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Adapting to the PLA's Near Constant Satellite Surveillance

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The U.S. and Chinese militaries have something new in common. Both must now operate under each other's nearly constant satellite surveillance.[1] Luckily, the United States has a legacy tool to alert commanders of foreign satellite overflights; the U.S. military just needs to consistently use it, even at bases in the United States. The Chinese continue to use their version of the satellite warning system, arguably with success. Usage of the tool is down in the United States, but routinely high in China. Indeed, in the words of a unit of the People's Liberation Army's (PLA's) Special Operations Forces, "It is equally important to be good at 'hiding' as it is to be able to 'fight' …by using superior concealment capabilities to evade your adversary's intelligence reconnaissance… the adversary [becomes] 'blind' and 'deaf.'"[2]

This article attempts a red team analysis of increasing Chinese satellite surveillance to find additional methods of adaptation for the United States military. The article suggests that the U.S.'s existing tools should be used to compliment new plans, rather than be thrown out. The suggestion is based on an analysis of how the Chinese military has responded to decades of satellite surveillance from the United States.

New problem, but the same useful solution

Even though the U.S. and China share this same problem, their responses are different. Current U.S. mitigation plans are focused on funding more satellites, potentially using offensive counterspace weapons, or even simply letting the adversary see more in an attempt to deter.[3] The Chinese on the other hand have for decades rigorously buttressed their operational security at the same time as advancing technological solutions like counter-ISR.[4]

To be clear, compared to China, the United States still has more satellites in general, and more satellites across the civilian and military earth observation and surveillance categories.[5] This gives the United States an advantage in watching China, but it also means China may have more experience responding to incoming satellite warnings by camouflaging and covertly concealing military operations. In particular, they probably have developed methods to determine which satellites matter for which operations, and how to quickly camouflage and conceal while staying on mission.

To know when to hide from overhead satellites, China consistently uses a solution the United States spearheaded. The United States fielded a satellite tracking tool called Satellite Reconnaissance Advanced Notification (SATRAN) in the 1990s to notify commanders when enemy satellites would pass overhead.[6] Commanders can request warnings depending on when and where U.S. forces will be. Over the last two decades, China's military has been training its personnel to leverage a similar tool to limit foreign satellite collection opportunities.[7] Even with China's newly established Aerospace Force and increasing space capabilities, the drills continue.[8] If it takes longer to get where they're headed, the PLA at least seems to believe it is worth it.

Based on publicly available information, current usage of satellite transit warnings across the U.S. military is mixed. The U.S. Navy is still well practiced in using satellite and weather notifications to maneuver long distances.[9] The U.S. Army as of January 2024 said it will start to take constant surveillance much more seriously.[10] The August 2024 update to the U.S. Joint Space Operations doctrine only briefly mentions the satellite overflight warnings, and instead puts more emphasis on the U.S. Space Command's responsibility to defend in space.[11] This report did not find examples of U.S. military units using satellite overflight warning while at bases in the United States.

SATRAN is a type of space indications and warning

Most publicly available information on "space indications and warning" (I&W) focuses on how satellites help collect strategic and tactical intelligence to support U.S. priorities, such as for ballistic missile defense.[12] This is just one aspect of I&W. Equally important are indications and warnings of what is happening in space.[13] In that regard, most information unfortunately overemphasizes the more easy to explain geosynchronous Earth orbit (GEO).[14] This is unfortunate because it is sometimes easier for the U.S. Space Force to alert commanders about the slower moving high orbits than it is to warn about the faster moving low orbits.[15] For example, there are just as many if not more nefarious maneuvering satellites in low Earth orbit (LEO), and when they move, it can take days to reidentify them.[16]

GEO matters when a U.S. commander is in the area of responsibility of the Indo-Pacific Command. There, China has a two optical imagery satellites and one synthetic aperture satellite staring down persistently.[17] The ability of those satellites to detect what matters over such a large area is unknown. Regardless, most of the U.S. military has been preparing for China to have a massive home-court advantage for years. What the United States has been less prepared for is the near constant surveillance achieved globally with satellites in LEO because this impacts operational security even at bases in the United States.

As an example of how LEO satellites could now impact military preparations in the United States, and how SATRAN could provide useful I&W, let's consider a daytime technology test. For example, one Chinese Earth observation satellite series in LEO called the JiLin constellation has over 117 satellites and self-reports being able to revisit any place on Earth around forty times a day.[18] If there are no clouds, which is rare, and with no other operational security measures, U.S. commanders would have to stop and cover for around 10 minutes at least

once every half hour, just for this satellite constellation. Even when commanders take measures to lower their electronic signature, adversaries might be able to use other types of satellites. For example, regardless of if China's hyperspectral satellites are ranked first or third, these satellites may detect some elements of radars and other electronic warfare and stealth equipment in the daylight, even when the systems are turned off.[19]

The above example of a daytime technology test with no other operational security measures and no overhead clouds, is the worst-case scenario, and unlikely. There are limited benefits of testing technology in perfect weather because results cannot support military contingency planning for bad weather.

With that in mind, let's also consider other types of Chinese satellites that can operate at night and through clouds. If a U.S. commander waited until nighttime, synthetic aperture radar satellites would become a problem. While China still lags in numbers and capabilities of these satellites in low Earth orbit compared with the United States, Chinese usage of them over U.S. domestic bases is a new phenomenon.[20] Implementing SATRAN training to practice mitigating Chinese SAR satellites at night could be a productive stepping stone as numbers of those satellites are likely to increase.

The legacy tool supports both operational security and information operations

While there are probably debates in both the United States and China on the cost-benefit calculus of slowing down to hide your footsteps, Chinese official media most often publishes the opinions and best practices of the pro-camouflage cohort.[21] This indicates that the PLA still continues to prioritize operational security at least equally with information operations to deceive and confuse observers.

It's with this balance in mind that the PLA continues to train for foreign satellite overflights. In fact, a recent PLA Daily article defined camouflage with characteristics of both operational security and information operations characteristics. It said camouflage is "various measures taken to conceal and protect oneself and to deceive and confuse the enemy."[22]

The United States has tried to strike a similar balance. In 2010, for example, U.S. Army guidance on camouflage, concealment, and decoys acknowledged that techniques to protect against enemy satellite overflights, "can be costly in terms of manpower, materials, and time."[23] The guidance seemed to conclude that trying to hide isn't worth it. Later, U.S. Air Force and Navy space components in 2018 argued that new techniques, tactics, and procedures for concealment practices in the face of growing satellite surveillance were still desperately needed.[24] They said that the first step was to, "identifying the spatial, spectral, and temporal signatures that most expose friendly forces' intent and plans" to "develop new camouflage, concealment, and deception or other counter-ISR capabilities."

Publicly available information indicates that the U.S. now prefers information operations over operational security when it comes to methods for adapting to foreign satellite surveillance. In 2023, a U.S. Army article argued that yes, new techniques were needed, but the authors didn't mention concealment.[25] The article instead focused on the need to widely use decoys. Recent

updates to the U.S. Marines deception doctrine states, "Deception activities can use space capabilities to present observables to adversary sensors, disrupt the adversary perception of reality, or to coordinate aspects of the activity," without reference to concealment.[26] The Marines doctrine does however address limiting electronic signatures which also mitigates surveillance from all domains.

As always, just because the Chinese do it, doesn't mean the United States should too. However, in the face of potentially throwing out an economically viable and elegant solution like SATRAN to emphasize information operations, it is worth recalling information operations can have at mixed results. An academic writing for the Texas National Security Review in 2023 argued that, "The very lack of doctrinal consistency over time [has] created a perpetual confusion as to what, exactly, information operations [is] supposed to offer."[27] And information operations can be difficult to coordinate and deconflict, with sometimes negative outcomes.[28]

Is there an opportunity to beat China at our own game and with our own tool?

The U.S. Space Command's establishment of Joint Integrated Space Teams could be an opportunity to reinvigorate the U.S. Combatant Command's regular usage of the satellite overflight warnings.[29] Updating the legacy tool to strengthen commanders' ability to conceal operations even when satellites maneuver in LEO is within reach with increasing integration of commercial space capabilities.[30] Furthermore, increasing operational security through use of SATRAN at U.S. bases for at least nighttime activities could be a useful incremental adaptation.

This article argues that as the United States adapts to the new normal of persistent Chinese satellite surveillance, it is worth considering the PLA's response to the same problem. If China is the only one consistently using a tool the U.S. spearheaded to train its forces, this may give the PLA operational security gains in the long run. The PLA fends off any frustration with the perceived inconvenience of slowing down to conceal operations with the motto: "Soldiers and the people are the source of victory."[31] As the U.S. weights new proposals, it is still important to leverage existing tools and double down on operational security.

Endnotes

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