Global Positioning Systems (GPS) Directorate

2019 Public Interface Control Working Group (ICWG) Meeting Minutes

Date: 25 September 2019
Meeting Time: 0830 – 1600 HRS (Pacific Time)
Location: PCT Facility (100 N. Pacific Coast Hwy El Segundo, CA 90245), Bldg 100
Dial In: 1-310-653-1000; Meeting ID: 6475364 Passcode: 123456
DCS: https://conference.apps.mil/webconf/gpspublicmeeting
Meeting started: 0830 HRS (Pacific Time)
Meeting ended: 1515 HRS (Pacific Time)

Agenda:

Part 1 (Public ICWG) – 0830 – 1200 HRS (Pacific Time)
Opening Remarks
Roll Call
Agenda Overview
Meeting Logistics
Rules of Engagement & Meeting Purpose
GPS Technical Baseline Change Management Process

- RFC 395 – Public Document Changes
- RFC 403 – Health Bit Clarification

Open RFC Discussion Session
Action Item Review

- Past years
- 2019

Adjourn

Part 2 (Public Forum) – 1330 – 1600 HRS (Pacific Time)
Reconvene
Roll Call, Rules of Engagement
Special Topic Presentations

- Time Since GPS Epoch
- Advanced Receiver Autonomous Integrity Messages (ARAIM)
- Concern on UTC Leap Second Schedule Announcements
- 2020 Public ICWG Look Ahead (ICD-GPS-240)

Walk-on Topics, Open Discussion
Action Item Review
Closing Remarks

Opening Remarks (Briefer: Col Claxton, Space & Missile Systems Center):

"Good morning everyone – pleasure to be here today. There are a lot more familiar faces than I thought would be here today. The status of the program is two-fold – there's a lot of stuff we've talked about in the last five, seven years, which have come to fruition the last couple years. I'm sure as we transition to GPS III, we'll have a lot of capability, but we'll need to keep good communication. Everything here [on slide Enterprise Operational View] is getting upgraded in the next few years. OCX has been a tough program – but it's going to happen. In the next couple years, OCX (Modernized Operational Control Segment) *will* come online. The constellation is as healthy as it's ever been. Getting a little aged on the back end with the IIAs and IIRs, but it's still strong, and still the envy of the whole world. We have four billion users! In August, we launched the second GPS III satellite, the first having been launched last January, and the next launch in the beginning of next year. So we're bringing on GPS III, SV01 and SV02; GPS IIIF has been on contract now almost a year, and it's almost the end of their CDR's (Critical Design Review). As for Control Segment: I mentioned OCX (we all have our eyes on OCX). We knew it'd be late years ago, so we did the Contingency Operations (COps), but we'll be bringing it over in the next few months. We'll also bring in M-Code Early Use (MCEU).

Regarding the Enterprise Roadmap: FY 20 and 21, see a lot more lines than other places, because there's a lot more going on than other places. COps, MCEU, and launches going like crazy. It's a lot of things to pay attention to. Much of what we've seen in the past will change, but we'll communicate those changes.

In preparing for the next generation of GPS – we've had some issues with some users, but we've worked through that, delayed a few things; but we're on track now. Don't take anything for granted as seen in the past. Use this forum to ask questions! There could be some changes in the way we do some operations. Regardless, GPS continues to be the Global Utility, and remains the 'Gold Standard'."

RFC-395 – Changes to the Public Document (Briefer: Anthony Flores, SAIC)

Changes from last year are separated into three categories in the slides: Signals in Space Concerns, Control Segment Concerns, and Administrative Clean-up. Note, all changes are fully depicted in the PCN.

Signal in Space Concerns: Went over charts. No discussion or comments.

Control Segment Concerns: Went over charts. No discussion or comments.

Clean-up: First change was deleting redundant week number; next change was adding GPS IIIF into the technical baseline. Regarding the latter, ICD-GPS-240 was not listed as an affected document, and Dr. Rhonda Slattery asked if it was checked for any applicable changes. Mr. Anthony Flores confirmed they checked, and found no corresponding changes.

Clean-up (cont.): Since AUTONAV is not in any current SV nor will it be in the initial GPS IIIF, the AUTONAV section was removed from IS-GPS-200 and IS-GPS-705. Dr. Rhonda Slattery relayed that Mr. Michael Dunn had commented he did not want to delete AUTONAV, as he believes it will come eventually – there was instead agreement to keep the title for AUTONAV, and have the text below that changed to Reserved. References will still be removed, just the title would be left. Mr. Anthony Flores concurred with this. Continued briefing last two cleanup items, and no further discussion or comments.

About to move on to Comment Review – Mr. Roger Kirpes referred back to the AUTONAV update – there are numerous comments referring to AUTONAV, and he asked if those will be removed. Mr. Anthony Flores said yes, but the title of the section will remain. Mr. Roger Kirpes said that the slides just show the removal of section 6.3.5 of IS-GPS-200 that describes AUTONAV, but there are other places that reference it. Dr. Rhonda Slattery clarified that all the other references were already removed – the only comment was to leave in the title. If there were other references that were missed, another comment should be submitted. Mr. Dan Godwin said that the government will reflect any additional changes in the slides, and the updated slides will be posted.

Mr. Brent Renfro asked to go back to the chart on SV equations. He stated that Applied Research Laboratories at University of Texas (ARLUT) spent some time looking at this and verifying it all works, and this is exactly how it should be done, except for the limit. When looking at it for QZSS, it won't work for all cases, like for the Galileo orbit. What they do for our GPS Toolkit (GPSTk) these days is iteration to a conversion limit. He said that he was quiet the first time we went through it because it works for GPS as defined, but for international operations, we might need to point out to our QZSS colleagues that they may want to change their ICD for this. He suggested a minimum of three iterations instead of flat iterations.

Question from the audience on how the convergence limit is defined – Mr. Brent Renfro replied that it'll converge when the error falls below $1x10^{-11}$ radians. It usually converges to 2-3 anyways, but for Galileo and QZSS it doesn't. Mr. Anthony Flores suggested that in the proposal where it says "Refined value", we put "Minimum of three iterations" there instead. Mr. Brent Renfro concurred with this suggestion. Dr. Rhonda Slattery commented that one more change is to the left side where it says E_3 – change it to say $E_3 = E_k$.

Comment Review: There was a total of 4 comments – 3 substantive, 1 administrative. The Public ICWG reviewed all comments except any accepted administrative comments.

Comment 1: When the Civil Navigation (CNAV) T_{GD} is '1000000000000' (13 bits), then the group delay is unavailable; however, there is no clarification for the Legacy Navigation (LNAV). Mr. Roger Kirpes's comment is to add clarification for LNAV in IS-GPS-200.

- Question: Did we determine what the control segment does today if the value is not available? Dr. Rhonda Slattery answered: "That's never happened, so nobody knew what we would do if it did happen. It seems like a good idea to have an option for it if it's unavailable – but we tend to keep broadcasting the latest value until another one is available."
- Question: Have we ever approached what that value would be? Dr. Rhonda Slattery answered that we did in fact use values for years that were really bad – we didn't broadcast Unavailable, just factory values until Jet Propulsion Laboratory (JPL) came back with new values.
- Question: When Control Segment goes to update these, are they just folded in? They were wondering if there was any implication to control segment software if it is manually entered in. Dr. Rhonda Slattery replied that we could manually enter it in. (Another member agreed with this.)
- Mr. Roger Kirpes said that if that's the way this system works, or is intended to be worked, then that is what we should document in the ICD, but expressed a concern with backwards compatibility with user equipment. Mr. Karl Kovach responded that while he appreciates Mr. Roger Kirpes's concern, the ICD doesn't say how the signals are generated, nor how to create them.
- This discussion continued briefly, including the use of default value of zero (zero may not be the default), and the User Range Accuracy (URA) index bumping the value (which may somewhat resolve the backward compatibility – if you read -128 (in binary) and it says Don't Use, then that's fine), but questioning if the control segment implements things using the URA index. This comment was ultimately deferred, as no resolution could be agreed upon.

Action #2019-05: Document in PRAT and track this comment going forward.

Comment 2: Replacement for Kepler's Equations should be re-considered. This comment was discussed prior to Public ICWG with the originator – resolution was a compromise, and will add wording for additional clarity. Mr. Anthony Flores added, they would also add clarification for the "minimum of" three iterations, as discussed earlier. Mr. Denis Bouvet concurred.

Comment 3: Statement was added along with velocity and acceleration equations, stating these equations are optional. No further comments; Mr. Denis Bouvet concurs.

Comment 4: Administrative – Mr. Frank Czopek's comment stated that it looks like two separate fields are being called out, and asked to remove the line between the direction of flow from SV and MSB first. This comment was rejected – 58 figures would need to be updated, and users have not had problems interpreting this. Frank was not online; no further comments from the floor.

Action: Follow up with Mr. Frank Czopek about his comment

RFC-395 Backup: Opened to floor to any further comments regarding RFC 395 – no other comments. Note that backup slides reference the report provided for the Broadcast equations. This has been uploaded onto GPS.gov for anyone interested in looking at them.

Break from 0940-0955 PCT

RFC-403 – Health Bit Clarification (Briefer: Ms. Jennifer Lemus, SAIC)

This RFC was originally at last year's Public ICWG, but it was deferred for further discussion and to come up with a better solution. Ms. Jennifer Lemus briefed the problem statement and proposed solution, as well as the summary of changes. (No comments/questions.) Next, Ms. Jennifer Lemus began going through the comments, both critical and substantive.

Comment 17, 19: Request to add clarification, and switch the definition of bits. Question from the audience on what happens when we start using the GPS III satellites and don't want people using L1C for a while. The L1 health bit would show 0, because the codes are okay, but how would we know L1C is not to be used? Dr. Rhonda Slattery clarified that there are multiple options that may happen on L1C, but the best case would be setting it to unhealthy, and the other codes would be set to healthy.

Comment 20: An audience member asked for a slight modification – he said that we're really thinking about a particular channel, like L1 or L5, but we don't want people on the user side or operation side thinking a health bit is referring to the entire satellite. Dr. Rhonda Slattery concurred, pointing out that redlines say the "SV" is unhealthy.

Action #2019-08: Ms. Jennifer Lemus to change the wording on slide 76 to say "capability" instead of SV, or something similar of that nature.

Comment 21: Dr. Rhonda Slattery expressed some concern with "single-frequency" language, as this seemed a little general, though maybe it's dependent on seeing it in context. Maybe should specify the signal users per document. Mr. Roger Kirpes agreed with this clarifying language. Further discussion about why SV configuration is only being added to L1C. The plan is that single-frequency will be done on L1 (either L1 C/A or L1C) and not many users will use just L2C or L5; L1 is the baseline.

Action #2019-08: Ms. Jennifer Lemus to update the directorate response with this rationale, including which signal is being spoken about in each document.

Comment 18; Comment 1; Comment 2: No further discussion or comments.

Comment 3: Dr. Rhonda Slattery asked why it was Accept with Comments – response was pretty straightforward. Ms. Jennifer Lemus confirmed this is a typo.

Action #2019-08: Update disposition to Accept

Comment 4; Comment 7, 8: Dr. Rhonda Slattery thought we clarified the monitoring of Index of Data Clock/Index of Data Ephemeris (IODC/IODE) in previous paragraphs. Maybe could find those paragraphs and put those in the directorate response to this comment. Ms. Jennifer Lemus replied that we'll take a look at that language, and once we review the language and we feel we need to update the text, we'll make those updates. Dr. Rhonda Slattery thinks RFC 312 was pretty thorough – maybe just reference it in the slides. Mr. Denis Bouvet had another comment, to which Mr. Karl

Kovach replied that they may have missed a parenthetical when Mr. John Dobyne copied over to the IS. A parenthetical that may not have been brought in/lost in translation. Ms. Jennifer Lemus took the action to check this.

Action #2019-08: Confirm that all correct information from SPS PS was copied over.

Comments 11, 12: Same as the previous comments about the CEI data sets, so we'll go ahead and take a look at the wording for these. Will get back to Denis on the answer for these.

Comments 5, 9, 13: PCN brought up on screen. Mr. Karl Kovach said, "That's really meant to be the Clock, Ephemeris, and Integrity (CEI) data set – words 3-10 generating the data… So can we say they transmitted CEI bits?" Dr. Rhonda Slattery said no, as there are some cases that they are not.

Action: (Mr. Karl Kovach and Dr. Rhonda Slattery) Look at Subframe (SF) 1,2, and 3 words 3-10 to make sure there are not any random bits in there

Second part of comment regarding civil moderate (CM) code signal, condition d – same issue as above, except this one won't be words, it will be bits.

Comment 6, 10: Regarding CM code signal alert condition (b). Another action to Dr. Rhonda Slattery and Mr. Karl Kovach to take a look at this again.

Comment 14: Discussion between Mr. Karl Kovach and Dr. Rhonda Slattery. Looking at the figures in section 30 – the intent is not for everything to go to 1's and 0's. This is where we stopped to negotiate, and will know it is Message Type (MT) 10, but after that will go to 1's and 0's. Mr. Karl Kovach said that bits 1-38 and the Cyclic Redundancy Check (CRC) bits may or may not be real; bits 39 through 276 – that's the payload part of the message that would go to all 0's or 1's. He said that the right words will get in there to clarify that. (If it all went to 1's and 0's, you wouldn't know what message type it was.) Mr. Gary Okerson from MITRE mentioned that there has been a message in the past where the entire 300 bit payload was 0's on GPS III. Mr. Steven Brown said that If we can't send a MT10, we don't muck with the bits in the MT10, instead we send MT0. Someone asked if message type 0 has a valid preamble – Dr. Rhonda Slattery said it does not, and would fall in to case (e). Ms. Jennifer Lemus pointed out that this particular comment falls into the previous action of having a valid preamble. Dr. Rhonda Slattery asked if we still need to cover CRC – Mr. Karl Kovach said that's explicitly said in the CRC table.

Action #2019-08: Clarify in condition (d) that the payload portion of the message is what is populated with 1's and 0's.

Comment 15: IS-GPS-200 PCN was shown on screen. Mr. Karl Kovach: In regards to the "marginal" conditions for URA_{ED} index, this specific information doesn't belong here in the ICDs. Paragraph 3, the last sentence is correct. Second sentence is trivial/irrelevant – strike the second and third sentences entirely. Question from Mr. John Dobyne: "Use at your own risk" signal – is that why it's marginal rather than unhealthy? Mr. Karl Kovach: Yes. Dr. Rhonda Slattery: So we should add to the slide that we do believe it is marginal. That resolves the comment that it should be in the "Don't Use" instead of the marginal section. Some discussion between Mr. Karl Kovach and Mr. Denis Bouvet regarding this marginal aspect – Mr. Karl Kovach said if you're a safety of life user, and value integrity, do not use this signal.

Comment 16: Comment asks for clarification on how the receiver can detect that a default message has replaced any MT10, MT11 or MT30s. Dr. Rhonda Slattery sees the confusion – don't know what the default message is in lieu of. Saying "in lieu of" means you have to make a sort of judgement call on what it was before message type 0. Mr. Brent Renfro mentioned we have a table at the end of the CNAV section in IS-GPS-200 of the maximum time we should expect between MT10, MT11, etc. Mr. Karl Kovach: So introduce some type of time out flexible construct. Mr. Steven Brown: "Let's say I send message type 0. I don't want people looking at type 10 or 11 because it's something I don't care about. The only way to know is that I should have gotten MT10 in that amount of time. If I haven't, making assumptions." Mr. Karl Kovach said that there's a type 0 in between. Mr. Steven Brown responded that they don't know what the MT0 is in place of – they only see the MT0. If he can't send MT14, will send MT0 in its place. Can still send MT10, MT11, etc. But

the user doesn't know what the MT0 he sent was replacing. Mr. Karl Kovach believes users will see the pattern, but Mr. Steven Brown says the pattern can change at any moment. Dr. Rhonda Slattery: "So go marginal every time there's a MT0?" After further clarification, seems that Mr. Karl Kovach wants a Period – not "in lieu of", just that you got a MT0, period. At this point, Lt Benjamin Ratner asked for this discussion to be continued offline.

Action #2019-08: Follow up with Mr. Karl Kovach for specific wording changes

Comment 22, 23, 26, 28; comment 24, 25: Dr. Rhonda Slattery expressed concern on just deleting paragraphs – suggested changing them to Reserved or leave them blank. Ms. Jennifer Lemus suggested leaving the section headers, and changing the text to <Reserved>. Mr. Roger Kirpes and Mr. John Dobyne agreed.

Open RFC Discussion

No questions or comments.

Action Item Review (Reference Attachment 2 for itemized list of Action Items)

2014:

- Item 26 – In Progress. PRN expansion still in internal development.
    - Mr. Karl Kovach mentioned this is a hot topic.
    - Dr. Rhonda Slattery: Maybe put a no later than (NLT) date on this? I do think OCX Block 1 going operational is a NLT date.

2015:

- Item 1 – In Progress. Topic on hold; may be considered for a future RFC. Dr. Rhonda Slattery noted this is another place where putting a "check back in six months" or something would be helpful.
- Item 41 – In Progress. Suggested that Mr. Denis Bouvet show that the ionosphere updates are insufficient and present a special topic at 2019 Public ICWG if needed to explain. Mr. Denis Bouvet not online at this time – Lt Benjamin Ratner said they'll reach back out to him to get a response.

2017:

- Item 5 – In Progress. Must reach out to Mr. Denis Bouvet prior to closure.

2018:

- Item 1 – In Progress. Currently in-work under RFC-395.
    - Dr. Rhonda Slattery: I'm not sure this was in 395. The modernized formats are described in the table – action was to go through and find out where the modernized formats will be defined, and find out when we will actually expect drafts of the XML schema to come out so people can start reviewing them.
    - Further discussion – Mr. Dan Godwin said the originator was the Coast Guard – the Air Force will find the references in ICD-GPS-870 regarding the modernized products, and get back to the Coast Guard. Dr. Rhonda Slattery asked when we can expect a draft of the schema to go out – cannot respond to this without having at least a proposed date out. Dr. Rhonda Slattery continues on to say this is really a completely new RFC (not under RFC-395). Someone else concurred – need to raise the question timewise, and may not make anywhere near next year's Public ICWG, but don't want to tie into 395 at all. Current action also has a note that a concern was opened – should separate that out.
    - Ms. Jennifer Lemus will reword the notes section of this action; but will find the concern that was created, make sure it's unlinked from RFC-395, and have it be its own concern. Later on, will follow up with Raytheon OCX and Coast Guard.
- Item 2 – In Progress. Topic withdrawn by originator; recommend closure. No further comments, so status will be changed to Closed.
- Item 3 – In Progress. Topic on hold; may be considered for a future RFC. Action remains open.
- Item 4 – In Progress. In work under RFC-395 (Kepler's equations we presented earlier). Recommend closure. Thumbs up from Lt Col Steven Brown– status will be changed to Closed.
- Item 5 – In Progress. Will be presented as a special topic. Close this action now – anything that comes out of the special topic will be added as new action items.
- Item 6 – In Progress. Conveyed answer from Boeing – recommend closure after follow up with Mr. Denis Bouvet.
- Item 7 – In Progress. On hold; may be considered for a future RFC. Dr. Rhonda Slattery: Helpful to add NLT date on this item as well.
- Item 8 – In Progress. Currently in work under RFC-395 – change is in the PCNs. Will be incorporated after today's discussion. Mr. Steven Hutsell dialed in and had no objections – status changed to closed.
- Item 9 – In Progress. On hold; may be considered for a future RFC. Special Topic – in RFC-413, which is in work.

2019

- Item 1 – In Progress. Recommend closure. No comments – consider this closed.
- Item 2 – In Progress. Recommend closure. Dr. Rhonda Slattery thought there was a concern with uploading that came out of the ICD itself. Ms. Jennifer Lemus said that she'll look and see if there is a general concern for uploading vs. updated, and if so, we'll add it as a new action for the general concern. Still recommend closure on this one. No further comments – consider closed.
- Item 3 – In Progress. Presentation slide material updated; recommend closure. No objections – consider closed.
- Item 4 – In Progress. Presentation slide material updated; recommend closure. Dr. Rhonda Slattery mentioned this was brought up in 395, and already took an action to go back, so should update the notes here. Ms. Jennifer Lemus clarified that this action is a bit different – this is just the spacing between the lines, the other is just putting the MSB in parentheses. Dr. Rhonda Slattery said this is referencing 200, and questioned if 200 was changed for this. Might be a mistake in actual description. Lt Benjamin Ratner and Ms. Jennifer Lemus to look into this and revise as needed.

2019 (From 25 Sept 19 Public ICWG)

- Item 5 – From slide 54 – clarification for the T_{GD} not available for IS-GPS-200, brought up by Mr. Roger Kirpes (CA), discussions with Mr. Anthony Flores.

End of Part 1. Part 2 began at 1330

Special Topics:

Time since GPS Epoch – (Briefer: Mr. Brent Renfro, ARLUT)

(Summary of the presentation): Motivation for this topic is that there are lots of places in the documents that reference week numbers and seconds of week numbers. The way in which it's done throughout the documents varies in quantities. Proposal is to clarify things for the users of the documents and make it a little less error prone. Propose a definition of two representations of GPS time (GPST) – the first is in week number (WN) and seconds of week (SOW). Second representation is the elapsed integer and fractional seconds since GPS time. Neither representations are very intuitive. The established approach will continue using the WN and SOW numbers we always have, but users are encouraged to use this new GPST. Quantities for converting from one to the other will also be defined. This would take advantage of how the GPS time is already continuous.

Discussion regarding $GPST_{OC}$ – this is a specific point in time. Mr. Albert Hayden asked if there is a risk of using the same nomenclature for time and time scale and is that something of concern? Additionally, Mr. Albert Hayden asked if there is a risk by implying to the user community that any set of correction parameters would be valid for all time if we express it with the new GPS time scale – Mr. Brent Renfro answered to both of those questions that there is no risk. Mr. Dan Godwin said that he'd like to poke a little at this offline, for implementation from the ground and program perspectives. Mr. Brent Renfro confirmed that it would be a receiver doing the new navigation. Mr. Dan Godwin says that the way forward is to turn this action into a concern where we can update the documentation. They will likely go out per normal battle rhythm and coordination. Mr. Brent Renfro proposed that we nominate a handful of SMEs to look at what has been done in more detail, as we want to make sure we do it right the first time. Taking a quick poll of interested parties that would like to be part of the public TIMs going forward: Mr. Karl Kovach (Aerospace), Mr. Brent Renfro (ARLUT), Ms. Miquela Stein (ARLUT), Dr. Rhonda Slattery (Aerospace), Mr. Hamza Abdusdan (FAA), Mr. Steven Brown (LM), Mr. Kevin Pi (RTN), Mr. Roger Kirpes (CA), Mr. Jim Semler (L3).

Advanced Receiver Autonomous Integrity Messages (ARAIM) Integrity Support Messages (ISMs) Update

– (Briefer: Dr. Andrew Hansen, DOT-Volpe)

This was briefed previously at the 2018 and 2016 Public ICWGs. Not much has changed since the last Public ICWG – MT-38, while that body of Working Group C was diving down into the deep and intellectual, not a lot has changed. The driver is the Galileo event, where they had a significant outage. They're talking about the ability to sign and manage traceability of MT-38. This brief is just socializing – the preliminary PCN needs to be put together, then presented here to get input from the group.

Mr. Dan Godwin: "On one of your slides you mentioned there was already international coordination going on with Working Group C. What is their overall thinking now on ISMs? Are they for it? Are they willing to help design the overall solution?" Dr. Andrew Hansen: "They are very positive on ISM mechanisms. The real push/pull has to do with how often that ISM would be updated, and debate is how long you need to observe a constellation and update it to receive any level of change." Dr. Andrew Hansen also confirmed that coordination with EU is in parallel to what is being done now.

Mr. Dan Godwin: "FAA source of data packages – have you looked on a lower level where that info comes from? Further defined where the data's going to be generated and how it's going to actually get to the Master Control Segment (MCS)?" Dr. Andrew Hansen: "ID of FAA as an entity, because it's safety of life and experience, and the fact that we've had to look at these constellation performances over the decades. We would expect Galileo would want the same kind of control over their parameters. So how would we accept their info in the same way we want them to accept ours? Trust but verify – we would continue to do monitoring on Galileo the same way we do for GPS. To do that and make it a trusted source – that's the purpose of the signature and trusted key." Mr. Dan Godwin asked where the FAA's source for generating those files is. Dr. Andrew Hansen said that it's unclear what mandate they have – their partners will be other government entities and the program office.

Mr. Dan Godwin asked what's the goal of when you could see this becoming reality? Followed up with, is it in the IIIF area timeline? Dr. Andrew Hansen responded back that he understands that's clearly a question of benefit for other constellations, but even if he went to GPS alone, L5 – earliest cases where we would see GPS benefit. That's a hint to the timeframe – somewhere between 2024 and 2025 space.

Mr. Calvin Miles: "The Navy Program Office Liaison (Commander Nicholas Sinnokrak) has expressed an interest in having ARAIM as soon as they can get it. Work with L1/L2 pairings instead of L5. We have them also as a customer also within FAA. This desire they've expressed may be a lead/follow."

Mr. Denis Bouvet had a couple questions – the first asking if we have space to give that instruction (the answer was Yes), and second, how to apply the same for URA. The remainder of this conversation was to be taken offline.

Question online: "Were you saying the pace for these messages to change would be a day or a week?" Dr. Andrew Hansen: "Galileo has some perspectives on that. US stakeholder perspective is that we gather messages for years, so information collected in a week isn't even significant. At the slowest, this process is meant to flow in minutes."

Note: There were a few more comments on this discussion, but due to shortage of time, will continue talking about this at future ICWGs.

Concern on Coordinated Universal Time (UTC) Leap Second Schedule Announcements – (Briefer: Karl Kovach, Aerospace)

(Summary of the presentation): All Department of Defense (DoDs) are required to use the International Earth Rotation and Reference Systems Service (IERS) announcements of the UTC leap second schedule – GPS should follow. There is currently a major disconnect – IERS and United States Naval Observatory (USNO) announced as of the end of 31 Dec 19, there is no leap second. GPS is announcing that at the end of 27 Nov 21, there is no leap second. There are numerous impact of Non-Standard Announcements, including aircrafts having trouble. Recommend adding a requirement clarification to the IS's. This is a manual process done at the control segment level. Aerospace Corporation recommends adding text that specifies to be consistent with announcements with the UTC information disseminated by USNO.

Mr. Dan Godwin asked if there have there been any initiatives in the past to make GPS standard – Mr. Karl Kovach replied yes, in 1983, when we set this up. It's just kind of fallen through the cracks. This change would affect Concept of Operations (CONOPS) and the human entry of data. Mr. Dan Godwin asked if the recommendation is to change this special topic into a concern – Mr. Steven Brown commented that first we need to work on the language. The way it's phrased, it reads that even when the six month one is uploaded, you still need to update one every six days, even though it's consistent. Lt Benjamin Ratner clarified that if this becomes a concern, there will be an opportunity to hash out the language and get it to perfection.

ICD-GPS-240 Updates: 2020 Public ICWG Look Ahead – (Briefer: Jennifer Lemus, SAIC)

ICD-GPS-240 updates: Update Technical Note 21 to 36 to enable smoother transition from Architecture Evolution Plan (AEP) to OCX. This topic was initially in another RFC, but got missed, and it has to go through the public process. Just wanted to give users an update that Technical Note 36 was coming.

Walk-On Topics

None

Open Forum Discussion

None

Action item Review (this session)

- Item 6 – Action to open a concern from Mr. Brent Renfro regarding GPS continuous time.
- Item 7 – Action to initiate a concern for leap second notifications process as it deals with 400, CONOPS, and other US government agencies, per Mr. Karl Kovach's special topic.

Closing Remarks – (Briefer Lt Benjamin Ratner, Space and Missile Systems Center)

Lt Benjamin Ratner closed the 2019 Public ICWG & Forum with a summary of remarks including, but not limited to post-Public ICWG actions & thanking everyone for their participation.

Attachment 1— Attendance List:

Name	Org	In Person	Online
Meg Abraham	Aerospace		X
Karl Kovach	Aerospace	X	
Rhonda Slattery	Aerospace	X	
Stephan M Hillman	Aerospace		X
Scott Strong	AFRL		X
Brent Renfro	ARL:UT	X	
Miquela Stein	ARL:UT	X	
Eduardo Villalba	ARL:UT		X
Jim Custodio	ATS		X
John Dobyne	BAH	X	
Garrett Shook	BAH/GPN		X
Joel Cardo	Collins Aerospace		X
Roger Kirpes	Collins Aerospace		X
Andrew Hansen	DOT-Volpe	X	
Calvin Miles	FAA	X	
Hamza Abdusdan	FAA	X	
Ha Nguyen	FAA	X	
Col John Claxton	GPE	X	
Daniel Godwin	GPE	X	
Lt Benjamin Ratner	GPE	X	
Capt Michael Telcide	GPE	X	
Capt Brice Van Roekel	GPE	X	
Capt Kyle Woodard	GPE	X	
Lt Julia Corton	GPE	X	
Ramon Hilario	GPN		X
CDR Nicholas Sinnokrak	GPN		X
James Semler	L3 Harris		X
Gary Okerson	MITRE	X	
JT Cardo	MITRE		X
Paul Kim	NASA	X	

Name	Org	In Person	Online
CWO Frank Crisafulli	NAVCEN		X
Todd Kawakami	NGA	X	
Trevor Garner	NGA		X
Dennis Morgan	NGA		X
Kevin Pi	Raytheon	X	
Lt Col Blair Thompson	RNSSI		X
Lt Col Steven Lewis	RNSSI		X
Al Sicam	SAIC	X	
Anthony Flores	SAIC	X	
Jeffrey Smith	SAIC	X	
Jennifer Lemus	SAIC	X	
Kevin Cano	SAIC	X	
Martin Lopez	SAIC	X	
Robert Lagatree	SAIC	X	
Samantha VonBibra	SAIC	X	
Thomas VonBibra	SAIC	X	
Sainath Vijayan	SAIC	X	
Dylan Nicholas	SAIC	X	
Kevin Greco	SAIC	X	
Nina Faustino	SAIC	X	
Jason Bolger	SAIC	X	
Jan Voss	SAIC	X	
Edgar Valenzuela	SAIC	X	
Shayne Douglass	SAIC	X	
Serena Chang	SAIC	X	
Kagan Richardson	SAIC	X	
Tracy Malone	SAIC	X	
Kristina Notaro	SAIC	X	
Albert Hayden III	SAIC	X	
Caaren Amirian	SAIC	X	
Tony Anthony	SAIC	X	
Chris Collins	SAIC		X
Jason Min	Sandia		X

Name	Org	In Person	Online
Subhasini Shettigar	Sandia		X
Steven Hutsell	2SOPS		X

Attachment 2— Action Item Review:

Year	Action Item #	Action	Description	Notes	Action Taken
2014	26	In Progress	Provide an informational briefing to remind the ICWG members that PRN expansion is coming.	In Progress. PRN expansion still in internal development.	Add NLT date.

Year	Action Item #	Action	Description	Notes	Action Taken
2015	1	In progress	Remove the UTC offset error (UTCOE) accuracy performance numbers from all ICDs and put it into the MGUE technical requirements documents.	Topic on hold; may be considered for a future RFC.	Add NLT date.
	41	Closing	Investigate suitability of current iono update rates and provide response to public (IS-GPS-200)	Action to Lt Ratner, respond to Denis Bouvet to close.	Mr. Bouvet concurs with closure. (10/2/19)

Year	Action Item #	Action	Description	Notes	Action Taken
2017	5	Closing	Add "For satellites without L5 signal capability the almanac L5 Signal Health will be set to 1."	Must reach out to Mr. Bouvet prior to closure.	Mr. Bouvet concurs with closure. (10/2/19)

Year	Action Item #	Action	Description	Notes	Action Taken
2018	1	In Progress	Consider updating GPS products depicted in ICD-GPS-870 to reflect the modernized formats described in ICD-GPS-870, Table 3-I.	Ms. Lemus to reword the notes section of this action; find previous concern that was created and unlink it from RFC-395 to its own concern.	
	2	Closing	Update the Operational Advisory or other documentation to accommodate dual-frequency operations involving the L5 signal in preparation for Full Operational Capability (FOC).	Topic withdrawn by originator	
	3	In Progress	It is beneficial to the public user community if the space vehicle (SV) could broadcast actual received carrier power values based on ICD/IS assumptions.	Topic on hold; may be considered for a future RFC.	
	4	Closing	Eccentric anomaly & true anomaly: Suggest simpler methods for solving Kepler's equations and removing redundant, unnecessary equations.	In work under RFC-395 – briefed at 2019 Public ICWG as change to Kepler's Equations.	
	5	Closing	Define a new quantity "Time since GPS epoch" with a new symbol (TBD) because clarity may be needed for text that is associated with handling GPS week rollovers.	Presented as a Special topic at 2019 Public ICWG.	
	6	Closing	Investigate SATZAP and how GPS IIF satellites are handling this procedure.	Waiting on follow-up with Mr. Bouvet (then recommend closure)	Mr. Bouvet concurs with closure (10/10/19)
	7	In Progress	Recall that L5 midi almanac may become optional in future use (few years from 2018), but for FAA purposes it is required (for now). (to be closed when L5 midi almanac becomes optional)	Topic on hold; may be considered for a future RFC.	Add NLT date.
	8	Closing	For the NMCT clarification for SV ID/PRN 32, make the clarity that the availability indicator for a transmitting SV with ID/PRN 32 will be 10 or 11.	Currently in work under RFC-395 – changes in PCNs. Mr. Hutsell concurred to close.	
	9	In Progress	Consider the addition of the MT 38, 39, and 40 while taking into consideration throughput of other CNAV messages (applies to L2 CNAV and L5 CNAV).	Special topic – in RFC-413	

Year	Action Item #	Action	Description	Notes	Action Taken
2019	1	Closing	Originated from the RFC-400 PICWG on 7 May 19: Fix "64800" typo in Virtual Public ICWG slide deck to be "86400"	Recommended closure – no objections.	
	2	Closing	Originated from the RFC-400 PICWG on 7 May 19: Clarify that the EOP accuracy degradation statement is for the CS updating the EOPs, not the CS uploading the EOPs	Ms. Lemus to see if there is a general concern for uploading and updating, and if so, will add it as a new action for the general concern.	Items are included in Concerns 981 (Closed) and 982 (In Work).
	3	Closing	Originated from the RFC-400 PICWG on 7 May 19: Make distinctions between singular and plural updates of "EOP Parameter(s) to EOP(s)"in the Virtual Public ICWG slide deck	Presentation slide material updated.	
	4	In Progress	Originated from the RFC-400 PICWG on 7 May 19: Add spacing such that "DIRECTION OF DATA FLOW FROM SV" and "MSB FIRST" are not connected to the arrows in Figure 3.5-3 of IS-GPS-200	This action is referencing 200 – Lt Ratner and Ms. Lemus to look into this and revise as needed.	
	5	New	Clarification of T_{GD} not available	From slide 54 – clarification for the T_{GD} not available for IS 200, brought up by Roger Kirpes (CA)	New concern submitted.
	6	New	GPS Continuous Time	Action to open a concern from Brent Renfro regarding GPS continuous time.	New concern submitted.
	7	New	Leap Second Notifications	Action to initiate a concern for leap second notifications process as it deals with 400, CONOPS, and other US government agencies, per Karl's special topic.	New concern submitted.
	8	New	Update Public ICWG Slides and PCNs	General action for all updates to Public ICWG slides and PCNs	Slides and PCNs have been updated. RFC-403 will have a courtesy review for PCNs.