



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFSPC)
LOS ANGELES AIR FORCE BASE, CALIFORNIA

Global Positioning Systems (GPS) Directorate
2016 Public Interface Control Working Group (ICWG)
Meeting Minutes

Date: 21 Sept 2016
Meeting Time: 0830 – 1630 HRS (Pacific Time)
Location: PCT Facility (100 N. Sepulveda Blvd El Segundo, CA 90245), Bldg 100
Dial In: 1-310-653-2663; Meeting ID: 6272252 Passcode: 000001
DCS: <https://conference.apps.mil/webconf/gpspublicmeeting>

Meeting started: 0830 HRS (Pacific Time)
Meeting ended: 1600 HRS (Pacific Time)

Agenda:

Opening Remarks

Roll Call

Agenda Overview

Meeting Logistics/Rules of Engagement

Meeting Purpose

Interface Control Working Group (ICWG) Introduction

Request for Change (RFC)-308 Update Interface Control Document (ICD)-GPS-870 & ICD-GPS-240

RFC-312 Definition Clarification for Time of Predict

RFC-318 2016 Public Document Clean-Up

Review of 2015 Comment Resolution Matrix

Action Item Review

Adjourn

RFC Breakout Sessions

Meeting Purpose

The purpose of the public interface control working group (ICWG) is to provide an update on GPS public document revisions and collect issues/comments for analysis and possible integration into future GPS public document revisions. The proposed interface revision notices (PIRNs) for each public document discussed during the public ICWG are available for viewing on GPS.gov.

Interface Control Working Group (ICWG) Introduction

The Government conducted an overview to familiarize the group with the ICWG ground rules, presentation template, and status of comments submitted against the ICWG process during the RFC review period. Numerous comments were submitted to the Government concerning the readability of the PIRNs that were distributed for review. The public ICWG planning committee is working to update the PIRN template to make the proposed changes easier to identify and understand.

To facilitate an effective ICWG discussion, the template for the RFC presentation slides was updated to illustrate the proposed changes against the baseline document more clearly. Each RFC presentation reviewed the critical, substantial, and administrative but rejected comments. The comment totals are summarized on the comment resolution matrix (CRM) status chart for each RFC. Every comment chart contains three sections to illustrate the evolution of the document text as changes were proposed by reviewers. In each presentation, the baseline text section shows the current approved version of the text. This is the text that can be found in the technical documents available on GPS.gov. The PIRN text section reflects the changes to the text originally released for public review. Finally, the proposed text section illustrates the final version of the text if the commenter's suggestion were to be incorporated. The disposition section at the top of each comment chart states the Government's decision to accept, reject, or defer the reviewer's suggestion. The Government is accepting feedback from the public on the new presentation template as well as the ICWG process. Contact the team at smcgper@us.af.mil with comments and suggestions.

RFC-308 Update Interface Control Document (ICD)-GPS-870 and ICD-GPS-240

The Government reviewed the proposed changes to ICD-GPS-870 and ICD-GPS-240 to incorporate various administrative changes to the document as well as codify the public release of the satellite outage file (SOF) from the current and future control system. In addition to administrative corrections, the changes implemented in this RFC include an update to the Notice Advisory to Navstar Users (NANU) notification times to remove the objective requirement time of 15 minutes after the start of a satellite outage, inclusion of the SOF description and file format which will be accessible on the United States Coast Guard (USCG) NAVCEN website, and adding a definition of the term "outage" in section 10.1. The objective requirement to release a NANU with a latency no more than 15 minutes does not delineate between the time it takes for the system to produce the NANU and a human operator's timeline to provide the product for public access. System designers want users to be aware of this two-party process. The group also discussed the possibility of archiving old SOF formats when a new format becomes available for at least 6 months versus the 4-months that is currently proposed. USCG NAVCEN confirmed that this is not a limitation and that the archived file formats are typically available for much longer than the prescribed timeframe. The SOF formats are sourced from the GPS Operations Center (GPSOC) Interface Design Document (IDD) and included in ICD-GPS-240 as an appendix.

RFC-312 Definition Clarification for Time of Predict

The Government reviewed the changes proposed by RFC-312, which aims to clarify the intent and proper use of the time of predict (t_{op}) and other timing parameters in navigation uploads. RFC-312 updates IS-GPS-200, IS-GPS-705, and IS-GPS-800. This update plays a critical role in the integration of the next generation of GPS space and control systems and constitutes a significant shift in the way developers and users understand and employ GPS timing parameters.

The genesis of this RFC aimed to establish a clear distinction between the time of predict in the navigation message (t_{op}) and the time of predict in the Navigation Message Correction Table (NMCT) (t_{op-D}). The ultimate goal is to ensure users have the ability to identify and process correlated sets of data from the navigation message, even in the event of an upload cutover or user equipment hot start. RFC-312 introduces a new descriptive label for parameters related to SV-specific user range error (URE), clock correction polynomial, ephemeris, and time tag that are characterized by t_{op} : Clock/Ephemeris/Integrity (CEI) data set. The group requested a table that explicitly lists the parameters that comprise the CEI data set, so the Government produced a draft of the table following the ICWG breakout session.

Several post-ICWG iterations have been made to RFC-312's proposed changes to reach a solution that imposes minimal impact on the user community. Each iteration of the update will continue to be published on GPS.gov for the public's review and comment until a final consensus is reached. The Government will present an out-brief detailing the final results of this extensive effort during the 2017 Public ICWG.

RFC-318 2016 Public Document Clean-Up

The Government reviewed the changes proposed in RFC-318, which injects numerous editorial and administrative corrections into IS-GPS-200, IS-GPS-705, and IS-GPS-800. The updates cover a broad range of topics and are meant to address the array of comments submitted by the public in an efficient manner. The Government presented RFC-288 (Data Message Validation Parameters and Clarifications) during the 2015 Public ICWG. Through the updates provided in RFC 288 and RFC 318, which adds a definition for the term "valid range", users now have the information required to distinguish a valid parameter from a parameter whose value is outside the Government-defined valid range. While discussing this addition to the public documents the group discussed the measures in place to minimize the likelihood of an invalid parameter being broadcast and the Government reiterated that GPS users assume the associated risks when they use GPS data that lies outside the identified valid range. Other changes implemented in this RFC include a correction to the text description of P-code generation, correction to universal coordinated time (UTC) parameters, update of X1B, X2A, and X2B clock control boxes in figure 3.3.2.2, and overall updates to improve clarity throughout the documents. Post-ICWG concerns were raised about the edits to the reduced almanac sections in IS-GPS-200, IS-GPS-705, and IS-GPS-800. This resulted in an update to the text and a delta PIRN review with the public in December 2016. The updated PIRN corrected the ICWG-agreed text so that the filler bits (i.e., alternating ones and zeros) following the PRN_a bits in message type 12 and Civil Navigation (CNAV) subframe 3, page 3 extend to the end of the packet instead of the end of the message.

Details of the specific changes discussed above can be viewed in the 2016 Public ICWG Presentations archived on GPS.gov for public reference at <http://www.gps.gov/technical/icwg/meetings/2016/>.

Open Action Item Review:

The GPS Directorate is dedicated to sustaining a Public ICWG founded on transparency and accountability. As a testament to this commitment, the Government reviews the status of existing action items stemmed from previous public ICWGs in an effort to ensure stakeholders are informed about ICWG action items and the measures in place to address them. The group reviewed public ICWG action items 2014, 2015, and 2016. A summary of the action items is provided below.

AI No.	Action Item Description	Status
14-17	Add definition of the term “outage” to ICD-GPS-240.	Completed in RFC-308
14-18	Provide satellite outage file (SOF) to users.	Completed in RFC-308
14-19	Clarify when NANU Forecast Cancellation (FCSTCANC) may be used.	In progress; Requirement will be added to 2017 update
14-20	Correct errors in first 12 chips (Octal) in IS-GPS-200.	Completed in RFC-269
14-24	Delete references to D(t) for L2 signal for IIR-M.	Completed in RFC-318
14-25	Update ICWG on CNAV status.	Completed at 2015 Public Forum
14-45	Update ICWG on status of PRN expansion.	Open; Planned for 2017 public forum
14-27	Discuss the utility of a receiver independent exchange format (RINEX) interface from the Control Segment.	Completed at 2016 Public Forum
14-30	Correct number of allocated bits for PRN number.	Completed in RFC-318
14-32	Add “pre-operational use” paragraph after paragraph 6.3.4.	Completed in RFC-318
14-33	Add value for effective range of eccentricity.	Completed in RFC-318
14-34	Modify P-code description and figure in IS-GPS-200.	Completed in RFC-318
14-35	Correct X1B, X2A, and X2B clock control function descriptions.	Action item withdrawn by submitter
14-37	Clarify Table 3-VII in IS-GPS-200.	Action item withdrawn by submitter
15-01	Remove Universal Coordinated Time offset error (UTC OE) accuracy performance number from all ICDs.	Deferred
15-02	Recalculate valid range values for omega dot with respect to the valid values for inclination.	Completed in RFC-288
15-03	Include valid ranges of parameters in IS-GPS-705 and IS-GPS-800.	Completed in RFC-288 and RFC-318
15-05	Add a “disposition” column to the public ICWG comment resolution matrix.	Complete in 2016 Public ICWG
15-07	Address data message validation parameters and clarification for the standard positioning service (SPS).	Completed in SPS update
15-08	Correct references to time of ephemeris (t_{oe}) and time of clock (t_{oc}).	Completed in RFC-312
15-09	Improve GPS Directorate tracking and implementation of comments and action items produced during the public ICWG.	Completed in 2016 Public ICWG

AI No.	Action Item Description	Status
15-11	Add an “Integrity Failure” NANU to ICD-GPS-240 and ICD-GPS-870.	In progress; Requirement will be added to 2017 update
15-12	Produce redline version of the PIRNs to facilitate more efficient document review.	Completed in 2016 Public ICWG
15-14	Add predicted ephemeris/state vector data (PRED) files to public ICDs.	Closed; PRED files are not publicly releasable
15-15	Add RINEX files to public ICDs.	In progress; Requirement will be added to 2017 update
15-38	Update UTCOE value in IS-GPS-200.	Completed in RFC-266
15-39	Determine feasibility of providing advance notice of leap second based on historical practice.	Completed in 2016 Public ICWG
15-40	Clarify that the data structure corresponding to currently defined Data ID values will continue to be fully functional.	In progress
15-41	Update ionospheric data update rate to enable users to determine the validity of the ionospheric data.	In progress
15-46	Include IIR-M and IIF L2C carrier phase noise plots in IS-GPS-200.	In progress
15-42	Clarify that extended operations is not applicable to L5.	In progress
15-43	Clarify descriptions concerning group delay parameters, L5 URA _{NED0} , and L5 IURA _{NED} .	In progress
16-47	Correct errors in IS-GPS-200H IRN003.	Completed in RFC-318
16-48	Correct valid range value for omega dot parameter to reflect a minimum value of -1.19E-07 (0xFFFF).	Completed in RFC-318

2016 Action Item Review:

The following items were submitted as actions during the 2016 Public ICWG.

2016 PUBLIC ICWG ACTION ITEMS				
AI No.	RFC	Description	Originator	GPS Directorate Point Of Contact
16-01	N/A	Coordinate with appropriate stakeholders to clarify message type 38 (MT-38) to support intended use in aviation applications.	FAA	2Lt Vazquez-Calderon, GPS Requirements, 310-653-4191
16-02	N/A	Open concern item in GPS issues database to correct the format, inaccuracies, and data limitations in operational advisory messages.	ARL:UT	Capt Anderson, GPS Requirements, 310-653-3064
16-03	318	Implement corresponding t_{oe}/t_{oc} updates to non-public documents to enforce consistency with the changes introduced in RFC 318.	LM	B. Charest, GPS Requirements, 310-653-2418
16-04	308	Replace literal list of NANU types with a reference to the existing NANU list to avoid a	ARL:UT	Capt Ji, GPS Requirements,

2016 PUBLIC ICWG ACTION ITEMS

AI No.	RFC	Description	Originator	GPS Directorate Point Of Contact
		potential disconnect between the two lists. Change proposed text to provide a SOF for every NANU issuance except for GENERAL.		310-653-3163
16-05	N/A	Standardize naming convention of published public IS and ICD updates. Implement change number nomenclature to aid reviewers in distinguishing between the numerous document versions available on GPS.gov.	Gov	Mr. Daniel Godwin, GPS Requirements, 310-653-3640
16-06	N/A	Identify the current baseline for each public GPS document.	LM	Mr. Daniel Godwin, GPS Requirements, 310-653-3640



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2016 Public Forum Meeting Minutes

Date: 22 Sept 2016
Meeting Time: 0830 – 1630 HRS (Pacific Time)
Location: PCT Facility (100 N. Sepulveda Blvd El Segundo, CA 90245), Bldg 100
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Meeting started: 0830 HRS (Pacific Time)
Meeting ended: 1600 HRS (Pacific Time)

Agenda:

Reconvene

Roll Call

Out-Briefs from ICWG Breakout Sessions

Appendix D to the Standard Positioning Service (SPS) Performance Standard (PS) (*K. Kovach, Aerospace*)

Release of Receiver Independent Exchange Format (RINEX) Data from Control Segment to Civil Users (*K. Kovach, Aerospace*)

Message Type 38 (*K. Kovach, Aerospace*)

Carrier Phase Noise via 3rd Order Jaffe-Rechtin Phase-Locked Loop (PLL) (*K. Kovach, Aerospace*)

Output of PRED Data; ICD-GPS-870B (*K. Kovach, Aerospace*)

Integrity Failure NANUs (*K. Kovach, Aerospace*)

Operational Advisories (*B. Renfro, Applied Research Laboratories, The University of Texas at Austin*)

How a change in IS-GPS-705 and IS-GPS-800 Could Save Lives (*D. Spinden, Rockwell Collins*)

Proposed Refinement of GPS Signal-in-Space (SIS) Carrier Phase Noise Specifications (*C. Miles, Federal Aviation Administration*)

Adding Satellite Vehicle Behavior to ICD-GPS-200 (*F. Czopek, Microcosm*)

Meeting Purpose

The purpose of the public forum is to discuss developments, issues, and proposals related to GPS. Each year, the public is invited to share GPS-related presentations with the public forum attendees. The GPS Directorate also uses the public forum to communicate upcoming changes in GPS that will impact the public. All special topic presentations are available on GPS.gov.

Breakout Session Out-Briefs

The Government facilitated various discussions following the public ICWG on 21 Sept 2016 to reach an ICWG consensus on the proposed changes. A representative from each discussion presented a brief summary of the breakout session discussion and the plan to resolve any remaining issues associated with each RFC. The final ICWG-approved changes will be published to GPS.gov once they are formally inducted into the GPS technical baseline. Please contact smcgper@us.af.mil with questions regarding the status of the public ICWG RFCs.

Appendix D to the SPS PS

The SPS PS will be updated to include design considerations and best practices that users can employ to increase GPS receiver resiliency and avoid SiS incompatibility. The SPS PS will be published to GPS.gov in 2017.

Output of RINEX Data; ICD-GPS-240A/870B

The control segment-to-user community ICDs will be updated to provide monitor station observation data using the receiver independent exchange format (RINEX). These updates will be included in RFC-308.

Message Type 38 (MT-38)

The GPS Directorate is developing an integrity support message (ISM) that will contain message integrity indicators for GPS, Galileo, Global Navigation Satellite System (GLONASS), BeiDou, Space Based Augmentation System (SBAS), Quasi-Zenith Satellite System (QZSS), Indian Regional Navigation Satellite System (IRNSS), and other global navigation satellite systems as needed.

Carrier Phase Noise Via 3rd Order Jaffe-Rechtin Phase Locked Loop

IS-GPS-200H, IS-GPS-705D, and IS-GPS-800D all contain text that indicates the expected accuracy (radians root mean squared [rms]) that is achievable given a phase noise spectral density of an unmodulated carrier with a phase locked loop of 10 Hz. IS-GPS-200 and IS-GPS-705 both require an accuracy of 0.1 radians rms while IS-GPS-800 requires an accuracy of 0.035 radians rms. While the IS-GPS-200 and IS-GPS-705 requirements are looser than their counterpart in IS-GPS-800, there is no significant benefit to tightening the requirement since 0.035 radians rms is far beyond the accuracy that currently receiver technology can actually exploit.

Output of Prediction (PRED) Data; ICD-GPS-870B

The Government was asked to investigate the possibility of releasing PRED files to the public. PRED files are controlled as For Official Use Only (FOUO) information. The files may be deemed publically releasable in the future, at which time the NAVCEN website would serve as the public community's dissemination source.

Integrity Failure (IF) NANUs; ICD-GPS-240A/870

Currently, both hard (i.e., loss of function) and soft (i.e., malfunction) failures are announced using Unscheduled Outage NANUs. The addition of a NANU type with integrity failure designators would provide a means to distinguish between hard and soft failure announcements.

Operational Advisories

Operational advisories provide a summary of the satellite constellation status. In their current form, these advisories contain numerous inaccuracies and format limitations.

How a Change to IS-GPS-705 and IS-GPS-800 Could Save Lives

The presenter proposed a repurposing of a subset of bits in the GPS navigation message to implement a global warning system which would be available to users worldwide without a subscription fee.

Proposed Refinement of GPS Signal-in-Space (SIS) Carrier Phase Noise Specifications

PLL tracking is a key enabler for high-accuracy GPS users. The presenter proposed an addition to the SiS carrier phase noise requirements to limit the aberrant phase noise over any 0.1 second interval in future GPS satellite designs.

Adding Satellite Vehicle Behavior to ICD-GPS-200

Some anomalous conditions observed on GPS satellites can be traced to a variation in satellite phase center. Documenting the as-built configuration of the satellite in ICD-GPS-200 with respect to each GPS satellite program's attitude control laws would inform antenna phase center testing/calibration and help the GPS community understand behavioral variances among different types of GPS satellites.

Details of the specific topics discussed above can be viewed in the 2016 Public ICWG Presentations archived on GPS.gov for public reference at <http://www.gps.gov/technical/icwg/meetings/2016/>. Please contact the GPS Directorate at smcgper@us.af.mil with any questions, comments, or feedback related to the GPS Public ICWG and Public Forum.