William J. Lynn, III

A Military Strategy for the New Space Environment

As disaster struck Japan and revolution swept the Middle East, Americans once again watched events unfold in real time, through a network of satellites in space that have revolutionized the dissemination of information and changed how we live. For decades, we have taken this network, and the operational environment of space which supports it, for granted. But quietly, almost imperceptibly, revolutions of a less visible kind have been unfolding above us in space itself. Over the Middle East, censorship imposed by autocratic states has for the first time extended into the upper reaches of the atmosphere. The satellite-based telecommunications services of Thuraya—a regional satellite phone provider—have been disrupted, and the satellite broadcasts of Al Jazeera, the Voice of America, and the BBC rendered unintelligible. Libya and Iran are the primary offenders, but even less technologically developed countries such as Ethiopia have employed jamming technologies for political purposes.

The willingness of states to interfere with satellites in orbit has serious implications for our national security. Space systems enable our modern way of war. They allow our warfighters to strike with precision, to navigate with accuracy, to communicate with certainty, and to see the battlefield with clarity. Without them, many of our most important military advantages evaporate.

The specter of jamming is not the only new concern. The February 2009 collision of an Iridium communications satellite with a defunct Soviet satellite, and the earlier, deliberate destruction of a satellite by China, produced thousands of debris fragments, each of which poses a potentially catastrophic threat to operational spacecraft. In an instant, these events—one accidental, the other purposeful—doubled the amount of space debris, making space operations more complicated and dangerous.

William J. Lynn, III is the U.S. Deputy Secretary of Defense.

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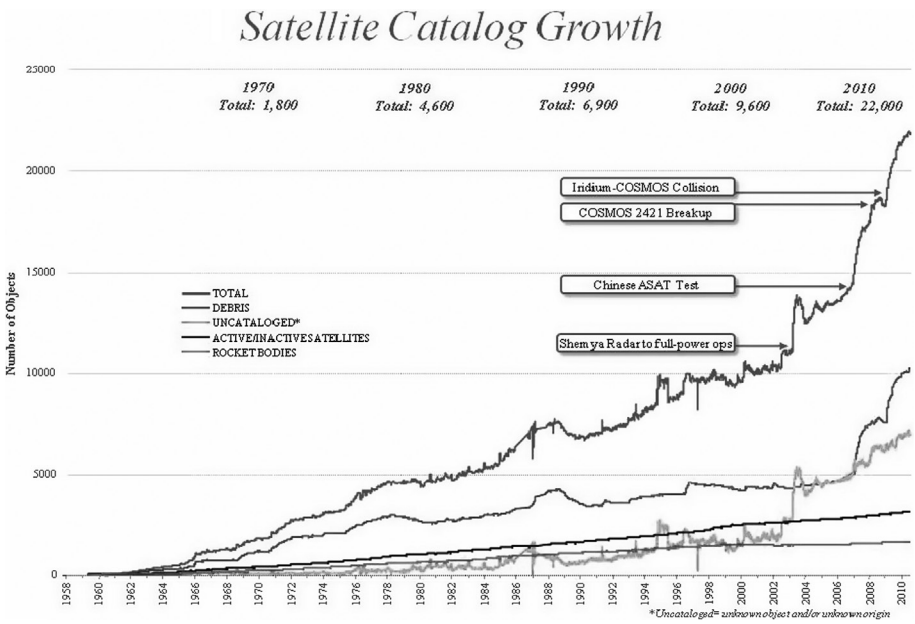
In less than a generation, space has fundamentally and irrevocability changed. Unlike the environment we knew for the first 50 years of the space age, space is now characterized by three "C's": it is increasingly congested, contested, and competitive. These changes not only pose tremendous technical challenges to military space systems, they also force rethinking of how we use space to maintain our national security. The National Security Space Strategy released on February 4, the first ever of its kind, establishes a new approach to space.[1] Building upon emerging norms of behavior and a renewed commitment to share capabilities with allies and partners, the strategy charts how we will maintain our strategic advantage despite the more complicated environment.

Congested

In 1957, at the dawn of the space age, there was just one man-made object in space—the Soviet satellite Sputnik. Today, more than 1,100 active systems and 22,000 pieces of man-made debris orbit earth (Figure 1). Eleven states now

Figure 1: Source: Joint Space Operations Center



operate 22 launch sites, and more than 60 nations have a presence in space. Not only has the number of objects in space grown, but the rate at which they materialized also has increased dramatically. It took 40 years to place the first 10,000 objects in outer space, and a mere 10 years to place the next 10,000 in orbit. Hundreds of thousands of additional pieces of debris remain too small to track with our current sensors. Whether or not we can see it, the debris is there. The danger is that each collision exponentially raises the potential for another, such that a debris cascade could someday render entire orbits unusable. Scientists today debate how soon the tipping point will be reached. More immediately, debris can instantly knock out capabilities on which both our military and the global economy rely.

Space is increasingly congested, contested, and competitive.

Space is also cluttered by electronic signals. Roughly 9,000 satellite transponders that send communications between space and the ground are expected to be active by 2015, increasing the probability of radio frequency interference. Military planners are keenly aware that a satellite does not need to be physically damaged to be rendered useless—it only has to be jammed, intentionally or otherwise. The dramatic increase in physical and electronic hazards means we are approaching a point at which the limitless frontier no longer seems quite so limitless.

The Obama administration has already taken notice. The president's National Space Policy, a landmark document issued in 2010, declares that the sustainability, stability, and free access to space are vital national interests.[2] To help bring order to this congested environment, the United States is promoting the responsible use of space. Along with the right to use and explore space comes the responsibility to be a good steward of it.

In 2007, the UN General Assembly approved guidelines to mitigate the creation of space debris. But how to operate safely in space needs to be further defined. The United States is working with the European Union on a proposed international Code of Conduct for Outer Space Activities. These guidelines would lay down "rules of the road" and allow the international community to hold accountable those who break them. Rules of the road for space can serve a similar purpose as maritime guidelines at sea—increasing safety for all operators and reducing the risk of dangerous incidents.

The Pentagon is also taking a hard look at how its own policies can help foster a more cooperative space environment. Just this year, we broadened our pre-launch notification policy to include space launch vehicles, rather than just ballistic missile launches. We hope that increasing our own transparency will encourage other space-faring nations to act responsibly when conducting space operations.

The 2011 National Security Space Strategy establishes a new approach to space.

In addition to rules, guidelines, and confidence-building measures, we are expanding our sharing of information regarding situational awareness in space. For years, the United States has provided data on the location of space objects to the global community, so that operators of space systems can avoid accidental collisions. The Secretary of Defense recently signed statements of principles with Australia, Canada, and France that lay the groundwork for expanding this cooperation. Further expanding the amount and kind of data we share will, over time, help foster the sustainable space environment that our own strategic advantage depends upon.

Contested

During the Cold War, space largely remained the private preserve of the United States and the Soviet Union, with space assets as tools of superpower control. Missile warning and imagery satellites enabled us to detect missile launches and to verify the arms control arrangements meant to lessen the risk of conflict. During this period, each nation developed hit-to-kill, anti-satellite weapons that had the potential to generate large clouds of space debris. Since the space domain was inextricably linked with our understanding of nuclear escalation, the employment of such weapons was believed to serve as the harbinger of a nuclear first-strike.

Although in the past information derived from space capabilities went almost exclusively to national decisionmakers, today we rely on space for almost everything we do. Space systems are critical to operations on the ground, at sea, and in the air, whether enforcing a no-fly zone over Libya or countering insurgents in Afghanistan. With such widespread reliance comes potential vulnerability. A greater number of potential adversaries now employ a wider spectrum of weapons capable of countering U.S. space capabilities. As a result, physically shooting down a satellite is no longer the most likely threat to our military systems.

Electronically jamming GPS and communications signals are among a range of relatively low-cost options for states seeking counterspace weapons. The threshold for using these weapons has been lowered, with a number of nations employing them for political purposes in peacetime or during crises. For example, Iran has recently jammed the BBC's Persian television service in an effort to limit information about regional unrest. Furthermore, counterspace weapons are no longer the weapon of last resort in a geo-strategic conflict. Instead, they are

becoming tools that advanced nations and sub-regional powers alike are incorporating into conventional military doctrine. Even non-state actors have found utility in employing jammers and manipulating communications satellites. For instance, the Tamil Tigers in Sri Lanka have been accused of hijacking transponders on commercial communications satellites to broadcast propaganda, demonstrating a sophisticated understanding of space technology. Irregular warfare has come to space.

To respond to the proliferation of counterspace weapons, the United States is employing new ways to prevent and deter aggression against U.S. and allied space systems. In the contested space environment of today, we can no longer rely solely on the threat of retaliation to protect space systems from attack. We must expand our traditional concepts of deterrence. Accordingly, the National Security Space Strategy outlines the multilayered approach we will take to deter aggression. This approach includes several important initiatives.

First, we are assessing diplomatic initiatives such as the EU Code of Conduct to promote international norms of responsible behavior. These initiatives define how responsible space-faring nations are expected to conduct themselves and should over time discourage destabilizing acts that threaten the overall stability of the space domain. Nations willfully acting contrary to such norms can expect to be isolated as rogue actors.

Second, we can utilize alliances in space to serve the same deterrent function as basing troops in allied countries. They can ensure an attack on one is an attack on all. As with terrestrial defense alliances, partnerships in space also can add resilience and capabilities, without relinquishing the strategic advantage our systems provide. At their fullest, these partnerships could consist of completely interoperable systems in which costs, benefits, and risks are shared among trusted participants. For instance, Australia recently became a full partner in the Wideband Global Satellite Communications System (WGS), which directly supports warfighters. The cost-savings from our partnership with Australia allowed the Pentagon to procure an additional satellite for the WGS constellation. By sharing the benefits and risks of developing this system, we enhanced our operational capability and raised the cost of aggression against it.

Increasingly, we will want to operate in coalitions in space, just as we do in other domains. To achieve this, the department will examine all mission areas to identify where shared interests open the door to greater levels of cooperation. One way to foster greater cooperation is to transform the Joint Space Operations Center, which provides command and control for our space forces, into a Combined Space Operations Center run in concert with international partners. Such an arrangement will allow our partners to work side-by-side with U.S. commanders, improving our situational awareness while integrating a multilateral approach to day-to-day operations. Networking our space

operations center with those of our allies offers a further way to expand collaboration. But even as we increasingly work in partnerships, we will maintain some U.S.-only capabilities for our most sensitive national security missions.

Third, we need to make our space systems more resilient, and our combat power less reliant on their full functioning. This will help deny adversaries the benefit from an attack in space. Just as in the cyber domain, denying the benefit of attack in space can join retaliatory deterrence as a disincentive to adversaries. To maintain our combat power, we are learning how to operate in a degraded information environment. Training exercises where we disrupt space-based capabilities help our forces become proficient at operating with interference. To improve resiliency, we are developing technology to help us mitigate the loss or degradation of on-orbit systems. For instance, we now have ground, air, and naval-based platforms which can increasingly augment or replace space assets. The U.S. military is one of the few militaries today with the capability to operate in all domains on a global basis, and this ability provides a strategic advantage when space capabilities come under threat.

Responsive space capabilities which rapidly launch replacements can also play an important role in reconstituting functionality either during or after an attack. And broader partnerships with commercial firms which enable national security payloads to ride on commercial satellites will further improve our resiliency. Hosting military payloads on commercial spacecraft, as we are already doing with a missile warning sensor, is not only cost-effective, it also enables a more diverse, robust, and distributed set of space systems.

Finally, the United States views free access to space as a vital national interest. Consistent with our inherent right of self-defense, we will respond accordingly to attacks on it, at a time and place of our choosing—and not necessarily in space. Ultimately, deterrence must impact the decision-making of particular countries and leaders in specific scenarios. A multilayered approach to deterrence offers the greatest likelihood of encouraging restraint, and thereby protecting our vital space capabilities from attack.

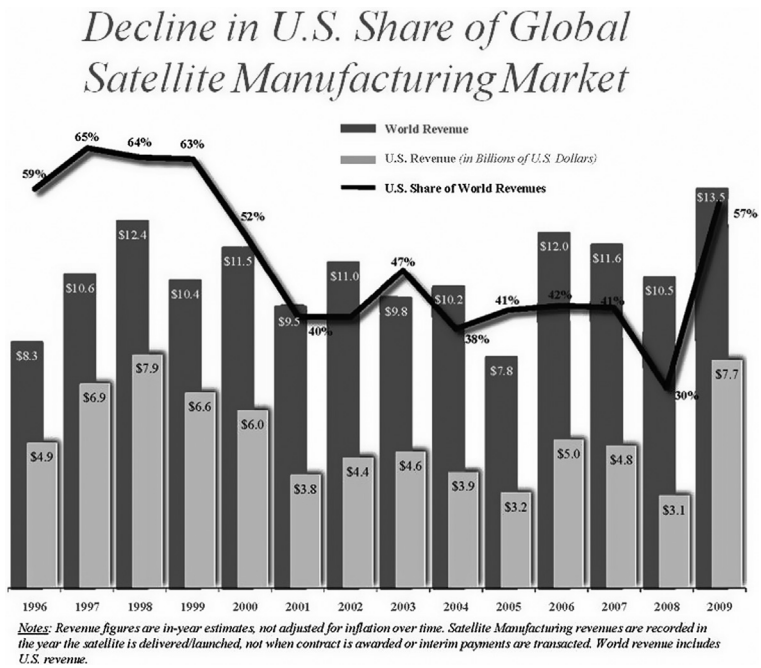
Competitive

Addressing the congested and contested environment is not the only challenge to maintaining our strategic advantage in space. Our nation's fiscal climate and the globalization of the aerospace industry also present new challenges. As noted, today there are more than 60 nations with satellites. Many of these nations have a national aerospace industry, presenting both challenges and opportunities for greater collaboration and partnership.

During the Cold War, the technological supremacy of the U.S. industrial base enabled the Pentagon and the Intelligence Community to field systems much more advanced than those of the Soviet Union. Although the United States continues to enjoy technological leadership, our share of satellite manufacturing has steadily declined since the end of the Cold War (Figure 2; note that 2009 appears to be an anomaly because of the unusually large number of spacecraft delivered to replenish commercial satellite fleets). As a result, advanced capabilities are more diffuse. For example, the precise navigation and timing data transmitted by the U.S. Air Force-operated Global Positioning System (GPS) is a capability that will soon be replicated by Europe's Galileo, Russia's Glonass, China's Beidou, Japan's Quasi Zenith, and India's Regional Navigation System. More broadly, space-enabled information and services that were once the exclusive province of the national security community are now available commercially. Satellite imagery distributed by companies like Google and satellite communications—such as phones and radio broadcasts—can be purchased globally. The U.S. technological lead is eroding in other areas as well, and without immediate intervention, the vitality of our space industrial base is at risk.

To ensure we maintain world-class space capabilities at affordable costs, the Pentagon must alter how it buys space systems. Our current approach of procuring one satellite at a time creates unpredictable demand, fostering a boom-

Figure 2: Source: Satellite Industry Association



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and-bust dynamic unhelpful to accumulating manufacturing and design expertise. So we are adopting a new approach to space acquisition meant to drive down costs and improve the stability of the space industrial base. Key tenets of this approach are block buys of satellites, fixed price contracting, stable investment in research and development, and a modified annual funding approach. The Pentagon plans to work with Congress to gain authority to implement this strategy for upcoming procurement of Advanced Extremely High Frequency (AEHF) communications satellites and Space-Based Infrared System (SBIRS) missile warning satellites. Our hope is that increasing the predictability of how we buy and manufacture space systems will yield both cost-savings and performance increases.

Change must also stretch beyond the Department of Defense, to the regulations that govern what our space industry is allowed to export. Presently, many items generally available on the global market for space commerce are prohibited from being sold by U.S. companies without government approval. Our current export policy puts us in a double bind. We are hurting our own space suppliers in the international market and are not really impeding states of concern from acquiring sensitive space technologies. To redress the current state of affairs, the administration is undertaking export control reform. The foundation of the new regime is to consolidate responsibility for export control into a single licensing agency, a single tiered list of controlled items, a single coordination center for enforcement, and a single, unified IT infrastructure. We recognize that controlling sensitive space exports remains a concern. So we are building "higher fences" around our most sensitive technologies, while de-listing those items whose export does not threaten our security.

The global spread of space technology in the last 20 years, and the related restructuring of our own space industry, is a development we can no longer ignore. The companies who manufacture our space systems are the source of innovation that has helped us maintain our leadership in space for more than half a century. To ensure their continued viability in the global market, we must change how we regulate the export of technology and how we buy space systems.

A New Type of Leadership

Space has fundamentally changed, and our national security strategy must change along with it. Today, our relationship to potential adversaries is very

different from our past stance toward the Soviet Union. Throughout the Cold War and for some years beyond, the United States focused almost exclusively on protecting the national security advantages we derived from space. We now must also worry about protecting both the domain itself and our industrial base. Our security depends on the integrity of both.

Our new National Security Space Strategy addresses the changing nature of space by building on our sources of strength at home, while continuing to lead the international community in pursuit of common objectives, including the sustainability, stability, and free access to space. Our success will increasingly be predicated on active U.S. leadership of alliance and coalition efforts in peacetime, crisis, and conflict. Strengthening our space posture will follow an approach that integrates all elements of national power, from technological prowess and industrial capacity to alliance building and diplomatic engagement.

Maintaining our ability to use space to influence the course of military and political situations will require many actions. We must reconsider what capabilities we develop, how to employ them, and what kind of partnerships to build into our systems. We must also ensure the stability of the space domain, expand how we protect space systems in a contested environment, and alter how we acquire space systems. The National Security Space Strategy builds on these tenets. But devising a strategy is only the first step. We must also execute it successfully.

Although space is central to our national security, the mechanisms in the Department of Defense that set priorities and oversee long-term planning have become diffused. Especially as we bring our policies, programs, and acquisition strategies into alignment around the elements I believe are essential to a new strategy, we need to manage space in a more effective manner. To provide the necessary leadership, we are revalidating the Secretary of the Air Force as the Executive Agent for Space. This administrative designation makes clear to everyone who is in charge. We have also established a Defense Space Council to coordinate space issues across the department. Our expectation is that better governance inside the department will lead to stronger capabilities, greater efficiencies, and a healthier space industrial base.

Given the dramatic changes we have witnessed in space, succeeding in the new space environment will depend as much on changing mindsets 50 years in the making as it will on altering longstanding institutional practices. The fundamental mission of the Department of Defense to deter war and to protect the security of our country stays the same. But how we use space capabilities to achieve this mission must change.

Notes

1. "U.S. National Security Space Strategy–Unclassified Summary," January 2011, http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf.
2. "National Space Policy of the United States of America," June 28, 2010, http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf.