SBIR 25.4 Release 12 Q&A Telecon Transcript
16 September 2025

- SOCOM254-007: Acoustic- based UAS Rainbow Oscillation Refraction Architecture (AURORA)
- SOCOM 254-008: Silencing with Acoustic Rainbow Emitters (SWARE)

SBIR Process Timeline

03 September 2025: Topic issued for pre-release
24 September 2025: USSOCOM begins accepting proposals via DSIP
08 October 2025: DSIP Topic Q&A closes to new questions at 12:00 p.m. ET
22 October 2025: Deadline for receipt of proposals no later than 12:00 p.m. ET

SOCOM254-007: Acoustic-based UAS Rainbow Oscillation Refraction Architecture (AURORA)

1. **Will only 'ARE' type mechanical refraction systems, like the 3D printed plate in the paper, be considered responsive for key system attribute 2?** No. We're only considering acoustic refraction technology responsive for this.
2. **Does "position" include the distance between two drones (wrt Key Attribute 4)?** Yes. The system should allow the drone to determine its position relative to other drones or the swarm as a whole.
3. **Attribute 4: must analog means be used to transmit information (e.g. lower frequencies indicate higher position), or will data based methods be acceptable?** Both methods would be acceptable for transmitting this data between drones.
4. **May we assume a drone has real-time roll, pitch, and yaw data available, so that we can ensure "lower frequencies are broadcast upward"?** Yes. We can assume an IMU or other mechanism is present in the drone to provide that information.
5. **Attribute 9: Will data transmission by physically moving the ARE plate, such movement arguably being an additional oscillator generating sound waves, be responsive?** Yes. The intent is to avoid any additional hardware that would consume additional power, but this would still be responsive.
6. **Are you looking for components or only end-to-end?** Our acoustic software boosts sensor performance and works in the real-world (air, water, underground). We are looking for an integrated solution or something lightweight that could be attached to the drones. Boosting software or low-noise amplification would also be desirable.
7. **Non-RF methods of communication between UAS include: IR/optical, ultrasonic, and magnetic. Is USSOCOM interested in their analysis and comparison with ARE?** Yes. That analysis would be really beneficial for this effort.
8. **The topic requires ARE for UAS communication. Can alternative systems — such as RF, optical, or active acoustic — be considered for relative UAS localization?** No. The intent is to have a system that relies solely on the sound already produced by the UAS.
9. **For communication purposes, what additional information needs to be acoustically relayed beyond the current position of the drones?** It depends on the amount of data we can reliably transmit. Potentially tasks, payload type, or drone type.
10. **Are there specific challenges in areas where only passive acoustic communication is desired?** Yes. In GPS-denied or jamming environments, acoustic communications are desirable to maintain low signature.

11. **What is the minimum bit-rate per channel (bps) that must be supported?** At this time we don't have a specific bit rate requirement.
12. **What are the reasons that microphones or emitters are not allowed?** Why emit acoustic signals from props instead a speaker? To avoid consuming more power by generating new sounds. We want to leverage the sound drones already produce.
13. **For Phase II prototypes, does SOCOM require acoustic comms interoperability with GPS-denied navigation systems?** This cannot be answered at this time.
14. **What is the typical anticipated acoustic communication distance?** Between 1 and 10 meters, depending on the drone model and sound output.
15. **Are these all class 1 UAS?** No. Group 2 and Group 3 are also appropriate.
16. **What brought about the creation of this topic?** One of the team members came across acoustic rainbow emitters in an article and we considered how they could be leveraged for inter-swarm communication without RF.
17. **Anticipated size range of swarms?** Between 5 and 20 drones in a swarm.
18. **What about consideration of ARE with active scatters?** That is something we would also consider.
19. **Number of units?** Not specifically addressed in a Phase I.
20. **Do the drones need to communicate through a mesh relay?** Likely not feasible, but it would not be considered non-responsive.
21. **One possible method for UAS propeller sound modulation is to excite additional propeller vibrations. Is this approach prohibited under Key Attribute 9?** Not prohibited, but undesirable if it requires more power. Acceptable if it contributes to more data transfer.
22. **Do you have numerical caps for flight performance impact from software modulation, like maximum RPM perturbation or induced power draw?** At this time, no numerical caps. Integration should not impede normal operation of the drone.

SOCOM254-008: Silencing with Acoustic Rainbow Emitters (SWARE)

1. **There are many researches regarding UAS noise reduction. Is USSOCOM interested in an analysis of these methods and their comparison with the announced ARE?** Yes. For Phase I, we would be interested in such a comparison as part of feasibility analysis.
2. **For Attribute 1, is a 6 dBA reduction of UAS SPL required, or is a 6 dB reduction of the main tonal components sufficient?** We are looking for a 10 dB reduction in audible signature to human ears, not just 6 dB SPL reduction.
3. **Acoustic Rainbow Splitter, is it the sole technology under consideration for noise scattering or lower noise emission?** The focus is on Acoustic Rainbow Emitters, but comparison to other technologies is acceptable.
4. **Is there interest in alternative technologies or methods that might result in low noise emission and masking?** Yes, if compared against Acoustic Rainbow Emitters.
5. **Is there any interest in modifying the vehicle controls specifically for noise reduction to take advantage of over-actuated flight schemes?** Not within the scope of this effort.
6. **What are the restrictions on placement of ARE's on the drone surfaces?** No restrictions beyond not interfering with payloads or sensors.
7. **Is there scope for investigating design modifications of the drones that could help reduce tonal components or scatter existing tonal noise?** If the modifications are related to adding an ARE, yes. Otherwise, no.
8. **Is acoustic reduction required across 20 Hz–20 kHz?** Yes. That is the human audible range. Reduction across the full band is desired.

9. **What are the mass and integration constraints for ARE modules including payload?** None specified. Smaller is better, but not limited.
10. **Does SOCOM require spectral redirection validation?** Not for Phase I. Could be relevant for Phase II.
11. **Would a solution that focuses on a single type of UAS be acceptable? (either multirotor or fixed wing)** Yes, acceptable. A one-size-fits-all solution is not expected.
12. **Is consideration of fixed wing drone with ARE installed on wings enough for submission?** Yes, as long as it meets the key system attributes.
13. **What is your opinion if drones in swarm are used as scatters in ARE?** Not within scope. The intent is application to a single drone, expandable to a swarm.
14. **Do you see limitation in sizes of ARE plates?** Only that the aircraft must still be able to fly. Trade-offs will exist.
15. **Should we include information regarding the potential performance degradation of drones when applying AREs for encapsulation?** Not required, but would be beneficial for understanding trade-offs.
16. **You said the broader the frequency range the better, but are there particular frequency ranges that are most important/problematic?** The focus is on the human audible range (20 Hz–20 kHz), followed by acoustic sensor ranges.
17. **Do you want to estimate Radar cross section increase due to ARE?** Not required for Phase I, but useful additional information.