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War In Space: How The Air Force Is Preparing, And What Might Go Wrong

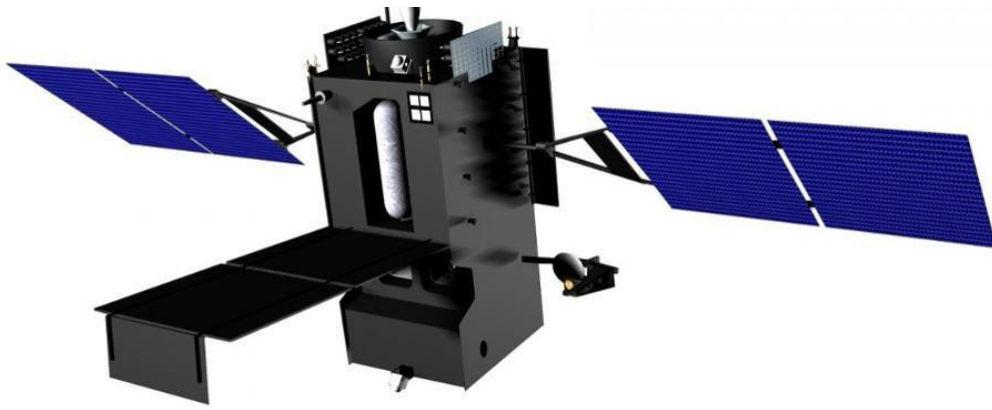


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War in space has begun. Although the details are secret and the action so far is mostly non-kinetic, U.S. rivals such as China are investing heavily in ways of degrading or destroying space-based capabilities on which America's military and civilian economy depend. A report by the Pentagon's most prestigious panel of advisers, the Defense Science Board, warned last year that electromagnetic threats to U.S. satellite communications "have rapidly escalated in the last few years," and likely will continue growing in the future.

These threats have the potential to severely impair U.S. military performance in wartime. Consider, for example, the Global Positioning System constellation of satellites which provides precise navigational information for users operating on or near the earth's surface. Without access to GPS signals, U.S. smart bombs would not work; executing complex military maneuvers would be much more challenging; and friendly-fire incidents would become more common because of the difficulty of locating forces in the fog of war.

And that's just the beginning. Civilians depend on GPS to synchronize cellular telephone operations; track commercial aircraft and trucking fleets; support auto navigation systems; provide emergency services; perform precision agriculture; and conduct a vast array of other functions. So the growing possibility that GPS satellites might be destroyed in wartime, or their relatively weak signals degraded by jamming, or their ground control stations impaired by cyber attacks, has consequences stretching far beyond the military realm.



The Space Based Infrared System built for the Air Force by Lockheed Martin provides early warning of hostile missile launches. If it were disabled, Washington might be unaware that missiles had been launched against the U.S.

Against that backdrop, the U.S. Air Force has begun a radical transformation in its approach to space. Rather than simply assuming the availability of space-based systems for providing secure communications, warning of missile launches, and navigational information, the nation's leading space service is posturing for a future in which space is a contested domain. In other words, for the first time since the Cold War ended, the Air Force is adopting a warfighting mindset in its approach to space.

The term that dominates this shift in thinking is "resilience," meaning the design and operation of spacecraft that are less susceptible to attack. That might involve hardening, maneuver, redundancy, deception, rapid reconstitution when assets are lost, or even shooting back against attackers. Similar measures are needed to protect the ground stations that control overhead constellations. Unfortunately, few of these features were incorporated into the current generation of military satellites built after the Cold War, because threats were thought to have abated.

Thus, one part of the Air Force's rethink of space is developing next-generation space systems that are much more resilient than those now in orbit. That will take two decades to fully implement. But the Air Force is already changing how it organizes for war in space, beginning with a new Space Enterprise Vision unveiled in 2016. Jointly formulated by Air Force Space Command and the National Reconnaissance Office -- the organization that develops spy satellites -- the vision calls for a more integrated approach to designing and operating national-security space systems.

In the early days after the Cold War ended, the various strands of national-security space were stovepiped, with little coordination between the pieces. You can see that mindset reflected when you fly over the National Reconnaissance

Office before landing at Washington's Dulles Airport. Imagery and eavesdropping satellites are managed in two separate buildings that are barely connected. The Space Enterprise Vision is aimed at breaking down barriers between disciplines and design teams to fashion a more holistic approach space.

The overarching goal of the Space Enterprise Vision is to implement a more resilient space posture by 2030. To get there, the Air Force will need to rewrite its doctrine for space operations, change how it trains airmen engaged in the space enterprise, and field a series of warfighting systems that were not previously deemed to be necessary. The new systems needed would enhance awareness of what is happening in space, bolster the control of space assets, and fashion a battle management system for overseeing the conduct of war in orbit.

Most of the details concerning new orbital systems are secret. But it doesn't take much reflection to see this all could be costly and time consuming. Eventually, every one of the existing national-security space constellations may need to be rearchitected, with several new constellations added for functions like command and control. And therein lies the explanation for how things might go wrong in pursuing the vision of greater resilience in space. If all-out war occurs before the redesign is effectuated, the consequences could be catastrophic.

This isn't just the result of great-power rivalry in space suddenly rearing its ugly head. As National Reconnaissance Office director Betty Sapp told Congress last year, Washington has been under-investing in national-security space for a long time. In a good year, military space -- not counting intelligence-community payloads -- gets about one day's worth of federal spending for the whole year. It will need a higher level of outlays to correct accumulated deficiencies, and there's no guarantee enemies won't attack before improvements are implemented.

Another thing that could go wrong is that the Air Force and NRO might pick the wrong approach to recapitalizing what they have. At the moment, the military space community seems enamored of commercial solutions to mission requirements such as small satellites that seem very unlikely to deliver the kind of functionality warfighters need. Aside from the physical laws limiting the applicability of small satellites to missions like missile warning, the one thing all commercial space systems have in common today is that they lack resilience.

There may be many areas where commercial products and processes can speed the delivery of more robust constellations, but it would not be smart to embrace a commercial development model in the absence of any real evidence it can meet Air Force requirements for greater resilience of space assets. Commercial space is efficient and profitable precisely because it avoids features that do not add value. But the military and intelligence communities measure value differently than the private sector does.

So even as the Air Force moves out aggressively to prepare for war in space, it probably needs to adopt an evolutionary rather than revolutionary approach to designing next-gen constellations. If it attempts a wholesale redesign of satellites that function well today but lack adequate resilience, it could end up with constellations that are neither resilient nor functional. That would be a bad outcome for a country that depends more on space than any other for its security and prosperity.