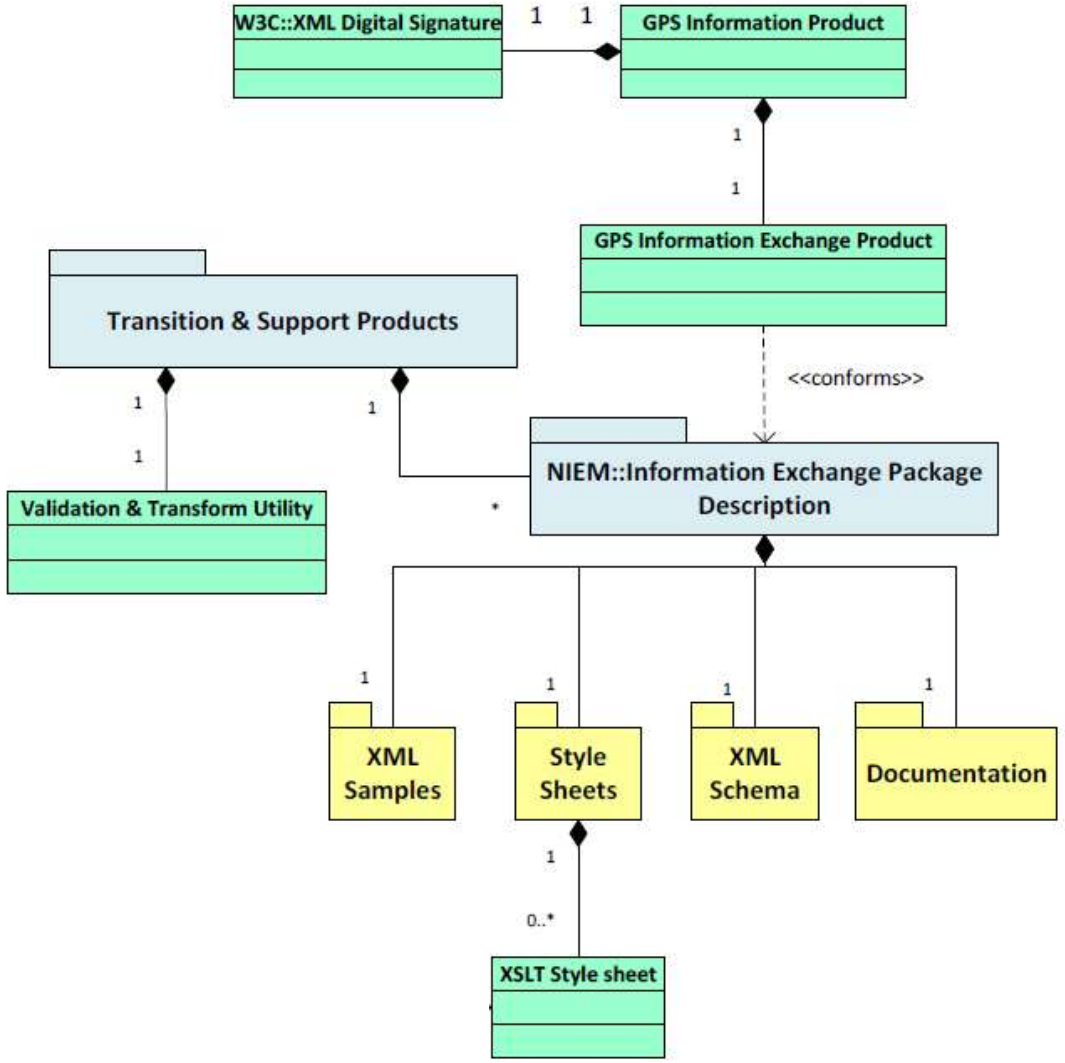
OCX- Era Product Design

- The OCX-era Information Products were designed to conform with the National Information Exchange Model (NIEM)
- "NIEM is a common vocabulary that enables efficient information exchange across diverse public and private organizations"
- The OCX-era products are compliant with NIEM Version 2.1
- See: https://www.niem.gov/

- IAW NIEM, each OCX-era product has an associated Information Exchange Package Documentation (IEPD)
- "A NIEM IEPD is a package that describes the construction and content of a NIEM information exchange"
- For the OCX-era products, each IEPD will be provided in the form of a digitally signed zip file containing a pre-defined directory structure with:
  - XML Schema
  - XML Sample Product/s
  - XSLT Stylesheet/s
  - Legacy (AEP-era) Sample Product/s
  - Documentation

- All OCX-era products will be digitally signed using DoD PKI

OCX-Era Product High Level Ontology



Data Integrity 1 of 2

- All OCX-era Information Products will contain a digital signature conforming to W3C standards to provide data integrity in transit and at rest
- The digital signature element of each product will include the x509 certificate corresponding to the digital signature
- See https://www.w3.org/TR/xmldsig-core1/
- Validation of digital signatures is not required to use the products, but it is strongly encouraged

```
<gpsocxmetadata:Header>
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
        <SignedInfo>
            <CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
            <SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
            <Reference URI="">
                <Transforms>
                    <Transform Algorithm="http://www.w3.org/2000/09/xmldsig#enveloped-signature"/>
                </Transforms>
                <DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
                <DigestValue>digest value</DigestValue>
            </Reference>
        </SignedInfo>
        <SignatureValue>signature</SignatureValue>
        <KeyInfo><X509Data><X509Certificate>certificate</X509Certificate></X509Data></KeyInfo>
    </Signature>
</gpsocxmetadata:Header>
```

Data Integrity 2 of 2

- The VATU and IEPD archives (zip files) are signed separately using Oracle's jarsigner

- See https://docs.oracle.com/en/java/javase/13/docs/specs/man/jarsigner.html
- See https://docs.oracle.com/en/java/javase/13/docs/specs/jar/jar.html
- Per the jarsigner standard, each archive contains a META-INF directory with the following files:
  - MANIFEST.MF
    - Contains two lines for each file found within the archive:
      - Line 1 – Filename
      - Line 2 – Name of the digest algorithm (ex SHA) followed by the digest (hash) of the binary data within the file
  - PRODUCT.SF
    - Contains two lines for each file found within the archive:
      - Line 1 – Filename
      - Line 2 – Name of the digest algorithm (ex SHA) followed by the digest (hash) value of the two lines for the corresponding source file in the manifest file
  - PRODUCT.RSA
    - Contains the signature of the PRODUCT.SF file
    - This file also contains, encoded inside it, the certificate or certificate chain from the keystore that authenticates the public key corresponding to the private key used for signing

Backwards Compatibility Approach 1 of 7

For systems that will not be updated to process the directly-distributed XML files, XSLT Stylesheets are provided for each OCX-era product that has one or more corresponding AEP-era products

- Directly distributed products (Information Products) include the GPS Advisory, GPS Advisory Collection, Ops Status, and Public Common Almanac XML files
- The Stylesheets allow for transformation of the directly-distributed XML products into the AEP-era ASCII text formats (or legacy XML in the case of the SOF file)
  - Stylesheets conform to W3C standard XSL Transformations 2.0.

For those users without the knowledge or resources to directly utilize the XSLT Stylesheets, GPS will provide a downloadable utility which will ingest an XML product and relevant XSLT Stylesheet, and then output the desired AEP-era formatted file

- The Validate and Transform Utility (VATU) is a stand-alone application that can be installed and used on local workstations
- A User Guide is included with the VATU to provide instructions on the tool's use

The VATU is provided with no warranty implied and is not intended as a long-term solution - users are encouraged to migrate to direct use of the XML and/or XSLT files as soon as practical

Backwards Compatibility Approach 2 of 7

Once the ValidateTransformUtility.zip file is extracted, you will see the following:

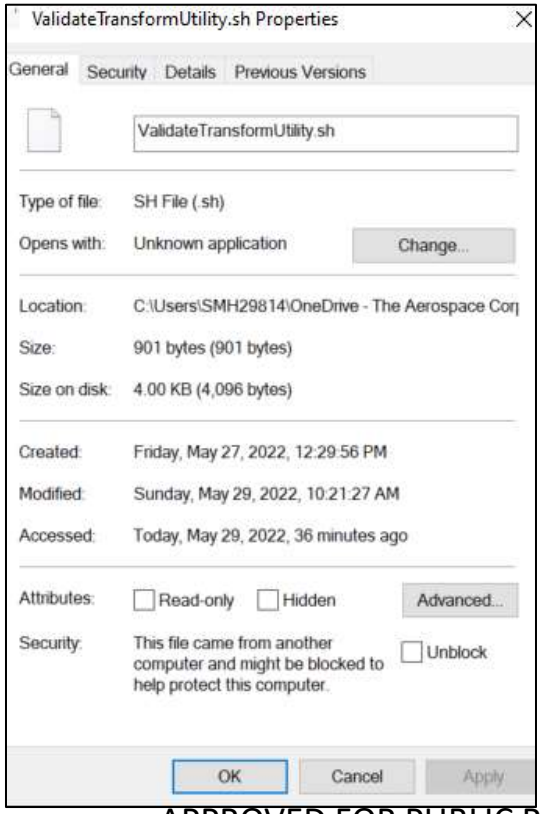
- As noted in Data Integrity, the META-INF folder contains digital signature information for the files contained in the ValidateTransformUtility.zip file
- The GGA Validate and Transform Utility User Guide.docx contains requirements and instructions for running the utility
- The ValidateTransformUtility.cmd and ValidateTransformUtility.sh files are scripts provided to assist with running the utility
- The ValidateTransformUtility.jar file is the utility itself and can be extracted in the same manner as a zip file in order to see additional information such as 3rd Party licenses and the government warranty statement
    - The utility may also be run by simply double-clicking on the jar file itself

Backwards Compatibility Approach 3 of 7

There is a known issue with Windows Smartscreen blocking execution of the scripts depending on the configuration of the user's computer

The following fix action is one possible solution, but results may vary depending on user configuration

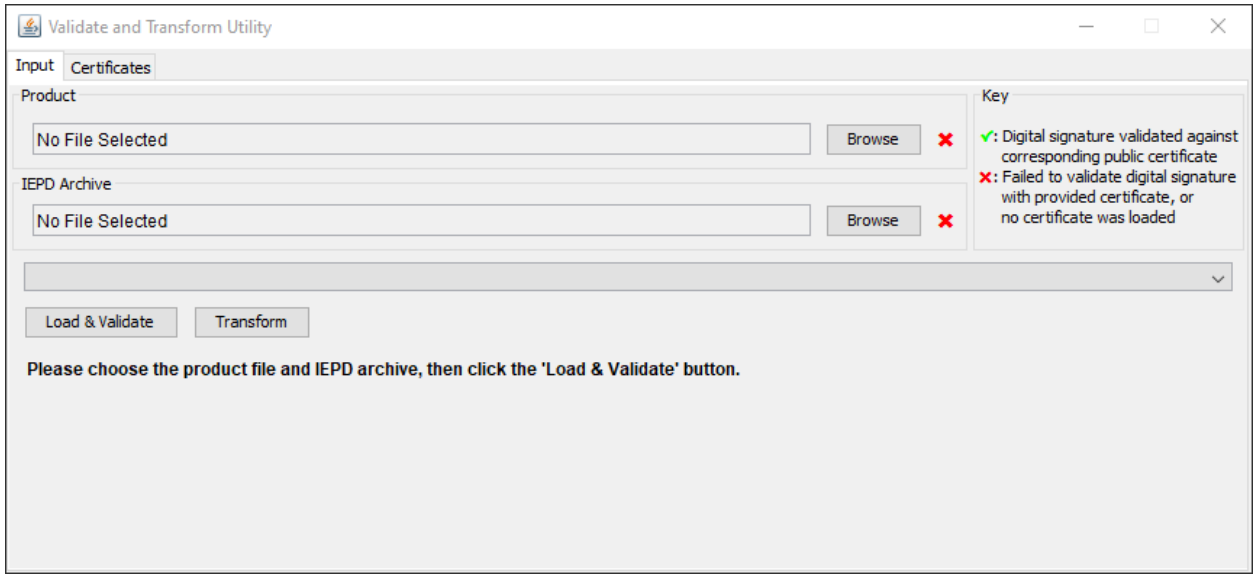
- Right-click on the file that will not execute and then select Properties to bring up the pop-up shown
- If available, select the Unblock check box on the bottom-right, select Apply, and then OK



Backwards Compatibility Approach 4 of 7

The Validate & Transform Utility (VATU) provides users with the option to validate a product's digital signature in addition to performing any transforms

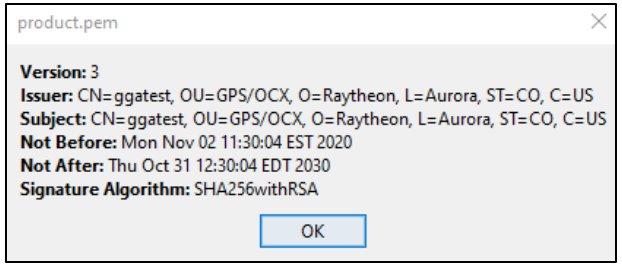
- The VATU ingests an Information Product and that Product's IEPD zip file



Backwards Compatibility Approach 5 of 7

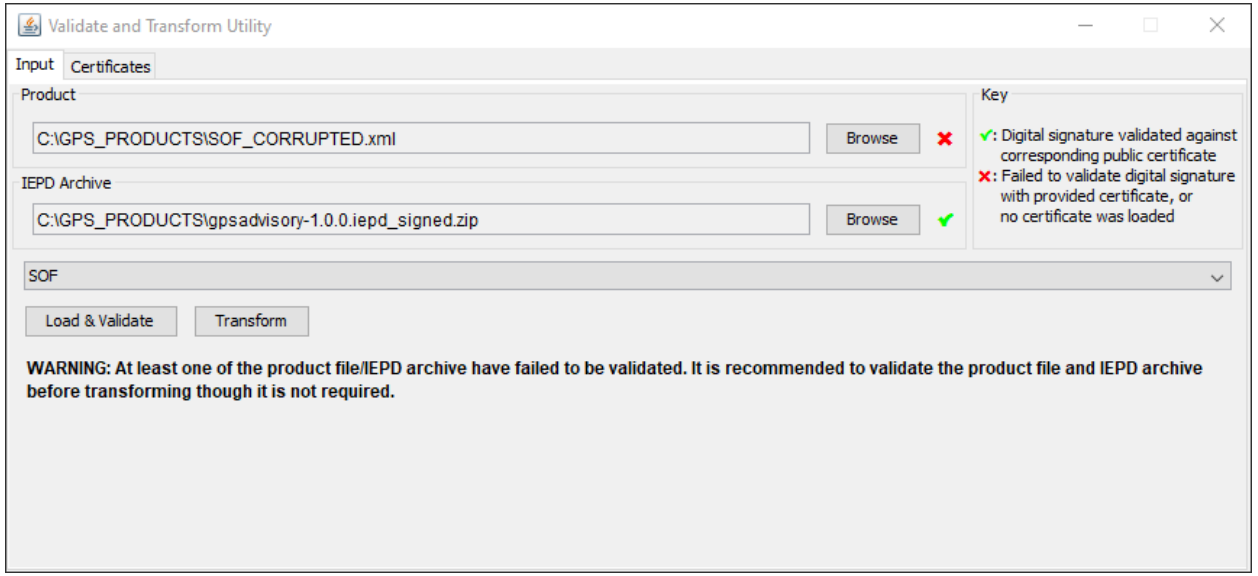
- If the *.pem files for the certificates used to sign the Information Product & IEPD are provided, the VATU will attempt to validate their digital signatures

- The VATU also provides an ability for the user to examine details of the loaded certificate if desired



Backwards Compatibility Approach 6 of 7

- Once the product, IEPD, and pem files are loaded, the tool will indicate whether the product and/or IEPD signatures validate and will present a dropdown of transformation options for the given product



See GGA Validate and Transform Utility User Guide.docx for full details

Backwards Compatibility Approach 7 of 7

There is a known issue on some platforms where after entering the desired product and IEPD Archive – *with no certificates loaded* – the below may result:

The fix action is to click on the bottom border of the window and drag it down to increase its vertical size until you see the problem is corrected

The software developer has an action to correct this issue prior to the tool being posted for operational use

IEPD Organization & Content 1 of 2

On the following slide is an example of the general organization and content of the IEPDs provided by GPS within the 870-IEPDs.zip file

- This example is based on the Ops Status Information Product IEPD, but all GPS IEPDs follow the same basic structure and conform to the same standards

Schema is provided to simplify adoption of the NIEM-compliant XML products

Mapping from NIEM-compliant XML data elements to the legacy text product can be found in the XSLT Stylesheet

The GPS program acknowledges not all users will be familiar with schema or XSLT standards, so the previously mentioned Validate and Transform Utility (VATU) is provided

Sample products provided for this review do not contain operationally realistic data

IEPD Organization & Content 2 of 2

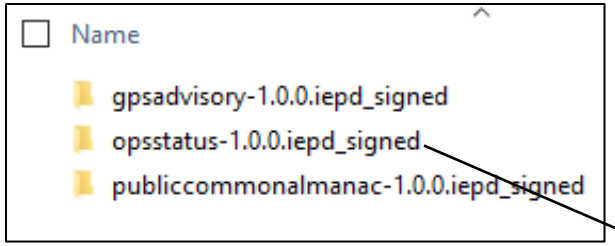


Figure 1

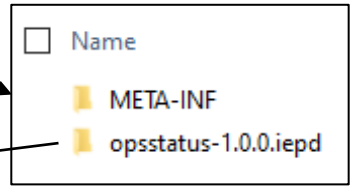


Figure 2

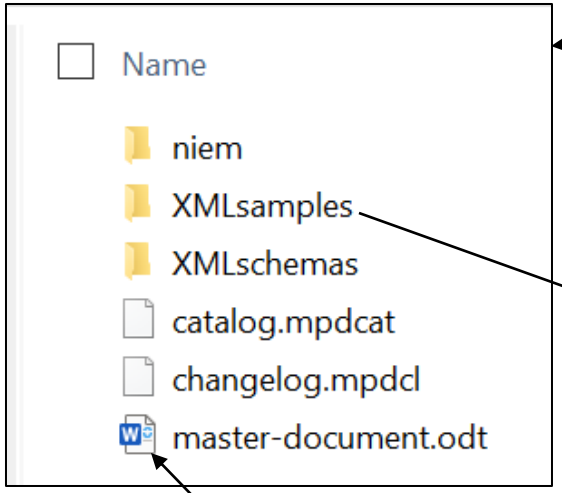


Figure 3

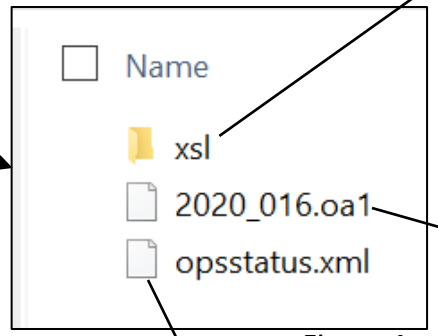


Figure 4

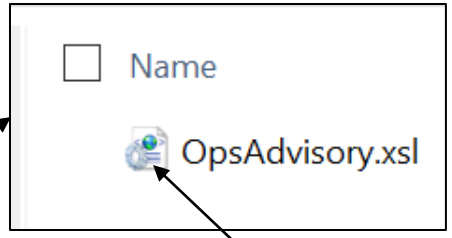


Figure 5

Sample of the legacy text formatted product, generated via the provided XSLT Stylesheet

Provides a list of artifacts, schemas, definitions, business rules, and other information found in the IEPD

Sample of the directly distributed, NIEM-compliant XML product

GPS vs UTC Time

Wherever a Date-Time Group (DTG) is displayed in the standard NIEM format as shown below, that DTG is referenced to UTC

```
<gpspub:CreatedDate>2020-01-16T16:31:09.000Z</gpspub:CreatedDate>
```

If the Legacy (AEP-era) product contained a DTG which is referenced to GPS rather than UTC, it is still shown in the NIEM format, but also includes the SourceGPSTime attribute

```
<gpspub:EffectiveDate gpspub:sourceGPSTime="1263228600" gpspub:timezoneCode="UTC">
   <nc:DateTime>2020-01-16T16:49:42.000Z</nc:DateTime>
</gpspub:EffectiveDate>
```

Sample taken from Effective Date field of GPS Advisory Collection which corresponds to the SOF REFERENCE DTG

This general format is used for any data element whose Legacy counterpart is referenced to the GPS Time Standard

- SourceGPSTime attribute provides seconds since GPS Epoch, 6 Jan 1980 0000Z
- The GPS time is then followed by a NIEM-standard DTG format, which is always in UTC
- If only the NIEM-standard DTG format is provided in an element, it will always be referenced to UTC

Ops Status 1 of 5

The Ops Status product provides the same information as found in the AEP-era Operational Advisory (OA) product, per the definition found in ICD-GPS-870 Rev E, Appendix 2

- Legacy Ops Advisory Header
  - This data is found within the opsstatus:GPSMetadata element under opsstatus:Constellation

Row 1 – Classification:

```
<gpspub:ICISMMetadata nism:ownerProducer="USA" nism:classification="U">
<gpspub:NoticeList>
<gpspub:Notice>
<gpspub:NoticeText>DoD-Dist-A</gpspub:NoticeText>
</gpspub:Notice>
</gpspub:NoticeList>
</gpspub:ICISMMetadata>
```

Rows 2 & 3 – Product Description & Date:

```
<gpspub:IdentifierValueText>2020_016.OA1</gpspub:IdentifierValueText>
<gpspub:KeywordValueText>OpsStatus</gpspub:KeywordValueText>
<gpspub:CreatedDate>2020-01-16T16:31:09.000Z</gpspub:CreatedDate>
```

Ops Status 2 of 5

- Legacy Ops Advisory Section 1 – Plane, Slot, & AFS Assignment
  - This data is grouped under opsstatus:Constellation within individual gpspub:SpaceVehicle elements for each PRN as follows

```
<gpspub:SpaceVehicle xsi:type="gpspub:GPSSpaceVehicleType" s:id="vehref27">
        <gpspub:PseudoRandomNoiseID>27</gpspub:PseudoRandomNoiseID>
        <gpspub:SlotNumeric>3</gpspub:SlotNumeric>
        <gpspub:PlaneText>F</gpspub:PlaneText>
        <gpspub:SVBlockCode>IIR</gpspub:SVBlockCode>
        <gpspub:NavigationPayload>
                <gpspub:Clock>
                        <gpspub:AtomicClockKindCode>rubidium</gpspub:AtomicClockKindCode>
                </gpspub:Clock>
        </gpspub:NavigationPayload>
</gpspub:SpaceVehicle>
```

Ops Status 3 of 5

- Legacy Ops Advisory Section 2
  - Current and recent advisories, forecasts, and general text NANUs
  - This data is grouped within individual opsstatus:GPSSpaceEvent elements for each PRN as follows

```
<opsstatus:GPSSpaceEvent>
   <nc:ActivityDateRange>
      <nc:StartDate>
         <nc:DateTime>2009-01-01T09:15:00.000Z</nc:DateTime>
      </nc:StartDate>
      <nc:EndDate>
         <nc:DateTime>2009-01-01T16:20:00.000Z</nc:DateTime>
      </nc:EndDate>
   </nc:ActivityDateRange>
   <gpspub:SpaceEventKindCode>ForecastMaintenance</gpspub:SpaceEventKindCode>
   <gpspub:GPSSpaceVehicleReference s:ref="vehref15"/>
   <opsstatus:GPSMetadata>
      <nc:EffectiveDate>
         <nc:DateTime>2009-01-02T11:05:00.000Z</nc:DateTime>
      </nc:EffectiveDate>
      <nc:ReportedDate>
         <nc:DateTime>2009-01-02T11:05:00.000Z</nc:DateTime>
       </nc:ReportedDate>
       <gpspub:DESVersionNumeric>9</gpspub:DESVersionNumeric>
       <gpspub:NtkDESVersionNumeric>7</gpspub:NtkDESVersionNumeric>
       <gpspub:ResourceElementIndicator>false</gpspub:ResourceElementIndicator>
       <gpspub:CreatedDate>2020-01-16T16:31:09.000Z</gpspub:CreatedDate>
       <gpspub:IdentifierValueText>2009001</gpspub:IdentifierValueText>
   </opsstatus:GPSMetadata>
</opsstatus:GPSSpaceEvent>
```

Ops Status 4 of 5

- Legacy Ops Advisory Section 2 – Continued
  - The following provides a basic mapping between key child elements within the opsstatus:GPSSpaceEvent element and the legacy Ops Advisory format:
    - ActivityDate – Event Start/Stop time as seen in the SUMMARY column
      - This is an optional element and may not be present if the NANU has no start/stop time information
      - ActivityDateRange will be used if the event has both start and stop DTG, with the start and stop DTG contained within the StartDate and EndDate elements
    - SpaceEventKindCode – NANU Type
      - Enumerations are fully spelled out rather than abbreviations
      - Ex, ForecastDeltaV instead of FCSTDV
    - GPSSpaceVehicleReference – PRN
    - EffectiveDate = ReportedDate – MSG DATE/TIME
    - CreatedDate – The creation DTG of the Ops Status product

Ops Status 5 of 5

- Legacy Ops Advisory Section 3 - Point of Contact Information
  - This data is found within the child elements of opsstatus:GPSMetadata under opsstatus:Constellation
    - Individual gpspub:PointOfContact records are provided for each POC as follows

```
<gpspub:PointOfContact>
        <nc:OrganizationName>NAVCEN</nc:OrganizationName>
        <nc:OrganizationPrimaryContactInformation>
                <nc:ContactTelephoneNumber>
                        <nc:NANPTelephoneNumber>
                                <nc:TelephoneAreaCodeID>703</nc:TelephoneAreaCodeID>
                                <nc:TelephoneExchangeID>313</nc:TelephoneExchangeID>
                                <nc:TelephoneLineID>5900</nc:TelephoneLineID>
                                <nc:TelephoneSuffixID xsi:nil="true"/>
                        </nc:NANPTelephoneNumber>
                </nc:ContactTelephoneNumber>
                <nc:ContactWebsiteURI> HTTPS://WWW.NAVCEN.USCG.GOV </nc:ContactWebsiteURI>
        </nc:OrganizationPrimaryContactInformation>     <gpspub:PointOfContactCategoryCode> CIVIL NON-
        AVIATION </gpspub:PointOfContactCategoryCode>
</gpspub:PointOfContact>
```

Public Common Almanac 1 of 3

The Public Common Almanac product provides the same information as found in the AEP-era SEM and YUMA almanacs as well as the Anti-Spoof and Extended Signals Health Status files, per the definitions found in ICD-GPS-870 Rev E, Appendix 2

The Public Common Almanac also contains classification and point of contact information as previously defined in for the Ops Status product

- The classification and point of contact data can be found within the pubcomalm:GPSMetadata element under pubcomalm:Constellation

Legacy Week Number & Time of Applicability are provided under the pubcomalm:TimeOfApplicabilityDateTime as follows

```
<pubcomalm:TimeOfApplicabilityDateTime>

    <gpspub:GPSWeekNumeric>40</gpspub:GPSWeekNumeric>
    <gpspub:GPSSecondsInWeekNumeric>18400</gpspub:GPSSecondsInWeekNumeric>

</pubcomalm:TimeOfApplicabilityDateTime>
```

Public Common Almanac 2 of 3

The Almanac and Anti-Spoof data is grouped under pubcomalm:Constellation within individual gpspub:SpaceVehicle elements for each PRN as follows

```
<gpspub:SpaceVehicle xsi:type="gpspub:GPSSpaceVehicleType">

    <nc:ItemName>SVN: 68, PRN: 27</nc:ItemName>
    <nc:ItemStatus xsi:nil="true"/>

    <gpspub:OrbitalState xsi:type="gpspub:SupplementalOrbitStateInfoType">

        <gpspub:EccentricityMeasure>0.006045738566963673</gpspub:EccentricityMeasure>
        <gpspub:SquareRootSemiMajorAxisMeasure>5153.6763027527095</gpspub:SquareRootSemiMajorAxisMeasure>
        <gpspub:ArgumentOfPerigeeMeasure>-0.9401327840266962</gpspub:ArgumentOfPerigeeMeasure>
        <gpspub:MeanAnomalyMeasure>0.3921527776300167</gpspub:MeanAnomalyMeasure>
        <gpspub:GeographicLongitudeOfOrbitalPlaneMeasure>
    -0.22369163821016966
        </gpspub:GeographicLongitudeOfOrbitalPlaneMeasure>
        <gpspub:InclinationOffsetMeasure>0.010640977589115507</gpspub:InclinationOffsetMeasure>
        <gpspub:RateOfRightAscensionMeasure>-2.454105210312804E-9</gpspub:RateOfRightAscensionMeasure>
        <gpspub:RightAscensionAngleMeasure>-7.709798899855139E-9</gpspub:RightAscensionAngleMeasure>

    </gpspub:OrbitalState>

    <gpspub:VehicleID>68</gpspub:VehicleID>
    <gpspub:PseudoRandomNoiseID>27</gpspub:PseudoRandomNoiseID>
    <gpspub:SVBlockCode>IIF</gpspub:SVBlockCode>
```

……Continued on next slide

Public Common Almanac 3 of 3

```
<gpspub:SpaceVehicle xsi:type="gpspub:GPSSpaceVehicleType">

    <gpspub:NavigationPayload xsi:type="gpscomalm:ModernizedNavigationPayloadType">

        <gpspub:AverageUserRangeAccuracyNumeric>0</gpspub:AverageUserRangeAccuracyNumeric>
        <gpspub:Anti-SpoofStatusCode>OFF</gpspub:Anti-SpoofStatusCode>
        <gpspub:SatelliteConfigurationNumeric>3</gpspub:SatelliteConfigurationNumeric>
        <gpspub:NAVHealthSummaryCode>all NAV data are OK</gpspub:NAVHealthSummaryCode>
        <gpspub:HealthOfSvSignalComponentsCode>All Signals OK</gpspub:HealthOfSvSignalComponentsCode>

        <gpspub:Clock>
            <gpspub:ClockBiasMeasure>1.3639616230718497E-4</gpspub:ClockBiasMeasure>
           <gpspub:ClockDriftMeasure>4.090584069820737E-12</gpspub:ClockDriftMeasure>
        </gpspub:Clock>

        <gpscomalm:L1>
            <gpspub:SignalCode>L1C</gpspub:SignalCode>
            <gpspub:SignalHealthCode>Signal bad or unavailable</gpspub:SignalHealthCode>
        </gpscomalm:L1>
        <gpscomalm:L2>
            <gpspub:SignalCode>L2C</gpspub:SignalCode>
            <gpspub:SignalHealthCode>Signal OK</gpspub:SignalHealthCode>
        </gpscomalm:L2>
        <gpscomalm:L5>
            <gpspub:SignalCode>L5</gpspub:SignalCode>
            <gpspub:SignalHealthCode>Signal OK</gpspub:SignalHealthCode>
        </gpscomalm:L5>

    </gpspub:NavigationPayload>

</gpspub:SpaceVehicle>
```

- NAVHealthSummaryCode per IS-GPS-200 section 20.3.3.3.1.4 SV Health
- HealthOfSvSignalComponentsCode per IS-GPS-200 Table 20-VIII
- SignalHealthCode per IS-GPS-200 section 30.3.3.1.1.2 Signal Health (L1/L2/L5).

GPS Advisory & Advisory Collection 1 of 4

There are two general types of GPS Advisory which can be differentiated based on the gpsadvisory:GpsAdvisoryKindCode element

- GPS Advisory – Corresponds to individual legacy NANUs
  - <gpsadvisory:GpsAdvisoryKindCode>NoticeAdvisoryToNavstarUsers</gpsadvisory:GpsAdvisoryKindCode>
- GPS Advisory Collection – Corresponds to the legacy Satellite Outage File
  - <gpsadvisory:GpsAdvisoryKindCode>SatelliteOutageFile</gpsadvisory:GpsAdvisoryKindCode>

Both types of GPS Advisory contain classification and point of contact information as previously defined in for the Ops Status product

- The classification and point of contact data can be found within the gpsadvisory:GPSMetadata element under gpsadvisory:GpsAdvisory

Similar to the Ops Status product, the GPS Advisory contains Created, Reported, and Effective date/time stamps within the gpsadvisory:GPSMetadata element under gpsadvisory:GpsAdvisory, though there is some difference between how ReportedDate is used between the GPS Advisory vs the GPS Advisory Collection

- CreatedDate – DTG of product creation
- ReportedDate –
  - GPS Advisory = NANU DTG (or REF NANU DTG as appropriate, see slide 3 of 4)
  - GPS Advisory Collection = DTG of product creation
- EffectiveDate – Internal system time to which the data is referenced, does not correlated to any DTG provided in the legacy NANUs

GPS Advisory & Advisory Collection 2 of 4

Data for the GPS Advisory can be found within the gpsadvisory:GPSSpaceEvent element under gpsadvisory:GpsAdvisory as well as within the gpsadvisory:GPSSpaceVehicle element

```
<gpsadvisory:GpsAdvisory>

   <gpsadvisory:GpsAdvisoryKindCode>NoticeAdvisoryToNavstarUsers</gpsadvisory:GpsAdvisoryKindCode>

   <gpsadvisory:GPSSpaceEvent>
      <nc:ActivityIdentification>
         <nc:IdentificationID>NANU2982127</nc:IdentificationID>
      </nc:ActivityIdentification>
      <nc:ActivityDateRange>
         <nc:StartDate>
            <nc:DateTime>2051-05-09T06:51:00.000Z</nc:DateTime>
         </nc:StartDate>
         <nc:EndDate>
            <nc:DateTime>2709-10-24T22:41:00.000Z</nc:DateTime>
         </nc:EndDate>
      </nc:ActivityDateRange>
      <gpspub:SpaceEventKindCode>ForecastMaintenance</gpspub:SpaceEventKindCode>
      <gpspub:GPSSpaceVehicleReference xmlns:s="http://niem.gov/niem/structures/2.0" s:ref="vehref72"/>
   </gpsadvisory:GPSSpaceEvent>

</gpsadvisory:GpsAdvisory>

<gpsadvisory:GPSSpaceVehicle xmlns:s="http://niem.gov/niem/structures/2.0" s:id="vehref72">
   <gpspub:VehicleID>72</gpspub:VehicleID>
   <gpspub:PseudoRandomNoiseID>45</gpspub:PseudoRandomNoiseID>
</gpsadvisory:GPSSpaceVehicle>
```

GPS Advisory & Advisory Collection 3 of 4

If the GPS Advisory references an earlier Advisory (ex, summary, cancel, extend, reschedule, etc), a second gpsadvisory:GpsAdvisory element with information on the referenced Advisory will be provided as follows

```
<gpsadvisory:GpsAdvisory xmlns:s="http://niem.gov/niem/structures/2.0" s:id="REF2982127">

    <gpsadvisory:GpsAdvisoryKindCode>NoticeAdvisoryToNavstarUsers</gpsadvisory:GpsAdvisoryKindCode>

    <gpsadvisory:GPSSpaceEvent>
        <nc:ActivityIdentification>
            <nc:IdentificationID>NANU2982127</nc:IdentificationID>
        </nc:ActivityIdentification>
    </gpsadvisory:GPSSpaceEvent>

    <gpsadvisory:GPSMetadata>
        <nc:ReportedDate>
            <nc:DateTime> 2323-01-13T04:26:00.000Z </nc:DateTime>
        </nc:ReportedDate>
        <gpspub:IdentifierValueText>NANU2982127</gpspub:IdentifierValueText>
        <gpspub:KeywordValueText>NoticeAdvisoryToNavstarUsers</gpspub:KeywordValueText>
    </gpsadvisory:GPSMetadata>

</gpsadvisory:GpsAdvisory>
```

GPS Advisory & Advisory Collection 4 of 4

The GPS Advisory Collection is constructed similarly to the GPS Advisory but it contains multiple gpsadvisory:GPSSpaceEvent elements, one for each NANU recorded in the Collection

The Collection also contains multiple gpsadvisory:GPSSpaceVehicle elements, one for each PRN/SVN pair referenced in the recorded NANUs

- Note, the primary key used for each NANU is gpspub:GPSSpaceVehicleReference within gpsadvisory:GPSSpaceEvent , which is the SVN
- gpsadvisory:GPSSpaceVehicle maps the SVN to the PRN

Otherwise, the structure of the data elements remains the same as shown previously for the GPS Advisory

QUESTIONS & COMMENTS?

BACKUP SLIDE

Map of Date/Time Fields from Modern to Legacy Product Types

GGA Product	GGA DateTime Element (UTC)	GGA xsd Type	Legacy Product	Legacy DateTime	Legacy Time Typ
GPS Advisory	GpsAdvisory[not(@s:id)]/GPSMetadata/ReportedDate	gpspub:UTCDateType	NANU	1. NANU DTG: <ddhhmmZ MMM yyyy>	UTC
GPS Advisory	GpsAdvisory[@s:id]/GPSMetadata/ReportedDate	gpspub:UTCDateType	NANU	1. REF NANU DTG: 2. DTG <ddhhmmZ MMM yyyy>	UTC
GPS Advisory	GPSSpaceEvent/ActivityDateRange/StartDate	gpspub:UTCDateType	NANU	UNUSABLE START TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDateRange/EndDate	gpspub:UTCDateType	NANU	DECOMMISSIONING START TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDate	gpspub:UTCDateType	NANU	LAUNCH TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDate (when no STOP)	gpspub:UTCDateType	NANU	START TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDateRange/StartDate	gpspub:UTCDateType	NANU	START TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDateRange/EndDate	gpspub:UTCDateType	NANU	STOP TIME ZULU / CALENDAR DATE	UTC
GPS Advisory	GPSSpaceEvent/ActivityDate	gpspub:UTCDateType	NANU	COORDINATED UNIVERSAL TIME (UTC) WILL SEQUENCE AS FOLLOWS:	UTC
GPS Advisory Collection	GPSMetadata/CreatedDate	niem-xsd:dateTime	Satellite Outage File	CREATION/@[YEAR|DOY|HR|MIN|SEC]	UTC
GPS Advisory Collection	GPSMetadata/EffectiveDate	gpspub:UTCDateType	Satellite Outage File	REFERENCE/@[YEAR|DOY|HR|MIN|SEC]	GPS
GPS Advisory Collection	ActivityDate	gpspub:UTCDateType	Satellite Outage File	CURRENT /@START_[YEAR|DOY|HR|MIN|SEC]	UTC
GPS Advisory Collection	ActivityDateRange/StartDate	gpspub:UTCDateType	Satellite Outage File	PREDICTED /@START_[YEAR|DOY|HR|MIN|SEC]	UTC
GPS Advisory Collection	ActivityDateRange/EndDate	gpspub:UTCDateType	Satellite Outage File	PREDICTED /@END_[YEAR|DOY|HR|MIN|SEC]	UTC
GPS Advisory Collection	ActivityDateRange/StartDate	gpspub:UTCDateType	Satellite Outage File	HISTORICAL /@START_[YEAR|DOY|HR|MIN|SEC]	UTC
GPS Advisory Collection	ActivityDateRange/EndDate	gpspub:UTCDateType	Satellite Outage File	HISTORICAL /@END_[YEAR|DOY|HR|MIN|SEC]	UTC
Ops Status	Constellation/GPSMetadata/CreatedDate	niem-xsd:dateTime	Ops Advisory	SUBJ: GPS STATUS <dd MMM yyyy>	UTC
Ops Status	GPSSpaceEvent/ActivityDate (when no STOP)	gpspub:UTCDateType	Ops Advisory	SUMMARY (JDAY/ZULU TIME START - STOP)	UTC
Ops Status	GPSSpaceEvent/ActivityDateRange/StartDate	gpspub:UTCDateType	Ops Advisory	SUMMARY (JDAY/ZULU TIME START - STOP)	UTC
Ops Status	GPSSpaceEvent/ActivityDateRange/EndDate	gpspub:UTCDateType	Ops Advisory	SUMMARY (JDAY/ZULU TIME START - STOP)	UTC
Ops Status	GPSSpaceEvent/GPSMetadata/ReportedDate	gpspub:UTCDateType	Ops Advisory	MSG DATE/TIME <dd MMM yyyy>	UTC
Public Common Almanac	TimeOfApplicabilityDateTime/GPSWeekNumeric	gpspub:GPSWeekSimpleType	Almanac (Any Format)	Week Number (WN)	GPS
Public Common Almanac	TimeOfApplicabilityDateTime/GPSSecondsInWeekNumeric	gpspub:GPSSecondsInWeekSimpleType	Almanac (Any Format)	Time of Applicability (TOA)	GPS

USCG Presentation

September 27, 2023

(In separate presentation)

Rick Hamilton
USCG

QUESTIONS & COMMENTS?

10 MINUTE BREAK

GPS PRN Expansion

Karl Kovach
Principle Engineer
The Aerospace Corporation

GPS PICWG
27 September 2023

APPROVED FOR PUBLIC RELEASE

Grandfather's GPS

- **L1 P(Y), L2 P(Y), L1 C/A**
  - Originally scoped for up to 25 satellites
    - 25 pages for almanacs in Subframe 5
    - 37 PRN code triplets, 5 assigned to Ground Transmitters (GTs)
    - ICD MH08-00004-400 Rev. F in 1975
    - Broadcast from 1977 to 1983
  - Later expanded to allow up to 32 satellites
    - 32 pages for almanacs in Subframe 5 and Subframe 4
    - Still the same 37 PRN code triplets, still 5 assigned to Yuma GTs
    - ICD-GPS-200 Rev. NC in 1983
    - Broadcast from 1983 to present

Father's GPS

- **[L1 P(Y), L2 P(Y), L1 C/A] + L2C, L5**
  - New signals developed/defined
    - Maintained the same 37 PRN code construct
      - 5 PRNs now generalized to "other uses" (not just GTs)
        - Satellites could be an "other use"
      - Almanac 'messages' (not 'pages') for PRNs in CNAV
        - Almanac messages for PRNs 33-37 directly in CNAV
    - Early milestones in GPS Modernization
      - IS-GPS-705 Rev. NC in 2003
      - IS-GPS-200 Rev. D in 2004
    - Never broadcast (used for future design planning)

Current GPS

- **[L1 P(Y), L2 P(Y), L1 C/A, L2C, L5] + L1C**
  - One more new signal developed/defined = L1C
  - Expanded scope to include 63 PRN codes
    - 63 L1C PRN codes from the very beginning
    - Added 26 sets of GPS P(Y), C/A, L2C, and L5 PRN codes
  - LNAV almanac pages and CNAV almanac messages for PRNs 1-63
  - Still more milestones in GPS Modernization
    - IS-GPS-800 Rev. NC in 2008
    - IS-GPS-705 Rev. A in 2010
    - IS-GPS-200 Rev. F in 2011
  - Only broadcasting the lower PRNs (1-32) so far
    - Higher PRNs (33-63) for future design planning

Segment Implementations

- **Space Segment**
  - Blocks IIR, IIR-M, IIF — PRNs 1-37
  - Blocks III, IIIF — PRNs 1-63
- **Control Segment**
  - AEP — PRNs 1-32
  - OCX — PRNs 1-63
- **User Segment**
  - Military
    - Legacy receivers — PRNs 1-32
    - MGUE receivers — PRNs 1-63
  - Civil
    - All receivers — ad hoc manufacturer decisions

QUESTIONS & COMMENTS?

Action Item Review

Walk-on Topics

September 27, 2023

(In separate presentations, if any)

APPROVED FOR PUBLIC RELEASE

Public Requirements Accountability Tool (PRAT)

- Status and Discussion of Closure of Existing Items 2014 through 2022
  - Total of 11 Open PRAT Items
- New PRAT Items for 2023
  - Only available after the 2023 Public ICWG

Existing PRAT Items

PRAT 2014-26 – Closure Candidate

Yr	2014	**Number**	26	**Status**	In Progress
Originator	Karl Kovach (Aerospace)			**POC**	Karl Kovach (Aerospace)

Description *Provide an informational briefing to remind the ICWG members that PRN expansion is coming.*

Livelink https://smclivelink.losangeles.af.mil/Livelink/llisapi.dll?func=ll&objaction=overview&objid=53525283

Notes

27 Sep 23: 2023 Public ICWG Presentatiion satisfies this PRAT Item. Ready to Close.

26 Oct 22: Explore presenting at the 2023 PICWG.
23 Aug 18: PRN expansion is still in internal development. Specific questions related to this topic can be addressed to the GPS Public Forum or the GPS Directorate spectrum management team.

6 Sep 17: Will remain deffered.

28 Aug 17: Defer until we get a better answer from the PRN Expansion Group.
Gov't Lead: Capt Duc Bui/Capt David Besson SME: Karl Kovach SE&I: Steve Nance

17 Apr 17: Combined action item 2014-45 with this item.

10 Apr 17: Work in progress. KK presented twice at the 2015 and 2016 PICWGs. The PRN expansion working group has been started since Mid Jan 2017. Bi-weekly meeting- Will present the go-forward plan to Mr. Horejsi in June. Might need to represent the findings to the PICWG as a special topic. SPAWAR mentioned of some interpretations of the public documents. There might be some findings/clarifications to be made in public doc. At the time, we can submist a concern to take care of all. RFC-251 only addresses some specific "Classified" tables. Does not touch the IS-200.

PRAT 2018-1- with RFC-477 – On Track to Close

Yr	2018	**Number**	1	**Status**	In Progress
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

27 Sep 23: Once RFC-477 has passed CCB, this item should be ready to close.

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 2020-3 – Not Addressed This Year – Still Open

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 and make all other ocassions consistent.*				
Livelink					
Notes	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 2021-2 – In Progress – Still Open

Yr	2021	**Number**	2	**Status**	In Progress
Originator	Mr. Albert H. Hayden (SE&I)			**POC**	Bert Hayden (Aerospace)

Description *Create a concern to investigate info in 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 27 Sep 23: In Progress. Still Open.

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 2021-3 – In Progress – Still Open

Yr	2021	**Number**	3	**Status**	In Progress
Originator	Mr. Karl Kovach (Aerospace Corporation)			**POC**	Karl Kovach (Aerospace)
Description	*Create a concern regarding 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	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. Mr. Albert H. Hayden (SE&I) accepted an action to create a concern regarding the removal of Inter Signal Corrections from the Core CEI Data in the public documents.				

PRAT 2021-4 Completed at 2022 Public ICWG but RFC-495A - not CCB Approved

Yr	2021	**Number**	4	**Status**	Complete
Originator	Dr. Andrew Hansen (DOT)			**POC**	Tony Anthony (SE&I)

Description *Create a concern regarding the use of Pconst instead of Rconst and MFDconst in the CNAV and CNAV2 Integrity Support Messages*

Livelink https://smclivelink.losangeles.af.mil/Livelink/livelink.exe?func=ll&objId=71853781&objAction=browse&viewType=1

Notes

27 Sep 23: RFC-495A was not CCB approved as anticipated. Candidate for reopening.

26 Oct 22: A Concern was created and RFC 495 is satisfying this Action Item. 2022 PICWG closed this action.

Mr. Albert H. Hayden (SE&I) accepted an action to write a concern regarding the use of Pconst instead of Rconst and MFDconst in the CNAV and CNAV2 Integrity Support Messages

PRAT 2021-5 With RFC-502 – On Track to Close

Yr	2021	**Number**	5	**Status**	In Progress
Originator	Mr. Denis Bouvet (Thales Group)			**POC**	Karl Kovach (Aerospace)
Description	*Create a Concern for the Data ID Issue and develop any requirements baseline changes needed to satisfy any consistency shortfalls or operational needs*				
Livelink					
Notes	27 Sep 23: Solution in RFC-502 may place this item on track for closure. 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 2022-1 – Needs More Discussion

Yr	2022	**Number**	1	**Status**	In Progress
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 27 Sep 23: Needs more discussion before closure.

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

PRAT 2022-2 None Found – Closure Candidate

Yr	2022	**Number**	2	**Status**	In Progress
Originator	2022 PICWG Team			**POC**	Jason Bolger (SE&I)
Description	*Baseline search for Bnom to determine if there are other documents that may require an update.*				
Livelink					
Notes	27 Sep 23: SE&I invenstigation shows there are no other documents that reference Bnom; therefore, no documents need to be updated regarding this parameter. This item can be closed.				

PRAT 2022-3 With RFC-502 – On Track to Close

Yr	2022	**Number**	3	**Status**	In Progress
Originator	2022 PICWG Team			**POC**	Bert Hayden (Aerospace)

Description *Investigate CNAV Schedules Technical Baseline changes for 2023 Public Documents Updates.*

Livelink

Notes

27 Sep 23: Significant progress has been made on this subject with CNAV changes proposed in RFC-502. The CNAV work is on track for closure. There may be significant work still needed on CNAV-2.

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

PRAT 2022-4 No Note Needed – Closure Candidate

Yr	2022	**Number**	4	**Status**	In Progress
Originator	Dan Godwin			**POC**	Bert Hayden (Aerospace)
Description	*Determine if a clarifying note is needed on equal applicability of the bnom computation for LNAV and CNAV*				
Livelink					
Notes	27 Sep 23: Actionee determined that the applicability of the bnom parameter should be left to the direction of the ISM generator since that applicability is determined by how the generator computes the bnom value. Data analysis determined that there is no significant difference between the LNAV and CNAV clock/ephemeris solutions. Differences between the LNAV and CNAV data formats themselves should not drive any difference in the bnom parameter. A separate but related question concerns the applicability of a single bnom parameter to L1 C/A, L1C, L2C and L5 signals themselves. Though differences between these signals could in theory justify separate bnom, in practice the ISM generator can accommodate any such differences as part of the computation of bnom. A single bnom value is therefore potentially applicable to all signals and data formats as the current ISM design implies. 26 Oct 22: Initiated at the Public ICWG. Originator specifically asked a Concern be created to implement this effort				

New 2023 PRAT Items

(start in Action Item Review – next slide)

Action Item Review

Closing Remarks

Backup Slides

Acronyms

AFL	Available for Launch
ASIC	Application Specific Integrated Circuit
CDD	Capability Development Document
CDR	Critical Design Review
DAGR	Defense Advanced GPS Receiver
DDG	Arleigh Burke Guide Missile Destroyer
DT	Developmental Testing
FOT&E	Follow-on Operational Test and Evaluation
FQT	Formal Qualification Testing
FUE	Field User Evaluation
GNST+	GPS IIIF Non-flight Satellite Test Bed
GRAM–S/M	GPS Receiver Application Module – Standard Elec Module/Modernized
HH	Handheld
HPE	Hewlett Packard Enterprise
IBM	International Business Machines
IBR	Integrated Baseline Review
IDR	Implementation Design Review
JTLV	Joint Light Tactical Vehicle
LCS	Launch and Checkout System
MGUE	Military GPS User Equipment
MSI	Miniature Serial Interface
OCX	Operational Control System
OT	Operational Testing
PDR	Preliminary Design Review
PNT	Positioning, Navigation, and Timing
SIS	Signal in Space
TRV	Technical Requirements Verification
URE	User Range Error
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy