SOFWERX

AIM Micro Sensors AE Q&A Telecon Transcript

events.sofwerx.org/aimmicrosensors

Tentative Event Timeline:

~~Completed Phase 1 – 11 May 2022 Government Only Collaboration Event (CE)~~
~~Completed Phase 2 – 30 August 2022 Industry, Academia, and Laboratory Collaboration Event (CE)~~

Phase 3 – 21 October 2022 to 23 November 2022 Submissions to the Assessment Event (AE) Open

~~Completed Phase 3a – 10 November 2022 Q&A Telecon~~

Phase 4 – 28 November 2022 to 07 December 2022 Down select
Phase 5 – 18 January 2023 to 20 January 2023 Assessment Event (AE)

1. **Does the proposed solution have to address all three Problem Statements?**
   CBRN micro sensors will have multiple use cases. So, the problem statements are just an idea to point us in the right direction, so I wouldn't say it would have to address all three.
   The proposed solution(s) does NOT need to address all 3 problem statements. Select the one (or more) problem statement(s) that your proposed solution addresses.

2. **Can you please indicate the level and structure of funding?**
   Funding will be disclosed if/when CBC (and partners) chooses to move forward with vendor(s) following the Assessment Event.

3. **What maturity level for the sensing device is appropriate to submit?**
   TRL 1-3. Maturity will occur during the development period in the program. But, if you have mature sensors, then those will still be considered. TRL should reflect the ability to deliver a proof of concept at the end of the PoP. PoPs will be focused on 6–9-month efforts

4. **For Problem Area 1, does the solution have to physically collect the hazard or is it sufficient that it just detects and/or identify the hazard?**
   Currently detection is the priority. Identification would be a long-term goal as the program matures. We're not looking for anything to collect a sample or anything. Just detect, and if it can identify then that's good. As the program matures and technology becomes more available, yes, identification is definitely something that we would want, but as of right now, it's sufficient for it to just detect.

5. **Can you please discuss the communications architecture - how do sensors communicate or report data**
   So, this is being ironed out right now, and the program this will tie you into is CSC2, which will be the command structure for the chemical reporting sensors. So essentially these sensors, as they're set up through the army, will gather the data, report that data to a sensor controller module, i.e. what is called CSC2, and that sensor controller module will be the entry point into the army network via either a mobile, handheld device or a mounted command platform device in order to get the information displayed all the up at the joint level on the CBCE computing environment.

6. **How do we indicate the collaborator we have in the white paper?**

Commented [BSCUD(1)]: Want to verify the TRL level. This seems appropriate to me.

Commented [WKSMCUA2R1]: TRL should reflect the ability to deliver a proof of concept at the end of the PoP. PoPs will be focused on 6-9 month efforts

Commented [BSCUD(3)]: Not sure about the response to this question.

Commented [WKSMCUA4R3]: Alan Samuels should address

Indicate that on the first page, that title page, where it asks about your company name. Include the other company name, if applicable. Maybe you could go into more detail if you have a room in the rest of the white Paper. Also be sure to delineate which company is carrying out the specific areas of the work.

7. **Can you elaborate on the ideal form factor of the solution?**
ARMY: So, the language that we have written in our requirements document, we just say CMS must physically be small, lightweight, as a military utility. We describe the size and weight in the problem statement. We are not trying to develop a traditional handheld detection device. It's like the size of a tennis ball or hockey puck or smaller.

SOCOM: I think a good frame of reference is when you look at from an unmanned systems perspective, and the sensors that are currently on those, those are typically big, and can only be flying around the outside of facilities. And when we're thinking of micro or small, we're thinking of something that could potentially be put on a very small UAS and operated indoors, and you know the size of the sensors right now doesn't allow that for the technology. So that's one of the things I think of.

> **Commented [WU5]:** I think this statement is ok to keep

8. **What specific target priorities are given (e.g., specific virus/bacterium/chemical)? This has a direct impact on effort/design.**
SOCOM: We are initially interested in high volatility chemical warfare agents for vapor detection followed by the more difficult area of aerosolized threats. There is also an interest in traditional HAZMAT threats including O2 & LEL. This would include chemicals likely to have immediate or acute impacts to warfighters.
And then, once you get to the bio space, we're trying to push the cusp on this now, realizing that there is very little between HHA and PCR. So, if there is something there, that meets the scenarios we'd be interested in some of the more common bacteria threats or toxins, viruses along with small radiological/nuclear detectors.
ARMY: Common CDAs, and NTAs are of interest. The only difference is that, for RAD, we just gave a threshold of Gamma, at least, gamma. And then all the rest of them as objectives if we could get down that far. And the only other difference is that we added in some TICs. So, the common chemicals, he described. We have all of that inside of the problem statement document as well.

9. **Is the $200 cost bogey in production a hard and fast number?**
SOCOM: Yeah, I think, from SOCOM's perspective the cost production unit is a conversation to be had later. Understanding that initial investment does cost money, and then we could buy down that cost by establishing production lines and getting commercial industry buy in, I'm personally not stuck to the $200. If you're coming in at $200,000, then, somewhere between $200-$200,000, there's wiggle room.
ARMY: So I think where this question comes from, $200 cost bogey in production, hard and fast number. So I'd say that is the initial vision. If we're entertaining this as a disposable option, but I will also echo the SOCOM response. There is trade space there. So if there are other options in terms of where to gain some C-SWaP performance from this becomes a recoverable sensor, or there's other performance measures gained $200 is not a hard and fast number, but that's just our initial and tentative vision, that is potentially a disposable option, and so cost does come into play with it for that.

> **Commented [BSCUD(6)]:** Where did $200 come from?
>
> **Commented [WKSMCUA7R6]:** Not sure. Low cost is our target….propose what you have at the prototype level then estimate what it could be in production

We have not set a specific cost for these sensors, capability and level of sophistication will determine cost. We have left the field open to recoverable and nonrecoverable sensors which may be determined based on price point and capability. Suggest that you propose a prototype level estimate and then what you anticipate production would be per 1000 units.

10. **Are you looking for software/data solutions? For low-SWaP data processing at the point of collection? Or the architecture into which sensors will plug and play?**
    SOCOM: I think for SOCOM, we're only looking for the hardware solution. Software that would drive the device, once it passes off into the established architecture, for the COM network, like the Army mentioned CSE-2, and then SOCOM we have the Enterprise Exchange information. So we're not looking for the back end architecture, but really just the front end analysis and collection of the data and the limited ability to transfer that data and then get it onto the network from there.
    ARMY: I would concur from the Army side, and I don't think we're looking for this to be a software-driven solution. But do understand that there will be some required software just to make the hardware, the sensing aspect of this run, and make the sensor able to actually connect to the network. But outside of that the primary software component will be a different piece of the architecture, a different program of which this will plug into in order to tie into the overall network picture.

11. **Where are the Problem Areas defined? Link to document(s)? Thank you!**
    Events.sofwerx.org/aimmicrosensors (bottom of the webpage)

12. **Without very technical industry terms; what is the most efficient way to pipeline products into SBIRs/SOFWERX/etc from outside DoD?**
    https://www.socom.mil/SOF-ATL/Pages/eSOF-main.aspx

    You can submit some basic information in there that will make its way around and get your white paper proposal in the system. For SOCOM, if somebody mentioned something and I need a detector, then I can go in, and I could reference that and then we can work through SOF AT&L to set up meetings. But Claire, you could probably talk a little more about SOFWERX and the SBIR process.

    SOFWERX: Our main process is that SOCOM will come to us with a problem/topic, we discuss and decide on a SOFWERX mechanism (or event structure) that will fit their problem set the best. Once we have that planned, we release it to our Ecosystem (email list: you can join by going to sofwerx.org/ecosystem), and we ask for submissions. That's the traditional route. However, there are other mechanisms for non-traditionals/small businesses/other non-DoD entities to get involved at SOFWERX. One of them is our weekly Tech Tuesday program. We are constantly asking for transformational technology to be submitted on our Tech Tuesday portal. By submitting, you may be selected to give a 30-minute virtual presentation to a government-only audience on a Tuesday afternoon. This audience is not only SOCOM, but other government entities as well. For more information, please visit: sofwerx.org/techtuesday/

For SOCOM's Small Business Innovation Research (SBIR), we advertise their topics when they are requesting proposals, we host their virtual Q&A Telecons, we set-up one-on-one briefs, and our program managers set up their contracts (Phase I, Phase II, and out of cycle Phase II). SBIR is a great avenue to work with SOCOM.

For any event related questions, please contact Claire Hawley, Claire.hawley@sofwerx.org

13. **Picking up on the cost discussion, so if our sensor was on a Group 2 and could be recoverable would you consider a sensor that was in the $20,000 range?**
SOCOM: From SOCOM's perspective, I think depending on the capability you submitted, in the $20,000 range, and what that SWaP-C was, then we could definitely have the discussion, especially if it's recoverable. I've seen some significant cost reductions. Once we establish program lines or production lines and when working with industry. Typically, whatever you have that it is capable of that would probably have commercial interest that would drive that price down. But Army probably has different opinion
ARMY: I will take a similar stance as to what SOCOM just reported. Really $20,000 - yes, we would consider it, pending the other SWaP-C trade-offs. But it would be measured against anything that's also lower in the cost range, so it really just depends. Although as you start creeping up in price, it does change the overall con-op so the way it would be deployed would have to be recoverable and we'd have to make sure it makes sense from a recurring use standpoint in terms of large-scale common operations that we would truly be able to recover it and gain the capability that we need with that sensor.
SOCOM: There are different echelons and tiers of information. So, if we're pushing this micro sensor and we're trying to get after a similar concept where we're pushing a lot of these out to potentially non-technical forces that we're asking them to receive whether it's a red light-green light, or maybe a detect and identify. We're really starting to push the cusp of how much that should cost ideally. If you find a way to smash GCMS into a 2lb box for $20,000, then I'll take it.

14. **If yes to a field-deployable organism, what does "non-recoverable" mean? Would DNA, fluorescence, or luminescence readouts be considered non-recoverable?**
SOCOM: We're working on something similar to this right now. And this concept came up that potentially, I have a DNA sequencing capability, that's relatively cheap compared to the laboratory scale stuff. And it's small and lightweight. If I could just throw that away, understanding that once you get exposed to an organism, and vs. investing a ton of money and making it heavier, and more expensive to survive decon, then that's kind of the trade space in the discussion that we would be at.
ARMY: Yeah and I think that we're taking the same stance. If it can do DNA and gene sequencing, we would definitely like to see it. And I don't think that something like that would be reusable.

15. **Would deployment of a purely biological solution, with detection via a stand-off device be appropriate?**
SOCOM: So I think you're getting after a physical stand-off, so not a non-contact, but just a mechanical stand-off somehow, between you and the sample medium. That would help with the sample sampling itself. But as far as the device goes, I assume that

Commented [WU8]: redundant

would probably add a significant amount of weight by having to add a drone or plane. We're looking at adding, there's a couple of government programs in the works now, where we have an, almost like a DFU. A filter collection type on a drone that could fly around and collect a sample, then we bring it back and inactivate the sample, and then run it through PCR. So that's the kind of example of what we're already working on.

ARMY: And for our side, we use an anomaly detection. So we have a little bit of stand-off already. I don't know how this could be incorporated into micro-sensors but if it's possible, then we would definitely like to see it.

16. **Revisiting the stand-off question. If we could get close to the two-pound weight bogey with a stand-off plume sensor for a group 2 is that of interest**

SOCOM: The biggest thing for us when it comes to UAV and UAS integration, is we typically cannot buy platforms. So if you're going to integrate into a platform, it's got to be a government program of record, a UAS. So you're really just adding a 2lb stand-off capability, so in this case the sensor itself would be a 2lb stand-off plume sensor. And that yeah, of course, that would definitely be of interest, but we wouldn't be interested in buying a full package UAV that's some commercial, non-government program of record one.

ARMY: Same stance. Look more toward modular mission payloads. That can be added onto various UASs.

17. **You mentioned CSC2 as the target sensor integration platform, but Prob Statement 3 requests a Sensor Integration and Delivery platform. Is such a platform of interest?**

I think we would be willing to take a look at that platform as we start to roll out CSC2. It also generates options, but **the primary purpose of micro sensors is no not looking for the actual sensor controller platform, or that piece of the network** that is, two separate components, two separate products so for micro-sensors. It will be independent of this sensor integration software or hardware device. But concurrently, we are looking at a way to standardize this, and that's what CSE-2 is, it'll be the approach to standardize command and control of CBRN sensors. If the solution can integrate into CSC2, that's a plus but don't focus on that at this point.

> **Commented [BSCUD(9)]:** Again, do we want to be so specific on this?

> **Commented [WKSMCUA10R9]:** Too specific - CSC2 is downstream. If their solution can integrate into CSC2, that's a plus but don't focus on that at this point.

18. **What are SOCOM's operational parameters? Would deployment of a purely biological solution, with detection via a stand-off device (e.g., hand-held telescope, drone, plane, satellite) be appropriate?**

SOCOM: I think we already answered this one earlier with my example that you we're looking at drones right now that do collect bio specimens, whether in aerosol form, around an objective, and then we bring that back, inactivate it, and then run it through a PCR. As an example. So if you had something similar, fitting this micro sensor construct, then sure.

ARMY: same answer

> **Commented [BSCUD(11)]:** I feel like we are so focused on SOCOM's preferences throughout the responses when they aren't the ones kicking in the $$$... Thoughts?

> **Commented [WKSMCUA12R11]:** Proposed solutions should address Army and SOCOM requirements.

> **Commented [WU13]:** I agree but since Army concurred with the statement then we can let this stay

19. **Could the product be a signaling organism that persists for the needed time in the operational environment? interest in an engineered organism and/or a device?**

SOCOM: I'm assuming a signaling organism that they're talking about something that would potentially change color or notify the presence of whether it be a toxin or a certain DNA or other pathogen organism. Probably more like a wet scale lab stuff.

Submit it. We see it, and it's of interest between us and the Army, I'm sure we know people that could invest in it further if it doesn't exactly meet this problem statement.

20. **Partnering with CCBC is an option?**

Performers can partner with CBC – i.e. to conduct testing, or through CRADAs, TSAs, etc.

21. **What program duration are you looking for? And what TRL beginning versus end are you expecting?**

SOCOM: It would have to be at least validated in a lab (TRL 4) before we brought it out as an operational prototype. But we want to see that you could actually execute at that SWaP-C. We're asking you for what you say you could do before we transition over.
Army: Spot on.

22. **Does the solution need to integrate to ATAK or a higher-level network? What file format are you expecting COT/ISA etc?**

SOCOM: SOCOM at least, we're big into integrating in ATAK, minimal integration. So not like flashing red lights, potentially getting rid of an operator's situational awareness by flashing an alarm every time something comes up, covering up his screen. But, getting into ATAK, through different means of communication, there's different types of network backbones that you can get into ATAK with. Then we typically use ATAK as a clearing house to push information on to the SOF network. So, when you're talking file format, the smaller the better, more streamlined, obviously no executables, or and then a heavy limitation on any proprietary information, most likely not looking for, raw spectra to be pushed over the network from a micro sensor.

ARMY: Yes from the army side, it'll end up with a strong push towards the ATAK operating system as well in the architecture. So if you're asking COT vs. ISA, I would say it's TBD. It will likely end up in the software, maybe being converted to a COT. But, in accordance with the Army computing environment (CE), sensor CEs, currently we were taking a look at asking all sensors to originate in ISA, and we're analyzing whether we're going to our controller or controller module, and that CSE-2, as referenced, will potentially be the area we're converting ISA to COT. But we would also consider just straight communication from the sensor in COT, and try and implement that in the architecture. So I don't have a final answer on that for you until we finalize what CSE-2 looks like for us.

23. **Is there desired programmatic compatibility/leverage with JPEO-CBRND Wearable Sensors initiative for this RFP?**

SOCOM: For SOCOM, I wouldn't say "a desired programmatic capability," it would be nice, but really that integration into the ATAK, the wearable itself, for SOCOM, we're looking for something that collects physiologic information, and then ultimately feeds that back through the ATAK through a separate information channel. So this would be outside of that wearable space.

ARMY: Concur. I think micro sensors and wearable will likely leverage the same architecture, but they do not have to leverage each other. But they'll both end up in the same information domain, on in TAK.

24. **How important is simultaneous multi-chemical detection?**

SOCOM: You really have those different tiers or echelons of information that we need. We're really focusing with the microsensor similar what the army is asking for – a

smaller sensor that gets after the more acute health effect chemical warfare agents and TICs, so simultaneous detection of those. I know that the CV-CAD is the baseline right now, which is, a couple of the primary CWA vapors, and then the easy VOCs that you can go after with the chemical detector not having to phase change within the device. So, it is pretty important to not just push a one trick pony out there that's 2lbs. We're looking at condensing capability and fielding something that's useful across at least those targeted CWAs and the easier VOCs

ARMY: Anytime that you can get multiple detection or multiple types of sensors rolled into one, that's a great modernization. So, I wouldn't say It's like top notch important for this, but it's important.

25. **Biological, persistent "solution," widely scattered in theatre. The bio then enables detection via a stand-off device, e.g., UAV etc. In-scope and of interest?**

SOCOM: What you're describing really sounds like JBTDS. If you're not familiar with that program, we pulled out of JBTDS because we didn't see the need. The tech is really difficult to accomplish a perimeter-based 24/7 bio detection module from a stand-off. So if you have a better answer than what they came up with in JBTDS, then maybe we could have a discussion. But besides that, not really.

ARMY: We are a part of that effort. But I see you said "e.g. UAV" so if you have something small that can provide this, I think that's worth looking at.

26. **Deployed organism that detects specific DNA, and signals YES or NO via color/fluor, enabling stand-off detection.**

SOCOM: Yeah, I like the idea. We'd have to have conversations on what's the specific, DNA, and what the limitations of pathogens or strains that it's targeting. From a SOCOM perspective we are trying to get away from, having to keep pace with the threats, which includes this whole new arena of weaponized biology. Whether natural or an engineered or purposeful mutation in DNA and pathogens, if they find out what we're looking for in that organism that we're using as a target, then they could escape that by modifying potentially some of those strains. We could always have the conversation further to see how many different pathogens you're able to detect.

27. **Is SOCOM's ask a single, multi-detection (multi-target) object, and/or multiple single-detection objects?**

SOCOM: If you gave me something that only detected aerosolized threats, but it was within, , thirty seconds, and you could tell me down to that EC-16 or at least IDLH, and it was only one pound or half a pound that I could only use it when I go into those environments where that's a higher threat risk, then that would be something I'd like to talk about. Also, if you have an understanding of an aerosolized threat and it might be a separate technology, and you are trying to ask too much of that one technology which may add to false alarms, and the expense that's different.

ARMY: We'll echo that. I think within reason we will take a look at multiple detectors. The objective from, talking to the schoolhouse and the modernization strategy here is that at some point in the future we continue to condense down close towards that single multi-detection capability up from one sensor. But knowing that is likely a bridge too far I think the obvious answer is, there will always be multiple detectors for the foreseeable future.

> **Commented [BSCUD(14)]:** Again… Is it SOCOM's ask??

> **Commented [WKSMCUA15R14]:** Needs to address both Army and SOCOM - this is a joint effort

But it's within reason. Don't have to carry around 10-20 different detectors. Really, if you can have 3-5 detectors, something of that nature, I think, it is within reason.

28. **Should sensor include power supply/battery internally or do you anticipate different packages for sensor where battery requirements would change?**
We are most interested in the sensor a standard non-proprietary battery is best. If unique power supply requirements arise, we will address that in another opportunity.

29. **What is the expected time from deployment to signal (positive identification of hazard)? Minutes/hours/days; medium-long remote monitoring?**
We are interested in understanding what your sensor is currently capable of providing. If your sensor has the capability for a variety of responses such as class based in a shorter period and identification over a longer timeframe provide that information. SOCOM: I've mentioned a couple of times. So really that acute hazard area, so under thirty seconds or under a minute is kind of a baseline for most of those agents that we're dealing with. Once you start increasing that that threshold or higher levels of contamination that we want to know sooner. Ideally right before or after we walk in the door, we're getting an alarm. I think, in the example of the bio, the larger pathogens over a dispersed area stand-off monitoring, that may not be as immediate understanding that you know it has. If you're running PCR, or something like that, I may take some time to get an answer.

30. **Are there requirements for stability of the device or deployed organism?**
SOCOM: For our operational context, almost everything we plan around is a twelve-hour mission cycle. So, if we're going to use a sensor, it's got to last for at least that twelve-hour mission cycle, when you back it up and do your pre combat checks and inspections. You're probably talking an extra two hours, so fourteen hours total. So, your battery life, you should be targeting that in a continuous run mode and worst case scenario they're stuck on the objective, and then after that we'll look to mission cycles, which are six to nine month deployment cycles. And that's kind of how I describe most of our capabilities in those two contexts.
ARMY: I would say, there's trade space there on the army side in terms of how long we're looking for it to operate. So, this, in conjunction with the SWaP-C, in conjunction with the battery question, the army's perspective, the con-op they're moving towards, and the objective space is that we'd have something that would be able to last through a duration of seventy-two and ninety-six hours. So throughout the duration of one mission that this is planned against, I think the threshold expectation is that this would last around twenty-four hours initially, so that throughout that mission set you do not have an entire unit trying to continuously redeploy these more than one time in the twenty-four hour period. So that's initially expecting twenty-four hour able to last through that. Again, that goes into the disposability as well. This is all SWaP-C questions, and all these questions are interrelated, but I think twenty-four hours would be our initial expectation for it to last through with our objective of seventy two to ninety-six. I'm. Thinking that we can dispose of it as well.

31. **Are you only looking for the sensor to detect? Or detect and identify? Would samples be able to be collected and measured by a device in a base? Or would the device need to be measured in the field?**

SOCOM: Operationally, we're looking for in a micro-sensor, at least a detection. So it doesn't have to collect a sample. If the detection goes off, then we'll bring in more technical instruments to really figure out what's there. Anything above that, you're really just buying into the trade space and the SWaP-C conversation.

ARMY: I'll echo that from the Army side. Our expectation, or the intent and vision going into this is that no, we don't need this to identify or collect samples. I think, really detect is our baseline metric because we're just trying to generate enough information to be able to gain awareness of the battlefield prior to us reaching that area.

32. **What is the length of the Program Objective Memorandum (POM) cycle?**
So right now we're doing the POM cycle for 2025-2029. That will be approved this summer. What I think you're asking is how soon can you get money. And that'd be more of a question for DEVCOM and DTRA. But from a programmatic standpoint, if this were to become a program, it would probably be 2026-2030 or beyond.

33. **On a field-deployable organism, what does "non-recoverable" mean? Would DNA, fluorescence, or luminescence readouts be considered non-recoverable?**
Although Bio was not our focus if you have a potential solution then propose it and state its advantages and limitations. For example, currently in the bio-space we have the hand-held amino assays and once they are exposed, they will get an answer and if we really need to bring that answer back then typically, we will just throw away the HHA or burn them, depending on where we are at. Then we will just bring the sample back. In the example that I gave using the DNA sequencer earlier, once that sample touched that device there was no way to stand off the HHA or the hand-held assay was just the ammino assay detection technology that we use for bio. It is just the small tickets, either 14 or 10 that they bring on an objective, that's a really quick way to get us an answer. For DNA, once it makes contact, we throw it away. For us it's luminescence or something similar, unless you can find a way to have some type of stand-off. We do have a capability to inactivate samples on or near the objective and bring them back as well.

> **Commented [BSCUD(19)]:** This didn't answer the question really.

> **Commented [WKSMCUA20R19]:** Bio wasn't our focus but if they have anything, propose it and the limitations

34. **Regarding the white paper format: can we place references/citations of our prior work in the footnotes (in the margin area)?**
If the information is critical to your response you need to work it into the space provided for their narrative. Referenced documents may not be reviewed.

35. **For Problem statement #3, "Deployable", what sort of range would you be looking for?**
Please propose your performance capabilities in terms of "deployment".

36. **Are you looking for a wearable or deployable sensor??**
Deployable sensors are priority. This call is not interested in any physiological sensors.

37. **You mentioned interest in detection/alerting of health effects, but the FAQ mentioned no wearable devices. Is a wearable sensor/device of interest?**
Deployable sensors are priority. This call is not interested in any physiological sensors.

38. **For vendors that may make sense to collaborate, should we submit independent proposals but mention/link to each other, or do you more desire a single proposal?**
We suggest submitting both the joint and individual proposals.

39. Expected time from deployment (of a bio reporter) to when (quick!) signal would be desired. Deployed minutes/hours/days in advance?
Propose what your technology is capable of. A suite of sensors is sought to address a multi-phased operational approach.

Commented [BSCUD(21):] These are all good, these are our responses.