Collider/Disrupter Event TFA#2 Q&A Telecon Transcript
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SOCOM TFA#2. Acoustic Sensor

Technology Focus Area Advocate: TVS/RSTA, PM TCC, PEO-TIS
Modernization Priority: Battlespace Awareness

1. **What's the emplacement CONOPs/CONEMP?**
   Really don't want to get into CONOPs discussions at this level. However, we will say that we're just trying to see what industry has to offer in the development of acoustic sensors to be used in either land, air or sea. We want it to be integrated into a camera system or perhaps to help trigger events or detect people or vessels or animals or false triggers or anything like that to see where current industry is right now. That's what we want to be looking at and evaluating and giving people an opportunity to approach us to offer their product from non-conventional methods. What we mean by that is the big industry, so other small companies having an opportunity to offer their products. Without getting into specific CONOPS, we are looking for things that would be employed by small teams since this is special operations and often carried by a person and set up by a small team or one, while possibly being transported and employed on the smaller or medium-sized vehicles as part of a larger force. Kind of scoping, we think what you're getting at with CONOP is often battery-powered. Sometimes you can plug it in, often carried by a person, one or more and employed that way, sometimes transported on a vehicle to wherever it's going to be employed. This is not a big service large system. Sometimes we want sensors just to be left stand-alone and out there for a bit, so maximum battery powered for anywhere from two days to six months. Now let's say no individual project or sensor here needs to accomplish everything we're talking about. We know that is unlikely to be possible, but the more pieces of what we talk about a given system can accomplish, the more useful it becomes.

2. **Submergible to what depth & time? Packable size & weight? Animals to distinguish from human? Do you have a tactical ISR System to integrate with our sensors?**
   Yes to all, but let me elaborate. For the time being if we're focused on this question we think is focused on maritime because it's asking submergible. We believe the depth, if we're trying to get an acoustic maritime sensor probably up to 100 meters is pretty reasonable. Time is anywhere between two days and six months, preferably battery-operated packable size and lightweight. Lots of trade-offs can be held in terms of size and weight. Depends, we realize maritime sensors do require a hardening that's different from ground sensors. Size and weight, it could be trade-offs and negotiable. To keep things general, lightweight so a person can carry it and place it. Yes, distinguished animals to humans, don't want the sensor going off all the time where if it's in a remote cow pasture area, you don't want to be tracking all the cows moving all the time. But if there's a human walking, maybe you want to know that and if it's in the maritime environment, yes, some marine life does make noises and things like that. Maybe being able to filter that out and just keep on man-made objects like boats or whatever and it will integrate with some of our systems. The important part of that is probably use commercial data sensing standards that we can integrate with our systems. As far as size and weight, we would

put out a large system to us is four medium Pelican cases with a pile of sensors in it. It doesn't all have to be packable by a man, but that's typically what we do. As far as does your system fit in the scope of what we're trying to get at, we would call it maybe a goodness factor. The closer you can come to what we're trying to achieve the more it fits what we're trying to do. There's no one-size-fits-all. As far as integration into our existing systems, yes, we usually ask for at least at the gateway point, if not further down to use your commercial or military standards that are nonunique to the company offering them let's say. We don't want to say non-proprietary because lots of public standards are proprietary in the sense that you have to license them, but using common standards so that we can integrate to other systems with a minimum of disruption and cost and a data feed of whatever type to do so.

3. **Is there a TRL range you are seeking?**
   Yes, we're seeking somewhere TRL 5-6 is ready to transition to a nine with some effort realizing that there are a lot of commercial off-the-shelf ideas that you probably be offering us. We're not interested in S&T efforts. Something that's already working, something that's already proven, but perhaps we need just to bring it up to speed to either talk to our systems or hardened for military applications.

4. **What is the target cost per unit in full-rate production?**
   That's a tricky question from the perspective of it depends on what your system is that you're offering. Is it just a little sensor that needs 3 or 4 integrated so it can detect some ground movement or people walking or is it a big, bigger, more articulate elaborate system. If the sensors at the unit single unit level, we would say individually we'd like to target something less than $5000 per sensor, but guess it depends on what you guys are offering and how it integrates into everything is, so kind of challenging to answer that cost per unit. Let me add, it's kind of a sliding scale of how much value does it add to the unit employing it and this is being paired with camera systems that may run the gamut from $1000 to $100,000 kits. So anywhere in that sliding range, the more value you add, the more likely it is to be purchased and deployed, the more expensive it is, the fewer units can have. It becomes a niche edge capability with only few units purchased rather than widely deployed. There's just not one answer to that.

5. **Is the emphasis to: (a) provide real-time, continuous data for an operator to monitor, or (b) alert an operator and provide time-late acoustic data snippets?**
   Both. It could be continuous or collect some sensor data and send at a pre-established time or when the operator wants to acquire it. The answer is yes to both.

6. **Should sensors be covert?**
   Don't want to get into too much detail on that, but we will say can it be buried or can withstand the elements of environmental considerations. Obviously covered up, it's not standing out or painted red with blinking lights all over it. Our point is, what reasonably can handle transport and can it handle the environmental conditions. Special Operations operates in a range of domains and appearances, so the more domains it can be in placed in, the better and to match whatever the operators want their presented profile to be, whether that be overt or covert.

7. **Is the ability to discriminate direction important - or just detection and classification?**
   Discriminate is always beneficial. Depends on the levels of sophistication or AI or ML that you've built into your system. It'd be a plus, but detect and classify is, we would say, that's probably at the starting level minimum, but it'd be nice to know where exactly that target is walking or located or not just detect somebody walking. Is it two people or is it three vehicles? Or is it just an animal that decided not to notify and where's it coming from? Yes, absolutely. The direction is of our interest as well, and how it all ties in together. This goes back to the sliding scale of value where all of the pieces are desired but the more things a kit can do for a given cost, the more valuable it is. Detect, classify, maybe uniquely identify, and geolocate. As you go up the scale of value, the more things you can do, the more valuable that sensor becomes to the operator. There's no one answer and all these will be reviewed later on for value given based on their capabilities.

8. **How is the desired capability different from prior efforts (https://www.sbir.gov/sbirsearch/detail/73143 https://www.sbir.gov/sbirsearch/detail/282033)?**
   Full disclosure, we haven't read all the SBIR proposals, but we glanced at these two linked ones and they're maritime-based applications which we see a value, but the point we're trying to make is, is it's not a SBIR white paper breadboard Phase I kind of thing. We're looking for more mature capabilities. If we have to invest some R&D into it, it's already at TRL level higher than 5/6.

9. **Can you provide a minimum level of maturity (TRL, MRL, etc) to be appropriate for this event?**
   TRL 5 or 6 should be appropriate. We are not developing new underlying technology here. Conceptually this effort would take a TRL 6 and take it to TRL 8 for user evaluation and feedback.

10. **With the transmitted signal, is low probability of detection a concern?**
    Yes, that would be. It depends if it's wireless or wired or what your solution is offering. Obviously LPD and LPI are buzzwords that ring along DoD a lot, but reliability is important too. We would say yes that it's a concern. If embedded communications are included, a system that does not have LPI/LPD qualities is much more limited in potential employment.

11. **For Maritime, is detecting and locating surface or submerged locations, and path a desired capability vs just acoustic signature (eg, detect boats, USVs etc)?**
    Yes, that's among things that are desired, identifying boats, vessels and whatever submerged objects we may find detect. Identifying and notifying us of that is desired.

12. **You mention family of sensors and integration into other kits. What protocols/data formats/etc are desired?**
    We briefly mentioned whatever commercial data formats typically are available, we would try to ingest that into our systems to be integrated as part of a bigger system that was alluded to earlier or just a standalone. Typically, we leave it to the industry often to define what the best protocol is for this use case, as long as it is an available accessible protocol that does not cause issues with integration to other systems usually. Preferably not propriety. Not in a sense of like

the MPEG group created compression standards for video and more, and it's used everywhere in its proprietary in the sense that it's licensed by the MPEG group, but it is publicly available, which is acceptable. This is a publicly available standard. We've encountered difficulties, as many others have in the past, of getting locked into somebody's particular interface and then it ends up being held to that company or standard, you have to always go back for any integration work and that makes things a lot more difficult in the long run. We don't have a specific one. We usually ask for publicly available standards, whether it be commercial, or government standards are also acceptable and that we can integrate into our other systems without specifying exactly what they are as an upfront requirement.

13. **Is innovation in the comms package or its integration that's part of this? Or is it acceptable to have 'placeholder' with standard interface for GOTS radio?**
    Yes, innovation in comms packages is interesting, but then it leads to specialized protocols or connectors or solutions that may not be readily available. We would agree, acceptable placeholder would be a standard interface for GOTS radios, at least in the first iteration if it's selected.

14. **Is there a ballpark quantity of sensors, or scale of coverage, that make sense as basis of estimate for this effort?**
    There is no ballpark quantity of sensors. Going back to the very first topics, we're just trying to see what you guys have to offer. Not knowing what you're offering, it's kind of hard to get an estimate based on cost or quantities and see how that integrates with us. There isn't a ballpark quantity.
    Keeping in mind that the sensors are attached to ISR systems, so cameras and whatnot and everything from the use of triggering or queuing to classify, record, and listen in. Those are all potential uses when attached to a ground ISR or maritime ISR system.

15. **For ground applications are you looking for broad areas more so than perimeters (or paths) or is there an application of greater need between those?**
    We hate to say it depends, but yes, sometimes they may be used in perimeter areas or paths. It's going back to what SOCOM does is anywhere in the world. At any time, anywhere in the world, we have to emplace something. If the system is more flexible to adjust to perimeters or paths or large ground areas, that's of interest but as well as specialized in areas so it depends, very challenging to answer those questions. Our sensors are used both for direct Intel gathering and also for protecting those who are gathering the Intel, so overlapping technologies there. A camera can be used for looking at what's in my environment, both for direct information gathering as well as making sure I know what's around me to protect myself. The answer is yes to both of those, and the more it can do, the more valuable it becomes as a kit.

16. **What is the expected range or coverage area sought for land and then maritime domains?**
    We'd like to be similar to what we want these devices to trigger. Perhaps cameras so that it can either pan, tilt, zoom into an area of interest or short ranges as well as long. If you're in the maritime domain, acoustic waves travel farther than ground-based ones and wow it's variable. It's trade-offs in what you have to offer, but there's no specific range that we're focused on.

17. **Is the ability to trigger other items important? What kind of testing/validation/confidence levels are needed for that to be useful?**
    Yes, it's important to help us gather more information better, like if it helped us discriminate a person or a group of people walking and triggering not only just a notification but also the queuing the camera or other systems that is important, that'd be probably a better use of the system because we don't think stand-alone systems going out in the future is what people are focused on. May be wrong, it's more of integrating systems into a more useful system that eliminates operator workload.
    Well, first to is to validate what you guys are offering does meet the metrics or the parameters that are identified. It would go through some statistical events couple 20 to 30/40/50 scenarios and get in the confidence of an interval from that and then from there we can make decisions on how is best to employ the sensor. It does go through some validation development tests.

18. **Data/comms protocol question follow-up. Are there existing systems that you can give as examples that might ingest this data?**
    We do have ingest systems both tactical, and they usually receive data over some sort of TCP/IP transport. In related standards trying to stay away from particular existing systems because don't want these tailored to a given system. But if the interface is with publicly accessible standards via both the connection transport and data protocol, then it should not be a heavy lift for existing systems to be able to integrate with. We don't think the outcome of this project is focused on integration per se, but that's not a limiting factor is more that we're looking for.

19. **Is rapid deployment a high priority, including automated, eg via drone?**
    You're talking about two things, emplacement of the sensor and how we field them. That could be one way of emplacing your sensor and it could be man-carried or automated. That's up to you to offer us a solution in the system. We would add that rapid deployment is a priority in the sense that it's going to be small teams pushing these forward and employing them, and they have hundreds if not thousands of other tasks to do, so making it reasonably simple and easy to employ is important.

20. **Is there a time frame that is targeted from TRL 5-6 to deployment? or what is not desirable?**
    From 5-6 to deployment, it just depends on how long we can make it fit the requirements upon contract award. Notionally speaking, you're at a 6 and we need to bring it to 8 or 9, give you anywhere between six months depending on the maturity level to maximum 18 months, which is not the desired, but anywhere between that time frame. Once we have the representative system or prototype, it would probably take another 8 to 12 months to get it tested and approved for fielding. A project like this can take anywhere between a year to two years. What's not desirable: more than that. We recognize that the commercial industry does modernize our equipment a lot faster than we in the government would like in terms of getting things tested and validated. We don't also want to stay in the development phases for a long time.

21. **Do you want AI solutions or are we feeding an existing AI system?**
    Yes to both. If you have low power, it depends on where power is. In our experience, on the tip of the sensor in the front-end, AI can consume a lot of power which is at the cost of long duration or batteries. At the same time, if it's a novel solution, we're willing to entertain its capability to be used, while at the same time, there may be systems out there that we have that can be able to ingest the data and provide some more AI to it. In other words, lessen the workload on the operator and making decisions quicker. It's usually looked at as the power trade-off between edge processing or back-end processing and how much does your comms solution consume power wise. The additional caveat is, the more you use your comms, the more you show up on other people's systems. It's trying to balance that trade-off. Yes to both, but it's within the scope of that trade-off.

22. **Should the T&E and validation effort required for high-confidence autonomous functionality (contractor labor to support/execute) be part of the ROM cost?**
    We don't know how complex the system is going to be for autonomous functionality. It just depends on what level of a system you guys are proposing. Absolutely. We would need to work together to test as a partner and develop troubleshooting, bug shooting, and proper emplacement and labor to develop it. Break it out (the T&E effort) so that the other parts can be compared apples to apples.

23. **Do you have a frequency range you are targeting? (i.e., infrasound arrays/long range detection vs acoustic arrays/ limited range. Footprint is also affected. The size is affected by frequency range.**
    We don't have a frequency range that we're targeting. We can be using this anywhere in the world, so frequency range isn't a limiting factor. Looking forward to seeing what novel ways of transmitting your data can be sent to us. No specific frequency range right now. What we're trying to do is see what you guys have to offer us and see where your product can be considered for us moving forward, but we don't have any requirements for frequency range at this point. May change when we learn a little bit more about your product. The focus is on what capability is brought regardless of frequency range.

24. **There are many other efforts for low-swap/low-signature comms. Why is that aspect relevant here vs the acoustic/smart sensor aspects? Is it about integration?**
    Agreed. Typically, you have small teams and placing sensors, not saying that we don't have the other way of having a big system employed at some area that we control, but the point is size, weight and power, and it is for what we consider long mission durations anywhere between like 2 days and six months. Battery, weight, and things of that nature are important. No, it can be a stand-alone system, preferably tied into other stuff so that we can discuss, the AI portion of it, we can use that information to help generate a better picture of things. No, it's not all about integration. It'd be nice if it integrated into other stuff, but it could be also a stand-alone providing us really good data and information. We don't want to limit your solutions. What we're on focused is acoustic smart sensors and see what it can provide, and what we can use and not use in different environments. The comms piece is not the focus, and if a solution comes in that does not have a great acoustic package but has great comms, that's not what this

effort is about. It's about the sensor piece. If you are proposing to include a comms piece in your package those are the characteristics that are desired if you are including it. That is not, that is not the focus of this at all. If you do not have comms embedded in your package, it's going to be evaluated straight up on the acoustic piece and we are going to work the low signature communications piece separately.

25. **If system does not rely on solely acoustic signatures is that of interest?**
    In today's world where sensors are multi capable of doing things we think it's of interest. Send us a white paper and we'll take a look at what you're implying, but we're focused on acoustic signatures. If it does that in other things, it's not just that, we'll give it a look. Acoustic sensors would feed other systems that do data fusion of one type or another, so if that's what's being proposed, we'd certainly look at it as long as it includes the acoustic part.

26. **Can you clarify scope of task to be costed here? Are you looking for just prototype effort or including some production qty?**
    When you say prototype, we hope you're not implying just one. One is none and two is one. That's the same around here. At minimum, we would be looking at something really close to production quantity level readiness and probably, we'd like to share it with different partners in our world and anywhere under 15 units. At the same time, that's the one we'll be testing to get a Fielding and Deployment Release (F&DR) and then they will tell us how many they want to buy depending on the performance and the applicability, and what it offers. We don't know what quantities you guys need to propose. For efforts like this we typically desire 10 kits that are close to production representative as a deliverable. We will use those for testing and to gather feedback on any changes needed/desired before our users will purchase production units.

27. **If we do one thing really well how do we work with the other interested parties to address this project?**
    We've seen in the past one company being very good at something and then struggling with another capability and they partnered up with another party, they worked together and produced us a capability that was excellent. We can't tell you who to work with, but obviously you may find people during events or discussions with folks in the community that maybe you may be approached by them to work together and things like that. It's a networking community. We encourage it, you can save cost, development costs by partnering. If there's a capability that somebody else that you recognize that can do better, quicker work than you, but you do have something to offer that they can't provide. Partnerships, we see it as an encouraging and quick solution method to get what we want.

28. **^ re scope of task - you said earlier expect <6-18 months to get to useful prototype, plus up to year to get tested in fielded. Should both be in the ROM?**
    Those are timeframes of what we think it could be. If you break it out that way perhaps, we think it'd be good to have that in the ROM. Separate your costs and lay hours and things like that so that we can do a review of the white paper a lot easier and see what your cost is breaking out into. It is useful to us to have the project broken into logical phases, such as

suggested in the question, with costs for each broken out.

29. **Would an existing system, in service for CUAS detection, meet your requirements? Other algorithms would be supported, if recordings are available.**
Tell me what you guys are going to propose and we'll be glad to read it and see how it fits. The notion that it's an existing system does not disqualify it from use in these other capabilities. This is of interest. It could be one of the applications that operators may have an interest in. The proposal's broad in the sense of air ground and maritime domains are of interest. Perhaps you have something in in the in that area of detection. It could be definitely considered and or maybe things out of that can be leveraged for what we were looking for.