New School and Old School

Operationalizing the space domain for SOF

by Maj Joshua Elliott

As the space domain plays an increasingly important role across all warfighting functions, special operations forces (SOF) must continue investments to maximize emerging space capabilities, mitigate vulnerabilities of space-dependent systems, and counter adversary space assets. Current technologies provide the SOF warfighter with tremendous potential for game-changing capabilities on today's battlefields. However, the lack of an integrated system to fuse these disparate, isolated systems and provide a responsive solution to commanders and SOF operators on the ground limits the effectiveness of such capabilities in an increasingly contested and complex operational environment. To increase its competitive advantage, SOF must integrate the wide array of available space-based capabilities in a user-friendly system tailored to frontline operators. The development of a SOF Integrated Common Operating Picture-Space (SICOP-S) could provide future operators such a competitive advantage to achieve our strategic national objectives, defeat highly capable adversaries, and prevail in future competition and conflict. Simultaneously, however, this future environment also demands a mindset shift to strengthen core warfighting skills and principles.

U.S. Space Command was established on 29 August 2019, followed soon thereafter by the establishment of U.S. Space Force on 20 December 2019.[1] The resurrection of the DOD's newest combatant command and establishment of the newest Service reflect the growing recognition within the defense community concerning the importance of space capabilities. Since the launch of the Russian satellite Sputnik in 1957, space has been a key battleground in the contest of nations struggling for supremacy across instruments of national power.[2] With the collapse of the Soviet Union and the overwhelming victory of the United States in the First Gulf War (in which space-based capabilities such as the Global Positioning System [GPS] played a decisive role), however, the contested nature of the space domain became an afterthought.[3] Finding itself as the international system's sole superpower, the post-Gulf War United States could exert influence across any domain, including space, without serious opposition. The joint force took supremacy within the space domain for granted, developing complex, exquisite systems highly dependent on space-based capabilities such as satellite communication systems, intelligence/surveillance/reconnaissance (ISR) assets, missile warning networks, and a host of systems relying on the GPS constellation. U.S. military forces deployed in support of the Global War on Terror fielded impressive capabilities, but the systems and nodes facilitating these capabilities relied on numerous supporting assets such as large numbers of both field and headquarters deployed personnel; unrestricted access, consent, and transit throughout the joint operations area and neighboring countries; reliable streams of logistics, communications, power, and internet bandwidth; superforward operating bases with exquisite infrastructure, easy reach-back to higher echelons of command and support, and protective systems negating most adversary attacks; and a highly stratified command structure with multiple echelons exerting similar functions.

The 2017 *National Security Strategy*, however, recognized that the world balance of power had dramatically shifted as peer competitor nations such as China and Russia had rapidly closed critical capability gaps, fielding a large number of asymmetric assets that could erode the traditional strengths of the United States.[4] Newly fielded capabilities such as anti-access/area denial (A2/AD) assets (advanced theater ballistic missiles, hypersonic glide vehicles, advanced early warning radars, long-range anti-ship and anti-air missiles); GPS and satellite jamming devices; space and counter-space systems (including anti-satellite) missiles, high energy lasers, and rendezvous/proximity satellites); and emboldened cyber capabilities pose challenges to the conventional strength of the United States and jeopardize all-domain supremacy, if not superiority. U.S. military forces, including SOF, must assume that future operations will occur in a contested, degraded, and operationally limited (CDO) environment. SOF must employ and exploit space-based capabilities in the most efficient manner possible in preparation for this future CDO environment to achieve and maintain a competitive edge.

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The capabilities offered by space-based systems are numerous and proliferate across the warfighting functions. Although environmental monitoring represents one of the most basic space capabilities, it is also one of the most critical to the history and development of SOF. In 1979, over-compartmentalization of information and a failed weather forecast prevented the raid force assigned to Operation EAGLE CLAW from detecting a massive haboob sandstorm, resulting in numerous aircraft malfunctions that forced the mission to abort and ultimately led to the tragic disaster at the Desert One landing strip.[5] In March of 2002, Operation ANACONDA was launched in the Sha-i-Kot Valley against a hardened al-Qaeda terrorist stronghold in the midst of strong scintillation effects from the ionosphere, dramatically affecting GPS accuracy, satellite communications reliability, and ultimately contributing to a heavy loss of life.[6] Similar conditions existed during Operation RED WINGS, limiting the effectiveness of blue force tracking devices, satellite communications, and iridium phones.[7] Although it is speculation to assume a different outcome from three highly complex events, it is possible that closer integration and more timely information from space-based environmental monitoring assets could have resulted in more successful operations and prevented unnecessary loss of life. A software program installed on an end-user device could provide the individual operator realtime information linked in from specialized atmospheric/space weather squadrons or civilian agencies to anticipate impacts on operations, adjust operations schedules, and take advantage of limited operational opportunities such as the 1944 D-Day invasion capitalizing on a break in the weather that the Germans did not detect.[8]

The positioning, navigation, and timing support provided by the GPS satellite constellation represents the life-blood of numerous mission critical systems—such as communications cryptologic equipment, precision fires munitions, and navigation devices. The Air Force currently runs the GPS Interference And Navigation Tool (GIANT) software program, which provides detailed modeling and forecasting for GPS accuracy and adversary jamming effects.[9] If integrated with up-to-date intelligence from national databases, ISR assets, and realtime reporting—such a tool—could provide invaluable battlefield situational awareness for the conduct of SOF mobility/insertion operations, precision strike analysis, and adversary capability mitigation. The GPS constellation also has the ability to employ flex power on request to overcome space-based environmental effects and some adversary jamming efforts.[10] An integrated software program maximizing the capabilities of GIANT and featuring a built-in Space Support Request submission application to streamline the request process for flex power could provide future operators a key advantage to maintain positioning, navigation, and timing capabilities while operating in a dynamic, contested environment.

In Operation EAGLE CLAW, over-compartmentalization of information and a failed weather forecast cost the lives of five Air Commandos and three Marines during the attempted rescue of American hostages held in Tehran, Iran. *(Photo by Senior Airman Andrea Posey.)*

In addition to leveraging friendly capabilities in support of operations, an integrated space software program could also facilitate the detection, identification, tracking, and mitigation of adversary space systems. The current Integrated Space Situational Awareness program can provide Satellite Reconnaissance Advanced Notice assessments to identify periods of potential exposure to adversary satellite systems.[11] By maintaining realtime awareness of overhead adversary systems, SOF elements can schedule deployments, movements, operations, and targeted messaging campaigns properly informed by operational security and risk considerations. In the event of an unplanned contingency or time sensitive target, instant access to such information for the ground operator would improve decision-making, flexibility, and freedom of maneuver during sensitive operations.

One of the greatest risks posed by the full range of adversary actors (including peer competitors, rogue nation states, and state-sponsored proxy forces) in the future environment will be the proliferation of precision ballistic missiles. The advent of highly advanced hypersonic glide vehicles further increases the risk posed by such weapons by reducing warning times and increasing uncertainty regarding the weapon's intended target. The current array of Overhead Persistent Infrared Satellites and ground tracking radar systems provides U.S. forces with a robust early warning network.[12] The Agile Client Common Operating Picture effectively integrates map data, blue force tracking tools, and displays of incoming adversary missile tracks based on information

Today, the capabilities exist for video downlinks from aircraft to joint terminal attack controller devices. *(Photo by LCpl Shellie Hall.)*

from those systems.[13] However, these situational awareness tools to process and display this information often reside at high-level headquarters. This capability does not exist in a useable form for the frontline operators. Advanced notice of incoming ballistic missiles currently relies on a series of isolated systems that often require processing and retransmission through several layers of command. Failure or even a delay at just one echelon of headquarters could prove devastating to frontline SOF operators. If a software program capable of providing realtime missile warning, such as Agile Client, were integrated into a common application available to the individual SOF operator, it would improve force protection, increase survivability, and provide enhanced situational awareness for dynamic targeting of adversary launch systems and sites.

In addition to employing current capabilities, an integrated space common operational picture designed for SOF operators should also project into the future to account for developing technologies. As the commercial space industry begins to gain momentum, there will be more opportunities for the joint force to deploy lower cost, higher volume space assets. USSOCOM has experimented with so-called CubeSats, which could provide dedicated, pervasive, survivable, and responsive space-based capabilities to individual units.[14] In a contested environment where traditional Unmanned Aerial Systems or manned reconnaissance cannot penetrate an adversary A2/AD bubble and larger satellite systems have been neutralized by adversary counterspace assets, a high volume of expendable, quickly replaced CubeSats could provide forward deployed operators a continuous stream of ISR capabilities even in a contested environment. These capabilities currently exist for video downlinks from aircraft to joint terminal attack controller devices as well as to data repositories such as the Unified Video Dissemination System. Linking senor inputs from CubeSats to an integrated space common operating picture at the individual level would be well within the realm of possibility. Emerging frontier technologies such as big data analytics, 5th Generation broadband networks, quantum computing, and even artificial intelligence will make such a CubeSat downlink as well as the integration of all the other legacy space-based capabilities into an individual interface far more feasible, responsive, and cost-efficient.

Although all these technologies either exist or appear on the near horizon, most space-based capabilities are designed to accommodate rear-area command facilities and robust U.S. Space Command or U.S. Space Force infrastructure without corresponding efforts to push down these tools to operators on the ground. In a contested environment against peer adversaries, the possibility of devastating long-range ballistic missiles, instantaneous effects from cyber-attacks, and highly sophisticated communications jamming assets dictate that forces must be dispersed in small echelons at expeditionary locations in order to remain both survivable and effective. Relying solely on an information-push from various levels of higher headquarters is no longer a feasible option. The lowest echelons of command must have immediate access to multi-domain awareness tools to maintain a competitive advantage against highly capable adversaries.

Even if all the various software programs were downloaded onto a handheld device, the proprietary nature of these stove-piped systems prevents the effective integration of all this information into a user-friendly common operational picture. Minor inconveniences for a rear-area command like multiple usernames/passwords, login initialization wait-times, and cross-referencing multiple displays may become catastrophic friction points for a SOF operator engaged in a struggle against the adversary as well as the elements. Time commitments for initial training and mandatory sustainment also become problematic for SOF operators tasked with a multitude of other demanding requirements. SOF operators already lack the required time to achieve full operational capability in every required baseline task, and the addition of a whole host of new requirements to learn incompatible, complex systems each with their own nuances is not feasible. Instead, these isolated programs should be merged into one user-friendly, integrated system. Each different capability could be another drop-down menu or icon selection within a fused common operating picture that utilizes common button-ology across all features. Such an interface would eliminate wasted training time spent on redundant tasks, decrease the

chances of inadvertent selections or misinterpretations of data, and ultimately reduce unnecessary steps in connecting the kill chain between sensors and execution platforms/operators.[15] Ideally, such a capability could be integrated into a system that SOF operators are already familiar with such as Palantir Gaia or the Android Tactical Assault Kit. Otherwise, the various managers for each of these different software platforms could collaborate to create a new application for the ultimate benefit of both the SOF warfighters and the platform managers themselves. A potential name for such a system could be the SICOP-S. Regardless of name, however, such a capability would surely enable future SOF to rapidly operationalize the space domain into a competitive advantage.

One final consideration for any technology-based solution, however, is that technology can fail. Whether as a result of adversary interdiction of critical systems, interference from environmental effects, user error, or simply Murphy's Law, technological solutions often fall short when needed the most. In addition to cutting-edge technology, the SOF operators of the future also require a backup plan to operate in a CDO environment against peer adversaries. As with many other problems, a return to brilliance in the basics offers perhaps the most reliable solution to operating in that future battlespace. Although this solution sounds easy to implement, it requires a mindset change from current operating methods that rely on acquiring ever-more exquisite gear in order to simplify and accelerate decision making in increasingly complex environments. Navigation by map and compass; dispersion and signature management; the fundamentals of patrolling and reconnaissance; development of communications PACE plans and communications windows; and trust in subordinates to take proper initiative based on commander's intent and mission type orders without micromanagement are the fundamentals that, when paired with a highly effective platform such as a SICOP-S, will ensure that SOF operators can maintain a competitive edge in any clime and place for the future operating environment.

SOF operators of the future must have a back-up in order to function in a communications degraded or denied environment. *(Photo by Cpl Dallas Johnson.)*

Notes

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