



SIGNATURE MANAGEMENT (SIGMAN)

After more than 16 years of sustained combat operations, United States Special Operations Command (USSOCOM) has reassessed its capability requirements in light of rapid changes occurring in the strategic operating environment.

Technology is rapidly accelerating and changing the geopolitical dynamics between state and non-state actors-that include violent extremist organizations.^[1] Advances in artificial intelligence (AI), materials, manufacturing, robotics/autonomous systems, long-range precision strike weapons, bio-technologies and energy will have a significant impact on future warfare and military instruments of power.

The world is becoming more complex, crowded and connected. Think about the impact to USSOCOM Special Operations Forces (SOF) identity security in a future where AI, facial recognition, and biometric tools at ports of entry and even crowd-source screening in public venues identifies and tracks individuals. In a networked world using AI tools, an individual's movements could be tracked over time, databased, and accessed from anywhere. To mitigate these effects and gain access to challenged regions/domains, SOF must have the ability to avoid drawing attention by better obscuring and concealing their physical and virtual presence to blend in and appear innocuous.

State and non-state actors threaten disruptive and destructive non-attributable engagements against non-military and military infrastructure, information systems, and equipment. Flexible, secure, and resilient communications systems must be developed that provide mission assured communications for SOF operating in any threat or disadvantaged combat environment. The future SOF operator's kit will have to include the means and skills to navigate at the intersection of the physical and virtual world.

Beyond the employment of improved technologies, adversaries will continue to rapidly evolve and adapt by employing novel tactics/techniques, capabilities, and resources to challenge US interests. The challenge for SOF is pacing with the commercial sectors on AI, data and machine learning as our competitors and adversaries rapidly acquire and leverage these technologies, anticipating emerging challenges and, when necessary, maintaining the ability to rapidly respond to erupting crises through non-traditional means or the employment of overwhelming force.

USSOCOM Acquisition, Technology, and Logistics Center's Science and Technology Directorate future concept of "Signature Management" will be part of USSOCOM's solution to the challenges posed by the accelerating velocity of human and technological change.

^[1] **State Actors** are entities that have sovereignty over an area of territory and the people within it and act on behalf of a governmental body. **Non-State Actors** are non-sovereign entities that exercise significant economic, political, or social power and influence at a national, and in some cases international level.

Providing Solutions - USSOCOM's S&T Innovation Ecosystem

Special Operations Forces (SOF) operators need to remain undetected in any way in order to successfully execute many of their mission tasks. The ability to move in close in any environment while remaining undetected by Radio Frequency (RF), Electro-Optical/Infrared (EO/IR), acoustic and other sensors enables small groups of SOF operators to execute missions that larger groups of conventional forces would be unable to do. SOF has several “No-Fail” missions. These include: the ability to successfully execute Hostage Rescue and Recovery (HRR), Countering Weapons of Mass Destruction (CWMD), and Countering Terrorism (CT) missions globally, at any time, under all conditions, unilaterally and with partners, to eliminate threats to the Nation. Maintaining unmatched advantage will require the discovery, development, and rapid injection of the most effective technology opportunities into SOF small units to meet future 2020-2030 challenges, opportunities, and threats.

SOF AT&L-ST's intent is to continue building an S&T Innovation Ecosystem by reaching out to external government and non-government organizations, industry, academia, and other non-traditional partners for solutions that can provide an asymmetric advantage for future SOF.

Each phase of a direct action type of mission requires managing the signature of the operators in different ways. The following notional mission outlines the possible signature management issues that may need to be addressed by SOF forces. Consider the notional mission for a small group to insert into hostile territory from the sea, cross overland, strike a target, and extract by air to a friendly location, all within one cycle of darkness. Specifically, USSOCOM is seeking your unique expertise to provide solutions for the following “Signature Management” issues:

Mission Segment Requirements	Signature Management Issues
Small unit must deploy from a large platform in international waters, cross miles of littorals and reach the beach undetected	<ul style="list-style-type: none"> - Transport Vessel(s) and individual operators must be undetected by RF, EO/IR, acoustic and magnetic sensors or mines - Maximum transit speed for minimization of exposure and risk of detection should be optimized - Vessel or swimmers must cross surf zone where IR and visual background changes rapidly
Unit must cross the beach and reach the vegetation line	<ul style="list-style-type: none"> - Beach is wide open and highly reflective, different background than surf zone - Transition from sea to land environment may create different thermal signatures for operator and equipment, increasing probability of IR detection - Physical evidence of operator beach transit
Unit must cross some expanse of cross country terrain to reach the vicinity of the target	<ul style="list-style-type: none"> - Terrain may change from wooded to grass to desert along the path of the journey - Threat sensors may include visual, IR, RF, and acoustic - Long distances may require vehicles which entail additional signature contributions

Assault on the target must remain undetected as long as possible for maximum surprise	<ul style="list-style-type: none"> - Individuals must be extremely close to the target before being seen or heard, every second delay in detection increases the chances of mission success - Minimize or eliminate risk of detection by animals used for sentry alert and by concealed lookout posts - Must not be detected by RF or IR sensors at longer ranges - Short range communications must not be detected by the target - During direct action, must minimize acoustic and visual signature to hinder targeting by threat
After assault, call in aircraft for extraction	<ul style="list-style-type: none"> - Communications signals and physical communications equipment must not be detectible by RF, EO/IR, or visual means
Aircraft infiltration across hostile terrain, before or after assault	<ul style="list-style-type: none"> - Rotorcraft or Vertical Takeoff and Landing (VTOL) aircraft must avoid detection by RF, IR sensors, or humans using visual or acoustic means - Existence and/or location of passive sensors/lookouts associated with the target may be unknown - If aircraft enters hostile airspace before the assault, the aircraft must be undetected at the close-in staging area during the assault - Man-Portable Air Defense Systems (MANPADS) are generally acoustically queued and visually/IR targeted
Unit must rendezvous with the aircraft, possibly away from the site of the assault	<ul style="list-style-type: none"> - Ground troops must identify their location to the aircraft without being detected by hostile forces - Aircraft must land at night, in unfamiliar territory, without using any landing aids that reveal their position
Aircraft exfiltration to friendly location	<ul style="list-style-type: none"> - Aircraft must avoid engagements by potentially alerted hostile forces - Integrated Air Defense Systems (IADS) may be actively searching with RF and networked sensors - May require that the destination location remain secret after the mission, requiring the aircraft to avoid all detections not just engagements

For many missions Tactics, Techniques, and Procedures (TTPs) can be used to avoid some of the signature management requirements listed above and most missions do not involve all of these elements. However, for some missions the operators simply accept an undesirable level of risk that they will be detected and their mission compromised to some extent. For this reason, any new technologies that allow the warfighter to avoid threats, skip mission steps, or reduce the likelihood of detection are of interest to USSOCOM.

Contacts/Collaborative Next Steps

- ***USSOCOM Public Website*** – <http://www.socom.mil>
- ***USSOCOM Technology and Industry Liaison Office (TILO)*** – <https://www.socom.mil/SOF-ATL/Pages/submit-your-idea.aspx> ; TILO@socom.mil
- ***USSOCOM Technical Experimentation (TE)*** – <https://www.socom.mil/SOF-ATL/Pages/technical-experimentation.aspx>

- **SOFWERX** – <https://www.sofwerx.org>
- **USSOCOM Small Business Innovation Research (SBIR)/Small Business Technology Transfer Programs** – <https://www.socom.mil/SOF-ATL/Pages/sbir.aspx>
- **Vulcan** – <https://www.vulcan-sof.com/home/request>