# Ensuring a Stable Space Domain for the 21st Century

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For the past decade and a half, we have struggled to understand the meaning of space power, space superiority, and space dominance. Why is this? With a half century of space experience, why is it so challenging to understand these terms? What impact have these terms had on space activities? And as we increasingly depend upon orbiting spacecraft for national security and global prosperity, how can we help ensure stability for the space domain?

These fundamental questions came to the fore during our work on the Quadrennial Defense Review (QDR). During the QDR, we observed the different views and priorities advocated by the various communities who have equities in space. To help come to terms with these questions and views, we asked the National Defense University to craft a space power theory that would be comparable to the theories that exist for other domains, for example, sea power.

This is not the first time the U.S. Government has commissioned a space power theory study. The first study was chartered in the late 1990s, soon after the Air Force transitioned its doctrinal lexicon from roles, missions, and functions to one described by core competencies. That transition has taken us on a long journey, one in which we have struggled to understand what space power and space superiority—within the boundaries established by the Outer Space Treaty—mean for our nation.

To help guide the contemporary work on a space power theory, we asked the study to focus on the underlying assumptions regarding why and how we as a society, nation, and military might use space to accomplish specific ends. We asked for a theory that addresses space power across the broad range of objectives that any space-faring state or nonstate actor may want to pursue and that explains the role of space in advancing national security objectives. And we asked for a theoretical framework to help judge the logic, significance, balance, and implications of space activities. Four questions guided this work:

- What constitutes space power?
- Is there a common set of principles that can be woven into a single space power theory?
- What makes space power "strategic"?
- What kinds of national strategies presume or require preeminence in space?

## What Is Space Power?

Using the term *space power* assumes that there is such a thing. As with the concepts of space superiority and space dominance, belief that space power is worthy of definition and exploration is a product of the Air Force's doctrinal shift to core competencies. This doctrinal shift applied new labels to space activities without providing any accompanying substantive definitions, principles, or philosophical underpinnings. At the outset, this change generated intense debates over whether the Air Force would speak in terms of *aerospace* versus *air and space* and *aerospace power* versus *air and space power*.

This emergence and use of terms that lack definition or common understanding among space practitioners are very different from the manner in which key airpower concepts emerged. Guilio Douhet, an early airpower theorist and believer in total war strategies, was an early proponent of transitioning aircraft from intelligence platforms to offensive military platforms, most notably for strategic bombing. In the early years of flight, Douhet articulated a theory that airpower would be the lynchpin in achieving victory. Accomplishing Douhet's vision would take several decades, but it was fully realized when the Allies leveled cities to break the will of the Axis powers in World War II. Douhet's theory—articulated in advance of the use of the term *airpower*—has stayed with us to this day.

Douhet proposed new ways to employ aircraft—that is, a theory for airpower—not many years after the Wright brothers' flight.

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But the same progress has not been achieved for space. Fifteen years after the introduction of the terms *space power*, *space superiority*, and *space dominance*, we find ourselves asking: If the concept of space power is important for our nation, why do we still encounter such difficulty defining or explaining it? We have been a space-faring nation for 50 years, yet we find ourselves reengaging on first principles, many of which were established long ago by the Outer Space Treaty and our National Space Policies. Why? We can find the answers by looking back 50 years to how we began our space journey.

### The 20th-century Space Domain

In 1962, Dave Garroway was the host of the *Today Show*. Day after day, he conducted a futile experiment in which he tried to obtain a television signal from London. Each time, the audience would see only static on their television screens. That was about to change. On July 10, 1962, the first television picture was relayed from Earth to space and back again. I will never forget seeing that first successful space transmission on our black and white television set; it showed an American flag waving in front of the Earth Station in Andover, Maine. This revolutionary transmission was made possible by the National Aeronautics and Space Administration (NASA) launch of the AT&T Telstar satellite, the world's first active communications satellite.

The idea of an active satellite, one that did not simply reflect signals but actually amplified and retransmitted them, was conceived by Arthur C. Clarke in 1945. In 1955, Bell Telephone Laboratories sketched the possibilities for satellite communications in a scientific paper. Researchers at Bell designed Telstar to be a 34.5-inch, 170-pound satellite that fit inside NASA's Delta rocket.

Telstar was launched on the morning of July 10, and that evening, AT&T president Fred Kappel picked up a phone in Andover and placed a call. Vice President Lyndon Johnson in Washington, DC, answered that first-ever call transmitted through space. Within 30 minutes, Telstar produced several other firsts: transmitting faxes, high-speed data, and both live and taped television. Remarkable—all in one day.

These first uses of a space system for communications missions allowed us to overcome the challenges of transmitting signals over great distances. Although expensive, these successes proved that space systems are an effective means for transmitting information that otherwise could not be shared.

At the same time, and unknown to all but a few, the United States was building a series of satellites to obtain Earth images. Washington and Moscow were embroiled in the Cold War, the Soviet Union had refused to agree to the 1955 U.S. "Open Skies" proposal for aircraft overflight in the use of reconnaissance, and the two powers were in the early stages of negotiating guidelines for space activities.

The United States instituted high-altitude reconnaissance flights over the Soviet Union to gain insight into its sensitive operations. To keep the military profile low, the Central Intelligence Agency took the lead for U–2 reconnaissance missions. By 1960, the United States had flown numerous missions over and around the Soviet Union, which the Soviets viewed as an infringement of their sovereign rights.

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At the same time, freedom in space was an open legal issue. Although the Soviets were the first to orbit an artificial satellite and had essentially confirmed the right of free passage, they viewed imagery satellites in the same vein as the U–2 flights: using satellites to spy was an unacceptable infringement of sovereign rights. To protect the U.S. satellite-based imagery programs and avoid diplomatic challenges, America concealed its emerging capabilities until they were accepted under arms control agreements.

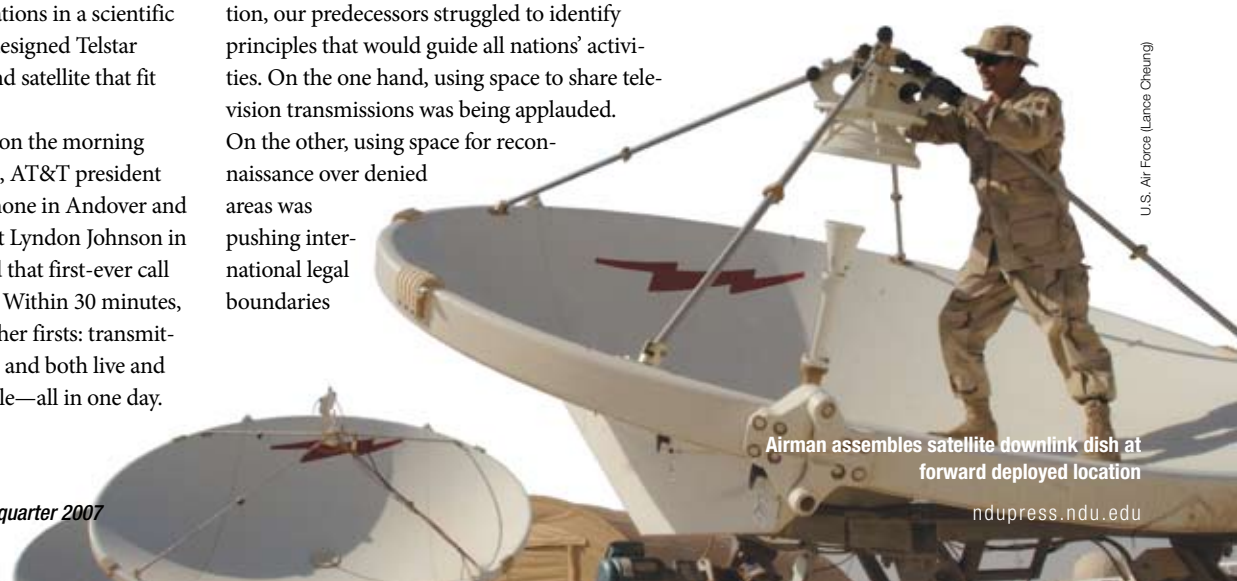
During these early days of space exploitation, our predecessors struggled to identify principles that would guide all nations' activities. On the one hand, using space to share television transmissions was being applauded. On the other, using space for reconnaissance over denied areas was pushing international legal boundaries and encouraging the concealment of technological advances.

As technical applications moved ahead, the Western powers made a series of proposals between 1959 and 1962 to bar the use of outer space for military purposes. Their plans included provisions to ban the orbiting and stationing in outer space of weapons of mass destruction. Addressing the United Nations General Assembly on September 22, 1960, President Dwight Eisenhower proposed that the principles of the Antarctic Treaty be applied to outer space. Soviet plans for general and complete disarmament between 1960 and 1962 also included provisions for ensuring the peaceful use of outer space.

After reaching agreement to ban nuclear weapons, limit military activities, and not position military bases on celestial bodies, the powers moved the General Assembly to commend the Outer Space Treaty. The treaty was opened for signature on January 27, 1967, and on April 25, the U.S. Senate gave unanimous consent to its ratification. The treaty entered into force on October 10, 1967.

This treaty established international principles for the use of space and, similar to the Antarctic Treaty, sought to prevent a new form of competition aimed at dominating outer space. Key principles included recognition that:

- space is the province of all mankind—a "global commons"
- space is to be used for peaceful purposes
- all states have an equal right to explore and use space
- international cooperation and consultation are essential
- signatories retain ownership of their space objects and bear responsibility for their space activities, including any damage inflicted on another state's space objects.



U.S. Air Force (Lance Cheung)

Airman assembles satellite downlink dish at forward deployed location

Building upon international standards such as these, the strategic principles, goals, and guidelines that the United States follows are captured in today's National Space Policy. This policy emphasizes the importance of preserving freedom of action in space, enabling unhindered operations in space, providing intelligence collection and analysis to support space situational awareness, and minimizing the creation of orbital debris—preserving the space environment.

The principles established by the Outer Space Treaty and our National Space Policies have helped guide all U.S. space activities, whether for civil, commercial, or national security purposes. We have collectively established the principle of unhindered access, at least in theory. Until the last several years, we had only to be concerned about our ability to use space in the event of nuclear war. Now things are different.

### The 21st-century Space Domain

Today, many of the technological advances of those early years—for example, communications, navigation, and electro-optical imagery—have moved into the commercial and military sectors for widespread use. The employment of space is orders of magnitude more significant than during those formative years, yet the challenges to freely operating there have never been greater.

Counterspace capabilities to deny space services or attack on-orbit spacecraft are more prevalent than they have ever been. Examples include the proliferation of satellite jamming capabilities and the reemergence of antisatellite capabilities.

It is important to note that counterspace capabilities that are designed to deny the use of on-orbit space systems have second-, third-, and fourth-order effects that cannot be completely anticipated. As we saw in January 2007, using kinetics to eliminate satellites creates debris clouds that pose dangers to other spacecraft.

Kinetic destruction of spacecraft has similarities to ballistic missile attacks. Because of the short flight times—30 minutes for intercontinental ballistic missiles and 10 minutes for direct ascent antisatellites—each creates the potential for uncontrolled escalation and miscalculation. Knowing this, the nuclear nations owning these capabilities put in place many technological, operational, and diplomatic steps to avoid ever getting to the point where they would be used. Space attack systems present similar challenges: space systems are fragile, and kinetic attacks against them increase the hostility of the domain as well as the potential for miscalculation.

The space domain and the international landscape we are examining today are in many ways similar to what our predecessors struggled to define. The concerns are much alike, but in today's world, we find ourselves dealing with the effects of decades of technological advancement that could be applied to deny the peaceful use of space.

When comparing the past to the present, in addition to recognizing the proliferation of space attack capabilities, we must also ask: How valid is our 15-year use of a lexicon that we borrowed from the air domain? That is, how valid is it to apply air terminology to space? Is it appropriate to think about space much like we think about the land, sea, or air, or should we revert to the model President Eisenhower provided in the 1960s? Are there useful parallels between air- or sea power and space power, or are these parallels misleading and misguided?

The concept of airpower includes air superiority, where others can fly only if allowed. A similar concept applies for sea power, where we operate with impunity on and under the sea. But do these concepts apply to space? It seems doubtful. At face value, space power sounds as if it implies projecting power through space. This interpretation comes from directly transferring airpower terminology to the space domain. However, that is neither how we use space nor how we envision using it. In addition, obtaining space superiority would be far more difficult, complex, technically challenging, and costly than we can foresee. Two examples illustrate this point.

Consider the key benefit that space offers, whether it is of the early Telstar communications satellite type, intelligence-gathering spacecraft, or some other capability. We use space to deliver information. The advantage of space lies in how it enables us to quickly obtain and transfer information over long distances—whether it is to obtain precise knowledge of location, receive communications from another point on the Earth, or look at a picture of a hurricane taken by a satellite. It is all about the timely receipt of information.

Air superiority gives access to denied areas, allows military forces to move safely, and provides for the use of force delivered by air platforms. If we were to achieve a level of space superiority similar to that of air or sea superiority, we would be talking about denying others access to information—information such as time and location or the trade, financial, and business transactions and processes that occur everyday. Using other means to communicate or navigate would be difficult, more expensive, and less effective than continuing to use the advantages of space systems.

A second example of the complexity of space power is illustrated by the fact that once spacecraft are on orbit, attempting to deny those capabilities can ultimately harm one's own space systems. Antisatellite capabilities such as those recently tested by China create fratricide threats to everyone's satellite systems. Relating this threat to the seas, instead of having a destroyed ship sink to the bottom of the ocean, it becomes thousands of mines that spread to the surface and subsurface of all the oceans. That is a complicating factor when trying to deny the use of space; it increases the risk to many satellites that are being used for many purposes. Additionally, direct attacks on space systems may be the least effective means to deny others the use of space. We have long known that the best way to deny space use is to eliminate capabilities while they

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NASA Kennedy Space Center

**Telstar 1 satellite launched by Thor Delta rocket**

are still on land—which, of course, is an issue for land, sea, or air forces to address.

In any attempt to draw parallels between dissimilar domains, we are immediately faced with such challenges. We quickly find that we cannot draw upon our historical experiences with land, sea, and air to craft a space power theory.

## Restabilizing Space

Getting back to the question of space power, why are we where we are? Air proponents defined airpower within a couple of decades of the Wright brothers' flight, so why are we still struggling to define space power? We appear to be in the midst of a transition from the global commons principles of the 20th century to a new set of principles in which technology will once again transform a domain unless we take action.

Douhet was driven to articulate a vision for airpower that was a product of the technological innovation and competition that was taking place at the time. During the 20th century, the Outer Space Treaty defined the principles for space. The domain was stabilized by widespread acceptance of those principles and also by the fact that the space-faring nations turned away from capabilities that would put space systems and the space domain in jeopardy. In that stabilized domain, we did not need a concept for space power. The question "What is space power?" was not relevant.

Where will we be in 10 or 20 years? By then, the United States will have recapitalized key space capabilities, and potential adversaries may well have honed their space attack capabilities. We may face adversaries with broad offensive capabilities that would affect our space systems. Some nations are already well along the path to realizing both destructive and service denial capabilities that could be used under a variety of circumstances.

For this future time period, we must think in terms of a peer competitor who has robust space capabilities—including attack capabilities—along with the intent to use them. We must confront the possibility of facing competitors who, if we choose to challenge their ability to pursue their objectives, are capable of creating a highly complex environment in space in which some of our capabilities are degraded and others are held at risk. This situation puts all space capabilities—and national capabilities and interests—under great stress. With all this in mind, what theoretical foundations, principles, and strategies can we put forward to best deal with this environment?

By way of offering a point of departure on this subject, we should first underscore the common use principle and add to that a central precept, the concept of a stabilizing protection strategy. This proposition takes us back to the understanding that was apparent in the 1960s when the Western powers and the Soviet Union recognized the value that emerging space technologies could provide in a domain that is available to all.

Developing a space protection strategy that accounts for all of this—the principles established by treaties and policies and the now destabilized space domain—requires us to define what we want to protect and why. Before jumping immediately to technical solutions, we need to think in terms of the domain, the principles of that domain, and the philosophical underpinnings of our protection strategy.

When we understand the domain and its challenges, our protection strategy should be as stabilizing as possible. It should therefore:

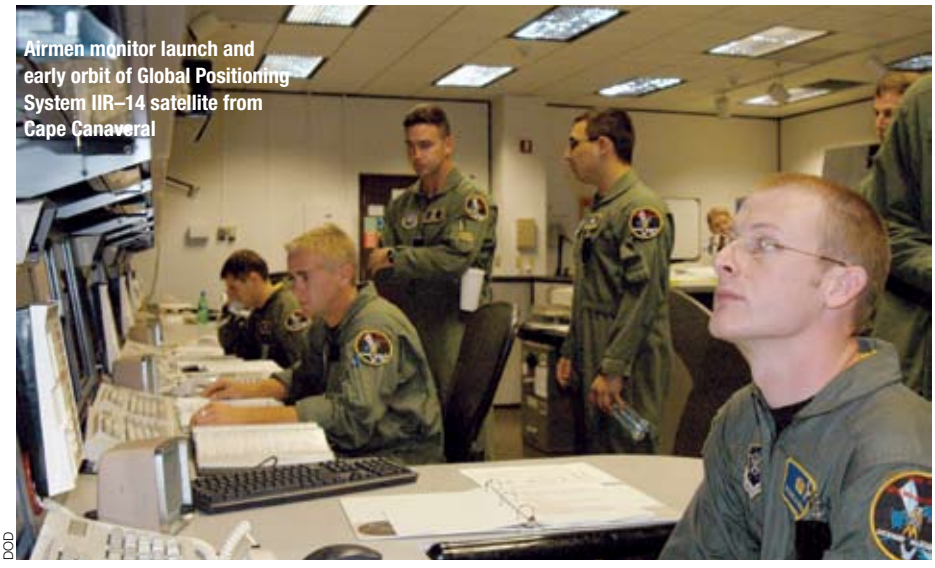
- focus on escalation control and transparency
- incentivize nations to avoid actions that are inherently destabilizing and cannot be reversed
- include an architecture based on defense in-depth—a layered defense—to ensure the availability of key services
- reduce adversaries' incentive and ability to target space capabilities
- create uncertainty with respect to the consequences of an adversary's action
- increase warning time to enable both strategic and operational level actions.

The philosophical underpinnings of this protection strategy are consistent with the first principles that were established by the Outer Space Treaty and our National Space Policy. They may also help us stay in a stabilized domain and judge the logic, significance, balance, implications, and priorities for our space activities.

As we go forward, exploring and developing space protection concepts will put us in a better position to understand the proper scope of space power. If we accept the proposition that space power is founded on the common use precept and advanced by establishing a stabilizing protection strategy, then we must think long and hard about whether offensive capabilities fit with this proposition or what, in fact, *offensive* means.

Early contributors to theoretical constructs for outer space sought to prevent competition and national efforts to dominate the space domain. Today, through proliferation of space attack capabilities, the debate over space power has once again become important. The challenge for today's space theorists is now very much like that of our early space pioneers as they grappled with the principles that led to the Outer Space Treaty. We are seeking to create a secure and stable space domain so all who so choose are free to exploit its advantages. **JFQ**

*This article was prepared with the efforts of Cynthia A.S. McKinley, Special Assistant for Space and Intelligence to the Deputy Under Secretary of Defense for Intelligence (Preparation and Warning).*



Airmen monitor launch and early orbit of Global Positioning System IIR–14 satellite from Cape Canaveral

DOD