Space & Missile Systems Center

Global Positioning Systems (GPS)

Public Interface Control Working Group (ICWG) & Public Forum

United States Air Force

Position, Navigation, and Timing Mission Area

25 September 2019, 0830 – 1630 PST

Dial-in: 310-653-2663, Meeting ID: 20190925, Password: 123456

DCS Website: https://conference.apps.mil/webconf/gpspublicmeeting

Agenda

Public ICWG (1st Half of Day)	Presenter
Opening Remarks	Col Claxton
GPS Tech Baseline Public ICWG Process Overview	Lt Ratner
2019 Public ICWG RFC Discussion	
• RFC-395 (2019 Public Document Changes)	Anthony Flores (SE&I)
• RFC-403 (Health Bit Clarification)	Jennifer Lemus (SE&I)
• Open RFC Discussion Session	
Action Item Review	

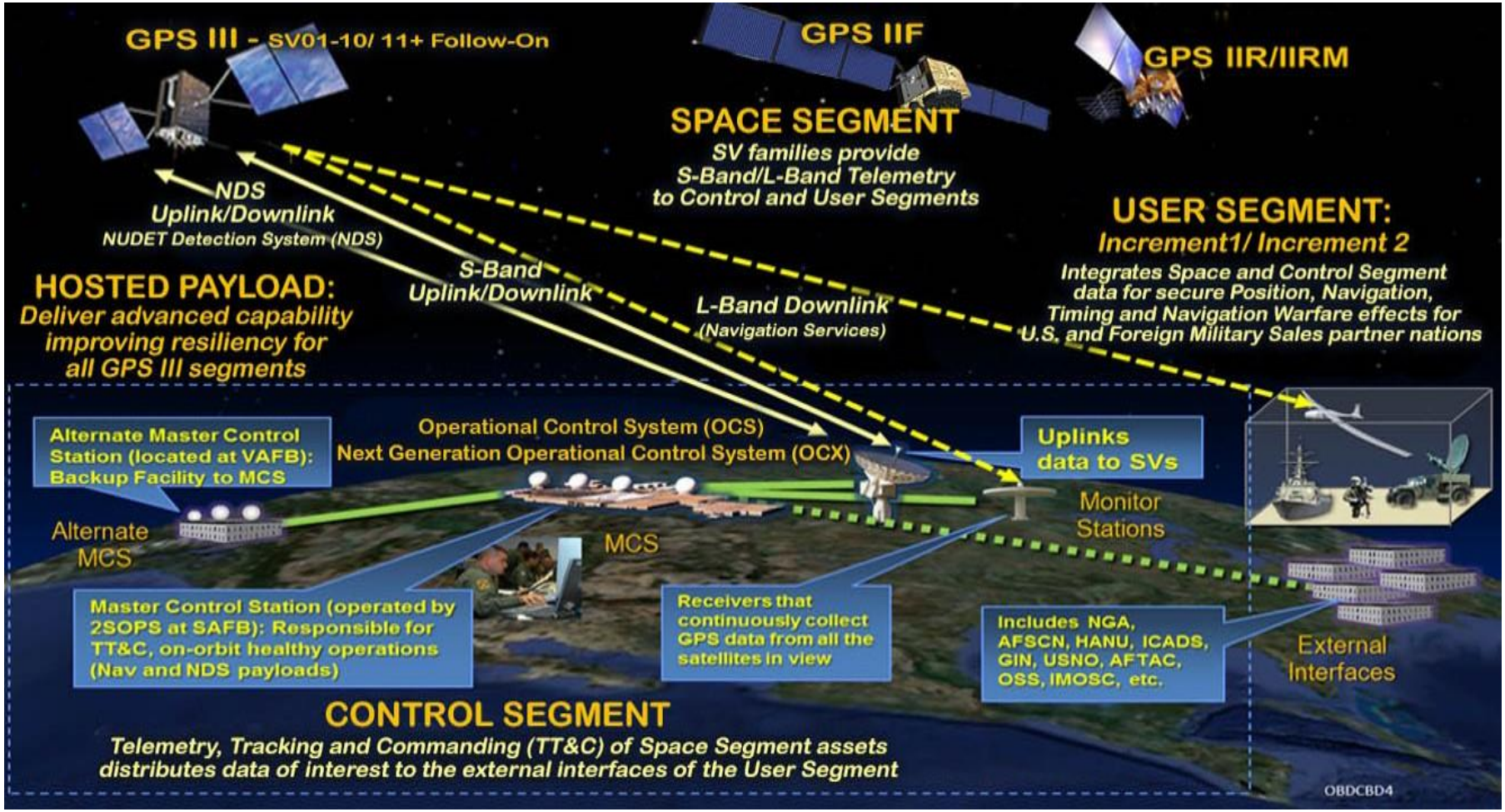
Public Forum (2nd Half of Day)	Presenter
Roll Call, Rules of Engagement	
Special Topic Presentations	
• Time Since GPS Epoch	Brent Renfro, Karl Kovach
• ARAIM	Dr. Andrew Hansen, Karl Kovach
• Concern on UTC Leap Second Schedule Announcements	Karl Kovach
• 2020 Public ICWG Look Ahead (ICD240)	Jennifer Lemus (SE&I)
Walk-on Topics, Open Discussion	
Action Item Review	

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

Col John Claxton

Chief, PNT Mission Integration

GPS Enterprise Operational View



GPS Overview

Civil Cooperation

- 4+ Billion civil & commercial users worldwide
- Search and Rescue
- Civil Signals
  - L1 C/A (Original Signal)
  - L2C (2nd Civil Signal)
  - L5 (Aviation Safety of Life)
  - L1C (International)

Spectrum

- World Radio Conference
- International Telecommunication Union
- Bilateral Agreements
- Adjacent Band Interference

Department of Transportation

- Federal Aviation Administration

Department of Homeland Security

- U.S. Coast Guard

34 Satellites / 31 Set Healthy
Baseline Constellation: 24 Satellites

Satellite Block	Quantity	Average Age	Oldest
GPS IIA	1	25.7	25.7
GPS IIR	11	17.4	22.0
GPS IIR-M	7	12.0	13.8
GPS IIF	12	5.5	9.1
Constellation	31	11.8	25.7

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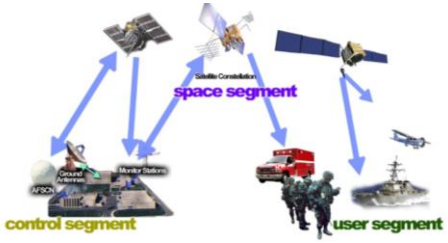


Department of Defense

- Services (Army, Navy, Air Force, USMC)
- Agencies (NGA & DISA)
- US Naval Observatory
- PNT EXCOM
- GPS Partnership Council

Maintenance

- Develop & Publish ICDs Annually
- Update GPS.gov Webpage
- Distribute PRNs for the World
  - 120 for US and 90 for GNSS

International Cooperation

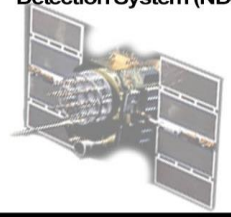
- 57 Authorized Allied Users
  - 25+ Years of Cooperation
- Global Navigation Satellite Systems (GNSS)
  - Europe - Galileo
  - China - Beidou
  - Russia - GLONASS
  - Japan - QZSS
  - India - NAVIC

GPS Modernization

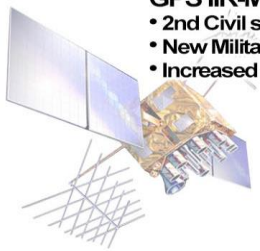
SPACE AND MISSILE SYSTEMS CENTER

Space System (Satellites)

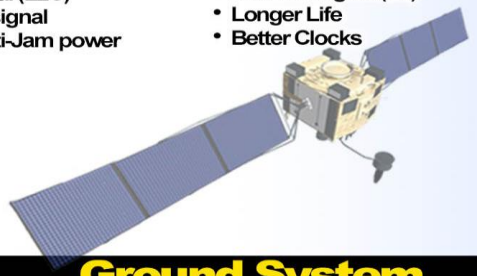
Legacy (GPS IIA/IIR)
- Basic GPS
- NUDET (Nuclear Detonation) Detection System (NDS)



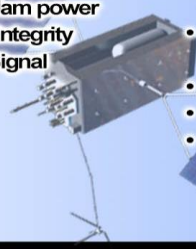
GPS IIR-M
- 2nd Civil signal (L2C)
- New Military signal
- Increased Anti-Jam power



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



GPS III (SV01-10)
- Accuracy & Power
- Increased Anti-Jam power
- Inherent Signal Integrity
- Common L1C Signal
- Longer Life



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

Ground System

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

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)
- Operational M-Code on AEP

OCX Block 1
- Fly Constellation & GPS III
- Control New Signals
- Upgraded Cyber Security

OCX Block 2+
- Control all signals
- Capability On-Ramps
- GPS III Evolution

User Equipment System (Receivers)

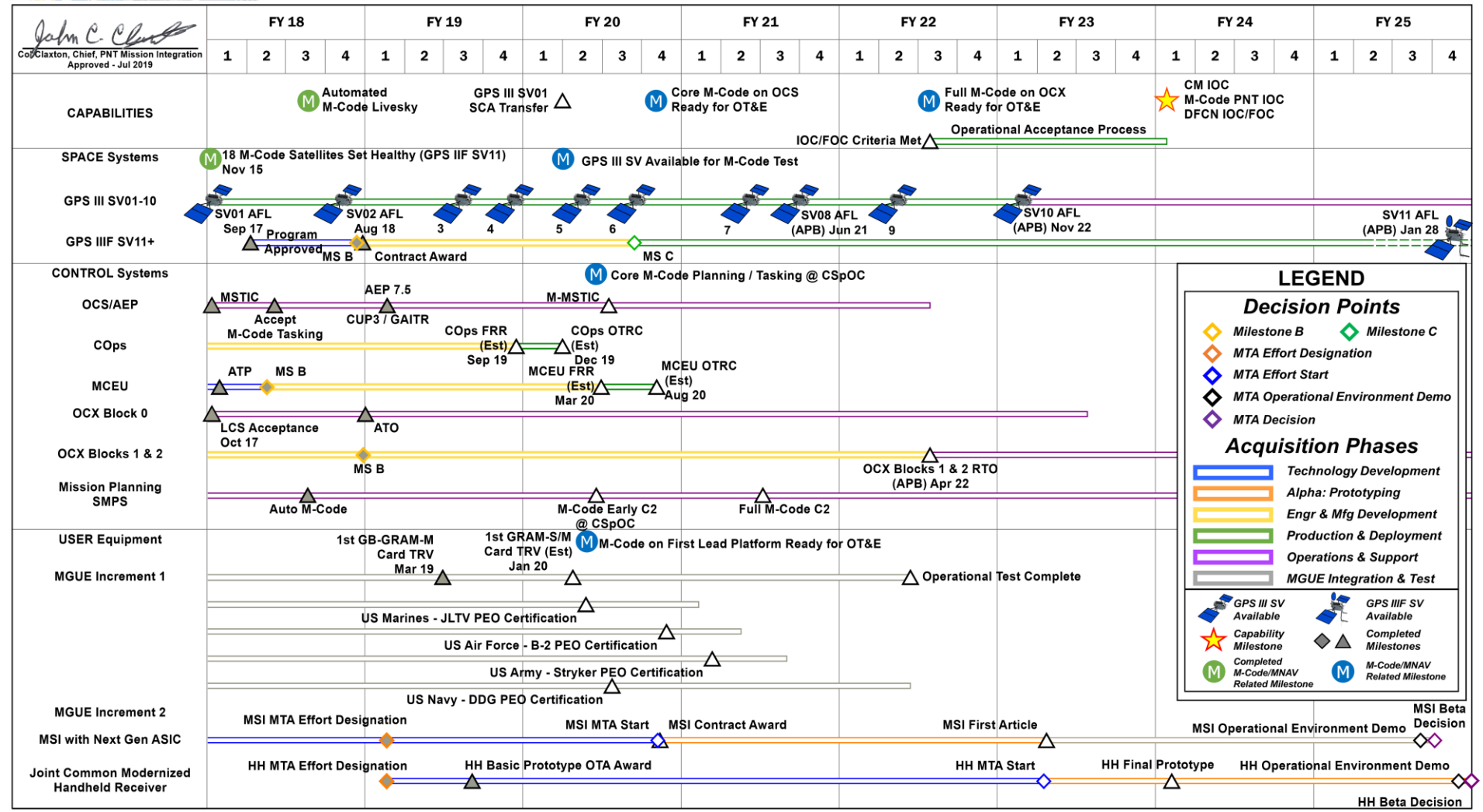
Legacy (PLGR/GAS-1/MAGR)
- First Generation System

User Equipment
- Improved Anti-Jam & Systems
- Reduced Size, Weight & Power

Upgraded Antennas
- Improved Anti-Jam Antennas

Modernized
- M-Code Receivers
- Common GPS Modules
- Increased Access Power with M-Code
- Increased Accuracy
- Increased Availability
- Increased Anti-Tamper Anti-Spoof
- Increased Acquisition in Jamming

GPS Enterprise Roadmap

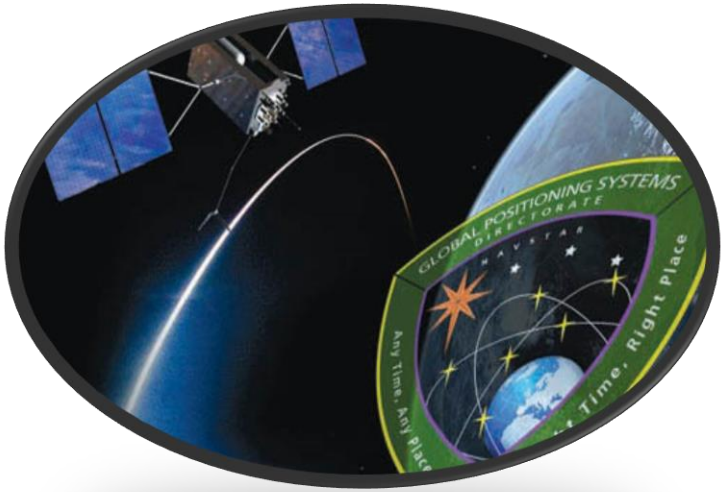


AEP	Architecture Evolution Plan	CSpOC	Combined Space Operations Center	GB-GRAM-M	Ground Based GPS Receiver Application Module – Modernized	MGUE	Military GPS User Equipment	OT&E	Operational Test and Evaluation
AFL	Available for Launch	CUP	COTS Upgrade Project	GRAM-S/M	GPS Receiver Application Module – Standard Elec Module/Modernized	M-MSTIC	Modernized-Monitor Station Tech Improvement & Capability	OTRC	Ops Test Readiness Certification
APB	Acquisition Program Baseline	DDG	Arleigh Burke Guided Missile Destroyer	HH	Handheld	MS	Milestone	PEO	Program Executive Officer
ASIC	Application-Specific Integrated Circuit	DFCN	Dual-Frequency Civil Navigation	IOC	Initial Operating Capability	MSI	Miniature Serial Interface	PNT	Positioning, Navigation & Timing
ATO	Authority to Operate	Est	Forecast Estimate	JLTV	Joint Light Tactical Vehicle	MTA	Middle Tier Acquisition	RTO	Ready for Transition to Ops
ATP	Authority to Proceed	FOC	Full Operational Capability	LCS	GPS III Launch & Checkout System	OCS	Operational Control System	SCA	Spacecraft Control Authority
C2	Command & Control	FRR	Fielding Readiness Review	MCEU	M-Code Early Use	OCX	Next Gen Operational Control System	SMPS	SAASM Mission Planning System
CM	Constellation Management	GAITR	Ground Antenna Interface Technical Refresh			OTA	Other Transaction Agreement	SV	Space Vehicle
COps	GPS III Contingency Operations							TRV	Technical Requirements Verification

Preparing for Next Generation GPS

- GPS III/IIIF, OCX, MGUE, COps,– all implement design changes to GPS
  - Found GPS user issues when the manufacturer did not follow approved Interface Control Document (ICD)
  - As GPS evolves, it will become even more important for manufacturers to be ICD compliant

Critical for civil users to ensure their receivers are ICD compliant



GPS continues the Global Utility

- "The Gold Standard"
- Committed to maintaining uninterrupted service
- Committed to maintaining domestic and international partnerships

GPS Requirements Team

Air Force

Col John Claxton, PNT Mission Area Chief of Integration

Mr. Daniel Godwin, Requirements Section Chief

Capt Michael Telcide, Space/Enterprise Requirement Systems Lead

Lt Benjamin Ratner, Ground/User Requirements Lead

Lt Julia Corton, Systems and Integration Requirements Lead

Aerospace

Dr. Rhonda Slattery, Enterprise Requirements Lead

Mr. Karl Kovach, Civil Requirements Lead

Systems Engineering and Integration (SE&I)

Mr. Anthony Flores, Responsible Engineer

Ms. Jennifer Lemus, Responsible Engineer

Mr. Albert Sicam, Responsible Engineer


AIR FORCE SPACE
SPACE & MISSILE SYSTEMS CENTER
SEMPER AD ASTRA
SMC
2.0
Always to the Stars

Roll Call

Meeting Logistics

- Restrooms
- Emergency Exits
- Refreshments
- Lunch
- Wi-Fi
- Additional Meeting Space
- Meeting Minutes

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 Changes Notices (PCNs) will be generated and distributed as a product of this meeting
- For in-person attendees, please raise your hand before speaking and someone will bring you a microphone
- 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

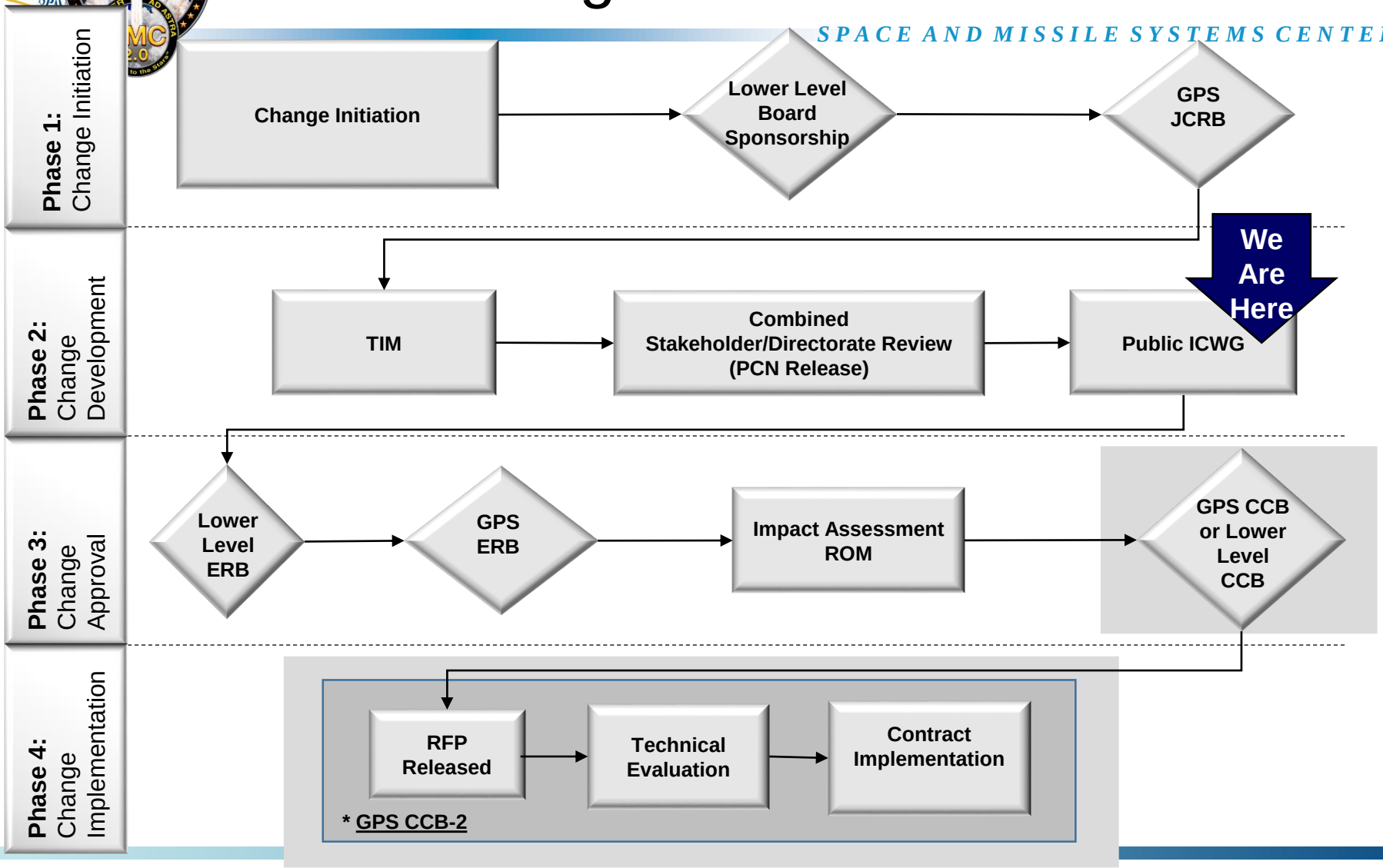
Meeting Purpose

- 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

Technical Baseline Change Management Process Flow Chart



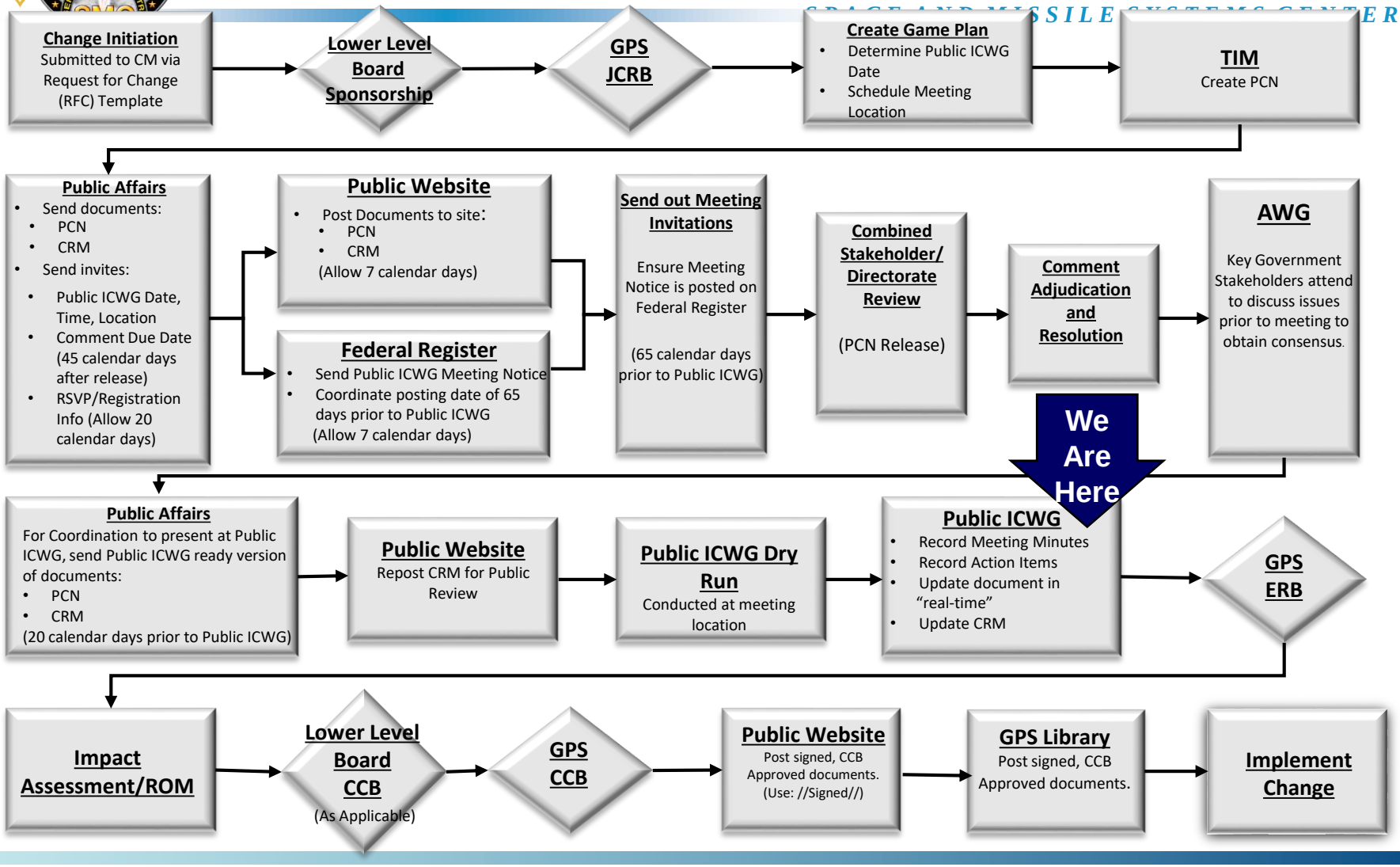
JCRB= Joint Change Review Board
ERB= Engineering Review Board

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

Technical Baseline Change Management Process – GPS Public Changes



CM= Configuration Management CRM= Comment Review Matrix AWG= Adjudication Working Group

Action Item / Concern Template

Submit any GPS public document concern to smcgper@us.af.mil

Action Item / Concern			Date:
Originator	**Organization**	**Phone No.**	**Email**
Description			
Proposed Resolution			
Document(s) Impacted			

2019 RFC Discussion

RFC-395: Public Document Changes

Lt Benjamin Ratner, SMC/ZAC
Mr. Anthony Flores, SE&I
Ms. Jennifer Lemus, SE&I
Mr. Albert Sicam, SE&I

RFC-395: 2019 Public Document Changes

Problem Statement:

1. Signals in Space Concerns
   a) L2/L5 Dual Frequency
   b) Broadcast Equations
2. Control Segment Concerns
   a) GPS Products Default Names
   b) Operational Advisories
3. Administrative Clean-up

UTC= Coordinated Universal Time
XML= Extensible Markup Language
ASCII= American Standard Code for Information Interchange

RFC-395: 2019 Public Document Changes

Proposed Solution:
1. Signals in Space Concerns a) Delete use of DF, L2/L5. b) Less complicated kinematic formulation that improves the equations in the Elements of Coordinate Systems tables in the Signal in Space (SiS) documents. 2. Control Segment a) Add description of default filenames for all legacy GPS products. b) This topic was originally addressed in RFC-374 but needs to be re-addressed in order to update ICD-GPS-870 such that OCX produces an OA with section one set to the original data or set to "RESERVED." 3. Administrative Clean- Up

Impacted Documents:
IS-GPS-200, IS-GPS-705, IS-GPS-800, ICD-GPS-870

DF= Dual Frequency
OA= Operational Advisories
IS= Interface Specifications
ICD= Interface Control Document
CNAV= Civil Navigation
OCX= Operational Control Segment- Next Generation

1. Signals in Space Concerns

RFC Summary of Changes

1a. Problem Description: IS-GPS-705 identifies dual frequency users as “L1/L2” and “L1/L5 (recommended)”. Users may interpret frequency pair (L2/L5) as a viable dual frequency; that is not recommended.

RFC Summary of Changes

Removing L2/L5 dual frequency; not defined as a valid DF pair

IS705-282 :

Section Number :
20.3.3.3.1.2.3

WAS :
L2/L5 Ionospheric Correction.

Redlines :
<DELETED OBJECT>

Look at PCNs for complete set of changes

RFC Summary of Changes

1b. Problem Description: User Equations

The user implementation community has identified equations in the Elements of Coordinates Systems tables in documents IS-GPS-200, IS-GPS-705, and IS-GPS-800 that can benefit from an improvement.

RFC Summary of Changes

Documents Affected	Tables Within Documents
IS-GPS-200J	Table 20-IV
	Table 30- II
IS-GPS-705E	Table 20- II
IS-GPS-800E	Table 3.5- 2

RFC Summary of Changes

Changes to Kepler's Equations

Eccentric Anomaly (E)

- Current equation tables state that Kepler's equations can be solved by iteration but no method is specified. Since GPS orbits are always near- circular (maximum valid eccentricity e = 0.03), the method below is ***proposed***.

$E_0 = M_k$ – Initial Value (radians)

$E_j = E_{j-1} + \frac{M_k - E_{j-1} + e \sin E_{j-1}}{1 - e \cos E_{j-1}}$ – Refined Value, three iterations, (j=1,2,3)

$E_k = E_3$ – Final Value (radians)

- In this method the initial estimate of the eccentric anomaly is set equal to the mean anomaly (M), and the final value is converged upon iterating 3 times.

RFC Summary of Changes

Changes to Kepler's Equations

True Anomaly (v)

- Current equations result in a quadrant ambiguity when finding true anomaly. The result gives you an answer with an unspecified quadrant, and if unresolved can lead to incorrect results. However, no method is given on how to resolve the ambiguity.
- The ***proposal*** is to delete the current equation and replace it with an unambiguous equation:

$$\nu_k = 2\tan^{-1}\left(\sqrt{\frac{1+e}{1-e}}\tan\frac{E_k}{2}\right) \qquad (2)$$

- Equation 2 resolves any quadrant ambiguity and is available to use for all programming languages

RFC Summary of Changes

Summary of Recommended Changes to Kepler's Equations

~~$M_k = E_k - e_n \sin E_k$~~	~~Kepler's equation for Eccentric Anomaly (radians) (may be solved by iteration)~~
	Kepler's equation ($M_k = E_k - e \sin E_k$) solved for Eccentric anomaly (E_k) by iteration:
$E_0 = M_k$	– Initial Value (radians)
$E_j = E_{j-1} + \frac{M_k - E_{j-1} + e \sin E_{j-1}}{1 - e \cos E_{j-1}}$	– Refined Value, three iterations, (j=1,2,3)
$E_k = E_3$	– Final Value (radians)
~~$\nu_k = \tan^{-1}\left(\frac{\sin \nu_k}{\cos \nu_k}\right)$~~	~~True Anomaly~~
~~$= \tan^{-1}\left(\frac{\sqrt{1 - e_n^2} \sin E_k / (1 - e_n \cos E_k)}{(\cos E_k - e_n)/(1 - e_n \cos E_k)}\right)$~~	
$\nu_k = 2 \tan^{-1}\left(\sqrt{\frac{1+e}{1-e}} \tan \frac{E_k}{2}\right)$	True Anomaly (unambiguous quadrant)
~~$E_k = \cos^{-1}\left(\frac{e_n + \cos \nu_k}{1 + e_n \cos \nu_k}\right)$~~	~~Eccentric Anomaly~~

RFC Summary of Changes

SV Velocity

- Current IS200, IS705, and IS800 do not have SV Velocity equations. Proposing new velocity equations to be added to the technical baseline.

SV Acceleration

- Current IS200, IS705, and IS800 do not have SV Acceleration equations. Proposing new acceleration equations that remain less complex then published alternatives.

RFC Summary of Changes

SV Velocity and Acceleration Statement

- Clarify that the new Acceleration and velocity equations are optional for the users to implement.

The user can compute velocity and acceleration for the SV, if required, utilizing a variation of the equations shown in Table XX.

Affected Documents:
IS-GPS-200
IS-GPS-705
IS-GPS-800

RFC Summary of Changes

Summary of the SV Velocity Equations and its Subsidiaries

Element/Equation	Description
SV Velocity	
$\dot{E}_k = n/(1 - e\cos E_k)$	Eccentric Anomaly Rate
$\dot{v}_k = \dot{E}_k \sqrt{1-e^2}/(1 - e\cos E_k)$	True Anomaly Rate
$(di_k/dt) = (\text{IDOT}) + 2\dot{v}_k(c_{is}\cos 2\phi_k - c_{ic}\sin 2\phi_k)$	Corrected Inclination Angle
$\dot{u}_k = \dot{v}_k + 2\dot{v}_k(c_{us}\cos 2\phi_k - c_{uc}\sin 2\phi_k)$	Corrected Argument of Latitude Rate
$\dot{r}_k = eA\dot{E}_k \sin E_k + 2\dot{v}_k(c_{rs}\cos 2\phi_k - c_{rc}\sin 2\phi_k)$	Corrected Radius Rate
$\dot{\Omega}_k = \dot{\Omega} - \dot{\Omega}_e$	Longitude of Ascending Node Rate
$\dot{x}'_k = \dot{r}_k\cos u_k - r_k\dot{u}_k \sin u_k$	In- plane x velocity
$\dot{y}'_k = \dot{r}_k\sin u_k + r_k\dot{u}_k \cos u_k$	In- plane y velocity
$\dot{x}_k = -x'_k\dot{\Omega}_k\sin\Omega_k + \dot{x}'_k\cos\Omega_k - \dot{y}'_k\sin\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\cos\Omega_k\cos i_k - (di_k/dt)\sin\Omega_k\sin i_k)$	Earth- Fixed x velocity (m/s)
$\dot{y}_k = x'_k\dot{\Omega}_k\cos\Omega_k + \dot{x}'_k\sin\Omega_k + \dot{y}'_k\cos\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\sin\Omega_k\cos i_k + (di_k/dt)\cos\Omega_k\sin i_k)$	Earth- Fixed y velocity (m/s)
$\dot{z}_k = \dot{y}'_k\sin i_k + y'_k(di_k/dt)\cos i_k$	Earth- Fixed z velocity (m/s)

RFC Summary of Changes

Summary of Recommended Additions to the Equation Tables

Element/Equation	Description
SV Acceleration	
$R_E = 6378137.0$ meters	WGS 84 Earth Equatorial Radius
$J_2 = 0.0010826262$	Oblate Earth Gravity Coefficient
$F = -(3/2)\, J_2\, (\mu / r_k^2)\, (R_E / r_k)^2$	Oblate Earth acceleration Factor
$\ddot{x}_k = -\mu\,(x_k / r_k^3) + F\,[(1 - 5\,(z_k / r_k)^2)(x_k / r_k)] + 2\dot{y}_k\dot{\Omega}_e + x_k\dot{\Omega}_e^2$	Earth- Fixed x acceleration (m/s^2)
$\ddot{y}_k = -\mu\,(y_k / r_k^3) + F\,[(1 - 5\,(z_k / r_k)^2)(y_k / r_k)] - 2\dot{x}_k\dot{\Omega}_e + y_k\dot{\Omega}_e^2$	Earth- Fixed y Acceleration (m/s^2)
$\ddot{z}_k = -\mu\,(z_k / r_k^3) + F\,[(3 - 5\,(z_k / r_k)^2)(z_k / r_k)]$	Earth- Fixed z Acceleration (m/s^2)

2. Control Segment Concerns

2a. Problem Description: Default File Names in ICD-GPS-870

OCX provides a utility to convert modernized GPS products to the legacy, AEP-formatted GPS products. The legacy formats are characterized with default filenames, which are important for the public user community to interpret and process the GPS products. However, these default filenames are not described in ICD-GPS-870.

RFC Summary of Changes

Legacy File Type (see Appendix ICD-GPS-870 Appendix 1-5)	Default Filename
NANU File (NANU)	yyyyNNN.nnu (see note 1 and 2 and 3)
Operational Advisory (OA)	yyyy_ddd.oa1 (see note 1 and 3)
SEM Almanac (PRN 1-32)	yyyy_ddd.al3 (see note 1 and 3)
SEM Almanac (PRN 1-63)	yyyy_ddd.bl3 (see note 1 and 3)
YUMA Almanac (PRN 1-32)	yyyy_ddd.alm (see note 1 and 3)
YUMA Almanac (PRN 1-63)	yyyy_ddd.blm (see note 1 and 3)
Anti-Spoof Status (AS) (PRN 1-32)	AS_yyyy_ddd.txt (see note 1 and 3)
Anti-Spoof Status AS2 (PRN 1-63)	AS2_yyyy_ddd.txt (see note 1 and 3)
Extended Signal Health Status	yyyy_ddd.ale (see note 1 and 3)
Satellite Outage File (SOF)	YYYY_DDD_HHMMSS_vnn.sof

Note 1:
- **yyyy is the year**
- **ddd is the 3 digit Julian day of year, zero-filled with a range from 001 to 366 beginning January 1**
- **hhmmss is the hour/minute/second UTC with hh range from 00 to 24 and with mm and ss range from 00 to 59**

Note 2:
- **NNN – sequentially assigned three-digit NANU ID number which begins at 001 for the first NANU of a new year. The ID number is incremented for each new NANU up to a maximum of 999 in any given calendar year, after which the ID number rolls over and begins numbering subsequent NANUs beginning with 001.**

Note 3:
- **The file is named with the reference date/time that the original GPS product was created by the CS.**

Note 4:
- **The nn is the file format version number and ranges from 01-09.**

RFC Summary of Changes

2b. Problem Description:

Currently the Operational Advisories (OAs) that are published and archived contain plane/slot descriptions that are not in the constellation definition provided to the public in the SPS Performance Standard as well as the data provided by the National Geospatial-Intelligence Agency (NGA) (refer to http://earthinfo.nga.mil/GandG/sathtml/satinfo.html). The OA does not have the capability to correctly publish information regarding fore/aft position since moving to the 24+3 constellation with three expanded slots. (Transferred from RFC-374)

RFC Summary of Changes

The original proposal in RFC-374 to strike the data from section one of the Operational Advisory was removed and is re-addressed in this RFC. Provides flexibility to OCX to provide either the original OA section one data or a “RESERVED” field.

RFC Summary of Changes

When data is available, Section 1 will be populated

```
1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I   : NONE
B. BLOCK II  : PRNS 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14
   PLANE     : SLOT B2, D1, C2, D4, B6, C5, A6, A3, A1, E3, D2, B4, F3, F1
   CLOCK     :      RB, RB, CS, RB, RB, RB, RB, CS, CS, CS, RB, RB, RB, RB
   BLOCK II  : PRNS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
   PLANE     : SLOT F2, B1, C4, E4, C3, E1, D3, E2, F4, D5, A5, F5, A4, B3
   CLOCK     :      RB, RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, CS, RB
   BLOCK II  : PRNS 29, 30, 31, 32
   PLANE     : SLOT C1, B5, A2, E5
   CLOCK     :      RB, CS, RB, RB
C. BLOCK III: PRNS 33, 34, 35
   PLANE     : SLOT A2, C3, F4
   CLOCK     :      RB, RB, RB
```

Figure 20-3 OA Section 1

RFC Summary of Changes

If no data is available, section one is denoted with “RESERVED”. An example is illustrated in Figure 20-3a.

1. RESERVED

Figure 20-3a OA Section One (No Data)

3. Cleanup

RFC Summary of Changes

Description: Cleanup

Public documents need clarification and clean-up, as identified in past Public ICWGs and as newly-identified changes of administrative nature.

RFC Summary of Changes

A redundant WN was found (WN_n). Deleted subscript 'n' to make it consistent across all documents

Table 6-I-1. CEI Data Set Parameters

Symbol	Parameter Name	Subframe	Message
SV Health	SV Health (6 bits)	1	N/A
IODC	Issue of Data, Clock	1	N/A
URA	URA Index	1	N/A
WN	Data Sequence Propagation Week Number	1	10 ~~N/A~~
~~WN_n~~	~~Week Number~~	~~N/A~~	~~10~~

Affected:

Table 6-I-1 and Figure 30-1 in IS-GPS-200

Table 6-I-1 and Figure 20-1 in IS-GPS-705

RFC Summary of Changes

Added ‘GPS IIIF’ into the technical baseline.

Section Number :

3.2.1.5.1.0-6

WAS :

Table 3-Ib. Expanded Code Phase Assignments (III and subsequent blocks only)

Redlines :

Table 3-Ib. Expanded Code Phase Assignments (GPS III, GPS IIIF, and subsequent blocks only)

IS :

Table 3-Ib. Expanded Code Phase Assignments (GPS III, GPS IIIF, and subsequent blocks only)

Affects IS-GPS-200, IS-GPS-705, IS-GPS-800 and ICD-GPS-870. Look at PCNs for exact changes

RFC Summary of Changes

Since AUTONAV is not in any current SV nor will it be in the initial GPS IIIF, the AUTONAV section was replaced with “Reserved”. The section title was kept. References to AUTONAV was also removed.

IS200-211 :

Section Number :
6.3.5.0-3

WAS :
In the Autonav mode, the almanac data, UTC parameters and ionospheric data are still calculated and maintained current by the CS and uploaded to the SV as required. If the CS is unable to upload the SVs, the almanac data, UTC parameters and ionospheric data will not be maintained current and will degrade in accuracy from the time of the last upload.

Redlines :
~~In the Autonav mode, the almanac data, UTC parameters and ionospheric data are still calculated and maintained current by the CS and uploaded to the SV as required. If the CS is unable to upload the SVs, the almanac data, UTC parameters and ionospheric data will not be maintained current and will degrade in accuracy from the time of the last upload.~~<RESERVED>

IS :
<RESERVED>

Global Removal in IS200, IS705, IS800, and ICD870 of “AUTONAV”

RFC Summary of Changes

Navigation Message Correction Table (addressed as a Special Topic at 2018 PICWG)

Splitting paragraph in Section 20.3.3.5.1.9 for better readability and adding statement at the end.

Section Number :
20.3.3.5.1.9.0-9

WAS :
N/A

Redlines :
<INSERTED OBJECT>

IS :
In addition, the CS shall ensure that the SV operating as SV ID 32 transmits an NMCT containing an AI setting equal to "10" or "11."

RFC Summary of Changes

Remove Section 20.3.3.3.1.1.1 of IS-GPS-705

~~**20.3.3.3.1.1.1 L1/L2/L5 Inter-Signal Group Delay Differential Correction.**~~

~~See paragraph 30.3.3.3.1.1.1 of IS-GPS-200.~~

Comment Review

RFC-395 Comments Resolution Matrix (CRM) Status

CRM – COMBINED REVIEW STATUS

Disposition/Type	Critical	Substantive	Administrative	Totals	Concurrence
Accept	00	00	00	00	00
Accept with Comment	00	02	00	02	02
Reject	00	00	01	01	01
Defer	00	01	00	01	01
Grand Totals:	00	03	01	04	04

DOORS ID	{DOORS ID(s)}		
Paragraph	{Insert text here}	**Comment Number**	{from CRM}
Comment Type	{Critical/Substantive}	**Disposition**	{Accept/Accept w/ Comment/Reject/Defer}
Comment Originator(s)	Commenter Name (Commenter Organization)		
Comment	{What was submitted by the commenter in the CRM}		
Directorate Response	{Text describing the rationale of the disposition}		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
{Text shown in current version of CCB-approved interface revision notice}	{Text from PCN}	{Proposed text received by the commenter during the PCN review, and/or proposed text by the government to adjudicate the subject comment}

{TEMPLATE for Comment Adjudication}

DOORS ID	IS-GPS-200		
Paragraph	20.3.3.3.1.7	**Comment Number**	1
Comment Type	S - Substantive	**Disposition**	***Defer***
Comment Originator(s)	Roger Kirpes (Collins Aerospace)		*Concur*
Comment	The interpretation of a T_{GD} value of '1000000000000', for CNAV/CNAV-2 data, and '10000000' for LNAV data, is inconsistent. With respect to CNAV/CNAV-2 data, this value is defined as indicating that the group delay value is not available. However, with respect to LNAV data, no such clarification is provided. Add clarification to IS-GPS-200 that a T_{GD} value of '10000000' in LNAV Subframe 1 indicates that the group delay value is not available.		
Directorate Response	There is no provision in IS200 that clarifies what LNAV does if there's no group delay value. Discuss at Public ICWG to evaluate impact. Due to further discussion needed, action was to defer the comment to 2020 Public document changes RFC.		

Section 20.3.3.3.1.7 Estimated Group Delay Differential.
Bits 17 through 24 of word seven contain the L1-L2 correction term, T_{GD}, for the benefit of "L1 only" or "L2 only" users; the related user algorithm is given in paragraph 20.3.3.3.3.

Section 30.3.3.3.1.1:
The group delay differential correction terms, T_{GD}, $ISC_{L1C/A}$, ISC_{L2C} for the benefit of single frequency L1 P, L1 C/A, L2 P, L2C users and dual frequency L1/L2 users are contained in bits 128 through 166 of Message Type 30 (see Figure 30-3 for complete bit allocation). The bit length, scale factors, ranges, and units of these parameters are given in Table 30-IV. The bit string of "1000000000000" shall indicate that the group delay value is not available. The related algorithm is given in paragraphs 30.3.3.3.1.1.1 and 30.3.3.3.1.1.2.

DOORS ID	IS-GPS-200		
Paragraph	20.3.3.4.3.2	**Comment Number**	2
Comment Type	S- Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		*Concur*
Comment	Replacement in Table 20-IV of Kepler's equation for eccentric anomaly by a 3-step iterative algorithm should be re-considered, as it can imply that the control segment computes and broadcasts URA, and provides performance commitments based on the assumption that all the GPS equipment apply this algorithm. This is not backward compatible with all the equipment produced so far. The algorithm solving Kepler's equation can be designed and adapted for specific applications by each manufacturer. Consider maintaining Table 20-IV as it was. Possibly add a note below the table describing a possible (but not unique) implementation to solve Kepler's equation.		
Directorate Response	The equations in the document state that they are optional to the users. Section 20.3.3.4.3 User Algorithm for Ephemeris Determination states that the equations are optional. Control Segment does not use these equations. They use their own variations of equations. The purpose of the change is to allow for easier implementation for new users. Old users do not have to revert to these equations. In fact, old users can still use their old equations with no additional effect. However, RE will add wording in the equations for clarity.		

BASELINE TEXT (WAS)
Table 20-IV

$\mu = 3.986005 \times 10^{14}$ meters^3/sec^2	WGS 84 value of the earth's gravitational constant for GPS user
$\dot{\Omega}_e = 7.2921151467 \times 10^{-5}$ rad/sec	WGS 84 value of the earth's rotation rate
$A = \left(\sqrt{A}\right)^2$	Semi-major axis
$n_0 = \sqrt{\frac{\mu}{A^3}}$	Computed mean motion (rad/sec)
$t_k = t - t_{oe}$*	Time from ephemeris reference epoch
$n = n_0 + \Delta n$	Corrected mean motion
$M_k = M_0 + nt_k$	Mean anomaly
$M_k = E_k - e \sin E_k$	Kepler's Equation for Eccentric Anomaly (may be solved by iteration) (radians)
$\nu_k = \tan^{-1}\left\{\frac{\sin \nu_k}{\cos \nu_k}\right\}$	True Anomaly
$= \tan^{-1}\left\{\frac{\sqrt{1-e^2}\sin E_k / (1 - e\cos E_k)}{(\cos E_k - e)/(1 - e\cos E_k)}\right\}$	

* t is GPS system time at time of transmission, i.e., GPS time corrected for transit time (range/speed of light). Furthermore, t_k shall be the actual total time difference between the time t and the epoch time t_{oe}, and must account for beginning or end of week crossovers. That is, if t_k is greater than 302,400 seconds, subtract 604,800 seconds from t_k. If t_k is less than -302,400 seconds, add 604,800 seconds to t_k.

PCN TEXT (IS)
Table 20-IV

$\mu = 3.986005 \times 10^{14}$ meters^3/sec^2	WGS 84 value of the earth's gravitational constant for GPS user
$\dot{\Omega}_e = 7.2921151467 \times 10^{-5}$ rad/sec	WGS 84 value of the earth's rotation rate
$A = \left(\sqrt{A}\right)^2$	Semi-major axis
$n_0 = \sqrt{\frac{\mu}{A^3}}$	Computed mean motion (rad/sec)
$t_k = t - t_{oe}$*	Time from ephemeris reference epoch
$n = n_0 + \Delta n$	Corrected mean motion
$M_k = M_0 + nt_k$	Mean anomaly
	Kepler's equation ($M_k = E_k - e \sin E_k$) solved for Eccentric anomaly (E_k) by iteration:
$E_0 = M_k$	– Initial Value (radians)
$E_j = E_{j-1} + \frac{M_k - E_{j-1} + e \sin E_{j-1}}{1 - e \cos E_{j-1}}$	– Refined Value, three iterations, (j=1,2,3)
$E_k = E_3$	– Final Value (radians)
$\nu_k = 2 \tan^{-1}\left(\sqrt{\frac{1+e}{1-e}} \tan \frac{E_k}{2}\right)$	True Anomaly (unambiguous quadrant)

* t is GPS system time at time of transmission, i.e., GPS time corrected for transit time (range/speed of light). Furthermore, t_k shall be the actual total time difference between the time t and the epoch time t_{oe}, and must account for beginning or end of week crossovers. That is, if t_k is greater than 302,400 seconds, subtract 604,800 seconds from t_k. If t_k is less than -302,400 seconds, add 604,800 seconds to t_k.

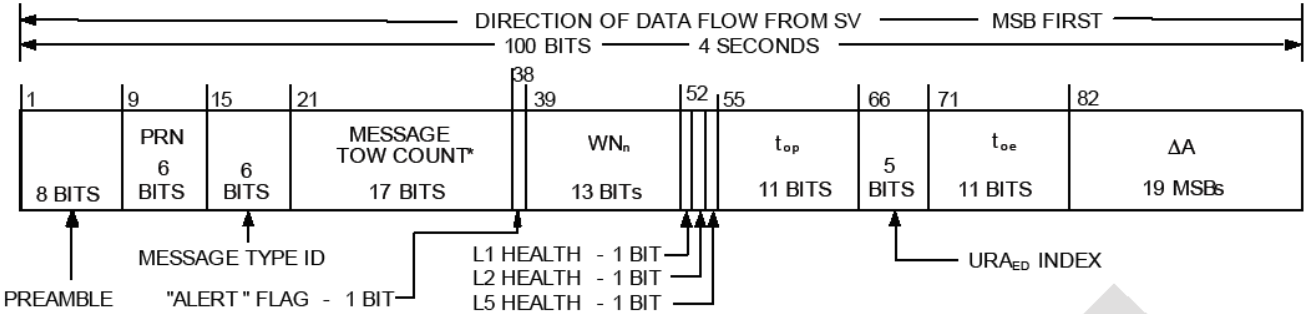
PCN TEXT (PROPOSED)
Table 20-IV

$\mu = 3.986005 \times 10^{14}$ meters^3/sec^2	WGS 84 value of the earth's gravitational constant for GPS user
$\dot{\Omega}_e = 7.2921151467 \times 10^{-5}$ rad/sec	WGS 84 value of the earth's rotation rate
$A = \left(\sqrt{A}\right)^2$	Semi-major axis
$n_0 = \sqrt{\frac{\mu}{A^3}}$	Computed mean motion (rad/sec)
$t_k = t - t_{oe}$*	Time from ephemeris reference epoch
$n = n_0 + \Delta n$	Corrected mean motion
$M_k = M_0 + nt_k$	Mean anomaly
	Kepler's equation ($M_k = E_k - e \sin E_k$) may be solved for Eccentric anomaly (E_k) by iteration:
$E_0 = M_k$	– Initial Value (radians)
$E_j = E_{j-1} + \frac{M_k - E_{j-1} + e \sin E_{j-1}}{1 - e \cos E_{j-1}}$	– Refined Value, three iterations, (j=1,2,3)
$E_k = E_3$	– Final Value (radians)
$\nu_k = 2 \tan^{-1}\left(\sqrt{\frac{1+e}{1-e}} \tan \frac{E_k}{2}\right)$	True Anomaly (unambiguous quadrant)

* t is GPS system time at time of transmission, i.e., GPS time corrected for transit time (range/speed of light). Furthermore, t_k shall be the actual total time difference between the time t and the epoch time t_{oe}, and must account for beginning or end of week crossovers. That is, if t_k is greater than 302,400 seconds, subtract 604,800 seconds from t_k. If t_k is less than -302,400 seconds, add 604,800 seconds to t_k.

DOORS ID	IS-GPS-200		
Paragraph	20.3.3.4.3.2	**Comment Number**	3
Comment Type	S- Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)	*Concur*	
Comment	Introduction of the satellite velocity and acceleration equation tables should be re-considered. GPS control segment may assume that it is only when the GPS equipment applies this new set of equations that the performance (for velocity and acceleration) defined in the SPS PS is met. Consider providing these equations as a possible algorithm, and clarifying that alternatives are acceptable.		
Directorate Response	A statement was added along with the velocity and acceleration equations stating that these equations are optional. Statement clarifies that alternatives are acceptable. They are not required to be used by the CS or UE.		

DOORS ID	IS-GPS-200, IS-GPS-705, IS-GPS-800 (Global)		
Paragraph	Global	**Comment Number**	4
Comment Type	A – Administrative	**Disposition**	***Reject***
Comment Originator(s)	Frank Czopeck	*Concur*	
Comment	[Deferred from RFC-400 Leap Second and Earth Orientation Parameters] Please note the separation between “DIRECTION OF FLOW FROM SV" and "MSB FIRST.” To me it looks like we are calling out two separate fields but in reality we are informing the reader the direction of data being sent and what bit is sent first. So I would like to see “DIRECTION OF FLOW FROM SV (MSB FIRST)” replace the header on the line.		
Directorate Response	There are 58 figures which would have to be updated – some figures are pictures and would need to be re-drawn. Users have not otherwise had problems interpreting/understanding the figures. The main ideas are to convey the direction of data flow, and that the MSB comes first – which may easily be interpreted from the current figures. See below.		



IS-GPS-200: Figure 30-1. Message Type 10 – Ephemeris 1 (excerpt)

RFC-395 Backup

RFC Summary of Changes

Thompson, Blair F., et al. *Computing GPS Satellite Velocity and Acceleration from the Broadcast Navigation Message*. Institute of Navigation (ION) Journal NAVIGATION, 2019, *Computing GPS Satellite Velocity and Acceleration from the Broadcast Navigation Message*

- PCNs

- https://www.gps.gov/technical/icwg/meetings/2019/09/

RFC-403: Health Bit Clarification

Lt Benjamin Ratner, SMC/ZAC
Ms. Jennifer Lemus, SE&I
Mr. Anthony Flores, SE&I
Mr. Albert Sicam, SE&I

RFC-403: Health Bit Clarification

Problem Statement:
The CNAV (L2C and L5) & CNAV-2 (L1C) health summary bits for L1, L2, and L5 are not clearly defined and can be interpreted in multiple ways. Documents affected: IS-GPS-200, IS-GPS-705, IS-GPS-800, and ICD-GPS-870 Note: Topic was previously introduced in RFC-374 (2018 Public Document Changes)
Proposed Solution:
Clarify the definition of the health summary bits. In addition, provide guidance for interpreting health indicators that eliminates ambiguity. Requires fix to message types.
Impacted Documents:
IS-GPS-200, IS-GPS-705, IS-GPS-800, ICD-GPS-870

RFC Summary of Changes

1. Specify that the health bit indications for L1, L2, and L5 apply to the codes and data on the carrier

WAS :

The three, one-bit, health indication in bits 52 through 54 of Message Type 10 refers to the L1, L2, and L5 signals of the transmitting SV. The health of each signal is indicated by:

0 = Signal OK,

1 = Signal bad or unavailable.

Redlines :

The three, one-bit, health indication in bits 52 through 54 of Message Type 10 refers to the L1, L2, and L5 ~~signals~~carrier of the transmitting SV. The health of each ~~signal~~carrier is indicated by:

0 = ~~Signal~~All codes and data on this carrier are OK,

1 = ~~Signal~~Some or all codes and data on this carrier are bad or unavailable.

Affected documents:

IS-GPS-200, paragraph 30.3.3.1.1.2 and 30.3.3.4.4

IS-GPS-705, paragraph 20.3.3.1.1.2 and 20.3.3.4.4

IS-GPS-800, paragraph 3.5.4.3.4

RFC Summary of Changes

2. Clarify that the health bit indication will be given relative to the capabilities of the SV as designated by the SV configuration code

WAS :

The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV.

Redlines :

The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, ~~The~~the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

Affected documents:

IS-GPS-200, paragraph 30.3.3.1.1.2 and 30.3.3.4.4

IS-GPS-705, paragraph 20.3.3.1.1.2 and 20.3.3.4.4

IS-GPS-800, paragraph 3.5.4.3.4

RFC Summary of Changes

3. Add a new section to provide guidance to users on how to interpret the various health indicators in SIS documents

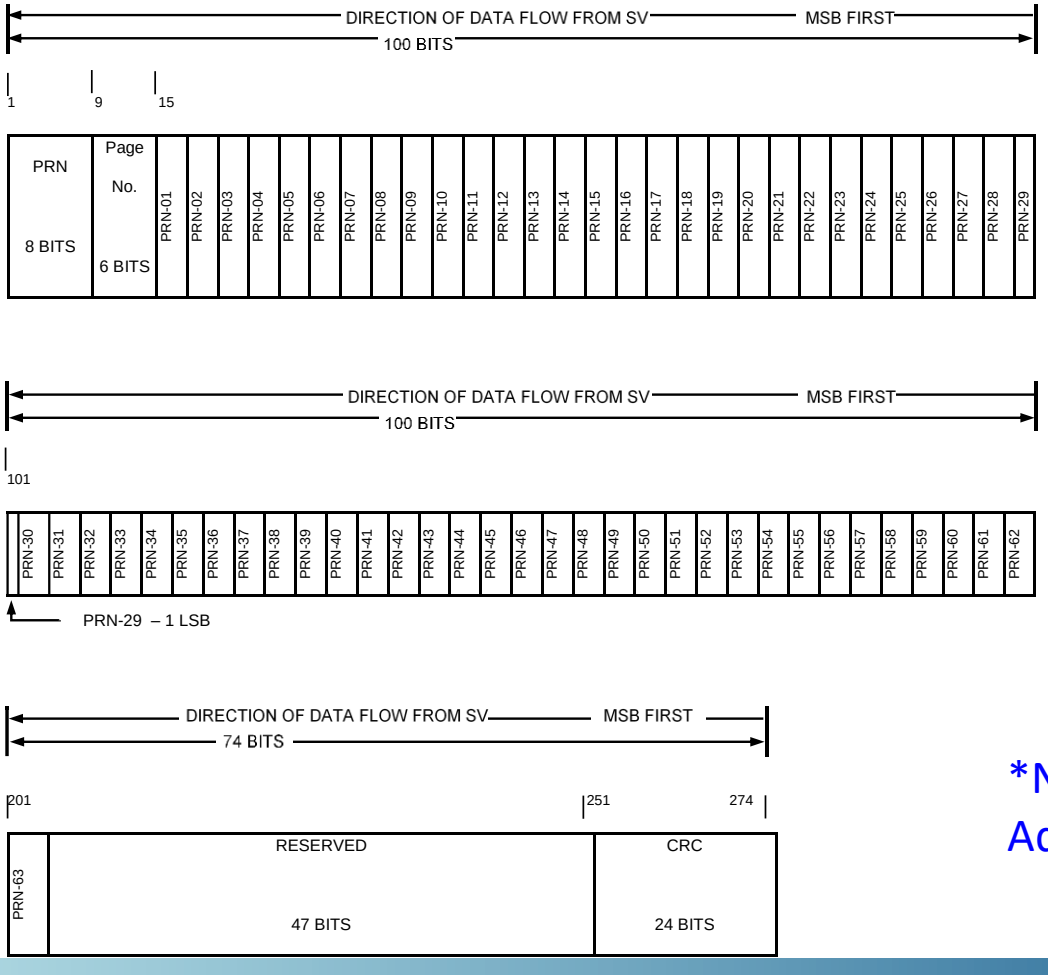
6.4.6 User Protocol for Signal Availability and Health Information

The GPS enterprise provides users with information in multiple ways which indicates the health of each satellite's broadcast signal components. Occasionally, the indications provided one way will conflict with the indications provided another way. The recommended user protocol for interpreting these indications is given below. The Control Segment will manage the GPS constellation assuming this protocol; users should plan accordingly. Users who vary from this protocol assume the responsibility to assess and mitigate any risk that might arise from that variance. The information is presented in the order of a typical acquisition sequence, but once satellites are successfully being tracked, the user should react to changing indications in any order in which they may be received.

*Full section text can be seen in PCN (links provided in backup)

RFC Summary of Changes

4. Add SV Configuration Code to CNAV-2



*New message type
Added to IS-GPS-800

NOTE: Broadcast sequence of subframe 3 pages is a variable and, as such, users must not expect a fixed pattern of page sequence

Comment Review

RFC-403 Comments Resolution Matrix (CRM) Status

CRM – COMBINED REVIEW STATUS

Disposition/Type	Critical	Substantive	Administrative	Totals	Concurrence
Accept	0	2	1	3	
Accept with Comment	2	22	1	25	
Reject	0	0	0	0	
Defer	0	0	0	0	
Grand Totals:	2	24	2	28	

DOORS ID	IS-GPS-200, IS-GPS-705, IS-GPS-800		
Paragraph	Multiple	**Comment Number**	17, 19
Comment Type	C – Critical	**Disposition**	***Accept with Comments***
Comment Originator(s)	Rhonda Slattery (Aerospace), Karl Kovach (Aerospace)		
Comment	1. Add sentence "These health indication bits only apply to codes and data defined in IS-GPS-200, IS-GPS-705 and IS-GPS-800." Clarify which signals the health applies to. 2. Switch definition of bits to 0 = Some or all codes are OK, 1 = All codes are bad. This is currently the definition in 800-251. There are multiple codes and data on each carrier. It is possible that one of those codes will be set unhealthy, in NSC, have default NAV data or be otherwise unavailable. Users currently use this bit to not look for signals. This causes them to ignore signals they want that are healthy, because a different signal, which they don't care about, is unhealthy. The intent of these bits is that if it is one, users should not look for a signal. If it is zero, they should. An additional sentence could be added like "When the bit is set to zero, and there are multiple signals on a carrier, the user is advised to search for the signal of interest".		
Directorate Response	Update definition of health indication bits to apply only to codes and data described in SIS documents. Switch definition of bits (0,1) so that: 0 = Some or all codes and data on this carrier are OK, 1 = All codes and data on this carrier are bad or unavailable		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
See following	See following	See following

BASELINE TEXT (WAS)	**[IS-GPS-200, paragraph 30.3.3.1.1.2 and 30.3.3.4.4]** The three, one-bit, health indication in bits 52 through 54 of Message Type 10 refers to the L1, L2, and L5 signals of the transmitting SV. The health of each signal is indicated by: 0 = Signal OK, 1 = Signal bad or unavailable.
PCN TEXT (IS)	The three, one-bit, health indication in bits 52 through 54 of Message Type 10 refers to the L1, L2, and L5 carrier of the transmitting SV. The health of each carrier is indicated by: 0 = All codes and data on this carrier are OK, 1 = Some or all codes and data on this carrier are bad or unavailable.
PROPOSED TEXT	The three, one-bit, health indication in bits 52 through 54 of Message Type 10 refers to the L1, L2, and L5 carrier of the transmitting SV. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800. The health of each carrier is indicated by: 0 = ~~A~~Some or all codes and data on this carrier are OK, 1 = ~~Some or a~~All codes and data on this carrier are bad or unavailable.

Changes will also apply to IS-GPS-705, paragraph 20.3.3.1.1.2 and 20.3.3.4.4 and IS-GPS-800, paragraph 3.5.4.3.4

DOORS ID	IS-GPS-200, IS-GPS-705, IS-GPS-800		
Paragraph	Multiple	**Comment Number**	20
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Rhonda Slattery (Aerospace), Karl Kovach (Aerospace)		
Comment	Add sentence, after "…does not require that capability". For SVs that do not have any capability, the Operating Command may choose to indicate the SV is "unhealthy". This will allow us to set L5 unhealthy on SVs with no L5 capability, enabling single-frequency L5 operations and test without needing to track L1 C/A or L1 C. Also accounts for dual frequency L1C L5 users until the config code update is implemented .		
Directorate Response	Add further clarification that the Operating Command, at their discretion, may set the health bit to “unhealthy” for an SV if a certain capability does not exist.		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
See following	See following	See following

BASELINE TEXT (WAS)	**[IS-GPS-200, paragraph 30.3.3.1.1.2 and 30.3.3.4.4]** The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV.
PCN TEXT (IS)	The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.
PROPOSED TEXT	The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as “healthy” if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit “unhealthy” for an SV without a certain capability. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

Changes will also apply to IS-GPS-705, paragraph 20.3.3.1.1.2 and 20.3.3.4.4 and IS-GPS-800, paragraph 3.5.4.3.4

DOORS ID	IS-GPS-200, IS-GPS-705		
Paragraph	N/A	**Comment Number**	21
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Roger Kirpes (Collins Aerospace)		
Comment	For health bits broadcast in CNAV almanac information, RFC-403 is clarifying that "The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4)." (see, for example, IS200-540). As SV configuration codes are not currently broadcast in the CNAV formats, this creates a continued dependency for the L5 and/or L2C user on L1 C/A. Instead, new CNAV messages should be created which transmit SV Configuration Codes for all SVs in the constellation.		
Directorate Response	L1 is the baseline frequency and there will be more single-frequency users on either L1 C/A or L1C than L2 or L5. Since SV Configuration is being added to CNAV-2 (L1C), we will not be adding an additional message for CNAV. For single-frequency users, add sentence to assume all signals are available.		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
N/A	See following	See following

BASELINE TEXT (WAS)	**[IS-GPS-200, paragraph 30.3.3.1.1.2 and 30.3.3.4.4]** The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV.
PCN TEXT (IS)	The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.
PROPOSED TEXT	The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L2C users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

Changes will also apply to IS-GPS-705 (L5), paragraph 20.3.3.1.1.2 and 20.3.3.4.4

BASELINE TEXT (WAS)	**[IS-GPS-800, paragraph 3.5.4.3.4]** … The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV.
PCN TEXT (IS)	… The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4 of IS-GPS-200) or the CNAV-2 message (paragraph 3.5.4.7). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.
PROPOSED TEXT	The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4) or the CNAV-2 message (paragraph 3.5.4.7). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as “healthy” if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit “unhealthy” for an SV without a certain capability. Users who have not received the configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

DOORS ID	ICD-GPS-870		
Paragraph	Table 50-II	**Comment Number**	18
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Rhonda Slattery (Aerospace), Karl Kovach (Aerospace)		
Comment	Replace specific bit definition with sentence like 870-260 (paragraph 50.1). Easier to maintain configuration control in the future.		
Directorate Response	Update text to reference information located in IS-GPS-200.		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
See following	See following	See following

BASELINE TEXT (WAS)

ICD-GPS-870, Table 50-II ESHS Description

Line No.	Parameter Name	Description	Units	Range	Accuracy	Resolutio
R-3	L1C/L2C/L5 Health Status	The health status of the L1C/L2C/L5 signals, defined as follows: 0 = Signal OK 1 = Signal bad or unavailable	None	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)	N/A	3 significar characters

PCN TEXT (IS)

Line No.	Parameter Name	Description	Units	Range	Accuracy	Resolutio
R-3	L1/L2/L5 Health Status	The health status of the L1/L2/L5 carrier, defined as follows: 0 = All codes and data on this carrier are OK, 1 = Some or all codes and data on this carrier are bad or unavailable	None	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)	N/A	3 significar characters

PROPOSED TEXT

Line No.	Parameter Name	Description	Units	Range	Accuracy	Resolutio
R-3	L1/L2/L5 Health Status	The health status of the L1/L2/L5 carrier~~,~~ are defined ~~as follows:~~ in section 30.3.3.1.1.2 of IS-GPS-200.	None	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)	N/A	3 significar characters

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.1.0-1	**Comment Number**	1
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	First criterion of §6.4.6.1 states that "LNAV almanac users should not use signals that appear to be from dummy satellites as defined via a currently broadcast LNAV almanac (see paragraphs 3.2.1)." So far, almanacs were used to identify the available constellation and optimize the acquisition process. This criterion seems to imply that equipment should now monitor the almanacs broadcast by the different SVs tracked, and de-select satellites used in the navigation solution if one of the decoded almanacs says "dummy" for this satellite (despite the fact that the health status broadcast in subframe 1 says HEALTHY). Please clarify the intent of this first criterion: - Option 1: it is meant to help the equipment to select valid satellites in the signal acquisition process (and then the equipment should listen to the Signal Alarm indications to use or not the satellite in the navigation solution) - Option 2: the "dummy' almanac is a new criterion to de-select a SV currently tracked (even if the satellite broadcasts a HEALTHY status in LNAV subframe 1)		
Directorate Response	Option 1 is the intent. The protocols are presented in order of a typical acquisition sequence. Users should then react to changing indications as they arise.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	See following	See following

PCN TEXT (IS)	PROPOSED TEXT
1. Constellation Almanac. LNAV almanac users should not use signals that appear to be from dummy satellites as defined via a currently broadcast LNAV almanac (see paragraphs 3.2.1). CNAV almanac users should not use signals that appear to be from satellites for which a CNAV almanac is not currently being broadcast in Message Types 12, 31, and/or 37 (see paragraph 30.3.3.4).	1. Constellation Almanac. LNAV almanac users should not ~~use~~ attempt to acquire signals that appear to be from dummy satellites as defined via a currently broadcast LNAV almanac (see paragraphs 3.2.1). CNAV almanac users should not ~~use~~ attempt to acquire signals that appear to be from satellites for which a CNAV almanac is not currently being broadcast in Message Types 12, 31, and/or 37 (see paragraph 30.3.3.4).

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.1.0-1	**Comment Number**	2
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	SV Configuration Code was understood as a way to give to the end user information about the signals actually broadcast by the satellite. In brief, it is useful to optimize signal acquisition. The 2nd criterion listed in §6.4.6.1 saying "Signals not identified as existing by the broadcast SV configuration code (see paragraph 20.3.3.5.1.4) for a satellite should be ignored." could be understood as follows: SV Configuration has now be monitored in real time by the equipment, and the satellite should be de-selected when receiving for instance an SV Configuration Code equal to 000, 110 or 111 (as we don't know which signals are allowed for these values). Can you clarify what is the intent of criterion #2: - require the equipment to monitor SV configuration code and de-select signals if tracked in contradiction with what is stated in the configuration code (which would mean that the health bits broadcast in LNAV subframe 1 are not sufficient anymore to indicate the unavailability of the signals) - indicate to the manufacturers that the SV configuration code can be used to optimize acquisition (by identifying which signals are available on the satellite)		
Directorate Response	Option 2 is the intent. The protocols are presented in order of a typical acquisition sequence. Users should then react to changing indications as they arise.		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
N/A	See following	See following

PCN TEXT (IS)	PROPOSED TEXT
2. SV Configuration Code. Signals not identified as existing by the broadcast SV configuration code (see paragraph 20.3.3.5.1.4) for a satellite should be ignored.	2. SV Configuration Code. Users should not attempt to acquire ~~S~~signals not identified as existing by the broadcast SV configuration code (see paragraph 20.3.3.5.1.4) for a satellite ~~should be ignored~~.

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.1.0-1	**Comment Number**	3
Comment Type	S – Substantive	**Disposition**	***Accept***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	Regarding criterion #4 "CEI Data Set. Signals from a satellite that are indicated as bad by the CEI data set in use from that satellite should be ignored. See paragraph 6.2.9 for a description of the CEI data set. See paragraph 20.3.3.5.1.3 or 30.3.3.1.1.2 for a description of the CEI data set health settings.", it seems that reference to paragraph 20.3.3.3.1.4 should replace reference to paragraph 20.3.3.5.1.3, as according to the SPS PS 2008, the satellite is "Unhealthy" when the MSB of the six-bit health indicator is set to 1.		
Directorate Response	Update reference to 20.3.3.3.1.4		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
N/A	See following	See following

PCN TEXT (IS)	PROPOSED TEXT
4. CEI Data Set. Signals from a satellite that are indicated as bad by the CEI data set in use from that satellite should be ignored. See paragraph 6.2.9 for a description of the CEI data set. See paragraph 20.3.3.5.1.3 or 30.3.3.1.1.2 for a description of the CEI data set health settings.	4. CEI Data Set. Signals from a satellite that are indicated as bad by the CEI data set in use from that satellite should be ignored. See paragraph 6.2.9 for a description of the CEI data set. See paragraph 20.3.3.~~5~~3.1.~~3~~4 or 30.3.3.1.1.2 for a description of the CEI data set health settings.

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	4
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	Formulation of condition (b) seems ambiguous: one could understand that the equipment has to monitor the consistency between IODE and IODC and de-select the satellite from the navigation solution as soon as an IODE/IODC discrepancy is detected and confirmed by a subsequent decoding of SF1, 2 and 3 with the same discrepancy (to filter out normal data set cutover). What is currently done in GPS airborne equipment is to condition the use of a CEI data set to the fact that SF1 IODC 8 LSBs match both SF2 and SF3 IODEs. If, for any reason, the equipment decodes SF1, SF2 and SF3 with inconsistent IODC/IODE, the equipment will use the CEI data set decoded before, until expiration of its validity period. In other words, in contradiction with condition (b), the equipment still uses the satellite even if it broadcasts SF1, 2 and 3 with non-matching IODC/IODE. Can you clarify the intent of condition (b): Option #1: make sure that equipment will not use a CEI data set with non consistent IODE/IODC Option #2: make sure that equipment will not use the satellite in the navigation solution upon reception of a non consistent set of LNAV subframes 1, 2 and 3, confirmed by the reception of a second non consistent set.		
Directorate Response	Option 1 is the intent. Condition shows the validity of the CEI data set.		

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	7, 8
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	1. CM-code signal alert condition (b): Same comment as before on the IODC/IODE checks: should we understand that the toe/toc has to be monitored: - option 1: to define a consistent CEI data set - option 2: to exclude the satellite upon reception twice of an inconsistent CEI data set, even if the equipment can still use a non-timed out CEI data set decoded before. Please clarify. 2. CM-code signal alert condition (c): Same comment as before on the IODC/IODE checks: should we understand that the top has to be monitored: - option 1: to define a consistent CEI data set - option 2: to exclude the satellite upon reception twice of an inconsistent CEI data set, even if the equipment can still use a non-timed out (and therefore still valid) CEI data set decoded before. Please clarify.		
Directorate Response	Option 1 is the intent. Condition shows the validity of the CEI data set		

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	11, 12
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	1. Criterion b) impact on receiver needs some explanations. Clarify whether the equipment is supposed to exclude the satellite when there is a confirmed discrepancy between toc and toe, or simply exclude the CEI data set (and possibly use the satellite with a previously decoded CEI data set with matching toc and toe) 2. For criterion c), clarify whether the equipment is supposed to exclude the satellite when there is a confirmed discrepancy between top associated with CEI having consistent toc/toe, or simply exclude the CEI data set (and possibly use one previously decoded meeting all the validity criteria).		
Directorate Response	Condition shows the validity of the CEI data set		

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	5, 9, 13
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	1. C/A-code or P(Y)-code signal alarm condition (c) seems to be redundant with alarm condition (e), as replacing all the bits in SF 1, 2 or 3 by ones or by zeros necessarily means that the 8-bit preamble will be different from 10001011. Please consider removing condition (c), unless some bits of SF1, SF2 or SF2 are left to their expected values (preamble for instance). If it's the case, this should be clarified. 2. CM-code signal alert condition (d) seems redundant with condition (e), as replacing all the bits by 0 or 1 means that the preamble will not equal 10001011. Please consider removing condition (d) or clarify which bits are actually replaced by 0s or 1s. 3. I5-Code signal alert condition (d) seems redundant with condition (e), as replacing all the bits by 0 or 1 means that the preamble will not equal 10001011. Please consider removing condition (d) or clarify which bits are actually replaced by 0s or 1s (if it's not the entirety of the message)		
Directorate Response	Only bits 39-276 are replaced with 0s and 1s. Bits 1-38 of the message can still be used to identify the message type and the message will contain a proper CRC parity block.		

DOORS ID	IS-GPS-200, IS-GPS-705		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	6, 10
Comment Type	A – Administrative, S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	1. CM-code signal alert condition (b): Can you clarify what "being current" means in "The broadcast time of ephemeris (toe) is not current“ 2. Criterion "The broadcast toe is not current" seems ambiguous. Please clarify what "current" means here.		
Directorate Response	Current means within the current curve-fit as defined in paragraph 30.3.4.4.		

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	14
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	It seems that there is no fixed positions in the navigation message for MT 10, 11 and 30s. As such, it does not seem possible to identify whether a message type 10, 11 or 30s has been replaced by 0s or 1s. Please clarify how condition (d) can be detected by an equipment.		
Directorate Response	Add wording to clarify that the health of a signal is marginal when a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1 (IS200) or 20.3.4.1 (IS705).		

DOORS ID	IS-GPS-200		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	15
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	Criteria for "marginal" include URAed or URAned0 index greater than 8. However, IS-GPS-705 also mentions that URAed or URAned0 index equal to -16 means "Use at own risk". Shouldn't URAed or URAned0 equal to -16 be part of the criteria to not use a satellite?		
Directorate Response	Yes, URA_{ED} or URA_{NED0} = -16 should be included as a “marginal” condition. Updating condition to include URA_{ED} or URA_{NED0} = -16		

DOORS ID	IS-GPS-705		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	16
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	Denis Bouvet (Thales)		
Comment	Criterion for I5 marginal #1 mentions default message replacing MT10, MT11 and M30s. However, it seems that one cannot predict the position of any MT10, 11 or 30s in the CNAV navigation message. Please clarify how the receiver can detect that a default message replaced any MT10, MT11 or MT30s. If not possible, it is suggested to simplify the criterion by conditioning the "marginal" status to the reception of any default message (regardless the message type it replaces).		
Directorate Response	Add wording to clarify that the health of a signal is marginal when a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1 (IS-GPS-200) or 20.3.4.1 (IS-GPS-705).		

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-200, paragraph 6.4.6.3] … 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., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available). See paragraph 30.3.3.	**[IS-GPS-200, paragraph 6.4.6.3]** … 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., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1). See paragraph 30.3.3.

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-705, paragraph 6.4.5.2] … 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. Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available). See paragraph 20.3.3.	**[IS-GPS-705, paragraph 6.4.5.2]** … 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. Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 20.3.4.1). See paragraph 20.3.3.

DOORS ID	IS-GPS-705, IS-GPS-800		
Paragraph	6.4.6.2.2.0-1	**Comment Number**	22, 23, 26, 28
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	1. Roger Kirpes (Collins Aerospace), 2., 3. John Dobyne (GPC)		
Comment	1. These objects should only discuss operational protocols to assist users in interpreting health information for signals/data which are defined in this ICD. 2. Include the L5 guidance material in IS200 and reference it in IS-GPS-705 3. The criteria for CNAV2 are incomplete. Additional work and discussion is required. Recommend postponing addition of the health criteria to a future RFC.		
Directorate Response	Add reference back to IS-GPS-200 and remove sections that do not apply to IS-GPS-705 or IS-GPS-800		

BASELINE TEXT (WAS)	PCN TEXT (IS)	PROPOSED TEXT
N/A	See following	See following

DOORS ID	IS-GPS-705		
Paragraph	6.4.5.1.0-1	**Comment Number**	24, 25
Comment Type	S – Substantive	**Disposition**	***Accept with Comments***
Comment Originator(s)	John Dobyne (GPC)		
Comment	1 . Constellation Almanac: L5 CNAV almanac reference should be 20.3.3.4 of IS-GPS-705. 2. Configuration Code: I think we should add a reference to IS-800 paragraph 3.4.5.6. We are adding the config code to CNAV2 as part of this RFC. L1C/L5 will be a useful dual-frequency combination in the future. 3. CEI Data Set: L5 CNAV Health bit reference should be 20.3.3.1.1.2 of IS-GPS-705. Note in IS705-1599: L5 CNAV almanac reference should be 20.3.3.4 of IS-GPS-705. Need to add the reference for L5 non-standard codes in IS-705: paragraph 3.2.1.2		
Directorate Response	Removing redundant sections from IS-GPS-705, keeping only L5 specific conditions (see previous comment). Removing information from IS-GPS-800 and replacing with reserved for future RFC update as needed.		

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-705, paragraph 6.4.5] 6.4.5 User Protocol for Signal Availability and Health Information The GPS enterprise provides users with information in multiple ways which indicates the health of each satellite's broadcast signal components. Occasionally, the indications provided one way will conflict with the indications provided another way. The recommended user protocol for interpreting these indications is given below. The Control Segment will manage the GPS constellation assuming this protocol; users should plan accordingly. Users who vary from this protocol assume the responsibility to assess and mitigate any risk that might arise from that variance. The information is presented in the order of a typical acquisition sequence, but once satellites are successfully being tracked, the user should react to changing indications in any order in which they may be received.	**[IS-GPS-705, paragraph 6.4.5]** 6.4.5 User Protocol for Signal Availability and Health Information ~~The GPS enterprise provides users with information in multiple ways which indicates the health of each satellite's broadcast signal components. Occasionally, the indications provided one way will conflict with the indications provided another way. The recommended user protocol for interpreting these indications is given below. The Control Segment will manage the GPS constellation assuming this protocol; users should plan accordingly. Users who vary from this protocol assume the responsibility to assess and mitigate any risk that might arise from that variance. The information is presented in the order of a typical acquisition sequence, but once satellites are successfully being tracked, the user should react to changing indications in any order in which they may be received.~~ See paragraph 6.4.6 of IS-GPS-200.

PROPOSED TEXT

[IS-GPS-705, paragraph 6.4.5.1]

~~1. Constellation Almanac. LNAV almanac users should not use signals that appear to be from dummy satellites as defined via a currently broadcast LNAV almanac (see paragraphs 3.2.1 of IS-GPS-200). CNAV almanac users should not use signals that appear to be from satellites for which a CNAV almanac is not currently being broadcast in Message Types 12, 31, and/or 37 (see paragraph 30.3.3.4 of IS-GPS-200).~~

~~2. SV Configuration Code. Signals not identified as existing by the broadcast SV configuration code (see paragraph 20.3.3.5.1.4 of IS-GPS-200) for a satellite should be ignored.~~

~~3. Signal Alarm Indication. Signals from a satellite that are subject to a signal alarm indication (see paragraph 6.4.5.2) should be ignored.~~

~~4. CEI Data Set. Signals from a satellite that are indicated as bad by the CEI data set in use from that satellite should be ignored. See paragraph 6.2.9 of IS-GPS-200 for a description of the CEI data set. See paragraph 30.3.3.1.1.2 of IS-GPS-200 for a description of the CEI data set health settings.~~

~~5. Marginal Indication. Signals from a satellite that are indicated as marginal (see paragraph 6.4.5.3) by that satellite may be ignored.~~

~~6. Other. Signals from a satellite whose suitability for use are suspect for other valid reasons (e.g., Receiver Autonomous Integrity Monitoring [RAIM]) may be ignored.~~

~~Note: Priority of SPS SIS Health Information. Satellite health indications in LNAV subframes 4 and 5 (see paragraphs 30.3.3.5.1.3 and 40.3.3.5.1.3 of IS-GPS-200) and CNAV health indications in Message Types 12, 31, and/or 37 (see paragraph 30.3.3.4 of IS-GPS-200) may not be the most recent indications of the health of a satellite. They indicate the health of the satellites in the constellation when the almanac was generated for upload to the satellite from which the almanac was obtained. The current availability and health of a satellite signal should be determined based on the criteria described in items 1-6 above.~~

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-705, paragraph 6.4.5.2] An otherwise healthy signal-in-space (SIS) signal or marginal SIS signal becomes unhealthy when it is the subject of a SIS alarm indication. The presence of any of the following alarm indications listed below means the information provided by the signal may not be correct.	**[IS-GPS-705, paragraph 6.4.5.2]** ~~An otherwise healthy signal-in-space (SIS) signal or marginal SIS signal becomes unhealthy when it is the subject of a SIS alarm indication. The presence of any of the following alarm indications listed below means the information provided by the signal may not be correct.~~

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-705, paragraph 6.4.5.2.1] 6.4.5.2.1. Common Alarm Indications The following alarm indications are common to all code signals. The code signal becomes untrackable (e.g., ≥ 20 dB decrease in transmitted signal power, ≥ 20 dB increase in correlation loss): (a) The code signal ceases transmission. (b) The elimination of the standard code (e.g., gibberish code). (c) The substitution of non-standard code for the standard code (see paragraph 3.2.1.6 of IS-GPS-200)	**[IS-GPS-705, paragraph 6.4.5.2.1]** ~~6.4.5.2.1. Common Alarm Indications~~ ~~The following alarm indications are common to all code signals.~~ ~~The code signal becomes untrackable (e.g., ≥ 20 dB decrease in transmitted signal power, ≥ 20 dB increase in correlation loss):~~ ~~(a) The code signal ceases transmission.~~ ~~(b) The elimination of the standard code (e.g., gibberish code).~~ ~~(c) The substitution of non-standard code for the standard code (see paragraph 3.2.1.6 of IS-GPS-200)~~

PCN TEXT (IS)

[IS-GPS-705, paragraph 6.4.5.2.2]

6.4.5.2.1. Specific Alarm Indications

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 of IS-GPS-200).

(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 of IS-GPS-200).

(c) The transmitted bits 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 of IS-GPS-200).

(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 20.3.3 of IS-GPS-200).

CM-Code Signal

(a) The failure of the cyclic redundancy check (CRC) on 5 successive CNAV messages (60 seconds) (see paragraph 30.3.5 of IS-GPS-200).

(b) The broadcast time of ephemeris (t_{oe}) is not current or does not match the broadcast time of clock (t_{oc}) (excluding normal data set cutovers, see paragraphs 30.3.3.1.1 and 30.3.4.4 of IS-GPS-200).

(c) The broadcast t_{op} is not consistent across the Message Types 10, 11 and Type 30's messages which comprise the current CEI data set (excluding normal data set cutovers, see paragraph 30.3.4.4 of IS-GPS-200).

(d) The transmitted bits in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.

(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 30.3.3 of IS-GPS-200).

I5-Code Signal

(a) The failure of the CRC on 5 successive CNAV messages (30 seconds) (see paragraph 20.3.5).

(b) The broadcast t_{oe} is not current or does not match the broadcast t_{oc} (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 CEI data set (excluding normal data set cutovers, see paragraph 20.3.4.4).

(d) The transmitted bits in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.

(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 20.3.3).

Notes:

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.

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.

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.

PROPOSED TEXT

[IS-GPS-705, paragraph 6.4.5.2.2]

6.4.5.2.1. Specific Alarm Indications for L5

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 of IS-GPS-200).~~

~~(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 of IS-GPS-200).~~

~~(c) The transmitted bits 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 of IS-GPS-200).~~

~~(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 20.3.3 of IS-GPS-200).~~

~~CM-Code Signal~~

~~(a) The failure of the cyclic redundancy check (CRC) on 5 successive CNAV messages (60 seconds) (see paragraph 30.3.5 of IS-GPS-200).~~

~~(b) The broadcast time of ephemeris (t_{oe}) is not current or does not match the broadcast time of clock (t_{oc}) (excluding normal data set cutovers, see paragraphs 30.3.3.1.1 and 30.3.4.4 of IS-GPS-200).~~

~~(c) The broadcast t_{op} is not consistent across the Message Types 10, 11 and Type 30's messages which comprise the current CEI data set (excluding normal data set cutovers, see paragraph 30.3.4.4 of IS-GPS-200).~~

~~(d) The transmitted bits in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.~~

~~(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 30.3.3 of IS-GPS-200).~~

I5-Code Signal

(a) The failure of the CRC on 5 successive CNAV messages (30 seconds) (see paragraph 20.3.5).

(b) The broadcast t_{oe} is not current or does not match the broadcast t_{oc} (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 CEI data set (excluding normal data set cutovers, see paragraph 20.3.4.4).

(d) The transmitted bits in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.

(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 20.3.3).

Notes:

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.

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 and~~ CNAV message data either by design or by circumstance (e.g., radio-frequency interference [RFI] can prevent reading ~~LNAV and~~ 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.

The SIS alarm indications related to the ~~LNAV and~~ 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.

[IS-GPS-705, paragraph 6.4.5.2.2]

6.4.5.2.1. Specific Alarm Indications for L5

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 t_{oe} is not current or does not match the broadcast t_{oc} (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 CEI data set (excluding normal data set cutovers, see paragraph 20.3.4.4).

(d) The transmitted bits in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.

(e) The 8-bit preamble does not equal 10001011_2, decimal 139, or hexadecimal 8B (see paragraph 20.3.3).

Notes:

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.

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.

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.

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.

PCN TEXT (IS)

[IS-GPS-705, paragraph 6.4.5.3]

6.5.4.3 “Marginal” Indications

The C/A-code signal is marginal when the C/A-code signal would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

The C/A-code signal indicates that any one of the satellite’s SIS components may not be fully capable. More specifically, the Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 (“all LNAV data are OK”) and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (“SV is temporarily out”). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200.

The URA alert flag is raised (i.e., bit 18 of the LNAV HOW is set to 1) and the URA does not apply. This means the URA may be worse than the URA index value transmitted in subframe 1. See paragraph 20.3.3.2 of IS-GPS-200.

The transmitted URA index in subframe 1 is greater than or equal to 8 ("N"=8). A URA index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraph 20.3.3.3.1.3 of IS-GPS-200.

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:

Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30’s on the CM-code signal (e.g., a current and consistent CEI data set is not available). See paragraph 30.3.3 of IS-GPS-200.

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 10 and Message Type 30’s. See paragraph 30.3.3 of IS-GPS-200.

Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30’s transmitted in the CM-code signal are greater than or equal to 8 ("N"=8). A URA_{ED} index or URA_{NED0} index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4 of IS-GPS-200.

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:

The Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (SV is temporarily out). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200.

The URA alert flag transmitted as bit 18 of the HOW is set to 1 and the URA does not apply as defined in ICD-GPS-224 and ICD-GPS-225.

The transmitted URA index "N"=15.

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:

Default CNAV data (i.e., Message Type 0) is being transmitted on the I5-code signal in lieu of Message Types 10, 11 and/or Type 30’s (e.g., a current and consistent CEI data set is not available). See paragraph 20.3.3.

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.

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 greater than or equal to 8 ("N"=8). A URA_{ED} index or URA_{NED0} index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraphs 20.3.3.1.1.4 and 20.3.3.2.4.

PROPOSED TEXT

[IS-GPS-705, paragraph 6.4.5.3]

6.5.4.3 “Marginal” Indications

~~The C/A-code signal is marginal when the C/A-code signal would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:~~

~~The C/A-code signal indicates that any one of the satellite’s SIS components may not be fully capable. More specifically, the Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 (“all LNAV data are OK”) and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (“SV is temporarily out”). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200.~~

~~The URA alert flag is raised (i.e., bit 18 of the LNAV HOW is set to 1) and the URA does not apply. This means the URA may be worse than the URA index value transmitted in subframe 1. See paragraph 20.3.3.2 of IS-GPS-200.~~

~~The transmitted URA index in subframe 1 is greater than or equal to 8 ("N"=8). A URA index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraph 20.3.3.3.1.3 of IS-GPS-200.~~

~~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:~~

~~Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30’s on the CM-code signal (e.g., a current and consistent CEI data set is not available). See paragraph 30.3.3 of IS-GPS-200.~~

~~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 10 and Message Type 30’s. See paragraph 30.3.3 of IS-GPS-200.~~

~~Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30’s transmitted in the CM-code signal are greater than or equal to 8 ("N"=8). A URA_{ED} index or URA_{NED0} index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4 of IS-GPS-200.~~

~~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:~~

~~The Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (SV is temporarily out). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200.~~

~~The URA alert flag transmitted as bit 18 of the HOW is set to 1 and the URA does not apply as defined in ICD-GPS-224 and ICD-GPS-225.~~

~~The transmitted URA index "N"=15.~~

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:

Default CNAV data (i.e., Message Type 0) is being transmitted on the I5-code signal in lieu of Message Types 10, 11 and/or Type 30’s (e.g., a current and consistent CEI data set is not available). See paragraph 20.3.3.

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.

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 greater than or equal to 8 ("N"=8). A URA_{ED} index or URA_{NED0} index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraphs 20.3.3.1.1.4 and 20.3.3.2.4.

[IS-GPS-705, paragraph 6.4.5.3]

6.5.4.3 “Marginal” Indications

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:

Default CNAV data (i.e., Message Type 0) is being transmitted on the I5-code signal in lieu of Message Types 10, 11 and/or Type 30’s (e.g., a current and consistent CEI data set is not available). See paragraph 20.3.3.

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.

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 greater than or equal to 8 ("N"=8). A URA_{ED} index or URA_{NED0} index of 8 or greater indicates that the URA is greater than 48 meters. An index of 15 indicates that the URA is greater than 6144 meters or that there is no URA prediction available. See paragraphs 20.3.3.1.1.4 and 20.3.3.2.4.

PCN TEXT (IS)	PROPOSED TEXT
[IS-GPS-800, paragraph 6.4.5] 6.4.5 User Protocol for Signal Availability and Health Information The GPS enterprise provides users with information in multiple ways which indicates the health of each satellite's broadcast signal components. Occasionally, the indications provided one way will conflict with the indications provided another way. The recommended user protocol for interpreting these indications is given below. The Control Segment will manage the GPS constellation assuming this protocol; users should plan accordingly. Users who vary from this protocol assume the responsibility to assess and mitigate any risk that might arise from that variance. The information is presented in the order of a typical acquisition sequence, but once satellites are successfully being tracked, the user should react to changing indications in any order in which they may be received.	**[IS-GPS-800, paragraph 6.4.5]** 6.4.5 User Protocol for Signal Availability and Health Information ~~The GPS enterprise provides users with information in multiple ways which indicates the health of each satellite's broadcast signal components. Occasionally, the indications provided one way will conflict with the indications provided another way. The recommended user protocol for interpreting these indications is given below. The Control Segment will manage the GPS constellation assuming this protocol; users should plan accordingly. Users who vary from this protocol assume the responsibility to assess and mitigate any risk that might arise from that variance. The information is presented in the order of a typical acquisition sequence, but once satellites are successfully being tracked, the user should react to changing indications in any order in which they may be received.~~ See paragraph 6.4.6 of IS-GPS-200.

[IS-GPS-800, paragraph 6.4.5]

6.4.5 User Protocol for Signal Availability and Health Information

See paragraph 6.4.6 of IS-GPS-200.

*Paragraphs 6.4.5.1 through 6.4.5.3 will be replaced with “Reserved”

RFC-403 Backup

- PCNs

- https://www.gps.gov/technical/icwg/meetings/2019/09/

Open RFC Discussion

- Questions/comments?

Action Item Review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ADJOURN

Space & Missile Systems Center

Global Positioning Systems (GPS)

Public Forum

United States Air Force

Position, Navigation, and Timing Mission Area

25 September 2019, 0830 – 1630 PST

Dial-in: 310-653-2663, Meeting ID: 20190925, Password: 123456

DCS Website: https://conference.apps.mil/webconf/gpspublicmeeting

Agenda

Public ICWG (1st Half of Day)	Presenter
Opening Remarks	Col Claxton
GPS Tech Baseline Public ICWG Process Overview	Lt Ratner
2019 Public ICWG RFC Discussion	
• RFC-395 (2019 Public Document Changes)	Anthony Flores (SE&I)
• RFC-403 (Health Bit Clarification)	Jennifer Lemus (SE&I)
• Open RFC Discussion Session	
Action Item Review	

Public Forum (2nd Half of Day)	Presenter
Roll Call, Rules of Engagement	
Special Topic Presentations	
• Time Since GPS Epoch	Brent Renfro, Karl Kovach
• ARAIM	Dr. Andrew Hansen, Karl Kovach
• Concern on UTC Leap Second Schedule Announcements	Karl Kovach
• 2020 Public ICWG Look Ahead (ICD240)	Jennifer Lemus (SE&I)
Walk-on Topics, Open Discussion	
Action Item Review	


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Roll Call

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 Changes Notices (PCNs) will be generated and distributed as a product of this meeting
- For in-person attendees, please raise your hand before speaking and someone will bring you a microphone
- Please announce your name and organization before addressing the group

Meeting Purpose

- The purpose of the meeting is to:

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

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

Space & Missile Systems Center

Time Since GPS Epoch

Brent Renfro (University of Texas)
Karl Kovach (Aerospace)

Space & Missile Systems Center

ARAIM ISMs Update

Dr. Andrew Hansen (FAA/DOT)

Karl Kovach (Aerospace)

Space & Missile Systems Center

Concern on UTC Leap Second Schedule Announcements

Karl Kovach (Aerospace)

Space & Missile Systems Center

ICD-GPS-240 Updates: 2020 Public ICWG Look Ahead

Jennifer Lemus (SE&I)

ICD-GPS-240 Updates

- For AEP, update current reference system from IERS Technical Note 21 to IERS Technical Note 36 (currently used by OCX)
  - Enables a smoother forward and backward data migration process
  - Helps users get ready to transition from AEP to OCX

IERS= International Earth Rotation & Reference Systems Service

ICD-GPS-240 Updates

- **Section 2.1 Government Documents**
  - Adding references to IERS Convention 1996 and IERS Technical Note 36

Other Publications

IS-GPS-200 Current Version	Navstar GPS Space Segment/Navigation User Interface
GP-03-001 Current Version	GPS Interface Control Working Group (ICWG) Charter
MOA Current Version	Interagency Memorandum of Agreement with Respect to Support of Users of the Navstar Global Positioning System (GPS)
IERS July 1996	International Earth Rotation and Reference Systems Service (IERS) Convention 1996, Chapter 5 and Chapter 8
IERS Technical Note 36 Current Issue	International Earth Rotation and Reference Systems Service (IERS) Technical Note 36, IERS Conventions (2010), Chapter 8 (Tidal Variations in the Earth's Rotation)

WALK-ON

Open Forum Discussion

- Questions/comments?

ACTION ITEM REVIEW

Closing Remarks

- Next steps
  - Courtesy Review for RFC-403 changes
  - ERB – Mid-October
  - CCB – FY2020 2nd Quarter
- Public ICWG Minutes will be posted on GPS.gov
- Public inputs may be provided for next year's revision to: smcgper@us.af.mil
- TBCMP Plan approved and will be provided on GPS.gov

Thank You

for attending the 2019 Public ICWG!