SBIR 24.4 R7 Q&A Telecon Transcript
20 SEPTEMBER 2024

- SOCOM244-P009: Open Topic for Autonomous Precision Timing in Contested/Congested RF Environments

SBIR Process Timeline

~~12 September: Topics issued for pre-release~~
26 September: USSOCOM begins accepting proposals via DSIP
15 October: DSIP Topics Q&A closes to new questions at 12:00 PM ET
29 October: Deadline for receipt of proposals no later than 12:00 PM ET

1. Is an RF-based capability for PNT - proven to work in congested RF environments - a viable option in this topic?
   This is some of the information that we're trying to get after. Generally, across the board, what we are trying to achieve or really get the questions answered for is: how are we going to deal with our weapon systems that have been so reliant upon the GPS signal from space? How are our weapon systems going to survive when those signals are taken away? We're relying upon that time and depending upon which weapon system we have, are those things going to be able to survive? When we talk about if we break this down from the perspective of, 'can an advantaged user update a disadvantaged user?' The RF-based capability has its own vulnerabilities. However, we don't know of other capabilities that are available and working today in a SWaP acceptable unit. From PEO-TIS's perspective and the radios on the ground, we don't know what we don't know. For us, a lot of our waveforms that depend on GPS in order to operate, what happens in an environment where GPS is being jammed? Can we still communicate through timing mechanisms through other sources? And that's what we're trying to understand. What's out there? What technology might we be able to leverage? We have RF waveforms that operate in contested environments. If you had some neat concept that you could have some type of anti-jam, RF-based PNT thing that delivered timing still, then, I mean, we're open, so it's viable. The question was can it work in a GPS denied environment? If you have something that works, then yes, it's viable and we would definitely look it over.

2. Understand focus is on atomic clocks, however would wireless picosecond relative time between server and clients be of interest?
   No, we are not demanding that the solution be an atomic clock. That's just what we're investing right now as a possible solution. Wireless is concerning in the environment that we're operating in, it becomes more vulnerable. It can potentially create a signature that we're not looking for. The wireless piece, we would need to investigate quite a bit more.

3. Is the ethernet connection a NTP and/or PTP, or something else?
   Yes, what we have integrated is an NTP into our aircraft, and that is an ethernet layer, so we have ethernet on the radios. Not sure that they are configured to take NTP, but even if they were, for the dismounted user, in this case, that's not a real viable option for us, because we're not going to have a connection back to an NTP source when we're dismounted and

using the radios. From our perspective of the paradigm, what we're looking at this is that we are the rotary wing component that's carrying that disadvantaged user to the locations that they need to go. There's probably going to be some combination of solutions that help the disadvantaged user, and then with the rotary wing, we can carry, obviously, significantly more. How can we, and we'll use this analogy, how can we be an NTR for a ground user? Similar to how, Link 16 works, how can we support that disadvantaged user from a more advantaged platform?

4. Is the L1/L2 SAASM GPS input a connection for an external GPS system (NMEA string and PPS?), or the system is expected to have an internal GPS system?
   That's potentially inside of the solution itself. If you were to propose something that that was the best way to get after it. As an overarching potential assumption that we have: Nothing can beat GPS. We've got decades and billions of dollars, and it is the most accurate delivery of time available. We are asking questions related to some of the following: how long can we expect in threat environments to not have access to that time signal? Obviously, how impactful is not having that time signal relative to systems that we have on board? When are those things going to break? With that as well, currently this is a general statement, we don't think the clocks that are in use today do a very good job. A couple examples is we're working with a KOR-24A for Link 16, which has nanosecond requirements. When we are not in line of sight with the NTR, we have about seven to nine minutes before we lose that time. And then our aircraft itself doesn't even have good clocks to hold time for certain periods of time. So, does it need this system inside of there? We don't know. The biggest thing that's being proposed, is we need something to carry us over from the times that we don't have a clear look to the sky for that timing signal so that we can continue to operate until we get that next second look to get us back healthy again with time. The follow-on question is, how much time accuracy do we need? Kind of talked Link 16 by itself needs nanoseconds. How long do we need this accurate? What does that hold over time? What can we achieve with the state of technology today? Are there clocks or are there solutions we should be getting after for just even the pieces of equipment that we have on board, that we should be looking at integrating into those pieces of equipment to solve this problem for the future.

5. How close to true time does the initial time need to be before holdover occurs?
   That's some of the question we have ourselves: how do we know when that time is beginning to slip? And either through the jamming of the signal or even a potential spoofing of the signal. Both scenarios are concerns we have, understand those protocols do that work for you. If we were to go to the biggest extreme, we're looking at that nanosecond range for the Link 16 holdover.

6. Is there any difference in performance or feature set between the Large Mobility and Small Personnel Version, or is one a base station for the other?
   Yes and no. From our perspective, when we're doing integration, we always look at our smallest problem set or the platform that has the least amount of weight to give up and the space available for them. If you can build something that meets the worst case or the most disadvantaged user and that's usable in the larger platform, then that's absolutely fantastic.

However, the rotary and assets have the ability to carry something a little bit larger. We wouldn't necessarily call it a base station for the other, rather than an opportunity to update disadvantaged user when that opportunity arises. From PEO-TIS' perspective, we have some really small UAV platforms as well as the Manpack and handheld radios. We don't know what's out there and what would be possible other than thinking from our perspective, SWaP is a huge concern. Some of the things we've seen are larger and would fit on the larger platforms like vehicles and aircraft. We're just looking for the realm of the possible. What is out there that we could potentially utilize in our really small, disadvantaged user scenarios?

7. Can you clarify if the L1/L2 SAASM interface is on the RF side or the demodulated signal side? I.e.; do we need a SAASM receiver integrated to our approach?
   We have SAASM receivers on our radios and in platforms, we're good as far as that side. If you needed some type of output from it, but unless you're integrating directly into the hardware of the radios, you're not going to get access to the demodulated signal. If you need that in your approach, that could be something that we could look towards working and trying to get some type of integration with the vendors. But we do have SAASM on there, so you wouldn't necessarily have to provide your own SAASM. Again, it just depends on your approach.

8. Is LEO signal of opportunity and derived Timing specifically Ku band LEO constellation writhing scope?
   From our perspective, we're not going to define the solution. What we are mindful of is how much new equipment do we have to bring on board in order to receive those signals. It appears that LEO is a very viable and a little less vulnerable solution, a little bit more resilient in those areas, as has been recently demonstrated. It is not out of the picture.

9. Who is an employee - on the project or in general (ref. RFP page 2) Does in Indian on an OPT visa qualify?
   The employee would not disqualify the company from submitting a proposal, but Foreign Nationals are generally disqualified from participating in the SBIR Program unless they have green cards. Each case would be handled on a case-by-case basis.

10. Is EMP (electromagnetic pulse) hardening valuable?
    Anything is valuable that protects us against the threat. We just have to put this again, relative to the size, weight and power that we're going to be bringing on board, either an aircraft or a disadvantaged user to support the solid timing question.

11. Which element of PNT is the key element e.g positioning, navigation or timing or all 3?
    What we're looking at here is we're focusing on timing, but if there's something that probably feeds another opportunity, we don't think anybody would push it away.

12. Is the intent for PEO-TIS to help develop this capability with this SOFWERX open call for all of SOCOM capabilities that are reliant on GPS?

From PEO TIS's perspective, we sort of wrote this RFI with the radios in mind, given that, C4 is in a lot of the other PEOs. There may be a need for this capability across the platforms and other PEOs, but we were just looking at this from our perspective for now, that what we could do as our radios are reliant on timing in certain situations, and the waveforms. If a great solution came out, any of the other PEOs would be more than welcome to come in and join it. We don't drive their solutions, so we could propose it to them as a way that we solve the problem, but it's up to them as platform integrators to ultimately come up with how they want to solve timing on their platforms.

13. How many Phase I's are you currently considering awarding?
    On average we award between 1 to 3. This is an open topic which tends to get more proposals, so that'll all be decided once we've got the proposals and the PEO decides that there's some good solutions out there.

14. Does the timing service be referenced back to UTC? Zulu time and the accuracy, drift time period e.g nanosecond and 1 nanosecond in 24h
    Yes, that's what we're going back to. We're going back to UTC. We are looking to understand the state of possible and what we can achieve relative to the SWaP required in order to achieve it. Having something more loosely defined is better. We would be looking at tradeoffs. If you were like, for this SWaP, we can get you 1 nanosecond drip in 24 hours, but we could decrease the SWaP significantly if we went to a microsecond in this time or something to that standpoint. So just so we can see what the trade space is and then compare it against the various waveforms that we have, and we want to support.

15. Are cleared facilities or personnel preferred?
    That really depends on the technology that's being presented and the classification of that technology.

16. Clarification: is a SAASM receiver to be integrated in the solution or is this an existing receiver that we integrate with?
    We are not asking for a SAASM receiver to be integrated into the solution. We are looking for alternative PNT solutions in GPS denied environments. The existing Program of Record radios already have a SAASM receiver.

17. Is this program open to non-US companies e.g UK technology company?
    This is a US based program, so all participants must be based in the US.

18. You have a spec for drift, but not a spec for how close to true one must start. Are they the same? And how long do we have to train on a true time source?
    The questions that we're asking and evaluating on our time is how much time accuracy do we need? We asked how far away from UTC are we? And then the second part of that is, how long do we need this accuracy? For the hold over time, how long can we hold it? One of the questions we also have is trying to understand how long does this clock need to be

disciplined? Because we think that is a factor in the hold over time. Even then, from what source the disciplining is taking place. This is a research project, so we're given somewhat, not going to say loose specs, but we want to know what's in the realm of possible. If you say that "I had a source and I could train for x amount of time, then I can give you this accuracy for this amount of time, but if I could train longer…", we are looking for those answers in your solution, and then we evaluate them.

19. Can the time syncing be local (within the swarm), meaning all vehicles are synced together or do they need to be referenced to GPS time?
    Technically, yes, they all could be just local and not be referenced to GPS time. The problem would arise if somebody new tried to join the swarm. That is not. So how do you pull them in? Or how do they get pulled in? But it is not that the GPS time is not necessarily the critical one in a lot of these cases. It's just that making sure that everybody is on a similar time and as somebody might come in later, that they somehow get on that same time basis. Keep in mind that all of the assets that join the party aren't necessarily starting off at the same location. There has to be some means for all of the players to be able to make sure they are on the same time.

20. Can a proposing US company have a UK based subcontractor as a part of their solution?
    In SBIR, the sub-awardee does not have to be located in the United States. However, all of the R&D work performed by the sub-awardee must be done in the U.S., so an SBIR application involving a foreign sub-awardee needs to address how that person or entity will be able to fulfill the "all R&D done in the US" requirement.

21. You mention rotary wing platforms. Is this the primary and only platform to solve for aPNT? Context is important for Air/Maritime/Ground units to solve for.
    If you find a solution that works across multiple platforms, that's going to be acceptable for each of those, that's going to be key. That's always an opportunity there. The only thing that would be considered is understanding maybe some differences where, for example, in a rotary wing platform, you're going to probably see some, some bigger differences in temperatures, some higher frequency ranges. Something like a maritime boat is probably going to have some very low, very robust frequencies that they're dealing with as they are slamming against the wave. All of those are going to come into consideration.

22. Is there a goal for a target cost (ballpark)?
    The Phase I has a Not to Exceed of $175K.

23. Are there any specific WF we should be aware of. Can the WF be leveraged to sync or is sync independent of WF?
    Yes and no. This is kind of us looking at the solutions that you are proposing if we can capitalize on an existing waveform or do we need a new waveform is the question that we would propose back.

24. Is the program considerate of a direct to Phase II or Phase III SBIR?

Only Phase I proposals will be accepted.

25. Are the drift requirements the same for the mobility platform and dismounted units?
    It all depends on the trade space.

26. PEO TIS. IRT C4 Tac Radios solutions. Is it designed to be integrated into current or new inventory? This determines possibilities of tech could be used.
    On the rotary wing piece, we think that there are two pieces here. The autonomous ability to hold over time, in our heads, needs to be its own piece of equipment that can service multiple pieces of equipment. The second part of that is kind of a spin off on what was talked about earlier, which is, are we building our hardware with the right clocks to also be able to live through that lack of a timing signal? From the disadvantaged user more so, it would be potentially integrated instead of a new thing for a user to carry. But, integrated can be done a couple of different ways. It could be in the radio; for our current inventory has a mission module capability. We could potentially put something into a mission module form factor to serve. If there is very good technology that came up that just needed to go into the radio, then we could also be looking at future hardware mods or just a new inventory or new requirements in the future.

27. Are there jitter requirements?
    These are some still outstanding questions that we have. This is an opportunity for us to get smarter on the whole trade space and solution space that is out there.

28. Is there opportunity for non US companies to tech transfer or license early TRL solutions to us companies for further development?
    A non US-based company is welcome to use ESOF to submit a white paper or register on Vulcan. Go to the SOCOM website and go to Do Business with SOCOM and you'll see some different opportunities there. There's also Tech Tuesdays at SOFWERX. There might be some opportunities there.

29. Is there a plan for Direct to Phase II?
    There's no plan for a Direct to Phase II on this topic. This is an open topic, Phase I.

30. Are we correct to assume that PEO TIS is the sponsor of this open topic? I may have missed that earlier
    Yes, PEO-TIS is the sponsor of this open topic.

31. Does the RFP require CUICMMC compliance?
    No. This is just a feasibility study. So no, it wouldn't be required at this point.

32. Is there a targeted run time for battery operations?
    This goes in to help us understand what is possible. There were some size and weight ideals in the RFP or topic description. Take that as your starting point to see what you can achieve with the size of what we kind of gave you there. From a radio perspective, we don't know how this

would affect radio operations. Obviously, the users are always looking for increased battery life, reduced swap. We're just trying to understand what we can do. From the rotary wing perspective, we've all obviously carried our own energy capability here. We're looking at a means of being able to keep power to the clock as we move it. We're expecting that it's going to have to be in a mission command area before we take it out to the aircraft and bring it into operation. From what we have learned today, the longer that you discipline the clock, the longer and more accurate that holdover time is going to be. There's going to be a transition time from us taking it from the operations area out to the aircraft and we need to cover that. Not saying that this is the requirement, but right now we are looking at 6 hours and then everything is going to be relative to what you're able to tell us, what is in the art of the possible in creating that trade space.

33. Is there a convergence time for sync e.g within 1 min to hit sync
    We don't believe an actual time was given in the topic description, but from a radio perspective, we don't know how this would affect radio operations. The users are always looking for increased battery life, reduced SWaP. We're just trying to understand what we can do. From the rotary wing perspective, we all obviously carry our own energy capability here. We're looking at a means of being able to keep power to the clock as we move it. We're expecting that it's going to have to be in a mission command area before we take it out to the aircraft and bring it into operation. From what we have learned today is the longer that you discipline the clock, the longer and more accurate that holdover time is going to be. There's going to be a transition time from us taking it from the operations area out to the aircraft and we need to cover that. Not saying that this is the requirement, but right now we are looking at 6 hours, and then everything is going to be relative to what you're able to tell us, what is in the art of the possible in creating that trade space.

34. Is there a standardized connector spec- for whatever else the unit needs to connect to?
    Sustainability is a big piece of this. What we want to do is keep with the military spec connectors that are readily available. We do not want to go to unique connectors that are expensive and not line repairable.

35. Is quantum clock an option?
    We don't know, that's kind of what we're looking for is answers to these types of questions.

36. Is the timing element a 1pps or 10mhz clock
    Focused on the 1pps, but not saying that the clock is not an option. We're looking at that 1 pps as being that signal and then the BCD to tell us what time that second dropped on.

37. Does the solution also need to generate NMEA message?
    We don't know, but the more opportunities you create are probably more opportunities for other users to ingest the time and maybe open up your market.

38. What radio are you wanting to interface to?
    The rotary wing answer is we're looking for an appliance that will feed multiple systems on the aircraft. For PEO-TIS, it's any of our program of record radios that are within the existing program of record.

39. When does the window for submissions close?
    29 October 12:00PM ET (noon)