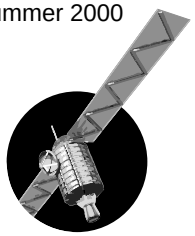

# Protecting Global Utilities

## Safeguarding the Next Millennium's Space-Based Public Services

LT GEN BRUCE CARLSON, USAF

*Global Utilities: Civil, military, or commercial systems—some or all of which are based in space—that provide communication, environmental, position, image, location, timing, or other vital technical services or data to global users.*

INVISIBLE LINES OF satellite information are rapidly supplementing the sealanes, roads, and cables of today and yesterday. Television, voice, weather, images, location, and other data stream down to Earth from satellites orbiting above—all of which are operated by military, civil, or commercial entities. These satellites perform functions similar to those of terrestrial public utilities, providing needed goods and services. Unlike their earthbound counterparts, which service only a neighborhood or city, these utilities are used on almost every continent by billions of people and may thus be appropriately labeled "global utilities." They are critically important to the national security, economies, and safety of the user nations. In May 1998, 40–45 million pager subscribers lost service; some ATM and credit card machines could not process transactions; news bureaus could not transmit information; and many areas lost television service—all because of the loss of *one* satellite.[1] Over the past years, the reliance on satellites for all types of global utilities has increased, and future loss of any of these satellites, whether through operator error or subversion, would have drastic implications.

Satellite services are invaluable to the United States and its allies. The use of space is one of this country's greatest strengths, but extensive reliance on global utilities also represents a substantial liability. Currently no physical system exists for protecting these global utilities. We can bring to bear economic, political, and other multilateral pressures on an offending nation or group, and we are party to treaties and agreements that prohibit certain activities—these have worked well in the past. But what if the threat comes from nongovernment organizations, terrorist groups, or an adversarial nation? Or what if we are unable to identify the sources of the offense? Treaties and sanctions may not prove so effective. We will need some other source of protection.

Because of the critical nature of these services, they should not be left without some form of security or escort. We provide protection for other potentially vulnerable goods and services traversing the seas or land. Specifically, the Navy has the ability and duty to escort and protect domestic and allied vessels through hostile seas, and the Army aids in disaster or famine relief in some countries and secures transit lines during some operations. But we provide space-based utilities no such security or assurance of safe passage or operation.

International laws and treaties—such as the various United Nations treaties—permit free travel in space, but history has demonstrated that international laws protecting the open seas can mean very little in a conflict. It

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is likely that in some future battle, space will become a battleground, as have all other mediums in the past. Yet, satellite systems[2] of the United States and its allies are, for the most part, unprotected on the open seas of space. Unfortunately, we have no method of protecting them from attack. The argument presented here is that protecting global utilities is a natural extension of the Air Force mission to protect other high-value airborne assets; it is also an extension of the Department of Defense's (DOD) protection of all friendly assets.

## Why Protect Global Utilities?

Utilities provided by satellites are numerous and varied (fig. 1). New commercial remote-imaging and communications satellites are being launched at an increasing pace. World reliance on satellite utilities increases every day and no doubt will continue to do so, with most projections indicating growth in communications satellites and a tripling of the number of satellites in service (fig. 2).

Let us consider one of the most important global utilities—the Global Positioning System (GPS). Although GPS provides precise positions for military, civil, and commercial purposes worldwide, it may be even more important as the "global clock." Users everywhere rely on GPS as a means of "time transfer" to clock a multitude of products precisely, from communications circuits to bank transactions—all to within a few billionths of a second. To see how important this is, consider what happened when a real error occurred in 1996. A satellite controller at the Air Force's GPS control center accidentally put the wrong time into just one of GPS's 24 satellites. The erroneous time was broadcast for only six seconds before automatic systems detected it and shut the satellite signal down. Nonetheless, over one hundred of the more than eight hundred cellular telephone networks on the US East Coast—which rely on precise GPS-provided timing—failed. Some took hours and even days to recover. GPS di-

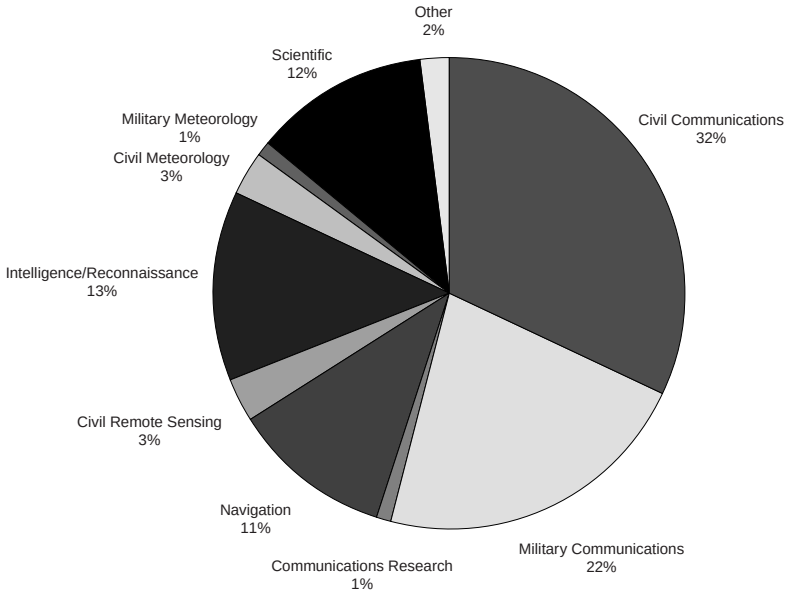


**Figure 1. Satellites by Mission (1996)**

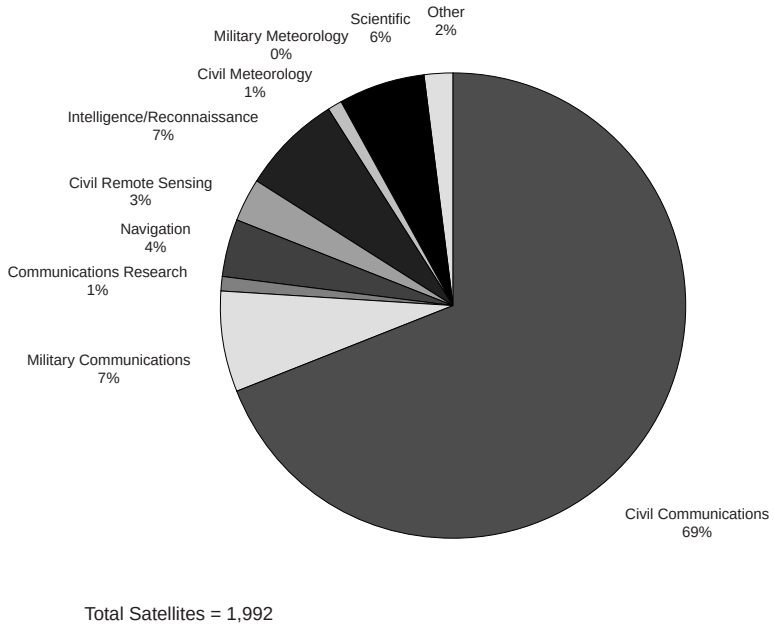


**Figure 2. Satellites by Mission (2010)**

rectly produces several tens of billions of dollars in revenue for the United States yearly. Indirectly, it produces many times this amount, so the economic implications are tremendous.

This kind of dependence on global utilities continues to grow. Almost two thousand satellites may provide service to the billions of people on Earth by 2010 (fig. 2), and none of them will have protection from an attack. We must develop a security system to ensure continued operation of these critical global utilities. Doctors depend on communications satellites to tell them if a patient is sick or if a donor organ is ready. Meteorologists rely on weather images from space. Banking and investing organizations count on real-time quotes and instantaneous transactions provided by satellites. War fighters, airline pilots, and others depend on GPS to tell them where they are and what time it is. Missiles rely on targeting information provided by satellites. These end users could find themselves without service due to an attack, and a lack of such service could result in casualties, political instability, or a risk to security.

## Who Should Protect Global Utilities?

Many, if not most, current global utilities, such as GPS and the Internet, with its global communications links, arose from DOD and US Air Force developments. More than likely, DOD—specifically, the Air Force—will build the initial increments and systems of new global utilities.

It seems self-evident that these utilities should receive protection. The larger question is, Who will provide it? The answers vary—from commercial sources, the US military, a multinational defense network, and so forth. Moreover, some people believe that there should be no organized protection system—that the operators should provide for the safe operation of their own satellites. They also believe that owner-based protection would remove the need for a military presence in space and, in turn, would preclude

the militarization of space. But this idea—analogous to asking car owners to build their own roads—is a nonstarter. The redundancy, costs, and efficiency of this framework make it the worst possible scenario. Every satellite manufacturer would have to create both a space-based defense system and a ground-segment security system, but no satellite manufacturer or operator currently has the financial resources or impetus to do that.

For the near future, a commercial protection system—along the lines of security services for buildings—seems highly improbable. Commercial satellite operators or a commercial security service would not likely invest in developing, building, launching, and maintaining a fleet of security satellites. Perhaps this might prove feasible further down the road, when launch costs decrease, technology becomes less expensive, and operators believe in the threat to their systems. Gen Richard Myers, commander in chief of US Space Command, echoed this mentality:

> Industry seems comforted by a number of assumptions and perceptions. First, space is seen as a peaceful medium—an international sanctuary for generating revenue. Accordingly, industry sees no threats on the horizon. In other words, they see neither the capability nor the intent to threaten their assets. Industry's imperative is, of course, to exploit space for profit. Therefore, given the perceived lack of threat, they see no business case for protection. Indeed, industry assumes the multinational aspect of space provides its own protection—sort of virtual neutrality enhancing the financial bottom line.[3]

Industry may realize, too late, that space offers no such sanctuary from attack.

A multinational security force is no more probable than a commercial one. Such an operation would involve civil and military space administrations from participating countries. Cost-sharing experiences with the International Space Station illustrate the advantages and disadvantages of using a multinational framework to mitigate costs. Countries like France, Japan, and Russia would have the most interest in conducting such an operation with the United States. Unfortunately, however, Russia's space-program budget is almost nonexistent, and the entire Japanese space-program budget is only a small fraction of what our National Aeronautics and Space Administration annually receives. Fiscally, then, this scenario places a larger burden on the United States and France, even though poorer partners would receive an equal amount of protection. Aside from the economic issues, security issues enter the picture. It is highly unlikely that these nations will reveal what technology they use on their current satellites or the function of those satellites. Furthermore, they are not likely to share proprietary technologies during the development of a security system. Thus, the scenario appears dead on arrival.

Having the Air Force assume responsibility for global satellite protection as an extension of its existing space-control responsibilities seems the most feasible option. Since the Air Force is tasked with controlling space,[4] placing global utilities under the protective umbrella of space control would be a matter of policy—not an expansion of technology or costs. The program description for the protection aspect of space control seems to make the point clearly: "Protection includes active and passive defensive activities to protect U.S. *and friendly* space-systems assets, resources, and operations from enemy attempts to negate or interfere" (emphasis added).[5] Global utilities, domestic or foreign, are vital to the United States, so it seems clear that the Air Force's task to protect US space capabilities includes all global utilities used by this country.

One should also note that although it is imperative for the United States to protect utilities, regulation—or even preventing an adversary or hostile state from using space services—could become an effective option to prevent conflict. Just as naval blockades form an essential part of our current diplomatic and economic sanctions to prevent war, blocking or preventing hostile groups from accessing space-based global utilities will become an increasingly formidable national se-

curity tool for the nation or nations with this ability. It is essential that the United States have this capability.

## Where Should We Place the Protection?

Maj Alexander P. de Seversky stated that "only air power can defeat air power."[6] Thus, it follows that only space power can defeat certain space-based threats. Certain threats can be effectively and economically countered from the ground, while other threats require a timely response and capabilities afforded only by space-based operations. For example, a direct-ascent nuclear attack on a satellite would require a very quick and deadly response, meaning that we will need a space-based system to protect global utilities in the direst situations. Without space-based capabilities in these situations, we may experience partial to total loss of global utilities—not to mention national security satellites. We cannot absorb a loss of this magnitude.

Active protection systems that could counter space-based threats range from space-based lasers, to kinetic-energy antisatellite weapons, to co-orbital "bodyguard" satellites. Passive-protection systems in space and on the ground will also augment other space-based capabilities. Those ground-based measures range from increased ground-station security to antijamming technologies.

Having a space-based presence provides quicker response time, a visible deterrent, and force-projection capability. Ground-based systems can protect only in their given theater, and they offer no force-projection capability. The presence of protective systems in space, however, will show an adversary that an attack on a space system of US interest will meet with a direct response—and hopefully deter the adversary from acting in the first place. We can best defeat an adversary's ability to attack global utilities with little or no warning by using in-theater space-based systems that can quickly respond to a threat. Space-based global-utility protection is the only option for effective security.

The key to space-based global-utility protection is the ability to access space swiftly and affordably and to reach any point in space with ease. The Air Force's start in developing reusable "space planes" and "microsatellites" plays an integral role in this capability. These programs could be ready for deployment later in the first decade of the twenty-first century. We must give them the highest priority.

## Conclusions

The best time to enunciate a global-utility protection plan is now. The long lead time needed to implement a comprehensive protection system necessitates immediate action in order to anticipate the increasing threat level. Our increasing reliance on satellites adds to their vulnerability as potential targets, so we have no excuse for leaving them unprotected.

We know what global utilities are, why we should protect them, who should protect them, where we should locate the protection, and when we should start protecting them. Global utilities are indispensable. Any loss of a utility and the ability to use space freely would have an enormous impact on society, the economy, and national security. The Air Force must step up now to meet this critical national security issue. □

**Notes**

1. The *Galaxy 4* satellite, owned by PanAmSat, lost attitude control on 19 May 1998.
2. A satellite system is defined as the terrestrial and space components necessary for a satellite to operate and perform its functions.
3. Gen Richard B. Myers, remarks to US Space Foundation, Colorado Springs, Colo., 7 April 1999.
4. Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, 23 August 1998, 7–13.
5. Space-Control Technology Research, Development, Test, and Evaluation (RDT&E) Budget Item Justification Sheet, February 1999.
6. Alexander P. de Seversky, *Victory through Air Power* (New York: Simon & Schuster, 1942), 24.